添付資料４

KCPE 試験問題
2015 年、2016 年、2017 年

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THE KENYA NATIONAL EXAMINATIONS COUNCIL

KCPE 2015

5074215

SCIENCE

Time: 1 hour 40 minutes

READ THESE INSTRUCTIONS CAREFULLY

1. You have been given this question booklet and a separate answer sheet. The question booklet contains 50 questions.
2. Do any necessary rough work in this booklet.
3. When you have chosen your answer, mark it on the **ANSWER SHEET**, not in this question booklet.

HOW TO USE THE ANSWER SHEET

4. Use an ordinary pencil.
5. Make sure you have written on the answer sheet:

   YOUR INDEX NUMBER
   YOUR NAME
   NAME OF YOUR SCHOOL

6. By drawing a **dark line** inside the correct numbered boxes, mark your full Index Number (i.e. School Code Number and the three-figure Candidate's Number) in the grid near the top of the answer sheet.
7. Do not make any marks outside the boxes.
8. Keep the sheet as clean as possible and do not fold it.
9. For each of the questions 1 – 50, four answers are given. The answers are lettered A, B, C and D. In each case only **ONE** of the four answers is correct. Choose the correct answer.
10. On the answer sheet the correct answer is to be shown by drawing a **dark line** inside the box in which the letter you have chosen is written.

    Example:

    In the Question Booklet:

    4. Some curative drugs are also called
    A. painkillers
    B. vaccines
    C. stimulants
    D. antibiotics

    The correct answer is "D"

    On the answer sheet:

    4 [A] [B] [C] ~~[D]~~ 32 [A] [B] [C] [D] 33 [A] [B] [C] [D] 34 [A] [B] [C] [D] 35 [A] [B] [C] [D]

    In the set of boxes numbered **4**, the box with the letter D printed in it is marked.

11. Your **dark line MUST** be within the box.
12. For each question **ONLY ONE** box is to be marked in each set of four boxes.

This question paper consists of 7 printed pages.

1. The main function of the hair and mucus found in the breathing system is to
A. help in exchange of gases
B. clean the air
C. protect the nose
D. keep the trachea open.

2. The following are characteristics of a certain type of tooth:
(i) sharp
(ii) chisel shaped
(iii) has one root

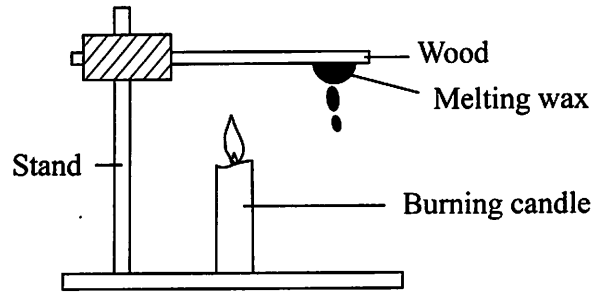
The type of tooth described is a
A. molar
B. canine
C. premolar
D. incisor.

3. Which one of the following pairs of diseases is **correctly** matched with the time of immunization?

	Six weeks	**Nine months**
A	Hepatitis B	Yellow fever.
B	Measles	Tuberculosis.
C	Diphtheria	Pertussis.
D	Polio	Tetanus.

4. Which is the **last** stage in energy transformation when a kerosene stove is burning?
A. Chemical.
B. Heat.
C. Light.
D. Sound.

5. The diagram below represents a set-up that can be used to demonstrate a certain aspect of heat energy.

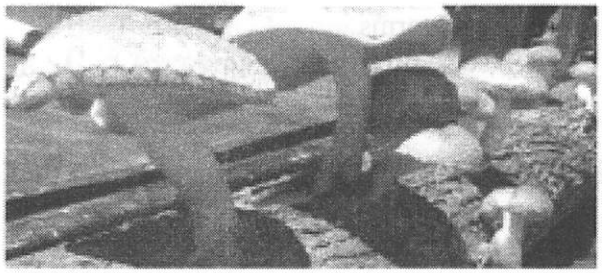


The aspect that can be demonstrated is
A. radiation and convection
B. expansion and conduction
C. convection and conduction
D. expansion and radiation.

6. Which one of the following is a compound fertilizer?
A. Muriate of potash
B. Triple Super Phosphate
C. Sulphate of Ammonia
D. Mono Ammonium phosphate

7. Which one of the following statements is **correct** about the digestive system?
A. Oesophagus makes it easy for food absorption.
B. Stomach mixes food with digestive juices.
C. Digestion of food occurs in the large intestine.
D. Water is absorbed in the small intestine.

8. The picture below represents a type of interdependence between plants.



The type of interdependence represented is
A. support
B. shade
C. habitat
D. shelter.

9. A pupil used water that had been used in rinsing clothes to mop the floor. Which method of water conservation did the pupil practice?
A. Re-using water.
B. Using water sparingly.
C. Recycling water.
D. Water harvesting.

10. The importance of fibre in the human diet is to help in the
A. digestion of food
B. movement of food
C. absorption of water
D. absorption of nutrients.

11. The following are characteristics of a certain animal:
(i) lays eggs
(ii) has constant temperature
(iii) has a hairy body

The animal is likely to be
A. ostrich
B. spiny anteater
C. whale
D. bat.

12. The picture below shows a tomato plant with a sign of crop disease.

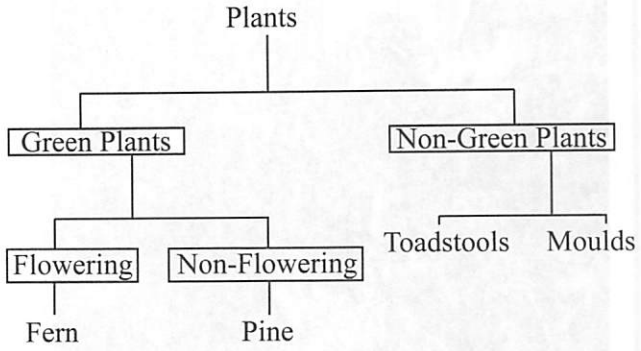
The sign shown is
A. leaf curling
B. spots
C. streaks
D. wilting.

13. Which one of the following components of air is **correctly** matched to its percentage?

	Oxygen	**Inert gases**
A.	21	78
B.	0.97	0.03
C.	21	0.97
D.	0.03	78

14. Which one of the following is a social effect of drug abuse?
A. Truancy.
B. Fits.
C. Withdrawal.
D. Addiction.

15. The chart below represents a simple classification of plants.



Which one of the following plants is **not** correctly classified?

A. Moulds.
B. Pine.
C. Toadstool.
D. Fern.

16. A child has the following signs and symptoms:

(i) gets out of breath
(ii) pale skin
(iii) dizziness.

Which one of the following foods should the child feed on?

A. Yams and cassava.
B. Beans and maize.
C. Kidney and spinach.
D. Carrots and pineapples.

17. Which one of the following materials is **non magnetic**?

A. Copper wire.
B. Steel wool.
C. Office pin.
D. Razor blade.

18. Which one of the following statements is **correct** about proper use and storage of medicine?

A. Sharing medicine with family members.
B. Labelling medicine containers.
C. Keeping medicine in a well lit place.
D. Storing medicine in sealed water bottles.

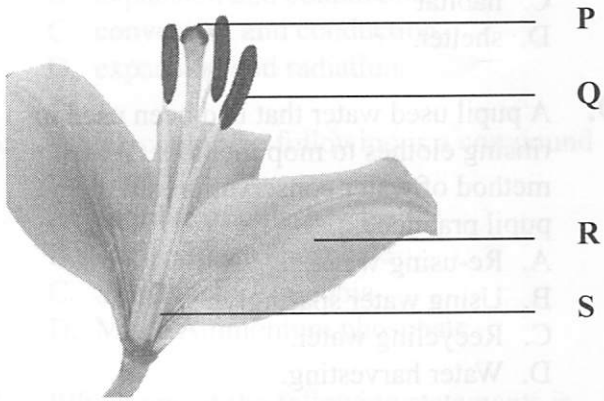
19. Anaemia and irritation in livestock can be a sign of attack by

A. liverflukes
B. tapeworms
C. tsetse flies
D. round worms.

20. Which of the following body fluids is the **least** likely to transmit HIV?

A. Breast milk.
B. Semen.
C. Vaginal secretions.
D. Saliva.

21. The picture below shows parts of a flower.



The parts labeled **P, Q, R** and **S** are

	P	Q	R	S
A.	Anther	Stigma	Sepal	Ovary
B.	Style	Filament	Petal	Ovule
C.	Stigma	Anther	Petal	Ovary
D.	Filament	Style	Sepal	Ovule

22. Which one of the following physical changes observed in boys and girls during adolescence is **not correctly** matched?

	Boys	Girls
A.	Voice breaks	Pubic hair grows
B.	Wet dreams	Hips broaden
C.	Pimples on face	Chest broadens
D.	Pubic hair grows	Pimples on face

23. Which one of the following livestock parasite control measures can be applied for **both** ticks and tapeworms?

A. Rotational grazing.
B. Dipping.
C. Deworming.
D. Spraying.

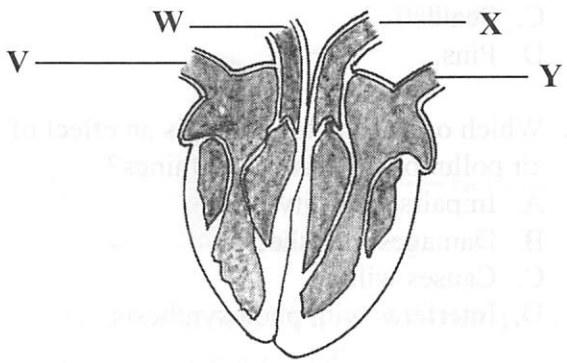
24. Which one of the following methods will **mainly** conserve soil and **not** water?
A. Mulching.
B. Terracing.
C. Cover crops.
D. Gabions.

25. In a certain activity, a sample of soil was mixed with water in a transparent container, shaken and allowed to settle. This was to investigate soil
A. drainage
B. fertility
C. composition
D. capillarity.

26. The most effective control measure against HIV transmission from mother to child is
A. public awareness on HIV/AIDS
B. voluntary counselling and testing
C. mass education
D. campaign through various media.

27. The surrounding of an organism is described as its
A. environment
B. home
C. shelter
D. habitat.

28. The diagram below shows parts of the human heart.



Blood from the legs enters the heart through the blood vessel labelled
A. V
B. W
C. X
D. Y

29. Which one of the following is the most commonly abused drug in Kenya?
A. Khat.
B. Glue.
C. Tobacco.
D. Alcohol.

30. The following materials can be used to construct a certain weather instrument:
(i) small plastic bottle
(ii) large plastic bottle
(iii) manila paper
(iv) cello tape.

The weather instrument likely to be constructed is
A. air thermometer
B. wind vane
C. rain gauge
D. liquid thermometer.

31. Which one of the following uses of water is **not** practised on the farm?
A. Mixing chemicals.
B. Washing toilet.
C. Cleaning implements.
D. Irrigation.

32. An example of a lever in which the load is between the effort and fulcrum is
A. wheelbarrow
B. spade
C. claw hammer
D. crowbar.

33. Which one of the following statements describes hard water?
A. Contains less mineral salts.
B. Lathers easily.
C. Boiled water.
D. Discolours clothes.

34. The following are some characteristics of plants:
(i) thin cuticle
(ii) silvery hairs
(iii) flexible stems
(iv) more stomata on lower leaf surface
(v) air sacs

Which pair of characteristics is for plants adapted to wet areas?
A. (ii) and (iv)
B. (i) and (v)
C. (iii) and (iv)
D. (i) and (ii)

35. Which one of the following is an example of a harmful animal?
A. Turkey.
B. Donkey.
C. Termite.
D. Dog.

36. The following are misconceptions about HIV and AIDS **EXCEPT**
A. HIV and AIDS is a curse
B. sex with a young girl cures HIV and AIDS
C. HIV and AIDS has no cure
D. all thin people have AIDS.

37. Which one of the following is the **least** effective preventive measure against the spread of typhoid?
A. Washing vegetables and fruit.
B. Washing hands after visiting a toilet.
C. Proper use of latrines and toilets.
D. Draining stagnant water.

38. During a thunderstorm, pupils were observed
(i) sheltering under the verandah
(ii) wearing red jackets in a classroom
(iii) playing on the football pitch
(iv) lying on the ground in the classroom.

In which pair of observations are the pupils **more likely** to be struck by lightning?
A. (i) and (iii)
B. (i) and (iv)
C. (ii) and (iii)
D. (ii) and (iv)

39. In which one of the following activities is renewable energy in use?
A. Driving a petrol powered car.
B. Using a windmill to grind maize.
C. Cooking on energy saving charcoal stove.
D. Using coal to generate electricity.

40. Which one of the following mixtures can be separated by **either** picking or sieving?
A. Maize and beans.
B. Rice and sorghum.
C. Maize and millet.
D. Green grams and peas.

41. Which one of the following is a way of maintaining simple tools?
A. Cleaning before use.
B. Storing in a safe place.
C. Using a tool for several purposes.
D. Oiling.

42. The following are some of the materials that were provided to pupils for making a beam balance:
(i) two tins of the same size
(ii) wires
(iii) plank of wood
(iv) nails

Which one of the following materials was missing?
A. Stand.
B. Strings.
C. Scale.
D. Pins.

43. Which one of the following is an effect of air pollution on non-living things?
A. Impairs visibility.
B. Damages iron sheets.
C. Causes wilting.
D. Interferes with photosynthesis.

44. To model the solar system, the following materials can be used:

(i) soft board
(ii) clay
(iii) pins
(iv) glue
(v) manila paper.

Which one of the following materials would be **most** suitable to use instead of the pins?

A. Wax.
B. Plasticine.
C. Pieces of barbed wire.
D. Pieces of cello tape.

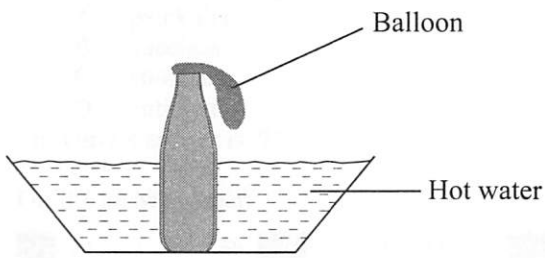
45. Which one of the following statements is **true** about splash erosion?

A. Forms shallow trenches.
B. Caused by wind and water.
C. Removes a thin layer of soil.
D. Occurs below roofs of buildings.

46. Which one of the following practices is the **most** effective in prevention of food poisoning from packed foods?

A. Washing hands before handling it.
B. Checking the expiry date.
C. Proper storage.
D. Proper cooking.

47. The diagram below shows a set-up used to demonstrate a certain aspect of matter.



Which one of the following is **likely** to occur after some time?

A. Air gets into the balloon.
B. Heat enters the balloon.
C. Water enters into the bottle.
D. Balloon contracts.

48. The following statements are true about energy **except**

A. it causes motion
B. it can be conserved
C. it changes from one form to another
D. is the ability to do work.

49. Which one of the following pairs of materials is suitable for demonstrating the formation of a rainbow when using the sun as a source of light?

A. Ruler and mirror.
B. Mirror and water.
C. Mirror and white screen.
D. Glass container and mirror.

50. Which one of the following materials will **not** form a shadow when light is shone on it?

A. White paper.
B. Mirror.
C. Glass of a lamp.
D. Sheet of aluminium.

THE KENYA NATIONAL EXAMINATIONS COUNCIL

KCPE 2016

SCIENCE

Time: 1 hour 40 minutes

INSTRUCTIONS TO CANDIDATES (Please read these instructions carefully)

1. You have been given this question booklet and a separate answer sheet. The question booklet contains 50 questions.
2. When you have chosen your answer, mark it on the **ANSWER SHEET**, not in this question booklet.

HOW TO USE THE ANSWER SHEET

3. Use an ordinary pencil.
4. Make sure you have written on the answer sheet:
   YOUR INDEX NUMBER
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   NAME OF YOUR SCHOOL
5. By drawing a **dark line** inside the correct numbered boxes, mark your full Index Number (i.e. School Code Number and the three-figure Candidate's Number) in the grid near the top of the answer sheet.
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   Example:
   In the Question Booklet

   4. Some curative drugs are also called
   A. painkillers
   B. vaccines
   C. stimulants
   D. antibiotics

   The correct answer is "D".

   On the answer sheet:

   4 [A] [B] [C] ~~[D]~~ 32 [A] [B] [C] [D] 33 [A] [B] [C] [D] 34 [A] [B] [C] [D] 35 [A] [B] [C] [D]

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This question paper consists of 7 printed pages and 1 blank page.

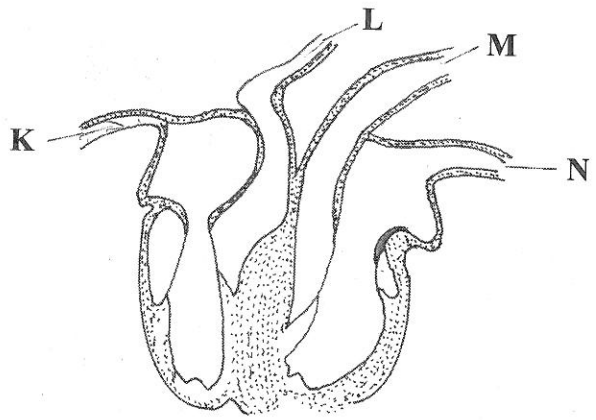
1. Which one of the following characteristics can be used to identify molars? Presence of
   A. one root and chisel shape
   B. cusps and ridges
   C. one root and cusps
   D. ridges and chisel shape.

2. The following are functions of the trachea **except**
   A. trapping dust
   B. moistening air
   C. warming air
   D. exchanging gases.

3. Which one of the following parts of the alimentary canal is **correctly** matched to its function?

	Part	Function
A.	Mouth	digestion of food
B.	Stomach	production of bile
C.	Small intestine	absorption of water
D.	Large intestine	absorption of digested food

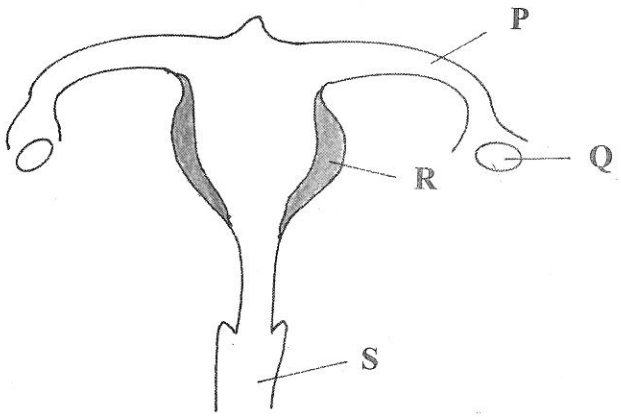
4. The diagram below represents the structure of a human heart.



Name the blood vessel labelled **K, L, M** and **N**.

	K	L	M	N
A.	Venacava	Pulmonary vein	Aorta	Pulmonary artery
B.	Pulmonary artery	Aorta	Pulmonary vein	Venacava
C.	Venacava	Pulmonary artery	Aorta	Pulmonary vein
D.	Pulmonary vein	Venacava	Pulmonary artery	Aorta

5. The diagram below represents a female reproductive system.



Which one of the parts labelled **P, Q, R** and **S** is correctly matched to its function?

	Part	Function
A.	P	site for fertilisation.
B.	Q	site for implantation.
C.	R	egg formation.
D.	S	ovulation.

6. Which one of the following is a health effect of drug abuse?
   A. Withdrawal.
   B. Marital conflict.
   C. Truancy.
   D. Rape.

7. The first stage of HIV infection is known as
   A. incubation
   B. widow
   C. symptomatic
   D. asymptomatic.

8. Which one of the following vaccines are **correctly** matched to the age when they are first administered?

	BCG	Tetanus	Polio	Measles
A.	At birth	10 weeks	6 weeks	9 months
B.	6 weeks	At birth	At birth	10 weeks
C.	10 weeks	9 months	10 weeks	At birth
D.	At birth	6 weeks	At birth	9 months

9. Which one of the following diseases can be prevented by draining stagnant water around homesteads?
   A. Tuberculosis.
   B. Typhoid.
   C. Cholera.
   D. Malaria.

10. A patient was instructed by a doctor to take two tablets of medicine every six hours. However, the patient forgot to take at noon and on remembering took four tablets at the same time. The patient should have
   A. taken three tablets every six hours
   B. taken two tablets every three hours
   C. revisited the doctor for advice
   D. thrown away the two extra tablets.

11. Which one of the following pairs consists **only** of illegal drugs in Kenya?
   A. Alcohol and miraa.
   B. Miraa and mandrax.
   C. Alcohol and bhang.
   D. Bhang and mandrax.

12. Which one of the following weeds has green-purple leaves?
   A. Mexican marigold.
   B. Black jack.
   C. Pig weed.
   D. Sodom apple.

13. Which one of the following pairs of plants stores food in the roots?
   A. Irish potato and cassava.
   B. Cassava and carrot.
   C. Onion and carrot.
   D. Irish potato and onion.

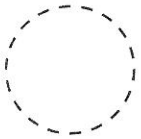
14. Which one of the following statements on interdependence between plants is **not true**? Some plants
   A. depend on others for carbon dioxide
   B. grow on dead plants
   C. depend on others for protection against strong sunlight
   D. depend on others for support.

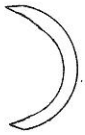
15. Which one of the following crop pests is **correctly** matched to the part of the plant it damages?

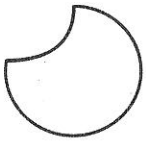
	Pest	Part damaged
A.	Weevil	leaves.
B.	Cutworm	stems.
C.	Stalk borer	flowers.
D.	Aphids	roots.

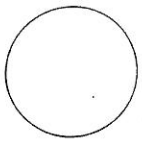
16. Which one of the following groups of plants consists of **only** flowering plants?
   A. Onion, sisal, nappier grass.
   B. Maize, kales, toadstools.
   C. Beans, mushrooms, peas.
   D. Euphorbia, cactus, moulds.

17. Which one of the following diagrams represents the shape of the new moon?

A. 

B. 

C. 

D. 

18. In the solar system, Jupiter is found between
A. Mercury and Saturn.
B. Mars and Earth.
C. Saturn and Mars.
D. Earth and Mercury.

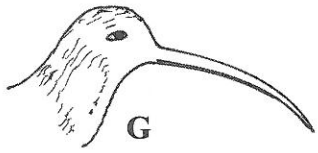
19. Pupils observed and classified certain animals into two groups **E** and **F** as shown below?

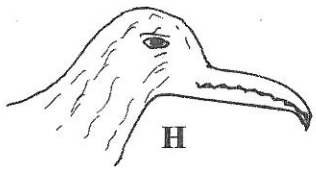
Group E	**Group F**
Bat	Chameleon
Eagle	Frog
Leopard	Snake

The pupils classified the animals on basis of
A. carnivorous and herbivorous
B. animals covered with fur and animals covered with scales
C. constant and varying body temperature
D. animals which give birth to young ones and those which lay eggs.

20. Standard five pupils observed a goat tied on a post to graze in the field. This method of grazing is classified as
A. rotational grazing
B. zero grazing
C. strip grazing
D. paddocking.

21. The diagrams below represents beaks of certain birds.





The birds whose beaks are represented by **G** and **H** are

	Bird G	**Bird H**
A.	grain eater	flesh eater
B.	nectar feeder	filter feeder
C.	flesh eater	grain eater
D.	filter feeder	nectar feeder

22. Which one of the following methods of controlling animal parasites is **correctly** matched to the parasite controlled?

	Method	**Parasite controlled**
A.	Rotational Grazing	Ticks and tapeworms
B.	Dipping	Fleas and tapeworms
C.	Deworming	Liver flukes and ticks
D.	Spraying	Fleas and liver flukes

23. Pupils gave the following statements about water.
(i) Lathers easily
(ii) Has a pleasant taste
(iii) Has mineral salts
(iv) Good for cleaning
Which two statements describe hard water?
A. (i) and (ii)
B. (ii) and (iii)
C. (iii) and (iv)
D. (i) and (iv)

24. Which one of the following pairs of diseases is as a result of drinking polluted water?
A. Bilharzia and typhoid.
B. Typhoid and cholera.
C. Cholera and bilharzia.
D. Malaria and cholera.

25. In which one of the following practices is water recycled?
A. Storing water for future use.
B. Recovering clean water from dirty water.
C. Harvesting rain water from roof tops.
D. Fetching water from a well.

26. Which one of the following pairs of signs and symptoms is for cholera?
A. Skin rash and diarrhoea.
B. Blood in stool and abdominal pains.
C. Abdominal pain and diarrhoea.
D. Skin rash and blood in stool.

27. Large furrows in the soil indicate
A. rill erosion
B. gulley erosion
C. splash erosion
D. sheet erosion.

28. Which one of the following statements is **true** about clay soil?
A. Has small air spaces.
B. Retains low amount of water.
C. Allows water to drain through easily.
D. Has large soil particles.

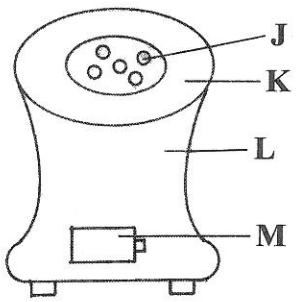
29. Which one of the following soil conservation measures conserves soil in the same way as mulching?
A. Planting cover crops.
B. Contour farming.
C. Use of gabions.
D. Terracing.

30. The following statements are true about breast milk **except**
A. it cannot transmit diseases
B. it allows the mother and the baby to bond
C. its available in the correct form and at right temperature
D. its easier for infants to digest.

31. A child who appears old with a wrinkled face is also likely to
A. lack blood
B. have swollen abdomen
C. have bow legs
D. cry often.

32. Which one of the following groups consists **only** of foods that will provide energy to the body?
A. Maize, rice, milk.
B. Cassava, beans, fish.
C. Ground nuts, coconut, sunflower.
D. Meat, wheat, peas.

33. The diagram below illustrates a jiko.



It is an improved jiko because the part labelled
A. **J** takes less charcoal
B. **K** is made of clay
C. **L** is metallic
D. **M** is closed.

34. Which one of the following sources of energy is exhaustible?
A. Petroleum
B. Wind
C. Biogas
D. Trees.

35. Which one of the following is an efficient way of using energy?
A. Drying grain using solar.
B. Using a vacuum flask to keep tea hot.
C. Using biogas.
D. Putting off wood fire when not in use.

36. The following can produce electricity **except**
A. solar drier
B. biogas
C. torch battery
D. dynamo.

37. A card with the word TEACHER written on it was placed in front of a mirror. Which three of the letters did **not** change in appearance?
A. R, A and C.
B. T, A and H.
C. H, E and R.
D. C, H and T.

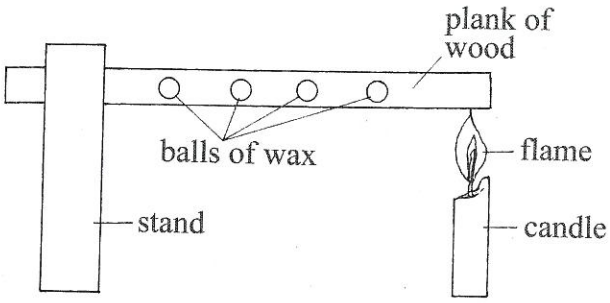
38. Which one of the following materials works in the same way as frosted glass?
A. Sky light.
B. Mirror.
C. Clear water.
D. Car windscreen.

39. The property of light used in the working of a lamp in a room is that light
A. travels in a straight line
B. spreads in all directions
C. bends as it passes from one media to another
D. forms shadows with opaque objects.

40. In which one of the following processes is carbon dioxide used?
A. Making electric bulbs.
B. Burning substances.
C. Fixing soil nutrients.
D. Preserving soft drinks.

41. After using a magnet, the next stage of separating a mixture of salt, sand and iron fillings is to
A. filter the mixture
B. decant the mixture
C. add water to the mixture
D. sieve the mixture.

42. The diagram below shows a set up used by pupils to demonstrate a certain property of matter.



The mistake made in the set up was to
A. use balls of wax of the same size
B. place balls of wax at equal intervals
C. use a plank of wood
D. place the candle at the end of the plank of wood.

43. Which one of the following groups of materials are **correctly** matched to magnetic and non magnetic?

	Magnetic	**Non magnetic**
A.	Office pins	steel wool
B.	Staples	copper coin
C.	Aluminium foil	nails
D.	Silver coin	glass

44. Which one of the following machines works in the same way as a staircase?
A. Spade.
B. Claw hammer.
C. Crowbar.
D. Ladder.

45. Which one of the following practices will help to control soil pollution?
A. Burning wastes in dump sites.
B. Using organic fertilisers.
C. Grouping wastes into categories.
D. Planting cover crops.

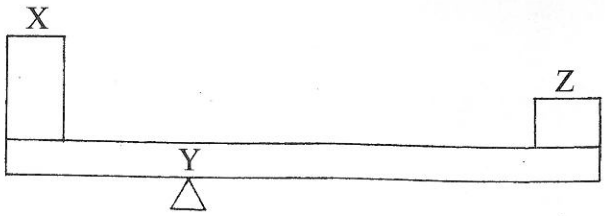
46. Which one of the following pairs **correctly** represents living and non-living components of the environment?

	Living	**Non-living**
A.	Soil	bat.
B.	Chameleon	mushroom plant.
C.	Earthworm	water.
D.	Oxygen	mineral salts.

47. The following are some ways by which soil is conserved.
(i) Reducing speed of surface runoff
(ii) Trapping soil
(iii) Reducing evaporation of soil water
(iv) Reducing impact of rain drops.
Which two ways are as result of contour farming?
A. (i) and (ii)
B. (ii) and (iii)
C. (iii) and (iv)
D. (i) and (iv)

48. Which one of the following practices would help in maintaining strong teeth in humans?
A. Drinking milk.
B. Using tooth picks after meals.
C. Using teeth to break hard objects.
D. Eating of bread.

49. The diagram below represents a lever in use.



If the lever is to make work easier, which one of the following will **correctly** represent the position of load, fulcrum and effort?

	Load	**Fulcrum**	**Effort**
A.	X	Y	Z
B.	Z	Y	X
C.	Y	Z	X
D.	Z	X	Y

50. In which one of the following is friction reduced by streamlining?
A. Biro pen casing.
B. Skating shoes.
C. Shoe soles.
D. Vehicle bodies.

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Primary Education

507 - SCIENCE -

Nov. 2017 – 1 hour 40 minutes

INSTRUCTIONS TO CANDIDATES (Please read these instructions carefully)

1. You have been given this question booklet and a separate answer sheet. The question booklet contains 50 questions.
2. Do any necessary rough work in this booklet.
3. When you have chosen your answer, mark it on the **ANSWER SHEET**, not in this question booklet.

HOW TO USE THE ANSWER SHEET

4. Use an ordinary pencil.
5. Confirm that the answer sheet that you have been provided with has the following:
   YOUR INDEX NUMBER
   YOUR NAME
   NAME OF YOUR SCHOOL
6. Do not make any marks outside the boxes.
7. Keep the sheet as clean as possible and do not fold it.
8. For each of the questions 1–50, four answers are given. The answers are lettered A, B, C and D. In each case, only **ONE** of the four answers is correct. Choose the correct answer.
9. On the answer sheet, show the correct answer by drawing a **dark line** inside the box in which the letter you have chosen is written.

   Example:

   In the Question Booklet.

   4. Which one of the following components of blood is involved in clotting after injury?
   A. Plasma
   B. White blood cells
   C. Red blood cells
   D. Platelets.

   The correct answer is D.

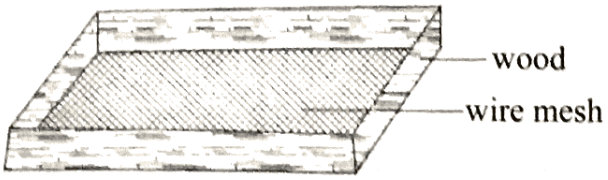
   On the answer sheet:

   4 [A] [B] [C] ~~[D]~~ 14 [A] [B] [C] [D] 24 [A] [B] [C] [D] 34 [A] [B] [C] [D] 44 [A] [B] [C] [D]

   In the set of boxes numbered **4**, the box with the letter D printed in it is marked.
10. Your **dark line MUST** be within the box.
11. For each question **ONLY ONE** box is to be marked in each set of four boxes.

This Question Paper consists of 8 printed pages.

1. The diagram below shows an equipment used to separate a mixture of solids.



The method of separation in which the equipment is used is

A. winnowing
B. picking
C. sieving
D. filtration.

2. In which one of the following activities is the tool used properly?

A. Splitting firewood using a jembe.
B. Cutting wires using a knife.
C. Using a saw to cut wood.
D. Breaking stones using a claw hammer.

3. The heat from a burning charcoal stove reaches the other parts of a room **mainly** by

A. radiation and conduction;
B. radiation only;
C. radiation and convection;
D. convection only.

4. Which one of the following characteristics is found in **both** tilapia and ducks?

A. Have scales.
B. Filter feeding.
C. External fertilisation.
D. Breathing under water.

5. Which one of the following statements is **correct** about water?

A. Filtration makes water safe for drinking.
B. Boiled hard water is safe for drinking.
C. Soft water should not be boiled before drinking.
D. Boiling makes hard water difficult to lather.

6. Which one of the following statements is TRUE about HIV and AIDS?

A. An individual in asymptomatic stage of HIV infection tests negative.
B. A person develops AIDS during the window period of HIV infection.
C. An individual infected with HIV does not necessarily have AIDS.
D. HIV can be spread by mosquito bites.

7. Which one of the following practices conserves water by using sparingly?

A. Washing cars along the lake shore.
B. Pouring water in the garden after washing fruits.
C. Watering animals in rivers.
D. Carrying out drip irrigation.

8. The following signs and symptoms were observed on a patient:

(i) Severe headache
(ii) Abdominal pain
(iii) Fever
(iv) Slight diarrhoea with blood stains
(v) Sores in the mouth.

The patient is likely to be suffering from

A. malaria
B. typhoid
C. cholera
D. bilharzia.

9. Which one of the following attaches itself on the uterus wall to develop into a baby?

A. Ovum.
B. Foetus.
C. Embryo.
D. Zygote.

10. Which one of the following is NOT a reason for HIV testing?

A. To know the number of people infected.
B. For future planning.
C. To be keen to protect yourself and others.
D. In order to avoid infected individuals.

11. The table below shows the results of an investigation done by pupils on floating and sinking.

STUDENT	OBJECTS THAT SINK	OBJECTS THAT FLOAT
E	Charcoal, pencil	Pin, razor blade
F	Bottle top, stone	Metal dish, plastic plate
G	Nail, piece of glass	Candle wax, plastic bag
H	Wood, wax	Nail, stone

The pupil who recorded the correct results was

A. E
B. F
C. G
D. H

12. Which one of the following parts of the human digestive system is **correctly** matched to its function?

	ORGAN	FUNCTION
A.	Mouth	Digests proteins.
B.	Stomach	Secretes digestive juice
C.	Small intestines	Absorbs water
D.	Large intestines	Stores digested food

13. The diagram below shows a certain animal parasite.

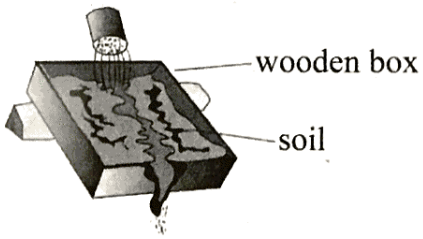
The parasite belongs to the same group as

A. Tapeworm and liver fluke;
B. Roundworm and flea;
C. Tsetse fly and tapeworm;
D. Flea and tsetse fly.

14. Which of the following is NOT advisable for a patient suffering from tuberculosis?

A. Ventilated housing.
B. Vaccination against the disease.
C. Isolation from healthy people.
D. Early treatment with antibiotics.

15. The diagram below demonstrates an experiment done by pupils to show a certain type of soil erosion.



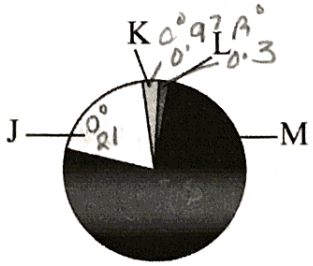
The type of soil erosion demonstrated by the pupils was

A. splash erosion
B. gulley erosion
C. rill erosion
D. sheet erosion.

16. Which one of the following pairs of plants stores food in the root?

A. Carrots and irish potatoes.
B. Irish potatoes and sweet potatoes.
C. Sweet potatoes and cassava.
D. Cassava and onions.

17. The diagram below represents the proportion of gases in air.



Which proportion represents the gas used in seed germination?

A. J
B. K
C. L
D. M

18. Which one of the following nutritional deficiency diseases makes the face and limbs of a child to swell?

A. Anaemia.
B. Marasmus.
C. Rickets.
D. Kwashiorkor.

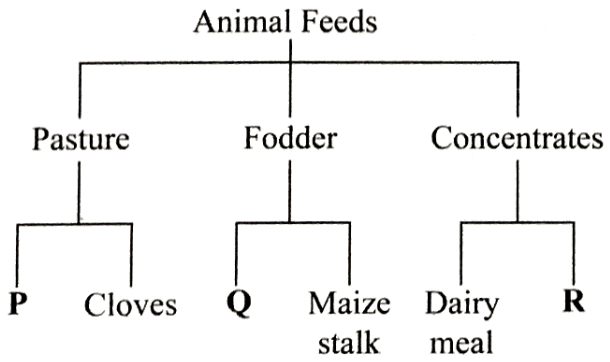
19. Which one of the following pairs consists **only** of sources of electricity?

A. Wind driven turbine and electric water heater.
B. Electric water heater and generator.
C. Generator and electric iron box.
D. Bicycle dynamo and wind driven turbine.

20. Which one of the following levers has the effort between the fulcrum and the load when in use?

A. Wheelbarrow.
B. Spade.
C. Crowbar.
D. Claw hammer.

21. The chart below shows a simple classification of animal feeds.



The feeds labelled **P**, **Q** and **R** can be best represented by

	P	**Q**	**R**
A.	Lucerne	Napier grass	Chick mash
B.	Desmodium	Calf pellets	Salt licks
C.	Sweet potatoes vines	Sorghum	Hay
D.	Lucerne	Desmodium	Layers mash

22. A plant has the adaptations below:

(i) thin cuticle
(ii) flexible stems
(iii) air sacs
(iv) waxy upper leaf surface.

The plant is likely to be a

A. cactus.
B. water lily.
C. sorghum.
D. bean.

23. Pupils put garden soil in a glass bottle containing water, shook it and allowed it to settle. Which one of the following could NOT be determined by the experiment?

A. Presence of air.
B. Presence of organic matter.
C. Presence of inorganic matter.
D. Sizes of different soil particles.

24. Which one of the following is a function of fibre in the human diet?

A. Helps in food digestion.
B. Helps in the absorption of digested food.
C. Prevents diarrhoea.
D. Removal of undigested materials.

25. Which one of the following pairs consists only of green plants.

A. Moss and fern.
B. Toadstool and moss.
C. Algae and mould.
D. Mould and fern.

26. The following are parts of a flower

(i) anther.
(ii) style.
(iii) ovary.
(iv) stigma.

Which pair of the plant parts is involved in pollination?

A. (i) and (iii)
B. (ii) and (iii)
C. (iii) and (iv)
D. (i) and (iv)

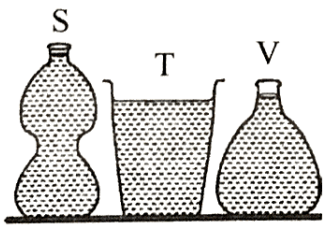
27. In an investigation, pupils placed a mirror in a basin containing water to direct light to a white wall. The pupils were investigating

A. how light travels.
B. reflection.
C. refraction.
D. making of a rainbow.

28. Which one of the following groups of materials consists only of non-magnetic materials.

A. Nickel, aluminium, copper.
B. Plastic, copper, aluminium.
C. Paper, iron, glass.
D. Staples, coal, iron.

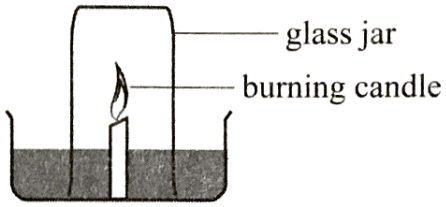
29. During an experiment pupils poured a certain amount of water into a container labelled **S**. They then transferred the same water into the containers labelled **T** and **V**.



The pupils were investigating whether liquids

A. have definite shape.
B. have definite volume.
C. occupy space.
D. exert same pressure.

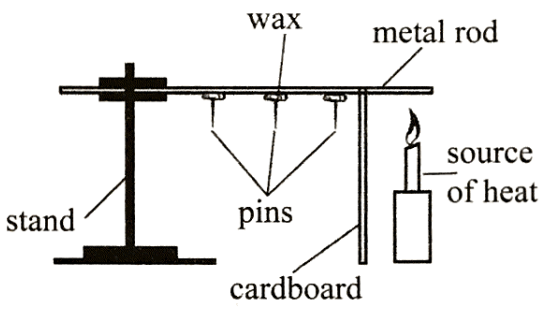
30. Pupils set up an experiment as shown in the diagram below.



Which one of the following was a correct observation from the experiment?

A. Water level in the trough increased.
B. Candle flame brightened.
C. Water level in the jar increased.
D. Colour of the water changed.

31. The diagram below represents a set-up used to demonstrate certain aspects of matter.



The pin next to the candle fell off as a result of

A. conduction and radiation.
B. radiation only.
C. convection and conduction.
D. conduction only.

32. Which one of the following components of the environment will be least affected when an oil pipe bursts?

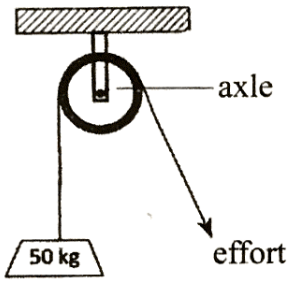
A. Air.
B. Water.
C. Soil.
D. Plants.

33. Pupils placed a bottle top on water and it floated. They then crushed and placed the same bottle top on the water again and it sunk.

Which one of the following factors that affect sinking and floating was being investigated?

A. Size of the material.
B. Type of the material.
C. Shape of the material.
D. Mass of the material.

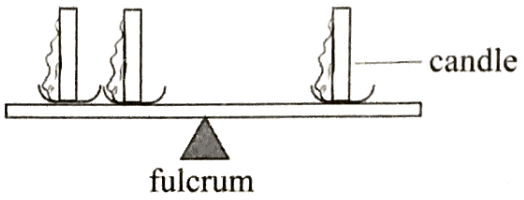
34. The diagram below represents a single fixed pulley in use.



Which one of the following is NOT true about the pulley?

A. It reduces the effort applied.
B. Effort and load move through equal distances.
C. Makes work easier by changing direction of effort.
D. The wheel reduces friction.

35. The diagram below illustrates two candles balancing against one.



If all the candles were lit at the same time, which one of the following is a correct observation made in the experiment?

A. The two candles were displaced upwards.
B. The single candle was displaced upwards.
C. There was no change in the set up.
D. The see-saw will swing towards both sides.

36. Which one of the following methods of food preservation is NOT modern?

A. Canning.
B. Drying.
C. Use of honey.
D. Refrigeration.

37. Which type of manure is common on dairy farms?

A. Green manure.
B. Compost manure.
C. Farmyard manure.
D. Organic mulches.

38. During digestion, the following activities occur in the mouth EXCEPT

A. mechanical breakdown of food.
B. secretion of digestive juice.
C. killing of germs.
D. rolling of food into bolus.

39. Which one of the following pairs of diseases is the infant immunised against at birth?

A. Tuberculosis and polio.
B. Polio and diphtheria.
C. Diphtheria and yellow fever.
D. Tuberculosis and yellow fever.

40. Which one of the following teeth problems can be prevented by feeding on a balanced diet?

A. Bleeding gums.
B. Dental cavities.
C. Bad smell.
D. Tooth decay.

41. Which one of the following plants is a cash crop?

A. Sunflower.
B. Irish potato.
C. Wheat.
D. Pineapple.

42. The chart below shows a weather record kept by pupils for five days.

DAY	MORNING	AFTERNOON
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		

KEY: Sunny; Calm; Rainy; Windy; Cloudy

From the chart, whenever it was

A. sunny in the morning, it rained in the afternoon.
B. cloudy in the morning, it was sunny in the afternoon.
C. calm in the morning, it was windy in the afternoon.
D. windy in the morning, it was calm in the afternoon.

43. Below is an illustration of a food chain.

Plant ⟶ Antelope ⟶ Lion ⟶ Vulture

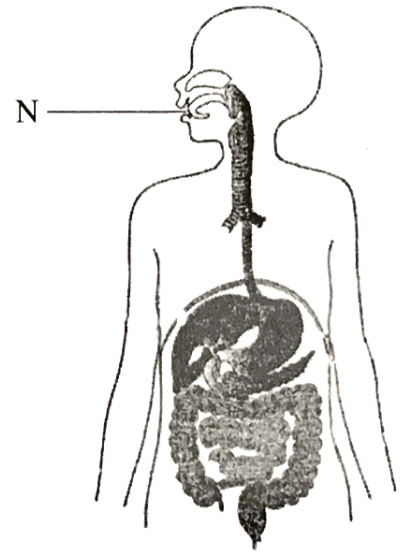
Tertiary consumers are represented by

A. plants.
B. antelope.
C. lion.
D. vulture.

44. Which one of the following planets is **closer** to the sun?

A. Jupiter.
B. Venus.
C. Earth.
D. Mars.

45. The diagram below shows the human digestive system.



The juice produced at the part labelled **N** is used to digest

A. carbohydrates.
B. proteins.
C. fats and oils.
D. mineral salts.

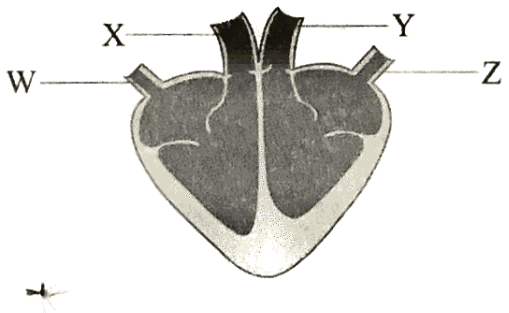
46. The table below shows the type and number of teeth in an adult human being.

TYPE OF TEETH	TOTAL NUMBER IN BOTH JAWS
E	4
Molars	**G**
F	8
Incisors	**H**

Which one of the following **correctly** represents **E**, **F**, **G** and **H**?

	E	F	G	H
A	Premolar	Canine	12	4
B	Canine	Premolar	4	12
C	Premolar	Canine	4	8
D	Canine	Premolar	12	8

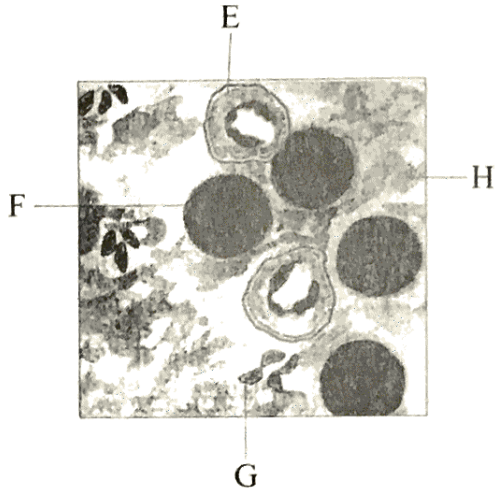
47. The diagram below represents a mammalian heart.



In which pair of blood vessels is blood under **highest** pressure?

A. W and X.
B. X and Y.
C. Y and Z.
D. W and Z.

48. The diagram below shows components of human blood.



The component that stops the bleeding of a wound is _____.

A. **E**
B. **F**
C. **G**
D. **H**

49. Which one of the following is NOT an excretory product in human beings?

A. Urine.
B. Faeces.
C. Sweat.
D. Carbon dioxide.

50. Which one of the following is a function of the amniotic sac during pregnancy?

A. Passes digested food to the foetus.
B. Allows gaseous exchange between the mother and foetus.
C. Prevents harmful micro-organisms from reaching the foetus.
D. Protects the foetus from physical shock.

添付資料５

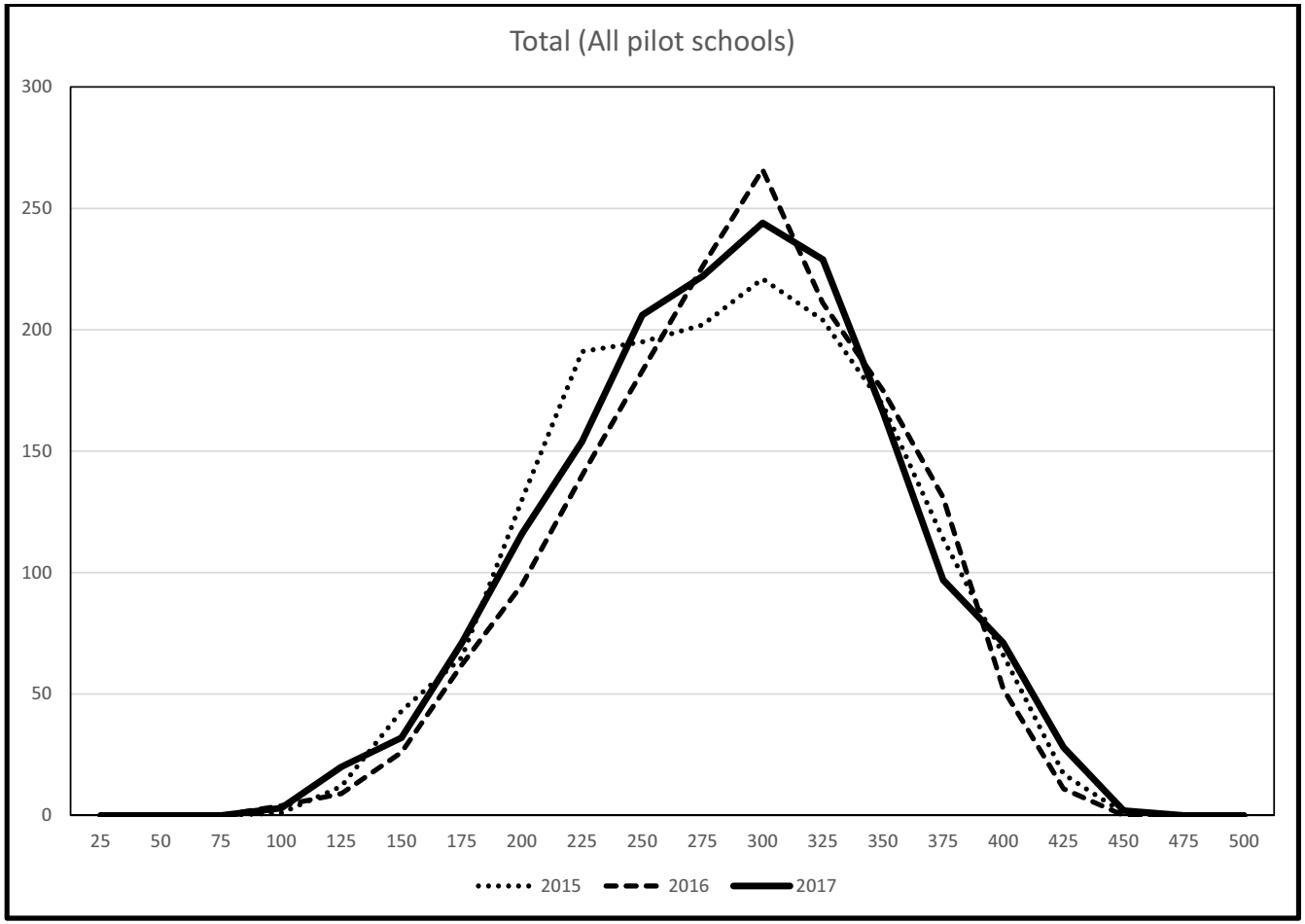
パイロット校
KCPE2015 年～2017 年
結　果

株式会社ナリカ

平成 30 年 6 月

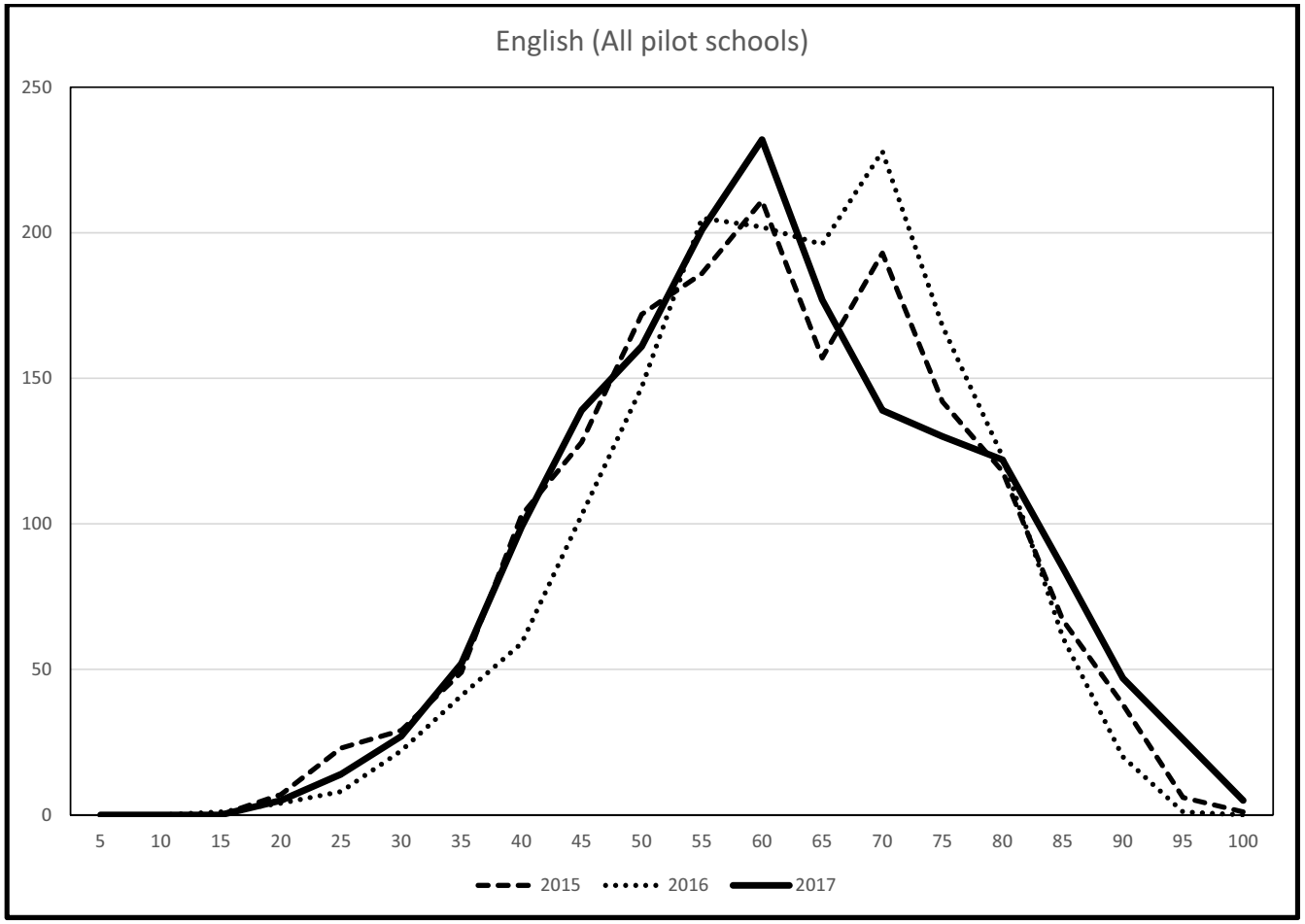
全科目KCPE2015-2017の結果推移(パイロット校)

Science (All pilot school)			
Data	2015	2016	2017
25	0	0	0
50	0	0	0
75	0	0	0
100	1	4	3
125	12	9	20
150	43	26	32
175	65	62	71
200	130	95	116
225	191	140	154
250	195	183	206
275	202	226	222
300	221	266	244
325	204	211	229
350	169	175	166
375	114	131	97
400	66	52	71
425	17	11	28
450	1	0	2
475	0	0	0
500	0	0	0



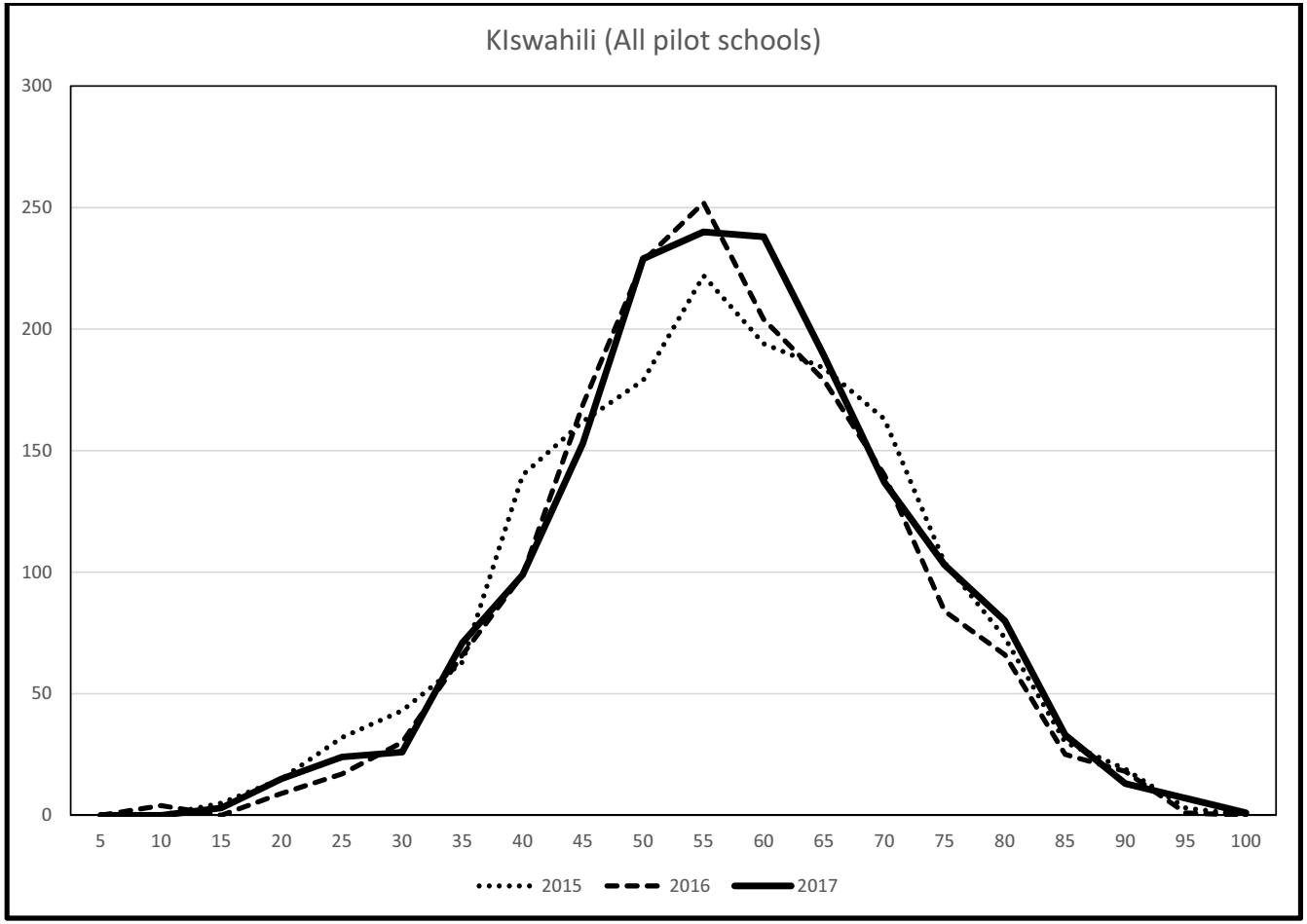
English KCPE2015-2017の結果推移（パイロット校）

English			
Data	2015	2016	2017
5	0	0	0
10	0	0	0
15	0	1	0
20	7	4	5
25	23	8	14
30	29	22	27
35	49	41	52
40	103	59	99
45	128	103	139
50	172	147	161
55	186	205	201
60	211	202	232
65	157	196	177
70	193	228	139
75	142	168	130
80	118	123	122
85	67	61	85
90	38	20	47
95	6	1	26
100	1	0	5



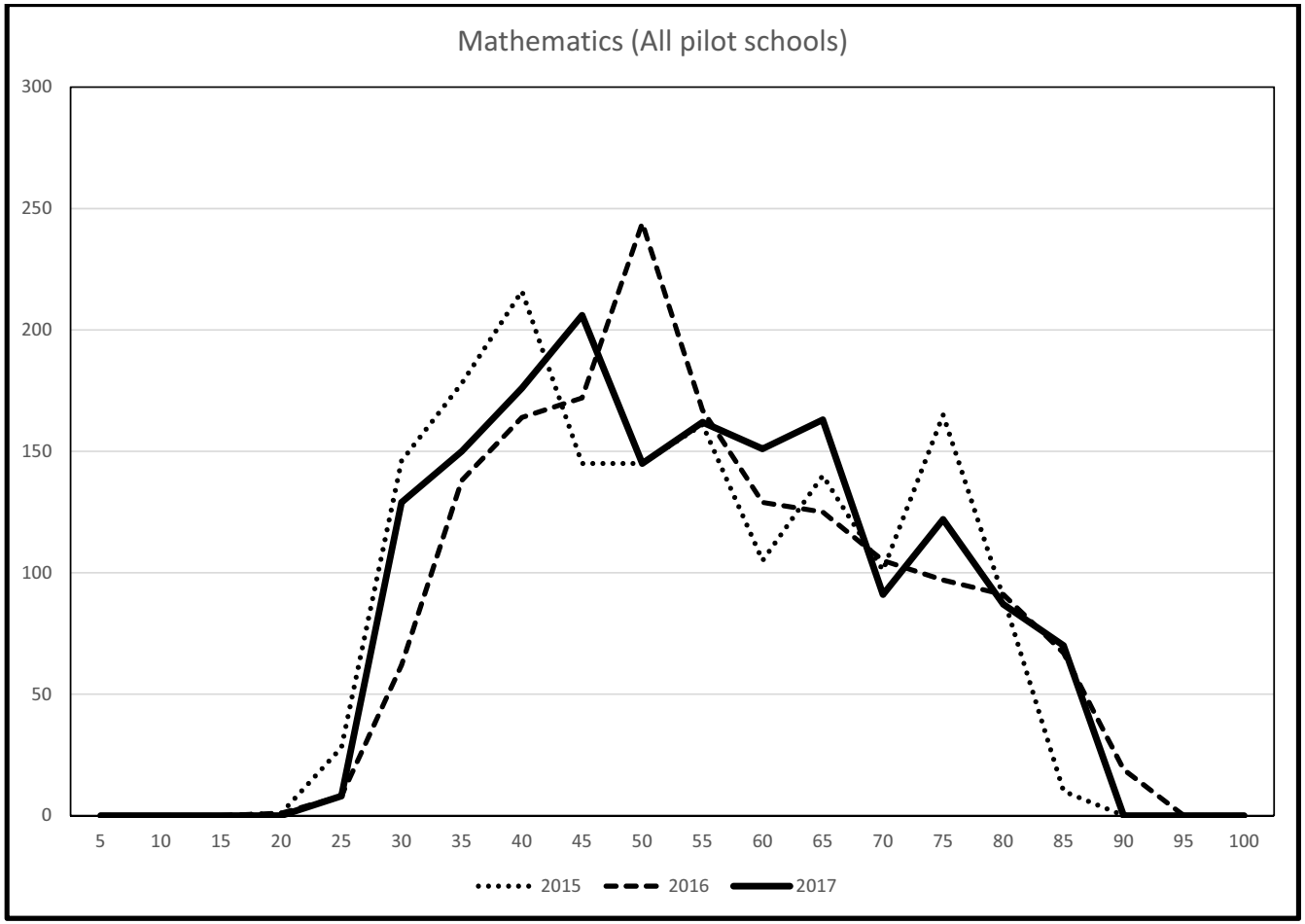
Kiswahili KCPE2015-2017の結果推移（パイロット校）

Kiswahili (All pilot school)			
Data	2015	2016	2017
5	0	0	0
10	0	4	0
15	5	0	3
20	15	9	15
25	32	17	24
30	43	30	26
35	63	66	71
40	140	99	99
45	162	169	153
50	179	228	229
55	222	252	240
60	194	204	238
65	184	179	189
70	163	140	137
75	104	84	103
80	73	66	80
85	30	25	33
90	19	18	13
95	3	1	7
100	0	0	1



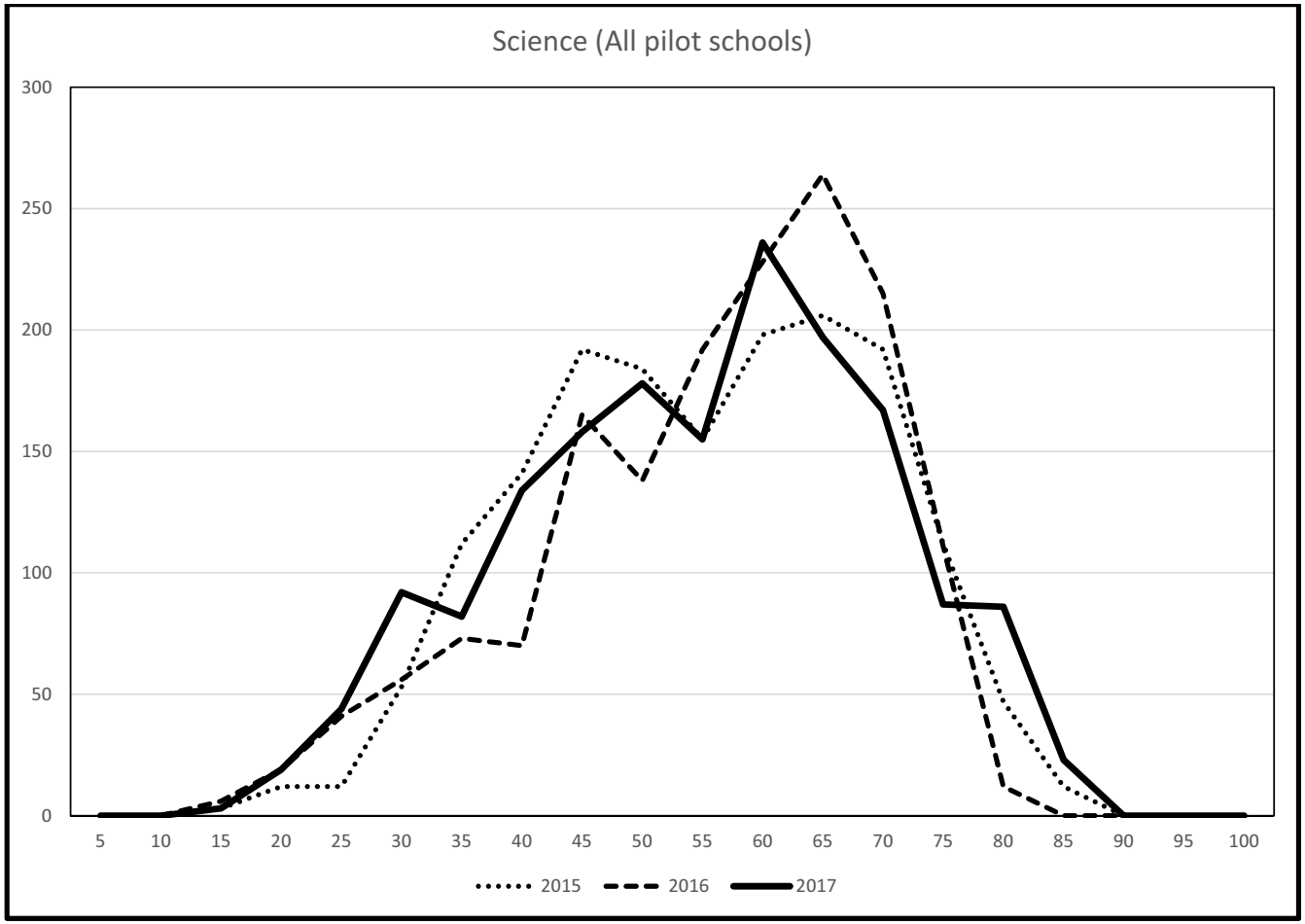
Mathematics KCPE2015-2017の結果推移（パイロット校）

Mathematics (All pilot school)			
Data	2015	2016	2017
5	0	0	0
10	0	0	0
15	0	0	0
20	1	1	0
25	28	8	8
30	146	62	129
35	178	138	150
40	216	164	176
45	145	172	206
50	145	244	145
55	161	167	162
60	105	129	151
65	140	125	163
70	101	105	91
75	165	97	122
80	90	91	87
85	10	67	70
90	0	19	0
95	0	0	0
100	0	0	0



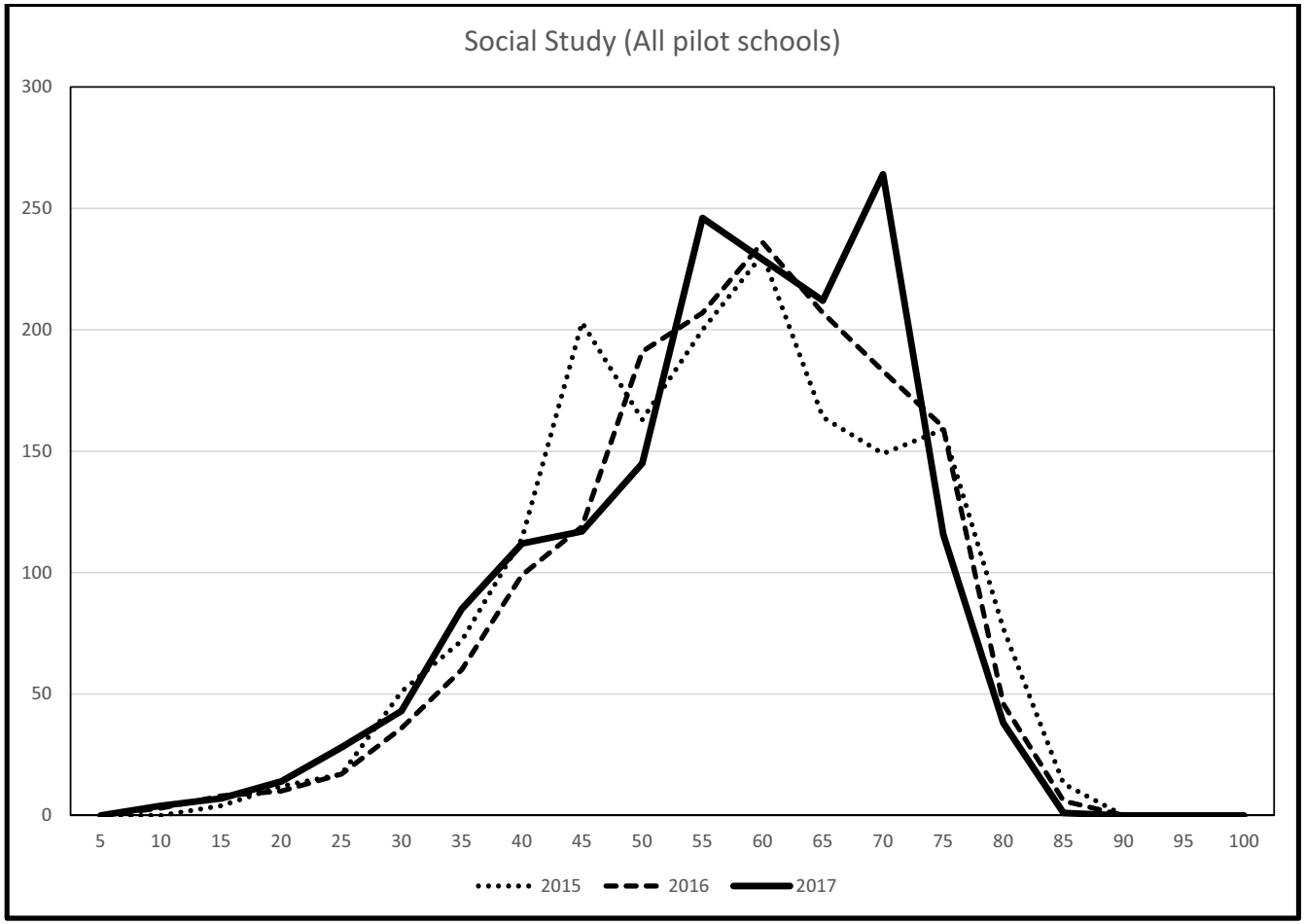
Science KCPE2015-2017の結果推移（パイロット校）

Science (All pilot school)			
Data	2015	2016	2017
5	0	0	0
10	0	0	0
15	3	6	3
20	12	19	19
25	12	41	44
30	53	56	92
35	112	73	82
40	141	70	134
45	192	165	158
50	184	138	178
55	155	192	155
60	198	228	236
65	206	264	197
70	192	215	167
75	112	111	87
80	47	12	86
85	12	0	23
90	0	0	0
95	0	0	0
100	0	0	0



Social Study KCPE2015-2017の結果推移（パイロット校）

Social Study (All pilot school)			
Data	2015	2016	2017
5	0	0	0
10	0	3	4
15	4	8	7
20	12	10	14
25	17	17	28
30	51	36	43
35	72	60	85
40	114	99	112
45	203	119	117
50	163	191	145
55	200	207	246
60	231	236	229
65	164	207	212
70	149	183	264
75	159	160	116
80	77	46	38
85	13	6	1
90	0	0	0
95	0	0	0
100	0	0	0



添付資料 6

MINISTRY OF EDUCATION
STATE DEPARTMENT OF BASIC EDUCATION
DIRECTORATE OF QUALITY ASSURANCE AND STANDARDS

STANDARDS FOR STEM EQUIPMENT, MATERIALS, AND LABORATORIES FOR BASIC EDUCATION INSTITUTIONS IN KENYA

JULY 2017

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ABBREVIATIONS

ADB	African Development Bank
CEMASTEA	Centre for Mathematics, Science and Technology Education in Africa
NG-CDF	National Government-Constituency Development Fund
DQAS	Directorate of Quality Assurance and Standards
DPP&EACA	Directorate of Policy, Partnerships and East African Community Affairs
FDSE	Free Day Secondary Education
DSTE	Directorate of Secondary and Tertiary Education
FPE	Free Primary Education
ICT	Information Communication Technology
KICD	Kenya Institute of Curriculum Development
MOE	Ministry of Education
NESP	National Education Sector Plan
OPEC	Organization Petroleum Exporting Countries
SEPU	School Equipment Production Unit
SIMU	School Infrastructure Management Unit
STEM	science, technology, engineering and mathematics
SSSLG	Secondary School Science Laboratories Guide
NEMA	National Environmental Management Authority
SDG	Sustainable Development Goals

FOREWORD

The global community under the United Nation's Sustainable Development Goal 4 (SDG4) committed to provide inclusive quality lifelong learning by 2030. At the continental level, African Union's Agenda 2063 seeks to attain a prosperous Africa based on inclusive growth and sustainable development driven by well-educated citizens and skilled labour underpinned by science, technology and innovation. Nationally, the Kenya Constitution 2010 under Chapter 2 Article 11(2b) recognizes the role of science and indigenous technologies in the development of the nation. In addition, under the 2nd Medium-Term Plan of Kenya Vision 2030, one of the flagship projects is repackaging of science, technology, engineering and mathematics (STEM) in education and training with a view to promoting experiential learning, innovation creativity and attraction to STEM related disciplines.

To realise these aspirations, focus has to be on strengthening the teaching and learning of STEM subjects. This is why the Ministry, with the support of stakeholders and development partners, has put in place several interventions to improve the quality of STEM education. Provision of adequate number of well designed, well constructed, well equipped, and well maintained laboratories and science rooms is critical to the success of this initiative. In order to standardize the design, construction, equipping and maintenance of science laboratories, the Ministry developed the Secondary School Science Laboratories Guide in 1989. However with the far-reaching changes in legal and policy regulatory frameworks, advancements in technology and contemporary pedagogical approaches to the teaching and learning of STEM subjects that have taken place since then, it has become necessary to review, improve and re-align the guidelines. This is why the Ministry has developed the Standards for STEM Equipment, Materials, and Laboratories for Basic Education Institutions in Kenya.

The development of the standards took into account contemporary approaches to STEM education, national aspirations as encapsulated in various legal and policy documents, and the unique and varying contexts within which schools operate across the country. This document embraces the Ministry's concept of a model laboratory and clearly outlines the basic requirements that any institution must meet in order to provide quality STEM education. It is my sincere hope that all schools and stakeholders seeking to establish STEM laboratories will find the standards a useful blueprint.

FRED MATIANG'I, PhD, EGH
CABINET SECRETARY
MINISTRY OF EDUCATION

PREFACE

This '*Standards for STEM Equipment, Materials, and Laboratories for Basic Education Institutions in Kenya'* is a sequel to the Secondary Schools Science Laboratories Guide. The goal is to provide a framework for ensuring quality learning environment in basic education institutions through provision of equitable, inclusive, and adequate laboratory infrastructure, equipment and materials. The objective is to align the 1989 Secondary Schools Science Laboratory Guide to the current legal and policy framework as well as contemporary pedagogical practices

The development of the Standard has been guided by Sessional Paper No.4 of 2016; Basic Education Act 2013; Science, Technology and Innovation Act, 2013; The Environmental Management and Co-ordination (Waste Management) Regulations, 2006; Safety Standards Manual for Schools in Kenya, 2008; the School Infrastructure Technical Handbook, 2007; and the Basic Standard Requirements for Registration of Educational and Training Institutions in the Ministry of Education, 2011.

It involved wide stakeholder consultation that included Ministry of Infrastructure officials, NEMA, quality assurance and standards officers, school and college principals, primary headteachers, mathematics and science teachers, laboratory technicians, and learners. This ensured broad consensus regarding the guidelines prescribed by the standard thus ensuring ownership. The standard prescribes guidelines under the following broad areas: Design and Construction of Laboratories; Science Equipment and Materials; Mathematics Equipment and Materials; Technology and Engineering Equipment and Materials; Primary Science Room Equipment and Materials; Primary Teacher Education Laboratory Equipment and Materials; Diploma Teacher Education Laboratory Equipment; Materials Laboratory Management; and Laboratory Management.

DR BELIO KIPSANG, EBS

PRINCIPAL SECRETARY

STATE DEPARTMENT OF BASIC EDUCATION

ACKNOWLEDGEMENT

The development of this '*Standards for STEM Equipment, Materials, and Laboratories for Basic Education Institutions in Kenya'* has been realised through tireless effort by Ministry of Education officials, Director and staff of CEMASTEA, Stakeholders and Partners. My sincere gratitude also goes to the Principal Secretary and Directors in the State Department of Basic Education in supporting this initiative. On behalf of the State Department of Education, I wish to acknowledge the role played by the Directorate of Quality Assurance and Standards in coordination of the development of this laboratory standards. I also wish to thank stakeholders and our partners for participating in the consultative process and validation of the standard. Last but not least, I acknowledge the great effort and personal sacrifice made by the following members of Technical Committee who worked tirelessly to ensure the completion of this standard:

1) Pius K. Mutisya	DQAS	Director, QAS
2) Stephen T. Mogoba	DQAS	Chairperson
3) John D. O. Okiya	DQAS	Member
4) Alice K. Gichana	DQAS	Member
5) Benson M. Muasya	DQAS	Member
6) Arch. Mwangi Kiragu	MOE-SIMU	Member
7) Anthony N. Ndungu	DSTE	Member
8) Loice N. Kimani	DPP&EACA	Member
9) John O. Ouma	DQAS	Member
10) Dr. Tom Mboya Okaya	CEMASTEA	Member
11) Patrick A. Kogolla	CEMASTEA	Member
12) Jacob O. Amimo	CEMASTEA	Member
13) Florence A. Odhiambo	DQAS	Member

ROBERT MASESE

DIRECTOR-GENERAL

STATE DEPARTMENT OF BASIC EDUCATION

EXECUTIVE SUMMARY

1.0 BACKGROUND

Kenya's basic education curriculum emphasizes the development of manipulative, analytical, and experimental skills among learners. The curriculum underscores the importance of inculcating 21st century skills such as imagination, creativity, problem-solving, effective communication, and collaboration. However, the common practice by teachers has been content driven pedagogy that emphasizes rote learning and passing examinations with little or no focus on development of practical skills yet practical approach to teaching of science and technology is essential for the development of the 21st century skills.

Practical teaching enables learners to interact with scientific methods and experimental equipment and apparatus through which innovative ideas originate. A well-designed laboratory is an indispensable component of this ideal experimental learning environment. Radho (2012) found a nexus between effective use of laboratories and students' performance in which schools with well-equipped laboratories have shown tremendous growth in enrolment and performance in science related subjects. To improve the quality of teaching and learning of STEM in basic education institutions, there is need to focus more on the provision of adequate and inclusive school laboratories.

The Ministry of Education (MOE) has therefore constantly initiated programs to provide conducive environment for teaching and learning of STEM related subjects. In 1976, MOE established the School Equipment Production Unit (SEPU) to design, manufacture, supply and distribute materials and laboratory apparatus for educational institutions. Moreover, in 1989, the Ministry in collaboration with the British Government developed guidelines for design and construction of laboratories as well as a list of equipment and materials for the 56 public secondary schools under the project. The document eventually became the guide for establishment of laboratories across the country.

The Constituency Development Fund (CDF) has also supported construction of several laboratories in many secondary schools at the grassroots since its initiation in1997. The Ministry has also continued to provide budgetary allocation in the form of school grants for construction of laboratories and purchase of equipment. These efforts have been complimented by county governments and development partners such as the African Development Bank (ADB) and the Organization Petroleum Exporting Countries (OPEC).

To enhance teachers' capacity in teaching STEM subjects through practical approach, the Ministry in partnership with Japan International Cooperation Agency (JICA) established the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA) in 2004. The program trains teachers on laboratory safety techniques and improvisation of equipment and materials.

In spite of these efforts, several challenges still remain. The STEM Baseline Survey by CEMASTEA (CEMASTEA, 2016) revealed that in spite of the SSSLG, great variations in design, construction, equipment and materials as well management of laboratories exist among the 47 extra-county secondary schools designated as STEM Education Model Schools. In some schools, the laboratories were inadequate with respect to safety measures, waste disposal, storage facilities, stores management, furniture, lighting, ventilation, among others. This could be attributed to lack of an updated standard guideline for the design, construction, installation of equipment, and management. Furthermore, even though far-reaching changes have taken place with regard to the legal and regulatory frameworks as well as contemporary approaches to teaching and learning of STEM subjects, the guidelines have not been reviewed and updated. Hence, a common, more comprehensive and inclusive guideline that will help schools establish or renovate laboratories to meet the demands of 21st Century practical teaching and learning is needed.

2.0 LEGAL AND POLICY CONTEXT

Kenya is a signatory and is committed to international and regional education conventions like 2030 Sustainable Development Goals (SDGs) and the African Union Agenda 2063. The sustainable development goal 4 (SDG4) emphasizes the need to provide inclusive quality lifelong learning. On the other hand, Agenda 2063 focuses on a prosperous Africa based on inclusive growth and sustainable development. This will be done by ensuring well-educated citizens and a skilled labor underpinned by science, technology and innovation.

The Kenya Constitution 2010 Chapter 2 Article 11(2b) recognizes the role of science and indigenous technologies in the development of the nation. The social pillar in Kenya Vision 2030 identifies science, technology and innovation as a foundation for the social and economic development. Science and technology are recognized as critical to development as new knowledge is expected to boost wealth creation, social welfare and international competiveness. The Government of Kenya through Sessional Paper of No.2 of 2016 affirms its mission to create an education and training environment that equips learners with desired values, attitudes, knowledge, skills, and competencies particularly in technology, innovation and entrepreneurship. One of the guiding principles of the Sessional Paper is to prioritize science, technology and innovation. Section 4(r) of the Basic Education Act 2013 recognizes the promotion of innovativeness, inventiveness, creativity, technology transfer and an entrepreneurial culture. The Science, Technology and Innovation Act, 2013 was also enacted to among others “entrench science, technology and innovation into the national production system and for related purposes”. The Environmental Management and Co-ordination (Waste Management) Regulations (2006) also prescribes handling, packaging, treatment, conditioning, reducing, recycling, reusing, storage and disposal of waste.

The SSSLG was developed to provide guidance to school administrators, District Development Committees and any other parties involved in the provision of science laboratories to secondary schools. Similarly, in 2008 the Safety Standards Manual for Schools in Kenya was also developed to provide common standards for child protection. It stipulates that that physical infrastructure in schools that include laboratories should be appropriate, adequate, and properly located, devoid of any risks to users or those around them and should also comply with the provisions of Education Act, Public Health Act and Public Works Building Regulations/Standards. The Ministry also prepared the School Infrastructure Technical Handbook (2007) to provide detailed guidelines on how to prepare school infrastructure development plan, managing a school construction project, and maintaining school infrastructure. The Basic Standard Requirements for Registration of Educational and Training Institutions in the Ministry of Education (MOE, 2011) also stipulates minimum laboratory/science room space meters per student.

The country's education and development frameworks therefore confirm that one of the Government's highest priorities in the medium and long term plan will continue to ensure affordable and equitable access to education through several strategies. The commitment is to attain quality education in all institutions of basic education by creating the conditions necessary to ensure that effective teaching of science, technology and ICT takes place. This will be achieved by collaborating with strategic partners in the provision of improved and accessible infrastructure, including laboratories, laboratory equipment and materials, science rooms, and science kits as stipulated under the National Education Sector Plan (NESP) 2013-2018 laboratory and laboratory equipment investment programme.

The new basic education curriculum reform framework provides for a competency-based curriculum which addresses the weaknesses in the existing curriculum that does not provide deliberate policies and appropriate pedagogical approaches and sufficient resources to lay foundation for the development of science technology and innovation skills (KICD, 2016). The framework provides for various pathways that include science and technology, engineering and mathematics.

3.0 RATIONALE AND SCOPE

3.1 Rationale

As was mentioned earlier under policy and legal context, the country has undertaken wide-ranging policy and legal reforms since the development of the SSSLG in 1989. These include the formulation of the Kenya Vision 2030, the enactment of the Constitution 2010 with its attendant legislative reforms, the introduction of Free Primary (FPE) and Free Day Secondary Education (FDSE) and the ongoing curriculum reforms amongst others. In addition, tremendous technological advancements have also been realized. These have had various impacts on the way teaching and learning is organized.

Currently, existing laboratories were designed for use by 40-45 students. However, class sizes are currently well above this a result of FPE and FDSE. The Ministry is also promoting ICT integration in teaching and learning yet the design of existing labs do not take care of this consideration. It is also noteworthy that in spite of the SSSLG there still exist a great variation in design, construction, fitting and installation of laboratories. Only a few schools have functional laboratories designed in conformity to these standards but which still miss out on important components such as proper waste disposal mechanisms, safety for learners and teachers, and provisions for special needs. In some schools, there are laboratories with basic fittings and equipment but which are not done in conformity to the standard. On the other hand, there are schools without designated rooms for carrying out science experiments but instead use classrooms. There are also schools that have just converted classrooms into laboratories without proper fittings and installations. It is also common practice in most schools to designate one laboratory for more than one subject.

It is therefore, important that the Ministry reviews and update the existing school laboratory standards to provide guidelines for design, construction and management that are in line with contemporary requirements for the teaching and learning of STEM related subjects. This document responds to the gaps identified in the use of the SSSLG and to the contemporary and emerging needs of STEM education in the country. It is intended that these revised guidelines will serve as beacons for education stakeholders in the effort to provide adequate facilities for harnessing research and innovative skills of the learner's at basic education level. It is hoped that this will contribute to the realization of Kenya Vision 2030.

3.2 Scope

This guideline is applicable to **all** basic education institutions and teacher training colleges, including SNE institutions offering the Kenyan school curriculum. It is also intended to expand laboratory-based learning from the traditional Physics, Chemistry and Biology to include additional overarching learning areas beginning from the local environment as well as enhancing investigative pedagogy.

Though this guideline replaces the SSLG, it should not be construed to replace existing legal requirements on the design, construction, installation and management of science laboratories among other works. Hence in the setting up and equipping of STEM laboratories, professional input, as well as fulfilling regulatory requirements will continue to be mandatory.

4.0 GOAL AND OBJECTIVES

4.1 Goal

The goal of this guideline is to provide a framework for ensuring quality learning environment in basic education institutions through provision of equitable, inclusive, and adequate laboratory infrastructure, equipment and materials.

4.2 Objectives

1. To align the 1989 Secondary Schools Science Laboratory Guide to the current legal and policy framework as well as contemporary pedagogical practices.
2. To provide guidelines for the
    a. design and construction,
    b. building and maintenance,
    c. materials and equipment and,
    d. management (including use and safety) of laboratories
3. To ensure improved accessible laboratories, science rooms, laboratory equipments, and science kits for quality education in institutions of basic education, including special needs institutions.

5.0 STANDARDS FOR DESIGN AND CONSTRUCTION OF LABORATORIES

PARAMETER	DESIGN & SPECIFICATIONS – draft two, (final still under development)
SIZE	40 Students will be accommodated in single stream lab as per MOE regulations 2.4 square metres per student Plus additional 1.0sqm(emergency corner shower point) plus 32 sqm(Store, Preparation Areas, &Teachers Office) GROSS TOTAL = 131 square metres inside dimensions, (Public works Ergonomics Department to confirm/Firm up figure) Emergency ablution facility via a separate, purpose made room in form of a Common-Gender Shower Cubicle, screened off in a canvas curtain, 1.0 square metre inside dimensions.
CONSTRUCTION/ MATETERIALS	Foundation Design & Specifications to align to different, soil, geographic & climatic regions . Walls to be of Concrete Block or Baked-brick (Public Works to confirm if this material has been installed & regulated) or dressed Local stone min thickness 225mm & minimum crushing strength …….. N/sqM (Public Works Structural Department to give crushing strength specifications) Pillars (RC or masonry) to be installed at a maximum spacing of …….. MM (Public Works Structural Department to give specifications) along outer walls to mitigate large spans & high wall. Walls & Pillars to have a mandatory ring beam of minimum size 225 x 400mm (Public Works Structural Department to give reinforcement & concrete mix specs of pillars /beams). Roofing to be in galvanized iron pre-painted to match institution's colours, minimum gauge 28 , corrugated or box profile, or equivalent. Asbestos or similar materials with any asbestos content are no longer an approved roofing materials. Each single laboratory to have two main entrance steel double doors. offices, preparation rooms, stores, etc. to have lockable steel security doors. One of these rooms to have a steel exit door. Windows to have cross ventilation on both the longer, opposite walls. Windows to be large enough to permit good natural Light & ventilation. Min glazing ratio to be ……. % of total wall area (Public Works Mechanical Department to give specifications) Beyond legislated light/ventilation requirements, Windows & Doors to have appropriate burglarproofing & lock systems Design & Specifcations for Height of wall and of Ceiling & choice of materials to align to different regional/climatic responses to light, aeration, & humidity; (Public Works Mechanical Department to give specs). In all cases minimum Height of wall to be 2700mm. Cabinets & shelving materials to be either painted steel or minimum 25 mm manufactured blockboard panels, allow retractable drawers as relevant.All surfaces which may potentially come into contact with fluids to be of concrete based construction. Floor/Benches materials to be of concrete based construction; plastered surfaces; Finishes to be tiles, terrazzo, or an equivalent robust material immune to impacts of falling objects & chemical corrosion.
SERVICES INSTALLATIONS	Electrical & Mechanical Services (Plumbing & Gas services) to be conveniently placed along outer walls for ease of supply & drainage . Specs of Quality,Sizes,Gauges, are as follows; ……..… …….. (Public Works Mechanical Department to give input). Emergency Shower to have a Shower Room with head shower & ,water-tap on one wall.

PARAMETER	DESIGN & SPECIFICATIONS – draft two, (final still under development)
FURNITURE & LAYOUT/ FITTINGS	Fixed worktops along walls, and movable tables in the middle of class, net accommodation to target forty (40 no.) students. Spaces within Cabinets as well as overhead shelves to be sufficient volumes and adequately partitioned to hold all requirements of a Science Laboratory. Laboratories to adopt contemporary technologies, including network cabling, White/Smart Board, Projector & Screen Emergency Ablution Shower Cubicle to have diameter 38mm chrome plated grab rails, & relevant shelving.
SAFETY INSTALLATIONS & ENVIRONMENTAL RESPONSE	One Main Door & at least one more Fire Escape Door, both as far apart as possible. A 3rd door to exit from stores/Preparation Room ares. Doors & windows to open outward. No permanent burglarproofing on windows. Stores to be burglarproofed. Schools to consider application of CCTV technology as a deterrence. Emergency Shower Cubicle Shower Room to have overhead shower, grab rails. Gas Cylinder housed external to Lab & roofed Fume Chamber of permanent construction,; to be double access with Gas, Electricity & Water supply with drip Cup drainage, as well as waste gas extractor fan. Public Works Mechanical Department to give specs on Materials, Flue Construction & anatomy , height of discharge spout, and prior treatment, if any required. System to be aluminium sliding frames with maximum glazed areas. Labs to have general purpose, regularly serviced First Aid Box containing minimum items as follow ; Bandages, Gauze, Scissors, scapel, methylated spirit, iodine solution, glucose …….. Emergency Shut-down master-switch controlling all power points in a Science Laboratory . Fire Prevention & Fighting Infrastructure, located in strategic places & regularly serviced (Public Works Mechanical Department to give fresh specifiations & capacity levels). ▪ Inflammable and/or harzadous laboratory substances such as chemicals etc to be stored in locked stores in tightly closed cans or containers and away from any source of heat .
SPECIAL NEEDS	Grab rails in shower corner. Shower nozzle to be accessible to all students Gentle Ramps to all external doors(minimum 1.5metres) Special dedicated, single workplace for SNE ;to be lowered sufficiently (0.8metres from floor); to have a clear void beneath to allow legroom ; to have low eat with backrest for non-wheelchair SNEs. School Labs to be preferably on ground level. If constructed as multi-storeys or set on upper floor of buildings, they are to be equipped with suitable ramps and/or mechanical access devices (lifts).
SAFETY IN OPERATION & BUILDING MAINTENANCE	▪ Inflammable substances such as petroleum, paint, chemicals etc should be stored in tightly closed cans or containers and away from any source of heat. They should never be stored in classrooms and dormitories ▪ Qualified maintenance staff should regularly check the mechanical & electrical & mechanical installations & organize repairs as relevant ▪ Laboratory Learners and staff should undertake periodic fire drills, at least twice a

PARAMETER	DESIGN & SPECIFICATIONS – draft two, (final still under development)
	term ▪ If poisonous gas or chemical leakages/emissions that are likely to pose a threat to learners and staff occur, lab authorities should quickly implement evacuation plans for all persons in the lab ▪ school authorities should be notified immediately. For affected individuals, school authorities should seek immediate emergency treatment at the nearest medical facility ▪ Once notified, school authorities should immediately contact relevant experts on gas or chemical risks **THIS SUB-CHAPTER IS STILL UNDER CONSTRUCTION**
LAB OPERATIONS & MANAGEMENT	Includes sub-topics including, but not limited to; Movement of apparatus eg Trolleys, etc Waste disposal Labcoat Human Resource in Lab Students Lab Gear, Aprons, Facial Masks etc Ledgers, Inventories, Stores, Record- Keeping Etc ***TO BE HANDLE IN CHAPTERS OTHER THAN DESIGN & CONSTRUCTION***
CONFORMITY OF SCHOOLS TO NEW STANDARDS	Schools putting up new Science Laboratories to conform to new standards booklet (SSLD 2017) from the date of publication of these new guidelines. Schools with existing Science Laboratories currently not in conformity with to new standards booklet (SSLD 2017) are required to take necessary measures to adapt to the new guidelines within a time frame of fie (5 no. years) from the date of publication of these new guidelines.
REFERENCES	***1.Basic Standard Requirements for Registration of Educational & Training Institutions in The Ministry of Education-MOE-QAS/UKAID-April, 2011*** ***2.Safety Standards Manual For Schools in Kenya-MOE/CWS-July 2008*** ***3.KESSP-School Infrastructure Technical Handbook-MOE,2007*** ***Secondary Schools Science Laboratory Guide-MOE-1989***
COMPILED	***MWANGI KIRAGU & ANTHONY NDUNG'U***

6.0 STANDARDS FOR SCIENCE EQUIPMENT AND MATERIALS

6.1 Biology Equipment and Materials

S/NO	ITEM	SPECIFICATION	QUANTITY
1	Beakers	Pyrex glass, squat form, with spout 50ml	10
2	Beakers	Pyrex glass, squat form, with spout 100ml	10
3	Beakers	Pyrex glass, squat form, with spout 250ml	10
4	Beakers	Pyrex glass, squat form, with spout 400ml	10
5	Beaker	Pyrex glass, squat form, with spout 1000ml	3
6	Beakers	Polypropylene, squat form, with spout 250ml	20
7	Beakers	Pyrex glass, squat form, with spout 400ml	20
8	Beakers	Polypropylene, squat form, with spout 400ml	20
9	Bottle	Dropping, TK pattern, clear glass, with slotted stopper, 100ml	10
10	Bottle	Clear glass, narrow neck, with ground glass stopper,125ml	30
11	Bottle	Clear glass, narrow neck, with polypropylene stopper,125ml	30
12	Wash bottle	Polythene 250ml	10
13	Cylinder	Graduated, with spout, soda glass, 10ml	5
14	Cylinder	Graduated, with spout, soda glass, 100ml	10
15	Cylinder	Graduated, with spout, soda glass, 1000ml	3
16	Funnel	Plain soda lime glass diameter 70mm	10
17	Funnel	Plain soda lime glass diameter 100mm	10
18	Funnel	Plain soda lime polypropylene 70mm	20
19	Funnel	Plain soda lime polypropylene 100mm	20
20	Funnel	Plain soda-lime glass diameter 100mm	2
21	Funnel	Plain soda-lime glass diameter 300mm	10
22	Filter paper	No.91, 110mm	200
23	Basin	Porcelain, round bottom, spouted, shallow form, 75ml, 80 x 30mm	20
24	Porous pot	Cylindrical, 140 x 60mm	10
25	Bell jar	Socket top, 200 x 150 mm	10
26	Stop cock	Borosilicate glass, 29/32, for use with ASP-390-050W and -070Q	3
27	Test tubes	Thermal, shock resisting glass, with rim, 150 x 25mm	100
28	Test tubes	Soda lime glass, normal wall, with rim, 125 x 16mm	200
29	Test tubes	Thermal, shock resisting glass, with rim, 75 x 10mm	200
30	Test tubes	Borosilicate glass, with side arm, 125 x 16mm	13
31	Pneumatic Trough	Glass, circular, diameter x height 250 x 125mm	10
32	Tube delivery	Straight 2 each 50, 70, 170mm	6
33	Stoppers	Rubber Assorted	120
34	Brushes	Burette bristle wire handle, head diameter, 19mm	12
35	Clips spring	Polythene coated metal diameter 6mm	20
36	Cork borers	Plated metal, range 4 – 10mm	3
37	Rods,	stirring Glass 200mm long x 7mm diameter	20
38	Spatula	Stainless steel, flat with rounded end 90 x 20mm	15
39	Cock stoppers	Assorted	150
40	Rubber stoppers	BS2775M solid, assorted	100
41	Test tube	Holders, wood, for up to 19mm diameter tubes	20
42	Test tube rack	Hard wood for 22mm holes and two 32mm holes	20
43	Combustion boats	Glazed porcelain, with handles 60 x 10 x 8mm	12
44	Crucibles and lids	Porcelain, squat 25ml	12
45	Mortar	Porcelain, unglazed	6

S/NO	ITEM	SPECIFICATION	QUANTITY
46	Pestle	100ml, 100 x 45mm	10
47	Funnel	Cinical, separating, BS2021 type 2A, Borosilicate glass, PTFE stop cock, 100mm	3
48	Clips	Type metal	15
50	Syringes	Polypropylene, 50ml, for use with gas syringes set	10
51	Aquarium	Plastic frame with glass panels, 410 x 250 x 250mm high	1
52	Blood lancets	Lancets metal	40
53	Charts	Botany	10
54	Charts	Physiology	10
55	Charts	Zoology	10
56	Dissecting set	plastic wallet	10
57	Dish dissecting	Aluminium, with fiange, 286 x 229 x 44mm deep	10
58	Insect pins	Black tempered steel, 38 x 0.4mm	200
59	Ear model	Anatomical setting model,mounted with key	2
60	Heart model	Dissectible model, mounted with key	2
61	Kidney model	Enlarged x 3, part –dissected, mounted on stand	2
62	Eye model	In orbit, enlarged x 5 model mounted with key	2
63	Microscope	Gamma 10	10
64	Microscope slides	Slides, with ground edges, 76mm x 26mm	200
65	Cover glass	No.1, 1/20.16 to 0.19mm thick, 18 x 18mm	200
66	Prepared microscope slides	bacteria	1 set

6.2 Chemistry Equipment and Materials

ITEM NO.	DESCRIPTION	SPECIFICATION	QUANTITY
1	Burette	Glass, with interchangeable stop clock, 50 x 0.1ml	50
2	Pipette	One mark, 25ml	50
3	Flask Conical	Pyrex glass, narrow mouth, graduation marks 100ml	50
4	Flask Conical	Conical, pyrex glass, narrow mouth, graduation marks 250ml	50
5	Flask	Conical, pyrex glass, narrow mouth, graduation marks 500ml	4
6	Flask	Conical, pyrex glass, narrow mouth, graduation marks 1000ml	3
7	Flask	Conical, pyrex glass, narrow mouth, graduation marks 2000ml	10
8	Flask	Conical, flat bottom, pyrex glass 250ml	5
9	Flask	Conical, flat bottom, pyrex glass 500ml	5
10	Flask	Conical, round bottom, pyrex glass 250ml	5
11	Flask	Distillation, pyrex glass, BS658, round bottom, 250ml	10
12	Flask distilation	Flat Bottomed 250ml	**2**
13	Condenser Liebig	borosilicate glass, with fused- on jacket, length 500 mm	10
14	Tube Combustion	Borosilicate glass, 150 x 25mm	10
15	Pipette Dropping glass	with teat, graduated, 2ml	24
16	Gas jar glass	ground top fiange, 200 x 50mm	25
17	Covers	75mm, for 50mm diameter gas jar	25
18	Absorption tube	Glass, u-form, 125 x 15mm	10
19	Absorption tube	Glass, u-form, with side arms, 125 x 15mm	10

ITEM NO.	DESCRIPTION	SPECIFICATION	QUANTITY
20	Watch glasses	Clear glass, with ground edge, 80mm	20
21	Bottle	Amber glass, Winchester type, screw cap, 2000ml	10
22	Pair of Tongs Crucible	Blackened steel, with bow, 200mm	10
23	Reel of Nickel chromium wire	125g	1
24	Triangles	Iron wire, 50mm side	10
25	Retort stand	Pressed steel, matt black finish, 200 x 125mm	50
26	Retort stand rod	Aluminium alloy, 600 x 12mm	50
27	Retort stand clamp	Hold articles from 2mm to 90mm diameter	50
28	Bosshead Offset jaws	Rod up to 16mm diameter	50
29	Ring	Closed, with stem ,Internal diameter 70mm	6
30	delivery Tube	Straight 2 each 50, 70, 170mm	6
31	Tubing	PVC colourless 6.5 x 1.5mm	10
32	Tubing	PVC normal wall 6.5 x 1.5mm	10
33	Stoppers	Assorted cork	120
34	Stoppers	Rubber Assorted	120
35	Test tube Holder	Wood upto 19mm diameter tubes	24
36	Test tube rack	Plastic 22mm holes and two 32 holes	24
37	Absorption tube	Glass straight form with one bulb 100 x 12 mm	2
38	Aspirator	Borosilicate glass with moulded side outlet 3L	3
39	Balance	Single pan ohaus 750gm,	1
		2610gm sensitivity of 0.1gm	1
41	Beehive shelf	Earthen ware 75mm diameter	10
42	Blow pipe	Bent plated brass approx. 200mm long	2
43	Absorption tube	Glass, straight form with one bulb 150 x 20mm	1
44	Combustion boats	Glazed porcelain with handle 60 x 10 x 8mm	20
45	Crucible and lids	Porcelain squat 25ml	20
46	Deflagrating spoons	Steel with aluminum flange	10
47	Desiccator knob cover	Barosillicate glass with metal disc diameter 150mm	10
48	dropping Funnel	Borosilicate glass 50mm	10
49	Absorption tower	Glass fitted tubulure 250 x 50mm	1
50	Mortar and pestle	Porcelain, ungazed 100ml, 100 x 45mm	20
51	Periodic Table chart	1050 x 782mm wall mounting	2
52	Retort Flask	stoppered Borosilicate glass 250ml	3
53	Sand baths deep form	Tinned iron 150 x 38mm	10
54	volumetric Flask	Class B, soda glass with stopper 250ml	20
55	separating Funnel	BS2021 TYPE 2A borosilicate glass PTFE stop cock 100ml	10
56	Hand centrifuge	2 place 15ml	2
57	Cylindrical centrifuge tubes	15ml, 111 x 17mm	10
61	Hoffmann voltameter	Glass unit graduated 0 to 50 x 0.2m	2
63	Electrodes	Hofmann voltmeter carbon voltmeter	2 pair
64	Electrode	Hofmann voltmeter platinum electrode	2 pair
65	Crocodile clips	Metallic,with rubber insulated	40
66	Zinc Plate with terminal	, 125 x 50 x 2mm	4 pair
67	Copper Plate with terminal	125 x 50 x 2mm	4 pair
68	Atom model	simple cubic lattice ,27 grifzote spheres 25mm diameter	1
69	Boyles law apparatus	Jolly's air thermometer bulb	1
70	Kinetic theory model	Electric motor 0-6v DC	1
71	Syringe	Polypropylene 50ml for use the glass syringe set	12

ITEM NO.	DESCRIPTION	SPECIFICATION	QUANTITY
	PART II: CHEMICALS		
1.	Acetone		500ml
2.	Aluminium metal powder fine		250g
3.	Aluminium foil		2pkts
4.	Ammonia solution, 0.880SG		2.5L
5.	Ammonium carbonate		500g
6.	Ammonium chloride		500g
7.	Ammonium Dichromate (VI)		500g
8.	Ammonium Nitrate		500g
9.	Ammonium Sulphate		500g
10.	Barium chloride LR		500g
11.	Barium nitrate LR		500g
12.	Barium peroxide LR		500g
13.	Bleaching powder		500g
14.	Calcium metal granules		500g
15.	Calcium carbonate LR		1kg
16.	Calcium chloride	Fused, granular, 307 mesh	1kg
17.	Calcium Hydroxide LR		1kg
18.	Calcium oxide	Technical	1kg
19.	Calcium nitrate tetrahydrate LR		500g
20.	Calcium sulphate LR		500g
21.	Charcoal	Granular coconut shell	500g
22.	Chromium (III) Potassium Sulphate Dodecahydrate		500g
23.	Cobalt (II) Nitrate LR 1477		500g
24.	Copper metal balt (II) Chloride		500g
25.	Copper metal turnings		500g
26.	Copper metal powder, precipitated		250g
27.	Copper (II) carbonate	Basic LR (cupric carbonate)	250g
28.	Copper (II) chloride	LR Dihydrate (cupric chloride)	500g
29.	Copper (II) nitrate	LR trihydrate (cupric nitrate)	250g
30.	Copper (II) sulphate	LR anhydrous (cupric sulphate)	250g
31.	Hydrogen Peroxide solution	100 vols LR 2014	500ml
32.	Iodine LR		100g
33.	Iron metal powder LR		500g
34.	Iron metal filings,	Fine	1kg
35.	Iron (III) chloride	Anhydrous (ferric chloride	500g
36.	Iron (II) sulphate LR	Heptahydrate (Ferrous sulphate)	1kg
37.	Ammonium iron (II) Sulphate		1kg
38.	Soft iron nails		50
39.	Lead metal foil		500g
40.	Lead (II) Acetate LR (Ethanoate)		500g
41.	Lead (II) carbonate LR		500g
42.	Lead (II) Nitrate LR		500g
43.	Lead (II) oxide LR (litharge)		500g
44.	Lead (IV) Oxide LR (lead dioxide)		500g
45.	Lead oxide LR (red lead)		500g
46.	Magnesium metal powder		250g
47.	Magnesium metal ribbon		25g

ITEM NO.	DESCRIPTION	SPECIFICATION	QUANTITY
48.	Magnesium carbonate LR		500g
49.	Magnesium chloride LR		500g
50.	Magnesium nitrate LR		500g
51.	Magnesium Oxide	Heavy LR	500g
52.	Magnesium Sulphate Heptahydrate AR		500g
53.	Manganese (IV) Dioxide LR		500g
54.	Calcium carbonate	About 13mm	1kg
55.	Nickel (II) Sulphate LR		250g
56.	Ethanedioic Acid LR (oxalic acid)		500g
57.	Phosphorous, amorphous red		100g
58.	Platinum wire	100 x 0.37mm diameter	1 each
59.	Potassium metal in liquid paraffin		25g
60.	Potassium Bromide LR		500g
61.	Potassium Nitrate LR		500g
62.	Potassium Chlorate (V) LR		500g
63.	Potassium chloride LR		500g
64.	Potassium Chlorate (VI) LR		500g
65.	Potassium Dichromate (VI)		500g
66.	Potassium Hydroxide	Pellets LR 1813	500g
67.	Potassium Manganate (VII) LR		500g
68.	Benzene-1, 2,3 – Triol crystal (pyrogallol)		100g
69.	Silver Nitrate LR		25g
70.	Soap solution, Clark's		2.5l
71.	Sodium metal in liquid paraffin		100g
72.	Sodium carbonate decahydrate LR		1kg
73.	Sodium chlorid AR		500g
74.	Sodium Hydrogen Carbonate LR		1kg
75.	Sodium Hydroxide Pellets LR		1kg
76.	Sodium iodide LR		100g
77.	Sodium Nitrate LR		500g
78.	Sodium sulphate decahydrate AR		500g
79.	Sodium thiosulphate pentahydrate LR		500g
80.	Sodium Sulphate Anhydrous LR		500g
81.	Sulphur	powder	1kg
82.	Zinc metal, granulated LR		500g
83.	Zinc metal	powder ,100 mesh-dust) LR	500g
84.	Zinc carbonate LR		500g
85.	Zinc nitrate LR 1514		500g
86.	Zinc oxide LR		500g
87.	Zinc sulphate LR		500g
88.	Hydrochloric Acid, 1.18SG LR		2.5L
89.	Nitric Acid, 1.42SG LR		2.5L
90.	Sulphuric Acid, 1.84SG LR		2.5L
91.	Acetic (ethanoic) Acid	Glacial LR	500ml
92.	Bromine LR		100ml
93.	Aluminium oxide LR		500g
94.	Butan-1-ol LR		1L
95.	Oil, castor		500ml
96.	Oil, coconut		250g
97.	Cotton wool, absorbent, white		500g

ITEM NO.	DESCRIPTION	SPECIFICATION	QUANTITY
98.	Cyclohexane		500ml
99.	Cyclohexene		250ml
100.	Calcium carbide, technical		500g
101.	Ethanol absolute	99/100 % pure (duty paid)	500ml
102.	Ethoxyethane LR (diethy ether)		500ml
103.	Feliling'solution no.1		500ml

6.3 Physics Equipment and Materials

S/No	Item	Specifications	Quantity
Pressure, Gas Laws			
1	Boyle's law apparatus	With Jolly's Air, Thermometer bulb,	1
2	Kinetic Theory Model	With electric motor, 0-6V	1
4	Barometer, Tube glass	Straight type, 900mm long, bore 4mm	1
5	Syringe	50ml, polypropylene for use with glass set syringe	3
6.	Syringe	50ml Glass, leur fitting	3
7.	Pump	Plastic or metal bicycle	1
8	Hair drier (Blower)		1
9	Balloons	Sets of assorted balloons	5
10	Density Bottle	25ml, unadjusted, with capillary stopper	10
11	Dynamic trolleys	Hardwood, 30cm long	10
12	Hydrometer	Range 0.7 to 2.00 subdivided to 0.01	2
13	Lift pump	Glass unmounted	1
14	Inclined plane	Simple, with pulley roller and scale	10
15	Inclined plane	Metallic rails and pendulum bobs	10
16	Magdeburg Hemispheres	Modified kitchen sufurias,	1
17	Manometer	Glass uncalibrated	1
Measurement			
18	Rule	Plastics vertical, mm divisions on both edges, ½ metre length	10
19	Rule	Plastics vertical, mm divisions on both edges, 1 metre length	10
20	Rule	30cm, plastic	41
21	Vernier callipers	With both inside & outside 0-12cm x 0.1mm	20
22.	Micrometer screw gauge	0-2.5 x 0.01mm	20
23	Displacement vessel	100 x 65mm	20
24	Digital stop watch	0 to 60 x 0.01s	10
Energy, Work, Power and Machines			
25	Pulley	Single plastic 50mm diameter, with one hook	20
26	Pulley	Double, plastic, 50mm diameter, with two hooks	20
27	Pulley	Triple plastic 50mm diameter, with two hooks	20
Hooke's Laws, Linear Motion, Newton's Laws			
28	Mass	Slotted, 20g	50
29	Mass	Slotted, 50g x 5 with hooks	5
30	Mass Hangers	50g	10
31	Mass	Small form, 50g	50
32	Spring	Steel, 800 x 8mm, stretching to 180mm, with 250g	10

S/No	Item	Specifications	Quantity
33	Spring balance (Dynamometer)	Flat form, 10 x0.1N	10
34	Spring balance (Dynamometer)	Flat form, 100 x5N	10
35	Ticker Tape Timer	12V ac/dc	10
36	Ticker Taper rolls	Pack of 5 rolls of 300m each + 30 carbon paper discs	5
37	Wooden blocks	60mmx100mmx 100mm	20
38	Pendulum bobs	13mm diameter, lead	10
39	Pendulum Bobs	Lead 19mm diameter, with eye ring	10
Heat and Heat Transfer			
40	Bar breaking apparatus	Standard apparatus	1
41	Ball and Ring	Gravesande	10
42	Rods	Cast iron, spare for bar breaking apparatus	12
43	Bimetallic strip	With wooden handle	10
44	Calorimeter set	Copper 75x50mm with wood lid stopper and stirrer	10
45	Conductivity Kit	Standard conductivity apparatus	1
46	Immersion heater	12V, 66W to fit calorimeter	1
47	Steam Generator	Copper, capacity of 1.5L with water gauge	1
48	Clinical Thermometer	Glass, 35^0 to 42^0C	10
49	Thermometer	Min -10 to Max 110^0 C divisions, 1.0^0C	10
50	Six's maximum and minimum thermometer		1
51	Vacuum Flask	450ml With screw stopper and cap	1
52	Set of specific heat capacity cylinders	Copper, Aluminium, Lead, Iron balls/cubes	5
Light, Reflection, Refraction, Lenses			
53	Colour filters	Unmounted, 75 x 50mm for ray boxes	10
54	Semi-circular glass block	Thickness 20mm, diameter 16mm	10
55	Rectangular glass block	114 x 63 x 19mm	10
56	Lens	Bi-concave diameter 50mm focal length 150mm	10
57	Lens	Bi-convex diameter 50mm focal length 150mm	10
58	Lens holder	Wooden for 50mm diameter	10
59	Mirror	Concave, spherical diameter 50mm focal length 150mm	10
60	Mirror	Convex spherical diameter 50mm focal length 150mm	10
61	Mirror	Plane, back silvered, 75 x25mm	10
62	Colour disc	300mm diameter	1
63	Pack of optical pins	Length 70mm	190
64	Pre formed cardboard	220 x 307 mm	9
65	Prism	Glass prism non-optically worked, equilateral 25 x 25mm	10
67	Prism	Glass prism non-optically worked 90^0, 45^0 25^0 x 25mm high x 5	10
68	Ray box	12V, 24W	1
69	Glass blocks	90 x 60 x 10mm	10
70	White screen	20 x 15 mm	20
Electricity and Magnetism			
70	Ammeter	Dual scale (0-1A & 0-5A) moving coil, dc with stand	10
71	Worcester circuit	board kit	10
72	Cells	Alkaline, Dry cell, 1.5V Size 'D'	10
73	Bicycle Dynamo assembly	1.25V, Lamp in holder	1
74	Electric Motor	12V, dc and ac	1

S/No	Item	Specifications	Quantity
75	Electric bell	3-8V ac/dc	1
76	Electrostatic Kit	Complete kit	1
77	Gold leaf Electroscope	Brass cap and plate with leaf	2
78	Connecting wires	Rolls	3
79	Crocodile clips	Insulated, red and black colours	100
80	Galvanometer	Moving Coil, 35-0-35mV	10
81	Induction Coil	With ordinary commutator spark in air 6mm	1
82	Leclanche cell,	500ml, 1.5V	1
84	Bar magnets	Chrome steel, with keepers 50x13x6mm	9 pairs
85	Cylindrical Magnet	Chrome steel, diameter 10mm, length 100mm	1
86	Horse shoe magnet	Chrome steel with keeper 75mm	1
87	Electromagnet	With soft Iron	1
88	Magnetic needle	Carbon Steel, with brass bearing, length 75mm	
89	Stand	For magnetic needles	1
90	Plotting compass	One glass face, diameter 15mm	9
91	Meter bridge	Scales: 0-100cmx1mm and 100cm-0cm x1mm	1
92	Knife edge jockey	Brass	2
93	Resistance box	1-1000 Ohms	1
94	Resistance coil	10 Ohms	9
95	Reel of Constantan wire,	Bare 26swg	1
96	Resistance Units	2, 5, 10, 15, 20 Ohms	5
97	Resistor	Sliding contact, 300 x 50mm 335 Ohms, 1.2A	2
98	Soft Iron rod	150 x 10mm	5
99	Demagnetizing solenoid	220-240 ac supply	1
100	Shunt	EHA-860-L, 0-1A dc	1
101	Voltmeter,	Dual scale, moving coil with stand 0-5V and)-15V	9
102	Transformer	Multi-tap of output: 2, 4, 6, 8 and 12 V 6A a.c 220-240V a.c supply	1
Sound, Waves			
103	Bell and Jar apparatus	Base with valve for removing air	1
106	Ripple tank	4-6Volts with ac/dc power supply	1
107	Elliptical reflector	For use with ripple tank	1
108	Illuminant	12V, with lamp for use with ripple tank	1
109	Hand stroboscope	For use with ripple tank	1
110	Savart wheel		1
103	Sonometer	Wood board	1
104	Sonometer wires	Spare for sonometer XEC-340-L	2
105	Tuning fork	Set of tuning forks blued steel of frequency 256Hz, 288Hz, 320Hz, 341.3Hz, 384Hz, 426.6Hz, 480Hz, 512Hz	1

7.0 STANDARDS FOR MATHEMATICS EQUIPMENT AND MATERIALS

S/No	Item	Standard, specifications	Quantity (per class of 40)
	NUMBERS		
1.	Abacus set	Wooden or plastic	9
2.	Thermometer (Provided for in Physics)		
3.	Bells	Manual type	3
4.	Stop clocks (Provided for in Physics)		
	Charts on numbers		
5.	Place value charts	Commercial quality (to be specified)	1
6.	Chart showing factor tree diagrams	1mx0.8m, canvas, waterproof surface.	1
7.	Chart illustrating divisibility tests	1mx0.8m, canvas, waterproof surface.	1
8.	Chart showing GCD tree	1mx0.8m, canvas, waterproof surface.	1
9.	Chart showing number line	1mx0.8m, canvas, waterproof surface.	1
10.	Charts showing fractions	1mx0.8m, canvas, waterproof surface.	1
11.	Chart showing decimals	1mx0.8m, canvas, waterproof surface.	1
12.	Chart(showing squares and square roots)	1mx0.8m, canvas, waterproof surface.	1
13.	Charts illustrating regular plane figures	1mx0.8m, canvas, waterproof surface.	1
14.	Chart (showing cubes and cube roots)	1mx0.8m, canvas, waterproof surface.	1
15.	Chart (showing reciprocals)	1mx0.8m, canvas, waterproof surface.	1
16.	Chart illustrating laws of indices and logarithms	1mx0.8m, canvas, waterproof surface.	1
17.	Chart illustrating the process of rationalization	1mx0.8m, canvas, waterproof surface.	1
18.	Chart illustrating logarithmic laws	1mx0.8m, canvas, waterproof surface.	1
19.	Chart illustrating number patterns	1mx0.8m, canvas, waterproof surface.	1
20.	Chart illustrating Pascal's triangle	1mx0.8m, canvas, waterproof surface.	1
	MEASUREMENT		
21.	Metre rule (provided for in Physics		
22.	Tape measure	Length 10 metres. (Other specifications to be given)	9
23.	Cubes	Wooden or plastic, 5cmx5cmx5cm (approx)	41
24.	cuboids	Wooden or plastic, 5cmx6cmx8cm	41
25.	cylinders	Wooden or plastic, Diameter 6cm, length 10cm	41
26.	Ruler	Length 30 cm, plastic	41
27.	Measuring cylinder	Plastic. (Other specifications to be given)	9
28.	Burette	Plastic	9
29.	Beam balance (provided for in Chemistry)		2
30.	Electric balance (provided for in Chemistry)		
31.	Analogue Clock	Face marked in numerals 1 to 12	2
32.	Digital Clock		2

S/No	Item	Standard, specifications	Quantity (per class of 40)
33.	Analogue watch	Face marked in numerals 1 to 12	9
34.	Digital watch		9
35.	Scientific calculator	FX82	41
	Charts on measurement		
36.	Charts(illustrating conversion of time from one system to another)	1mx0.8m, canvas, waterproof surface	1
37.	Chart(showing currencies of different countries)	1mx0.8m, canvas, waterproof surface	1
38.	Chart showing income tax schedule/bands	1mx0.8m, canvas, waterproof surface	1
	GEOMETRY		
39.	Geometrical instruments set	Standard type	41
40.	Topographical map	1mx0.8m, canvas, waterproof surface	1
41.	Polygonal shapes(assorted)		41
42.	Blackboard protractor	Plastic or wooden. (Other specifications to be given)	4
43.	Blackboard ruler	Plastic or wooden. (Other specifications to be given)	4
44.	Blackboard pair of compasses	Plastic or wooden. (Other specifications to be given)	4
45.	Blackboard set square	Plastic or wooden. (Other specifications to be given)	4
46.	Magnetic compass	Small (diameter 2cm approx)	10
47.	Clinometer	Wooden or plastic	10
48.	Globe	Small size (diameter about 25cm)	9
49.	Cotton strings (rolls)	thick (2mm approx.)	5
50.	Square boards/geoboard	Wooden, 1mx1m	20
51.	Mirrors	Approximately 10cm by 10cm.	10
52.	Tracing paper	A4 size	1 ream
	Charts on geometry		
53.	Map showing longitudes and latitudes	The surveyor's standard	1
54.	Chart(showing Cartesian plane)	1mx0.8m, canvas, waterproof surface	1
55.	Chart illustrating similarity and enlargement	1mx0.8m, canvas, waterproof surface	1
56.	Chart showing types of triangles	1mx0.8m, canvas, waterproof surface	1
57.	Chart illustrating different ways of getting area of a triangle	1mx0.8m, canvas, waterproof surface	1
58.	Chart illustrating various polygons	1mx0.8m, canvas, waterproof surface	1
59.	Chart illustrating sectors, segments and common region between two circles	1mx0.8m, canvas, waterproof surface	1
60.	Chart showing different solids (i.e. pyramids, frustrum, prism, cone, sphere)	1mx0.8m, canvas, waterproof surface	1
61.	Chart illustrating angle properties of a circle	1mx0.8m, canvas, waterproof surface	1
62.	Chart of a unit circle	1mx0.8m, canvas, waterproof surface	1
63.	Chart illustrating various properties of circles, cords and tangents	1mx0.8m, canvas, waterproof surface	1

S/No	Item	Standard, specifications	Quantity (per class of 40)
64.	Chart showing geometrical patterns	1mx0.8m, canvas, waterproof surface	1
65.	Chart illustrating amplitude, period and phase angle in a wave	1mx0.8m, canvas, waterproof surface	1
	LINEAR MOTION		
66.	Chart showing linear motion tables	1mx0.8m, canvas, waterproof surface	1
67.	Chart showing linear motion graphs	1mx0.8m, canvas, waterproof surface	1
	ALGEBRA		
68.	Match sticks		5 boxes
69.	Chart illustrating quadratic identities	1mx0.8m, canvas, waterproof surface	1
	STATISTICS AND PROBABILITY		
70.	Dice	2cmx2cmx2cm approx.	20
71.	Chart illustrating various presentations of data	1mx0.8m, canvas, waterproof surface	1

8.0 STANDARDS FOR TECHNOLOGY AND ENGINEERING EQUIPMENT AND MATERIALS

	Item	Specification	Qty
1.	Desktop Computer	Commercial standards	1
2.	Optical Reader	Commercial standards	1
3.	LED Projector (Fixed)	Commercial standards	1
4.	Robotics educational kits or intelligent machines	Commercial standards	9
5.	Loudspeakers	Commercial standards	2
6.	STEM Digital Content	Per subjects	1
7.	Laptops	Commercial standards	9
8.	mini speakers	Commercial standards	9
9.	SMART board	Commercial standards	1
10.	Lead removers	Commercial standards	9
11.	Soldering Kit (gun and wire)	Commercial standards	9
12.	Claw Hammer	Commercial standards	9
13.	Nails (Assorted)	1”, 2” and 5”	5kg
14.	Pliers	Commercial standards	9
15.	Scissors	Commercial standards	9
16.	Cork borers	Commercial standards	9
17.	Glass cutter	Commercial standards	9
18.	Multisockets	Commercial standards	9
19.	Screw drivers	Commercial standards	9
20.	A set of screw and bolts	Commercial standards	9
21.	Adhesive PVC Tapes	Commercial standards	9
22.	Plastic pylons (box) or straws	Commercial standards	20
23.	Plastic and paper cups and plates (packets)	Commercial standards	20
24.	Protective eye and ear masks or gear	Commercial standards	20
25.	Mother board and circuit boards	Commercial standards	20
26.	Rescue Rails	Commercial standards	20
27.	Marbles	Commercial standards	20
28.	Curtain rails (1 metre)	Commercial standards	20
29.	Buzzes	Commercial standards	20
30.	Tool Box	Commercial standards	9
31.	Solar panels (mini)	Commercial standards	20
32.	Musical cards	Commercial standards	40
33.	Metal shears	Commercial standards	9
34.	Hack saw	Commercial standards	10
35.	Rip saw	Commercial standards	10

9.0 STANDARDS FOR PRIMARY SCIENCE ROOM EQUIPMENT AND MATERIALS

10.0 STANDARDS FOR PRIMARY TEACHER EDUCATION LABORATORY EQUIPMENT AND MATERIALS

11.0 STANDARDS FOR DIPLOMA TEACHER EDUCATION LABORATORY EQUIPMENT AND MATERIALS

12.0 LABORATORY MANAGEMENT

12.1 Waste Disposal Management

GENERAL CONSIDERATIONS

The first philosophy of waste management is that Wastes should be minimised where possible
All potential waste streams that arise as part of laboratory operations needs to be assessed and an appropriate disposal route selected prior to it actually being generated..
All laboratory Staff/Student body must ensure segregation, accurate and complete labelling and safe storage, transport, treatment and disposal of laboratory wastes.
Wastes to be stored in suitable areas whilst awaiting collection and must not be accumulated. mixing avoided where possible, as unexpected reactions may occur.Regular disposal from the laboratory must be part of the laboratory program.

Containers/ Waste bins must not not leaking and there is no spillage on the exterior of containers.

Untrained staff and students are not to handle hazardous wastes and must not be given responsibility for them.
Personal Protective Gear equipment to be worn when handling uncertain chemical waste.

B. PURPOSE-BUILT, UNDERGROUND LIQUID WASTE DISPOSAL SYSTEM

Over 75 % waste involves liquids/solution which may never leave the School compound. Thus authorities are to construct An Approved Underground Liquid Waste Disposal System in form of a modified soak-away pit into which liquid waste from one or several labs is discharged via an approved pipe network. Soakpit to be a round chamber, in Masonry Stone walls, semi-filled in Hardcore & roofed at ground level as per Public Works Standard specifications.
Modification involves an advance covered treatment chamber through which all liquid waste chemicals pass first, and into which neutralizing/precipitating chemicals are periodically injected (Simple Specifications on nature & rate of periodic treatment to be obtained from PPB / GC / Public Health / KEBS).
School s located in Sewered Regions eg urban centres can discharge liquid waste (ie. strictly after it passes the advance covered treatment chamber) with prior approval by regulatory authorities.
All plumbing installations to have suitable water-based traps to pre-empt the seep-back of all gasses from waste water system into the lab. Properly fitted, air-tight covers to the Inspection Chambers for the same reasons. Regular inspection of these installation by school artisans to be done every 3 months to safeguard expiries

C. DETAILED WASTE DISPOSAL ROUTES

WASTE TYPE	SOURCE	MANAGEMENT METHOD
SOLID	General Cleaning, Solids, packaging material, timber	-laboratory users to use the “green “ WM philosophy; five conventional separation/segregations; 1.polythene & Plastics materials

	paper, polythene materials, metal,wood, bio-degradable organic substances, broken glass etc	2.metal, 3.wood & paper, 4. bio-degradable organic substances 5.broken glass These are to be stored in covered waste bins, marked clearly (different colours recommended) taken away periodically by Local Authority Waste disposal Services or Private Sector Waste disposal Services. Items listed in 3 & 4 above can be incinerated in a controlled manner(school incinerator) to save on weight & hence cost of outsourcing services. Items listed in 4 above can be injected back into nature (school garden) to again save on disposal costs
SOLID	Chemical Processes; Chemical Solids, precipitates, Contaminated Materials eg gloves ,wipes,paper	Laboratory Staff to verify and neutralize any hazardous properties Larger waste to be be taken away by Local Authority Waste Services as per method above Finer waste particles to be flushed down into purpose-built, approved underground waste system
LIQUIDS	Chemical Processes; Chemical Solutions, precipitate Suspensions, Waste water after cleaning	Laboratory staff to verify and neutralize any hazardous properties All Liquid waste to be flushed down into purpose-built, approved underground waste system
GASES	Chemical Processes;	Laboratory staff to supervise that gases with potentially hazardous effects are handled only through Fume Chamber built to standard & approved specifications
OTHER	Natural Attrition Processes; Unlabelled /uncertain Chemical & Solids, Expired substances	Laboratory Staff to organize these materials to be be taken away by Local Authority Waste Services

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12.2 Records Management

Record keeping is one of the essential services in managing a science laboratory stores. As such all materials must be catered in their respective records. This enhances accountability for equipment and materials.

Poor record keeping has been the main course of loses in schools. shortage of equipment and materials due to irregular replacement occasioned by absence of records.

there are three store ledgers used in stores:-

(a) permanent stores ledger;
(b) consumable store ledgers
(c) expendable store ledger

Permanent stores ledger

Permanent stores are those stores which have a life exceeding two years and an initial value of Kshs.400.00.

i. furniture including stools and tables
ii. permanent equipment such as balances, microscope and meters

Consumables stores ledger

Consumable stores are items which change their nature or form upon being used or retain their identity but have a value of Kshs.20.00 or less

i. chemicals
ii. stationery

Expendable stores ledger

expendable stores are all other items not included either under Permanent stores or under consumable stores.

i. expendable equipment such as glassware and bottles
ii. textbooks are expendable but they require a SEPARATE LEDGER

Inventories

Every person with Permanent or Expendable Stores in charge must hold an inventory book for the stores in question. Therefore an inventory book must be provided for the laboratory and all appropriate items recorded.
The book should be retained by the school administration and when the person with the items on charge is replaced a full physical inspection must be done and the taking over certificate on the back of the book signed.
Inventory book entries must be made whenever stores are either issued from or returned to the school stores.
Broken or unserviceable articles should be withdrawn and replaced by new ones without any entry being made in the inventory book.

Stores accounting
all items received must be ledgered showing the number of the payment voucher against which payment is made. whilst the value of the items need not be entered it is advisable to do this.
Back up of records in retrievable form is recommended
Give examples of required records at least a page for reference

12.3 Human Resources

Roles of officers

(i) Secondary schools and colleges

1) Head of department (HOD) Science

a) Coordinates use of lab, eg. Lab time table
b) Prepare procurement plan for materials and equipment and submits to the administration
c) Advise the administration of the institution on the maintenance of the lab eg. Repairs and improvements
d) Advises the administration on any other issue related to the management of science materials, equipment and the labs.

2) Head of subject (HOS)

a) Prepares a procurement plan at subject level and submits to the HOD Science
b) Schedules the use of the labs at the subject level
c) Advises the HOD on lab maintenance eg. repairs and improvements.

3) Subject Teacher

a) Submit requirements for materials and equipment to the HOS
b) In charge of learning and safety of learners during his/her lessons
c) To ensure that materials and equipments used during lessons are returned to appropriate places.
d) Advise the HOD on lab maintenance eg. repairs and improvements.

4) **Lab technician/assistant**
   a) Assists the teacher in preparations of materials and equipment for use in lessons
   b) Assists the teachers during the lessons
   c) Ensure the cleanliness of the lab and equipment
   d) Ensure proper storage and organization of materials and equipment for ease of access when needed
   e) Advise the subject teachers on the requirements of materials and equipment
   f) Advise the HOD on lab maintenance eg. repairs and improvements.
   g) Assists learners in practical work under the teacher's guidance and instructions.
   h) Document and maintain records on the stock and consumables

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REPUBLIC OF KENYA

LOWER PRIMARY LEVEL CURRICULUM DESIGNS

VOLUME TWO

SUBJECTS:
MATHEMATICS, ENVIRONMENTAL, HYGIENE AND NUTRITION ACTIVITIES

KENYA INSTITUTE OF CURRICULUM EDUCATION

2017

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FOREWARD

The Basic Education Curriculum Framework (BECF) outlines the vision and mission of Kenya's curriculum reforms. The vision of the curriculum reforms is to develop an engaged, empowered and ethical citizen. The mission is to nature the potential of every learner.

The framework adopts a Competency-based Curriculum and has identified seven core competencies, namely; communication and collaboration, critical thinking and problem solving, creative and imagination, citizenship, digital literacy, learning to learn and self-efficacy. It provides a variety of opportunities for identification and nurturing of a learner's potentials and talents in preparation for life and the world of work. The framework is geared towards making learning enjoyable.

Suitable curriculum designs have been developed to facilitate the implementation of the Basic Education Curriculum Framework. The designs contain the National Goals of Education, outline of the Early Years Education (EYE) and general and specific learning outcomes of each subject. They also suggest a variety of learning experiences, assessment and resources. The designs also link the topics to values, and Pertinent and Contemporary Issues (PCI).

It is my hope that all educators in Early Years Education Level will anchor their delivery of Basic and Teacher education on the curriculum designs.

FRED MATIANG'I, PHD, EGH,
CABINET SECRETARY,
MINISTRY OF EDUCATION

PREFACE

Kenya values the education of its citizen. At the heart of this education is the school curriculum. The constitution and the Kenya Vision 2030 clearly outline the role of education in the country. The dictates of the Constitution and the national aspirations of Vision 2030 triggered the curriculum reforms process. The process began with a needs assessment that was meant to identify and address the development agenda of the country.

The Basic Education Curriculum Framework (BECF) is a first for this country. The Curriculum Reform Technical Team at the Kenya Institute of Curriculum Development developed the framework. The team, led by experienced curriculum developers, benchmarked with various countries and developed a framework that aptly resonates with national needs.

The BECF is the guide to all education stakeholders on the national curriculum. It outlines the vision and mission of the curriculum, the structure of education, the levels of education, the learning areas for each level and the learning outcomes. It also stipulates the pillars that guide the reform process.

The learning areas are supported with curriculum designs that cover the educational content and guide the development of teachers' guides and various formats of curriculum support materials. The competency based curriculum in Kenya targets to develop globally competitive citizens who embrace 21st Century Skills.

DR. BELIO R. KIPSANG, CBS
PRINCIPAL SECRETARY,
STATE DEPARTMENT OF BASIC EDUCATION

ACKNOWLEDGMENT

This curriculum design has been developed to facilitate the implementation of the Competence Based Curriculum for lower Primary – Grades 1, 2, & 3. The curriculum designs are organized in four volumes. Volume one contains Kiswahili, Literacy and Indigenous languages and English Activities. Volume two contains Mathematics, Environmental, Hygiene and Nutrition Activities. Volume three contains Christian Religious Education, Hindu Religious Education and Islamic Religious Education Activities. Volume four contains Movement and Creative Arts Activities.

The Curriculum designs for the Competence Based Curriculum for Early Years Education have been developed through a participatory approach embracing the various stakeholders at different levels of development. My sincere gratitude goes to all officers of Kenya Institute of Curriculum Development who ably guided the various panels. I am also grateful to all the panel members in the various learning areas for Early Years Education for their commitment, dedication and diligence in accomplishing this task. I also wish to thank all the Development Partners who provided financial and technical support throughout the process. My sincere thanks to the colleagues at the Ministry of Education for all their support.

It is my conviction that these designs will lay the foundation of the Competence Based Curriculum geared towards ensuring all our learners achieve their full potential through the learning experiences and activities they will be engaged in.

JULIUS O. JWAN, PhD., MBS
DIRECTOR/CHIEF EXECUTIVE OFFICER
KENYA INSTITUTE OF CURRICULUM DEVELOPMENT

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INTRODUCTION

The Lower Primary designs are meant for learners in Grade 1 to 3. They have taken cognisance of the various aspects of development of learners of that age cohort. The designs are comprehensive enough to guide the teachers to effectively deliver the curriculum.

The teacher must understand the learning outcomes and be able to use the suggested learning experiences to achieve the outcomes. The teacher can also design own learning experiences as long as they achieve the designed learning outcomes. A variety of learning experiences will ensure that learners are engaged in the learning experience. Practical experiences will allow learners to retain more in the learning process. The designs allow the teachers to use a variety of assessment methods but in the end they must evaluate the achievement of the learning outcomes.

The curriculum designs are very critical and teachers must make reference to them consistently.

The Curriculum Designs for Lower Primary are in four volumes:

Volume One

- Kiswahili Activities
- Literacy
- English Activities

Volume Two

- Mathematics Activities
- Environmental Activities
- Hygiene and Nutrition Activities

Volume Three

- Christian Religious Education
- Hindu Religious Education
- Islamic Religious Education

Volume Four

- Movement and Creative Activities

LEARNING AREAS TIME ALLOCATION

	Learning Area	Lessons Per Week
1	Literacy Activities	5
2	Kiswahili Language Activities/Kenya Sign Language	3
3	English Language Activities	3
4	Mathematical Activities	5
5	Environmental Activities	5
6	Hygiene and Nutrition Activities	2
7	Religious Activities	3
8	Movement and Creative Activities	8(*** 5 for PE)
9	Pastoral Programme of Instruction	1
	Total Lesson Per Week	35

NATIONAL GOALS OF EDUCATION

1. Foster nationalism, patriotism, and promote national unity
   Kenya's people belong to different communities, races and religions and should be able to live and interact as one people. Education should enable the learner acquire a sense of nationhood and patriotism. It should also promote peace and mutual respect for harmonious co-existence.

2. Promote social, economic, technological and industrial needs for national development
   Education should prepare the learner to play an effective and productive role in the nation.

   a) Social Needs
      Education should instill social and adaptive skills in the learner for effective participation in community and national development.

   b) Economic Needs
      Education should prepare a learner with requisite competences that support a modern and independent growing economy. This should translate into high standards of living for every individual.

   c) Technological and Industrial Needs
      Education should provide the learner with necessary competences for technological and industrial development in tandem with changing global trends.

3. Promote individual development and self-fulfillment
   Education should provide opportunities for the learner to develop to the fullest potential. This includes development of one's interests, talents and character for positive contribution to the society.

4 Promote sound moral and religious values
   Education should promote acquisition of national values as enshrined in the Constitution. It should be geared towards developing a self-disciplined and ethical citizen with sound moral and religious values.

5. Promote social equity and responsibility
   Education should promote social equity and responsibility. It should provide inclusive and equitable access to quality and differentiated education; including learners with special educational needs and disabilities. Education should also provide the learner with opportunities for shared responsibility and accountability through service learning.

6. Promote respect for and development of Kenya's rich and varied cultures
Education should instill in the learner appreciation of Kenya's rich and diverse cultural heritage. The learner should value own and respect other people's culture as well as embrace positive cultural practices in a dynamic society.

7. Promote international consciousness and foster positive attitudes towards other nations
Kenya is part of the interdependent network of diverse peoples and nations. Education should therefore enable the learner to respect, appreciate and participate in the opportunities within the international community. Education should also facilitate the learner to operate within the international community with full knowledge of the obligations, responsibilities, rights and benefits that this membership entails.

8. good health and environmental protection
Education should inculcate in the learner the value of physical and psychological well-being for self and others. It should promote environmental preservation and conservation, including animal welfare for sustainable development.

GENERAL LEARNING OUTCOMES FOR EARLY YEARS EDUCATION

By the end of early years' education, the learner should be able to:-

1. Demonstrate basic literacy and numeracy skills for learning.
2. Communicate appropriately using verbal and/or non-verbal modes in a variety of contexts.
3. Demonstrate appropriate etiquette in social relationships.
4. Apply creativity and critical thinking skills in problem solving.
5. Explore the immediate environment for learning and enjoyment.
6. Practice hygiene, nutrition, sanitation, safety skills to promote health and wellbeing.
7. Demonstrate the acquisition of emotional, physical, spiritual, aesthetic and moral development for balanced living.
8. Demonstrate appreciation of the country's rich and diverse cultural heritage for harmonious co-existence.
9. Apply digital literacy skills for learning and enjoyment.

MATHEMATICS ACTIVITIES

ESSENCE STATEMENT

Numeracy is a foundational skill that prepares the learner for number work, Mathematics in higher levels of schooling and mathematical approaches in all aspects of life. Numeracy activities involve identification and value placement of mathematical numerals, basic mathematical operations as well as measuring and describing shapes.

GENERAL LEARNING OUTCOMES

By the end of Early Years Education, the learner should be able to:-

1) demonstrate mastery of number concepts by working out problems in day to day life,
2) apply measurement skills to find solutions to problems in a variety of contexts,
3) describe properties of geometrical shapes and spatial relationships in real life experiences.

GRADE ONE

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.1 Number Concept (20 lessons)	By the end of the sub-strand, the learner should be able to:- a) sort and group objects according to different attributes within the classroom, b) pair and match objects in the environment, c) order and sequence objects in ascending and descending order, d) make patterns using real objects, e) recite number names in order up to 50, f) represent numbers 1-30 using concrete objects, g) demonstrate through counting that a group in all situations has only one count, h) appreciate the use of sorting and grouping items in day to day activities.	• Learners in pairs/groups to collect different types of safe objects. • Learners in pairs/groups to sort objects with same attribute and group them together. • Learners to play digital games involving sorting and grouping according to different attributes. • Learners in pairs/groups to pair and match objects to establish "equal to", "more than" and "less than." • Learners to order objects according to size from smallest to biggest and vice versa. • Learners to make patterns using real objects. • Learners to recite number names up to 50. • Learners to represent numbers 1-30 using concrete objects as well as their body parts. • Learners to demonstrate that any given group has only one count. • Learner in pairs/groups to collect and sort litter in the environment and put it in various groups according to an attribute of their choice and give reasons for the grouping. • Learners in pairs/groups could assist in arranging, edible items like fruits, cabbages according to size and colour in the school store. • Learners could visit a market for them to observe the sorting and grouping of fruits and vegetables.	1) How can we find out which group has more objects than another? 2) How can we group items?

Core Competences to be developed: learning to learn, communication and collaboration, imagination and creativity, digital literacy, critical thinking and problem solving.	
Link to PCIs: Life skills: self-awareness and self-esteem- when using body parts in counting. ESD: DRR; safety- when collecting items and litter in the environment, environmental awareness-don't litter the environment.	Link to Values: • responsibility • unity
Link to other learning areas: • Environmental activities • Religious activities • Language activities	Suggested Community Service Learning Activities: learners to assist in collecting and sorting litter in their locality and observe how it is disposed.
Suggested non-formal activity to support learning: learners to count trees in the school compound.	Suggested assessment: oral questions, written exercise, observation.

Assessment Rubrics

Exceeds expectations	Meets expectations	Approaches expectations	Below expectations
Correctly: sorts and groups, pairs and matches, orders and sequences, recites numbers 1-50, represents numbers 1-30 using concrete objects and beyond.	Correctly: sorts and groups, pairs and matches, orders and sequences, recites numbers 1-50, represents numbers 1-30 using concrete objects.	Inconsistently: sorts and groups, pairs and matches, orders and sequences, recites numbers 1-50, represents numbers 1-30 using concrete objects.	Major inaccuracies in: sorting and grouping, pairing and matching, ordering and sequencing, reciting numbers 1-50, representing numbers 1-30 using concrete objects.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.2 Whole Numbers (25 lessons)	By the end of the sub-strand, the learner should be able to:- a) count numbers forward and backward up to 100, b) represent numbers 1-50 using concrete objects, c) identify place value of ones and tens, d) read and write numbers 1-50 in symbols, e) write numbers 1-10 in words, f) identify missing numbers in number patterns up to 20, g) appreciate number patterns by creating and extending patterns during play activities.	• Learners in pairs/groups to count by 1's and 2's up to 20 starting from any point using concrete objects as well as body parts. • Learners to take turns in counting by: -5's up to 50 starting from zero -10's up to 100 starting from zero. • Learners in pairs/groups to count by1's and 2's using a number line. • Learners in pairs/groups to play games that involve representing numbers 1-50 using concrete objects. • Learners to identify place value of ones and tens. • Learners in pairs to recite and write numbers 1-50 in symbols. • Learners to practice writing numbers 1-10 in words. • Learners to identify missing numbers in number patterns up to 20. • Learners in pairs to create patterns with numbers up to 20 and share with other groups. • Learners to play digital games involving whole numbers. • Learners to role play a cashier in day to day life activities such as a cashier counting 5 shilling coins.	How many ways can we count from 1-20?
Core Competences to be developed: learning to learn, communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: • Life skills: self-awareness and self-esteem- when using body parts in counting.			Link to values: • responsibility • unity	

• ESD: DRR; safety -when collecting items and litter in the environment, environmental awareness-don't litter the environment.	
Link to other learning areas: • Environmental activities • Religious activities • Language activities	Suggested Community Service Learning Activities: learnersto assist in putting objects in groups of 2's, 5's and 10's together in community activities.
Suggested non-formal activity to support learning: learners to count different types of flowers in the school compound.	Suggested assessment: oral questions, written exercises, observation.

Assessment Rubrics

Exceeds expectations	Meets expectations	Approaches expectations	Below expectations
Correctly: counts up to100, represents numbers 1-50 using concrete objects, identifies place value of ones and tens, reads, writes numbers in symbols and words, works out missing numbers in number patterns and beyond.	Correctly: counts up to 100, represents numbers 1-50 using concrete objects, identifies place value of ones and tens, reads, writes numbers in symbols and words, works out missing numbers in number patterns.	Inconsistently: counts up to 100, represents numbers 1-50 using concrete objects, identifies place value of ones and tens, reads, writes numbers in symbols and words, works out missing numbers in number patterns.	Major inaccuracies in: counting up to 100, representing numbers 1-50 using concrete objects, identifying place value of ones and tens, reading and writing numbers in symbols and words, working out missing numbers in number patterns.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.3 Addition (25 lessons)	By the end of the sub-strand, the learner should be able to:- a) model addition as putting objects together, b) use '+' and '=' signs in writing addition sentences,	• Learners in pairs/groups to put two groups of objects together and count to get the total. • Learners to use '+' and '=' signs inwriting addition sentences. • Learners to add 2- single digit-numbers by skipping on a number line.	How can you add a 2-digit number to a 1- digit number?

		c) add 2- single digit numbers up to a sum of 10, d) add 3- single digit numbers up to a sum of 10 in different contexts, e) add a 2- digit number to a 1- digit number without regrouping, horizontally and vertically with sum not exceeding 100, f) add multiples of 10 up to 100 vertically, g) work out missing numbers in patterns involving addition of whole numbers up to 100.	• Learners to add 2- single digit numbers using the family of 10. • Learners to add 2- single digit number by counting on. • Learners to add 3- single digit numbers using a number line. • Learners to add 3- single digit numbers by counting on. • Learners to add 3- single digit numbers using the family of 10. • Learners to add a 2- digit number to a 1- digit number without regrouping horizontally and vertically with sum not exceeding 100. • Learners to add multiples of 10 up to a 100 vertically. • Learners to play digital games involving addition. • Learners to make patterns involving addition with numbers up to 100.	
Core competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: ESD: DRR; safety- when handling objects.			Link to values: • responsibility • unity • integrity	
Link to other learning areas: • Environmental activities • Language activities			Suggested Community Service Learning Activities: learners to work out totals of items at home.	
Suggested non-formal Activity to support learning: learners to plant flowers in patterns at school during their free time and count them.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaching Expectations	Below Expectations
Correctly: models addition, uses '+' and '=' signs, adds more than 2-digit numbers to 1-digit numbers using different strategies, adds 3-single digit numbers up to a sum of 10, adds multiples of 10 up to 100, works out missing numbers in patterns beyond 100.	Correctly: models addition, uses '+' and '=' signs, adds up to 2-digit numbers to 1-digit numbers using different strategies, adds 3-single digit numbers up to a sum of 10, adds multiples of 10 up to 100, works out missing numbers in patterns up to 100.	Inconsistently: models addition, uses '+' and '=' signs, adds up to 2-digit numbers to 1-digit numbers using different strategies, adds 3-single digit numbers up to a sum of 10, adds multiples of 10 up to 100, works out missing numbers in patterns up to 100.	Major inaccuracies in: modeling addition, using '+' and '=' signs, adding up to 2-digit numbers to 1-digit numbers using different strategies, adding 3-single digit numbers up to a sum of 10, adding multiples of 10 up to 100, working out missing numbers in patterns up to 100.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)

1.0 Numbers	1.4 Subtraction (20 lessons)	By the end of the sub-strand, the learner should be able to:- a) model subtraction as 'taking away' using concrete objects, b) use the ' - ' and '=' signs in writing subtraction sentences, c) subtract single digit numbers, d) subtract a 1- digit number from a 2- digit number based on basic addition facts, e) use the relationship between addition and subtraction in working out problems involving basic addition facts, f) subtract multiples of 10 up to 90, g) work out missing numbers in patterns involving subtraction of whole numbers up to 100.	• Learners in pairs/groups to model subtraction using concrete objects. • Learners to use ' - ' and '=' signs in writing subtraction sentences. • Learners in pairs/groups to subtract by counting backwards • Learners in pairs/groups to subtract using the number line. • Learners to solve routine and non-routine problems involving subtraction of a 1-digit number from a 2- digit number based on basic addition facts. • Learners to create subtraction sentences related to basic addition facts. • Learners to use tablets to workout subtraction of multiples of 10 up to 90. • Learners in pairs /groups to create patterns involving subtraction.	How do you subtract a single digit number from a 2-digit number?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy, creativity and imagination, citizenship, self-efficacy.				
Link to PCIs: ESD: DRR; safety- as learners handle objects.			Link to Values: • responsibility • unity	
Link to other learning areas: • Environmental Activities • Language Activities			Suggested Community Service LearningActivities: learners to collect litter from the environment.	
Suggested non- formal activity to support learning: learners to plant trees in patterns in the school compound during their free time.			Suggested Assessment: written exercise, observation, oral questions.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaching Expectations	Below Expectations
Correctly: models subtraction as taking away, uses '-' and ' =' signs to write subtraction sentences, subtracts single digit numbers, subtracts 1- digit numbers from 2-digit numbers based on basic addition facts, relates addition and subtraction in working out problems involving basic addition facts, subtracts multiples of 10 from more than 90 and works out missing numbers in patterns up to 100 and beyond.	Correctly: models subtraction as taking away, uses '-' and ' =' signs to write subtraction sentences, subtracts single digit numbers, subtracts 1- digit numbers from 2-digit numbers based on basic addition facts, relates addition and subtraction in working out problems involving basic addition facts, subtracts multiples of 10 from up to 90 and works out missing numbers in patterns up to 100.	Inconsistently: models subtraction as taking away, uses, uses '-' and ' =' signs to write subtraction sentences, subtracts single digit numbers, subtracts 1- digit numbers from 2-digit numbers based on basic addition facts, relates addition and subtraction in working out problems involving basic addition facts, subtracts multiples of 10 from up to 90 and works out missing numbers in patterns up to 100.	Major inaccuracies in: modeling subtraction as taking away, using '-' and' =' signs to write subtraction sentences, subtracting single digit numbers, subtracting 1- digit numbers from 2- digit numbers based on basic addition facts, relating addition and subtraction in working out problems involving basic addition facts, subtracting multiples of 10 from up to 90 and working out missing numbers in patterns up to 100.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.1Length (10 lessons)	By the end of the sub-strand, the learner should be able to:- a) compare length of objects directly, b) conserve length through manipulation, c) measure length using arbitrary units.	• Learners in pairs/groups to compare objects directly to identify objects which are longer than, shorter than or same as. • Learners to place objects of equal length in different orientations and describe them using words such as longer than, shorter than and same as. • Learners in pairs /groups to measure lengths using different objects as arbitrary units and discuss the measurements from the various groups.	1) How do you compare the length of two objects? 2) Which objects can be used to measure the length of the teacher's table?
Core competencies to be developed: communication and collaboration, imagination and creativity, critical thinking and problem solving, self-efficacy.				
Link to PCIs:		Link to values:		

ESD: DRR; safety- as learners in handle objects.	• responsibility • Integrity • unity
Link to other learning areas: • Environmental Activities • Language activities	Suggested Community Service Learning Activities: learners to plant trees /flowers using a stick to determine the distance between seedlings in religious institutions/ dispensaries.
Suggested non-formal Activity to support learning: learners to plant flowers in school spacing them equally.	Suggested assessment: written exercises, observation, oral questions.

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: compares length directly, conserves length and measures length using arbitrary units and beyond.	Correctly: compares length directly, conserves length and measures length using arbitrary units.	Inconsistently: compares length directly, conserves length and measures length using arbitrary units.	Major inaccuracies in: comparing length directly, conserving length and measuring length using arbitrary units.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested learning experiences	Key Inquiry Question(s)
2.0 Measurements	2.2 Mass (10 lessons)	By the end of the sub-strand, the learner should be able to:- a) compare mass of objects directly, b) conserve mass through manipulation, c) measure mass using arbitrary units.	• Learners in pairs/groups use safe objects to identify those heavier than, lighter than or same. • Learners to use two objects of equal mass and a beam balance to demonstrate that change of shape does not change the mass of an object. • Learners in pairs/groups to use an identified mass to compare the mass of other objects using the words heavier than, lighter than or same as.	1) How can you compare the mass of two or more objects? 2) What would you do to show that shape does not change mass? 3) How can you show that an object is heavier than, lighter than or same as your mathematics textbook?

Core Competencies to be developed: Communication and collaboration in group work, critical thinking and problem solving, self-efficacy.	
Link to PCIs: • ESD: DRR; safety - in handling materials, animal welfare -feeding animals. • Health education: personal hygiene -appropriate size of materials. • Citizenship: honesty.	Link to Values: • responsibility • integrity • unity • respect
Links to other learning areas: • Environmental activities • Language activities • Music and movement and activities	Suggested Community Service Learning Activities: learners to assist neighbours in feeding animals by measuring quantities.
Suggested non-formal Activity to support learning: learners to compare mass of objects in the classroom.	Suggested assessment: written exercises, oral questions, observation.

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: compares mass directly using the words heavier than, lighter than, and same as, conserves mass through manipulation, measures mass using arbitrary units and beyond.	Correctly: compares mass using the words heavier than, lighter than and same as, conserves mass through manipulation, measures mass using arbitrary units.	Inconsistently: compares mass using the words heavier than, lighter than and same as, conserves mass through manipulation, measures mass using arbitrary units.	Major inaccuracies in: comparing mass using the words heavier than, lighter than and same as, conserving mass through manipulation and measuring mass using arbitrary units.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)

2.0 Measurement	2.3 Capacity (12 lessons)	By the end of the sub-strand, the learner should be able to:- a) compare capacity of containers directly, b) conserve capacity through manipulation, c) measure capacity using arbitrary units.	• Learners to empty and fill water in different containers to establish which holds more, which holds less and which holds the same. • Learners to identify and compare containers which holds more, less or same as. • Learners to fill containers of different shapes and sizes with water then empty into others so as to establish that some containers can hold the same amount although their shapes are different. • Learners to be given water, same size basins and different small containers. The learners to count the number of small containers they use to fill the basin.	How can we find out which of two containers hold more, less or same as?

Core Competencies to be developed: critical thinking and problem solving, communication and collaboration ,imagination and creativity, citizenship, self-efficacy.	
Link to PCIs: • ESD: DRR; safety in handling materials, Health education – appropriate size of materials and, environmental conservation as learners re- use containers they used in measuring capacity; animal welfare – watering animals. • Citizenship: honesty. • Health education: safety- as learners collect safe and appropriate containers. • Life skills: self-awareness- as learners work in groups.	Link to values: • responsibility • integrity • unity • respect
Link to other learning areas: • Environmental Activities • Language Activities	Suggested Community Service Learning Activities: learners to water trees and flowers around religious institutions, health centres and at home.
Suggested non-formal activity to support learning: learners to water school /class flowers.	Suggested assessment: written exercises, observation, oral. questions

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: compares capacity of different containers using the terms holds more, less or same as, conserves capacity using containers of different shapes and sizes, measures capacity using arbitrary units and beyond.	Correctly: compares capacity of different containers using the terms holds more, less or same as, conserves capacity using containers of different shapes and sizes, measures capacity using arbitrary units.	Inconsistently: compares capacity of different containers using the terms holds more, less or same as, conserves capacity using containers of different shapes and sizes, measures capacity using arbitrary units.	Major inaccuracies in: comparing capacity of different containers using the terms holds more, less or same as, conserving capacity using containers of different shapes and sizes, measuring capacity using arbitrary units.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.4 Time (8 lessons)	By the end of the sub-strand, the learner should be able to:- a) relate daily activities to time, b) relate days of the week with various activities.	• Learners in pairs/groups to identify activities they do in the morning, afternoon and evening both at home and school. • Learners to sing songs/rhymes related to days of the week. • Learners in pairs/groups to identify activities that take place during the days of the week.	1) Which day of the week do you raise the school flag? 2) Which day of the week do you worship?
Core competence to be developed: communication and collaboration, self-efficacy, citizenship				
Link to PCIs:			Link to values: • respect	

• Citizenship: patriotism – the Kenyan flag. • Health Education: time to brush teeth, wash face, sleep, take meals time to plant, harvest, among other activities.	• responsibility • patriotism
Link to other learning areas: • Environmental Activities • Language Activities	Suggested Community Service Learning Activities: learners to visit/help the needy during school holidays.
Suggested non-formal activity to support learning :learnerswrite school daily activities and recite during assembly.	Suggested assessment: oral questions, written exercises, observation.

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: relates daily activities to time, relates days of the week with various activities, recites days of the week and demonstrates more aspects of time.	Correctly: relates daily activities to time, relates days of the week with various activities, recites days of the week.	Inconsistently: relates daily activities to time, relates days of the week with various activities, recites days of the week.	Major inaccuracies in: relating daily activities to time, relating days of the week with various activities, reciting days of the week.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.5 Money (8 lessons)	By the end of the sub-strand, the learner should be able to:- a) identify Kenyan currency coins and notes up to sh.100, b) relate money to goods and services up to sh.100 in shopping activities,	• Learners in pairs/groups to sort out different Kenyan currency coins and notes according to their value up to sh.100. • Learners to put together coins and notes up to sh.100 according to their value and features. • Learners in pairs/groups to give their own experiences in relation to shopping activities. • Learners to discuss the value of items in the classroom shop up to sh.100.	How can you identify Kenyan currency coins and notes?

		c) differentiate between needs and wants in real life context, d) appreciate spending and saving in real life situations.	• Learners in pairs/groups to discuss items they cannot do without and those that are necessary but they can do without. • Learners in pairs/groups to identify needs and wants. • Learners to play digital games involving needs and wants. • Learners to give their own experiences on saving and spending of money. • Learners to role play buying and selling from the classroom shop.	
Core competence to be developed: communication and collaboration, self-efficacy, citizenship, digital literacy.				
Link to PCIs: • ESD: DRR; safety- as learners handle money. • Citizenship: patriotism-features on Kenya currency.			Link to values: • integrity • responsibility • honesty	
Link to other learning areas: • Language activities • Religious activities • Environmental activities			Suggested Community Service Learning Activities: learners to sort money in places of worship and other functions.	
Suggested non-formal Activity to support learning: learners to help sort money into various denominations with school cashier or in a school function.			Suggested assessment: written exercises, oral questions, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: identifies Kenyan currency coins and notes up tosh.100, relates money to goods and services and differentiates between needs and wants, and beyond.	Correctly: identifies Kenyan currency coins and notes up to sh.100, relates money to goods and services and differentiates between needs and wants.	Inconsistently: identifies Kenyan currency coins and notes up to sh.100, relates money to goods and services and differentiates between needs and wants.	Major inaccuracies in: identifying Kenyan currency coins and notes up to sh.100, relating money to goods and services and differentiating between needs and wants.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
3.0Geometry	3.1 Lines (6 lessons)	By the end of the sub-strand, the learner should be able to:- a) draw straight lines for application in real life, b) draw curved lines for application in real life situations.	• Learners to stand behind one another facing the same side and identify what they have formed as a straight line. • Learners in pairs/groups to mark two points on the ground and using a stick to draw a line joining the two points to come up with a straight line. • Learners to practice drawing straight lines on the ground and in their books. • Learners in groups to form a semi-circle and one of them to draw a line around it and identify the semi-circle drawn as a curved line. • Learners to practice drawing curved lines on the ground and in their books. • Learners could visit a water selling kiosk to observe how the water containers are arranged.	What types of lines are there?
Core-Competence to be developed: communication and collaboration, imagination and creativity, learning to learn.				
Link to PCIs: • ESD: DRR;safety- as learners use sticks to draw. • Life Skills: self- awareness -when forming lines using their hands, inter-personal relationship.			Link to Values: • unity • responsibility • love	
Link to other learning areas: • Movement and creative arts			Suggested Community Service Learning Activities: learners could visit a community function and assist in arranging seats in straight or curved lines.	
Suggested non- formal Activity to support learning: learners to arrange seats in straight lines in class during cleaning.			Suggested assessment: written exercises, observation, oral questions.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly draws straight and curved lines and also other types of lines.	Correctly draws straight and curved lines.	Inconsistently draws straight and curved lines.	Major inaccuracies in drawing straight and curved lines.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
3.0 Geometry	3.2 Shapes (6 lessons)	By the end of the sub-strand, the learner should be able to:- a) identify rectangles, circles and triangles in the environment, b) make patterns involving rectangles, circles and triangles, c) appreciate the beauty of patterns in the environment.	• Learners in pairs/groups to sort and group different shapes using one attribute. • Learners in pairs /groups discuss the types of lines that make rectangles, circles, triangles and name them. • Learners working individually to make patterns of their choice using the three shapes. • Learners in groups make patterns, colour them and share with other groups.	What shapes can you identify in your school?
Core-Competence to be developed : communication and collaboration, imagination and creativity				
Link to PCIs : ESD: DRR;safety-as learners pick objects to trace and when colouring the patterns.			Link to Values: • responsibility • unity	
Link to other learning areas: • Movement and creative activities • Environmental activities			Suggested Community Service Learning activities: learners to visit the elderly and beautify their walls with patterns drawn on manila paper.	
Suggested non-formal activity to support learning :learners could visit pre - school and decorate the walls using patterns drawn on manila paper.			Suggested assessment: written exercises, oral questions, observation.	

ASSESSMENT RUBRICS

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly identifies shapes and makes patterns using rectangles, circles, triangles and other shapes.	Correctly identifies shapes and makes patterns using rectangles, circles and triangles.	Inconsistently identifies shapes and makes patterns using rectangles, circles and triangles.	Major inaccuracies in identifying shapes and making patterns using rectangles, circles and triangles.

SUGGESTED RESOURCES

SUB-STRANDS	RESOURCES
NUMBER CONCEPT	Sticks, stones, grains
WHOLE NUMBERS	Sticks, marbles ,stones grains ,a number line drawn on the ground/floor
ADDITION	Place value chart, abacus basic addition facts, number line drawn on the ground/floor, table, sticks, marbles ,stones, grains and many more
SUBTRACTION	Sticks, marbles, stones ,grains, basic addition facts table, number line drawn on the ground/floor
LENGTH	Books, pencils, sticks, bottles, rulers and others
MASS	Items of different mass such as books ,stones, pieces of wood, items of same mass

CAPACITY	Containers of different sizes, water, sand ,soil and others
TIME	Charts with days of the week and months of the year in order
MONEY	One shilling coins (copper, silver, small and big coins) sh.10, sh.20, sh.40 coins, sh.50 notes and classroom shop
LINES	Sticks, strings
SHAPES	Cut- outs of rectangles, circles, and triangles of different sizes

NOTE

The following ICT devices may be used in the teaching/learning of mathematics at this level:

Learner digital devices (LDD),Teacher digital devices(TDD),Mobile phones, Digital clocks, Television sets, Videos, Cameras, Projectors, Radios, DVD players, CD's, Scanners , Internet among others.

GRADE TWO

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0Numbers	1.1 Number Concept (8 lessons)	By the end of the sub-strand, the learner should be able to:- a) read numbers 1-100 in symbols, b) represent numbers 1-100 using concrete objects in the environment.	• Learners to read number names from 1-100. • Learners in groups of five to count their fingers and toes.	How can we find the number of objects in a group?

			• Learners in pairs/groups to play games of representing numbers 1-100 using safe concrete objects. • Learners to play digital games of representing groups with numbers.	
Core Competences to be developed: communication and collaboration, imagination and creativity, digital literacy, critical thinking and problem solving.				
Link to PCIs: • Life skills: self-awareness and self-esteem -when using body parts. • ESD: DRR; safety- when collecting items in the environment.			Link to Values: • respect • responsibility	
Link to other learning areas: • Language activities • Hygiene and Nutrition activities			Suggested Community Service Learning Activities:learners to visit older citizens and listen to stories on how they used to count their animals and household items.	
Suggested non- formal Activity to support learning: learners to count number of different objects in the classroom.			Suggested assessment: oral questions, observation, written exercise.	

Assessment Rubrics

Exceeds expectations	Meets expectations	Approaches expectations	Below expectations
Correctly: reads numbers more than100 in symbols, represents numbers more than 100 using concrete objects.	Correctly: reads numbers 1-100 in symbols, represents numbers 1-100 using concrete objects.	Inconsistently: reads numbers 1-100 in symbols, represents numbers 1-100 using concrete objects.	Major inaccuracies in: reading numbers 1-100 in symbols, representing numbers 1-100 using concrete objects.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)

1.0 Numbers	1.2 Whole Numbers (20 lessons)	By the end of the sub-strand, the learner should be able to:- a) count numbers forward and backward up to 100, b) identify place value up to hundreds. c) read numbers 1-100 in symbols, d) read and write numbers 1-20 in words, e) work out missing numbers in number patterns up to 100, f) appreciate number patterns as they skip on the number line.	• Learners in pairs/groups to count in 2's and 5's forward and backward starting from any point. • Learners in pairs/groups to count their fingers and toes in 2's and 10's forward and backward starting at any point. • Learners in pairs / groups to discuss place value up to hundreds. • Learners in pairs to read numbers 1-100 in symbols. • Learners to read and write numbers 1-20 in words. • Learners to play digital games involving whole numbers. • Learners to work out missing numbers in patterns up to 100. • Learners in pairs/groups to make number patterns and share with other groups.	How do we get the next number in a pattern?
Core Competences to be developed: communication and collaboration, critical thinking, problem solving, digital literacy.				
Link to PCIs: Citizenship: leadership- as learners work in groups.			Link to Values: • respect • responsibility	
Link to other learning areas : • Language activities • Environmental activities • Movement and creative activities			Suggested Community Service Learning Activities: learners to assist in arranging chairs and tables in rows and columns during community functions.	
Suggested non- formal Activity to support learning: learners to plant flowers in patterns in the school.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds expectations	Meets expectations	Approaches expectations	Below expectations
Correctly: Counts to more than100,identifies place value up to more than hundreds, reads numbers more than100 in symbols, reads and writes numbers more than20 in words, works out missing numbers in patterns.	Correctly: counts from 1- 100 identifies place value up to hundreds, reads numbers 1-100 in symbols, reads and writes numbers 1-20 in words, works out missing numbers in patterns.	Inconsistently: counts from 1-100, identifies place value up to hundreds, reads numbers 1-100 in symbols, reads and writes numbers 1-20 in words, works out missing numbers in patterns.	Major inaccuracies in: counting from 1-100, identifying place value up to hundreds, reading numbers 1-100 in symbols; reading and writing numbers 1-20 in words, working out missing numbers in patterns.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.3 Fractions (12 lessons)	By the end of the sub-strand, the learner should be able to:- a) identify a $\frac{1}{2}$ as part of a whole, b) identify a $\frac{1}{4}$ as part of a whole.	• Learners in pairs to make circular paper cut- outs. • Learners in pairs to fold the circular paper cut – outs into two equal parts and identify one of the parts as a half of the whole written as $\frac{1}{2}$ • Learners in pairs to make rectangular paper cut – outs and fold them into two equal parts to get a half of a whole written as $\frac{1}{2}$ • Learners in pairs to fold circular paper cut – outs to get 4 equal parts and identify one of the parts as a $\frac{1}{4}$ of a whole.	What fraction do you get when you fold a circular paper cut- out into 4 equal parts?

			• Learners to play digital games involving fractions. • Learners in pairs to practice making halves and quarters of a whole.	
Core Competences to be developed: :imagination and creativity, communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: Life skills: interpersonal relationship- making friends.			Link to Values: • unity • integrity • responsibility	
Link to other learning areas: • Language activities • Hygiene and Nutrition activities			Suggested Community Service Learning Activities: learners to share whole edible items in $\frac{1}{2}$s and $\frac{1}{4}$s during community functions.	
Suggested non- formal Activity to support learning: learners to share whole edible items in halves and quarters in school.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly identifies $\frac{1}{2}$ and $\frac{1}{4}$ and more fractions as part of a whole.	Correctly identifies $\frac{1}{2}$ and $\frac{1}{4}$ as part of a whole.	Inconsistently identifies $\frac{1}{2}$ and $\frac{1}{4}$ as part of a whole.	Major inaccuracies in identifying $\frac{1}{4}$ and $\frac{1}{2}$ as part of a whole.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.4 Addition (20 lessons)	By the end of the sub-strand, the learner should be able to:- a) add a 2- digit number to a 1-digit number without and with regrouping with sum not exceeding 100,	• Learners in pairs to write addition sentences given in horizontal form vertically according to place value. • Learners to add a 2- digit number to a 1- digit number without and with regrouping. • Learners to practice addition by skipping on the number line.	1) How can we align a 2-digit number and a 1-digit number vertically in order to add? 2) When do we regroup?

		b) add 3-single digit numbers up to a sum of 20, c) add a 2-digit number to a 2-digit number without and with regrouping, with sum not exceeding 100, d) workout missing numbers in patterns involving addition of whole numbers up to 100.	• Learners in pairs/groups to collect different safe objects and use them in addition of 3-single digit numbers. • Learners in pairs/groups to practice breaking numbers apart to make a 10. • Learners in pairs to come up with different ways of adding two 2-digit numbers without and with regrouping. • Learners to play digital games involving addition. • Learners in groups to make patterns using numbers up to 100.	
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: • ESD: DRR; safety – as learners collect objects. • Citizenship: social cohesion - when working in groups.			Link to Values: • respect • responsibility • unity	
Link to other learning areas : • Language activities • Hygiene and Nutrition activities			Suggested Community Service Learning Activities: learners to visit older citizen homes and assist them in getting the total number of different items in their homes.	
Suggested non-formal Activity to support learning: learnersto plant flowers in patterns in school.			Suggested assessment: oral questions, written exercises, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: adds more than two 2-digit numbers with sums not exceeding 100 using different strategies, works out missing numbers in patterns up to 100.	Correctly: adds up to two 2-digit numbers with sums not exceeding 100 using different strategies, works out missing numbers in patterns up to 100.	Inconsistently: adds up to two 2-digit numbers with sums not exceeding 100 using different strategies, works out missing numbers in patterns up to 100.	Major inaccuracies in: adding up to two 2-digit numbers with sums not exceeding 100 using different strategies, working out missing numbers in patterns up to 100.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.5 Subtraction (20 lessons)	By the end of the sub-strand, the learner should be able to:- a) subtract up to 2- digit numbers without regrouping, b) use the relationship between addition and subtraction in working out problems, c) work out missing numbers in subtraction of up to 2- digit numbers, d) work out missing numbers in patterns involving subtraction up to 100.	• Learners in pairs /groups to subtract single digit numbers by comparing groups of objects. • Learners to subtract up to 2-digit numbers without regrouping in horizontal and vertical forms. • Learners to discuss the relationship between addition and subtraction using number families. • Learners to work out missing numbers in subtraction of up to 2- digit numbers. • Learners to play digital games involving subtraction. • Learners to work out missing numbers in patterns involving subtraction.	How do you work out missing numbers in patterns involving subtraction?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, self -efficacy, imagination and creativity, digital literacy.				
Link to PCIs: • Life skills: interpersonal relationship, effective communication, friendship formation - as learners work in groups. • Citizenship: social cohesion – as learners work in groups.			Link to Values: • respect • unity • responsibility	
Link to other learning areas: • Language activities • Environmental activities			Suggested Community Service Learning Activities: learners to participate in cleaning environment activities organized by community members.	
Suggested non- formal Activity to support learning: learners to collect litter during school cleaning activities.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaching Expectations	Below Expectations
Correctly: Subtracts up to more than 2- digit numbers without regrouping, works out missing numbers in number patterns up to 100.	Correctly: subtracts up to 2- digit numbers without regrouping, works out missing numbers in number patterns up to 100.	Inconsistently: subtracts up to 2- digit numbers without regrouping, works out missing numbers in number patterns up to 100.	Major inaccuracies in: subtracting up to 2- digit numbers without regrouping, working out missing numbers in number patterns up to 100.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.6 Multiplication (12 lessons)	By the end of the sub-strand, the learner should be able to:- a) represent multiplication as repeated addition using numbers 1, 2, 3, 4 and 5 up to five times, b) write repeated addition sentences as multiplication, using '×' sign, c) multiply single digit numbers by 1, 2, 3, 4, 5 and 10.	• Learners in pairs/groups to use counters to represent multiplication as repeated addition. • Learners in pairs/groups to use number lines to represent multiplication as repeated addition. • Learners to use '×' sign in writing repeated addition sentences as multiplication. • Learners to multiply single digit numbers by 1, 2, 3, 4, 5 and 10. • Learners to play digital games involving multiplication. • Learners could visit the local market to see how fruits are arranged in groups of	How do you represent multiplication as repeated addition?

			3's, 4's ,5's or 10's a certain number of times.	
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy				
Link to PCIs: • Life skills: self- awareness- when learners use their fingers. • ESD:DRR; environmental awareness - re- use of materials collected.			Link to Values: • respect • unity • responsibility	
Link to other learning areas: • Language activities • Environmental activities			Suggested Community Service Learning Activities: learners to visit older citizens and assist them in arranging items in groups of equal numbers.	
Suggested non- formal Activity to support learning: learner to work out total number of desks in their classroom through repeated addition.			Suggested assessment: oral questions, written exercises, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: represents multiplication as repeated addition, uses multiplication sign, multiplies single digit numbers by 1, 2, 3, 4, 5,and 10 and goes beyond.	Correctly: represents multiplication as repeated addition, uses multiplication sign, multiplies single digit numbers by 1, 2, 3, 4, 5 and 10.	Inconsistently: represents multiplication as repeated addition, uses multiplication sign, multiplies single digit numbers by 1, 2, 3, 4, 5 and 10.	Major inaccuracies in: representing multiplication as repeated addition, using multiplication sign, multiplying single digit numbers by 1, 2, 3, 4, 5 and 10.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)

1.0 Numbers	1.7 Division (8 lessons)	By the end of the sub-strand, the learner should be able to:- a) represent division as equal sharing, b) represent division as equal grouping, c) use ' ÷'sign in writing division sentences, d) divide numbers up to 25 by 2, 3, 4 and 5 without a remainder in real life situations.	• Learners in pairs/groups to share a given number of objects equally by each picking one object at a time until all are finished and then count how many each got. • Learners in pairs/groups to pick an equal number of objects at a time from the main group and count the number of small equal groups formed. • Learners to use ' ÷' sign in writing division sentences. • Learners to play digital games involving division. • Learners to divide numbers up to 25 by 2, 3, 4 and 5 without a remainder.	How can you share a given number of objects equally?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: • Citizenship: social cohesion- as learners work in groups. • ESD:DRR; safety - of materials that learners use.			Link to Values: • respect • responsibility • love • integrity • social justice	
Link to other learning areas: • Languages activities • Environmental activities			Suggested Community Service Learning Activities: learners to visit children's homes and share fruits as a way of giving back to the community	
Suggested non- formal activity to support learning: learners to plant seedlings in rows in school.			Suggested assessment: oral questions, written exercises, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations

Correctly: represents division as equal sharing and equal grouping, uses division sign, divides numbers up to 25 by 2, 3, 4, and 5 without a remainder and goes beyond.	Correctly: represents division as equal sharing and equal grouping, uses division sign, divides numbers up to 25 by 2, 3, 4 and 5 without a remainder.	Inconsistently: represents division as equal sharing and equal grouping, uses division sign, divides numbers up to 25 by 2, 3, 4 and 5 without a remainder.	Major inaccuracies in: representing division as equal sharing and equal grouping, using division sign, dividing numbers up to 25 by 2, 3, 4, and 5 without a remainder.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.1 Length (6 lessons)	By the end of the sub-strand, the learner should be able to:- a) measure length using fixed units, b) identify the metre as a unit of measuring length, c) measure length in metres.	• Learners in pairs/groups to use sticks of equal length to measure different lengths, record and discuss the results. • Learners in pairs/groups to measure length using sticks of different lengths, including 1-metre sticks and identify the 1-metre sticks. • Learners to make 1-metre sticks and use them in measuring various lengths within the classroom , record and discuss the results. • Learners to play digital games involving length in metres.	What can you use to measure different lengths?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, imagination and creativity, digital literacy, learning to learn.				
Link to PCIs: • Citizenship: social cohesion- as workers work in groups. • ESD:DRR; safety- of materials learners use .			Link to Values: • respect • responsibility	
Link to other learning areas : • Languages activities • Environmental activities			Suggested Community Service Learning Activities: learners to assist their neighbours to measure length during building of chicken /rabbit cages among others.	

Suggested non- formal activity to support learning: learners to measure length of their school fields in metres during games.	Suggested assessment: oral questions, written exercises, observation.

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: measures length using fixed units, identifies the metre as a unit of measuring length and measures length in metres with ease.	Correctly: measures length using fixed units, identifies the metre as a unit of measuring length and measures length in metres.	Inconsistently: measures length using fixed units, identifies the metre as a unit of measuring length and measures length in metres.	Major inaccuracies in: measuring length using fixed units, identifying the metre as a unit of measuring length and measuring length in metres.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.2 Mass (6 lessons)	By the end of the sub-strand, the learner should be able to:- a) measure mass using fixed units, b) identify the kilogram as a unit of measuring mass, c) measure mass in kilograms.	• Learners in pairs/groups to use items of same mass and a beam balance to measure different masses record and discuss the results. • Learners in pairs/groups to use an item equivalent to a 1-kilogram mass and a beam balance to make other 1-kilogram masses and use them to compare other masses.	What can we use to measure mass?

			• Learner to practice measuring mass in kilograms using a 1- kilogram mass. • Learners to play digital games involving mass in kilograms.	
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, imagination and creativity, digital literacy.				
Link to PCIs: • Citizenship: social cohesion- as learners work in groups. • ESD:DRR; safety -of materials learners use.			Link to Values: • respect • integrity • responsibility	
Link to other learning areas : • Language activities • Environmental activities			Suggested Community Service Learning Activities: learners to assist their neighbours to measure mass of items in their homes in kilograms.	
Suggested non- formal activity to support learning: learners to measure mass of items in their classroom in kilograms during their free time.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: measures mass using fixed units, identifies and uses the kilogram as a unit measuring mass with ease.	Correctly: measures mass using fixed units, identifies and uses the kilogram as a unit of measuring mass.	Inconsistently: measures mass using fixed units, identifies and uses the kilogram as a unit of measuring mass.	Major inaccuracies in: measuring mass using fixed units, identifying and using the kilogram as a unit measuring mass.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.3 Capacity (8 lessons)	By the end of the sub-strand, the learner should be able to:- a) measure capacity using fixed units, b) identify the litre as a unit of measuring capacity, c) measure capacity in litres.	• Learners in pairs /groups to use small containers of equal capacity to fill bigger containers of same capacity but different shapes with water and count the number of small containers used to fill them. • Learners in pairs/groups to use 1 litre containers to fill big containers with	What can you use to measure capacity of different containers?

			water and count the number of litres used to fill the big containers. • Learners in groups to measure the capacity of different containers in litres. • Learners to play digital games involving capacity.	
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, imagination and creativity, citizenship, digital literacy.				
Link to PCIs: • Life Skills: interpersonal relationships - as learners work in groups. • Citizenship: social cohesion- as learners work in groups. • ESD:DRR; safety- of materials learners use.			Link to Values: • respect • responsibility	
Link to other learning areas: • Language activities • Environmental activities			Suggested Community Service Learning Activities: learners to assist their neighbours to measure capacity of containers used in storing liquids.	
Suggested non- formal activity to support learning: learners to measure capacity of containers in their classroom in litres during their free time.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: measures capacity using fixed units, uses the litre as a unit of measuring capacity and measures capacity in litres with ease.	Correctly: measures capacity using fixed units, identifies the litre as a unit of measuring capacity and measures capacity in litres.	Inconsistently: measures capacity using fixed units, identifies the litre as a unit of measuring capacity and measures capacity in litres.	Major inaccuracies in: measuring capacity using fixed units, identifying the litre as a unit of measuring capacity and measuring capacity in litres.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2. 4 Time (10 lessons)	By the end of the sub-strand, the learner should be able to:- a) relate the months of the year with various activities, b) recite the number of days in each month of the year, c) measure time using arbitrary units, d) measure time using fixed units, e) identify the clock face, f) read, tell and write time by the hour.	• Learners in pairs/groups to discuss activities that take place in the months of the year. • Learners in pairs/groups to sing songs, rhymes related to number of days in the months of the year. • Learners in pairs/groups to measure time taken to perform an activity using arbitrary units. • Learners in pairs/groups to measure time taken to perform an activity using fixed units. • Learners to discuss places where they have seen clocks displayed as well as how they look like. • Learners to observe a clock face and discuss the minute hand and the hour hand. • Learners to discuss how to read, tell and write time by the hour using both the analogue and digital clock.	1) In which month do you celebrate your birth day? 2) Which month has the least number of days?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, imagination and creativity, self- efficacy, digital literacy.				
Link to PCIs: • Health Education: personal hygiene - brushing teeth, washing face. • Citizenship: social cohesion- as learners work in groups. • ESD:DRR; safety- of materials learners use.			Link to Values: • respect • responsibility	
Link to other learning areas: • Language activities • Religious activities			Suggested Community Service Learning Activities: learners to assist their neighbours in keeping their compounds clean during school holidays.	
Suggested non-formal activity to support learning: learners to clean their classroom during free time.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaching Expectations	Below Expectations
Correctly: relates months of the year to various activities, identifies number of days in each month, measures time using arbitrary and fixed units, identifies the minute and the hour hand in a clock face and reads, tells and writes time by the hour with ease.	Correctly: relates months of the year to various activities, identifies number of days in each month, measures time using arbitrary and fixed units, identifies the minute and the hour hand in a clock face and reads, tells and writes time by the hour.	Inconsistently: relates months of the year to various activities, identifies number of days in each month, measures time using arbitrary and fixed units, identifies the minute and the hour hand in a clock face and reads, tells and writes time by the hour.	Major inaccuracies in: relating months of the year to various activities, identifying number of days in each month, measuring time using arbitrary and fixed units, identifying the minute and the hour hand in a clock face and reading, telling and writing time by the hour.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested learning experiences	Key Inquiry Question(s)
2.0 Measurement	2.5Money (10 lessons)	By the end of the sub-strand, the learner should be able to:- a) identify Kenyan currency coins and notes up to sh.100, b) count money in sh.1, sh.5, sh.10, sh.20, sh.40, sh.50 up to sh.100, c) represent same amount of money in different denominations, d) relate money to goods and services up to sh.100, e) differentiate between needs and wants in real life context, f) appreciate spending and saving of money in real life situations.	• Learners in pairs/groups to sort out Kenyan currency coins and notes according to their features up to sh.100. • Learners in groups to put different coins and notes together and separate them according to their values and features. • Learners in pairs/groups to count money in sh.1, sh.5, sh.10,sh.20,sh.40, sh.50 up to sh.100. • Learners in pairs/groups to make same amount of money using different denominations. • Learners in pairs/groups to discuss items they cannot do without and those that are necessary but they can do without up to a value of sh.100. • Learners in pairs/groups to classify needs and wants.	How can you identify different Kenyan currencies?

			• Learners to discuss the importance of saving. • Learners to play digital games involving money. • Learners could record a video during a role play of classroom shopping activities for replay and discussion later.	
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, imagination and creativity, citizenship, digital literacy.				
Link to PCIs: • Life Skills: interpersonal relationship, effective communication – during shopping activities. • Citizenship: patriotism–money is a symbol of national unity. • ESD:DRR; safety of materials in classroom shop, financial literacy.			Link to Values: • respect • responsibility • integrity • patriotism	
Link to other learning areas : • Language activities • Environmental activities • Religious activities			Suggested Community Service Learning Activities: learners to assist in counting money offered in religious and non-religious functions.	
Suggested non- formal activity to support learning: learners to assist the school clerk in sorting coins and notes according to their value.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: identifies Kenyan currency notes and coins beyond sh.100, counts money in different denominations, works out	Correctly: identifies Kenyan currency notes and coins up to sh.100, counts money in different denominations, works out	Inconsistently: identifies Kenyan currency notes and coins up to sh.100, counts money in different denominations, works out	Major inaccuracies in: identifying Kenyan currency notes and coins up to sh.100, counting money in different denominations, working out

equivalence of different denominations, relates money to goods and services and differentiates needs and wants.	equivalence of different denominations and relates money to goods and services, and differentiates needs and wants.	equivalence of different denominations, relates money to goods and services and differentiates needs and wants.	equivalence of different denominations, relating money to goods and services and differentiating needs and wants.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
3.0Geometry	3.1 Lines (5 lessons)	By the end of the sub-strand, the learner should be able to:- a) draw and model straight lines, b) draw and model curved lines.	• Learners in pairs /groups to model straight and curved lines using sticks plasticine /clay/ papiermache. • Learners in groups to model straight and curved lines using strings. • Learners in groups to model straight and curved lines by holding their hands. • Learners to draw straight and curved lines. • Learners to model straight and curved lines using learner digital devices.	What types of lines do you know?
Core Competences to be developed: communication and collaboration, imagination and creativity, self- efficacy, digital literacy.				
Link to PCIs: • Life Skills: self- awareness - as learners use their body parts. • ESD:DRR; safety- of materials in modeling lines.			Link to Values: • respect • responsibility	
Links to other learning areas: • Movement and creative activities • Environmental activities			Suggested Community Service Learning Activities: learners to assist in arranging seats in straight lines in community functions.	
Suggested non- formal activity to support learning: learners to arrange seats in straight lines in the classroom.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly draws and models straight and curved lines with ease.	Correctly draws and models straight and curved lines.	Inconsistently draws and models straight and curved lines.	Major inaccuracies in drawing and modeling straight and curved lines.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
3.0 Geometry	3.2 Shapes (5 lessons)	By the end of the sub-strand, the learner should be able to:- a) identify rectangles, circles, triangles, ovals and squares, b) appreciate making patterns involving rectangles, circles, triangles, ovals and squares.	• Learners in pairs/groups to sort and group items of different shapes. • Learners in pairs/groups to discuss types of lines making different shapes. • Learners to identify and name the different shapes found in their classroom. • Learners to make patterns of their choice using the five shapes. • Learners in groups to make patterns, colour them and share with other groups. • Learners to make patterns using digital devices.	1) What shapes can you identify in your environment? 2) What shapes are made by straight lines? 3) What shapes are made by curved lines?
Core Competences to be developed: communication and collaboration, imagination and creativity, self- efficacy, digital literacy.				
Link to PCIs: • Life Skills: self- awareness - use of their hands in making patterns. • ESD:DRR; safety- of materials in making patterns.			Link to Values: • respect • unity • responsibility	
Link to other learning areas: • Movement and creative activities • Environmental activities			Suggested Community Service Learning Activities: learners to visit the children homes and beautify their walls with patterns drawn on paper.	
Suggested non- formal activity to support learning: learners to make patterns and stick them on classroom walls for beauty.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly identifies shapes and makes patterns involving rectangles, circles, triangles, ovals and squares with ease.	Correctly identifies shapes and makes patterns involving rectangles, circles, triangles, ovals and squares.	Inaccurately identifies shapes and makes patterns involving rectangles, circles, triangles, ovals and squares.	Major inaccuracies in identifying shapes and making patterns involving rectangles, triangles, circles, ovals and squares.

SUGGESTED RESOURCES

SUB -STRANDS	RESOURCES
NUMBER CONCEPT	Bottle tops , marbles ,sticks, stones, grains
WHOLE NUMBERS	Bottle tops, marbles , sticks, stones, grains, a number line drawn on the ground/floor
FRACTIONS	Circular and rectangular cut outs
ADDITION	Bottle tops, marbles, stones, sticks, grains, place value chart, abacus, basic addition facts table, a number line drawn on the ground/floor
SUBTRACTION	Bottle tops, marbles, sticks, stones, grains, basic addition facts table, a number line drawn on the ground/floor
MULTIPLICATION	Bottle tops, marbles, stones, grains, number line drawn on the ground/floor, multiplication table
DIVISION	Bottle tops, marbles, sticks, stones, grains, multiplication tables
LENGTH	Pencils, sticks, rulers, strings, ropes
MASS	Items of different masses such as books ,stones, pieces of wood, items of same mass, beam balance
CAPACITY	Containers of different sizes, 1-litre containers, water, soil, sand
TIME	Charts with number of days in each month and months of the year in order, clock face both analogue and digital

MONEY	Money in coins and notes sh.1, sh.5, sh.10, sh.20, sh.40, sh.50, sh.100, classroom shop
LINES	Sticks, clay, plasticine, strings, ropes
SHAPES	Cut- outs of rectangles, circles, triangles , ovals and squares of different sizes

NOTE

The following ICT devices may be used in the teaching/learning of Mathematics at this level:

Learner digital devices (LDD),Teacher digital devices(TDD),Mobile phones, Digital clocks, Television sets, Videos, Cameras, Projectors, Radios, DVD players, CD's, Scanners, Internet among others.

GRADE THREE

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.1 Number Concept (8 lessons)	By the end of the sub-strand, the learner should be able to:- use ordinal numbers to identify position from 1-20.	• Learners in pairs/groups to arrange different items in order of size starting with the smallest. • Learners to identify the position of an object from a reference point using first, second up to 20th . • Learners in groups to run for a distance and each to identify their position using the words first, second up to 20th position. • Learners in pairs/groups to relate numbers 1 –20 to positions first, second up to 20th using concrete objects. • Learners to play digital games involving position 1st - 20th.	In which position were you when you came to class in the morning?
Core-Competences to be developed: communication and collaboration, learning to learn, imagination and creativity, critical thinking and problem solving ,self–efficacy, digital literacy.				

Link to PCIs: Life Skills: self– awareness- as they use their body parts.	Link to Values: • cooperation • social justice • positive competition
Link to other learning areas: • Language activities	Suggested Community Service Learning Activities: learners may assist in giving patients cards in health facilities according to their arrival time.
Suggested non-formal activity to support learning: learners to take turns in playing games.	Suggested assessment: written exercises, oral questions , observation.

Assessment Rubric

Exceeds expectations	Meets expectations	Approaches expectations	Below expectations
Correctly uses ordinal numbers in identifying positions from 1^{st}-$20^{th}$and beyond with ease.	Correctly uses ordinal numbers in identifying positions from 1^{st}-20^{th}.	Inconsistently uses ordinal numbers in identifying positions from 1^{st}-20^{th}.	Major inaccuracies in using ordinal numbers in identifying positions from 1^{st}-20^{th}.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)

1.0 Numbers	1.2 Whole Numbers (20 lessons)	By the end of the sub-strand, the learner should be able to:- a) count numbers forward and backward from 1-1000, b) identify place value up to thousands, c) read numbers 1-1000 in symbols, d) read and write numbers 1-100 in words, e) identify missing numbers in number patterns up to 1000, f) appreciate number patterns as they skip on a number line.	• Learners in pairs/groups to count in 2's and 5's forward and backward starting from any point. • Learners in pairs/groups to count their fingers and toes in 2's and 10's forward and backward starting from any point. • Learners in pairs / groups to discuss place value up to thousands. • Learners in pairs / groups to compete reading numbers 1-1000 in symbols. • Learners to read and write numbers 1-100 in words. • Learners to play digital games involving whole numbers. • Learners in pairs/groups to make number patterns up to 1000 and share with other groups.	How would you get the total number of people in a group?
Core-Competence to be developed: communication and collaboration, critically thinking and problem solving, imagination and creativity, digital literacy.				
Link to PCIs: • Life skills: self- awareness -as learners count their fingers and toes. • Citizenship: social cohesion -as learners work in groups.			Link to Values: • Integrity • cooperation • unity • responsibility	
Link to other learning areas: • Environmental activities • Language activities			Suggested Community Service Learning Activities: learners may assist in counting the number of chairs in a community function.	
Suggested non-formal activity to support learning: learners to count trees in the school compound.			Suggested assessment: written exercise, oral questions, observation.	

Assessment Rubrics

Exceeds expectations	Meets expectations	Approaches expectations	Below expectations
Correctly: counts numbers from 1 -1000, reads and writes numbers 1-100 in words, reads and writes number symbols from 1 - 1000, identifies place value up to thousands, works out missing numbers in patterns up to 1000 with ease.	Correctly: counts numbers from 1 - 1000, reads and writes numbers 1-100 in words, reads and writes number symbols from 1 - 1000, identifies place value up to thousands, works out missing numbers in patterns up to 1000.	Inconsistently: counts numbers from 1 -1000, reads and writes numbers 1-100 in words, reads and writes number symbols from 1 -1000, identifies place value up to thousands, works out missing numbers in patterns up to 1000.	Major inaccuracies in: counting numbers from 1 - 1000, reading and writing numbers 1-100 in words, reading and writing number symbols from 1- 1000, identifying place value up to thousands, working out missing numbers in patterns up to 1000.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.1 Fractions (10 lessons)	By the end of the sub-strand the learner should be able to:- a) identify $\frac{1}{4}$ and as part of a whole. b) identify $\frac{1}{2}$, and $\frac{1}{8}$ as part of a group.	• Learners in pairs /groups to make circular cut-outs. • Learners in pairs /groups to fold circular cut-outs into 2 equal parts and identify one part as $\frac{1}{2}$ of the whole. • Learners in pairs /groups to make rectangular cut-outs and fold them into 4	How can you represent a half, a quarter or an eighth of a group?

			equal parts to get a quarter of a whole and identify each part as $\frac{1}{4}$ of the whole. • Learners in pairs /groups to make rectangular cut-outs and fold to get 8 equal parts and identify one part as $\frac{1}{8}$ of the whole. • Learners in pairs /groups to divide a number of objects into 2 equal groups and identify each of the small groups as $\frac{1}{2}$ of the whole group. • Learners in pairs /groups to divide a number of objects into 4 equal groups and identify each of the small groups as $\frac{1}{4}$ of the whole group. • Learners in pairs /groups to divide a number of objects into 8 equal groups and identify each of the small groups $\frac{1}{8}$ of the whole group. • Learners to play digital games involving $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$.	
Core-Competence to be developed: imagination and creativity, communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: • Life skills: interpersonal relationships- friendship formation and decision making. • Citizenship: integrity-sharing, social cohesion -as they work in groups. • ESD: environmental awareness- as learners collect objects like sticks.			Link to Values: • integrity • unity • responsibility	

Link to other learning areas: • Hygiene and Nutrition activities • Environmental activities • Language activities	Suggested Community Service Learning Activities: learners can share responsibilities during community activities.
Suggested non-formal Activity to support learning: learners to share library books during free time.	Suggested assessment: written exercise, observation, oral questions.

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly identifies $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ and more as part of a whole and as part of a group.	Correctly identifies $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ as part of a whole and as part of a group.	Inconsistently identifies $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ as part of a whole and as part of a group.	Major inaccuracies in identifying $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$ as part of a whole and as part of a group.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0Numbers	1.2 Addition (25 lessons)	By the end of the sub-strand, the learner should be able to:- a) add a 3- digit number to up to a 2 -digit number without regrouping with sum not exceeding 1000, b) add a 3- digit number to up to a 2- digit number with single regrouping with sum not exceeding 1000, c) add three single digit numbers with sum up to 27,	• Learners to add up to two 3- digit numbers without and with regrouping with sum not exceeding 1000. • Learners to practice adding horizontally and vertically. • Learners in pairs to come up with different ways of adding 3- single digit numbers. • Learners to play digital games involving addition.	1) How do you arrange numbers when adding vertically 2) How do you identify the first two numbers to add when adding three single digit numbers? 3) How can you get the next number in a given pattern?

		d) add two 3- digit numbers without regrouping, e) add two 3- digit numbers with single regrouping with sum not exceeding 1000, f) work out missing numbers in patterns involving addition up to 1000, g) create number patterns involving addition up to 1000.	• Learners to create and work out missing numbers in patterns involving addition up to 1000.	
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy, imagination and creativity.				
Link to PCIs: • ESD: DRR; safety-environmental awareness. • Life skills: self- awareness-as they use body parts in counting.			Link to Values: • integrity • responsibility	
Link to other learning areas: • Environmental activities • Language activities • Religious activities			Suggested Community Service Learning Activities: learners may assist in working out the total number of different trees in their locality in order to find out which type should be planted.	
Suggested non-formal activity to support learning: learners to work out total number of learners in the school.			Suggested assessment: written exercise, observation, oral questions.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaching Expectations	Below Expectations
Correctly: adds a 3- digit number to up to 3- digit numbers with double regrouping with sum not exceeding 1000,works out missing numbers in number patterns up to 1000, creates patterns involving addition up to 1000.	Correctly: adds a 3- digit number to up to 3- digit numbers with single regrouping with sum not exceeding 1000,works out missing numbers in number patterns up to 1000, creates patterns involving addition up to 1000.	Inconsistently: adds a 3- digit number to up to 3- digit numbers with single regrouping with sum not exceeding 1000,works out missing numbers in number patterns up to 1000, creates patterns involving addition up to 1000.	Major inaccuracies in: adding a 3- digit number to up to 3- digit numbers with single regrouping with sum not exceeding 1000,working out missing numbers in number patterns up to 1000, creating patterns involving addition up to 1000.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.5 Subtraction (20 lessons)	By the end of the sub-strand, the learner should be able to:- a) subtract up to 3- digit numbers without regrouping, b) subtract up to 3- digit numbers involving missing numbers with single regrouping, c) work out missing numbers in number patterns involving subtraction up to 1000.	• Learners to work out subtraction of up to 3-digit numbers without regrouping in real life situations. • Learners to work out missing numbers in subtraction of up to 3- digit numbers with single regrouping using a variety of strategies such as number families. • Learners to play digital games involving subtraction. • Learners to discuss how to work out missing numbers in patterns involving subtraction up to 1000.	1) When do you regroup during subtraction? 2) How do you identify the missing number in a number pattern?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: ESD: environmental awareness- as learners work out subtraction.			Link to Values: • respect • responsibility • integrity	
Link to other learning areas: • Language activities • Hygiene and Nutrition activities • Environmental activities			Suggested Community Service Learning Activities: learners to participate in community environmental cleaning activities.	
Suggested non- formal activity to support learning: learners to clean up their school.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaching Expectations	Below Expectations
Correctly: subtracts up to 3- digit numbers without regrouping, subtracts up to 3- digit numbers involving missing numbers with single regrouping, works out missing numbers in patterns up to 1000 with ease.	Correctly: subtracts up to 3- digit numbers without regrouping, subtracts up to 3- digit numbers involving missing numbers with single regrouping, works out missing numbers in patterns up to 1000.	Inconsistently: subtracts up to 3- digit numbers without regrouping, subtracts up to 3- digit numbers involving missing numbers with single regrouping, works out missing numbers in patterns up to 1000.	Major inaccuracies in: subtracting up to 3- digit numbers without regrouping, subtracting up to 3- digit numbers involving missing numbers with single regrouping, working out missing numbers in patterns up to 1000.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.6 Multiplication (10 lessons)	By the end of the sub-strand, the learner should be able to:- multiply single digit numbers by numbers 1-10 in different contexts.	• Learners in pairs/groups to multiply single digit numbers by numbers1-10 using: -groups of objects -repeated addition -multiplication table. • Learners to play digital games involving multiplication.	1) How can you work out multiplication using repeated addition? 2) How can we get the answer to a multiplication question using the multiplication table?
Core competences to be developed: communication and collaboration, imagination and creativity ,self-efficacy, digital literacy.				
Link to PCIs: • Life skills: self –awareness -learners use body parts in grouping objects.			Link to values • integrity • unity	

• ESD:DRR; Environmental conservation-learners re-use materials and objects; animal welfare-feeding animals in small portions at a time.	• cooperation
Link to other learning areas: • Language activities • Environmental activities • Movement and creative activities	Suggested Community Service Learning Activities: learners to assist farmers in finding out how many seedlings planted in rows are in a seed bed.
Suggested non-formal activities to support learning: learners to play games involving multiplication in school.	Suggested assessment: written exercise, observation, oral questions.

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly multiplies single digit numbers by numbers 1-10 and beyond.	Correctly multiplies single digit numbers by numbers 1-10.	Inconsistently multiplies single digit numbers by numbers 1-10.	Major inaccuracies in multiplying single digit numbers by numbers 1-10.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Numbers	1.7 Division (8 lessons)	By the end of the sub-strand, the learner should be able to:- a) represent division as repeated subtraction up to 5 times, b) show relationship between multiplication and division using mathematical sentences up to $9 \times 10 = 90$.	• Learners to take away from a group a specific number of objects at a time until all are finished and then count the number of small groups formed. • Learners to represent division as repeated subtraction up to 5 times. • Learners to discuss the relationship between division and multiplication using the multiplication table. • Learners in pairs/groups to practice how to divide numbers related to multiplication of up to	1) How can we divide numbers using subtraction? 2) How can we use the multiplication table to work out division questions?

			$9 \times 10 = 90$. • Learners to play digital games involving division.	
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: ESD: animal welfare- feeding animals by giving small portions at a time.			Link to Values: • respect • responsibility • love	
Link to other learning areas : • Language activities • Hygiene and Nutrition activities • Environmental activities			Suggested Community Service Learning Activities: learners to assist in sharing food in functions.	
Suggested non- formal activity to support learning: learners to water flowers and trees in the school compound.			Suggested assessment: oral questions, written exercise, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly represents division as repeated subtraction up to more than 5 times and relates division to multiplication up to 9 x10 = 90.	Correctly represents division as repeated subtraction up to 5 times and relates division to multiplication up to 9x10= 90.	Inconsistently: represents division as repeated subtraction up to 5 times, relates division to multiplication up to 9 x10 = 90.	Major inaccuracies in: representing division as repeated subtraction up to 5 times and in relating division to multiplication up to 9 x10 = 90.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)

2.0 Measurement	2.1 Length (6 lessons)	By the end of the sub-strand, the learner should be able to:- a) measure length in metres, b) add and subtract length in metres, c) estimate length up to 20 metres.	• Learners in pairs/groups to use metre sticks to measure various distances and record their results. • Learners to prepare 5 metres long strings with knots at intervals of one metre to measure long distances. • Learners in groups to measure the lengths of the 4 walls in their classroom and add the lengths. • Learners to measure the length of the chalkboard and the wall it is fixed and work out the difference in length. • Learners to work out questions involving addition and subtraction of length in metres based on real life situations. • Learners in pairs/groups to estimate distances around the school up to 20 metres and measure to confirm. • Learners to take videos of others measuring length then playback and discuss.	1) How do you measure the chalkboard using a metre stick? 2) How do you get the total length in metres of the 4 classroom walls? 3) How do you measure the distance between the flag post and the staffroom using a 5 metres long string?
Core Competencies to be developed: communication and collaboration, imagination and creativity, critical thinking and problem solving, self-efficacy, digital literacy.				
Link to PCIs: ESD:DRR; environmental awareness-re-use of materials, safety- of materials learners use.			Link to values: • integrity • unity • responsibility	
Link to other learning areas: • Environmental activities • Language activities			Suggested Community Service Learning Activities: learners to assist their neighbours in measuring length when building chicken and rabbit cages among others.	

Suggested non-formal activity to support learning: learners to measure lengths of buildings in school.	Suggested assessment: oral questions, observation' written exercise.

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: measures length in metres, adds length in metres, subtracts length in metres and estimates length up to 20 metres and beyond.	Correctly measures length in metres, adds length in metres, subtracts length in metres and estimates length up to 20 metres.	Inconsistently: measures length in metres, adds length in metres, subtracts length in metres and estimates length up to 20 metres.	Major inaccuracies in: measuring length in metres, adding length in metres, subtracting length in metres and estimating length up to 20 metres.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.2 Mass (6 lessons)	By the end of the sub-strand, the learner should be able to:- a) measure mass in kilograms, b) add and subtract mass in kilograms, c) estimate mass up to 5 kilograms.	• Learners to measure mass in kilograms using a beam balance. • Learners to make masses of 1kg using sand/soil by measuring against the kilogram standard unit. • Learners to add and subtract mass in kilograms in real life situations. • Learners to use a 5kg mass to compare other masses.	How can you make a 1kg mass using a beam balance?

			• Learners to estimate mass up to 5kg and measure to confirm. • Learners to play digital games involving mass.	
Core competencies to be developed: communication and collaboration, imagination and creativity, critical thinking and problem solving, self-efficacy, digital literacy.				
Link to PCIs: • Citizenship: social cohesion- as learners work in groups. • ESD:DRR; safety- in selecting appropriate materials.			Link to Values: • integrity • unity • honesty	
Link to other learning areas: • Environmental activities • Language activities • Movement and creative activities			Suggested Community Service Learning Activities: learners to assist neighbours in arranging light items.	
Suggested non-formal activity to support learning: learners to measure mass of different items in kilograms.			Suggested assessment: written exercise, oral questions, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaching Expectations	Below Expectations
Correctly: measures mass in kilograms, adds and subtracts mass in kilograms and estimates mass up to 5kg and beyond.	Correctly: measures mass in kilograms, adds and subtracts mass in kilograms and estimates mass up to 5kg.	Inconsistently: measures mass in kilograms, adds and subtracts mass in kilograms and estimates mass up to 5kg.	Major inaccuracies in: measuring mass in kilograms, adding and subtracting mass in kilograms and estimating mass up to 5kg..

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.3 Capacity (8 lessons)	By the end of the sub-strand, the learner should be able to:- a) measure capacity in litres, b) add and subtract capacity in litres, c) estimate capacity up to 5 litres.	• Learners in pairs/groups measure capacity of different containers in litres. • Learners to add and subtract capacity in litres in real life situations. • Learners to estimate capacity up to 5 litres and measure to confirm. • Learners play digital games involving capacity.	What can we use to measure capacity?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy, imagination and creativity, citizenship.				
Link to PCIs: ESD: animal welfare – feed animals with water			Link to Values: • respect • responsibility • integrity	
Link to other learning areas: • Language activities • Nutrition and hygiene activities • Environmental activities • Movement and creative activities			Suggested Community Service Learning Activities: learners to take part in watering flowers and trees around places of worship, health centres and at home.	
Suggested non-formal activity to support learning: learners to water flowers and trees in the school compound.			Suggested assessment: oral questions, observation, written exercise.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: measures capacity in litres, adds and subtracts capacity in litres in real life experiences and estimates capacity up to 5 litres and beyond.	Correctly: measures capacity in litres, adds and subtracts capacity in litres in real life experiences and estimates capacity up to 5 litres	Inconsistently: measures capacity in litres, adds and subtracts capacity in litres in real life experiences and estimates capacity up to 5 litres	Major inaccuracies in: measuring capacity in litres, adding and subtracting capacity in litres in real life experiences and estimating capacity up to 5 litres

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.4 Time (10 lessons)	By the end of the sub-strand, the learner should be able to:- a) identify the minute as a unit of measuring time, b) read and tell time using the digital clock, c) read and tell time using 'past' and 'to' the hour using the clock face, d) write time using 'past' and 'to' the hour, e) estimate time in hours, f) add and subtract time involving hours and minutes without conversion in real life situations.	• Learners to discuss the divisions on a clock face and what each division represents. • Learners to read time on a digital clock • Learners in pairs/groups to discuss the relationship between hours and minutes using a clock face. • Learners in pairs/groups to read, tell and write time using 'past' and 'to' the hour. • Learners in pairs/groups to estimate time in hours. • Learners in pairs/groups to add and subtract time involving hours and minutes without conversion in real life situations.	How do we convert hours to minutes?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy, learning to learn.				
Link to PCIs: • Health education: HIV and AIDS- drugs time adherence. • Citizenship: governance- law and order in school in keeping time.			Link to Values: • respect • responsibility • integrity • social justice	
Link to other learning areas : • Language activities • Nutrition and Hygiene activities • Environmental activities			Suggested Community Service Learning Activities: learners to assist in being time keepers in community activities.	

Suggested non-formal activity to support learning: learners to assist in time keeping during games.	Suggested assessment: oral questions, observation, written exercise.

Assessment rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: reads, tells, writes time using 'past' and 'to' the hour, estimates time in hours and minutes, adds and subtracts time involving hours and minutes without conversion in real life situations with ease.	Correctly: reads, tells, writes time using 'past' and 'to' the hour, estimates time in hours, adds and subtracts time involving hours and minutes without conversion in real life situations.	Inconsistently: reads, tells, writes time using 'past' and 'to' the hour, estimates time in hours, adds and subtracts time involving hours and minutes without conversion in real life situations.	Major inaccuracies in: reading, telling, writing time using 'past' and 'to' the hour, estimating time in hours, adding and subtracting time involving hours and minutes without conversion in real life situations.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
2.0 Measurement	2.5 Money (10 lessons)	By the end of the sub-strand, the learner should be able to:- a) identify Kenyan currency notes up to sh.1000, b) count money in different denominations up to sh.1000, c) add and subtract money involving up to sh.1000,	• Learners in pairs/groups to sort out Kenyan currency notes according to their value and features up to sh.1000. • Learners in pairs/groups to practice addition and subtraction of money in real life situations up to sh.1000. • Learners in pairs/groups to practice giving change and balance using imitation money up to sh.1000 in shopping activities.	What is the difference between needs and wants?

		d) carry out shopping activities involving change and balance, e) relate money to goods and services up to sh.1000, f) differentiate between needs and wants, g) appreciate spending and saving of money in real life situations.	• Learners in pairs/groups to share own experiences in relation to shopping activities. • Learners in pairs/groups to discuss items they cannot do without and those that are necessary but they can do without. • Learners in pairs/groups to classify needs and wants. • Learners to play digital games involving money.	
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy, citizenship.				
Link to PCIs: • ESD: financial literacy- the choice of what to buy and what not to buy. • Parental Empowerment and engagement: selection of what to buy and what not to buy.			Link to Values: • respect • responsibility • integrity • social justice	
Link to other learning areas: • Language activities • Hygiene and Nutrition activities			Suggested Community Service Learning Activities: learners to visit older citizens to listen to stories involving money features.	
Suggested non-formal activity to support learning: learners to help count money in school activities.			Suggested assessment: written exercise, oral questions, observation.	

Assessment Rubrics

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly: identifies Kenyan currency notes up to sh. 1000,counts money in different denominations, adds, subtracts, carries out shopping activities above sh.1000, relates money to goods and services, differentiates needs and wants, explains	Correctly: identifies Kenyan currency notes up to sh. 1000,counts money in different denominations, adds, subtracts, carries out shopping activities within sh.1000, relates money to goods and services, differentiates needs and wants, explains meaning	Inconsistently: identifies Kenyan currency notes up to sh.1000,counts money in different denominations, adds, subtracts, carries out shopping activities within sh.1000, relates money to goods and services, differentiates needs and wants, explains	Major inaccuracies in: identifying Kenya currency notes up to sh.1000, counting money in different denominations, adding, subtracting, carrying out shopping activities within sh.1000, relating money to goods and services, differentiating needs and wants, explaining meaning of spending and saving in real life situations.

meaning of spending and saving in real life situations.	of spending and saving in real life situations.	meaning of spending and saving in real life situations.	

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
3.0 Geometry	3.1 Position and Direction (5 lessons)	By the end of the sub-strand, the learner should be able to:- a) move along a straight line from a point, b) turn to the right from a point, c) turn to the left from a point.	• Learners in pairs /groups to move along a straight line from a given point. • Learners in pairs/groups to move straight along the outside of their classroom and then turn to the right or left. • Learners in pairs practice moving along a straight line and turning left or right. • Learners to play digital games on movement.	What do you do when you get to a road junction?
Core Competences to be developed: communication and collaboration, critical thinking and problem solving, digital literacy, imagination and creativity.				
Link to PCIs: • Life skills: self- awareness - as learners use their body parts in movement. • Citizenship: social cohesion- as learners work in groups.			Link to Values: • cooperation • responsibility • unity	
Link to other learning areas: • Language activities • Movement and creative activities • Environmental activities			Suggested Community Service Learning Activities: learners to assist in ushering people during community functions.	
Suggested non- formal activity to support learning: learners to participate in games, athletics and scouting.			Suggested assessment: written exercise, oral questions, observation.	

Assessment Rubric

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly demonstrates movement along a straight line and turning to the right orleft with ease.	Correctly demonstrates movement along a straight line and turning to the right or left.	Inaccurately: demonstrates movement along a straight line, and turning to the right or left.	Major inaccuracies in: demonstrating movement along a straight line and turning to the right or left.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
3.0 Geometry	3.2 Shapes (4 lessons)	By the end of the sub-strand, the learner should be able to:- a) make patterns involving rectangles, circles, triangles, ovals and squares, b) appreciate making patterns involving rectangles, circles, triangles, ovals and squares.	• Learners to sort and group items of different shapes. • Learners in pairs /groups to discuss the types of lines making various shapes. • Learners to identify and name the different shapes found in their environment. • Learners to make patterns using the five shapes. • Learners in groups to make patterns, colour them and share with other groups. • Learners to play digital games involving shapes.	What shapes can you identify in your school?
Core Competences to be developed: communication and collaboration, creativity and imagination, critical thinking and problem solving, digital literacy.				
Link to PCIs: • Citizenship: leadership development, social cohesion- as learners work in groups. • Life skills: self- esteem and awareness- as learners make patterns			Link to Values: • respect • responsibility • unity	
Link to other learning areas : • Languages activities • Movement and creative activities • Environmental activities			Suggested Community Service Learning Activities: learners to visit children homes and beautify their rooms with patterns drawn on paper.	
Suggested non- formal activity to support learning: learners to mark games /sports fields.			Suggested assessment: written exercises, oral questions, observation.	

Assessment Rubric

Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Correctly makes patterns involving rectangles, circles, triangles, ovals and squares with ease.	Correctly makes patterns involving rectangles, circles, triangles, ovals and squares.	Inaccurately makes patterns involving rectangles, circles, triangles, ovals and squares.	Major inaccuracies in making patterns involving rectangles, circles, triangles, ovals and squares.

SUGGESTED RESOURCES

SUB -STRANDS	RESOURCES
NUMBER CONCEPT	Marbles, sticks, stones, grains
WHOLE NUMBERS	A number line drawn on the ground/floor, place value chart
FRACTIONS	Circular and rectangular cut outs, marbles, bottle tops ,sticks, grains, stones
ADDITION	Place value chart, abacus, basic addition facts table
SUBTRACTION	Basic addition facts table, place value chart
MULTIPLICATION	Bottle tops ,marbles, stones, grains, number line drawn on the ground/floor, multiplication tables

DIVISION	Bottle tops, marbles, stones, sticks, grains, multiplication tables
LENGTH	Books, pencils, rulers, sticks, bottles, metre rule, metre sticks
MASS	Masses of 1kg, soil, sand, beam balance
CAPACITY	Containers of different sizes, 1litre containers, sand soil water,5 litre containers
TIME	Clock face both analogue and digital
MONEY	Kenyan currency coins and notes/imitations up to sh.1000, classroom shop
POSITION AND DIRECTION	Charts showing a straight line, a turn to the left and a turn to the right
SHAPES	Cut- outs of rectangles, circles, triangles, ovals and squares of different sizes

NOTE

The following ICT devices may be used in the teaching/learning of mathematics at this level:

Learner digital devices (LDD),Teacher digital devices(TDD),Mobile phones, Digital clocks, Television sets, Videos, Cameras, Projectors, Radios, DVD players, CD's, Scanners, Internet among others.

ENVIRONMENTAL ACTIVITIES

Essence Statement

This is an integrated learning area comprising of Science, Social and Agricultural activities. The learner will acquire knowledge, skills, values and attitudes leading to competency that will enable exploration of the environment for enjoyment, learning and problem solving. The competences will form basis for concepts to be acquired at higher levels of learning for sustainable development.

General Learning Outcomes

By the end of Early Years Education, the learner should be able to:-

a) practice proper sanitation and safety precautions to limit risks to self, others and the environment
b) demonstrate appropriate values, attitudes and practices for sustainable interactions
c) explore the immediate environment for learning and enjoyment
d) apply acquired competences in solving environmental challenges for sustainable development
e) appreciate the country's rich, diverse environmental resources and cultural heritage for harmonious living
f) develop appropriate organizational, practical and technological skills for problem solving in conserving the environment
g) communicate environmental friendly messages through technological, verbal and non-verbal modes for conservation, improvement and protection of the environment
h) participate in community service learning to promote the environmental and social well being.

GRADE ONE

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Question(s)
1.0 Environment and its resources	1.1 Weather and Sky (10 lessons) 1.1.1 Observing the Sky	By the end of the sub-strand, the learner should be able to:- a) describe the appearance of the sky during the day and at night, b) observe differences in appearance of the sky during the day and at night, c) develop curiosity in observing appearance of the sky for enjoyment.	• Learners to observe the sky (the sun, moon, stars and clouds)during the day and share their observations with others • With the help of parents or guardians learners to observe appearance of the sky at night and report back • Use stimulus materials to show appearance of the sky during the day and at night • Learners to play educative computer games on the Sun, moon, clouds and stars • Learners to draw and colour the Sun, moon, clouds and stars.	1) What do we see when look at the sky during the day and during the night? 2) What differences do we observe in the day and night sky?
	1.1.2 Exploring weather conditions	By the end of the sub-strand, the learner should be able to:- a) identify weather conditions of the day b) make reasonable weather forecast of the day c) appreciate weather conditions at different times of the day.	• Learners to explore weather conditions as an outdoor activity (windy, cloudy, rainy and sunny) • In groups, learners to observe weather conditions of the day in the immediate environment • Learners to share experiences about daily weather conditions • Learners to identify various weather conditions of a day using age appropriate stimulus materials • Learners to mime various weather conditions for enjoyment	How is the weather today?

			• Learners to find out more about the sky during the day and at night from parents or guardians. • Learners to draw and colour a picture on weather.	
Core Competences to be developed: Communication and collaboration, imagination and creativity, critical thinking and problem solving.				
Link to PCIs and Values :ESD: Environmental Education			Link to values: Unity and respect when working together	
Links to other learning activity areas: Religious Education :Appreciating God's creation Movement and Creative Arts: drawing and colouring			Suggested Community Service Learning activities: learners are guided by parents or guardians to observe the sky at night.	
Suggested non formal activity to support learning: Learners to develop and colour a poster on weather.			Suggested assessment: observation as they draw and colour the poster, oral questions on weather.	

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches expectations	Below expectations
• Consistently and accurately identifies the sun, moon ,stars and clouds • Appreciates different weather conditions.	• Accurately identifies the sun, moon, stars and clouds • Appreciates different weather conditions.	• Occasionally identifies the sun, moon ,stars and clouds • Sometimes appreciates different weather conditions.	Rarely identifies and appreciates weather conditions.

Strand	Sub-Strand	Specific Learning Outcome	Suggested Learning Experiences	Key Inquiry Question(s)
	1.3 Water (10 lessons) 1.3.1 Sources of water	By the end of the sub-strand, the learner should be able to:- a) identify different sources of water in the immediate environment, b) observe different sources of water in the immediate environment, c) appreciate different sources of water in the immediate environment.	• Learners to brainstorm on sources of water • Learners to observe a variety of stimulus materials on sources of water. • In groups, learners to share ideas on different sources of water in the immediate environment • With the support of the teacher, learners to make model sources of water in the class learning space/corner as a project.	What are the sources of water in our immediate environment?
	1.3.2 Uses of water	By the end of the sub-strand, the learner should be able to:- a) identify different uses of water in the home and school, b) demonstrate careful use of water in the home and school, c) appreciate careful use of water in the home and school.	• Learners to identify different uses of water using varied stimulus materials • In groups, learners to identify different uses of water in the home and school from the stimulus materials • Learners to discuss careful use of water in the home and school • Learners to create and share with others a scrapbook on careful use of water either in the home or at school as part of a personal experience and to bring out the value of careful use of water	How could we use water responsibly in the home and school?
Core-competence to be developed: Communication and collaboration while working in groups; Digital literacy; Creativity: ability to think critically and creatively in making the scrapbook				
Links to PCIs: Personal hygiene			Links to values: Moral values of cleanliness	
Link to other learning activity areas : Religious Education: Religious values, appreciate water sources as a gift from God; Nutrition and Hygiene cleanliness			Suggested Community Service Learning activities: Learners to find out more about sources and uses of water from their parents or guardians.	
Suggested non-formal activity to support learning through application Make a display of the scrapbook for other learners to appreciate.			Suggested assessment: Use a checklist to assess the scrapbook, Observation on group work, written and oral questions.	

Suggested Assessment Rubric

Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Consistently and correctly identifies many sources and uses of water and demonstrates careful use of water.	Correctly identifies sources and uses of water. Appreciates and demonstrates careful use of water.	To some extent, correctly identifies sources and use of water. May appreciate and demonstrate careful uses of water.	Rarely identifies and appreciates sources and uses of water.

Strand	Sub -strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question (s)
Environment and its resources	1.4 Soil (10 lessons) 1.4.1 Playing with soil	By the end of the sub-strand, the learner should be able to:- a) identify ways of playing with soil for enjoyment, b) play with soil in different ways for enjoyment, c) model different objects using soil at school, d) develop curiosity in playing with soil for enjoyment.	• Learners to identify ways of playing with soil • Learners to fill and empty cans with soil for fun • Learner to model different objects using soil • Learners to draw on the soil and make different patterns using soil paints • Learners to find out more from parents or guardians on how to play with soil.	How could we play with soil?
Core-competence to be development: creativity and imagination, communication and collaboration as learners make patterns using paints from soil.				
Links to PCIs: ESD: Environment and its resources			Links to values: Responsibility as learners work together	
Links to other learning activity areas : Mathematics: Emptying and filling cans Movement and Creative activities: Drawing and making patterns			Suggested Community Service Learning activities: Learners find out from parents or guardians how to play with soil.	
Suggested non-formal activity to support learning: Displaying patterns from soil paints for peers to appraise.			Suggested assessment: Oral questions and observation of the soil activities.	

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Consistently plays and creatively model objects, makes a variety of patterns using soil and shows curiosity in playing with soil.	Correctly plays, model objects, make patterns using soil and shows curiosity in playing with soil.	Sometimes plays, model objects, make few patterns using soil and shows little interest in playing with soil.	Rarely plays, model objects or make patterns using soil.

Strand	Sub-strand	Learning outcome	Suggested Learning experience	Key Inquiry question(s)
Environment and its resources	1.5 Plants (15 Lessons) 1.5.1Exploring plants in the immediate environment	By the end of the sub-strand, the learner should be able to:- a) identify plants in the immediate environment, b) observe plants in the immediate environment to realize the diversity in plants, c) appreciate plant diversity in the immediate environment.	• Learners to take a nature walk to observe different plants in the immediate environment. • Learners to think, pair and share about plants that they observed during the nature walk • Learners to draw and colour plants that they liked during the nature walk • Learners to gather more information parents or guardians about plants and report back. • Learners to search for pictures on plants from digital and print resources • Learners to sing a song on plants.	What plants are found in the immediate environment?
Core Competences to be developed: Communication and collaboration: sharing experiences in groups about plants. Imagination and creativity: drawing and coloring plants. Learning to learn: gathering information through taking a nature walk				
Link to PCIs: ESD: Environmental awareness			Link to values: Responsibility and unity inworking with others	
Links to other learning activity areas: Religious Activities: Appreciating plants as God's creation. Movement and Creative Activities: Drawing and colouring plants			Suggested Community Service Learning activities: learners to find out names of plants from parents or guardians.	

Suggested non formal activity to support learning: Sing songs on plants during the school assembly.	Suggested assessment: Oral questions, observation and written work on Activity sheet on plants.

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Consistently and correctly identifies the plants in the immediate environment.	Correctly identifies plants in the immediate environment.	Sometimes identifies some plants in the immediate environment.	Rarely identifies plants in the immediate environment.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key inquiry Question(s)
1.0 Environment and its resources	1.6 Animals (15 lessons) 1.5.1 Exploring animals in the immediate environment.	By the end of the sub-strand, the learner should be able to:- a) identify different animals in the immediate environment, b) observe different animals in the immediate environment, c) appreciate diversity of animals in the immediate environment.	• Learners are guided safely explore animals in the immediate environment • Using stimulus materials, learners in groups observe and identify different animals • Learners to take a nature walk to observe diversity in animals. • Learners to share their findings on animals that they observed • Learners listen to case stories on animals for enjoyment • Learners to gather more information on animals from parents or guardians.	What animals are found in the immediate environment?
Core Competence to be developed: Creativity and imagination, Learning to learn Communication and collaboration				
Link to PCIs: ESD: Environmental awareness. Life skills: Effective communications as learners identify animals.			Link to Values: Respect, kindness, care, safety: learners appreciate animals in their natural environment.	
Link to other learning activity areas: Religious Education: appreciating animals as God's creation.			Suggested Community Service Learning activities: Learners to explore animals in the immediate environment	

Literacy: listening to stories on animals	
Suggested non formal activity to support learning through application: Present a message on care of animal to other learners.	Suggested assessment: Oral questions on identifying animals in the immediate environment.

Suggested Assessment Rubric

Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Consistently and correctly identifies, observes and appreciates different animals in the immediate environment.	Correctly identifies different animals, observes and appreciates the animals in the immediate environment.	Sometimes identifies different animals, observes and rarely shows appreciation of the different animals in the immediate environment.	Rarely identifies and appreciate different animals in the immediate environment.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
1.0 Environment and its resources	1.7 Energy (10 Lessons) 1.7.1 Producing sounds	By the end of the sub-strand, the learner should be able to:- a) recognize sounds in the immediate environment, b) identify ways of producing sounds from different objects, c) create sounds from a variety of sources for enjoyment d) develop curiosity in producing sounds from different objects.	• Learners take a sound walk in the immediate environment • Learners think, pair and share the sounds they heard • Learners to imitate sounds from humans, animals, machines or that which is natural such as thunder) • Learners to identity ways of creating sound using the body, objects and voice (plucking, hitting, blowing, shaking snapping, tapping and clicking) • Learners to listen to different sounds from common instruments using multimedia resources.	1 What produces sounds in the immediate environment? 2 How could we produce sounds?

	1.7.2 Sounds that alert us on dangers	By the end of the sub-strand, the learner should be able to:- a) identify sounds that alert us on dangers in the immediate environment, b) discriminate sounds that alert us on dangers for appropriate response, c) appreciate different sounds that alerts on dangers.	• Learners to come up with different sounds that alert us on dangers • Learners to identify sounds used to alert us on dangerous situations • In groups, learners to match different sound alerts with correct danger • Organize learners to practice appropriate response to sounds that alert us on dangers • Learners to ask parents or guardians how to appropriately respond to sounds that alert people on dangers in the community.	1. What sounds alert on danger? 2. How could we respond appropriately to various sounds?
	1.7.3 Harmful effects of loud sounds	By the end of the sub-strand, the learner should be able to:- a) identify sources of loud sounds in the immediate environment b) recognize harmful effects of loud sound to health and safety c) observe practices that limit harmful effects of loud sounds d) demonstrate willingness to limit harmful effects of loud sounds to self and others.	• Learners to explore sources of loud sound in the immediate environment • Learners to be aware of effects of loud sounds on their wellbeing • Learners to identify ways of avoiding loud sound • Learners to recite a poem on limiting harmful effects of loud sounds.	1. What are the sources loud sounds? 2. How could loud sound harm us? 3. How could we avoid loud sound?
Core-competence to be development: Creativity and imagination when creating sound, dancing and singing Self-efficacy – discussing on how to avoid practices that brings about loud sound				
Links to PCIs: ESD: Environment and its Resources Life skills: Effective communication , learners produce sounds in different ways Citizenship: Social cohesion, learners sing and dance to different sounds			Link to values: Responsibility and unity as learners work together	

Links to other learning activity areas (s): Language: Reciting poems Nutrition and Health: Loss of hearing Movement and creative Arts: Singing and dancing	Suggested Community Service Learning activity: Display messages that warn on harmful effects of loud sounds.
Suggested non-formal activity to support learning through application Communicate messages of avoiding loud sounds through clubs movements and societies.	Suggested assessment: Sound quiz,written questions

Suggested Assessment Rubric

Sub-strand	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Producing sounds	Correctly and consistently identifies sources of sounds and creatively creates sound.	Correctly identifies sources of sounds and creates sounds.	Identifies some sources of sounds and creates some sounds.	Rarely identifies sources of sounds or creates sounds.
Sounds that alert us on dangers	Correctly and consistently make sounds, identifies and discriminates sounds that alert on dangers.	Correctly identifies and discriminate sounds that alert on dangers.	Sometimes identifies and discriminate some sounds that alert on dangers.	Rarely identifies and discriminate some sounds that alert on dangers.
Dangers of loud sounds	Correctly and consistently observe and appreciates practices that protect self and others from loud sounds.	Correctly observe and appreciates practices that protect self and others from loud sounds.	Sometimes observe and appreciates practices that protect self and others from loud sounds.	Rarely observes practices that protect one from loud sounds.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
2.0 Social environment	Home Environment (20 lessons) 2.1.1 Caring for things found in the home	By the end of the sub-strand, the learner should be able to:- a) name various things found in the home, b) care for things found in the home, c) develop positive attitude towards caring for things in the home.	• Learners to identify and name things found in the home (utensils and furniture) • Learners to identify ways of caring for things found in the home (cleaning and dusting) • Learners to demonstrate ways of caring for things found in the home.	1. What things are found in the home? 2. How could we care for things found in the home?

	2.1.2 Keeping home environment clean	By the end of the sub-strand, the learner should be able to:- a) identify what t makes the home environment dirty, b) participate actively in making the home environment clean, c) demonstrate willingness to keep the home environment clean.	• Learners find out what makes the home environment dirty • Learners to demonstrate cleaning of home environment using relevant cleaning activities • Learners to visit a nearby home, if possible of an elderly person, and clean the home environment.	1. What makes our home environment dirty? 2. How could we keep our home environment clean?
	2.1.3 Keeping safe and secure in the home	By the end of the sub-strand, the learner should be able to:- a) recognize common risks at home, b) observe safety and security in the home environment to avoid risk to self and others, c) demonstrate responsibility towards own safety and security in the home environment.	• Learners to listen to case story on possible risks in the home • Learners to recognize common risks in the home • Using supporting stimulus, learners demonstrate ways of keeping safe and secure in the home • Learners to talk with parents or guardians and report back on keeping safe and secure in the home.	1. What are some of the possible risks in the home? 2. How could we keep safe and secure in the home?
	2.1.4 Child Rights and responsibilities in the family.	By the end of the sub-strand, the learner should be able to:- a) identify Child Rights in the family b) demonstrate responsibilities of a child in the family c) develop a sense of responsibility for family social cohesion.	• Using stimulus materials, learners to identify child rights in the family (right to a name, nutrition, shelter, schooling and play) • Using stimulus materials, learners to identify responsibilities of a child in the family • In groups, learners to complete a postcard on responsibilities of a child in the family.	1. What are the rights of a child in the family? 2. What are the responsibilities of a child in the family?
	2.1.5 Meeting family needs.	By the end of the sub-strand, the learner should be able to:- a) Recognize basic needs in the family,	• Using probing questions learners to state some of the basic family needs (food, water and shelter) • Learners to fill printable age appropriate forms on basic family needs	1. What are basic family needs? 2. How could parents or guardians meet

		b) identify ways in which parents or guardians meets basic family needs c) appreciate the efforts of parents or guardians in meeting family needs.	• Using age appropriate stimulus materials, learners to identify how parents or guardians meet basic family needs (farming, employment and business) • Learners to sing songs and recite poems or rhymes on how parents or guardians meet basic family needs.	basic family needs?
Core Competence: Citizenship (Child Rights and family values), Self-efficacy: able to make social decisions.				
PCIs: ESD: Safety and Security Life skills: Moral education and self-awareness; Citizenship: Family responsibilities.			Link to values: Respecting family members, responsibility in meeting family needs, love, care	
Link to other learning activity areas : Religious Education: Moral values and responsibilities			Suggested Community Service Learning activities: Learners to be guided to find out from parents or guardians how they meet family needs.	
Suggested non formal activity to support learning: Learners to sing and recite poems on how parents or guardians meet family needs during a parents' day.			Suggested assessment: Oral questions, observations written questions	

Suggested Assessment Rubric

Sub –strand	Exceeds expectation	Meets expectation	Approaching expectation	Below expectation
Caring for things in the home	Consistently and correctly names various things found in the home, cares for things found in the home.	Correctly names various things found in the home, cares for things found in the home.	Occasionally correctly names some things found in the home, cares for some things found in the home.	Rarely names and care for things found in the home.
Keeping the home environment clean	Consistently and effectively participates in making the home environment clean and appreciate keeping the home environment clean.	Correctly participates in making the home environment clean and appreciate keeping the home environment clean.	Occasionally participates and appreciates in making the home environment clean and appreciate keeping the home environment clean.	Rarely participates in making the home environment clean.

Keeping the home safe and secure	Consistently identifies risks and effectively keeps safe and secure	Correctly identifies risks and keeps safe and secure	Occasionally identifies risks and keeps safe and secure	Rarely to identify risks and keep safe and secure
Child Rights and responsibility in the family	Consistently identifies rights and responsibilities in the family and effectively exercises rights and responsibilities	Correctly identifies rights and responsibilities in the family.	Occasionally identifies rights and responsibilities in the family.	Rarely identifies rights and responsibilities in the family.
Meeting Family Needs	Consistently recognizes family needs and responsibilities and always appreciates the efforts of parents or guardians in meeting family needs.	Correctly recognizes family needs and responsibilities and always appreciates the efforts of parents or guardians in meeting family needs.	Occasionally recognizes family needs and responsibilities and appreciates the efforts of parents or guardians in meeting family needs.	Rarely recognizes family needs, responsibilities the efforts of parents or guardians in meeting family needs.

Strand	Sub –strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
2.0 Social environment	2.2 Enterprise projects (30 lessons) 2.2.1 Ways of making money in the family	By the end of the sub-strand, the learner should be able to:- a) identify ways of making money rightfully in the family, b) demonstrate awareness of rightful ways of making money to promote good citizenship, c) appreciate genuine ways of making money as good citizens.	• Learners are guided through probing questions to identify how families make money • In groups, learners to discuss rightful ways of making money. • Using case stories, learners to identify different ways of making money rightfully • Learners to find out more from parents or guardians on rightful ways of earning money	How could the family make money rightfully?
	2.2.2 Exploring the environment for appropriate income generating activities.	By the end of the sub-strand, the learner should be able to:- a) identify income generating activities for the family,	• learners to suggest an income generating activity at home • learners to use varied stimulus materials to explore income	What activities could generate income for the family?

		b) suggest possible income generating activities for the family, c) demonstrate interest in the income generating activities at home.	generating activities that could be carried out in the family • Learners to think, pair and share on income generating activities that could be undertaken by the family • Learners to share suggestions on income generating activities with guardians or parents • Learners to visit an ongoing income generating project for kids.	
Core Competences to be developed: Communication and collaboration, imagination and creativity, critical thinking and problem solving.				
Link to PCIs and Values: ESD Environmental Education and its resources: environment and its resources. Financial literacy: income generating activities Life skills : Effective communication, service learning and parental involvement			Link to values: Honesty, integrity	
Links to other learning activity areas: Literacy, Religious Education			Suggested Community Service Learning activities: discussion with parents or guardians on income generating projects.	
Suggested non formal Activity to support learning Visit an ongoing income generating project for kids			Suggested assessment: Observation as they perform the poem or sing. Oral question on weather	

Suggested Assessment Rubric

Sub-strand	Exceeds expectation	Meets expectation	Approaching expectation	Below expectation
Ways of Making money	Consistently and creatively identifies ways of making money, demonstrates and appreciates rightful ways of making money.	Identifies ways of making money, demonstrates and appreciates rightful ways of making money.	Sometimes identifies ways of making money, may demonstrate and appreciates rightful ways of making money.	Rarely identifies ways of making money.

Exploring the environment for appropriate income generating activities	Creatively and consistently identifies and suggests various possible income generating activities for the family.	Identifies and suggests possible income generating activities for the family.	Sometimes identify possible income generating activities for the family.	Rarely identifies possible income generating activities for the family.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
3.0 Care for the environment	3.1 Caring for plants (5 lessons) 3.1.1 Watering flower beds at school.	By the end of the sub-strand, the learner should be able to:- a) point out when flowers should be watered at school, b) water flower beds appropriately within the school environment, c) demonstrate willingness to take responsibility in watering flowers at school.	• Learners to suggest reasons for watering flowers. • In groups, learners to identify things used for watering flowers (watering can, sprinklers, hose pipe, bucket, improvised watering cans) • Learners are guided to watch age appropriate media on watering of flower beds • Learners to practice correct procedure of watering flower beds and takes photographs • Learners to take turns in watering flower beds • Learners to participate in planting flowers to beautify the school compound.	1. When do we water flower beds? 2. How could we water flower beds?
Core Competences to be developed: Communication and collaboration taking turns in watering flowers. Imagination and creativity: improvising watering cans.				
Link to PCIs and Values: Environmental Education: Caring for plants Life skills: Cooperating while taking turns in watering flowers.			Link to values: Respect, responsibility as learners take turns in watering flowers at school	

Links to other learning activity areas: Religious Education Activities: Respect plants as God's creation.	Suggested Community Service Learning activities: Participate in watering flowers in school
Suggested non formal Activity to support Beautify the school compound through school clubs and societies.	Suggested assessment: Observing the procedure of watering flowers.

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Consistently and correctly points out when flower beds should be watered at school, waters flower beds appropriately within the school environment and demonstrates willingness to take responsibility in watering flowers at school.	Correctly points out when flower beds should be watered at school, waters flower beds appropriately within the school environment and demonstrates willingness to take responsibility in watering flowers at school.	Sometimes point out when flower beds should be watered at school, waters flower beds appropriately within the school environment and sometimes takes responsibility in watering flowers at school.	Rarely points out when flower beds should be watered at school and may water flower beds appropriately within the school environment.

Strand	Sub-strand	Specific learning outcome	Suggested Learning Experiences	Key Inquiry Question(s)
Caring for the environment	3.2 Caring for animals (5 lessons) 3.2.1 Feeding and watering animals	By the end of the sub-strand, the learner should be able to:- a) identify common feeds for various animals at home b) identify common equipment for watering and feeding animals at home , c) clean the equipment for watering and feeding animals at home, d) appreciate the need to feed and water animals at home.	• Learners to identify common feeds, feeding and watering equipment for animals at home • In groups, learners share experiences on feeding and watering animals (chicken, cow, cat and dog) • Learners to visit a farm or watch a video clip to identify animal feeds and watering equipment	1. What do animals at home eat? 2. What equipment do we use in watering and feeding animals at home? 3. How could we keep watering and feeding equipment clean?

			• Learners to practice feeding and watering animals at home.	
Core-competence to be development: Collaboration and communication : learners working in groups				
Links to PCIs and values: ESD: Animal Welfare Education– Freedom for animals			Links values: Respect and care for animals	
Links to other learning activity areas: Nutrition and Hygiene: cleanliness Religious Education: Respect of God's creation			Suggested Community Service Learning activities: Learners are guided to find out from a farm some of the common animal feeds and watering equipment.	
Suggested non-formal activity to support learning through application: Visit a farm or attend agricultural shows to learn more on animals.			Suggested assessment: Oral questions, observation as learners practice feeding and watering animals.	

Suggested Assessment Rubric

Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Correctly and consistently identifies animal feeds and watering equipment for domestic animals, is able to feed, water and clean the watering equipment appropriately.	Correctly identifies common animal feeds and is able to feed and water animals appropriately.	Sometimes identifies common animal feeds and is able to feed and water animals appropriately.	Rarely identifies common animal feeds and is able to feed and water animals appropriately.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
3.0 Care for the environment	3.3 Managing waste responsibly (10 lessons) 3.3.1 Exploring types of waste in the classroom	By the end of the sub-strand, the learner should be able to:- a) identify types of waste in the classroom, b) safely sort out waste in the in the classroom for appropriate disposal, c) dispose of waste responsibly to limit risks to self, others and environment,	• Learners to brainstorm types of waste from the classroom (Plastic and non-plastics) • Learners to record types of waste (by writing or drawing) • Learners to safely sort out wastes from the classroom • Learners to make a plan to reduce and effectively dispose of waste from the classroom	1. What types of waste are found in the classroom? 2. How could we dispose of classroom waste responsibly?

		d) appreciate a clean classroom environment for good health.		
	3.3.2Safety in handling waste in the home	By the end of the sub-strand, the learner should be able to:- a) identify types of waste found in the home b) sort out waste for safe and effective disposal in the home c) appreciate the need for safety when handling waste at home to limit risk to self and others.	• Learners to identify types of waste found in the home • Learners to watch video clips on safe handling of wastes • Learners to identify safe ways of handling wastes in the home • In groups, learners to simulate safety in handling different types of waste in the home • Learners to discuss with parents or guardians about safe ways of handling wastes in the home. • Learnersto participate in making sign posts and place them at appropriate places to guide disposal of waste.	1. What wastes are found in the home? 2. How could we safely dispose of waste at home?
	Core Competences to be Developed: Communication and collaboration, critical thinking and problem solving practice safe handling of different types of waste; learning to learn: gathering information on waste disposal.			
	Link to PCIs: ESD: Care of the environment Life skills: Service learning, Cooperating with others while working in groups.		Link to values: Responsibility and teamwork as learners simulate safety and make sign posts	
	Links to other learning activity areas: Hygiene and Nutrition: Waste disposal		Suggested Community Service Learning activity: Ask parents or guardians about ways of handling waste	
	Suggested non formal activity to support learning through application: Engage clubsto create sign posts and place them at appropriate places to guide disposal of waste.		Suggested assessment: Observation,written assignment	

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Consistently and correctly identifies and disposes home and classroom wastes effectively and efficiently.	Correctly identifies and disposes home and classroom wastes effectively.	Sometimes identifies and disposes home and classroom wastes effectively.	Rarely identifies and disposes home and classroom wastes effectively.

Strand	Sub-strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
3.0 Care for the environment	3.4 Caring for water (5 lessons) 3.4.1 Using water sparingly	By the end of the sub-strand, the learner should be able to:- a) state ways in which water is wasted at home and school, b) identify ways of using water sparingly to reduce wastage, c) use water sparingly at home and school, d) demonstrate willingness to use water sparingly.	• Learners to identify ways of using water sparingly at home and school • Learners to use age appropriate stimulus materials showing various ways in which water is used sparingly • In groups, learners to demonstrate the different practices of careful use of water • Learners to identify common practices that lead to wastage of water in the home and school. • In pairs, learners to discuss ways of using water sparingly. • Organize learners to participate in school water day to share experiences on careful use of water.	1. How is water wasted at home and school? 2. How could we reduce water wastage at home and school?

Core-competence to be development: Critical thinking and problem solving: learner practicing use of water sparingly, Communication and collaboration: learners in groups carry out simple activities on careful use of water.	
Links to PCIs: ESD: Water conservation	Links to values: Using water sparingly
Links to other learning activity areas (s): Hygiene and Nutrition: Use of water	Suggested Community Service Learning activity Learners to find out from their parents or guardians on how water is used sparingly at home and school.
Suggested non-formal activity to support learning through application: Organize an event on school water day to share careful use of water.	Suggested assessment: Oral interviews on water use and direct observation of group work.

Suggested Assessment Rubric

Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Consistently and correctly uses water sparingly.	Correctly uses water sparingly.	Sometimes uses water sparingly.	Rarely uses water sparingly.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
3.0 Care for the environment	3.5 Conserving Light Energy in the home and School (5 Lessons)	By the end of the sub-strand, the learner should be able to:- a) state responsible ways of using light energy in the home and school, b) demonstrate correct ways of using light energy in the home and school, c) use light energy sparingly and responsibly at home and school to conserve energy.	• Learners to discuss ways of saving light energy in the home and school • Using stimulus materials, learners to discuss ways of saving light energy • Learners to make rules on conserving light energy in the home and school • Learners to colour designed stickers and display them. The stickers to contain messages on conserving light.	How could we save light energy in the home and school?
Core Competences to be developed: Communication and collaboration: displaying stickers on conserving energy. Critical thinking and problem solving: when develop rules on conserving light energy at home and school.				
Link to PCIs: ESD: Environmental education; Social Environment			Link to values: Responsibility in conserving light	

Life skills : Responsibility in conserving light	
Links to other learning activity areas: Movement and Creative Arts: designing stickers	Suggested Community Service Learning activity: Learners to share information with parents or guardians on light saving and report back.
Suggested non formal Activity to support learning through application: Track the use of light energy at home or school to determine if there is a positive change towards conserving energy.	Suggested assessment: assessing the stickers

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Consistently and responsibly demonstrate ways of saving light energy at home and school.	Responsibly demonstrate ways of saving light energy at home and school.	Sometimes demonstrate saving of light energy at home and school.	Rarely demonstrate saving of light energy at home and school.

GRADE TWO

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
1.0 Environment and its resources	1.1 Weather (15 Lessons) 1.1.1 Responding to different weather conditions.	By the end of the topic, the learner should be able to:- a) state different weather conditions, b) state ways of responding to different weather conditions, c) Respond appropriately to different weather conditions to limit risks to self, others and the environment, d) Appreciate differences in weather conditions.	• Learners to observe and discuss prevailing weather conditions, as an outdoor activity • Learners to think, pair and share experiences on how they could respond to different weather conditions (hot, cold, rainy) • Using pictures, video clips, learners identify ways of responding to various weather conditions • Learners to perform a skit on ways of responding to various weather conditions	1. What are the different weather conditions? 2. How could we respond to different weather conditions?

			• Learners to read or listen to stories about responding appropriately to adverse weather conditions • Learners to find out from parents, guardians or community members on how to respond to different weather conditions and report back.	
	1.1.2 Recording weather conditions	By the end of the sub-strand, the learner should be able to:- a) describe weather conditions at different times of the day, b) draw weather symbols to represent different weather conditions, c) create a weather record using symbols for a period of one week, d) develop interest in recording weather conditions.	• Learners to observe the weather at different times of the day as an outdoor activity • Learners to describe different weather conditions (sunny, windy, cloudy, calm, rainy) • Learners identify weather symbols from charts and other learning resources • Learners to practice drawing weather symbols using free hand and electronic devices • Learners to observe and record weather conditions of the day using symbols • Learners to play relevant and educative computer games on weather conditions • In groups, learners observe and record weather conditions over a period of one week and share the chart with others.	1. How is the weather today? 2. What symbols are used to record different weather conditions? 3. How could we record weather conditions?
	1.1.3 Interpreting weather messages	By the end of the sub-strand, the learner should be able to:-	• Learners to use weather charts to interpret different weather symbols	1. How could we use symbols to

		a) interpret weather charts correctly, b) communicate weather messages accurately, c) develop interest in interpreting and communicating weather messages.	• In pairs, learners practice using weather symbols to interpret weather messages • In a class contest, learners to compete narrating weather occurrences for a past week weather chart recording • Learners to gather more information on weather from parents or guardians.	communicate weather messages 2. How could we communicate weather messages to others?
Core Competences to be developed: Communication and collaboration, imagination and creativity, critical thinking and problem solving, digital literacy.				
Link to PCIs: ESD: Disaster Risk Reduction on weather calamities Service learning: parental engagement.		Links to values: Responsibility, unity and respect.		
Links to other learning activity areas: Religious Activities: Creation		Suggested Community Service Learning activities: sourcing information on weather from parents or guardians.		
Suggested non formal activity to support learning: track and record weather in their diaries or journals		Suggested assessment: Oral questions, observations of the charts or weather messages, observation of participation in the contest		

Suggested Assessment Rubric

Sub-strand	Exceeds expectations	Meets expectation	Approaches expectations	Below expectations
Responding to various weather conditions	Appropriately and effectively states and responds to various weather conditions.	Appropriately responds to weather conditions.	Occasionally responds to weather conditions.	Rarely responds to weather conditions.
Recording weather	Accurately and creatively draws symbols and records weather conditions.	Accurately draws symbols and records weather conditions.	Sometimes draws some symbols and records weather conditions.	Rarely draws symbols and records weather conditions.
Interpreting weather messages	Consistently and correctly interprets weather messages and suggests possible weather conditions for the day.	Correctly interprets weather messages.	Sometimes interprets weather messages.	Rarely interprets weather messages.

Strand	Sub strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question
1.0 Environment and its resources	1.2 Water (10 Lessons) 1.2.1 Storing water	By the end of the sub-strand, the learner should be able to:- a) state the importance of storing water at home and school, b) identify ways of storing water in the home and school, c) store water appropriately in the home and school, d) appreciate safe water storage to prevent health risks to self and others.	• Learners to explore and observe various ways of storing water at home and in the school • In groups, learners to share their experiences on why water is stored at homes and school. • In groups, learners to share their experiences on how water is stored at homes and school. • Learners to use video clips, pictures and photographs to identify appropriate ways of storing water at home and school • Learners to gather more information on ways of storing water in the at home and report back	1. Why do we store water at home and school? 2. How could we store water at home and school?
	1.2.2 Transporting Water	By the end of the sub-strand, the learner should be able to:- a) identify different ways of transporting water at home and school, b) demonstrate suitable ways of carrying small quantities of water at home and school, c) appreciate different means of transporting water at home and school.	• In groups, learners share experiences on various ways in which water is transported at home and school • Using pictures and video clips, learners to identify ways of transporting water • Learners read, tell, or listen to stories about transporting water • Using age-appropriate containers, learners to carry and store water for personal use • Learners to find out how water is transported and stored.	How is water transported at home and school?
Core-competence to be development: Communication and collaboration, critical thinking and problem solving, digital literacy.				

Links to PCIs: ESD: Personal safety in transporting water.	Links values: Responsibility
Links to other learning activity areas (s): Hygiene and Nutrition: Use of clean water	Suggested Community Service Learning activities: Learners to find out from parents how they transport water.
Suggested non-formal activity to support learning: Learners to be guided to carry and store water for their personal use using age-appropriate containers.	Suggested assessment: Oral questions and observations on storing and transporting water.

Suggested Assessment Rubric

Sub- strands	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Storing water	Correctly and consistently states importance and identifies suitable ways of storing water.	Correctly states importance and identifies suitable ways of storing water.	Sometimes states importance and identifies suitable ways of storing water.	Rarely states importance and identifies suitable ways of storing water.
Transporting water	Appropriately and consistently transports water for personal use and utilizes the water sparingly.	Appropriately transports water for personal use.	Sometimes transports water for personal use.	Rarely transports water for personal use.

Strand	Sub- strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
1.0 Environment and its resources	1.3 Soil (15 Lessons) 1.3.1 Exploring soil	By the end of the sub-strand, the learner should be able to:- a) model objects with different types of soil, b) determine the soil that makes long smooth ribbons, c) appreciate different types of soil in the immediate environment.	• model objects (balls, ribbons, pots) with different types of soils (clay, loam, sand) • In groups, learners to model soil ribbons using the soil samples provided (clay, loam, sand). Learners to observe to find out which soil samples make smooth long ribbons • Learners to observe how ball from different soils crumble into small fragments. The balls to be displayed for the class to observe how balls from the different soil samples break up. • Learners to visit the school neighbourhood to observe or take pictures of different types of soils and their uses (sand for construction, clay for modeling, loam for farming).	1. What objects could we make with soil? 2. Which type of soil make good ribbons?
Core-competence to be developed: Creativity and imagination, communication and collaboration.				
Links to PCIs: ESD: Environmental awareness			Links to values: Responsibility and unity when working in groups.	
Links to other learning activity areas (s): Movement and Creative Activities in making ribbons			Suggested community Service Learning activity: Visiting community to observe uses of different types of soils.	
Non-formal activity to support learning: Explore the school neighbourhood to observe uses of different types of soils.			Suggested assessment: Oral questions and observations.	

Suggested Assessment Rubric

Exceed expectations	Meet expectations	Approaching expectations	Below expectations
Creatively and consistently models different objects using provided soil samples and	Models different objects using provided soil samples.	Models some objects using provided soil samples.	Rarely models objects using provided soil samples.

associates the balls to characteristics to the various soil samples.			

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
1.0 Environment and its resources	1. 4 Plants (15 Lessons) 1.4.1 Exploring parts plants	By the end of the sub-strand, the learner should be able to:- a) identify parts of a plant , b) draw different parts of a plant from the immediate environment, c) show interest in parts of a plant for learning and enjoyment.	• In a nature walk, learners to explore different plants in the immediate environment. Learners to observe parts of the plants (roots, stem, leaves, flowers, fruits) from different types of plants • Using video clip, pictures and photographs learners to identify different parts of a plant. • In groups, learners talk about parts of a plant. • Learners draw or take photographs of parts of a plant. • Learners are guided to display their work for further learning and peer- assessment.	1. What are the different parts of a plant?
	Core Competences to be developed: Communication and collaboration, imagination and creativity and learning to learn.			
	Link to PCIs: ESD: Environmental awareness.		Link to values: Respect and unity.	
	Link to other learning activity areas: Religious Education: Appreciation of God's creation.		Suggested Community Service Learning activities: Learners learn from peersabout plants in different habitats.	
	Suggested non formal activity to support learning: Through nature walk, learners are guided to observe plants in different habitats.		Suggested assessments: Observation, oral questions.	

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches expectation	Below expectation

Consistently and correctly identifies and draws parts of plants found in the environment and so associates parts of the plants to their uses.	Correctly identifies and draws parts of plants found in the immediate environment.	Sometimes identifies and draws parts of plants found in the immediate environment.	Rarely identifies and draws parts of plants found in the immediate environment.

Strand	Sub- strand	Specific learning outcomes	Learning experiences	Key inquiry question(s)
1.0 Environment and its resources	1.5 Animals (10 Lessons) 1.5.1 Categorizing animals	By the end of the sub-strand, the learner should be able to:- a) recognize animals in the immediate environment, b) categorize different animals in the environment, c) appreciate different animals in the environment.	• In nature walk, learners to observe and identify animals in the environment • In groups, and referring from appropriate references learners categorize animals using the provided criteria: (domestic/wild, harmful/non-harmful, large/small) • In groups, learners use papiermache, clay or plasticine to model different animals. • Learners sing song related to different animals.	1. What animals are found in the immediate environment? 2. How could we categorize animals in the immediate environment?
	1.6 Safety when handling animals.	By the end of the sub-strand, the learner should be able to:- a) identify possible dangers when handling animals, b) practice safety measures when handling animals, c) appreciate importance of safety when dealing with animals to avoid risk to self others and the animal.	• Learners to share their experiences on handling animals • In groups, learners discuss possible dangers that may occur when handling animals • Learners to watch video clips, pictures or photographs of safe handling of animals • Learners to observe a demonstrate from a guest speaker on safety when handling of animals	How could we protect ourselves from harm when handling animals?

			• Learners practice /simulate safe ways of handling animals to avoid harm to self others and the animal.	
Core Competence to be developed: Communication and collaboration, critical thinking and problem solving, creativity, Digital literacy				
Link to PCIs: ESD: animal welfare, safety and security. Life skills: effective decision making for personal safety. Citizenship: Social cohesion		Link to values: Responsibility. Care for animals Unity: Working in groups		
Link to other learning activity areas: Religious Education: Respect for God's creation.		Suggested Community Service Learning: Guest speaker to discuss animal welfare.		
Non-non formal activity to support learning: Organize an essay interclass competition on handling animals		Suggested Assessment: Oral, observation and peer assessment on the essays		

Suggested Assessment Rubric

Sub-strands	Exceeds expectations	Meets expectations	Approaches expectation	Below expectation
Categorizing animals	Consistently and correctly categorizes animals in the environment.	Correctly categorizes animals in the environment.	Sometimes categorizes animals in the environment.	Rarely categorizes animals in the environment.
Safety in animal handling	Consistently and correctly observes safety when handling animals.	Correctly observes safety when handling animals.	Sometimes observes safety when handling animals.	Rarely observes safety when handling animals.

Strand	Sub-Strand	Learning Outcomes	Suggested learning experience	Key inquiry question(s)
1.0 Environment and its resources	1.7 Energy: Light (10 Lessons) 1.7.1 Sources of light	By the end of the sub-strand, the learner should be able to:- a) identify different sources of light in the environment,	• Learners to identify and name sources of light • Using relevant pictures and realia, learners to identify sources of light	What are the sources of light?

		b) produce light using different objects for enjoyment, c) develop interest in different sources of light energy.	energy (sun, stars, oil lamps, candles, fire flies, electric bulb, torch and fire) • In groups, learners to discuss different sources of light used in the home • Learners to produce light using different sources. In this activity, teacher has to guide the activity and ensure safety of learners	
	1.7.2 Forming shadows in light	By the end of the sub-strand, the learner should be able to:- a) explain how shadows are formed in presence of light, b) manipulate objects to form shadows in presence of light for enjoyment, c) categorize objects into those that can form shadows and those that cannot in presence of light.	• Learners observe different shadows formed by different objects in the school environment. • Learners manipulate different objects to identify shadows of different shapes and sizes • In groups, learners play with objects in presence of light to form shadows. • Use selected objects to form shadows (ball, sticks, ruler, clear piece of glass, mirror). Categorize object that form shadows and those that do not.	1. How are shadows formed? 2. What objects form shadows?
	1.7.3Precautions when using light energy	By the end of the sub-strand, the learner should be able to:- a) identify practices in which light energy could harm eyes, b) take safety measure against harmful light energy to reduce risk to self and others, c) appreciate safety precautions when using light energy.	• Learners to identify practices that in which light energy could harm the eyes (reading in dim light, looking directly at bright light with bare eyes, long exposure to bright light from electronic devices) • In groups, learners discuss safety precautions in protecting self and others from harmful light energy	1. How could light energy harm us? 2. How could we protect ourselves from harmful light energy?

			• Learners create messages on awareness of harmful effects of light energy • Learners to share messages on harmful effects of light and safety precautions.	
Core Competence to be developed: Communication and collaboration, critical thinking and problem solving.				
Link to PCIs: ESD: Disaster Risk Reduction: safety and security			Link to values: Responsibility, unity in group work.	
Link to other learning activity areas: Languages: Creating safety precaution messages against light energy.			Suggested Community Service Learning activities: invite a resource person to discuss about various sources of light energy and applicable safety precautions when using light energy.	
Suggested non normal activity to support learning: create and share a safety precaution message against bright light.			Suggested assessment: Oral question and observation.	

Suggested Assessment Rubric

Sub-strand	Exceeds expectations	Meets expectations	Approaching expectations	Below expectations
Sources of light	Consistently and correctly identifies sources of light and uses objects to produces light.	Correctly identifies sources of light and uses objects to produces light.	Sometimes identifies sources of light and uses objects to produces light.	Rarely identifies sources of light and uses objects to produces light.
Forming shadows	Consistently and correctly explain how shadows are formed, manipulates and categorizes objects to form shadows.	Correctly explains how shadows are formed, manipulates and categorizes objects to form shadows.	Sometimes explains how shadows are formed, manipulates and categorizes objects to form shadows.	Rarely explains how shadows are formed, manipulates and categorizes objects to form shadows.

Precautions when using light energy	Consistently and correctly identifies practices, take safety precautions and communicate precautionary messages against light energy.	Correctly identifies practices, take safety precautions and communicate precautionary messages against light energy.	Sometimes identifies some practices, take safety precautions and communicate precautionary messages against light energy.	Rarely identifies practices, take safety precautions or communicate precautionary messages against light energy.

Strand	Sub-strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
2.0 Social environment	2.1 School environment and its neighbourhood (20 Lessons) 2.1.1 Locating places using key features.	By the end of the sub-strand, the learner should be able to:- a) point out the main features between home and school, b) locate places using main features between home and school, c) appreciate the significance of locating places using key features.	• Learners to discuss the main features between home and school (physical and build-up features such as rivers, hills, valleys, forest, bridges, roads , railway line, buildings) • In a nature walk, learners to point out the main features between home and school • Using video clips, pictures and photographs, learners to identify the main features between home and school • Learners to locate main features between their homes and school (relative location)	1. What are the main features between your home and school? 2. How could you your school from home using main features?

			• Learners to play educative games on locating main features between their home and school • Learners to practice locating places teacher made sketch maps.	
Core-competence to be development: Communication and collaboration as they take nature walk, critical thinking and problem solving in locating places.				
Links to PCIs: ESD: Environmental Education			Links to values: Unity: working in groups.	
Links to other learning activity areas (s): Languages: naming features.			Suggested community Service Learning activities: Learners to find out more about features found between home and school other learners	
Suggested non-formal activity to support learning through application: Nature walk to familiarize with the surroundings.			Suggested assessment: Oral questions, observation, project work on modeling main features.	

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches expectation	Below expectation

Consistently and correctly identifies features, locate places using the main features between home and school and is able to give relative direction using the features.	Correctly identifies features, locate places using the main features between home and school and is able to give relative direction using the features.	Sometimes identifies features, locate places using the main features between home and school and is able to give relative direction using the features.	Rarely identifies features, locate places using the main features between home and school or give relative direction using the features.

Strand	Sub- strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
2.0 Social environment	2.1.2 Keeping the school environment clean	By the end of the sub-strand, the learner should be able to:- a) state ways of keeping the school environment clean, b) outline the importance of a clean school environment, c) participate in keeping the school environment clean, d) appreciate a clean school environment for health and safety.	• Learners discuss what makes the school environment dirty • Using video clips and pictures, learners discuss ways of keeping the school environment clean • In groups learners discuss importance of keeping the school environment clean. • Learners practice keeping the school environment clean • Learners recite a poem or sing a song about a clean school environment. • Learners plan for future school clean-up activities.	1. How could we keep the school environment clean? 2. Why should we keep the school environment clean?
	2.1.3 Keeping Safe and Secure in School	By the end of the sub-strand, the learner should be able to:- a) identify possible dangers in the school, b) suggest ways of keeping safe and secure in school, c) develop habits that will keep one safe and secure in school.	• Learners walk around the school compound to identify what could expose them to danger in the school. • In groups, learners identify possible dangers in the school.(by drawing or writing) • Using video clips, photographs and pictures, learners identify how to keep safe and secure in school • Learners share ways of keeping safe and secure in school	1. What are the possible dangers in the school? 2. How could we keep safe and secure in school?

			• Learners to observe demonstrations and discussions on how to keep safe and secure in school from a resource person • In groups, learners to discuss the importance of keeping safe and secure at school • Learners develop rules on keeping safe and secure at school • Learners to find out more on keeping safe and secure in school from parents and guardians.	
Core-competence to be developed: Citizenship, Critical thinking and Problem solving ,digital literacy				
Links to PCIs: ESD: Environmental Education, disaster risk reduction Citizenship: Participating in school clean ups			Links to values: Responsibility, love, and unity as they work in groups.	
Links to other learning activity areas: Hygiene and Nutrition and Religious Education Activities: keeping the environment clean			Suggested Community Service Learning: find out from parents or guardians how to keep safe in school.	
Non-formal activity to support: Learners participate in school environmental audit specifically on cleanliness, safety and security			Suggested assessment: oral, observation	

Suggested Assessment Rubric

Sub-strand	Exceeds expectations	Meets expectation	Approaches expectation	Below expectation
Keeping school environment clean	Consistently and correctly outlines importance of keeping school environment clean, actively participated in keeping the environment clean.	Correctly outlines importance of keeping school environment clean, actively participated in keeping the environment clean.	Sometimes outlines importance of keeping school environment clean, actively participated in keeping the environment clean.	Rarely outlines importance of keeping school environment clean, actively participated in keeping the environment clean.

Keeping safe and secure in school	Consistently and correctly identifies areas of danger, suggest safety activities and develops safe habits.	Correctly identifies areas of danger, suggest safety activities and develops safe habits.	Sometimes identifies some areas of danger, suggest some safety activities and may develop safe habits.	Rarely identifies some areas of danger and may suggest some safety activities.

Strand	Sub strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
2.0 Social environment	2.1.4 The National flag of Kenya	By the end of the sub-strand, the learner should be able to:- a) identify colours of the Kenya National flag as a National symbol, b) demonstrate respect for the Kenya national flag as a National symbol, c) Appreciate the National flag as a symbol for national unity.	• Using the Kenya National flag, learners to identify its colours • Learners to observe and describe the expected behaviour (stand at attention and show respect) when raising and lowering the National Flag • Learners to draw and colour the Kenya National Flag • Learners to find out from parents or guardians the importance of the National flag of Kenya.	1. What are the colours of the Kenya National flag? 2. How could we demonstrate respect for the Kenya National flag?
	2.1.5 The National Anthem of Kenya	By the end of the sub-strand, the learner should be able to:- a) identify occasions when the Kenya National Anthem is sung, b) demonstrate etiquette when singing the Kenya National Anthem , c) appreciate the importance of National Anthem as a national symbol of unity.	• In groups, learners to sing the National Anthem. • Learners to demonstrate the expected conduct when singing the Kenya National Anthem. • Using audio recording and pictures, learners to identify occasions when the Kenya National Anthem is sung. • Learners to find out from parents or guardians on the importance of National Anthem of Kenya.	On what occasions do we sing the Kenya National Anthem?
Core-competence to be development: Citizenship: appreciating the National flag and the National anthem. Digital literacy: use of audio devices.				
Links to PCIs: Citizenship: patriotism and social cohesion when singing the National Anthem.			Links to values: Respect, unity and patriotism.	

Links to other learning activity areas (s): Languages, Movement and Creative activities.	Suggested community Service Learning: Finding out from parents or guardians on the importance of National flag.
Suggested non-formal activity to support learning: Interacting with members of the scouting movement to find out more about the National flag and the National anthem.	Suggested assessment: observation and oral questions.

Suggested Assessment Rubric

Sub- Strand	Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
The Kenya National flag	Consistently and correctly states colours, show respect and appreciates the flag as a National symbol.	Correctly states colours, show respect and appreciates the flag as a National symbol.	Sometimes states colours, show respect and appreciates the flag as a National symbol.	Rarely states colours, show respect or appreciates the flag as a National symbol.
The Kenya National anthem	Consistently and correctly identifies occasions when the National Anthem and demonstrate etiquette when singing it.	Correctly identifies occasions when the National Anthem and demonstrate etiquette when singing it.	Sometimes identifies occasions when the National Anthem and demonstrate etiquette when singing it.	Rarely identifies occasions when the National Anthem and demonstrate etiquette when singing it.

Strand	Sub strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
2.0 Social environment	2.1.6 Child Rights and responsibilities	By the end of the sub-strand, the learner should be able to:- a) outline Child Rights and responsibilities in the school, b) outline responsibilities of the child in school, c) demonstrate responsibilities of a child in school, d) appreciate child rights and responsibilities for attainment of social justice.	• Learners identify Child Rights and responsibilities using age appropriate stories (parental care, health care, protection from exploitation and cruelty) • Learners discuss some of the responsibilities of children in school • In pairs, learners simulate responsibilities of children in school • Learners to use multi- media resources to explore responsibilities of children in school.	1. What are the basic Child Rights? 2. What are the responsibilities of the child in school?
	2.1.7 School rules	By the end of the sub-strand, the learner should be able to:- a) outline the rules that guide conduct in school b) state the importance of school rules, c) participate in making school rules, d) appreciate the importance of obeying school rules for harmonious living.	• Using probing question learners discuss the importance of school rules. • Learners to participate in making school rules. • Learners to think pair and share their experiences on what happen when school rules not observed • Learners to be guided to debate on importance of school rules and develop a poster for the school rules. • Learners to share the school rules with their parents and guardians.	1. What are the school rules? 2. What is the importance of school rules?
Core-competence to be development: Citizenship: developing school rules; communication and collaboration as learners debate				
Links to PCIs: Citizenship: qualities of a good citizen.			Links to values: Responsibility, peace and social justice.	
Links to other learning activity areas (s): Religious Education activities andLanguages, on making and obeying school rules.			Suggested community Service Learning activity: Learners to share the school rules with their parents and guardians.	
Non-formal activity to support learning: Displaying children's rights, school rules at strategic points in school.			Suggested assessment: Oral questions, observation.	

Suggested Assessment Rubric

Sub- strand	Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Children's Rights and responsibilities	Consistently and correctly outlines and exercises rights, identifies and carries acts responsibly.	Correctly outlines and exercises rights, identifies and carries acts responsibly.	Sometimes outlines and exercises rights, identifies and carries acts responsibly.	Rarely outlines and exercises rights, identifies and carries acts responsibly.
School Rules	Consistently and correctly outlines importance of rules. Actively participates in making and observing the rules.	Correctly outlines importance of rules. Actively participates in making and observing the rules.	Sometimes outlines importance of rules and participates in making and observing the rules.	Rarely outlines importance of rules or participates in making and observing the rules.

Strand	Sub strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
2.0 Social environment	2.1.8 Class Leadership	By the end of the sub-strand, the learner should be able to:- a) describe a good class leader, b) outline the work of a good class leader, c) appreciate good class leadership for harmonious living.	• Learners to listen to narrative of inspirational stories of child leaders, heroes or heroines • Learners to discuss "who is a good class leader"? • Learners to discuss the work a class leader • Learners to find out from parents or guardians about good leaders in the community and report back.	1. Who is a good class leader? 2. What is the work of a class leader?
	2.1.9 The school community	By the end of the sub-strand, the learner should be able to:- a) identify members of the school community, b) outline the importance of the school community c) work together with members of the school community,	• In groups, learners to identify members of the school community (Head teacher, teachers, non-teaching staff and learners) • Learners to outline the general importance of members of the school community	1. Who are the members of the school community? 2. What is the importance of the school community?

		d) appreciate working together with the school community for sustainable interactions.	• Learners to discuss their roles as members of the school community • Learners to skit different work of members of the school community.	
Core-competence to be development: Citizenship: Leadership and good governance. Communication and collaboration in the skit play.				
Links to PCI: Citizenship: Leadership and good governance and inclusivity			Links to values: Responsibility, honesty, integrity and decision making.	
Links to other learning activity areas (s): Languages, Religious Education			Suggested community Service Learning activities: Learners find out from parents or guardians about the school community.	
Suggested non-formal activity to support learning: open day event to bring the school community together.			Suggested assessment: Oral questions and observations.	

Suggested Assessment Rubric

Sub-strands	Exceeds expectations	Meets expectation	Approaches expectation	Below expectation
Class leadership	Consistently and correctly identifies good class leader and the work of the leader.	Correctly identifies good class leader and the work of the leader.	Sometimes identifies good class leader and the work of the leader.	Rarely identifies good class leader or the work of the leader.
The school community	Consistently and correctly identifies the members and outlines the importance of and works in the school community.	Correctly identifies the members and outlines the importance of and works in the school community.	Sometimes identifies the members and outlines the importance of and works in the school community.	Rarely identifies the members and outlines the importance of and works in the school community.

Strand	Sub strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
2.0 Social environment	2.2 Enterprise projects (30 Lessons) 2.2.1 Exploring the environment for appropriate income generating activity.	By the end of the sub-strand, the learner should be able to:- a) identify a viable income generating for the class within the school environment, b) analyze income generating activities within the school environment, c) determine a workable income generating activity for their class, d) develop interest in income generate activities within the school environment.	• In groups, learners to suggest income generating activities the class could carry out within the school • Using video clips, pictures and photographs, booklets, or magazines, learners explore and analyze possible income generating activities for the class • In a class discussion, learners to select a workable income generating activity that they could undertake at school (activity selected should promote conservation of the environment) • Learners to present selected enterprise • Learners to find out from guardians or parents on income generating activities and report back.	What activity could we undertake to generate income for our class?
	2.2.2 Initiating a class income generating project	By the end of the sub-strand, the learner should be able to:- a) plan for an income generating activity for the class, b) participate in initiating the class income generating activity, c) participate in the management of the class income generating activity,	• In a class discussion, learners to plan for an age-appropriate income generating activity to be carried out by the class. (responsibilities, resources required and time for the activity) • Learners to share responsibilities and be guided to carry them out respectively in initiating the selected project • Learners to be guided to carry out responsibilities as according to the plan.	1. How could we plan for an income generating activity? 2. How could we manage the class income generating activity?

		d) appreciate individual efforts in the success of a group activity.		
Core-competence to be developed: Critical thinking and problem solving, collaboration and communication, self-efficacy.				
Links to PCIs: ESD: Financial literacy: Income generating projects; Environmental education.			Links to values: Integrity, teamwork, responsibility, social equity.	
Links to other learning activity areas (s): Mathematical activities- Money			Suggested Community Service Learning activity: find out from guardians/parents about income generating activities at home.	
Suggested non-formal activity to support learning: presenting to the school selected income generating activity for the class.			Suggested assessment: oral questions, observation and project.	

Suggested Assessment Rubric

Sub-strand	Exceeds expectations	Meets expectation	Approaches expectation	Below expectation
Exploring the environment for appropriate income generating activities.	Correctly and consistently identifies, analyze and determines a workable income generating activities for the class.	Correctly identifies, analyze and determines a workable income generating activities for the class.	Sometimes identifies, analyze and determines a workable income generating activities for the class.	Rarely identifies, analyze or determines a workable income generating activities for the class.
Initiating a class income generating project	Correctly and consistently plans, starts and manages an income generating project for the class.	Correctly plans, starts and manages an income generating project for the class.	Sometimes plans, starts and manages an income generating project for the class.	Rarely plans, starts and manages an income generating project for the class.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
3.0 Care for the environment	3.1 Caring for plants (5 Lessons) 3.1.1. Communicating plant protection messages	By the end of the sub-strand, the learner should be able to:- a) recognize appropriate messages on plant protection in school, b) create appropriate plant protection messages to promote conservation, c) appreciate plant protection for environmental sustainability.	• Learners observe pictures, photographs, and video clips of areas where plants have been destroyed. In groups, learners to outline messages on plant protection • Learners display and peers assess the plant protection messages developed • In groups, learners create plant protection messages using hand scripts, electronic and print resources • Learners share selected plant protection messages with the school community • Learners recite verses and sing songs on plant protection.	What messages could be used to communicate plant protection?
Core Competences to be developed: Communication and collaboration: creating plant protection messages, singing and reciting poems; Learning to learn: gathering information on plant protection, Digital literacy: developing electronic messages.				
Link to PCIs: Learner support programme: mentorship and peer education		Links to values: Unity, responsibility and respect for others		
Links to other learning activity areas: Languages -Imagination and creativity: Creating plant protection messages		Suggested Community Service Learning activities: Communicating plant protection messages to the community in various forums.		
Suggested non formal activity to support learning: display plant protection messages to the school community.		Suggested assessments: oral questions, observation and project		

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Creatively and consistently develops appropriate plant protection messages and promotes plant protection.	Correctively develops appropriate plant protection messages and promotes plant protection.	Sometimes develops some plant protection messages and promotes plant protection.	Rarely develops plant protection messages or promotes plant protection.

Strand	Sub -strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
3.0 Caring for the environment	3.2 Caring for Animals (5 Lessons) 3.2.1 Keeping an animal shelter clean and secure	By the end of the sub-strand, the learner should be able to:- a) identify ways of keeping an animal shelter clean at home and school, b) participate in keeping an animal shelter clean at home and school, c) suggest ways of making an animal shelter secure at home and school, d) appreciate clean and secure animal shelter to reduce risk to the animals.	• Using video clips, photographs and pictures, learners to observe various clean animal shelters being cleaned (dog's kennel, rabbit hutch and cow shed). Learners to shoot photographs at home of clean animal shelter and share with others. • In groups, learners to discuss ways of keeping an animal shelter clean • In groups, learners to be guided to participate in keeping animal shelters clean at home or in school • In groups, learners discuss how to make animals shelter secure • Learners sing or tell stories about clean and secure animal shelters.	1. How could we keep an animal shelter clean? 2. How could we make an animal shelter secure?
Core-competence to be development: Communication and collaboration: sharing experiences in groups, critical thinking and problem solving; Digital literacy: shooting photographs.				

Links to PCIs: ESD: animal welfare: keeping animals clean and secure safety for animals, kindness to animals.	Links to values: Responsibility, keeping animal shelter clean and secure.
Links to other learning activity areas (s): Religious Education activities: God's creation	Suggested community Service Learning activity: Learners to visit a nearby farm and observe animal's shelters.
Suggested non-formal activity to support learning: Organize inter-class verse completion on clean and secure animal shelters.	Suggested assessment: Observation, oral question.

Suggested Assessment Rubric

Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Consistently and correctly identifies ways and participates in making animal shelter clean secure.	Correctly identifies ways and participates in making animal shelter clean secure.	Sometimes identifies ways and participates in making animal shelter clean secure.	Rarely identifies ways or participates in making animal shelter clean secure.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
3.0 Care for the environment	3. 3 Managing waste (5 Lessons) 3.3.1 Types of waste in school	By the end of the sub-strand, the learner should be able to:- a) identify types of waste in the school environment, b) sort out different types of waste in the school environment for safe disposal, c) appreciate a clean school environment for health and safety.	• In groups, learners to identify different types of waste in the school environment • In groups or pairs, learners to share their experiences on different types of waste in school • Using videos, pictures and photographs, learners to identify different types of waste. • Using appropriate educative multimedia games, learners to sort out different types of wastes • In groups, learners sort out waste of different nature such as separating decomposable wastes from plastic, metallic and glass waste and placing them in different containers for appropriate disposal.	What types of waste are found in our school environment?
	3.3.2 Safety in handling wastes	By the end of the sub-strand, the learner should be able to:- a) identify dangers when handling waste in school, b) practice safety measures when handling wastes in school, c) communicate safety measures when handling waste in school, d) appreciate the need of safety in handling waste in school to limit risks to self, others and the environment.	• Through probing questions, learners to identify dangers when handling wastes in school. • Using multimedia resources, learners to outline safety measures in handling wastes in school. • Learners listen to a resource person talking on dangers and safety measures when handling wastes in school. • Learners simulate safety measures when handling waste in school. • Learners to participate in activities that promote safe disposal of waste in school. Activities to include promoting knowledge and passing messages to the school community.	1. What dangers are we likely to face when handling different types of waste in school? 2. How should we safely handle different types of waste in school?

	Core Competences to be developed: Communication and collaboration: promoting safety measures through messages; Digital literacy: use of multimedia resources.	
	Link to PCIs: ESD: Environmental Education: managing waste responsibly, safety and security, practice safety measures in handling waste in school.	Links to values: Respect and unity: working in groups and pairs
	Links to other learning activity areas: Languages, Hygiene and Nutrition	Suggested Community Service Learning activity: Inviting a resource person to share on waste management.
	Suggested non formal activity to support learning: Participating in safe disposal of waste in school.	Suggested assessment: oral questions and observation.

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches expectation	Below expectation
Consistently and correctly identifies waste and dangers; safely sorts waste for appropriate disposal and promotes safety in waste disposal at school.	Correctly identifies waste and dangers; safely sorts waste for appropriate disposal and promotes safety in waste disposal at school.	Sometimes identifies waste and dangers; safely sorts waste for appropriate disposal and promotes safety in waste disposal at school.	Rarely identifies waste or dangers; safely sorts waste for appropriate disposal or promotes safety in waste disposal at school.

Strand	Sub-strand	Specific learning outcome	Suggested learning experiences	Key inquiry question (s)
3.0 Caring for the environment	3.5 Caring for water (5 Lessons) 3.5.1 Keeping stored water safe	By the end of the sub-strand, the learner should be able to:- a) state the importance of keeping water safe for human and animal use at home and school, b) participate in keeping stored water safe at home and school, c) appreciate the importance of keeping stored water safe for human and animal use.	• Learners to take an excursion around the neighbourhood to identify safely stored or unsafely stored water. Then in groups, learners to discuss the importance of keeping stored water safe. • In groups, learners share experiences on what makes water unsafe in the home and school • Using multimedia resources, learners identify ways of keeping stored water safe. • Learners observe demonstrations on methods of keeping stored water safe at home and in school.	How could we keep stored water safe for use?
	3.5.2 Re-using water	By the end of the sub-strand, the learner should be able to:- a) suggest how water could be re-used at home and school, b) participate in re-using water to reduce wastage at home and school, c) appreciate re-using water as a way of conserving it.	• In groups, learners discuss how water could be re-used in the home and school. • Using video clips, videos, pictures and photographs, learners to observe various ways of re-using water. • Learners to visit the community to find out how water is re-used to reduce wastage. • Learners to suggest how they could participate in re-using water to reduce wastage at home and school.	How could we re-use water in the home and school?

Core-competence to be development: Communication and collaboration: Groups sharing experiences, critical thinking and problem solving: water conservation.	
Links to PCIs: ESD: Environmental conservation, caring for water.	Links to values: Responsibility in keeping water safe
Links to other learning activity areas (s): Hygiene and Nutrition: waste management	Suggested community Service Learning activity: Excursion to the school neighbourhood to interact with the community to find out how they store water.
Suggested non-formal activity to support learning: Organize a clean and safe storage of water week to enrich learners experience.	Suggested assessment: Oral questions and observation. Filling in a teacher made activity sheet on caring for water.

Suggested Assessment Rubric

Sub-strand	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Keeping stored water safe	Consistently and correctly states the importance and participate in keeping stored water safe.	Correctly states the importance and participate in keeping stored water safe.	Sometimes state the importance and participate in keeping stored water safe.	Rarely states importance or participate in keeping stored water safe with assistance.
Re-using water to control wastage.	Consistently and correctly suggests how water is re-used and participates in re-using water to control wastage.	Correctly suggests how water is re-used and participates in re-using water to control wastage.	Sometimes correctly suggests how water is reused and participates in re-using water to control wastage.	Rarely suggests how water is re-used or participates in re-using water to control wastage with assistance.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)

3.0 Care for the environment	3.5.3 Conservation of Energy (5 Lessons) 3.5.3.1Communicating energy conservation messages.	By the end of the sub-strand, the learner should be able to:- a) recognize appropriate messages on energy conservation, b) create energy conservation messages to promote awareness at and home and school, c) display energy conservation messages to create awareness in school, d) demonstrate interest in energy conservation for conservation for improvement and protection of the environment.	• Through probing questions, learners discuss reasons for conserving energy • Using video clips, internet sources,newspaper cuttings and brochures, learners identify simple messages on conserving energy • In pairs, learners to create simple persuasive energy conservation messages • Learners display and peer assesses the energy conservation messages. • In groups, learners are guided to read aloud the energy conservation messages they develop.	What messages could be used to communicate conservation of energy?
Core Competences to be developed: Communication and collaboration: Creating energy conservation messages. • Imagination and creativity: Creating energy conservation messages. Learning to learn: gathering information on energy conservation messages. • Self efficacy: show casing their messages.				
Link to PCIs: ESD: Environmental Education: passing information on conservation			Links to values: Responsibility and unity: cooperation in creating messages.	
Links to other learning activity areas: Languages; Movement and Creative activities. Creating energy conservation messages and reciting a poem			Suggested Community Service Learning activity: Communicating energy conservation messages to the community.	
Suggested non formal activity to support learning: Hold inter-class display on energy conservation messages			Suggested assessment: observation, oral question and project on developing messages.	

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Consistently and correctly recognizes, creates and displays energy conservation messages.	Correctly recognizes, creates and displays energy conservation messages.	Sometimes recognizes, creates and displays some energy conservation messages.	Rarely recognizes, creates or displays energy conservation messages.

GRADE THREE

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
1.0 Environment and its resources	1.1 Weather (5 Lessons) 1.1.1 Exploring unfavourable weather conditions	By the end of the sub-strand, the learner should be able to:- a) describe unfavourable weather conditions, b) observe the effects of unfavourable weather conditions for safety, c) develop curiosity in identifying effects of weather conditions in the environment.	• Using relevant stimulus materials, learners to discuss the meaning of unfavourable weather conditions (floods and drought) • Using multimedia resources, learners to play relevant educative games on effects of unfavourable weather conditions. • In groups, learners to share their experiences on effects of unfavourable weather conditions. • Learners to listen to stories on unfavourable weather conditions and its effects from elders in the community. • Learners gather more information on unfavourable from internet sources, libraries .Then write a paragraph on each unfavourable weather condition • Learners share the information	1. How could weather conditions be unfavourable? 2. What happens when the weather conditions become unfavourable?
	1.1.2 Keeping safe from unfavourable weather conditions	By the end of the sub-strand, the learner should be able to:- a) identify ways of keeping safe from unfavourable weather conditions, b) keep safe from unfavourable weather conditions, c) demonstrate knowledge of keeping safe from	• using age appropriate stimulus, learners could be guided to identify ways of keeping safe from unfavourable weather conditions (floods, drought) • In groups, learners share experiences on how to keep safe from unfavourable weather conditions • Learners to simulate how to keep safe from unfavourable weather conditions • Learners to gather information from parents or guardians on how to keep safe	How could we keep safe from unfavourable weather conditions?

		unfavourable weather condition.	during unfavourable weather conditions and report back.	
Core Competences to be developed: Communication and collaboration, critical thinking and problem solving, digital literacy.				
Link to PCIs: ESD: Environmental Education; effects of unfavourable weather; Disaster Risk Reduction, concern on effects of unfavourable weather Citizenship: Social Cohesion: Learners share experiences			Links to values: Responsibility; respect-learners share experiences in groups	
Links to other learning activity areas: Languages: listening to cultural stories on weather.			Suggested Community Service Learning activities: Learners to interact and find out from their parents or guardians on how to keep safe during unfavourable weather conditions.	
Suggested non formal activity to support learning through application: Learners to develop keep safe messages for the school.			Suggested assessment: Written work, oral questioning and simulated computer exercises.	

Suggested Assessment Rubric

Sub-strand	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Exploring unfavourable weather conditions	Consistently and correctly describes unfavourable weather and identifies its effects	Demonstrate ability to observe and identify effects of unfavourable weather and keep safe from unfavourable weather conditions.	Demonstrates some knowledge to observe and identify effects of unfavourable weather and how to keep safe.	Unable to demonstrate ability to observe and identify effects of unfavourable weather and keep safe
Keeping safe from unfavourable weather conditions	Consistently and correctly identifies ways of keeping safe and demonstrates knowledge of keeping safe from unfavourable weather conditions.	Correctly identifies ways of keeping safe and demonstrates knowledge of keeping safe from unfavourable weather conditions.	Sometimes identifies ways of keeping safe and demonstrates knowledge of keeping safe from unfavourable weather conditions.	Rarely identifies ways of keeping safe or demonstrates knowledge of keeping safe from unfavourable weather conditions.

Strand	Sub strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question
1.0 Environment and its resources	1.2 Water (5 lessons) 1.2.1 Making water safe for use	By the end of the sub-strand, the learner should be able to:- a) identify ways of making water clean and safe for use in the home, b) make water clean and safe using different methods, c) construct a simple water filter for cleaning water at home, d) appreciate clean and safe water for use to reduce health risks.	• Learners to listen and respond to case story on the need to use clean and safe water. • Learners to share experiences on how to make water clean and safe for use in the home • Learners to observe a sample of dirty water and discuss how the water could be made clean and safe for use (decantation, filtering, boiling) • Learners to make a simple water filter using locally available materials • Learners to decant filter and boil water to make it clean and safe for use.	How could we make water clean and safe for use in the home?
Core-competence to be developed: Critical thinking and problem solving, communication and collaboration, imagination and creativity.				
Links to PCIs: ESD-Environmental Education: Environment and water, Effective communication: learners name methods of making water clean and safe for use			Links to values: Responsibility and teamwork as they make a simple water filter	
Links to other learning activity areas (s): Hygiene and Nutrition, Movement and Creative art; Literacy			Suggested Community Service Learning activities: sharing with parents or guardians on different ways of making water clean and safe for use.	
Suggested non-formal activity to support learning through application: Giving a message at the school assembly on clean and safe water for use.			Suggested assessment: Oral questions, observe as they work in groups, written questions, project work on making water filter.	

Suggested Assessment Rubric

Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
• Consistently and correctly identifies ways of making water clean, creatively constructs a simple water filter, and makes water clean and safe for use at home.	Correctly identifies ways of making water clean, constructs a simple water filter, and makes water clean and safe for use at home.	Sometimes identifies ways of making water clean, constructs a simple water filter, and makes water clean and safe for use at home.	Rarely identifies ways of making water clean, constructs a simple water filter, or makes water clean and safe for use at home.

Strand	Sub –strand	Specific learning outcome	Suggested learning experiences	Key inquiry question(s)
1.0 Environment and its resources	1.3 Soil (10 Lessons) 1.3.1 Exploring soil characteristics	By the end of the sub-strand, the learner should be able to:- a) differentiate soils by texture from provided soil samples, b) differentiate soils by size of soil particles from provided soil samples, c) name the three types of soils based on their characteristics, d) develop interest in characteristics of soils as an environmental resource.	• Learners to explore the environment and collect different soil samples (sand, loam and clay) • In groups, learners to feel between their fingers the different soil samples and record findings (course, medium, fine) • Learners to share their experiences on how different samples of soils feel between their fingers • Learners to observe the particle sizes of the three soil samples (large, medium and small sized particles) • Learners to mount (using glue) the different soil samples on a chart. Learners to display the chart in the learning corner. • Learners find out from parents or guardians on the types of soils found in their locality and report back.	How could we differentiate types of soils?

Core-competence to be development: Communication and collaboration, critical thinking and problem solving, learning to learn	
Links to PCIs: Effective communication: learners name types of soil; ESD: Environmental Education: Environment and soil.	Links to values: Unity –in groups learners discuss characteristics of soil.
Links to other learning activity areas (s): Movement and Creative Arts activities – displaying types of soils.	Suggested community Service Learning activities: Find out and report back from parents or guardians on the types of soils found in their locality
Suggested non-formal activity to support learning through application: Recite a poem on soil.	Suggested assessment: Oral questions, observation as they work in groups, written questions, assessing the displayed project.

Suggested Assessment Rubric

Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Consistently and correctly differentiates soil textures, size of particles and deduces name of soil based on their characteristics.	Correctly differentiates soil textures, size of particles and deduces name of soil based on their characteristics.	Sometimes differentiates soil textures, size of particles and deduces name of soil based on their characteristics.	Rarely differentiates soil textures, size of particles or deduces name of soil based on their characteristics.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key inquiry question(s)
1.0 Environment and its resources	1.4 Plants (10 Lessons) 1.4.1 Categorizing plants.	By the end of the sub-strand, the learner should be able to:- a) identify different types of plants, b) categorize plants in the immediate environment according to specified features, c) appreciate the rich diversity in plants.	• Learners to carry out a nature walk to observe and identify the plants (edible/non-edible, thorny/non-thorny, poisonous/non-poisonous) • Learners to take photographs of different plants during the nature walk • Using relevant stimulus materials, learners to be guided to categorize plants according to specified features (edible/non-edible, thorny/non-thorny, poisonous/non-poisonous) • Learners to draw one type of plant and share their work with others.	How could we categorize plants?
	1.4.2Safety when handling plants	By the end of the sub-strand, the learner should be able to:- a) describe safe ways of handling different plants, b) observe safety when handling different plants in the immediate environment, c) appreciate the need to handle plants responsibly to reduce health risks.	• Learners to watch video clips or pictures or posters on safety when handling plants • Learners listen to a resource person on safety when handling plants • Learners to share information on how to handle different plants • Learners to simulate safety when handling plants.	How could we handle plants safely?
Core Competences to be developed: Critical thinking and problem solving; creativity and imagination.				
Link to PCIs: Disaster risk reduction; safety when handling plants. ESD –Environmental Education			Link to values: Responsibility, care for plants, respect the rich diversity in plants.	
Links to other learning activity areas: Hygiene and Nutrition			Suggested Community Service Learning through application: Learners listen to a guest speaker on plant safety.	
Suggested Non formal Activity to support learning: learners to present a message on safe ways when handling plants to enhance safety.			Suggested assessment: oral questions, written questions, e-assessment or quiz.	

Suggested Assessment Rubric

Sub-strand	Exceeds expectations	Meets expectation	Approaches Expectation	Below expectation
Categorizing plants	Consistently and correctly identify and categorize plants according to specified features.	Correctly identify and categorize plants according to specified features.	Sometimes identify and categorize plants according to specified features.	Rarely identify or categorize plants according to specified features.
Safety when handling plants	Consistently and correctly describes and observe safety when handling plants	Correctly describes and observe safety when handling plants.	Sometimes describes and observe safety when handling plants.	Rarely describes or observes safety when handling plants.

Strand	Sub-strand	Specific learning outcomes	Suggested learning experiences	Key question(s)
1.0 Environment and its resources	1.5 Animals (10 Lessons) 1.5.1 Importance of animals	By the end of the sub-strand, the learner should be able to:- a) state different uses of animals to people, b) identify different animals that provide food products, c) appreciate the importance of animals to the people.	• Learners to use stimulus materials to identify the different uses of animals to people (source of food, security, companionship, manure, animal power, sports, tourist attraction) • Learners discuss the different food products people get from animals (meat, milk, eggs, honey) • In groups, learners make a journal on uses of animals to people as a class project. • Learners discuss with the teacher the suggested assessment criteria for the project and timeframe.	What are the uses of animals to people?

Core Competence to be developed: Learning to learn, Critical thinking and problem solving, creativity and imagination, communication and collaboration.	
Link to PCIs: ESD: animal welfare Education: Environment and its resources. Life skills: Effective communication; learners state the importance of animals to humans.	Link to values: Responsibility, care, love: learners appreciate the usefulness of animals to people.
Link to other learning activity areas: Religious Education: appreciating God's creation.	Suggested community service learning activity: Finding out on the uses of different animals from parents or guardians.
Suggested non formal activity to support learning: learners to display the class project for the other learners to appreciate.	Suggested assessments Oral questions, observe as they work in groups, written questions.

Suggested Assessment Rubric

Exceeds expectations	Meets expectation	Approaching expectations	Below expectation
Consistently and correctly states the uses of animals to people and identifies different food products people get from animals.	Correctly states the uses of animals to people and identifies different food products people get from animals.	Sometimes states the uses of animals to people and identifies different food products people get from animals.	Rarely states the uses of animals to people or identifies different food products people get from animals.

Republic of Kenya

Ministry of Education, Science and Technology

Summary Report

Verification Survey with Private Sector for Disseminating Japanese Technologies for Science Teaching Materials to Enhance Student-Centered Education in Kenya

July 31, 2018

Narika Corporation (Tokyo)

1. Purposes of this project

The purposes of this project are to verify and disseminating the Narika Science Wagon (NSW) including the Teacher's Guide, which is a combination of localized teaching materials developed based on Japanese-style ones in light of the needs of the Kenyan schools and local environment, as well as, the analytical finding on the questions of the Kenya Certificate of Primary Education (KCPE) examination, in order to deploy the business model after confirming its adequacy.

A) Verification Activities

(1) Development and Verification of NSW

NSW (composed of the "science demonstration experiment kit for teachers" and the "wagon") ideal for schools in Kenya is developed on the basis of research and analysis of the Kenyan education curriculum (syllabus), pupils'/students' learning environment, contents of textbooks, and past examination questions of KCPE. Verify the effectiveness of NSW and its impact on teachers at the pilot schools who take training on NSW and use it in their classes by studying the changes in the results of KCPE taken by pupils/students at their classes, as well as, the changes in the degree of the positivity of the teachers' attitudes.

(2) Verification of the adequacy of NSW/Business Model

After specifying local distributors and factories, verify the adequacy of the NSW/Business Model on the premise that business partnerships with them are established in Kenya.

B) Dissemination Activities

(1) Holding of NSW workshops for teachers in the pilot schools

Promote NSW in the area by positioning pilot schools as the core of the promotion activities.

1. To have teachers in pilot schools participate in the NSW workshops and use NSW on a trial basis in their schools for the purpose of promoting NSW.
2. To have the teachers realize the impact of NSW on their classes, as well as, the pupils' and students' learning.
3. To output the method for utilizing NSW as a lesson plan based on the discussions at sessions of the NSW workshops.

(2) Exhibit at the events of related organizations

1. Kenya Primary Schools Headteacher Association (KEPSHA)
2. Kenya Private Schools Association (KPSA)
3. Pan-African High-level Conference on Education (PACE2018)

Enhance the awareness towards NSW through the active participation in the above-mentioned annual meetings and exhibitions attended by many Kenyan educators.

C) Expected outcomes

(1) Successful completion of the development of NSW suitable for the educational curriculum and schools in Kenya

(2) Transition to the learning environment where NSW is used in classes for pupils and students on a daily basis through the efforts of pilot schools' teachers who play a central role in the project
(3) Enhanced awareness and understanding towards the effectiveness of NSW among CP and primary schools throughout Kenya

2. Development issues in target fields in the country where the project is conducted.

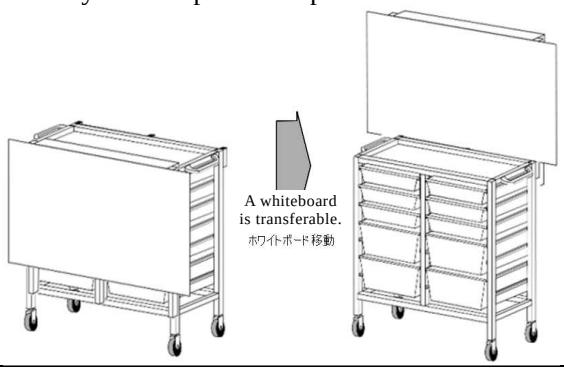
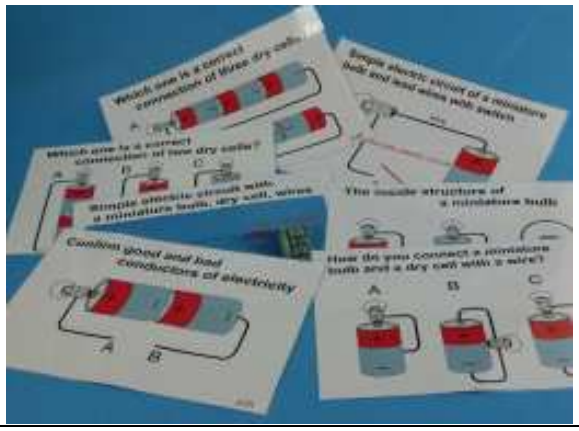
A) Lack of teachers and schools compared to the number of pupils and students.
B) Lack of school equipment and learning materials due to budget shortfalls.
C) There are no classes in which science teaching materials are used.
D) Not all pupils and students have textbooks.
E) Classes are mainly held in a manner where teachers explain orally/unilaterally and write it on a blackboard.

3. Outline of the product

Narika has specialized in the development, manufacturing, and sales of a variety of experimental apparatuses for Japanese science education for 100 years. Accordingly, our product catalog contains approximately 20,000 products. Moreover, we distribute our catalog to primary and junior high schools throughout Japan (a total of approximately 40,000 schools). We expected that equipment suitable for Japanese curriculum guidelines would not be easily accepted in other counties as every country's school education (public education) is affected by its own politics and culture.

Therefore, since September 2015, we had adjusted some products out of totally/approximately 20,000 experimental apparatuses for science education to make them suitable for the educational policy, syllabus, and contents of textbooks in Kenya and stored equipment that can be used for eight topics in four areas in each tray in response to the request of teachers and produced a wagon to store such trays. In addition, we also produced the *Teacher's Guide* that conforms to the syllabus and textbooks and explanation panels. Thus, we have successfully created the entire Narika Science Wagon (hereafter referred to as NSW). The outline of NSW shall be as follows.

Name	NSW (a science demonstration experiment kit for teachers)
Target	Primary standard 5-8 / Primary education syllabus in the Ministry of Education of Kenya (equivalent to primary school 5th grade to junior high school 2nd grade of Japanese schools)
Unit	Topic 1: Effect of heat on matter / Properties of matter / Standard 5 (Effect of Heat on Matter/5th grade) Topic 2: Electricity / Energy / Energy / Standard 7 (Simple Electric Circuit/7th grade) Topic 3: Transformation of energy / Energy / Standard 8 (Energy Conversion/8th grade) Topic 4: Conservation of energy/ Energy / Standard 8 (Conservation of Energy/8th grade) Topic 5: Simple machines/ Making work easier / Standard 8 (Slope and pulley/8th grade) Topic 6: Human breathing system / Human body / Standard 5 (Human Breathing System/5th grade) Topic 7: Human digestive system / Human body / Standard 5 (Human Digestive System/5th grade) Topic 8: Blood circulatory system / Human body / Standard 7 (Blood Circulatory System/7th grade)

Outline	NSW consists of experimental equipment used for Topics 1 to 8, trays in which such equipment is stored, and a wagon in which trays are stored. The top surface of the wagon can be used as a laboratory table, and the wagon is also equipped with a magnetic whiteboard. As it has four large wheels, it has become easier to move it from the storage to classrooms and between classrooms. In addition to the above, it comes with the *Teacher's Guide* that conforms to the syllabus in Kenya and explanation panels.  
Supporting Materials for NSW	【Teacher's Guide】 NSW contains instructions for using the equipment, maintenance methods, and explanations and tips on experiment methods for all the topics. 【Explanation Panel】(flipchart-type panel) Laminated magnetic color panels that can be fixed to a whiteboard. Such panels include figures/illustrations of experimental setup and supplemental illustrations for teachers. 
Advantages of NSW compared to competitive products	● For each of the equipment, there are similar products produced by our domestic and foreign competitors; however, in terms of the aspects of safety, durability, and user-friendly design, there is nothing comparable to our products and brand strengths. In addition, there are no such science teaching materials in the African markets, including Kenya. ● NSW is a science demonstration experiment kit for teachers developed based on analysis of the past KCEP examination questions for approximately 20 years and research on textbooks issued by multiple companies by using the syllabus in Kenya as a standard. Accordingly, it can be said that it is the one and only experiment kit exclusively developed for Kenya in the world. Therefore, there are no competitors that produce such products. ● NSW can be used as a substitute for a science laboratory not in existence in schools, and it can be moved to other locations according to the class and room schedules; accordingly, it can temporarily change a normal class room into a science room. This is our strength that cannot be offered by our competitors. ● Equipment is stored by topic in cases with lids, and such cases are easily stored in NSW. Cases alone for required topics can be brought to a classroom and used in class depending on the situation at the school.

4. Project Activities

A) Activities to verify NSW

(1) Localization of NSW

We considered that, in order to confirm the adequacy of the future business plan, it would be important for us, based on the results of an analysis of the syllabus and KCPE, to make changes to Japanese-style science materials to develop the specification suitable for the needs and school environments in Kenya.

In response to Kenya's situation where teachers conduct experiments infrequently in classes because there are insufficient experiment equipment and storage for such equipment in schools, we have set the basic concept of this project as a science experiment kit for demonstrations conducted by the teacher.

Based on this basic concept, we developed NSW and provided it to pilot schools. Teachers used it on a trial basis in schools and then provided us feedback regarding matters to be improved and requests, and we added three topics based on their feedback.

As a result, the initial NSW included five topics; however, the NSW finally included eight topics (Refer to Figure 1). Refer to the attachment 2, *Teacher's Guide* for details.

	Theme	Grade	Category
Topic 1	Effect of Heat on Matter	5th	Property of Matter
Topic 2	Simple Electric Circuit	7th	Energy
Topic 3	Energy Conversion	8th	Energy
Topic 4	Conservation of Energy	8th	Energy
Topic 5	Simple Machines	8th	Making Work Easier
Topic 6	Human Breathing System	5th	Human Body
Topic 7	Human Digestive System	5th	Human Body
Topic 8	Blood Circulatory System	8th	Human Body

Figure 1: List of NSW Topics

(2) Verification of the effects of NSW

As a method of verifying the effects of NSW, we used the level of teachers' satisfaction with NSW and the changes in the scores gained by their students at KCPE science examinations.

1. A level of satisfaction with NSW

According to the first questioner survey conducted among teachers (Table 1), most of them answered they were satisfied with NSW. Also, we received reactions from teachers that the demonstration experiments conducted using NSW contributed to the enhancement of motivation of not only the teachers but also pupils and students. Moreover, the feedback from teachers after they used it for one year includes the following: "I have no trouble using it as it is ready to use." "It can produce immediate effects on academic results of pupils and students".

Given the feedback, we can say that our investigation activities for approximately one year, the analysis of KCPE examination questions for the past 20 years, the selection of topics suitable for the syllabus and textbooks in Kenya, and NSW designed to suit the local school environment have been accepted without problems.

However, there were no significant changes in the KCPE Science examination scores in pilot schools for the past three years (from 2015 to 2017). Moreover, we received a strong request from teachers to add topics in the Human Body category for the reason that the tendency of examination questions was different from the estimations. Accordingly, we selected three topics from this category and added them to the NSW.

Table 1: Results of the first questionnaire survey on NSW (by topic)

Learning Topics	Bad				Good
	1	2	3	4	5
No. 1 Effects of Heat on Matter	-	-	1	1	26
No. 2 Simple Electric Circuit	-	-	1	3	24
No. 3 Energy Conversion	-	-	-	7	21
No. 4 Conservation of Energy	-	-	-	6	22
No. 5 Making Working Easier	-	-	1	2	25

2. Changes in scores of KCPE science examinations

The following figure 2 shows the histogram of pilot schools' KECP Science scores in the period between 2015 and 2017. According to figure 2, in the period between 2015 and 2016, the mode changed from 54 to 65, which shows that it shifted from the lower score area to the upper score area. Moreover, the figure shows that the histogram in 2017 was similar to the one in 2015. As a result, it can be said that NSW had no direct effect on KCPE examination scores.

Science (All pilot school)			
Data	2015	2016	2017
5	0	0	0
10	0	0	0
15	3	6	3
20	12	19	19
25	12	41	44
30	53	56	92
35	112	73	82
40	141	70	134
45	192	165	158
50	184	138	178
55	155	192	155
60	198	228	236
65	206	264	197
70	192	215	167
75	112	111	87
80	47	12	86
85	12	0	23
90	0	0	0
95	0	0	0
100	0	0	0

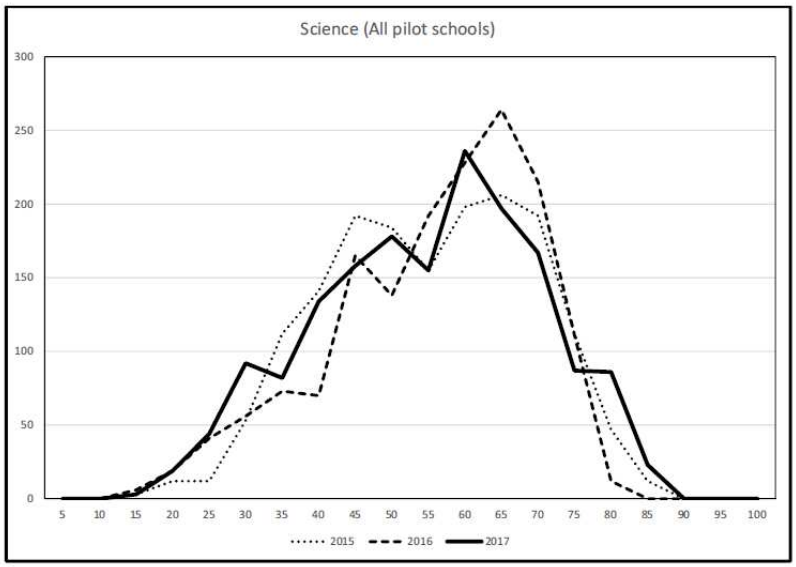


Figure 2: Histogram of KCPE Science 2015-2017

3. Changes in topics covered by KCPE

The following table 2 and figure 3 show the ratios of each topic covered by KCPE in the period between 2002 and 2014 and in 2015, 2016, and 2017. Until 2014, “Energy”, “Properties of Matter” and “Making Work Easier” accounted for approximately 40% of the total; however, in 2015, 2016, and 2017, the ratio of these three topics covered by KCPE declined to approximately 30% in 2015, 18% in 2016, and 14% in 2017.

Moreover, until 2014, the ratio of Human Body and Health Education covered by KCPE was approximately 13%; however, the said ratio increased to 24% in 2015, 24% in 2016, and 30% in 2017.

It can be considered that the reason why previous version of NSW seemed to have no direct effect on KCPE scores was that the fact that there were fewer questions from topics covered by the NSW, which reflected in the results of KCPE scores at the pilot schools. As a result, we received strong requests to add topics from the category of the Human Body. Accordingly, we added the above-mentioned three topics to the current version of NSW.

Since this happened in January 2017, the effect of the current version of NSW on KCPE scores can be expected in and after KCPE 2018.

Table 2: Changes in topics covered by KCPE (2002 to 2017)

Topic	Ratio in the KCPE			
	2002 - 2014	2015	2016	2017
Human Body	6.8%	10.0%	10.0%	18.0%
Health Education	6.4%	14.0%	14.0%	12.0%
Plants	11.4%	10.0%	4.0%	4.0%
Weather and the solar system	6.8%	4.0%	10.0%	12.0%
Animals	9.0%	8.0%	8.0%	6.0%
Environment	4.5%	8.0%	8.0%	4.0%
Water	3.2%	6.0%	6.0%	8.0%
Soil	6.6%	6.0%	6.0%	14.0%
Foods and Nutrition	4.0%	6.0%	16.0%	8.0%
Energy	13.4%	14.0%	6.0%	6.0%
Properties of Matter	17.0%	8.0%	6.0%	2.0%
Making Work Easier	10.9%	6.0%	6.0%	6.0%

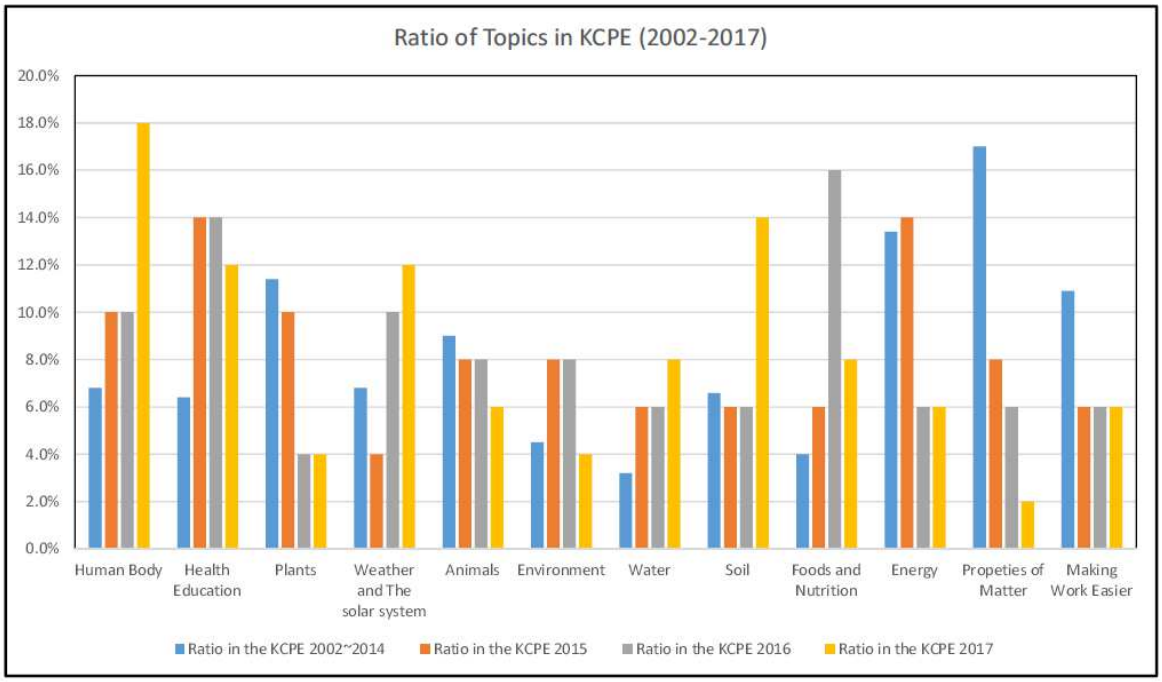


Figure 3: Ratio of Topic in KCPE (2002-2017)

B) Activities to promote NSW

(1) KEPSHA Annual Delegates Conference
Period: August 7 to 12, 2016
Place: Mombasa

1) NSW was introduced to those concerned with school education including many primary school head teachers.
2) Our various experiment kits and teachers' panels contained in NSW were well received.
3) NSW was well received among attendees for its content validity, practical utility, durability, and portability.

(2) Participation in KPSA Exhibition as an exhibitor
Period: January 5 to 8, 2017
Place: Nairobi

1) Many visitors endorsed the development concept of NSW.
2) Science teachers from private schools also showed the intention to introduce NSW.
3) Science teachers from public schools have commented that the product produced based on such a concept is consistent with the direction of the new curriculum to be introduced in Kenya and is useful for teachers to conduct classes based on the new curriculum.

(3) Pan-African High-level Conference on Education (PACE 2018)
Period: April 25 to 27, 2018
Place: Nairobi

1) In conjunction with the exhibition sponsored by CEMASTEA, the display of NSW and the demonstration of science experiment were conducted by Kenyan based external staff.
2) The demonstrations on electricity and energy were conducted by utilizing Narika's hand-held DC generator (Genecon), and at the same time, the development concept of NSW was explained as a consolidated mobile mini laboratory by selecting topics of educational

materials while reflecting voices of Kenyan teachers in order to change an ordinary public primary school classroom to a “science laboratory”.

3) The product demonstration and explanation were given to attendees such as President Uhuru Kenyatta, Amina (Minister of MOE), Kipsang (Permanent Secretary of MOE), Minister of Malawian MOE, Minister of Botswanan MOE, Ms. Yokozeki (Director of UNESCO-IICBA), and Prof. George Godia (ambassador and permanent representative of the republic of Kenya to UNESCO).

5. NARIKA Training Program in Japan

A) Purposes

Training participants were divided into two groups and the following purposes and assignments were given to each group in advance.

Group A: Education Administrative Management Position (3 people)

The purposes were to introduce the historical background of the enactment of the Science Education Promotion Act in Japan to the trainees and to prepare a draft of the Kenyan version of the Science Education Promotion Act through a comparison between the situation of science education in Japan at the time of the enactment of the said Act and the situation of science education in Kenya and the understanding of effects and issues of the adoption of the uniform nationwide education system.

Group B: In-service science teachers (3 people)

The purposes were to have teachers acquire skills to prepare a student-centered lesson plan and skills to amend such lesson plans so that trainees can play a leading role in the preparation of the lesson plan.

B) Outline

Name: Promotion of Science Teaching Materials to Enhance Student-Centered Education
Period: April 16 to 30, 2017 (15 days)
Organization implementing the trainings: Narika Corporation
External Staff: Dr. Takemura, Dr. Ikeda (Professor Emeritus, Hiroshima University, Japan), Mr. Naganuma (ILINK Co., Ltd.)
Cooperating Organization: Gunma Kokusai Academy, Kyoritu Girls’ Junior and Senior High School
Training participants: six people (Education Administration Management Position: three people, In-service science teachers: three people)

No.	Name	Organization	Position or Title
1	Mr. Pius Kimani Mutisya	MOE	Director, QAS
2	Mr. Stephen Mwaura Njoroge	CEMASTEA	Director
3	Mr. Jacob Odhiambo Aoyi	CEMASTEA	National Trainer
4	Ms. Millicent Mwikali Mutavi	Kyamulendu Pri. Sch.	Science Teacher
5	Mr. Joseph Mwangi Karori	Egerton Univ. Pri. Sch.	Science Teacher
6	Ms. Nancy Nyambura Wachira	Murang'a College Pri. Sch.	Science Teacher

Wachira, Okuda, Naganuma, Ikeda, Mutisya, Takemura, Njoroge, Karori, Marcik, Aoyi, Mutavi, Tanaka

C) Training Outcomes

(1) Preparation of the draft of the Kenyan version of the Science Education Promotion Act

Under the guidance of Mr. Takemura (Professor Emeritus), Group A lead by Mr. Pius Kimani Mutisya (Director of the Ministry of Education) and Mr. Stephen Mwaura Njoroge (Director of CEMASTEA) prepared a list of educational materials for the primary science education based on the contents of the current syllabus (2002 version).

After returning to Kenya, Mr. Mutisya and Mr. Njoroge provided Mr. Matiangi (Education Minister) with an explanation regarding the need for the Kenyan Version of the Science Education Promotion Act and a list of educational materials required (for the primary and secondary education) and the formulation of the standards for the establishment of a science laboratory (mainly for the secondary education), and then established a working group for the establishment of the Kenyan Version of the Science Education Promotion Act in accordance with the new curriculum and further drafted the Kenya School Laboratory Standards.

(2) Preparation of the lesson plan and provision of research classes

In this training, Mr. Ikeda (Professor Emeritus) provided lectures in terms of (1) the procedures to prepare a lesson plan, (2) the designing of student-centered classes, and (3) the designing of experiment-focused classes as well as a) teaching skills to make students aware, b) how to conduct classes in the form of active learning, and c) how to conduct classes in the form of trapping-type learning. Then, the Group B selected the themes of 1) conductor and non-conductor from the category of electricity and 2) electromagnet from the category of energy and prepared the lesson plans and provided research classes using prepared lesson plans at Gunma Kokusai Academy and Kyoritu Girls' Junior and Senior High Schools.

6. Investigations conducted toward local production and sales

In considering local production and local sales, we placed importance on whether or not candidates (for local manufacturers and distributors) can take pleasure in contributing to Kenya through the stable operation and payment of taxes by producing safe and high quality educational materials by themselves at reasonable cost and selling them at fair prices for children who will shoulder the future of the country.

A) Local Production

We were introduced to multiple companies, such as furniture studios and factories and metal processing factories in Nairobi by locally based external staff. Out of such companies, we could find a studio that can meet our needs for the local production. The studio is the Don Bosco studio, which is one of pilot schools. The Don Bosco studio is an organization where 1) street children are accepted and trained at the Don Bosco school, 2) such children acquire skills of wooden and metal processing at the training studio in the school, 3) they produce products at the studio after graduation, and 4) the proceeds from sales of such products are allocated as expenses to operate the school.

B) Local Sales

Through the investigation activities conducted by locally based external staff, candidates for local distributors were identified and, after the multiple negotiation sessions, we successfully executed the distributorship agreement with JIMCO Africa Ltd. as of March 1, 2018.

7. Progress on the achievement of the project purposes

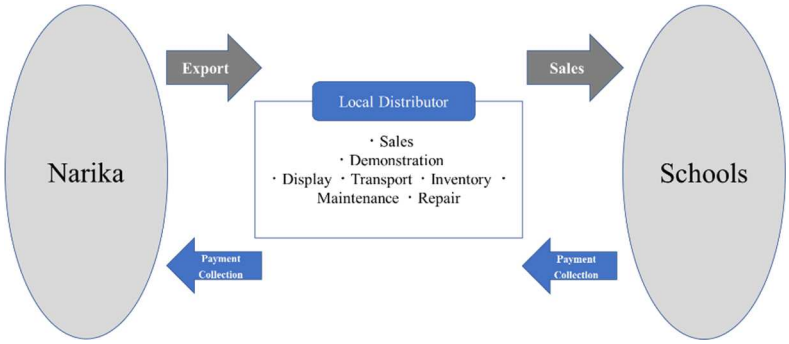
Significant changes made by NSW were as follows: (1) The establishment of science laboratories and preparation rooms in the pilot schools has been promoted, and they have already been established in some pilot schools. (2) The communication regarding NSW has been promoted among teachers; accordingly, they have become actively involved in the preparation of a lesson plan. (3) Students' attitudes and reactions during classes became more positive. (4) The frequency of demonstration experiments by teachers has increased. We consider that the purposes of this project have been achieved for the above-mentioned reasons.

Purposes (Issues)	Results
➢ To provide science experiment equipment that can be accepted by local schools in Kenya. ➢ Reduction in the quality of classes due to the fact that the number of pupils and students per teacher is too large. ➢ To enable the verification of effects through KCPE ➢ To allocate the budgets for the introduction of the science experimental equipment	➢ NSW has been accepted by schools. ➢ NSW can serve as a measure to improve the quality of classes. ➢ Effects have been observed in KCPE. ➢ The committee consisting mainly of members of the Ministry of Education has been established.

8. Business Development Plan after the implementation of the project

A) Business Model

Under the current situation, the Kenyan government cannot allocate the budget for purchasing science experimental materials (budget for introducing science equipment), and there are no education industries and organizations required to develop the business. Accordingly, it was considered that the development of such business would be impossible at the time of the commencement of the project; however, we succeeded in the execution of the distributorship agreement with a local distributor in March 2018, and we decided to proceed with the business model shown in the figure 64.



B) Expectation towards the new curriculum adopted in Kenya and the formation of science experimental equipment market.

The improvement of school facilities and equipment, teachers' skills, and educational materials is essential for the establishment of the new curriculum adopted in Kenya and the Kenyan version of the Science Education Promotion Act. Accordingly, it can be said that the view that there is no education industry in Kenya is outdated. Actually, the STEM project launched for the on-site verification of the new curriculum, and the budget has been allocated for the project. Accordingly, the creation and expansion of the (science) education industry are greatly expected.

9. Issues to be addressed in the future and expectations for JICA

A) The enactment of the Kenyan version of the Science Education Promotion Act and the allocation of the budget for the introduction of science equipment

It can be said that the significant results achieved through this project are the fact that the Kenyan version of the Science Education Promotion Act based on the new curriculum holds a prominent position for Kenya to become an industrial nation under Vision 2030, and it has become commonly understood by the entire MOE including Mr. Njoroge (CEMASTEA) and Mr. Pius (QAS). Going forward, all we can do is wait until this Act is enacted. Under such circumstances, we would expect JICA to support the Kenya Ministry of Education in promoting the enactment of the Act while giving us advice on the actions we should take.

B) Smooth transition to the new curriculum (to 2030)

As is clear from the contents of the new curriculum, the overall Kenyan educational system will be changed, which includes changes in the contents of textbooks and learning, the school system (from the 8-4 system to the 2-6-3-3 system), and the graduation examination system and the transition to the new system is aimed to be completed in 2030. Accordingly, we consider it a great opportunity

for our company; unfortunately, it would not be possible for a small/ medium-sized company alone to develop the business regarding the overall Kenyan educational system. Moreover, although the Kenya Ministry of Education started considering the transition to the new curriculum and the changes of the educational system before this project was launched, we did not receive any information on the new curriculum from JICA. As education is a national policy, we consider that it will take at least 20 years to establish the educational foundation and produce results. We expect JICA's continued efforts in international cooperation in the educational field in Kenya.

C) Creation and implementation of the collaboration between CEMASTEA and Narika

As for Japanese science education, the Ministry of Education, Culture, Sports, Science and Technology and the Association for the Promotion of Science Education and Equipment work together on the repeatability/reproductivity test, verification and development for the experiment set-up in accordance with the science curriculum guidance, as well as, the development of related experimental equipment every time the revisions on the curriculum guidelines are made. Then, textbooks will be updated with those results, and the transition to the new curriculum guidelines will be implemented. Thus, it is difficult to implement the science education without public-private cooperation.

Currently, the Kenyan government organizations (such as CEMASTEA and KICD), local governments, and schools have mainly been targeted for the project; however, the transition to the new curriculum and the new educational system would also be difficult without the cooperation of the private sector. Under the current circumstances, the educational industry (such as companies dealing with textbooks or educational materials) that can cooperate with the national government has not been established. Accordingly, upon termination of this project, we would like to commence the negotiations to create collaboration between CEMASTEA and our company for the purpose of verifying experiments in accordance with the new curriculum and proposing and developing experimental equipment. Therefore, we would expect JICA's continued support the creation of the collaboration.

D) Creation and implementation of the collaboration between KLB and Narika

Based on the background and concept as stated above, textbooks are the most remarkable results to be achieved by the new curriculum and the new educational system; accordingly, we aim to create collaboration with government organizations (such as KICD and KLB) that manage textbooks for the verification and proposals for experiments to be included in textbooks. Therefore, we would like to have continued support from JICA for the creation of the collaboration.