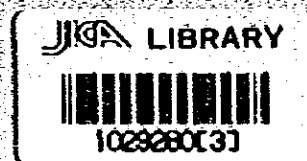


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TABLE 1

THEMES AND ITEMS OF STUDY(PHYSICS AND CHEMISTRY)



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Item	Theme of study	Contents of principal experiment	Remarks
1. Equilibrium of force	1. Notation of force 2. Composition of forces, decomposition of forces 3. Equilibrium of material point 4. Static friction 5. Moment of force 6. Composition of parallel forces 7. Couple 8. Center of gravity of a body 9. Equilibrium of rigid bodies	Equilibrium of forces Measurement of the maximum friction Moment of force, equilibrium of parallel forces	Use a slope
2. Elasticity	1. Elasticity 2. Elasticity of elongation 3. Elastic deformation and stress 4. Plastic deformation	Hooke's law Young's modulus	
3. Static fluid	1. Pressure in a fluid 2. Pascal's principle 3. Atmospheric pressure	Measurement of static pressure of a liquid Torricelli's experiment	

Item	Theme of study	Contents of principal experiment	Remarks
4. Dynamic fluid	4. Boyle's law 5. Bouyancy 6. Measurement of specific gravity 1. Stationary flow 2. Bernoulli's theorem 3. Dynamic pressure and static pressure 4. Viscosity 5. Resistance of fluid	Boyle's law Experiment of Archimedes' principle Experiment for specific gravity measurement Measurement of the pressure of running water Wind channel experiment	
5. Motion	1. Velocity, acceleration 2. Composition of velocity, composition of acceleration 3. Falling motion 4. Parabolic motion	Measurement of velocity, acceleration Experiment for falling motion in vacuum Acceleration of falling motion Experiment of monkey-hunting	
6. Force and motion	1. Law of motion 2. Mass, weight 3. Kinetic friction 4. Momentum, impulse	Experiment of inertia Second law of motion Measurement of mass Investigate the relation between motion and impulse	Use a dynamic truck Use a balance

Item	Theme of study	Contents of principal experiment	Remarks
7. Rotation	5. Conservation of momentum 6. Collision against a wall 1. Circular motion 2. Centripetal force and centrifugal force 3. Central force and areal velocity 4. Universal gravitation 5. Motion of a rigid body 6. Moment of inertia 7. Conservation of angular momentum	Law of conservation of momentum Measurement of universal gravitation constant Measurement of the moment of inertia Conservation of angular momentum	
8. Simple oscillation	1. Simple oscillation 2. Simple pendulum 3. Spring pendulum 4. Conical pendulum	Examine the property of simple pendulum Measurement of gravitational acceleration	
9. Mechanical energy	1. Work, power 2. Potential energy 3. Kinetic energy	Experiment for comparison of works Experiment for transformation of mechanical energy conservation of kinetic energy.	

Item	Theme of study	Contents of principal experiment	Remarks
13. Wave	4. Transformation of state and molecular motion 5. Vapor pressure 1. Transversal and longitudinal waves 2. Propagation of wave 3. Interference of waves, diffraction	Measurement of Vapor density Observation of wave experiment Experiment and observation of water wave	
14. Sound wave	1. Propagation of sound wave 2. Sound generator 3. Resonance 4. Doppler effect	Melde's experiment Kundt's experiment Experiment for resonance of an air pipe Experiment of beat	Use a Braun-tube oscilloscope
15. Lightwave	1. Velocity of light 2. Refraction and reflection of light 3. Diffraction and interference of light 4. Spectrum of light 5. Polarization of light	Measurement of velocity of light Measurement of refractive index of light Measurement of focal length of a lens Young's experiment Observation of Newton's rings Observation of spectrum of light and measurement of wave length Observation of polarization of light	Diffraction and interference with laser light

Item	Theme of study	Contents of principal experiment	Remarks
16. Static electricity	<ol style="list-style-type: none"> 1. Electric charge and electric field 2. Electrostatic induction 3. Condenser 4. Dielectrics 	<p>Experiment with electrostatic high tension generator</p> <p>Experiment with leaf electroscope</p> <p>Observation of charging and discharging a condenser</p>	Use a oscilloscope
17. Electric current and work	<ol style="list-style-type: none"> 1. Electric resistance 2. Specific resistance 3. Internal resistance of a cell 4. Electric current and work 5. Direct current circuit 	<p>Ohm's law</p> <p>Measurement of resistance</p> <p>Measurement of the internal resistance of a cell</p> <p>Measurement of the electromotive force of a cell</p> <p>Measurement of Joule's heat</p> <p>Use a tester</p>	Bridge circuit
18. Electric current and magnetic field	<ol style="list-style-type: none"> 1. Magnetic field, terrestrial magnetic field 2. Magnetic field generated by an electric current 3. Force on electric currents by a magnetic field 4. Force between electric currents 	<p>Measurement of dip</p> <p>Measurement of electromagnetic force</p> <p>Observation of electromagnetic force</p> <p>Observation of Lorentz's force</p> <p>discharge tube</p>	Use an ampere balance

Item	Theme of study	Contents of principal experiment	Remarks
19. Electromagnetic induction	1. Induction electromotive force 2. Eddy current 3. Self-induction 4. Mutual-induction 5. Dynamo	Experiment of electromagnetic induction Experiment of eddy current Experiment of self-induction Experiment of mutual-induction Principle of direct current generator	Double coil Experiment with rotary magnetic field Wartenhofen's pendulum Observation of waveform with an oscilloscope
20. Alternating current	1. Generating alternating current 2. Effective value of alternating current 3. AC circuit 4. Resonance circuit 5. Transformer and power transmission 6. Induction motor	Principle of an alternating current generator Experiment for showing inductive and capacitive reactance Experiment for LC resonance Experiment with an assembled transformer Principle of induction motor	
21. Electromagnetic wave	1. Electric oscillation 2. Electromagnetic wave 3. Ultra-violet rays, infrared rays	Observation of electric oscillation Observation of the property of electromagnetic wave	Oscilloscope Microwave demonstrator
22. Electron and photon	1. Cathode ray	Observation of vacuum discharge	each kind of Crookes' tube

Item	Theme of study	Contents of principal experiment	Remarks
23. Atom and atomic nucleus	2. Specific charge of electron	Measurement of specific charge of electron	Millikan's experiment
	3. Electric elementary quantum	Measurement of electric elementary quantum	
	4. Wave nature of electron	Diffraction experiment of electron beam	
	5. Particle nature of light	Experiment of photoelectric effect Measurement of Planck's constant	
	6. X ray		
	7. Thermal electron and vacuum tube	Measurement of the characteristics of diode	
	8. Semiconductor element	Rectification effect of diodes	
	1. Atomic structure	Franck-Hertz's experiment	
	2. Structure of atomic nucleus	Observation of cloud-chamber	
	3. Radioactivity	Ionization effect of α ray	
	4. Transformation of atomic nucleus		
	5. Nucleus energy	Measurement of the velocity of α particle	
	6. Utilization of atomic energy		

TABLE 2

EQUIPMENT LIST

COST OF EQUIPMENT BY FACILITY

Facility No.	Facility Name	Price Thousand Yen	Price US \$
I	Physics Laboratory	22,087	113,267
II	Chemistry Laboratory	8,828	45,271
Grand Total:		30,915	158,538

Note: 1) Conversion rate of 195 yen to 1 US dollar was adopted, with fraction of 0.5 and over counting as a whole number and disregarding the rest.

I. EQUIPMENT FOR PHYSICS LABORATORY

NO.	Name of Article	Price Thousand Yen	Price US \$
1.	Measuring Instruments	6,722	34,472
2.	General Laboratory Apparatus	2,192	11,241
3.	Experimental Instruments	11,773	60,374
4.	Batteries and Power Supplies	1,400	7,180
Total:		22,087	113,267

I. Physics 1. Measuring Instruments

No.	Name	Specification	Q'ty	Unit price	Amount
1-1	Slide rule	25 cm, made of bamboo	2	3,600	7,200
1-2	Counter	4 digits, with zero resetter	2	1,400	2,800
1-3	Tape measure	Of stainless steel 2 meters in case, mm graduations	7	800	5,600
1-4	Tape measure of steel	50 meters in case, cm graduations	1	8,500	8,500
1-5	Vernier calipers	Of stainless steel scale range: 0 ~ 150 mm with case	12	4,000	48,000
1-6	Micrometer screw gauge	Measuring range: 0 ~ 25 mm With ratchet stop	2	5,500	11,000
1-7	Travelling microscope	Measurement range: vertical 160 mm horizontal 200 mm	1	120,000	120,000
1-8	Objective micrometer	For microscope use In 0.01 graduations	2	2,500	5,000
1-9	Eyepiece micrometer	For microscope use In 0.01 graduations	2	1,300	2,600
1-10	Mirror scale	Graduated 300 mm in 1 mm Protector plate fitted	12	2,900	34,800
1-11	Spherometer	Measuring range: -20 ~ +20 mm	1	35,000	35,000
1-12	Optical lever	Distance between legs: 22mm Fitted with two mirrors	1	5,300	5,300
1-13	Planimeter	Double-type planimeter	1	20,000	20,000
1-14	Measuring cylinders	100 ml , 250 ml	7	3,200	22,400
1-15	Measuring cylinders	500 ml , 1,000 ml	7	8,500	59,500

No.	Name	Specification	Q'ty	Unit price	Amount
1-16	Measuring pipettes	5 ml , 10 ml	7	990	6,930
1-17	Measuring flasks	200 ml, 500 ml	7	5,000	35,000
1-18	Table balance	Capacity: 100g	2	7,000	14,000
1-19	Table balance	Capacity: 200g	2	8,200	16,400
1-20	Table balance	Capacity: 500g	1	18,500	18,500
1-21	Table balance	Capacity: 2kg	1	43,000	43,000
1-22	Physical balance	Capacity: 500g Sensitivity: 10mg	12	34,000	408,000
1-23	Direct reading analytical balance	Capacity: 200g Optical scale range: 0 - 1000mg	1	400,000	400,000
1-24	Automatic table balance	Capacity: 200g Sensitivity: 2g	2	4,800	9,600
1-25	Automatic table balance	Capacity: 8kg	1	5,000	5,000
1-26	Spring balance	Capacity: 8kg	2	1,500	3,000
1-27	Spring balance	For use in dynamics experiments Capacity: 200g Sensitivity: 2g	12	1,300	15,600
1-28	Newton's spring balance	Capacity: 80N, with zero adjustment	2	1,800	3,600
1-29	Baume's hydrometer	A set of two, light and heavy	12	1,400	16,800
1-30	Jolly's spring balance	Length of mirror scale: 700mm With two springs (for light and heavy weights)	1	50,000	50,000
1-31	Precision balance	Capacity: 310g Sensitivity: 0.01g	1	44,000	44,000
1-32	Precision balance	Capacity: 1600g Sensitivity: 0.1g	1	48,000	48,000
1-33	Double chain dial balance	Capacity: 50g, Sensitivity: 10mg	1	37,000	37,000
1-34	Chain dial balance	For student Capacity: 100g Sensitivity: 20mg	7	15,500	108,500

No	Name	Specification	Qty	Unit price	Amount
1-35	Stop watch	30-minute stop watch	7	13,000	91,000
1-36	Stop watch	30-minute stop watch with push	2	14,000	28,000
1-37	Digital stop watch	Minimum graduation: 0.01 second with push	7	18,000	126,000
1-38	Darkroom clock	Alarm stop clock	1	6,500	6,500
1-39	Electric stop watch	Range: 0.01 ~ 10 seconds	1	65,000	65,000
1-40	Digital electric stop watch	The transparent display reading is easy to project with an OHP or projection meter.	1	74,000	74,000
1-41	Photoelectric switch	For electric stopclock	1	62,000	62,000
1-42	Dial tachometer	Clock type	1	22,500	22,500
1-43	Stroboscope	Measuring range: 60 ~ 15,000 r.p.m.	1	168,000	168,000
1-44	Stroboscope	Xenon flash tube used	1	350,000	350,000
1-45	Retarder	Time retarded: 1 ~ 1,000ms three ranges	1	65,000	65,000
1-46	Photoelectric pick-up	Output voltage: 10Vp differential wave form	1	58,000	58,000
1-47	Gate time equipment	Used with stroboscope	1	70,000	70,000
1-48	Photoelectric tachometer	Range of measurement: four ranges 0 ~ 36,000 r.p.m.	1	39,000	39,000
1-49	Thermometer	Mercury, -5° ~ +105°C	7	700	4,900
1-50	Thermometer	Mercury, 0° ~ 360°C	7	1,200	8,400
1-51	Thermometer	Alcohol, -30° ~ +50°C	7	450	3,150
1-52	Thermometer	Alcohol, -5° ~ +105°C	7	400	2,800

No.	Name	Specification	Qty	Unit price	Amount
1-53	Standard thermometer	Enclosed scale: 0° ~ 100°C 0.1°C graduations	1	7,500	7,500
1-54	Thermister thermometer	Measuring range: -25° ~ 60°/60° ~ 150°C	2	64,000	128,000
1-55	Thermometer for OHP	-5° ~ +105°C, two in set	2	4,700	9,400
1-56	Thermocouple	Chromel-alumel, 1.6mm in diameter	1	6,500	6,500
1-57	DC voltmeter	3/15/300V	12	7,000	84,000
1-58	AC voltmeter	15/150V	7	7,000	49,000
1-59	DC ammeter	50/500mA /5A	12	7,000	84,000
1-60	AC ammeter	100mA /1/10A	7	7,000	49,000
1-61	DC volt-ammeter	300V/300mA	1	15,000	15,000
1-62	Precision DC volt-ammeter	Measuring range: 75/150/300V 75mA 0.3/1.5/7.5/30A eight ranges	1	30,000	30,000
1-63	Milli-voltmeter	Double scale: 0 ~ 50mV and 0 ~ 1,200°C (may also be used as thermoelectric pyrometer)	1	59,000	59,000
1-64	Precision milli-ammeter	Measuring range: 10/30/100/300mA four ranges	1	20,000	20,000
1-65	Micro-ammeter	DC 100 μ A	1	7,800	7,800
1-66	Micro-ammeter	DC 50 ~ 0 ~ 50 μ A	1	7,800	7,800
1-67	Precision micro-ammeter	10/30/100/300 μ A	1	20,000	20,000
1-68	Precision micro-ammeter	150/300 μ A	1	18,000	18,000
1-69	Galvanometer	Circular scale: 83mm	7	7,800	54,600
1-70	Demonstration galvanometer	Circular scale: 250mm	1	38,000	38,000

No.	Name	Specification	Qty	Unit price	Amount
1-71	Pointer galvanometer	Moving coil type	2	10,000	20,000
1-72	Demonstration universal-meter	For DC and AC	1	80,000	80,000
1-73	Reflection galvanometer	Lamp and scale in case	1	65,000	65,000
1-74	Reflection galvanometer	Current sensitivity: $2.4 \times 10^{-10}A$	1	90,000	90,000
1-75	Lamp and scale	A horizontal scale plate, double graduations 250 ~ 0 ~ 250 and 0 ~ 500mm With an illuminator	1	42,000	42,000
1-76	Projection meter	With projector With DC voltmeter, DC ammeter, AC voltmeter, AC ammeter, galvanometer and micro-ammeter	1 set	140,000	140,000
1-77	AC-DC voltmeter	Digital indicating type	1	77,000	77,000
1-78	AC-DC ammeter	Digital indicating type	1	78,500	78,500
1-79	Projection tester	Used with projection meter	1	15,000	15,000
1-80	Electronic voltmeter	Range: 50/100/150/500mV 1.5/5/15/50/150/500V ten ranges With dB.dBm scale	1	53,000	53,000
1-81	Vacuum tube volt-ohm meter	AC-DC measuring range: 1.5 ~ 1,500V Resistance measuring range: 0.1 ~ 1,000 Ω , seven ranges	1	49,000	49,000
1-82	Circuit tester	Range: DC-V 5 ~ 1,000V, DC-A 50 ~ 500mA, AC-V 10 ~ 1,000V, Ohms 25 Ω / 2M Ω	12	5,500	66,000
1-83	Adapter for checking transistor	Used together with circuit tester	4	4,000	16,000

No.	Name	Specification	Q'ty	Unit price	Amount
1-84	Thermistor probe	Used for measuring the electric resistance by connecting to circuit tester	4	4,200	16,800
1-85	Universal tester	Range: DC-V 3 ~ 1,200V, AC-V 12 ~ 1,200V, DC-A 60 μ A ~ 300mA, Ohms 1 ~ 1,000k Ω	2	19,000	38,000
1-86	Insulation resistance tester	Voltage produced: 500V Resistance value: 100M Ω	1	34,000	34,000
1-87	Integrating wattmeter	For demonstration	1	14,000	14,000
1-88	Meter-stick bridge	Ostwald type	12	12,000	144,000
1-89	Resistance box	Resistance values: 1,000/100/10/1/0.1 Ω (5 steps)	12	9,000	108,000
1-90	Plug type resistance box	Maximum resistance: 1,111 Ω Accuracy: within 0.1%	1	33,000	33,000
1-91	Plug type resistance box	Maximum resistance: 11,111 Ω Accuracy: within 1%	1	13,000	13,000
1-92	Test oscillator	Range of oscillating frequencies: 100kHz ~ 30 MHz	1	40,000	40,000
1-93	Low frequency oscillator	Range of oscillating frequencies: 30Hz ~ 300KHz	2	38,000	72,000
1-94	Braun tube oscilloscope	For demonstration Braun tube: 133mm	1	75,000	75,000
1-95	Braun tube oscilloscope	For student Braun tube: 75mm	6	45,000	270,000
1-96	Dual trace synchroscope	With trigger circuit	1	190,000	190,000
1-97	Electronic digital counter	Range of measurement: 20Hz ~ 99.99kHz decimal system, four digits	1	140,000	140,000

No.	Name	Specification	Q'ty	Unit price	Amount
1-98	Electronic digital counter	Range of measurement: 20Hz ~ 999.9kHz The transparent display reading is easy to project with OHP.	1	100,000	100,000
1-99	Gauss meter	Measurable magnetic field: AC and DC magnetic field Range of measurement: 0 ~ 3.0wb/m ² seven ranges	1	170,000	170,000
1-100	Schematic circuit panel equipment	For oscilloscope and synchroscope	1	90,000	90,000
1-101	Electrostatic voltmeter	For measuring static electricity Range of measurement: 0 ~ ±10kV seven convertible ranges	1	220,000	220,000
1-102	Small recorder	Two pen type Range of measurement: 1mV Recording paper: 250mm	1	310,000	310,000
1-103	X-Y recorder	X-axis 250mm, Y-axis 180mm	1	250,000	250,000
	Total				¥6,721,780

1. Physics 2. General Laboratory Apparatus

No.	Name	Specification	Q'ty	Unit price	Amount
2-1	Water jet pump	Length: 200mm	2	1,400	2,800
2-2	Foot bellows	Width: approx. 200 mm	2	8,000	16,000
2-3	Scheibler's desiccator	Of glass, with porcelain shelf plate Diameter: 240mm	1	13,000	13,000
2-4	Soil sieve set	Inner diameter: 55mm Set of five with different hole sizes	1	10,000	10,000
2-5	Cork squeezer	Wheel type	1	3,800	3,800
2-6	Cork borers	Set of six	2	1,100	2,200
2-7	Electric drill	With two types of gimlets for woodwork and two drills for metal work	1	23,000	23,000
2-8	Electric wood working tools	With case	1	56,300	56,300
2-9	Parallel vise	125mm	1	19,000	19,000
2-10	Anvil	10kg	1	4,100	4,100
2-11	Surface plate	For metal working 300 x 350 mm	1	23,800	23,800
2-12	Assembling tools	For metal working Consisting of spanners, two screw drivers, pliers, a punch, vice, hammer, and punture repair outfit	1	9,600	9,600
2-13	Metalworking tool set	Of 35 different kinds, in a wall cabinet	1	110,000	110,000
2-14	Woodworking tool set	Of 24 different kinds, in a wall cabinet	1	88,000	88,000
2-15	Electrician's tool set	Set of 20 tools, in a case	1	22,000	22,000
2-16	Tool-box		1	9,600	9,600

No.	Name	Specification	Q'ty	Unit price	Amount
2-17	Resin plate bender		1	16,000	16,000
2-18	Foam resin cutter		1	37,000	37,000
2-19	Spring winder		1	13,000	13,000
2-20	Iron stand	Supporting rod: height 675mm diameter 16mm	12	17,000	204,000
2-21	Iron stand	Supporting rod: height 600mm diameter 12mm	6	9,800	58,800
2-22	Iron stand	Supporting rod: height 1,120mm diameter 16mm	2	16,500	33,000
2-23	Iron stand	Supporting rod: height 1,180mm diameter 16mm	2	18,000	36,000
2-24	Height adjustable stand	Board dimensions: two boards 150 x 150mm, 180 x 180mm	2	9,500	19,000
2-25	Iron tripod	Diameter: 90mm	1	500	500
2-26	Test tube stand	Of plastics , Holds 12 test tubes	1	450	450
2-27	Crucible tongs	Of stainless steel	1	500	500
2-28	"C" clamp	Maximum distance between jaws: 100mm	21	1,350	28,350
2-29	"C" clamp	Maximum distance between jaws: 75mm	21	800	16,800
2-30	"C" clamp	Maximum distance between jaws: 50mm	21	500	10,500
2-31	"C" clamp	Maximum distance between jaws: 25mm	21	400	8,400
2-32	Alcohol lamp	With wick About 100ml	2	400	800
2-33	Gas burner		7	1,600	11,200
2-34	Gas blast burner	For glass work With universal joint	1	9,000	9,000

No.	Name	Specification	Qty	Unit price	Amount
2-35	Electric heater		1	5,000	5,000
2-36	Microscope	For demonstration Magnification: 50x ~ 1,500x	1	130,000	130,000
2-37	Microscope	For student Magnification: 100x ~ 600x	6	34,500	207,000
2-38	Metallurgical microscope	Magnification: 30 x ~ 1,500 x	1	155,000	155,000
2-39	Stereo microscope	Magnification: 20 x 40x	1	60,500	60,500
2-40	Magnifying glass	Magnification: 5x With stand	2	1,100	2,200
2-41	Magnifying glass	Magnification: 6x Pull-out type double	2	460	920
2-42	Magnifying glass	Magnification: 10x	2	350	700
2-43	Magnifying glass	Magnification: 20x	2	400	800
2-44	Magnifying glass	Magnification: 5x	2	1,000	2,000
2-45	Reading telescope	With scale and support Magnification: 9x	1	65,000	65,000
2-46	Scientific photographing apparatus		1 set	87,000	87,000
2-47	Tripod	Total length when extended: about 150cm	1	6,000	6,000
2-48	Darkroom instruments		1 set	51,000	51,000
2-49	Steam generator	Gas type Capacity: 8l	1	34,000	34,000
2-50	Overhead projector		2	98,000	196,000
2-51	Projecting table for OHP	Also for housing OHP	2	29,000	58,000

No.	Name	Specification	Q'ty	Unit price	Amount
2-52	Transparency		1	126,000	126,000
2-53	TP (projection film for OHP use) art kit		1	12,500	12,500
2-54	Projection screen	Size: 180 x 180cm White	1	40,000	40,000
2-55	Projection screen	Size: 180 x 180cm With portable stand	1	36,000	36,000
	Total				¥2,192,120

I. Physics 3. Experimental Instruments

No.	Name	Specification	Q'ty	Unit price	Amount
	(Force Motion and Mechanics of Solid)				
3-1	Tackle blocks	For demonstration Capable of carrying a 100kg load	1	14,000	14,000
3-2	Table clamp pulley	Arm is about 100mm long and can be raised and lowered	1	7,500	7,500
3-3	Table clamp pulley	Pulley: 35mm diameter Load limit: 4kg	1	3,300	3,300
3-4	Inclined plane	Inclined plane: L1,020 x W150mm	1	23,000	23,000
3-5	Gears	A combination of spur gear, helical gear, worm and worm wheel	1	15,000	15,000
3-6	Experimental kit for fundamental dynamics		1	42,000	42,000
3-7	Assorted weights for dynamics	Weights: a set of twelve 20g and ten 30g	12	5,800	69,600
3-8	Experimental sets for moment of force	Six a set	1	26,000	26,000
3-9	Helical steel springs	3 kinds a set	6	2,100	12,600
3-10	Helical steel spring for dynamics	Of 1mm wire, diameter of the spring 12mm Weights included	6	3,900	23,400
3-11	Young's modulus apparatus	Searle's pattern	1	45,000	45,000
3-12	Young's modulus apparatus	Ewing's pattern Test beams: of copper, steel and brass	1	43,000	43,000
3-13	Torsional rigidity apparatus	Two types of test wire	1	25,000	25,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-14	Tester for water bottom pressure	With 4 tubes for comparison	1	23,500	23,500
3-15	Tester for water pressure top and bottom	Water tank diameter: 90mm height: 180mm	1	3,000	3,000
3-16	Tester for water side pressure	Water tank diameter: 75mm, height: 300mm	1	2,100	2,100
3-17	Pascal's principle apparatus	Two clyster pipes, large and small	1	7,600	7,600
3-18	Torricelli's law experimental kit	Glass tubes: 1,000mm length With approximately 200g of mercury	1	30,000	30,000
3-19	Boyle's law experimental kit	Elasticity of gas A set of weights	6	10,800	64,800
3-20	Archimedes' principle apparatus	Of metal	1	2,800	2,800
3-21	Buoyancy experimental apparatus	Six a set	1	6,500	6,500
3-22	Level	Length: 300mm with wooden base	1	1,000	1,000
3-23	Level	Length: 110mm with metal base	1	2,300	2,300
3-24	Gay-Lussac's specific gravity bottles	25ml	1	1,300	1,300
3-25	Gay-Lussac's specific gravity bottles	50ml	1	1,800	1,800
3-26	Hare's specific gravity tubes	Scale on the tube: 500mm with stand	1	14,000	14,000
3-27	Metal cubes and cylinders set	Iron, copper, and aluminum objects, four of each, twelve a set	6	3,000	18,000
3-28	Tester for running water pressure	Bernoulli's principle explanation	1	9,000	9,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-29	Wind tunnel demonstrator	Blower: outlet diameter 180 mm	1	300,000	300,000
3-30	Tester for surface tension	Du Nouy type Measuring range: 0 ~ 180 dyn/cm	1	260,000	260,000
3-31	Rotary vacuum pump	Horizontal type with electric motor Ultimate vacuum: 10^{-3} Torr Pumping speed: 50 l/min	1	115,000	115,000
3-32	Evacuation plate	Diameter of the plate: 190mm Manometer and bell jar are provided	1	46,000	46,000
3-33	Vacuum manometer	Measuring range: 0 ~ 160mmHg	1	11,000	11,000
3-34	Oil diffusion pump	Maximum vacuum: 10^{-6} Torr	1	74,000	74,000
3-35	Rotary MacLeod vacuum gauge	Measuring range: 10^{-1} ~ 10^{-4} Torr	1	80,000	80,000
3-36	Vacuum grease		2	1,500	3,000
3-37	Pair of dynamics carts	Metallic	12	8,300	99,600
3-38	Gas bearing movement apparatus	Metal base: W250 x L1,500mm With gliding body	1	22,000	22,000
3-39	Dry cell operated gliding body		2	8,500	17,000
3-40	Fall tube	Length of glass tube: 1,000mm	1	10,000	10,000
3-41	Falling-ball experimental kit	Two steel balls, large and small With tape measure	1	10,500	10,500
3-42	Two kinds free-fall falls	Device for simultaneous dropping: two plastic balls With ruler (white mark lines on the black background)	1	12,000	12,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-43	Monkey-hunter experimental kit		1	17,000	17,000
3-44	Rotational inertia apparatus	With recording timer	1	27,000	27,000
3-45	Rotational inertia outfit		1	50,000	50,000
3-46	Ballistics cart	With cart and projector	1	24,000	24,000
3-47	Gas bearing runway for dynamics	Length of sliding board: 2m With recording device kit	1	90,000	90,000
3-48	Accelo-detector	Attachable to dynamics cart	1	20,000	20,000
3-49	Impulse detector		1	25,000	25,000
3-50	Recording timer	AC, provided with C-shaped clamp	12	5,800	69,600
3-51	Recording timer	DC, provided with C-shaped clamp	12	5,800	69,600
3-52	Collision apparatus	Board: total length 1,100mm 7 steel balls in a case	1	15,500	15,500
3-53	Air table for dynamics	Table dimensions: approx. 490 x 640 mm	1	80,000	80,000
3-54	Rotating platform	For precession experiments Of metal, 500mm in diameter	1	36,000	36,000
3-55	Electric motor driven rotating platform	Disk for rotation: 50cm in diameter Accessory set	1	89,000	89,000
3-56	Whirling device (centrifugal force test stand)	Of metal	1	20,000	20,000
3-57	Centrifugal hoop	Used with Whirling Device	1	4,000	4,000
3-58	Watt's governor	Used with Whirling Device	1	6,000	6,000
3-59	Centripetal force apparatus	Four a set	3	3,900	11,700

No.	Name	Specification	Qty	Unit price	Amount
3-60	Experimental set for measurement of universal gravitation constant	Torsion balance for attraction and others	1	180,000	180,000
3-61	Angular momentum kit	With recording timer	1	78,000	78,000
3-62	Simple pendulum	With metal ball (40 mm in diameter) In a case	12	5,500	66,000
3-63	Borda's pendulum	With metal ball (40 mm in diameter) In a case	1	19,000	19,000
3-64	Gravity changeable simple pendulum	With support and electromagnet	1	20,000	20,000
3-65	Kater's reversible pendulum	Distance between edges: 1,000mm	1	150,000	150,000
3-66	Spring pendulum	Helical spring: spring constant 4kg/m With weight	1	3,200	3,200
3-67	Comparable apparatus with work	Apparatus to measure the amount of work (for vertical and horizontal uses)	6	12,000	72,000
3-68	Work integrator	With dynamics cart vertical recording	1	12,000	12,000
3-69	Work integrator	With dynamics cart Horizontal recording For student	12	12,000	144,000
3-70	Transformable dynamics cart by mechanical energy	Coil spring constant: about 1kg/cm	1	15,000	15,000
3-71	Area-speed experiment apparatus	Discharge cycle: 1 ~ 0.033 sec	1	38,000	38,000

No.	Name	Specification	Q'ty	Unit price	Amount
	(Heat, Light and Sound)				
3-72	Crooke's radiometer	Two separate shafts to each vane With stand	2	5,500	11,000
3-73	Dewar's vessel	400ml with wooden base	2	5,000	10,000
3-74	Linear expansion apparatus	Four sample rods (of copper, brass, iron and aluminium) With optical lever	1	30,000	30,000
3-75	Linear expansion apparatus for the use of roller	With two sample tubes (copper and aluminium)	1	20,000	20,000
3-76	Joule's calorimeter	Electric resistance heat apparatus	12	8,300	99,600
3-77	Specific heat specimens	Three types (iron, brass and copper)	12	3,500	42,000
3-78	Regnault's calorimeter		1	58,000	58,000
3-79	Paul's dew point hygrometer	With a thermometer (to 50°C) and a rubber bellows	1	8,500	8,500
3-80	Hot air drier	Heater: 350W	1	7,500	7,500
3-81	Thermoelectric magnet	Thermocouple: copper rod and constantan rod With weight	1	23,000	23,000
3-82	Mechanical equivalent of heat device	Body releasing heat: metallic With spring balance	1	12,000	12,000
3-83	Mechanical equivalent of heat apparatus	Measuring set of J. value With motor and thermometer	1	32,000	32,000
3-84	Heat engine experimental set	Cylinder of heat-resistant glass, 60mm in a diameter	1	700,000	700,000
3-85	Brownian movement stage	Electric bulb: 6V 0.8A	4	2,300	9,200
3-86	Mechanical gas model	Cylinder: 40mm in a diameter	1	27,000	27,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-87	Random motion of molecules, mechanical model	For OHP	1	40,000	40,000
3-88	Mechanical trimorphism model	For OHP	1	10,000	10,000
3-89	Pair of mercurialize tubes	Two tubes a set with a ball and powder	1	15,000	15,000
3-90	Pneumatic fire syringe	Length of cylinder: 240mm	1	3,800	3,800
3-91	Victor Meyer's vapour density apparatus		1	39,000	39,000
3-92	Pressure gauge	For Amon Charles-Gay Lussac's Law Pressure gauge: $\pm 0.5 \sim 0 \sim 0.5$ kgw/cm ²	1	8,500	8,500
3-93	Wave motion démonstrator	Hayashida's type	1	25,000	25,000
3-94	Shive's wave machine		1	65,000	65,000
3-95	Supplementary equipment for Shive's wave machine	No. 2 machine included	1	85,000	85,000
3-96	Flat wire coil for wave démonstrator	Plain wire helical spring Diameter: 75mm	1	2,400	2,400
3-97	String vibrator	The range of variation of frequency: 50 ~ 200Hz	1	32,000	32,000
3-98	Double vice	Chladni plate A 250mm square plate and a 250mm diameter plate	1	11,000	11,000
3-99	Ripple tank	Water trough: L550 x W550 x D40mm	7	18,000	126,000
3-100	Ripple tank for OHP	For démonstration	1	27,000	27,000
3-101	Tuning fork	Of steel With resonance box	7	6,000	42,000
3-102	Sympathetic tuning forks	A pair of steel tuning forks	2	13,500	27,000

No.	Name	Specification	Qty	Unit price	Amount
3-103	Standard tuning forks	A set of thirteen tuning forks in a case	1	31,000	31,000
3-104	Electromagnetic tuning fork	Frequency: 50c/s	1	31,000	31,000
3-105	Electromagnetic tuning fork	Frequency: 100c/s	1	31,000	31,000
3-106	Rotary drum	Diameter of drum: 160mm Length: 180mm	1	28,000	28,000
3-107	Organ pipe	One octave scale	1	10,000	10,000
3-108	Sonometer	For demonstration	1	27,000	27,000
3-109	Rotary mirror	4 mirrors Manual rotation	1	24,000	24,000
3-110	Sound experiment apparatus	Frequency: pulse waves 2 ~ 20Hz sinusoidal wave 30Hz ~ 30kHz	1	140,000	140,000
3-111	Air column resonance apparatus	Dimensions of glass tube: dia. 30 x L880mm	6	19,000	114,000
3-112	Tuning fork for air column resonance apparatus	Of steel Frequency: 600c/s	6	2,800	16,800
3-113	Acoustic oscillator for air column resonance apparatus	Power source: DC 9 ~ 12 V	6	4,400	26,400
3-114	Sound-wave interference set	Quincke's type	1	14,000	14,000
3-115	Carbon arc lamp	Automatic adjusting type With rheostat	1	52,000	52,000
3-116	Arc lamp for point light	With zircon lamp and change-over switch	1	80,000	80,000
3-117	Standard bulb	150cd with measuring table	2	17,000	34,000
3-118	Mineral identifier	With two mercury electric discharge lamps Of the camera obscura type	1	30,000	30,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-119	Spectro-lamp	With one each of sodium, mercury and cadmium tubes	2	78,000	156,000
3-120	Light source	Source bulb: 80W	2	17,000	34,000
3-121	Light source	Source bulb: 150W	2	37,000	74,000
3-122	Laser complete apparatus	For senior high school science education External modulation terminal is attached	2	100,000	200,000
3-123	Laser optical bench	With adjustable bench for attaching parts	2	16,000	32,000
3-124	Experiment apparatus for measurement of light velocity	With high speed rotating motor	1	370,000	370,000
3-125	Luxmeter	Range: 0 ~ 500 or 0 ~ 5,000 lux	2	23,000	46,000
3-126	Colour mix-projector	With adjustable support	1	12,000	12,000
3-127	Optical bench for demonstration	Bench: made of metal 1,500mm	1	90,000	90,000
3-128	Optical bench	For student Bench: made of metal 1,200mm	2	22,000	44,000
3-129	Optical slit	Slit: 20mm long made of stainless steel	2	16,000	32,000
3-130	Optical trough	Of plastic	1	7,000	7,000
3-131	Reflection and refraction apparatus	With a single filament bulb	1	14,000	14,000
3-132	Plane mirror	400 x 300mm On adjustable metal stand	2	10,500	21,000
3-133	Convex mirror	Diameter: 90mm On adjustable metal stand and A-shaped base	2	4,300	8,600

No.	Name	Specification	Qty	Unit price	Amount
3-134	Concave mirror	Diameter: 90mm On adjustable metal stand and A-shaped base	2	4,300	8,600
3-135	Convex lens	Diameter: 75mm On adjustable metal stand and A-shaped base	6	4,100	24,600
3-136	Concave lens	Diameter: 75mm On adjustable metal stand and A-shaped base	6	4,100	24,600
3-137	Aplanatic lens	Diameter: 60mm Aplanat f: 250mm	1	5,500	5,500
3-138	Index of refraction plate	Trapezoid dimensions (approx): W70 x D15 x H40mm	2	1,200	2,400
3-139	Equilateral prism	Length (approx): 75mm Each edge approx 25mm long	2	4,300	8,600
3-140	Right-angle prisms	Two to the set Longest side approx 40mm and thickness 20mm	2	1,900	3,800
3-141	Achromatic prisms	Two to the set Length of one edge: 30mm	1	4,000	4,000
3-142	Spectrometer	Graduated disc: 360°C divisions	1	145,000	145,000
3-143	Spectroscope	Collimator lens (f: 150mm)	1	110,000	110,000
3-144	Direct vision pocket spectroscopy	Length of the tube: 90mm	6	11,500	69,000
3-145	Newton's ring apparatus	Glass portion: 85mm in diameter	1	8,000	8,000
3-146	Biprism	For interference of light Length of prism side: approx. 30mm	1	13,000	13,000

No.	Name	Specification	Qty	Unit price	Amount
3-147	Diffraction grating	500 lines /10mm	2	7,000	14,000
3-148	Diffraction grating	1,000 lines /10mm	2	10,000	20,000
3-149	Interference plates	Two sheets of glass	6	2,000	12,000
3-150	Michelson's interferential device	With metal base	1	46,000	46,000
3-151	Diffraction grating spectroscope	Diffraction grating: replica grating 596 lines /mm	12	3,600	43,200
3-152	Absorption sodium flame tube		1	9,400	9,400
3-153	Photo-elasticity apparatus	Polarization plate: 200 x 200mm	1	320,000	320,000
3-154	Calcite		2	2,800	5,600
3-155	High voltage supply	Induction coil	1	20,000	20,000

No.	Name	Specification	Q'ty	Unit price	Amount
(Magnetism and Electricity)					
3-156	Friction rods	Positive and negative (one glass and one ebonite) in the set	7	1,700	11,900
3-157	Electrical pendulum	Two light-weight balls	2	1,000	2,000
3-158	Leaf electroscope	Of glass bottle	6	3,000	18,000
3-159	Electrostatics kit with graduation	For projection	7	9,500	66,500
3-160	Electrophorus	Diameter: 120mm	1	5,500	5,500
3-161	Van de Graaff electrostatic generator	Maximum output: approx. 250kV	1	64,000	64,000
3-162	Leyden jar	Diameter: approx. 95mm Height: approx. 190mm	2	5,200	10,400
3-163	Discharger	Overall length: 480mm	1	3,300	3,300
3-164	Insulating platform	A triangular platform, each side of which measures 300mm	1	7,700	7,700
3-165	Hamilton's electric whirl		1	1,100	1,100
3-166	Ohm's law demonstration apparatus	Operates on 3 ~ 6V DC	6	14,500	87,000
3-167	Resistance measurement practicing set	Wheatstone's bridge circuit	1	100,000	100,000
3-168	Circuit trainer	Resin block type	2	72,000	144,000
3-169	DC circuit trainer	3 pieces of 5 kinds resistance element	1	95,000	95,000
3-170	Slide rheostats	For demonstration Three a set	1	65,000	65,000
3-171	Slide rheostat	For student Total resistance: 30Ω Safety current: 2A	12	15,000	180,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-172	U-shaped magnet	Distance between arms inside: 50mm	7	1,800	12,600
3-173	Bar magnets	Length: 150mm Two to the set	7	1,600	11,200
3-174	Powerful bar magnets	Of N.K.S. steel	2	7,200	14,400
3-175	Powerful U-shaped magnets	Distance between arms inside: 45mm of ALNICO	2	6,700	13,400
3-176	Magnetic field creator	Two in one set	7	6,500	45,500
3-177	Electromagnet	U-shaped	7	2,700	18,900
3-178	Electromagnet	With Wartenhoffen pendulum	1	53,000	53,000
3-179	Magnetizing coil	With two solenoids (200-turns) and wire lead	2	8,800	17,600
3-180	Magnetic needle	Length of needle: 100mm	7	500	3,500
3-181	Magnetic compass	Diameter: 45mm In round metal case	7	300	2,100
3-182	Dip needle	Length of needle: 75mm With levelling screws	1	40,000	40,000
3-183	Deflection magnetometer	Length: 1,200mm	1	24,000	24,000
3-184	Oscillation magnetometer	Two bar magnets of N.K.S. steel Two brass bars	1	24,000	24,000
3-185	Primary and secondary coils	For demonstration	1	19,000	19,000
3-186	Primary and secondary coils	For student	6	12,500	75,000
3-187	Electromagnetic phenomena demonstration outfit	Coils: a 23,000T coil (for high voltage transformer) a 500T coil (with intermediate tap) a 250T coil and a 50T coil (with 6 taps)	1	82,000	82,000

No.	Name	Specification	Qty	Unit price	Amount
3-188	Case for electromagnetic phenomena demonstration outfit		1	14,000	14,000
3-189	Measurement of a magnetic field in fundamental combination	With air core solenoid	1	9,500	9,500
3-190	Induction coil	Spark gap: 100mm	1	90,000	90,000
3-191	Electromagnetic force demonstration	With a reflecting mirror and a coil for flux of electric current	1	8,200	8,200
3-192	Electromagnetic induction experiment kit	Speed reducing pulley: two kinds of 1:2 and 1:5	1	18,500	18,500
3-193	Fleming's law demonstrator		1	43,000	43,000
3-194	A. A. de la Rive's discharge tube	Discharge tube: outer diameter 90 x 215mm long	1	7,400	7,400
3-195	Rotating magnetic field demonstrator	With U-shaped magnet and rotator	1	17,000	17,000
3-196	Induction motor demonstrator	With field coil and basket-shaped rotator	1	15,500	15,500
3-197	Generator model for AC and DC	Rotator: rotation is made by manual handle	1	52,000	52,000
3-198	Self-induction current demonstrator		1	9,500	9,500
3-199	Dissectible transformer	Transforming into 10V, 6V, 4V and 2V	1	31,000	31,000
3-200	Small series motors		1	33,000	33,000
3-201	Single phase induction motor	Can be assembled and disassembled Diameter: 130mm	1	40,000	40,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-202	Demonstrator for conversion of energy	Weights: one 200g and two 400g	1	14,000	14,000
3-203	Demonstrator for conversion of energy	DC 6V	1	29,000	29,000
3-204	Electromagnetic induction demonstrator	Magnet pulling speed: switching in three stages	1	65,000	65,000
3-205	Magnetic circuit demonstrator	Excitation coil: 250/500/750/1,000 turns	1	150,000	150,000
3-206	Dynamo demonstrator	With a three-phase motor model Electromotive force: 8V	1	70,000	70,000
3-207	Resonating pendulums	Two large springs and one small spring	1	16,500	16,500
3-208	Electric resonance experimental set	Discharge distance: 0 ~ 5mm	1	27,000	27,000
3-209	Microwave demonstrator	Oscillating wave length: about 3cm	1	190,000	190,000
3-210	Simple radio wave experiment apparatus	For student Oscillation wave length: approx. 25cm	6	22,000	132,000
3-211	Audio amplifier	Output: 5W	1	58,000	58,000
3-212	Direct current amplifier	Amplification degree: 100x 500x 1000x	1	69,000	69,000
3-213	Electronic cooling demonstrator	With power supply	1	80,000	80,000
3-214	Spectrum tubes	Five a set: H, He, O, N, Ar	3	24,000	72,000
3-215	Spectrum tube	Ne	3	4,900	14,700
3-216	Spectrum tube	Cl	3	4,900	14,700
3-217	Spectrum tube	Hg	3	4,900	14,700

No.	Name	Specification	Q'ty	Unit price	Amount
3-218	Spectrum tube stand		2	6,200	12,400
3-219	Cross vacuum scales	Set of six	1	34,000	34,000
3-220	Vacuum discharge tube	Length: 400mm	2	6,200	12,400
3-221	Crookes' tube	With rotating wheel Horizontal type	1	12,000	12,000
3-222	Crookes' tube	With rotating wheel Vertical type	1	12,000	12,000
3-223	Crookes' tube	With cross	1	9,000	9,000
3-224	Crookes' tube	Showing magnetic field effect	1	9,000	9,000
3-225	Crookes' tube	With deflection electrode plate	1	17,000	17,000
3-226	e/m Measuring apparatus	Hermholtz coil: diameter about 30cm	1	95,000	95,000
3-227	Millikan's elementary charge apparatus	With microscope and electrode tank	1	75,000	75,000
3-228	Demonstration X-ray apparatus	With Laue-Debye-Sherrer's camera	1	530,000	530,000
3-229	Photoelectric demonstration set	With transmitter and receiver	1	72,000	72,000
3-230	Semi-conductor sample set		7	15,000	105,000
3-231	Semi-conductor element demonstration set		1	110,000	110,000
3-232	Franck-Hertz apparatus	Voltage for acceleration: DC 0 ~ 20V	1	85,000	85,000
3-233	Planck's constant apparatus	Filter: four kinds	1	58,000	58,000
3-234	Diffusion cloud chamber	Diffusion type (high temperature)	1	50,000	50,000
3-235	Wilson's cloud chamber	Spray type	1	42,000	42,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-236	Radiation detector	The GM tube used is for both beta and gamma rays	1	140,000	140,000
3-237	Radiation meter	Digital display	1	110,000	110,000
3-238	Geiger-Mueller probe stand	Shelf board: two kinds four pieces stand	1	15,500	15,500
	Total				¥11,772,500

I. Physics 4. Batteries and Power Supplies

No.	Name	Specification	Q'ty	Unit price	Amount
4-1	GS alkali storage battery	Capacity: 6V 7.5AH	7	43,000	301,000
4-2	Power source for vacuum tubes	Output: DC·AC 0 ~ 500V	2	63,000	126,000
4-3	Universal power house	Current capacity: 5A	6	35,000	210,000
4-4	Universal power house	Current capacity: 10A	1	70,000	70,000
4-5	Regulated DC power supply	DC output 1 ~ 15V 3A	6	60,000	360,000
4-6	Constant voltage power source	Capacity: 200VA	1	65,000	65,000
4-7	Auto-transformer	Safe current 10A AC 0 ~ 130V	3	21,000	63,000
4-8	Variable auto-transformer	Safe current 3A	2	17,000	34,000
4-9	Variable auto-transformer	Safe current 5A	2	39,600	79,200
4-10	Variable auto-transformer	Safe current 10A	2	46,000	92,000
	Total				¥1,400,200

II. EQUIPMENT FOR CHEMISTRY LABORATORY

NO.	Name of Article	Price Throusand Yen	Price US \$
1	Measuring Instruments	2,419	12,405
2	General Laboratory Apparatus	2,265	11,615
3	Experimental Instruments	3,855	19,769
4	Specimens and Models	289	1,482
Total:		8,828	45,271

II. Chemistry 1. Measuring Instruments

No.	Name	Specification	Q'ty	Unit price	Amount
1-1	Slide rule	25cm, made of bamboo	2	3,600	7,200
1-2	Counter	4 digits, with zero resetter	2	1,400	2,800
1-3	Tape measure	Of stainless steel 2 meters in case, mm graduations	2	800	1,600
1-4	Vernier calipers	Of stainless steel scale range: 0 ~ 150mm with case	1	4,800	4,800
1-5	Micrometer screw gauge	Measuring range: 0 ~ 25mm With ratchet stop	1	5,500	5,500
1-6	Measuring cylinders	One each of 10ml, 50ml, 100ml and 250ml	12	5,180	62,160
1-7	Measuring cylinders	500ml, 1,000ml	12	8,500	102,000
1-8	Hall's pipettes	One each of 5ml, 10ml, 20ml, 25ml and 50ml	12	3,380	40,560
1-9	Measuring pipettes	One each of 1ml, 2ml, 5ml and 10ml	12	1,680	20,160
1-10	Burette	One each of 10ml, 25ml, 50ml and 100ml	12	19,700	236,400
1-11	Measuring flasks	One each of 25ml, 50ml, 100ml and 250ml	12	6,100	73,200
1-12	Measuring flasks	500ml, 1,000ml	12	5,300	63,600
1-13	Gas burette	100ml Minimum division 0.2ml	2	15,000	30,000
1-14	Table balance	Capacity: 100g Sensitivity: 0.1g	12	7,000	84,000
1-15	Pharmaceutical balance	Capacity: 50g Sensitivity: 10mg	2	27,000	54,000

No.	Name	Specification	Qty	Unit price	Amount
1-16	Analytical balance	Capacity: 200g Sensitivity: 2mg	1	120,000	120,000
1-17	Direct reading analytical balance	Capacity: 200g Sensitivity: 0.1mg	2	380,000	760,000
1-18	Automatic table balance	Capacity: 200g Sensitivity: 2g	2	4,800	9,600
1-19	Hydrometer	A set of seven With thermometer	2	10,000	20,000
1-20	Precision balance	Capacity: 310g	4	44,000	176,000
1-21	Double chain dial balance	Capacity: 50g Sensitivity: 10mg	1	37,000	37,000
1-22	Stop watch	30-minute stop watch	2	13,000	26,000
1-23	Stop watch	30-minute stop watch with push	2	14,000	28,000
1-24	Digital stop watch	Minimum graduation: 0.01 second With push	2	18,000	36,000
1-25	Alarm stop clock	Second hand: can be returned to the zero point	1	6,500	6,500
1-26	Thermometer	Mercury, -5° ~ +105°C	12	700	8,400
1-27	Thermometer	Mercury, 0° ~ 360°C	12	1,200	14,400
1-28	Thermometer	Alcohol, -30° ~ +50°C	12	450	5,400
1-29	Thermometer	Alcohol, -5° ~ +105°C	12	400	4,800
1-30	Thermister thermometer	Measuring range: -25° ~ 60° / 60° ~ 150°C two ranges	2	64,000	128,000
1-31	DC voltmeter	3/15/300V	2	7,000	14,000
1-32	AC voltmeter	15/150V	1	7,000	7,000

No.	Name	Specification	Qty	Unit price	Amount
1-33	DC ammeter	50/500mA /5A	2	7,000	14,000
1-34	AC ammeter	100mA /1 /10A	1	7,000	7,000
1-35	Precision DC voltammeter	Seven ranges	1	32,000	32,000
1-36	Milli-voltmeter	0 ~ 50mV	1	59,000	59,000
1-37	Circuit tester	Ohms 20k Ω /2m Ω	2	5,500	11,000
1-38	DC voltmeter	250mV /2.5V	6	9,000	54,000
1-39	Electronic voltmeter	Electric power: AC Range: 0 ~ 500V	1	53,000	53,000
					¥2,419,080

II. Chemistry 2. General Laboratory Apparatus

No.	Name	Specification	Q'ty	Unit price	Amount
2-1	Water jet pump	Of glass Length: 200mm	7	1,400	9,800
2-2	Hand centrifuge	Two 15ml tubes	1	9,000	9,000
2-3	Electric centrifuge	Holds four 15ml tubes Operates at 0 ~ 3,000 rpm	1	56,000	56,000
2-4	Automatic water distillation apparatus	Distilling capacity: 3 ~ 4 litres per hour, 3kW	1	95,000	95,000
2-5	Ionization water purification apparatus	Capacity: 10 litres per hour	1	99,000	99,000
2-6	Foot bellows	Width: approx 200mm	2	8,000	16,000
2-7	Schöibler's desiccator	Diameter: 240mm With porcelain shelf plate	3	13,000	39,000
2-8	Soil sieve set	Of brass Inner diameter: 55mm Set of five	1	10,000	10,000
2-9	Platinum needle	Diameter: 0.3mm Length: 50mm With glass holder	12	1,700	20,400
2-10	Cork squeezer	Wheel type	2	3,800	7,600
2-11	Cork borers	Set of six	2	1,100	2,200
2-12	Cork borer	Desk type With set of cutters (six)	1	27,000	27,000
2-13	Blowpipe	Of brass	6	900	5,400
2-14	Steel mortar	Diameter: 150mm	2	6,500	13,000
2-15	Porcelain mortars	Set of three	6	1,400	8,400
2-16	Alumina mortar	Diameter: approx. 50mm	2	4,000	8,000

No	Name	Specification	Q'ty	Unit price	Amount
2-17	Warehouse for chemicals		2	160,000	320,000
2-18	Iron stand	Supporting rod: diameter 16mm	1	17,000	17,000
2-19	Iron stand	Supporting rod: diameter 12mm	2	9,800	19,600
2-20	Retort stand	Supporting rod: height 500mm	12	4,800	57,600
2-21	Portable universal knockdown stand		2	24,500	49,000
2-22	Funnel stand	Of metal With holder for two funnels	12	1,900	22,800
2-23	Burette stand	Of metal Holds two burettes	12	2,800	33,600
2-24	Pipette stand		12	1,800	3,600
2-25	Iron tripod	Height: 210mm Diameter: 90mm	12	500	6,000
2-26	Test tube stand	Of plastics Holds 12 test tubes	14	450	6,300
2-27	Crucible tongs	Of stainless steel	12	500	6,000
2-28	Height adjustable stand		2	9,500	19,000
2-29	Alcohol lamp	100ml	12	400	4,800
2-30	Gas burner		7	1,600	11,200
2-31	Bunsen gas blast burner	With universal joint	2	9,000	18,000
2-32	Electric heater		1	5,000	5,000
2-33	Magnifying glass	Magnification: 5x	2	1,000	2,000
2-34	Overhead projector		1	98,000	98,000
2-35	Projecting table for OHP	Also for housing OHP	1	29,000	29,000
2-36	Transparency		1	126,000	126,000
2-37	TP (projection film for OHP use) art kit		1	12,500	12,500

No.	Name	Specification	Qty	Unit price	Amount
2-38	Projection screen	Size: 180 x 180cm With portable stand	1	36,000	36,000
2-39	Microscope		2	34,500	69,000
2-40	Metallurgical microscope	Magnification: 30x ~ 1,500x With lamps	1	155,000	155,000
2-41	Horizontal and vertical phenomena projector	With chemical instruments for projection	1	90,000	90,000
2-42	Slide rheostats	A set of three	1	65,000	65,000
2-43	Auto-transformer	AC 0 ~ 130V Safe current: 10A	1	21,000	21,000
2-44	GS alkali storage battery	Capacity: 6V / 15AH	2	43,000	86,000
2-45	Universal power house	DC-V 0 ~ 12V (5A) AC-V 0 ~ 130V (3A)	1	50,000	50,000
2-46	Regulated DC power supply	DC output 1 ~ 15V 1A	6	48,000	288,000
2-47	Induction coil	Spark gap 60mm	1	78,000	78,000
2-48	Electric hot cone heater	Maximum temperature: 600°C	1	34,000	34,000
	Total				¥2,264,800

II. Chemistry 3. Experimental Instruments

No.	Name	Specification	Q'ty	Unit price	Amount
3-1	Rotary vacuum pump	With electric motor Ultimate vacuum: 10^{-3} Torr	1	115,000	115,000
3-2	Vacuum manometer	Measuring range: 0 ~ 160mmHg With a movable mirror scale	1	1,100	1,100
3-3	Dewar's vessel	400ml With wooden base	2	5,000	10,000
3-4	Hot air drier	Heater: 350W With stand	2	7,500	15,000
3-5	Mechanical gas model	With motor	1	27,000	27,000
3-6	Brownian movement apparatus	Can be used for both liquids and gases	2	27,000	54,000
3-7	Direct vision pocket spectroscope	Length of the tube: 90mm Length of slit edge: 4mm	7	11,500	80,500
3-8	Demonstration volta cell	Removable electrode type	2	2,800	5,600
3-9	Daniel cell	Cylindrical type	1	5,000	5,000
3-10	Copper voltameter	Copper plate: W100 x L130mm With wooden base	1	25,000	25,000
3-11	Kipp's gas generator	Capacity: 500ml	7	14,000	98,000
3-12	Liebig's condenser	Of glass Length of outer tube: 360mm	7	2,200	15,400
3-13	Soxhlet's fat extractor	With three flasks	3	11,000	33,000
3-14	Heater for Soxhlet's fat extractor	Holds four flasks	1	60,000	60,000
3-15	Aspirating bottle	500ml	7	2,300	16,100
3-16	Aspirating funnel	Diameter: 90mm	7	1,000	7,000
3-17	Hot water funnel	Diameter: approx. 100mm	2	4,000	8,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-18	Hemispherical water bath	Diameter: 180mm Of copper	7	4,000	28,000
3-19	Electric water bath	Outside diam of bath: 240mm	1	46,000	46,000
3-20	Hofmann electrolysis apparatus	With platinum electrodes	12	17,000	204,000
3-21	Eudiometer	With graduated glass tube	1	14,500	14,500
3-22	Heumann's ozonizer	Length: 320mm With stand	1	10,000	10,000
3-23	Osmotic pressure demonstrator	Diameter of somotic filter: 50mm With water container	2	5,200	10,400
3-24	Glass electrode pH meter	Graduation for measurement: pH 0 ~ 14 Portable	1	68,000	68,000
3-25	Yamada's pH indicator set	The range between pH 4 and pH 10 is divided into 13 reaction colors.	7	2,600	18,200
3-26	Beckmann's molecular weight apparatus	Set of both boiling point and freesing point apparatus	1	65,000	65,000
3-27	Ukena's colorimeter	Ten colorimetry tubes	1	20,000	20,000
3-28	Pippettes washer	Of plastics	1	48,000	48,000
3-29	Photoelectric colorimeter	Digital display: with three filters	1	140,000	140,000
3-30	Photoelectric colorimeter	Diffraction grating type Range of wave length: 340~ 950m μ	1	320,000	320,000
3-31	Laurent system Polari-Sacchari meter	Polarization graduations: +130° ~ -130°	1	195,000	195,000
3-32	Abbe's refractometer	Measuring range: index of refraction 1.3000 ~ 1.7000	1	220,000	220,000
3-33	Test tube drier	Twelve test tubes can be dried at the same time.	1	48,000	48,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-34	Electric drying oven	Maximum temperature: 150°C Internal dimensions: W450 x D400 x H400mm	1	72,000	72,000
3-35	Electric drying oven	Maximum temperature: 200°C Internal dimensions: W450 x D400 x H400mm	1	117,000	117,000
3-36	Infrared ray drier	Two infrared lamp used	1	75,000	75,000
3-37	Electric thermostat	Maximum temperature: 80°C Dimensions of the water tank: W350 x D500 x H350mm	1	280,000	280,000
3-38	Electric crucible furnace	Maximum temperature: 1,000°C Maximum power consumed: 1.7kW	1	90,000	90,000
3-39	Magnetic stirrer	Dimensions of main part of stirrer: dia. 180mm With heating bath	1	63,000	63,000
3-40	Magnetic mini-stirrer	Three kinds of rotators	6	9,000	54,000
3-41	Paper chromatograph jar	Both ascending and descending method are functioned.	2	13,000	26,000
3-42	Orsat's gas analyzer	Capacity of gas burette: 50ml	1	52,000	52,000
3-43	Kjeldahl's nitrogen determination apparatus	With stand (double type for two flasks)	1	16,000	16,000
3-44	Electric heating mantle	Temperature regulating	2	23,000	46,000
3-45	Immersion heater		2	10,000	20,000
3-46	Laboratory cart	Two plastic made shelves Four casters	2	15,000	30,000
3-47	Electric muffle furnace	Internal dimensions of the furnace: W150 x D300 x H100mm Maximum power used: 3.2kW	1	180,000	180,000

No.	Name	Specification	Q'ty	Unit price	Amount
3-48	Semimicro chemical kit	19 kinds With container	1	36,000	36,000
3-49	Bottle set for chemicals for semimicro chemical kit	105 reagent bottles	1	18,000	18,000
3-50	Accessory set for semimicro chemical kit	28 accessories included	1	7,000	7,000
3-51	Gas burner for semimicro chemical kit		1	3,200	3,200
3-52	Chemistry experiment kit	With case	2	30,000	60,000
3-53	Pensky and Marten's flash point tester	Gas-heated type	1	110,000	110,000
3-54	Redwood's viscosimeter		1	110,000	110,000
3-55	Refrigerator	1701 or larger	1	200,000	200,000
3-56	Variable auto-transformer	Safe current 3A	2	17,000	34,000
3-57	Variable auto-transformer	Safe current 5A	2	39,600	79,200
3-58	Variable auto-transformer	Safe current 10A	1	46,000	46,000
	Total				¥3,855,200

II. Chemistry 4. Specimens and Models

No.	Name	Specification	Q'ty	Unit price	Amount
4-1	Plastic	10 kinds in a case	1	7,000	7,000
4-2	Metal	15 kinds in a case	1	6,000	6,000
4-3	Alloy	10 kinds in a case	1	4,500	4,500
4-4	Pigment	10 kinds in a case	1	7,000	7,000
4-5	Coal industry	Dimensions: approx. 32 x 43 x 4cm	1	8,000	8,000
4-6	Oil refining steps	Dimensions: approx. 32 x 43 x 4cm	1	8,000	8,000
4-7	Molecular model		7	26,000	182,000
4-8	Crystal model assembly set		1	44,000	44,000
4-9	Molecular model for lecture		1	22,000	22,000
	Total				¥288,500

