

3. TCVN 取得手順¹⁾

TCVN の規格制度の開発は、MOST の STAMEQ（基準・計量・品質総局）と STAMEQ 傘下の VSQI（ベトナム基準品質機関）や QUACERT（ベトナム認証センター）等が管轄している。

表-12 MOST 組織別の業務内容

略称	日本語訳	業務内容
MOST	科学技術省	<ul style="list-style-type: none"> 科学技術関連業務 知的財産権に係る業務全般 標準化活動統括
STAMEQ	標準・計量・品質総局	<ul style="list-style-type: none"> 標準、計量及び品質管理に関する法律及び開発計画の作成 TCVN の開発等による国家規格体系の統一 適合性評価制度にかかわる規制及び指導 国家計量標準の維持及び改正 標準、計量及び品質に関し他の省庁・機関組織に対する指導・監督
BOA	認定局	<ul style="list-style-type: none"> 試験所・校正機関、検査機関、認証機関等の適合性評価機関の認定
VSQI	ベトナム標準品質機関	<ul style="list-style-type: none"> TCVN の開発 TCVN の国際標準への整合化 標準化の専門委員会の事務局 標準化関連の文書発行 規格の普及に係るコンサルティング業務等
QUACERT	ベトナム認証センター	<ul style="list-style-type: none"> 製品認証及びマネジメントシステム認証
QUATEST	品質保証試験センター	<ul style="list-style-type: none"> QUATEST1：機械及び電気電子製品、繊維製品、農産物等の試験や検査、一部製品認証 QUATEST2：製品の試験や検査 QUATEST3：試験業務、製品認証業務、各種コンサルティング業務

出典：「ベトナム社会主義共和国 基準認証制度運用体制強化プロジェクト詳細計画策定調査報告書」を参考に JST 作成

TCVN の基準を作成する方法には、下記に示す 3 通りの方法がある。

[CASE1]：古くなった TCVN を修正する

[CASE2]：海外の基準をそのまま翻訳する、もしくは翻訳したものを一部修正する
(他の基準と混ぜる場合もある)

[CASE3]：TCCS から TCVN に繰り上げる

TCVN を基準化するには、最低でも 2 年間かかり、実際には実験等も必要になる可能性もあることから、さらに時間がかかるケースが多い。一般的な TCVN の基準化プロセスを図 1-13 に示す。

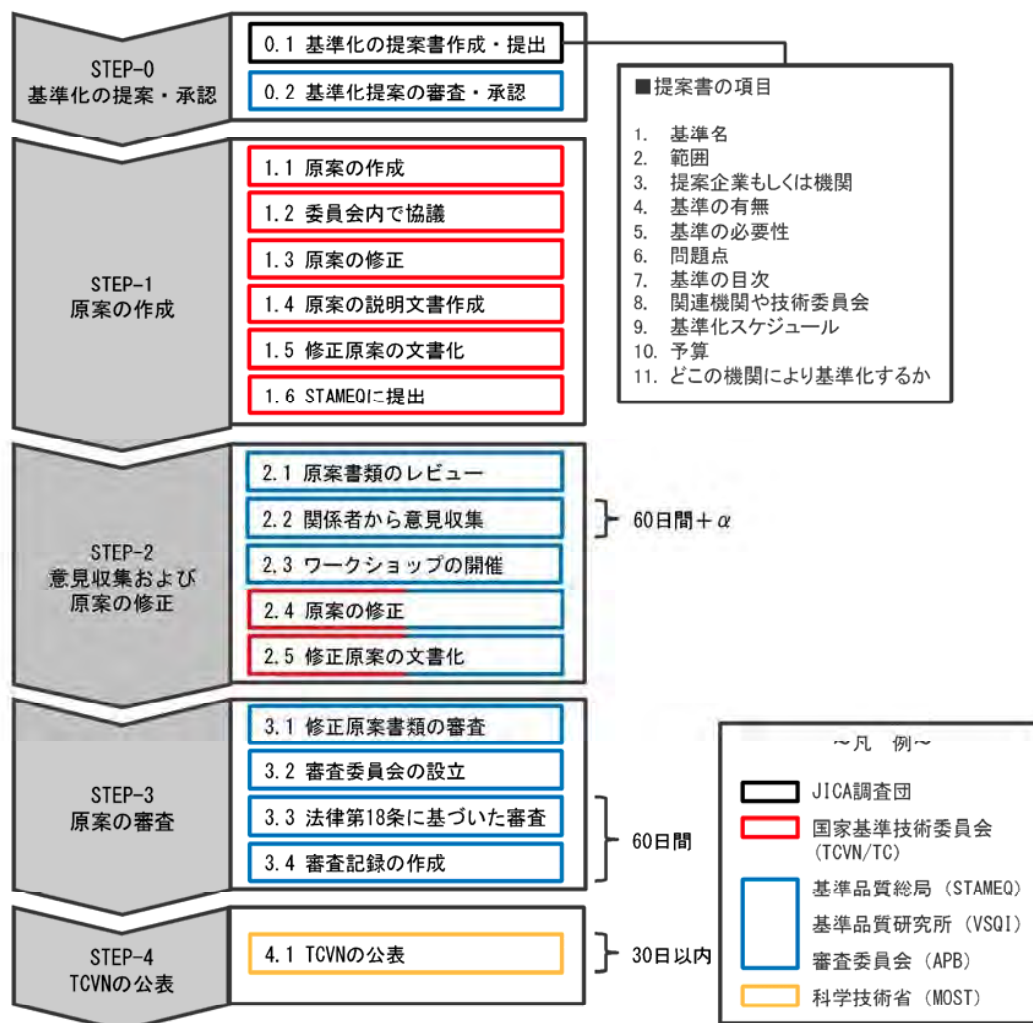


図-18 TCVN 基準化プロセス

国家基準技術委員会(TCVN/TC) 及び審査委員会 (APB) の編成方法を以下に示す。

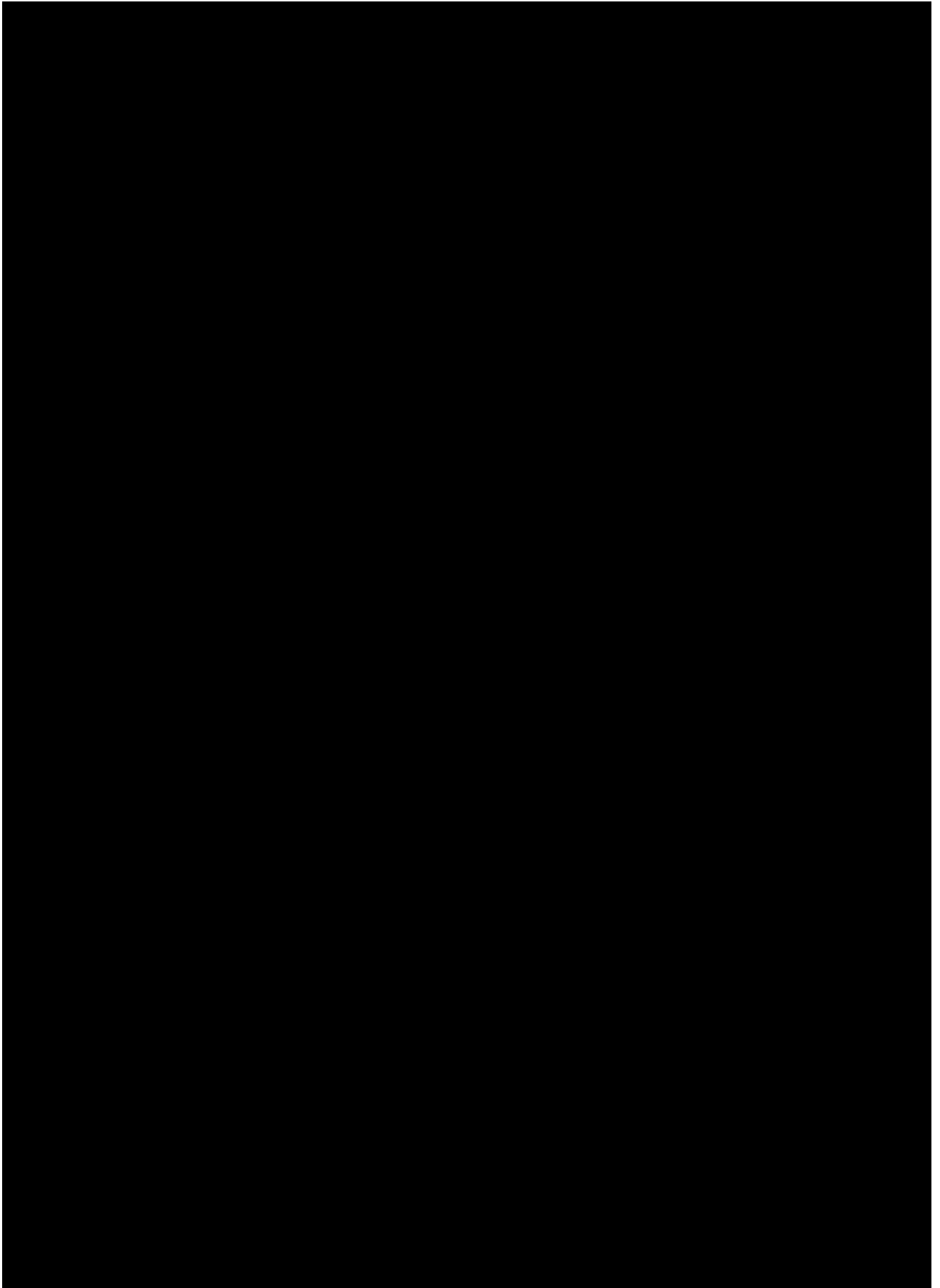
- ・ 国家基準技術委員会：提案者、学識者及び研究機関等から編成される
- ・ 審査委員会：STAMEQ と VSQI に加えて、専門知識をもつ専門家により編成される。

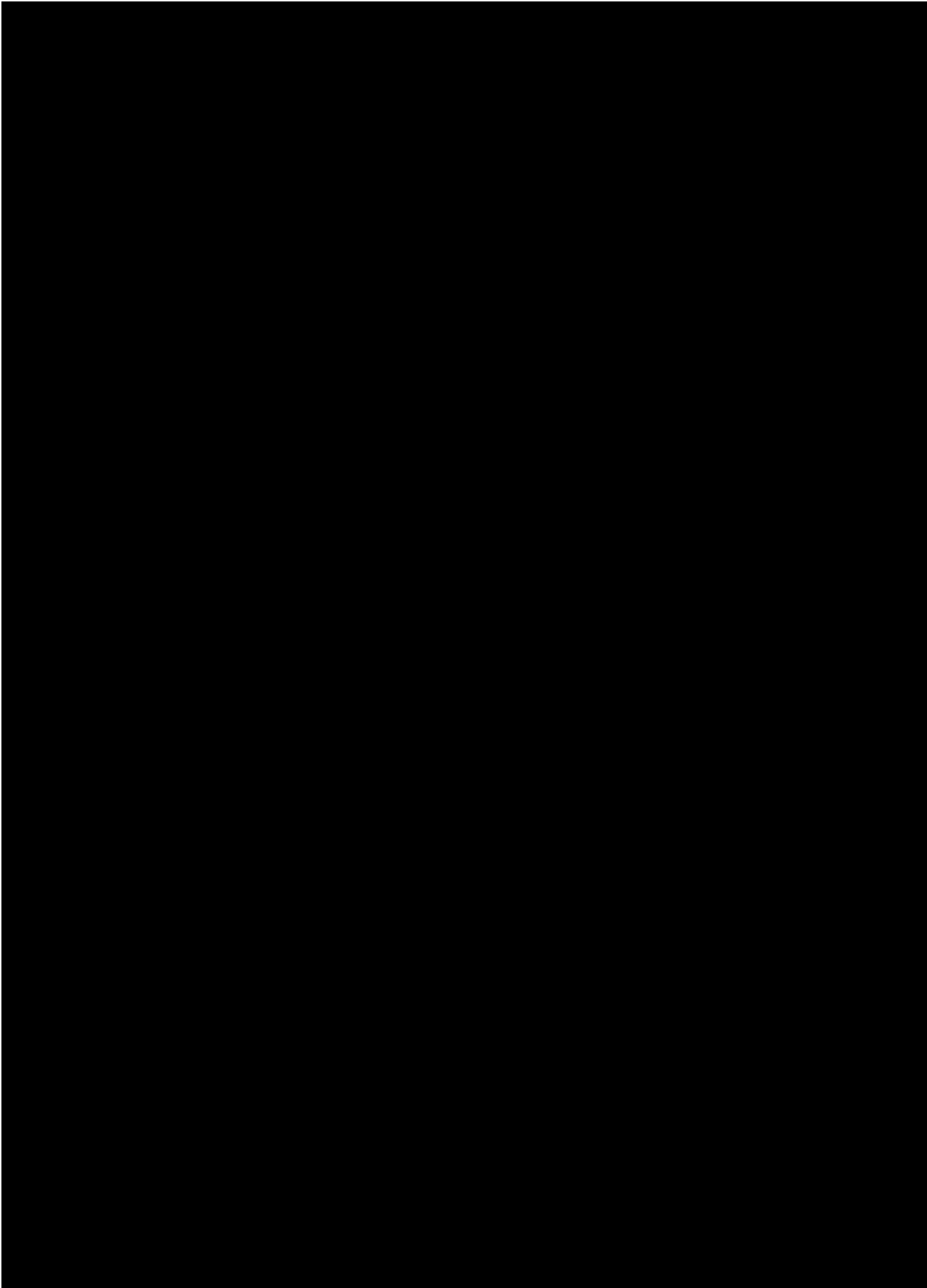
参考文献

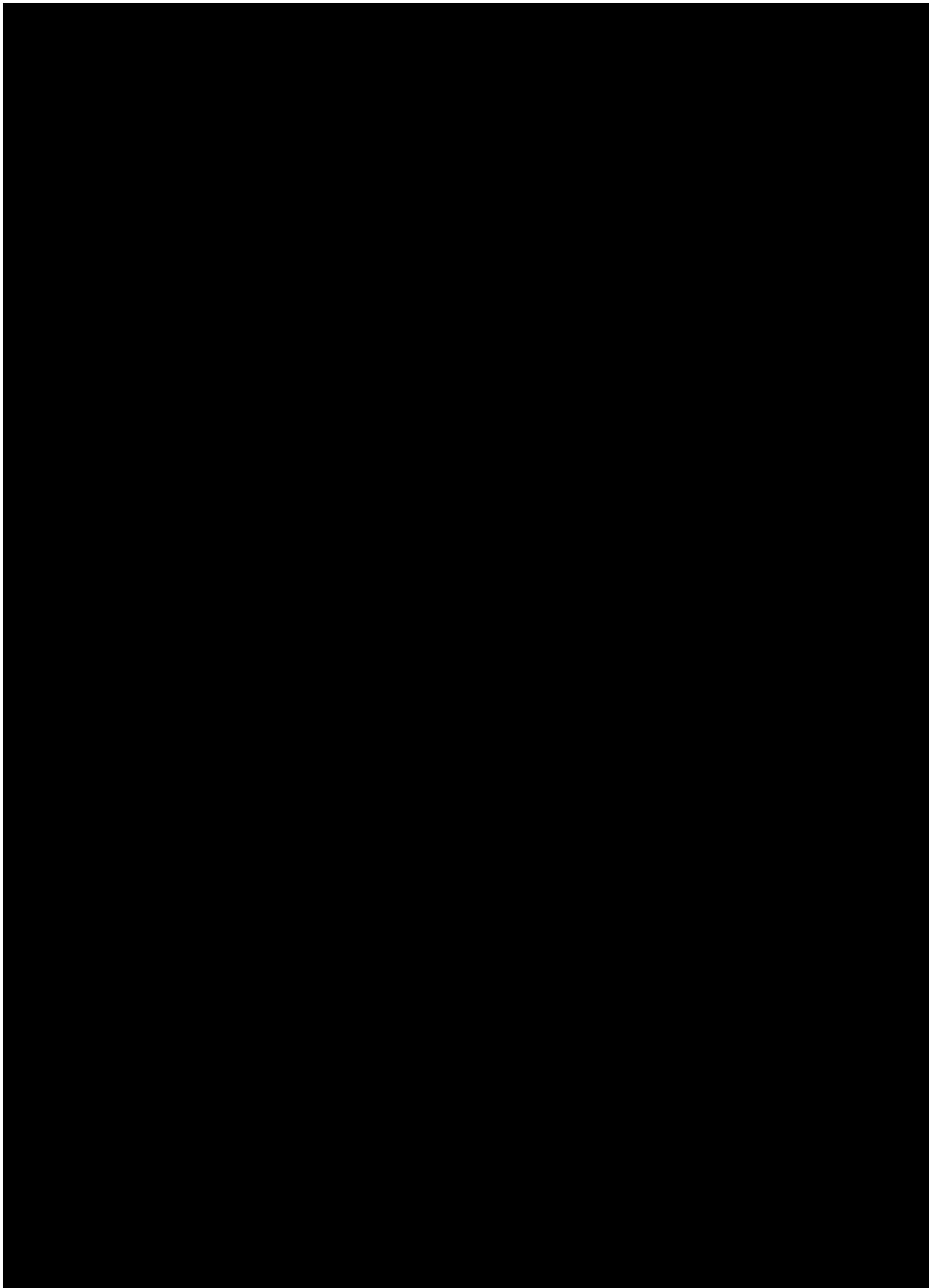
- 1) ベトナム国軟弱地盤地域における TNF 工法（地盤改良型直接基礎構造）普及に向けた案件化調査業務完了報告書/平成 28 年 6 月/株式会社タケウチ建設

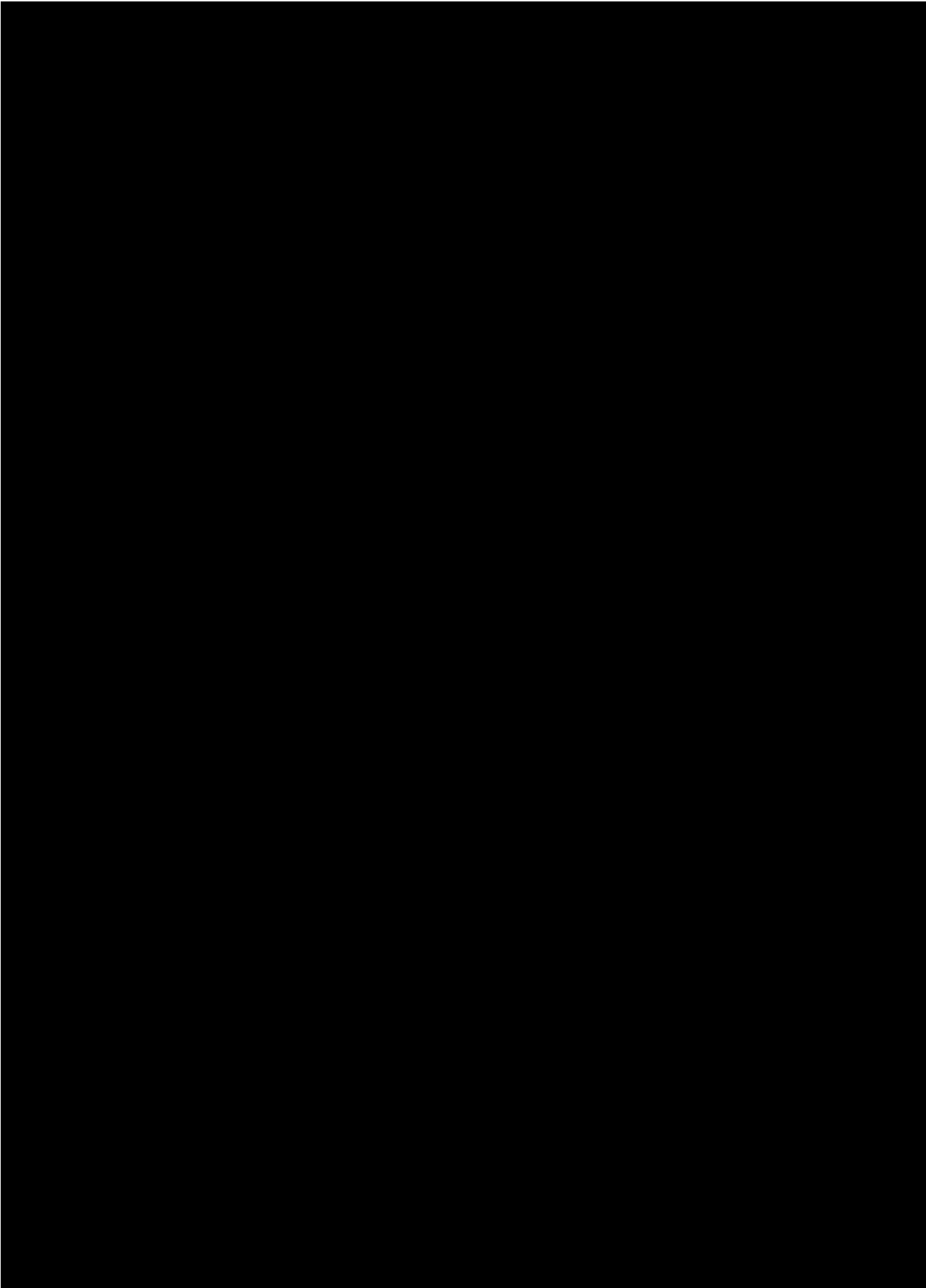
4. 鉄道線施工基準

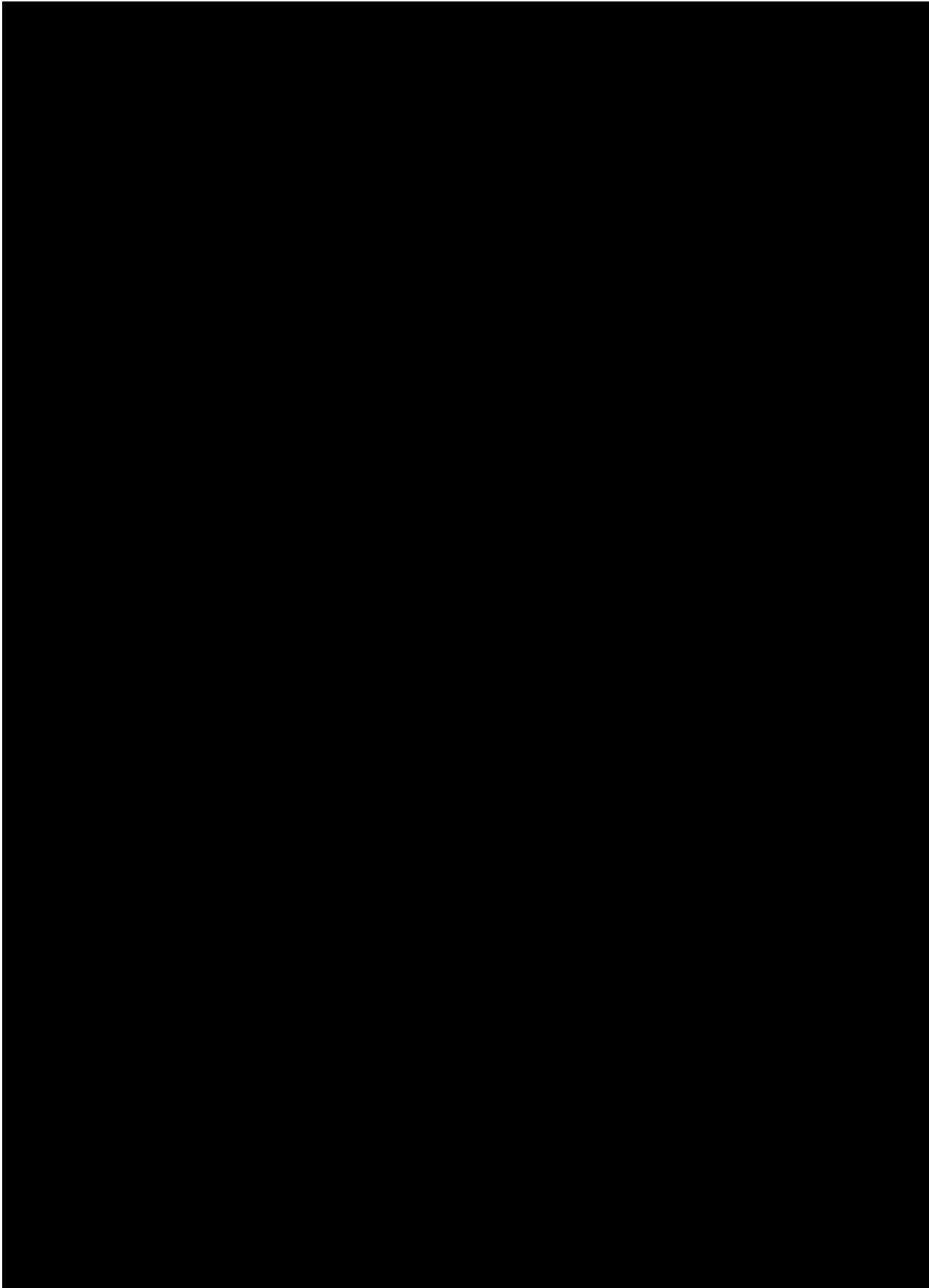
VNR から入手した鉄道線施工基準を以下に示す。

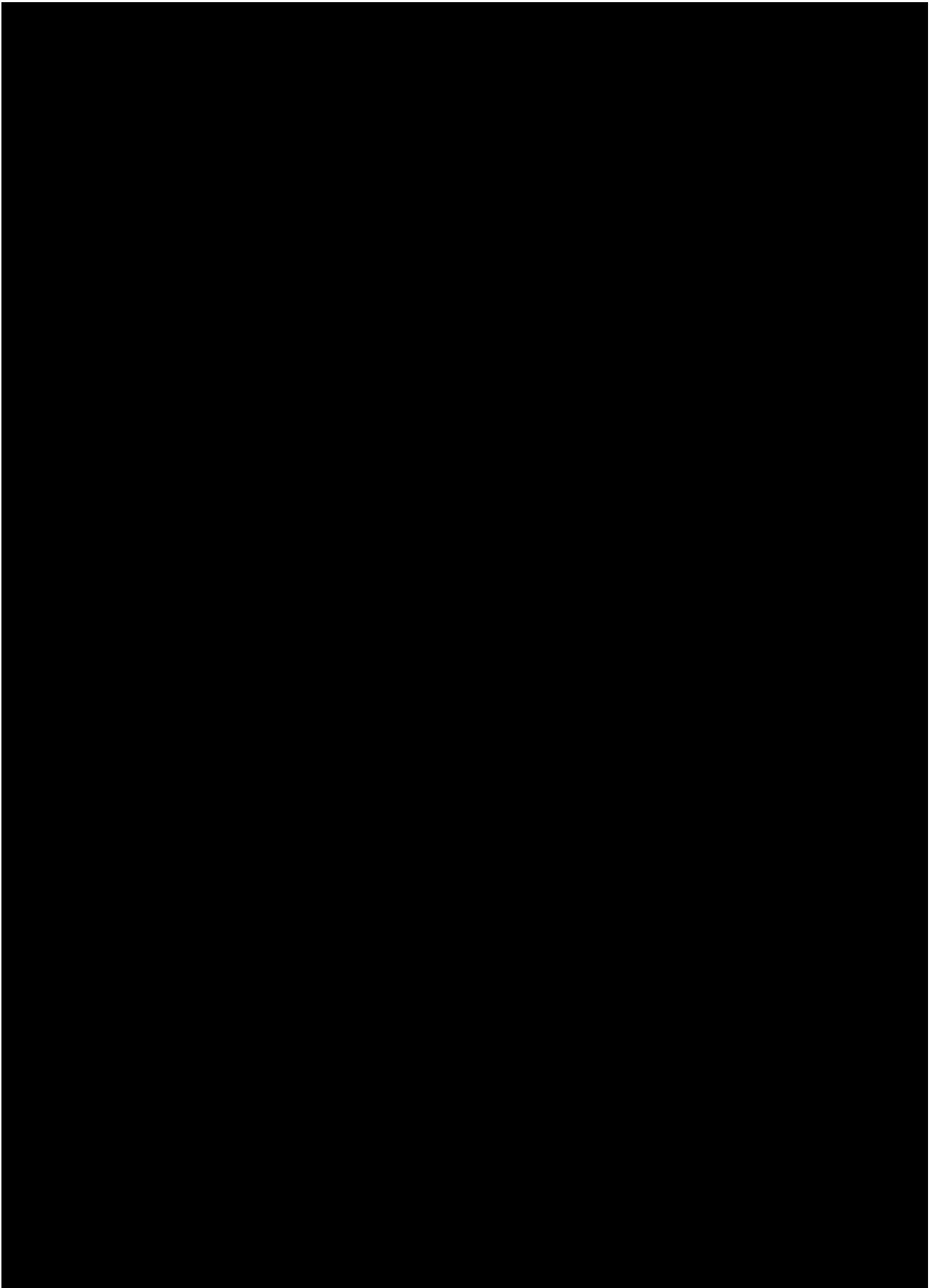


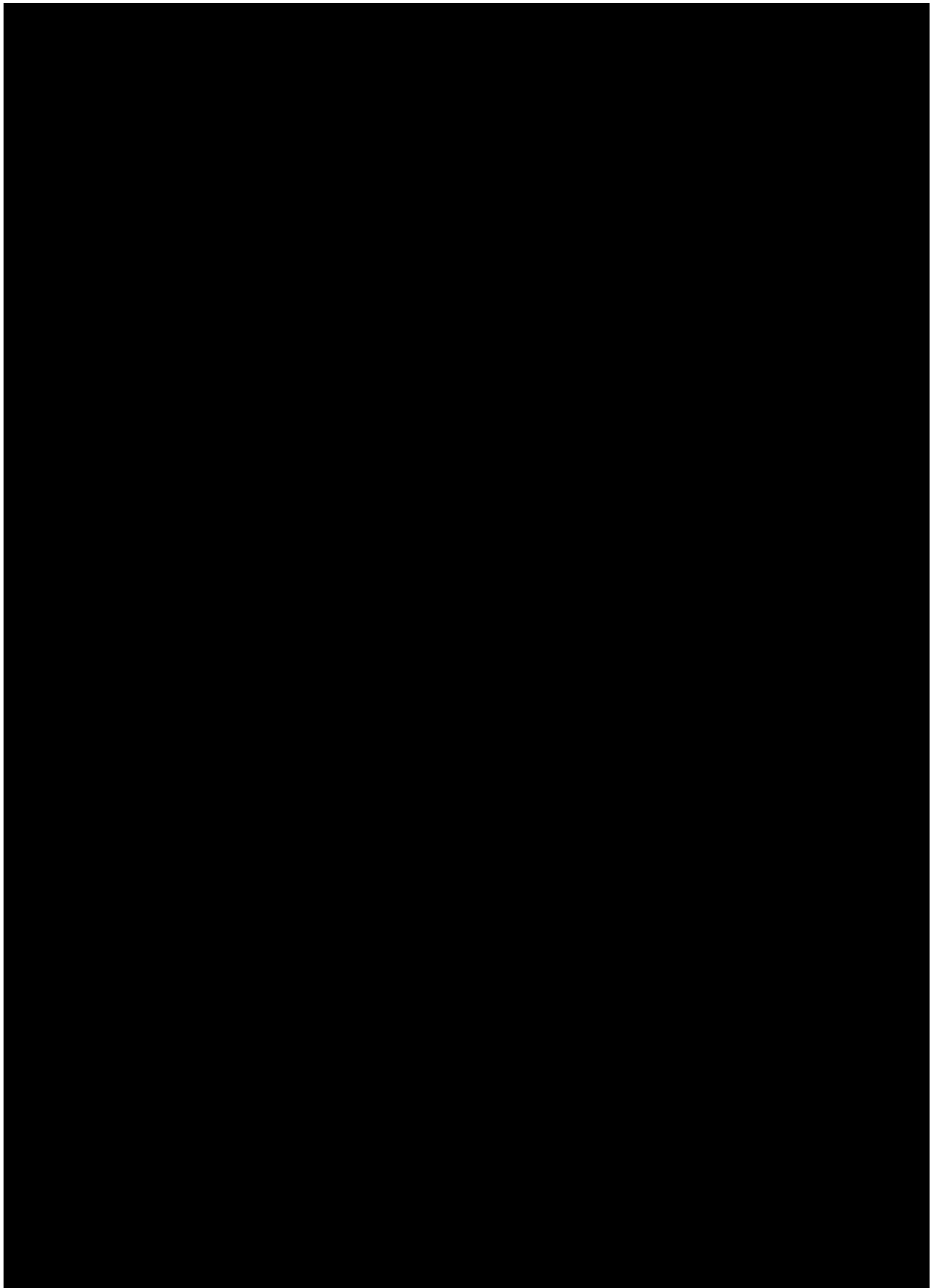


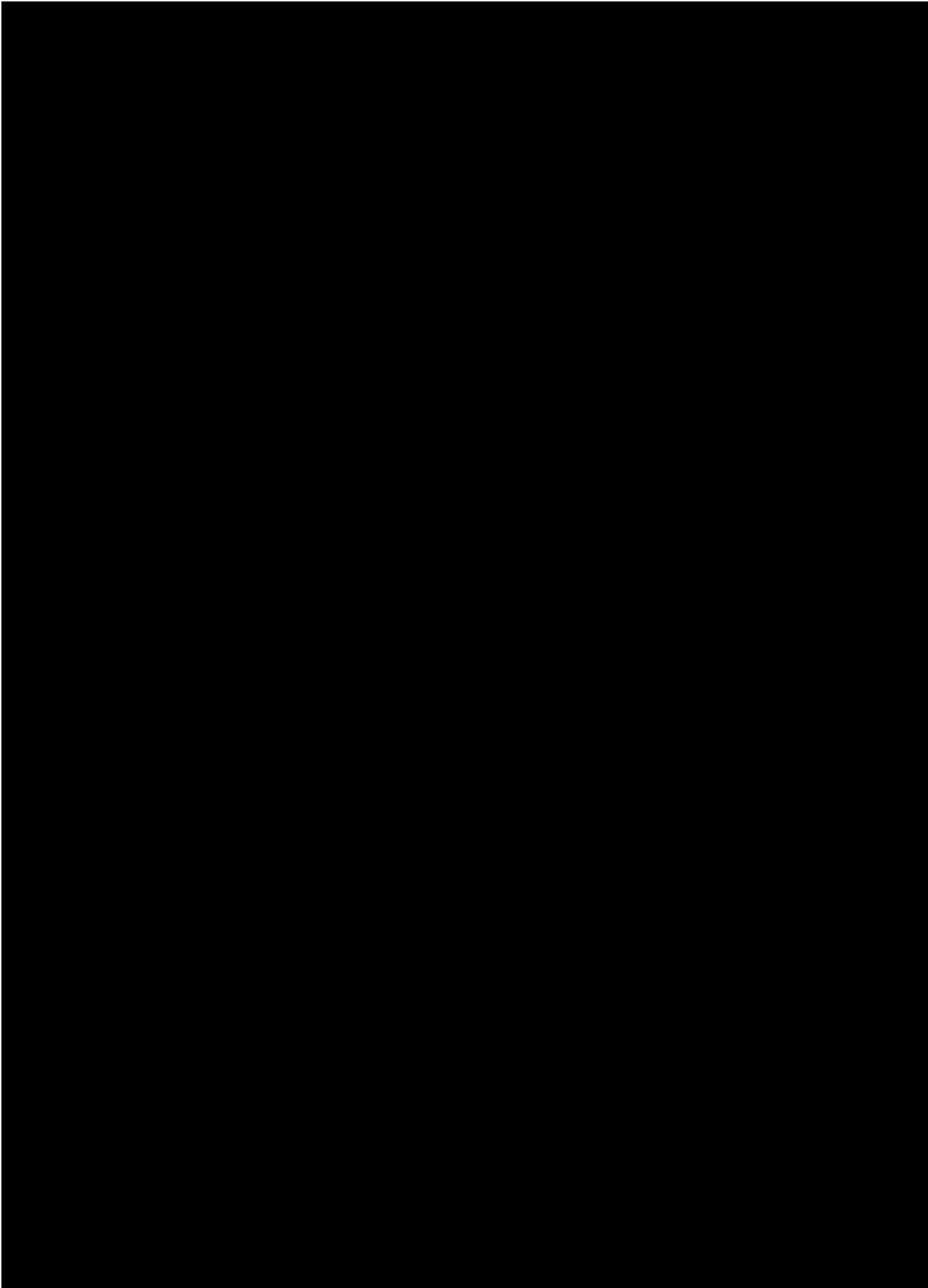


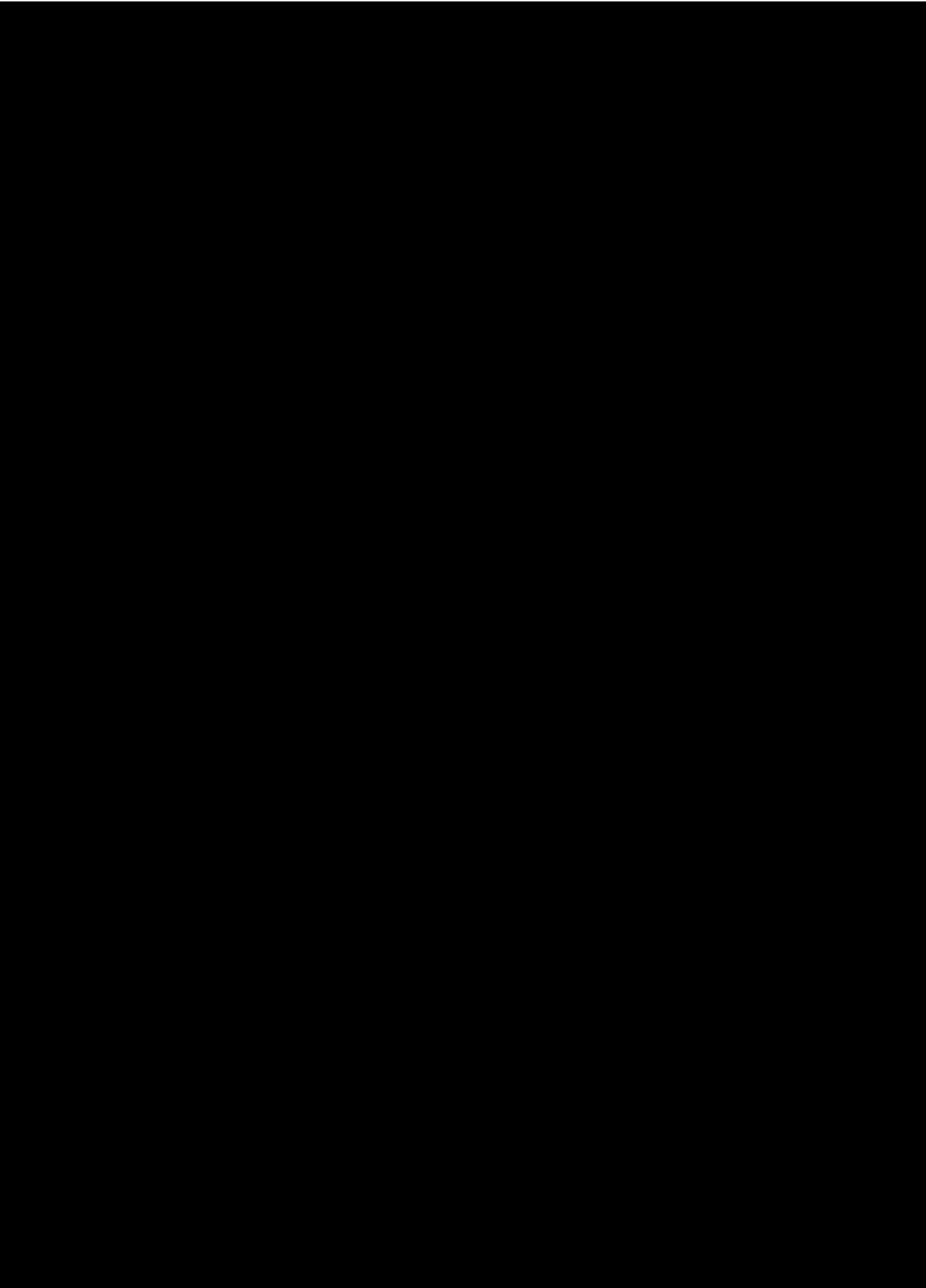


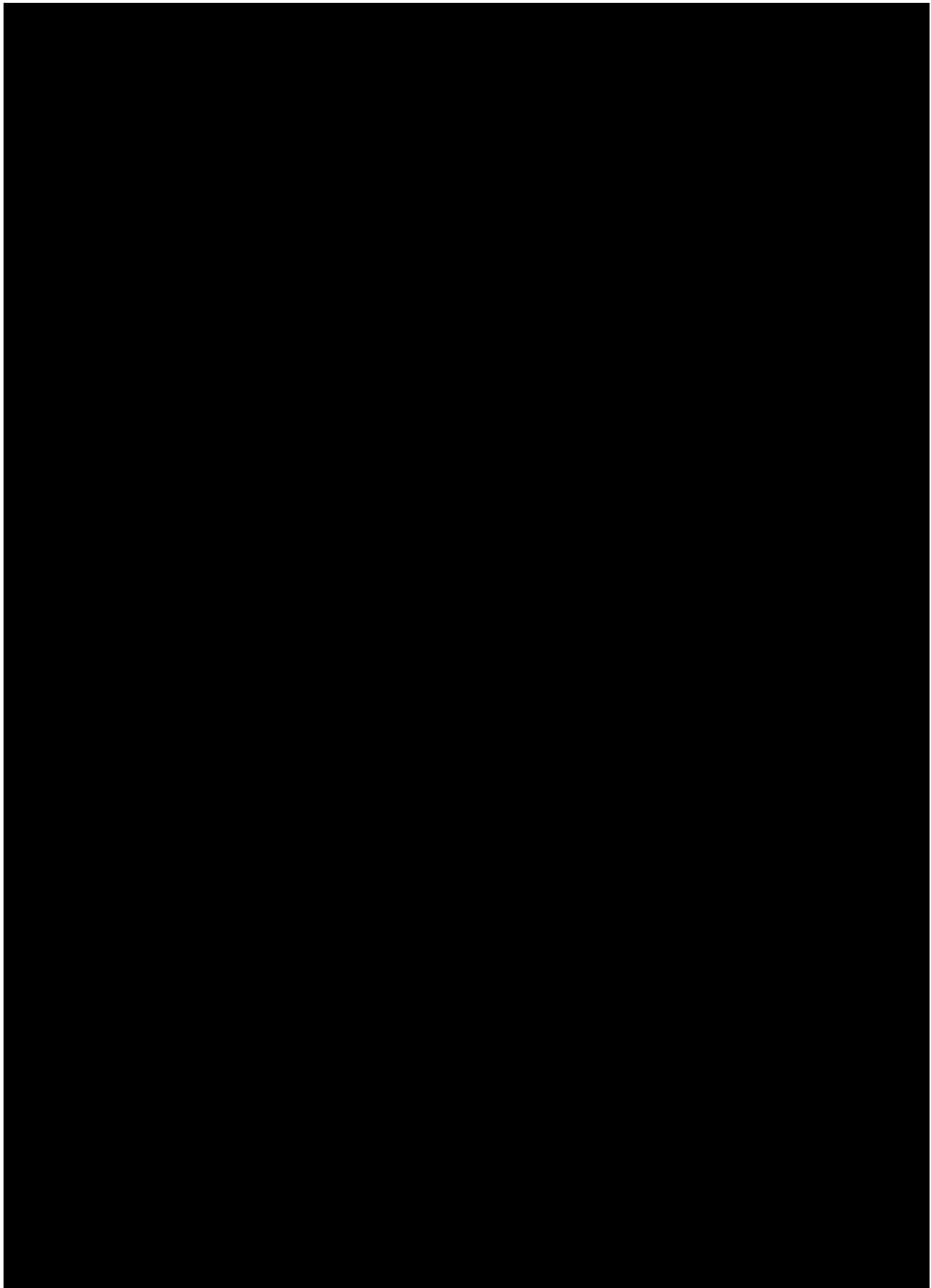


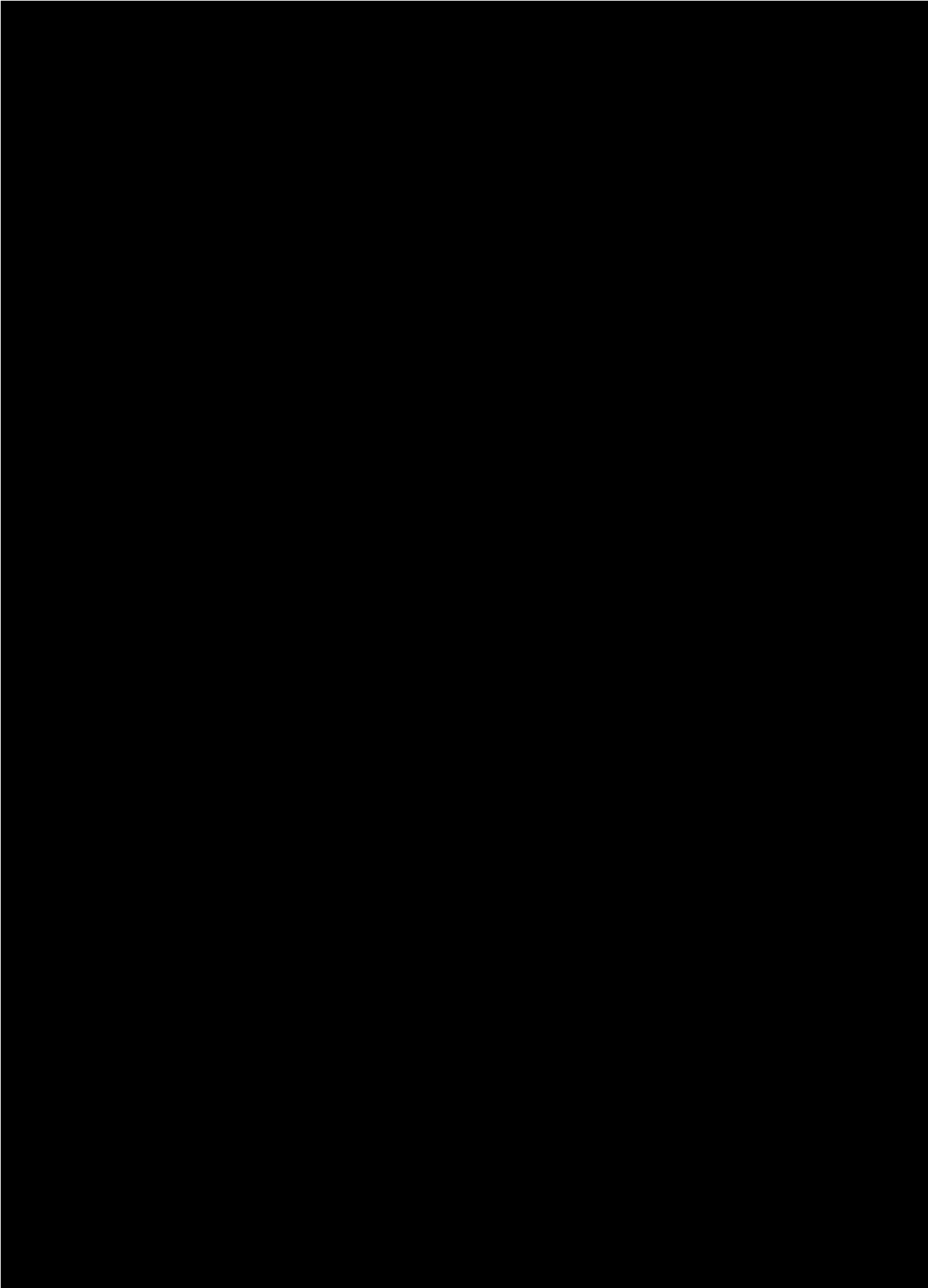


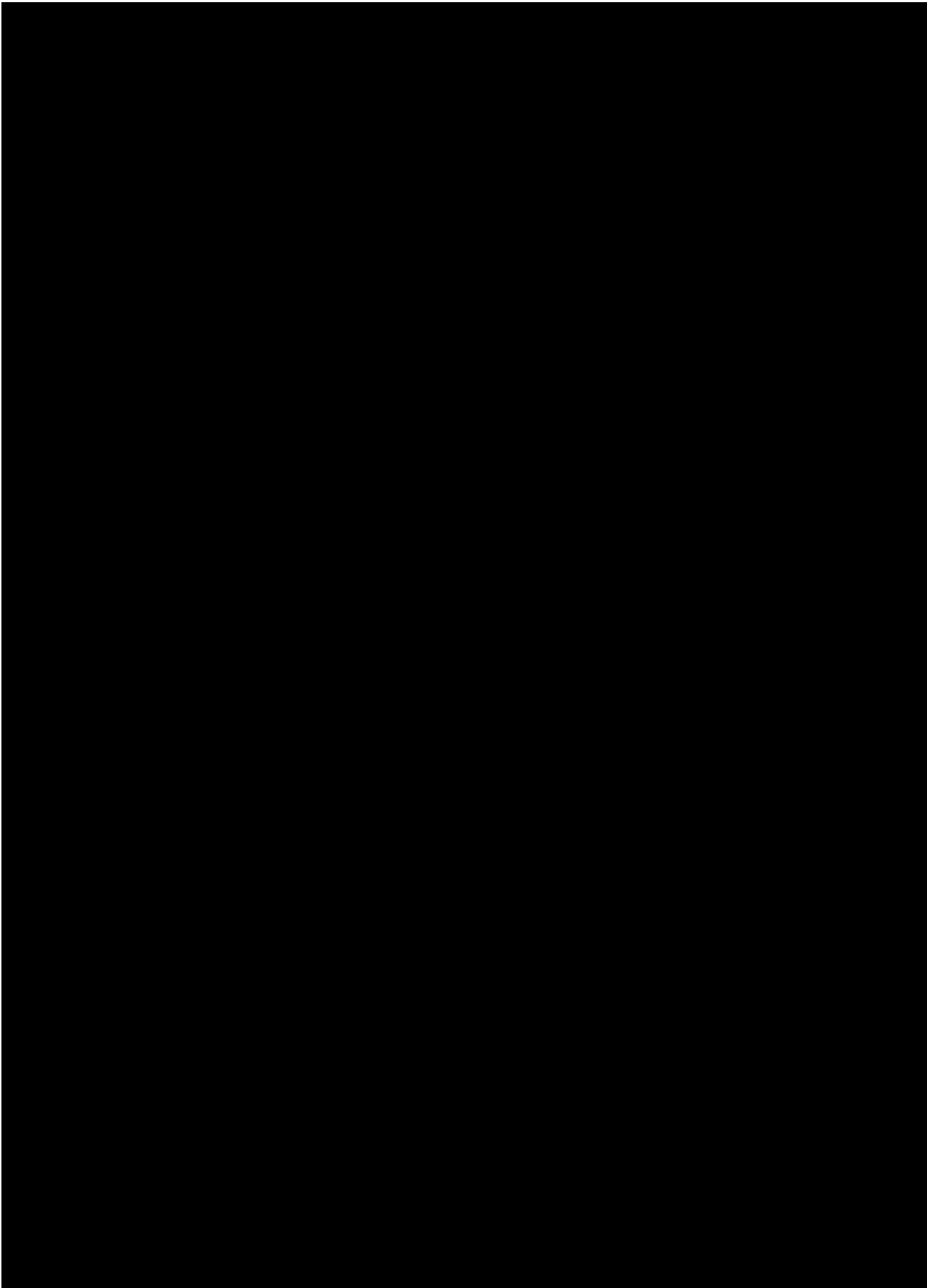


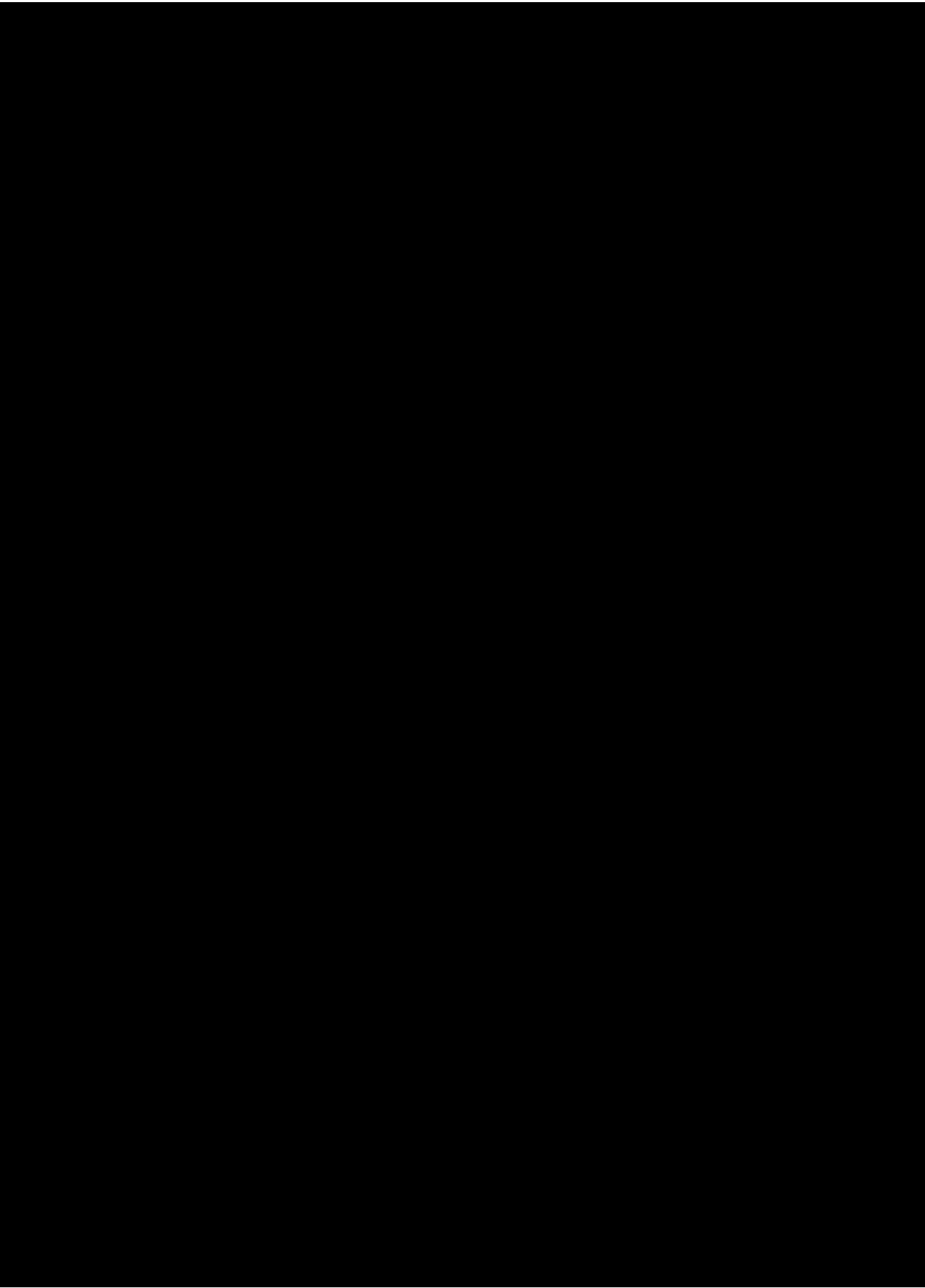


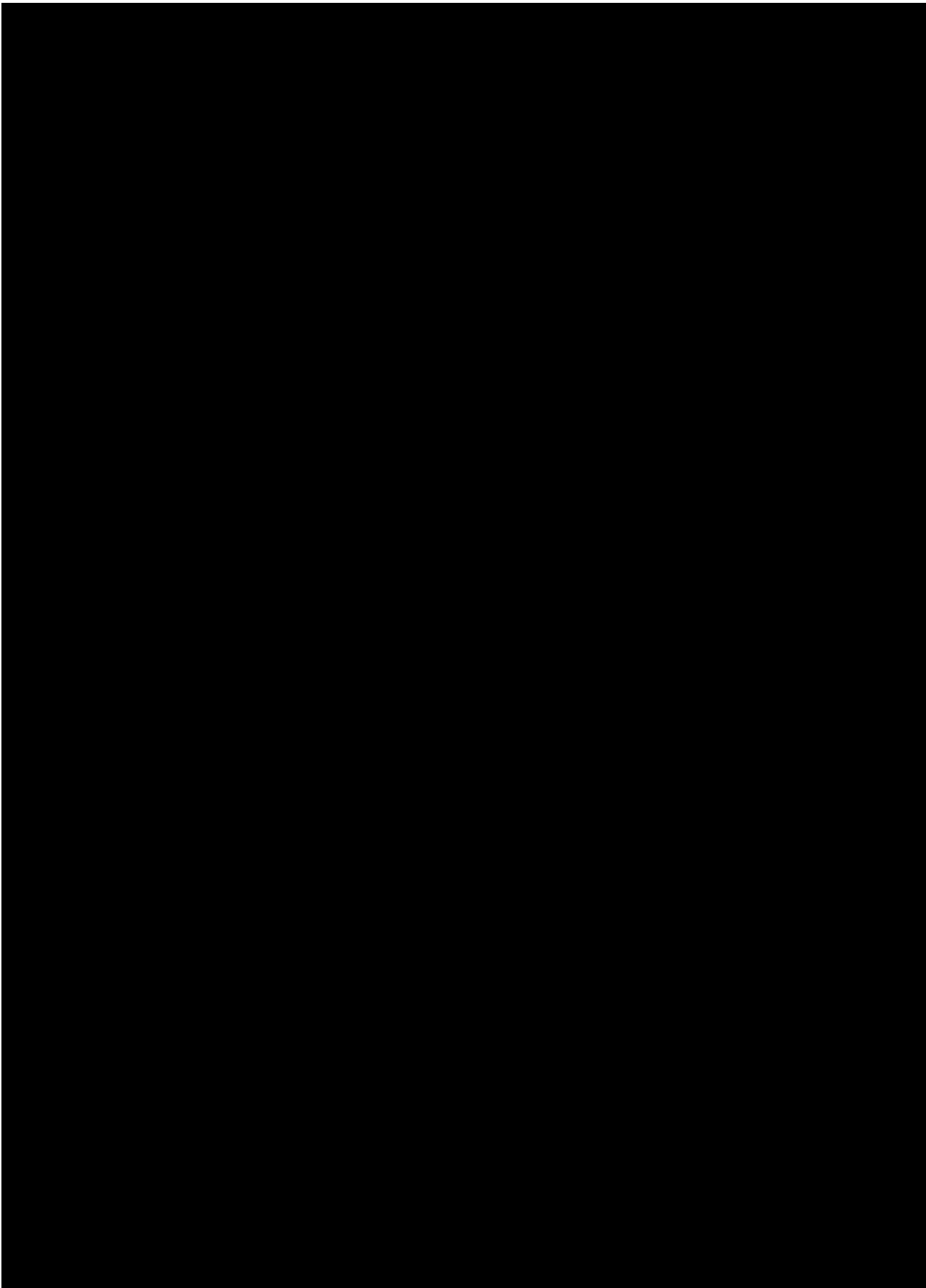


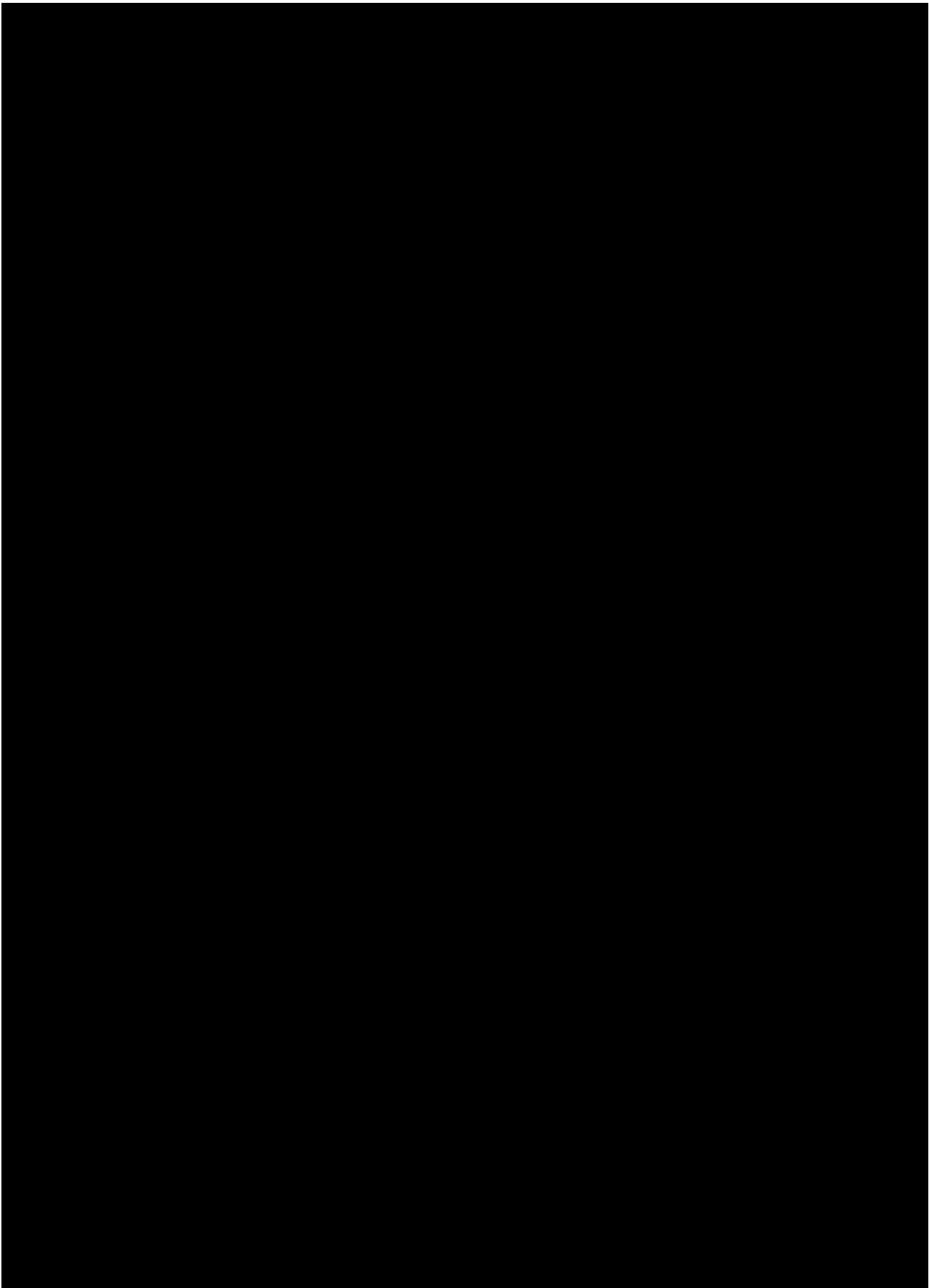


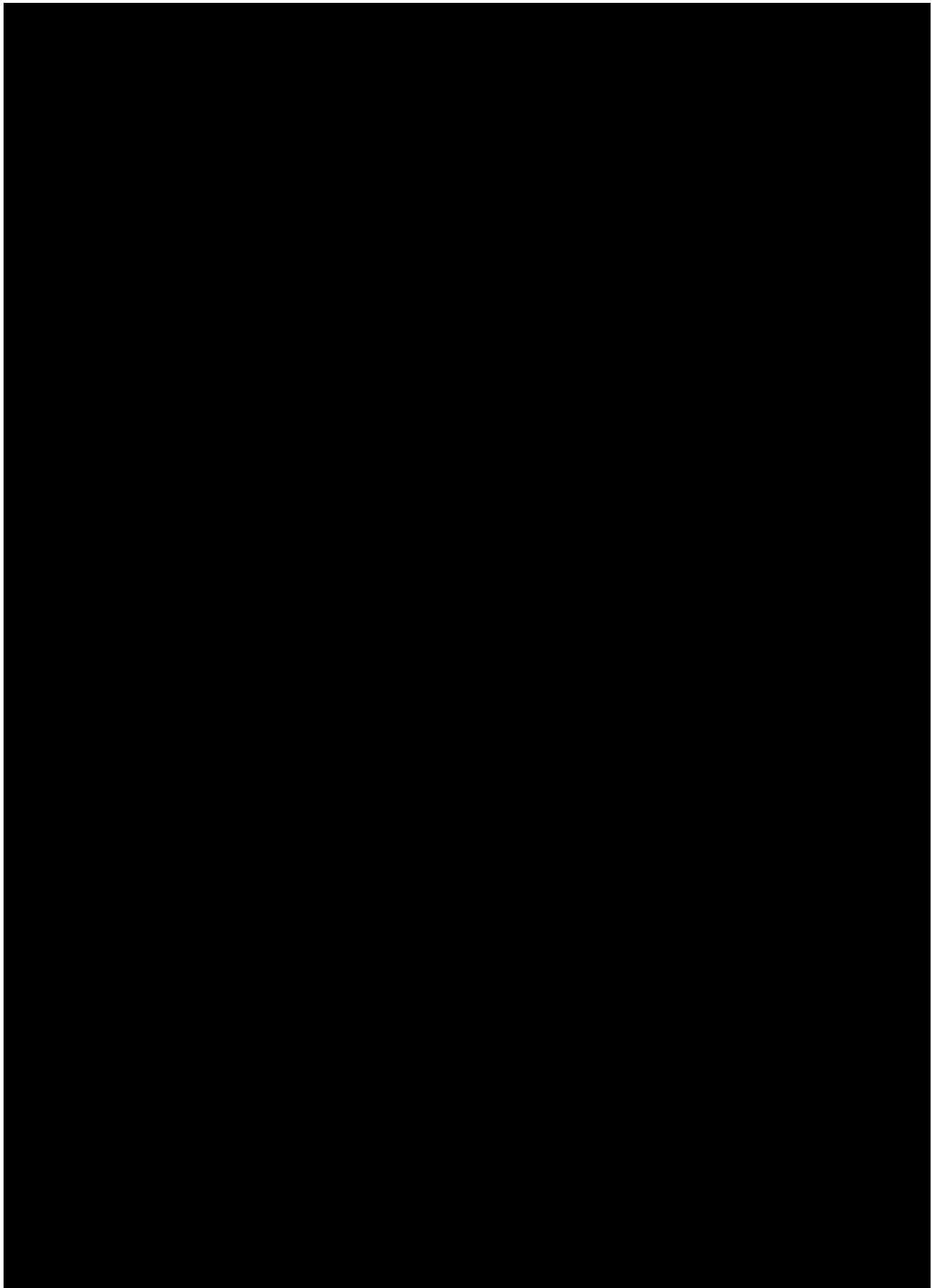


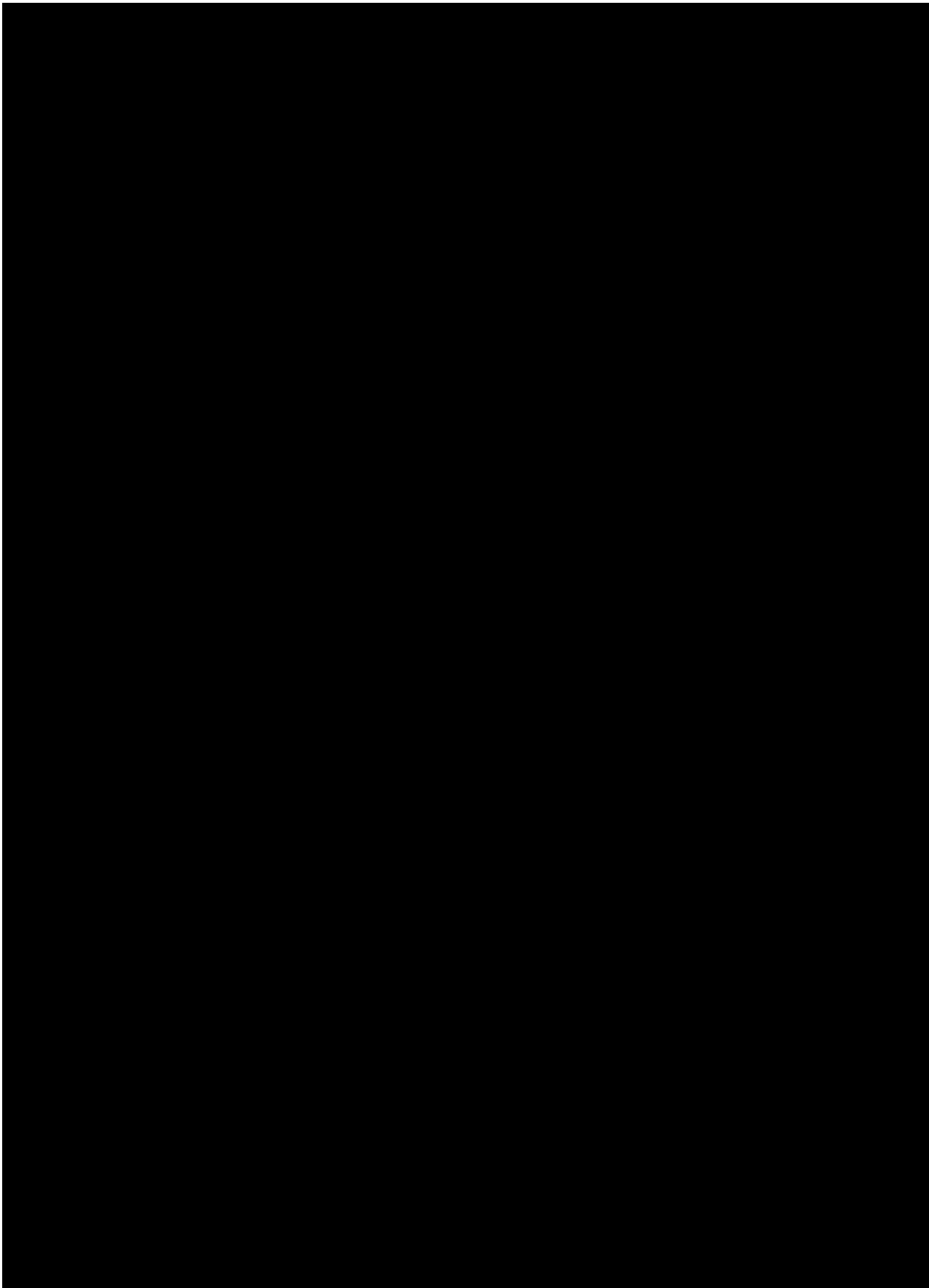


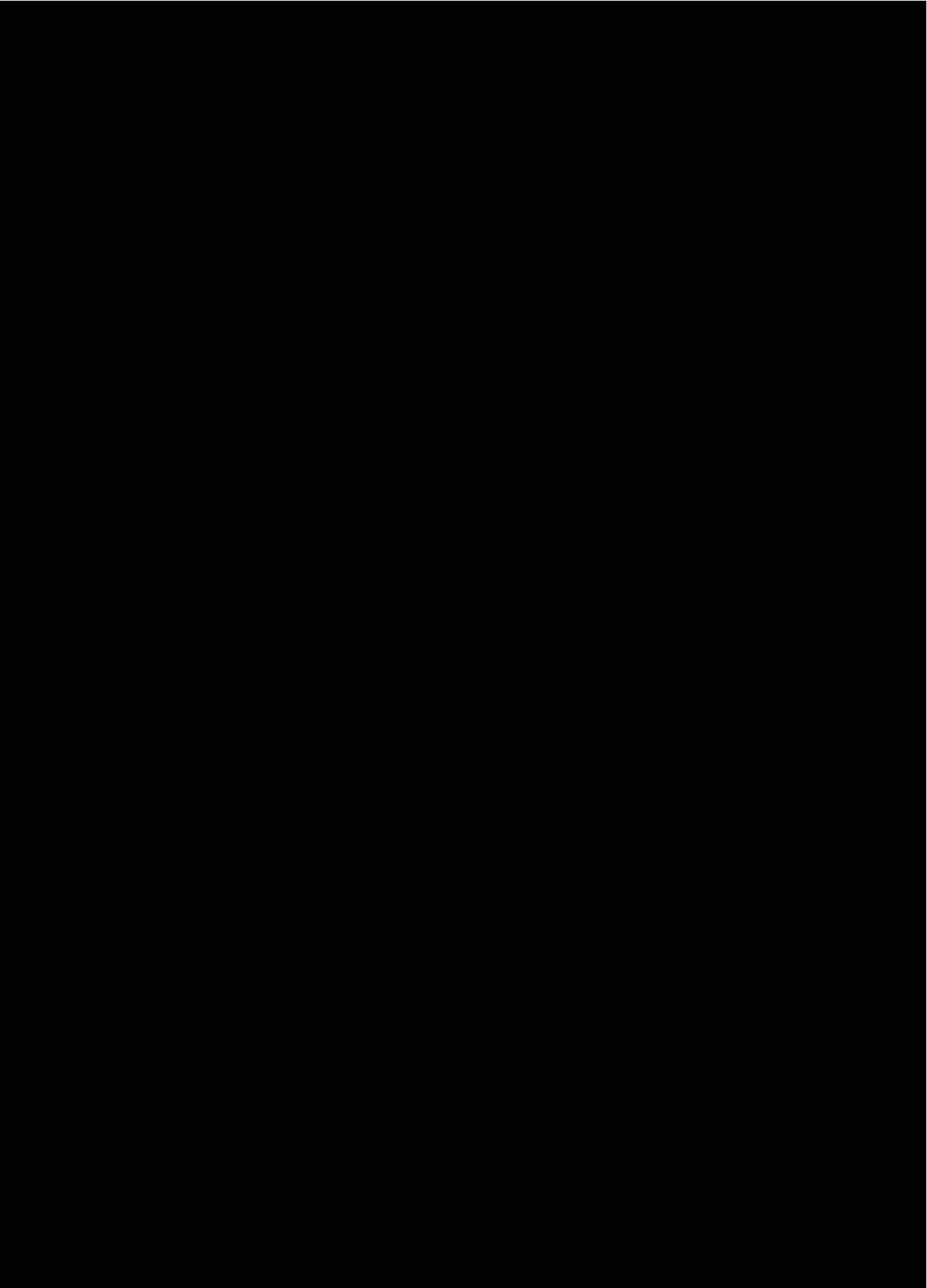


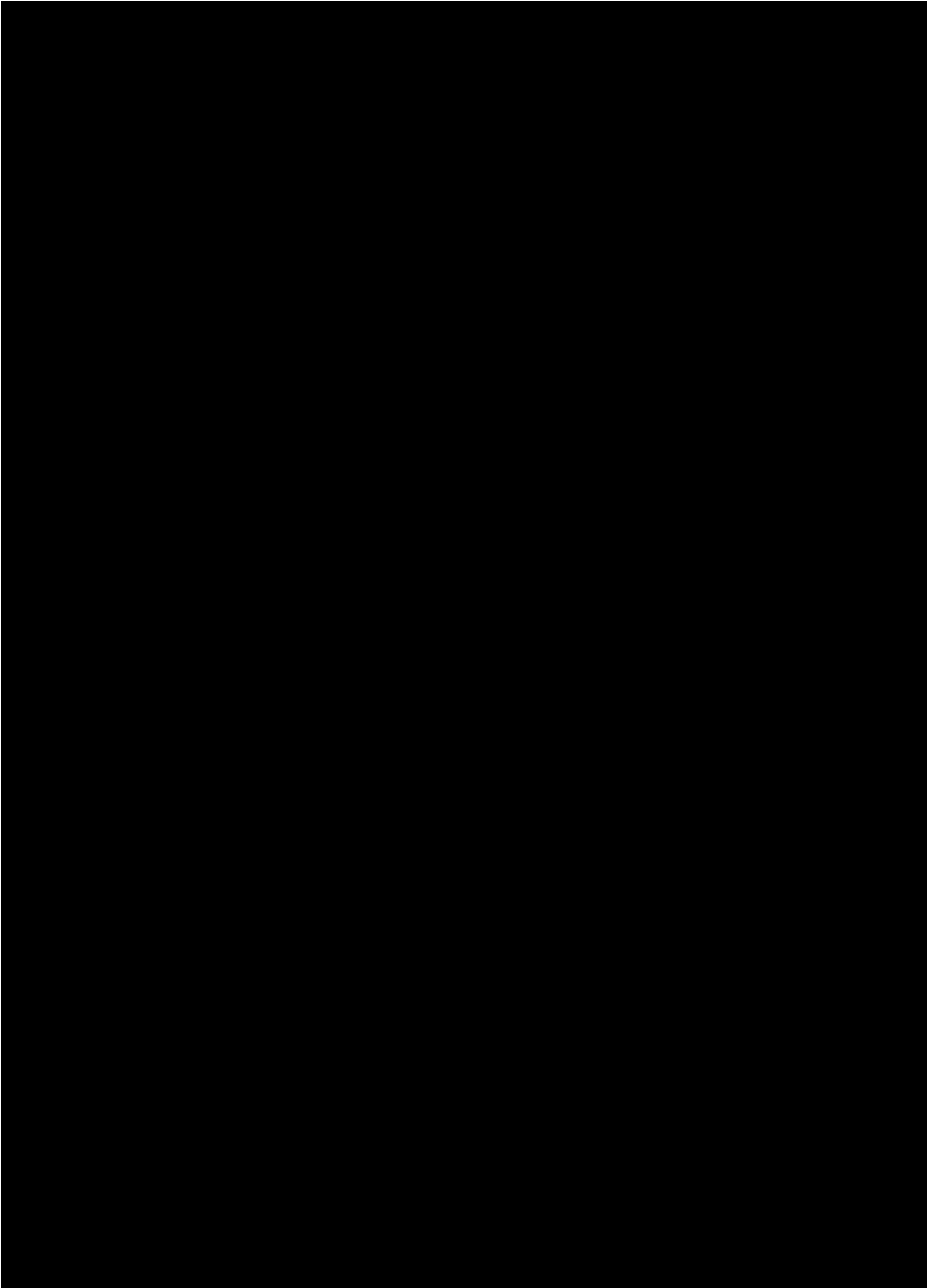


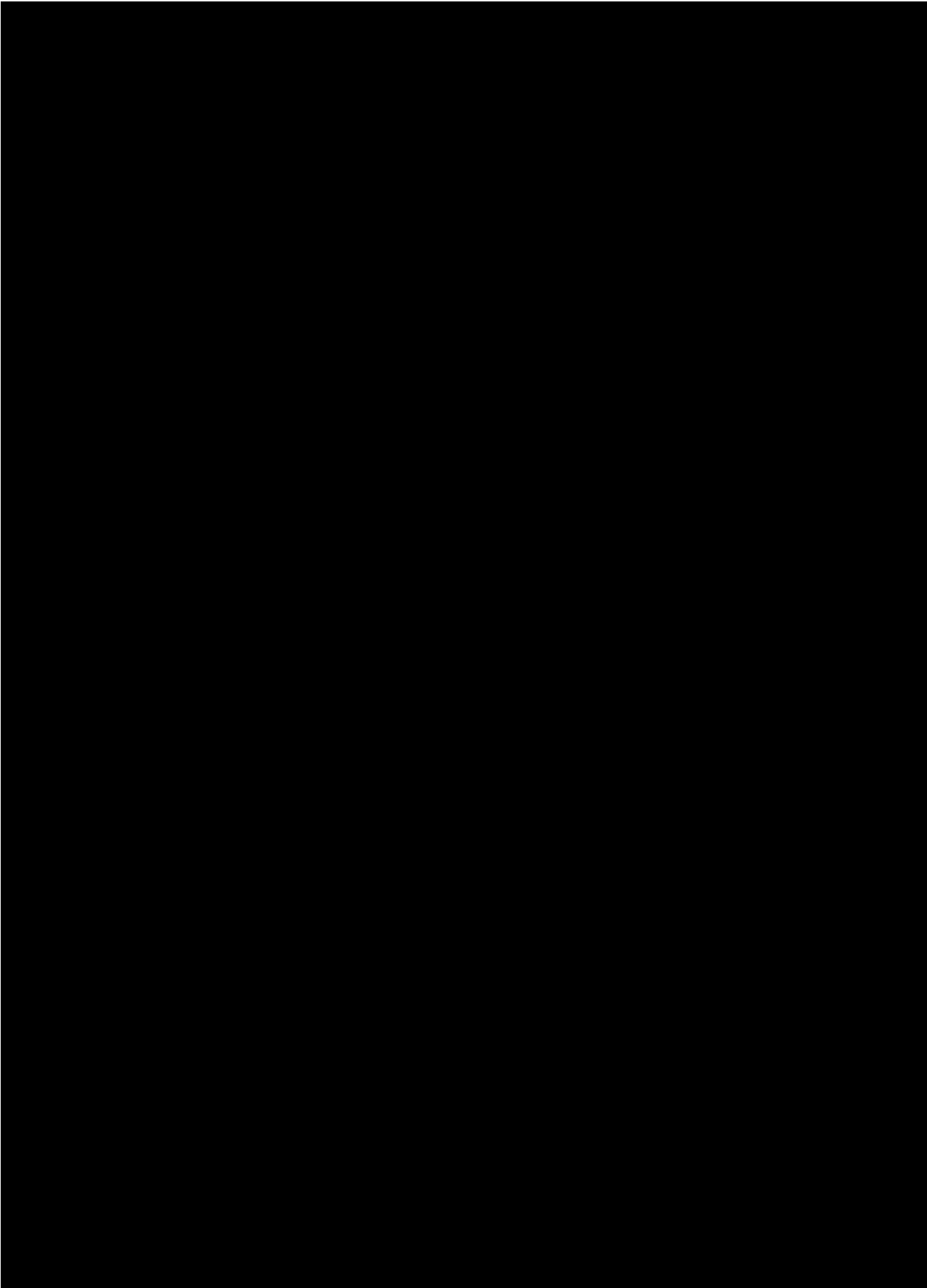


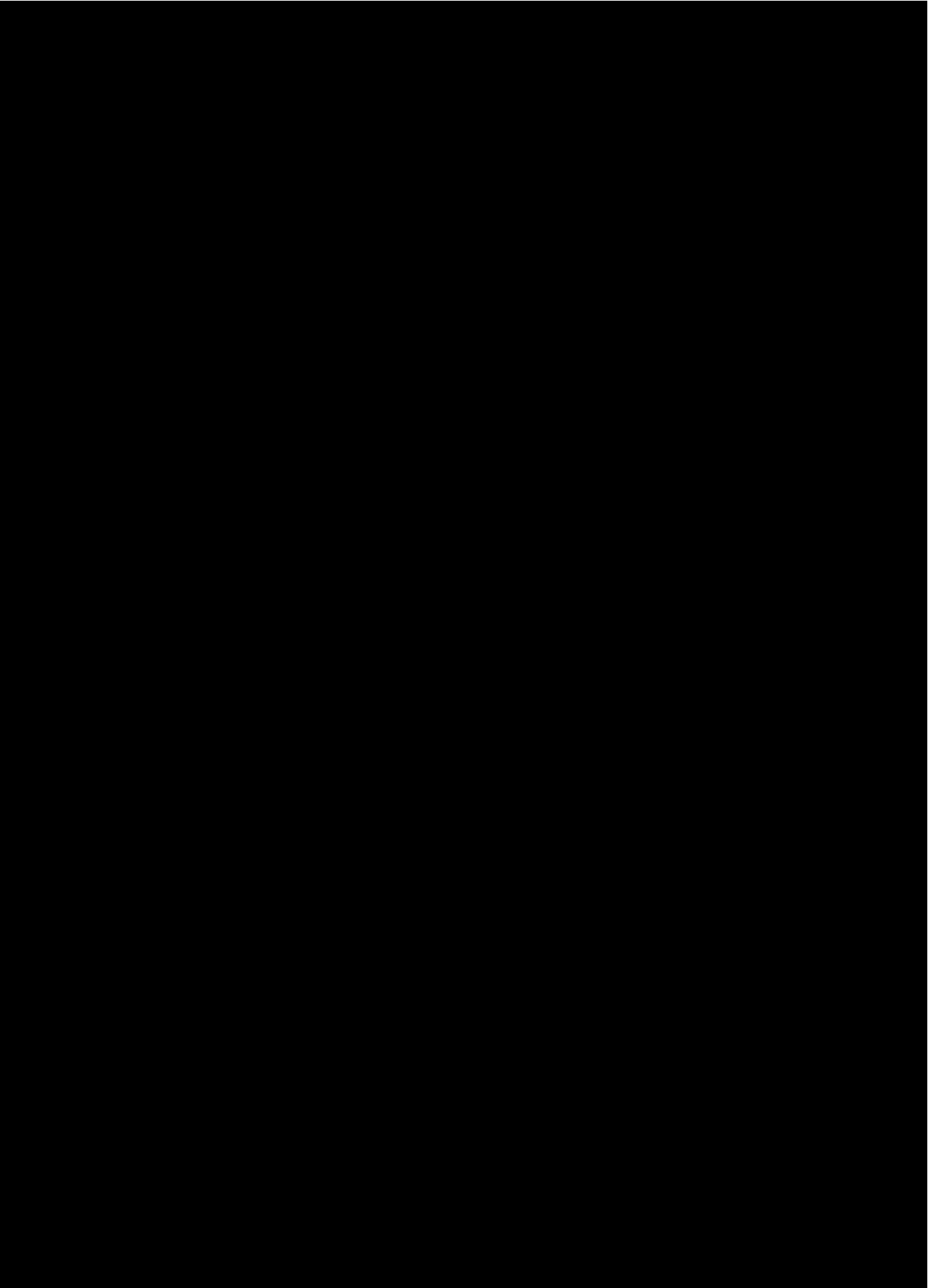


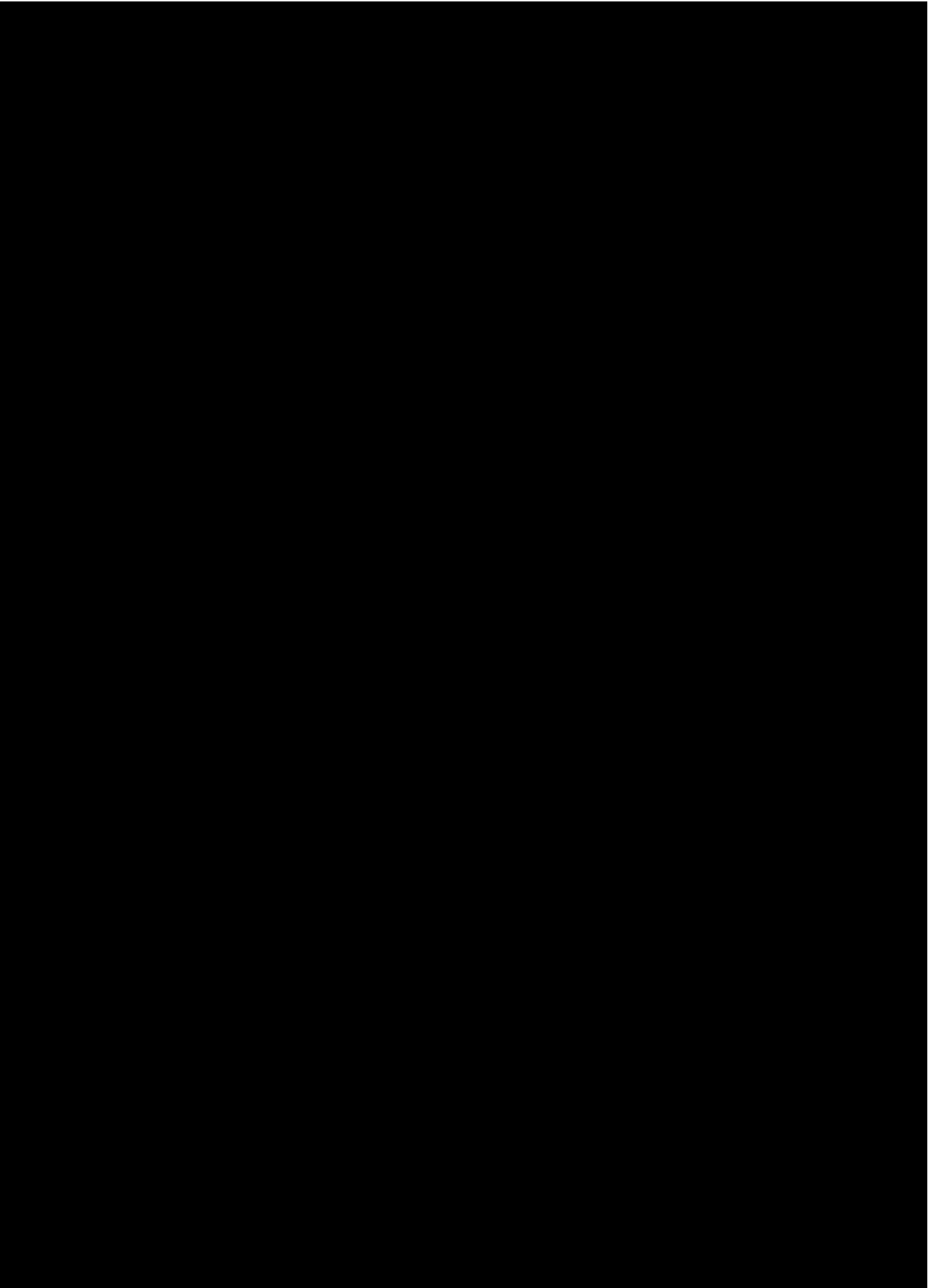


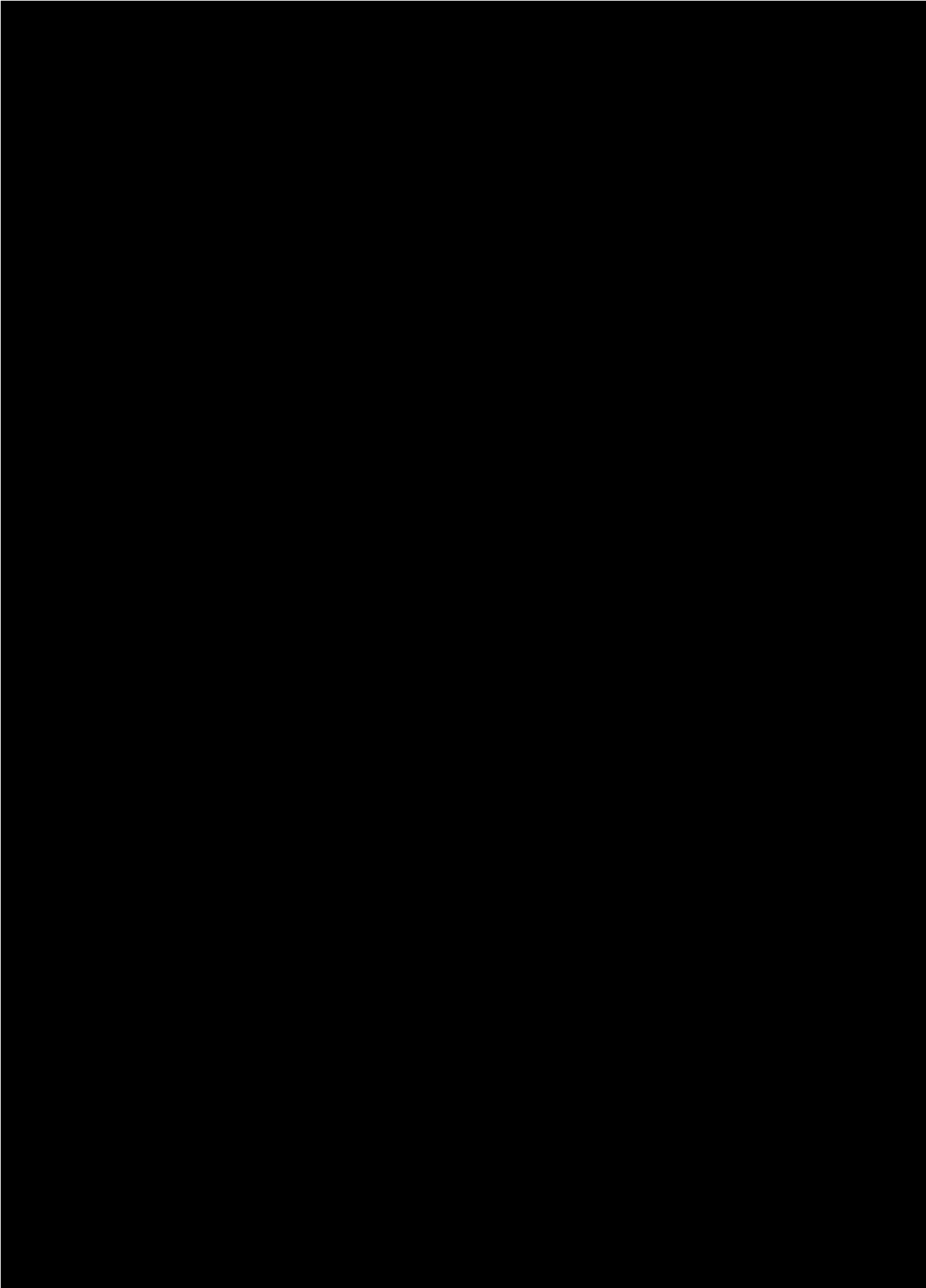


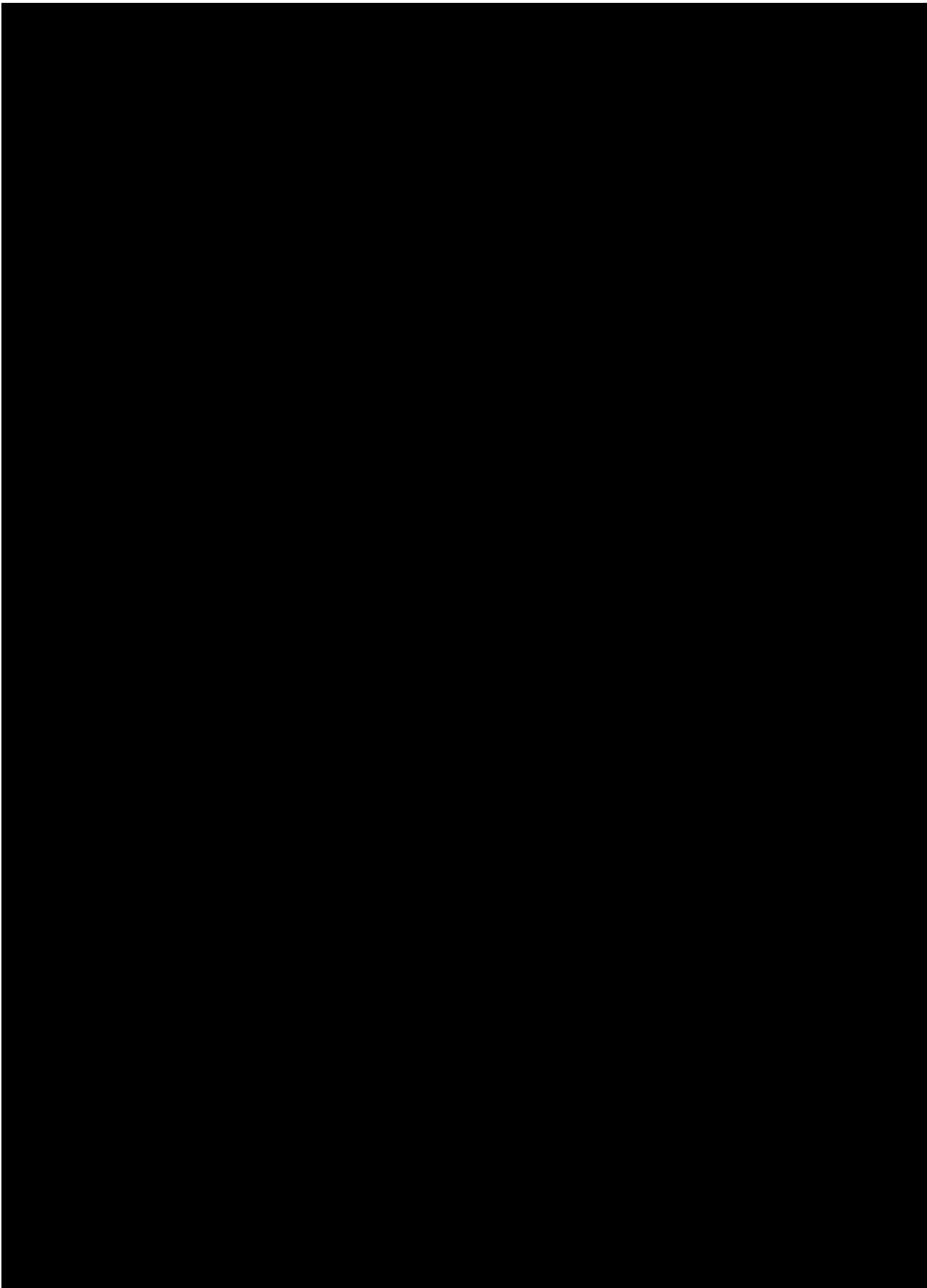


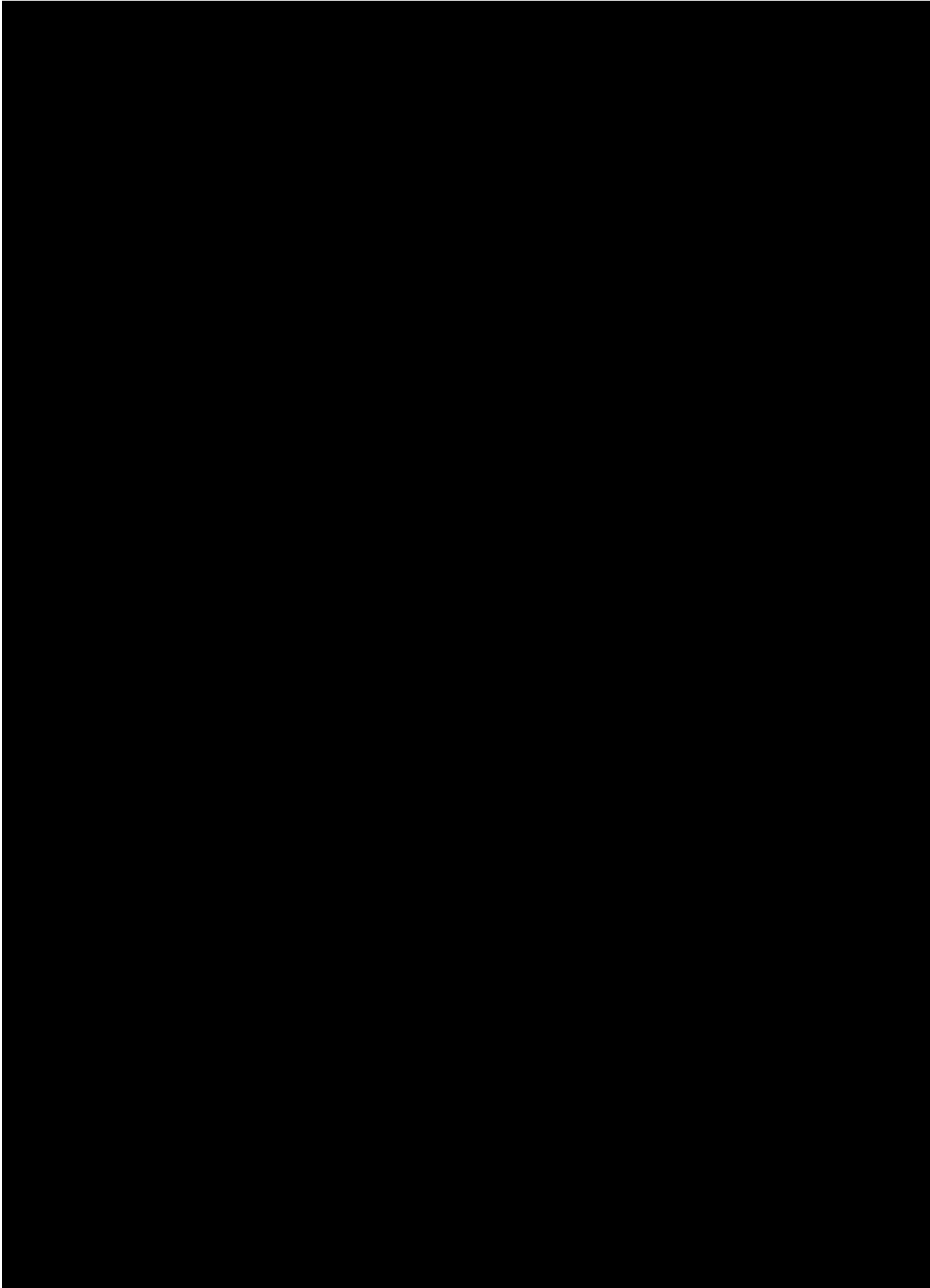


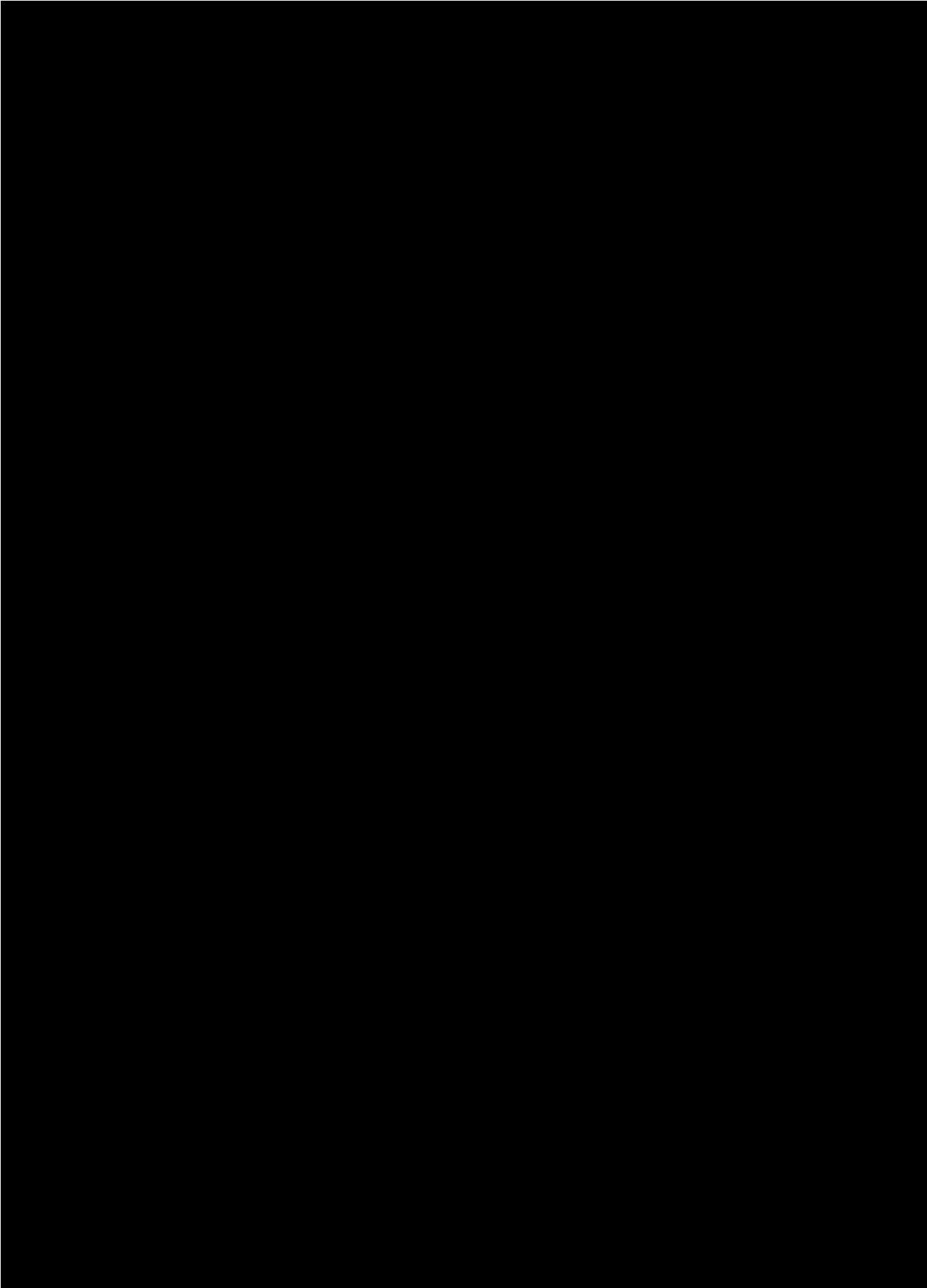


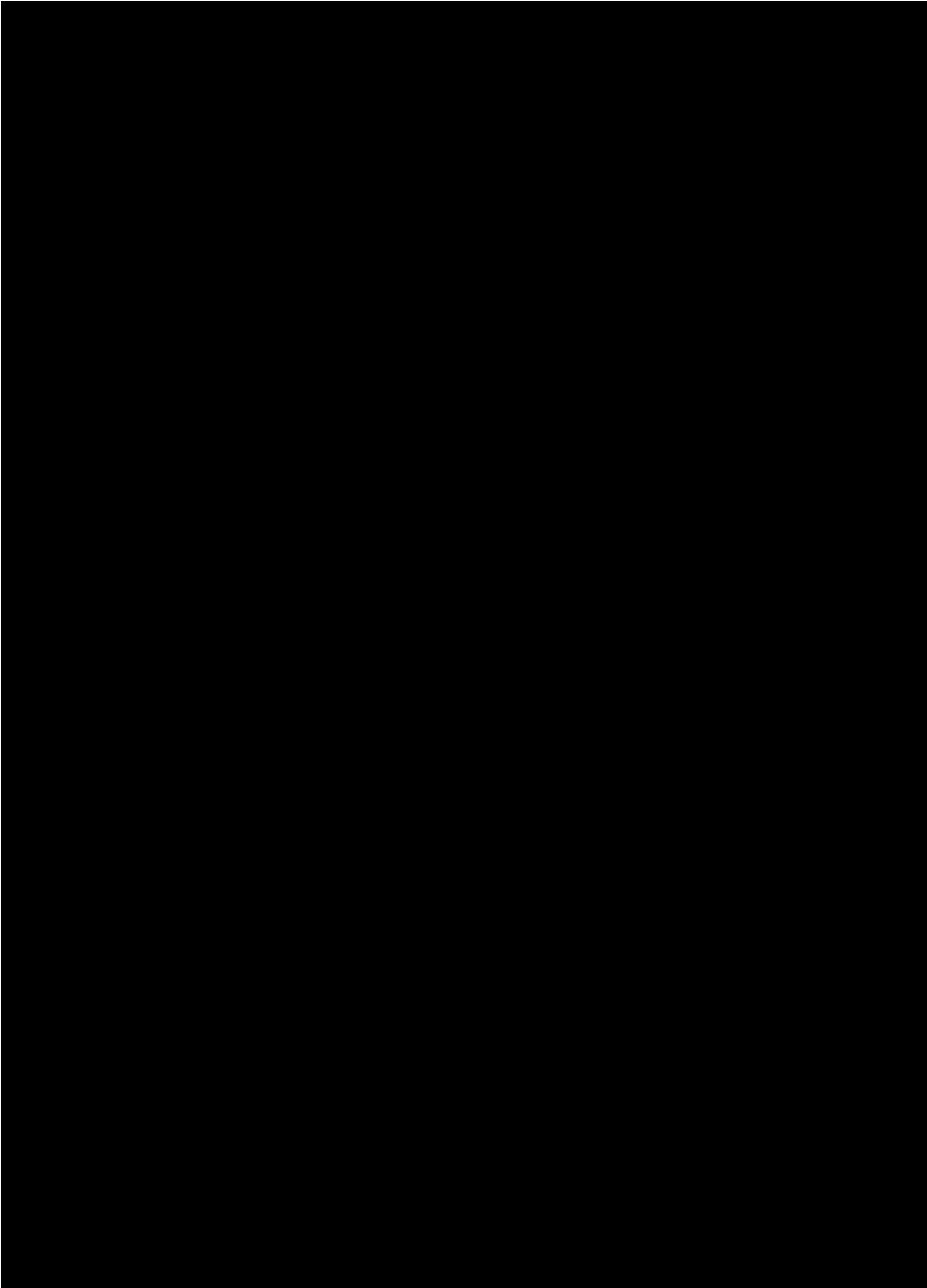


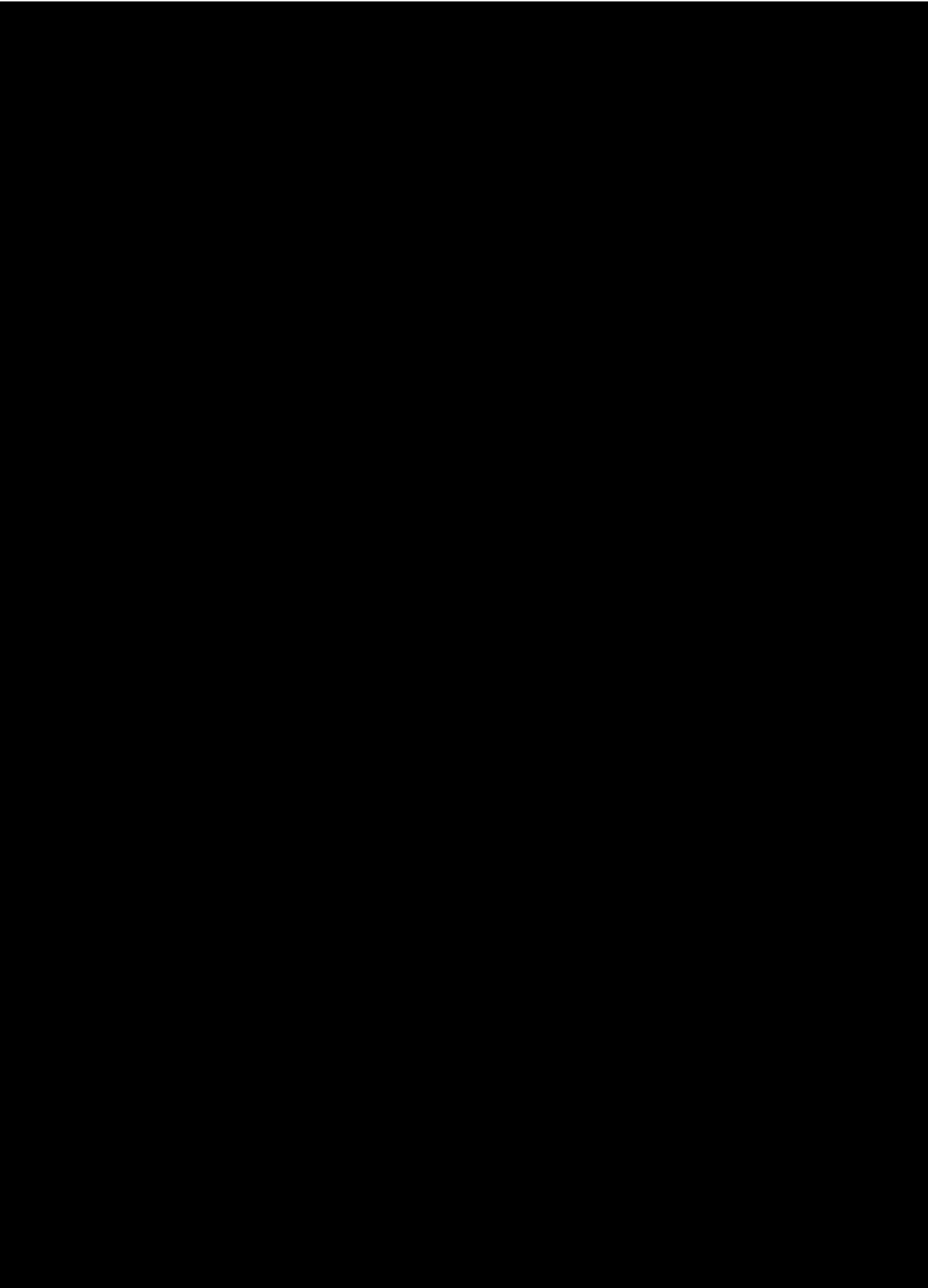


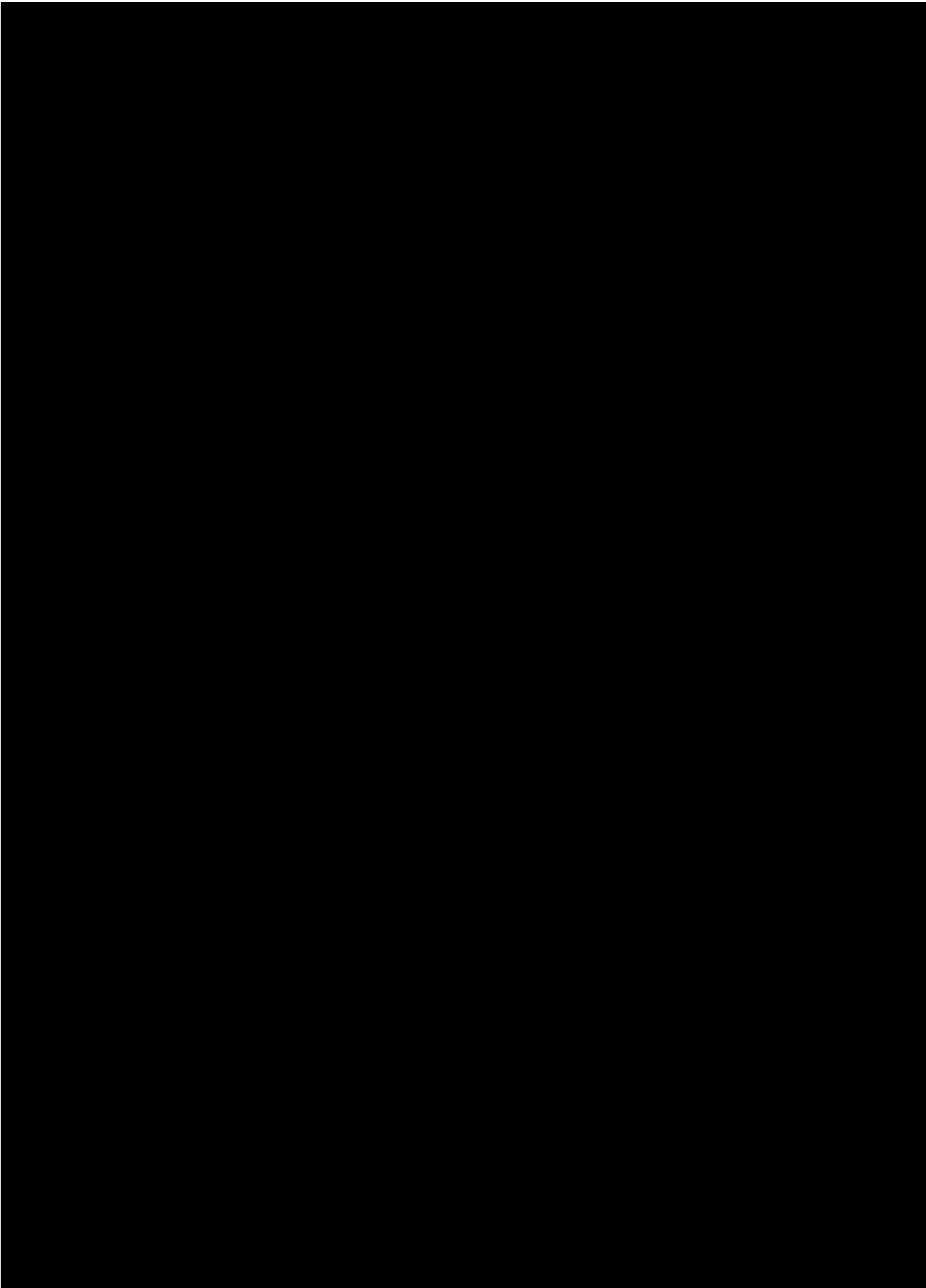


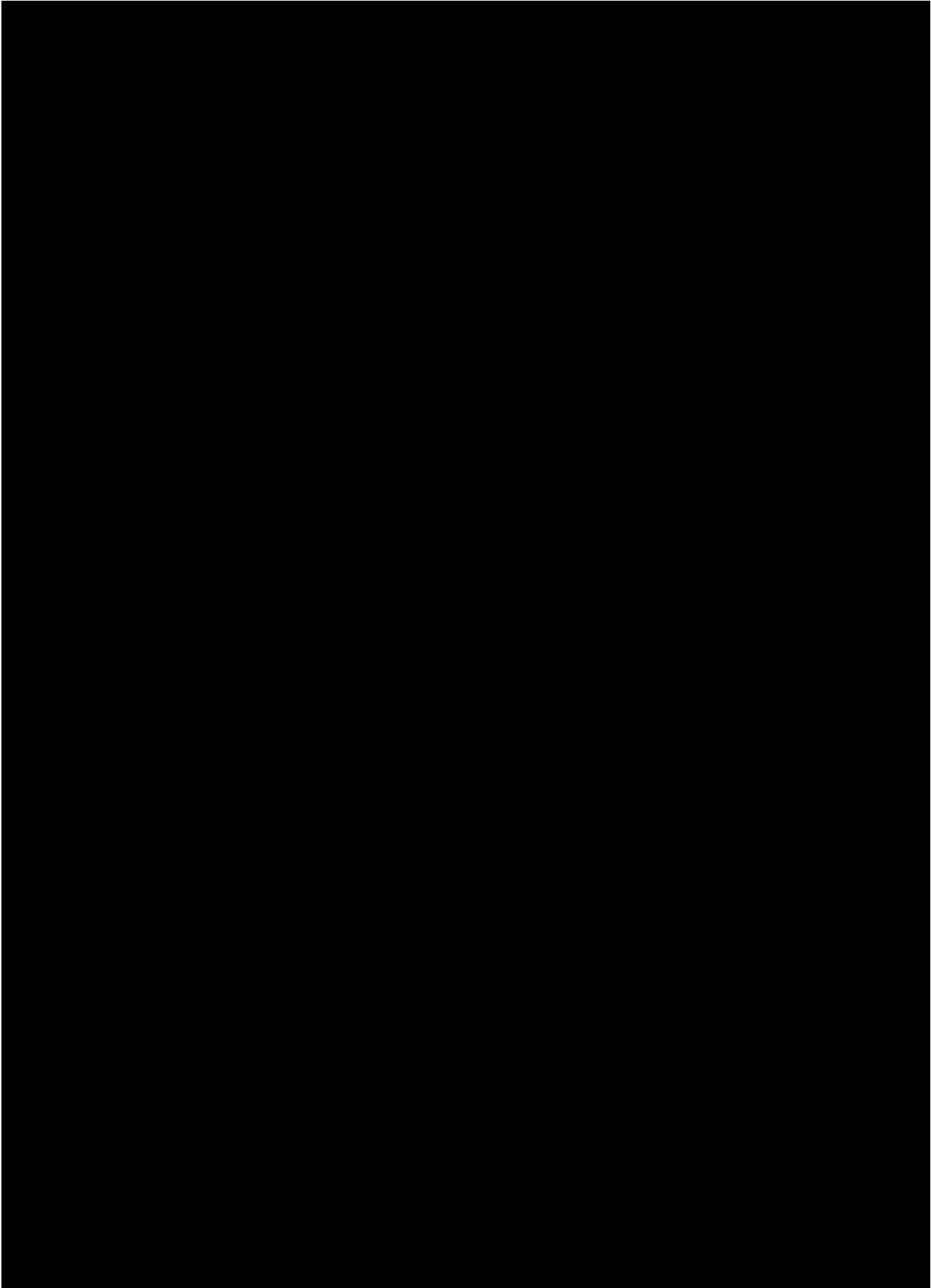


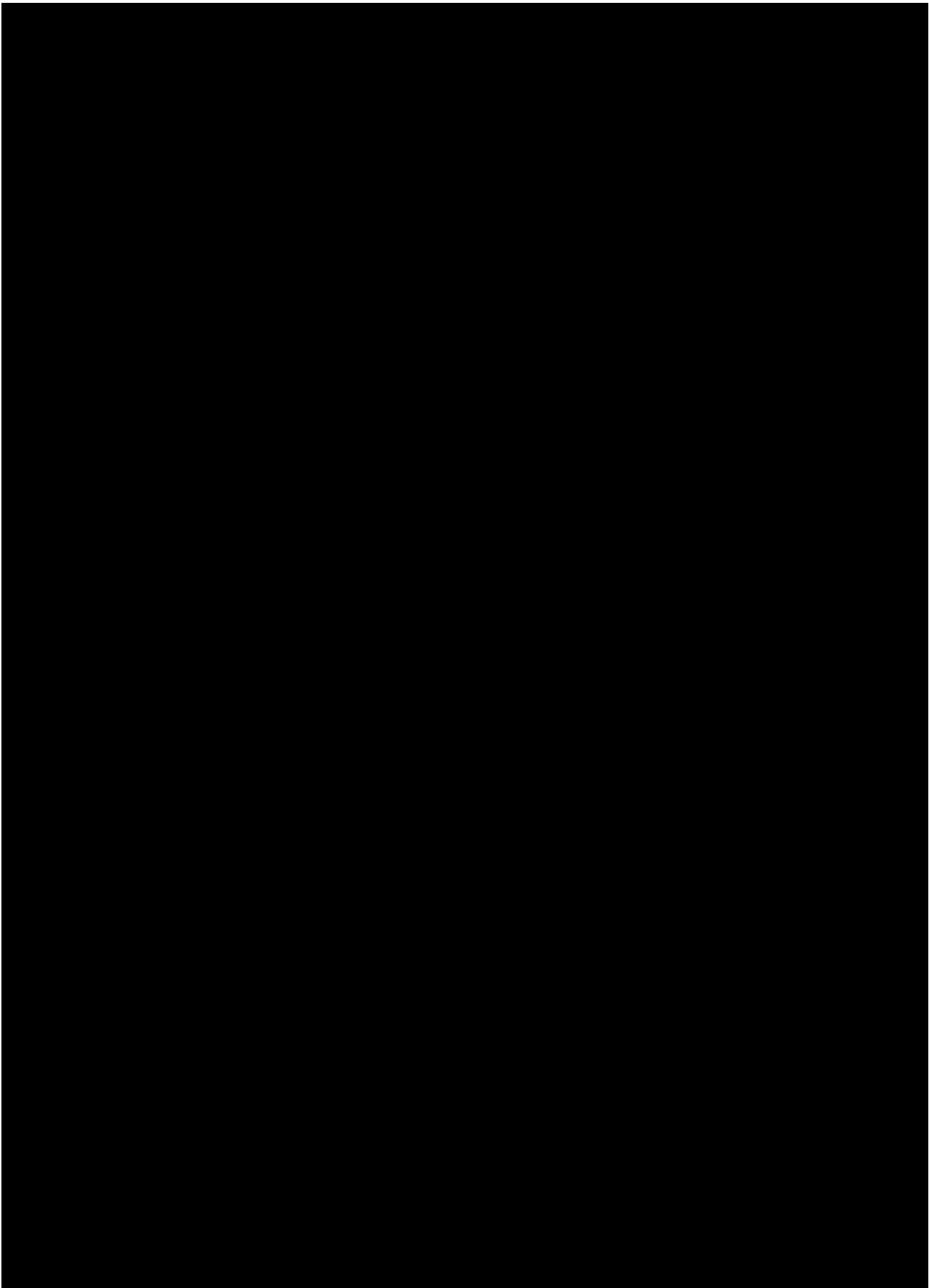


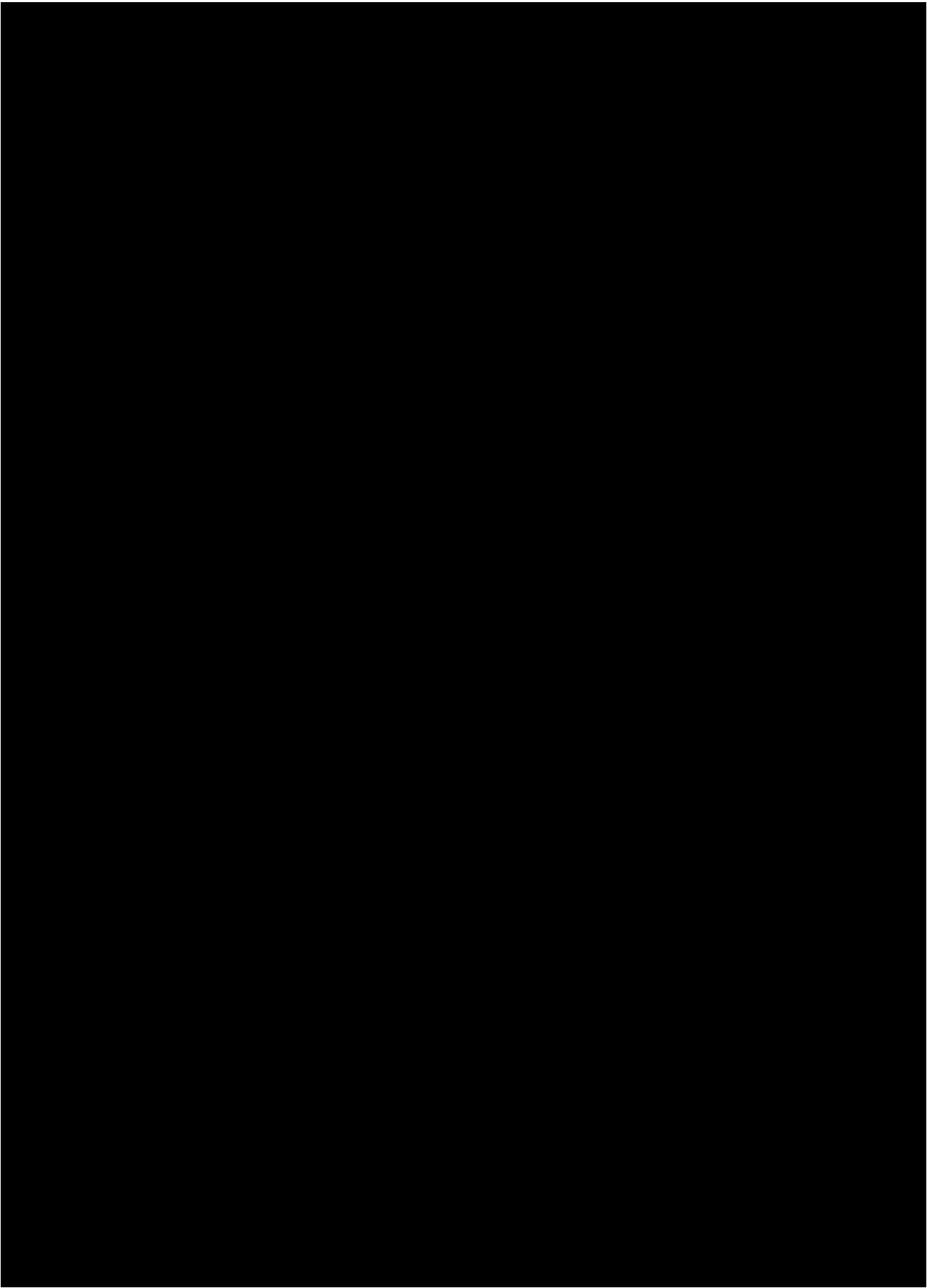


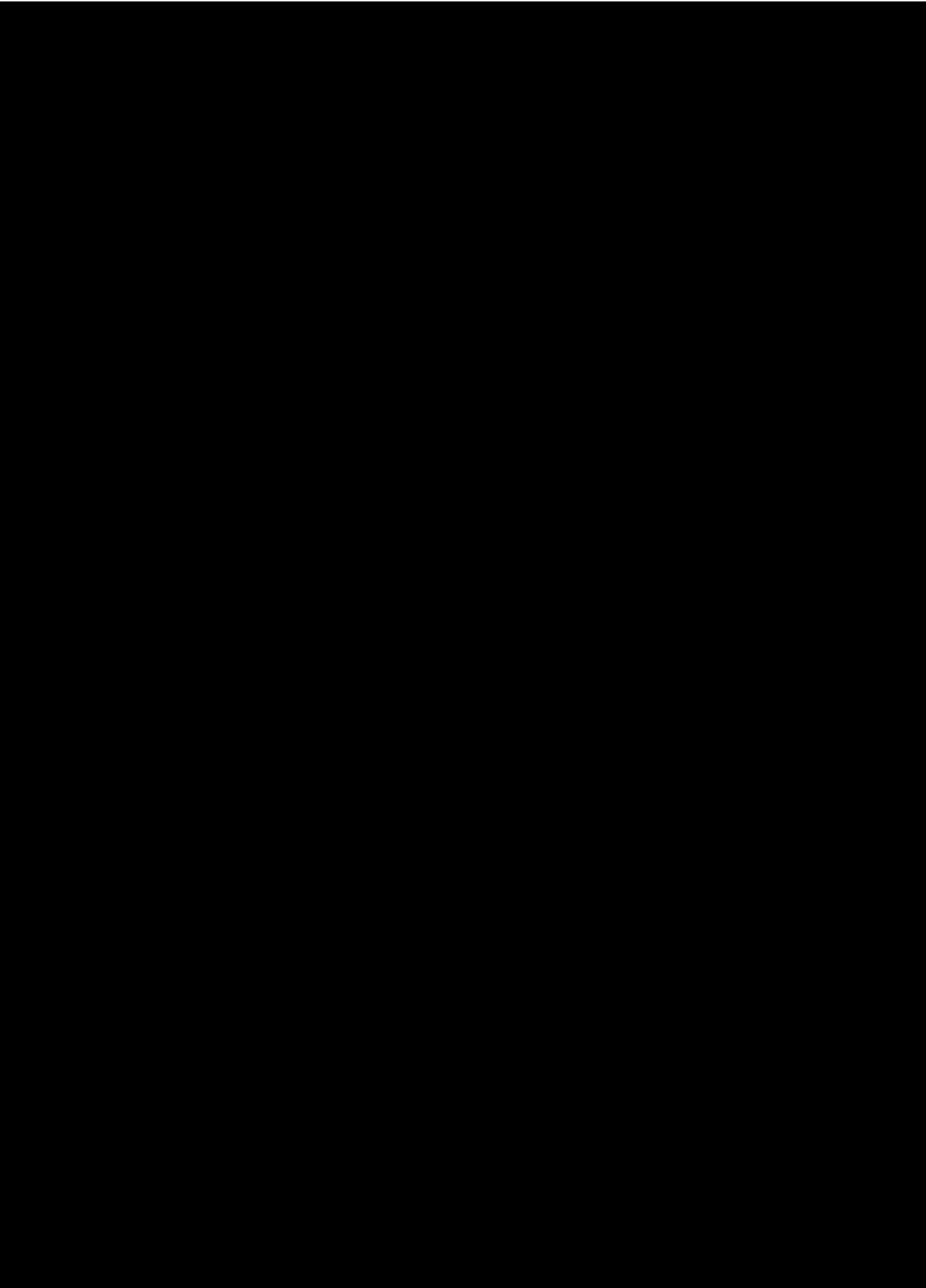


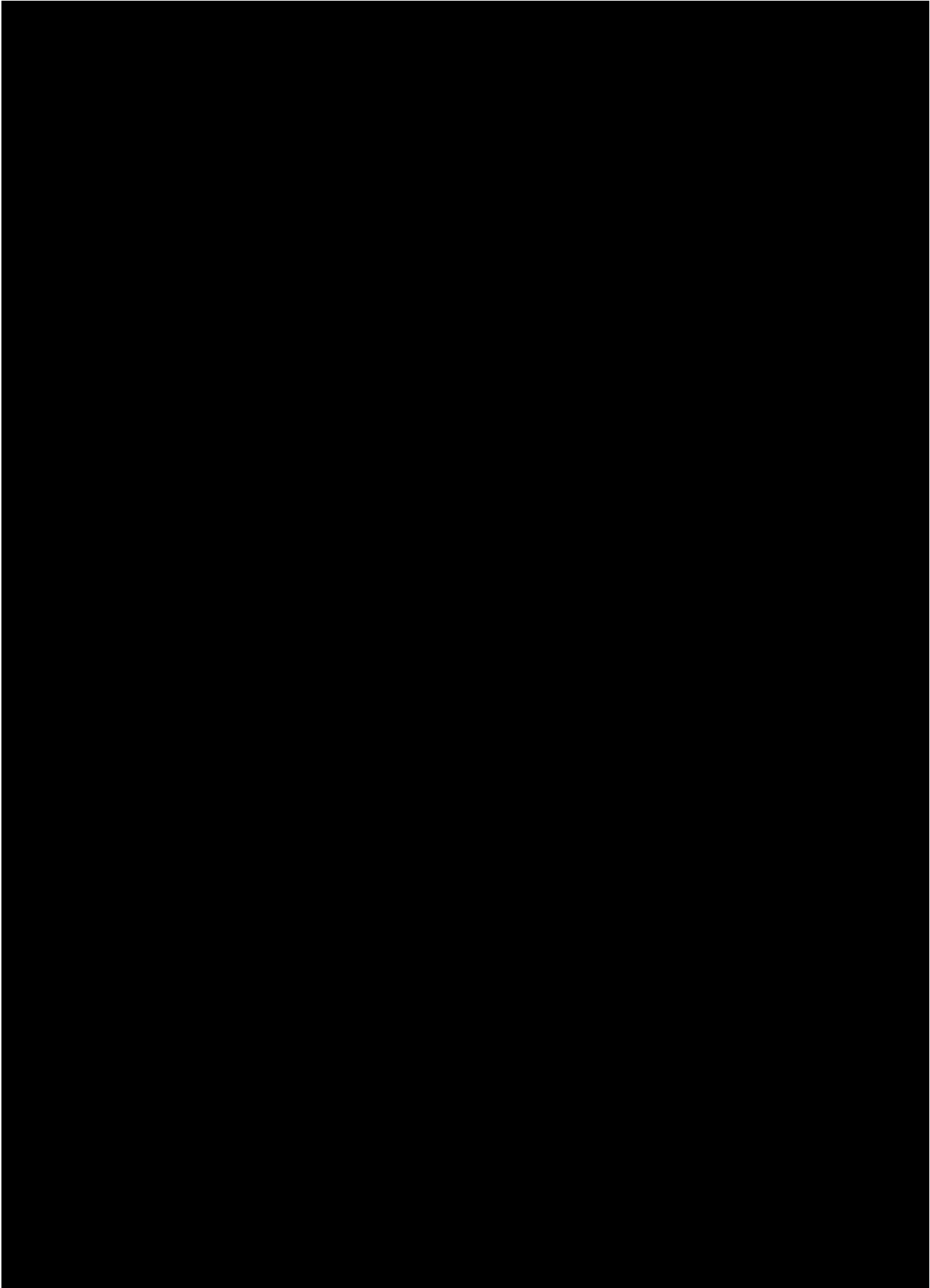


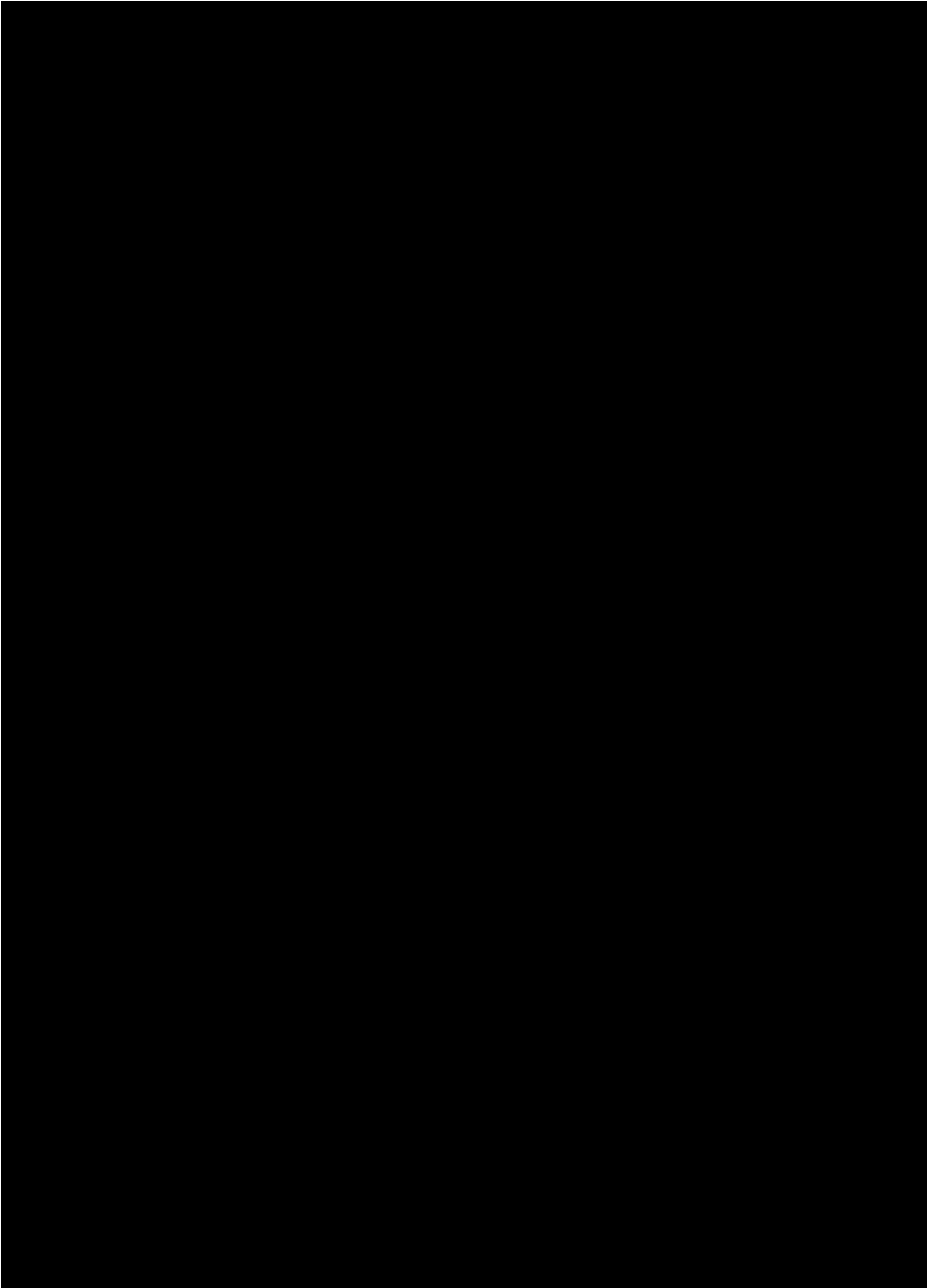


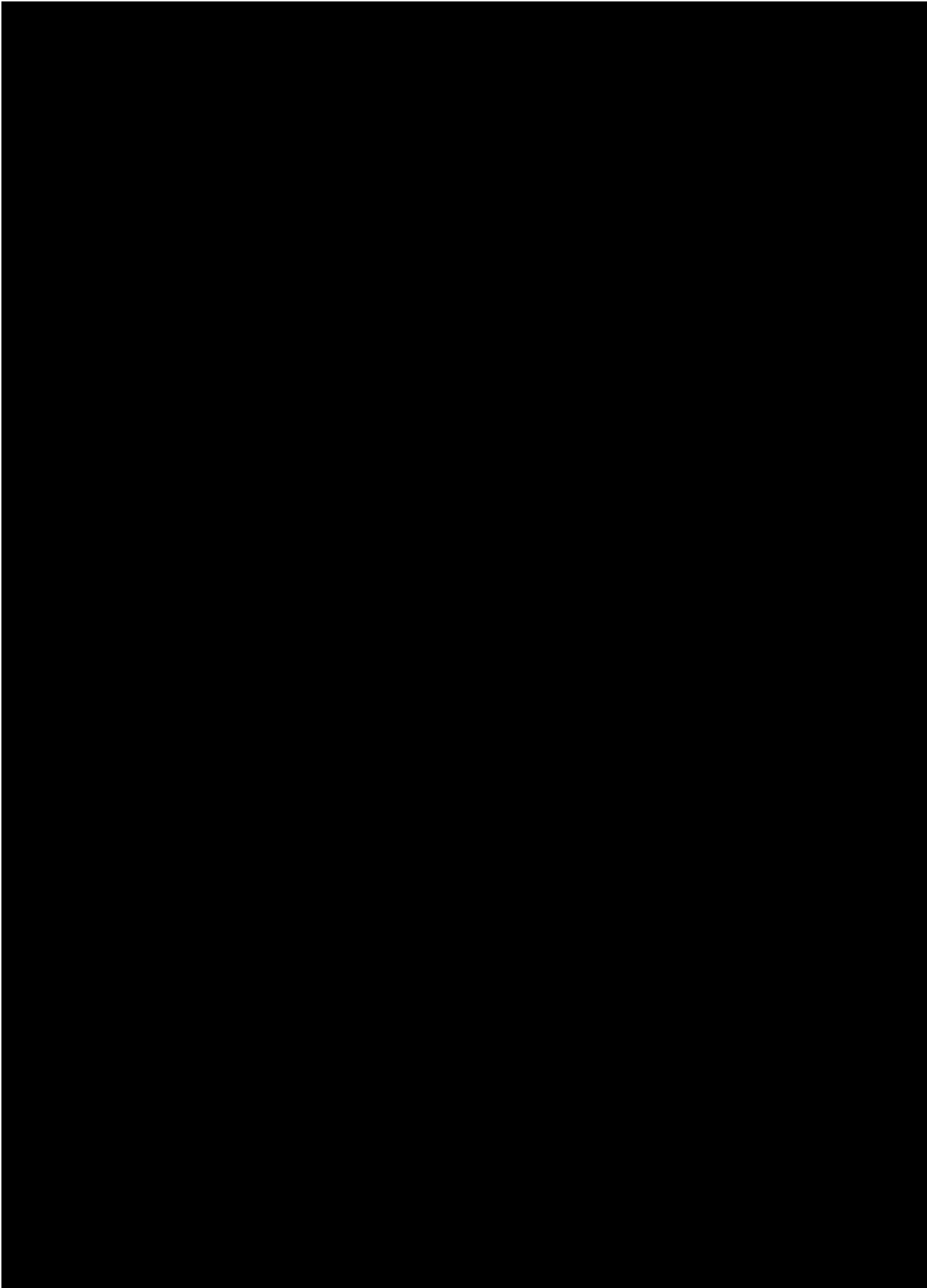


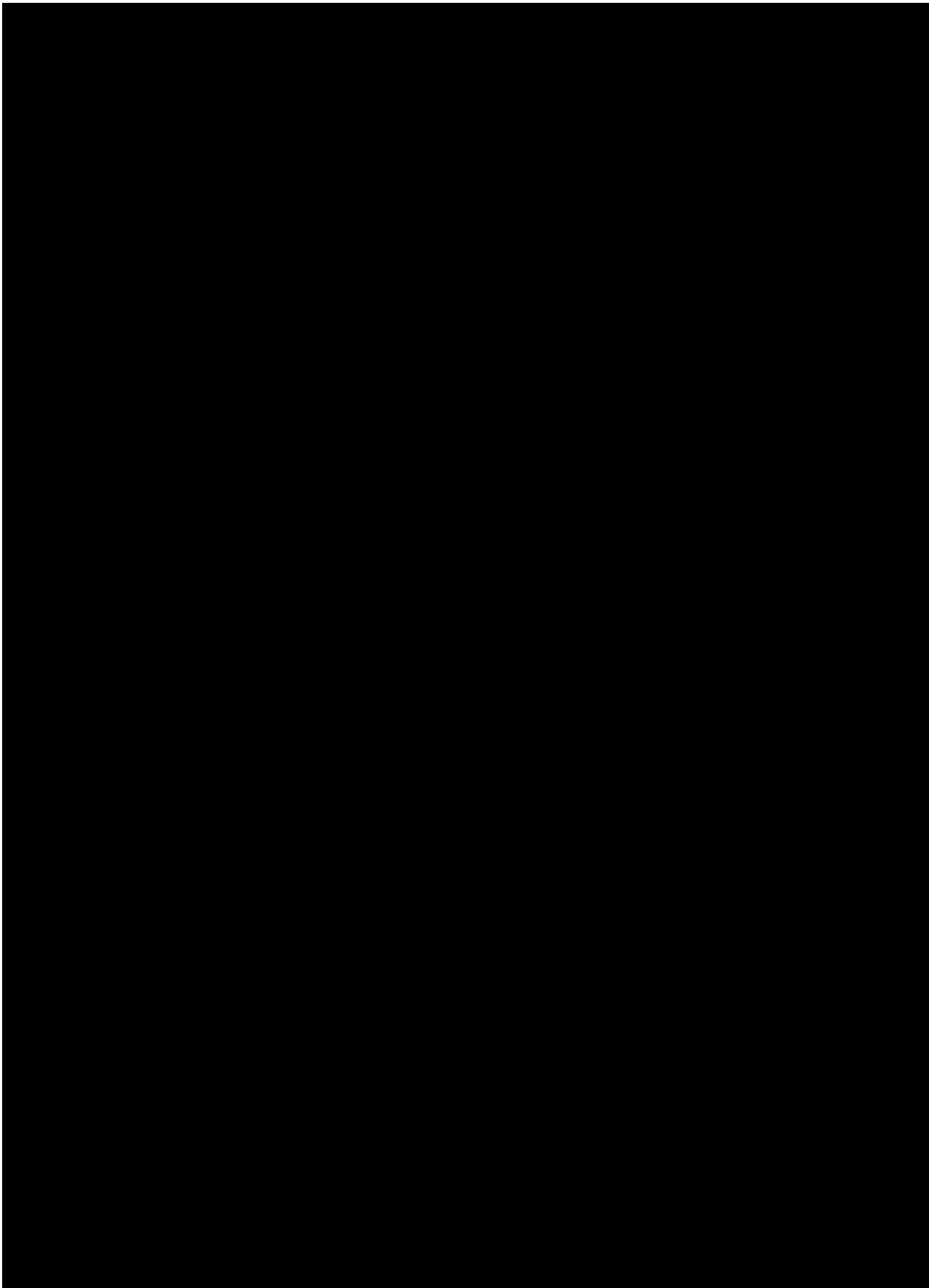


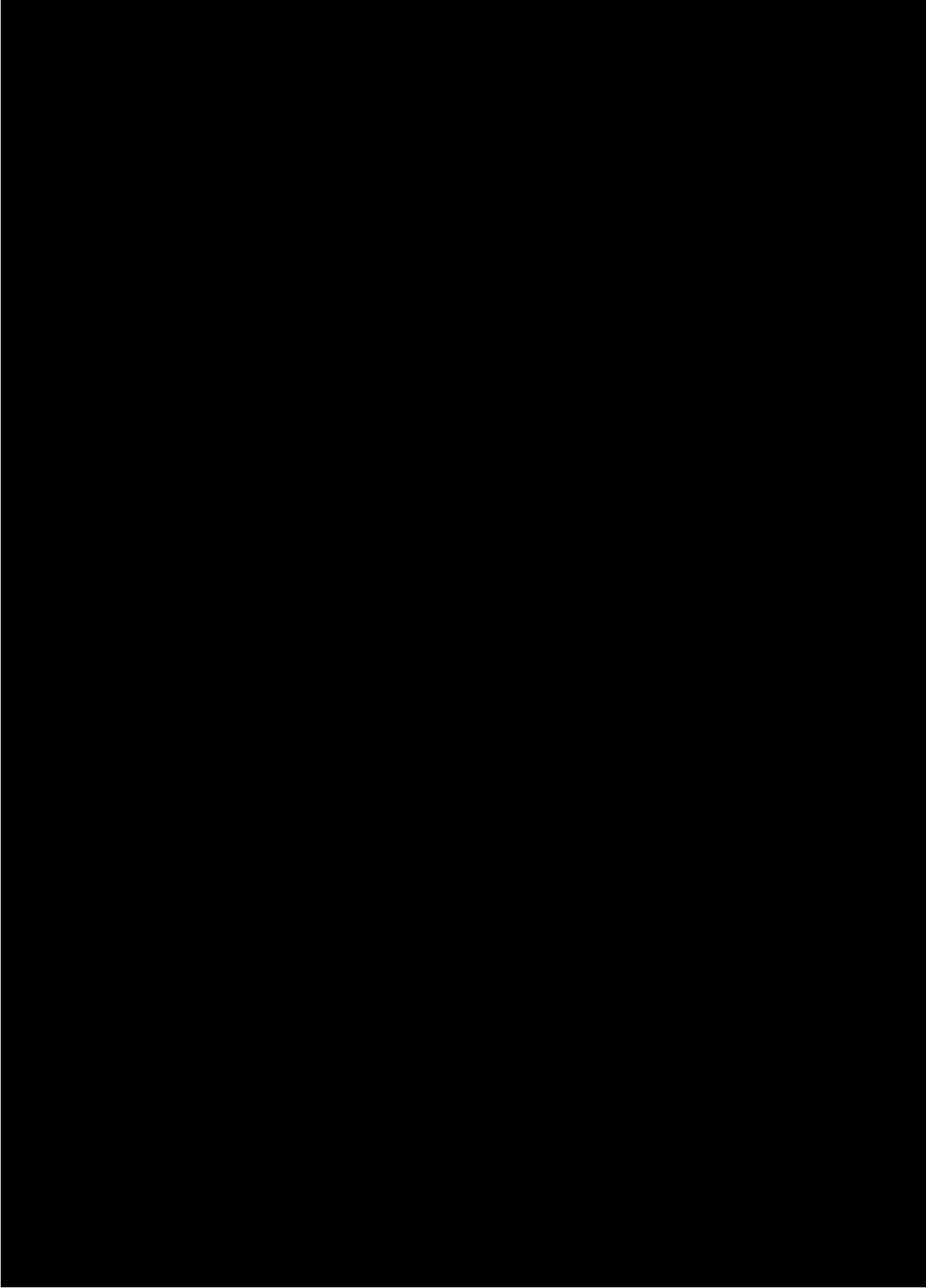


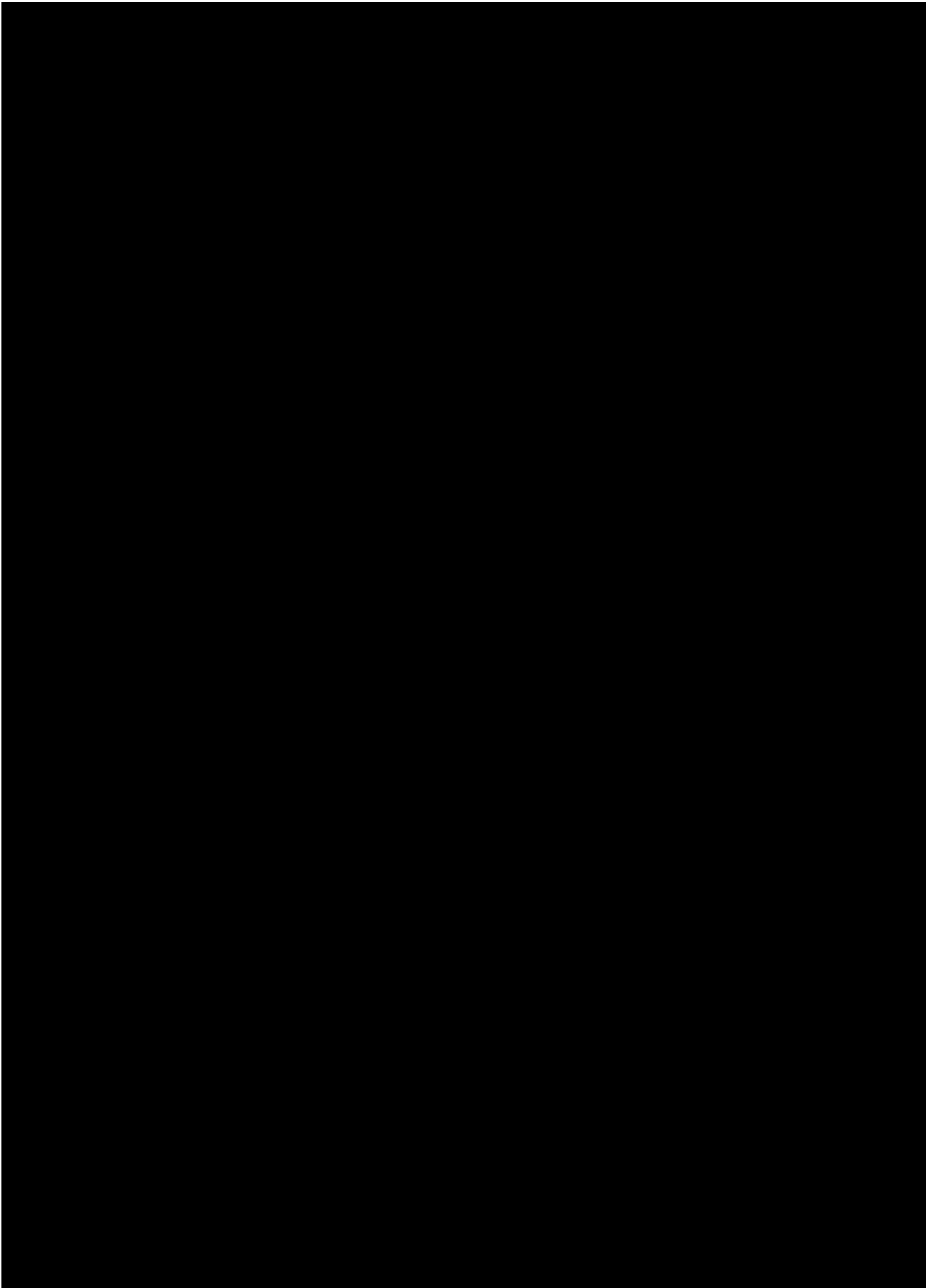


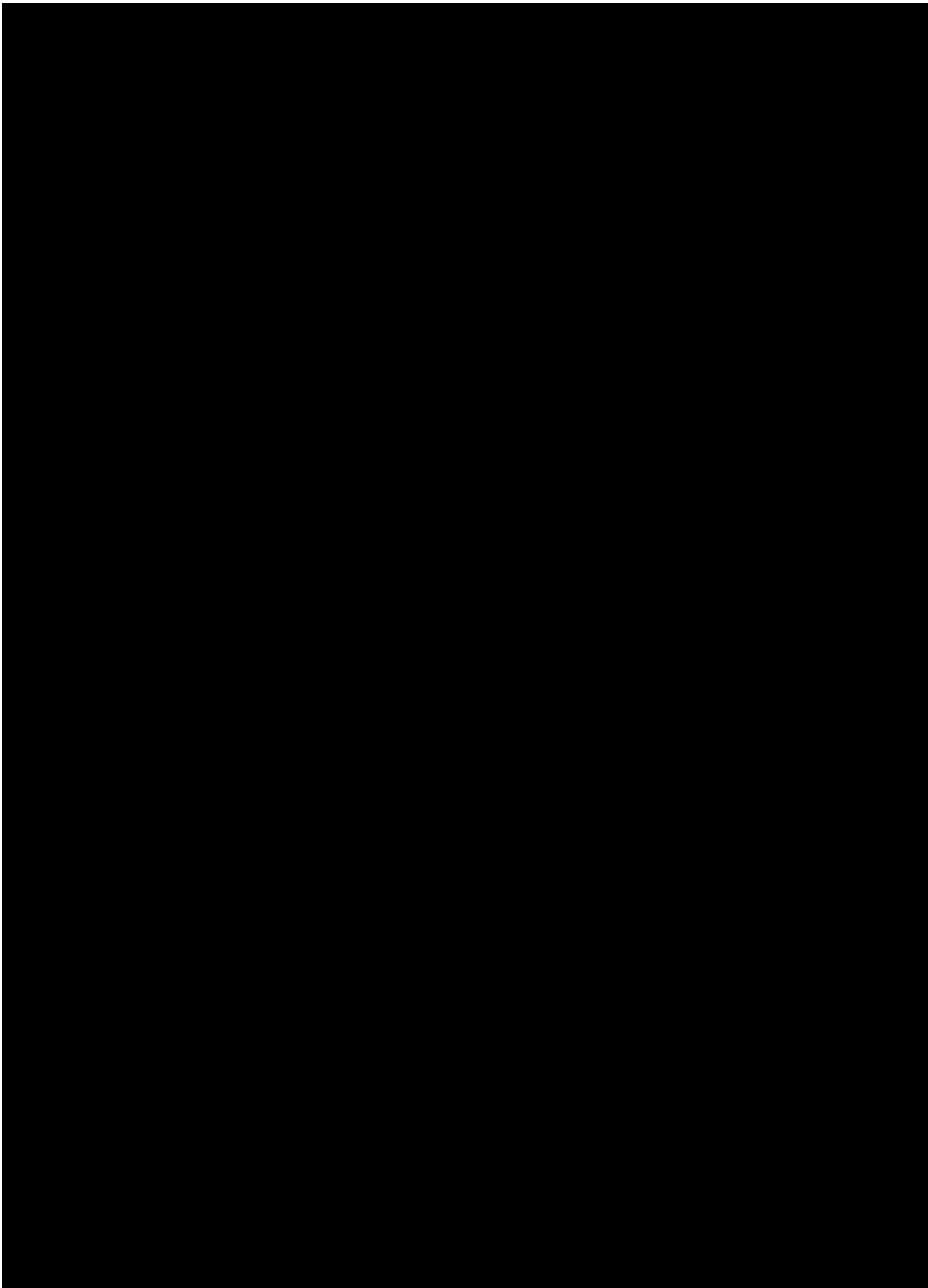


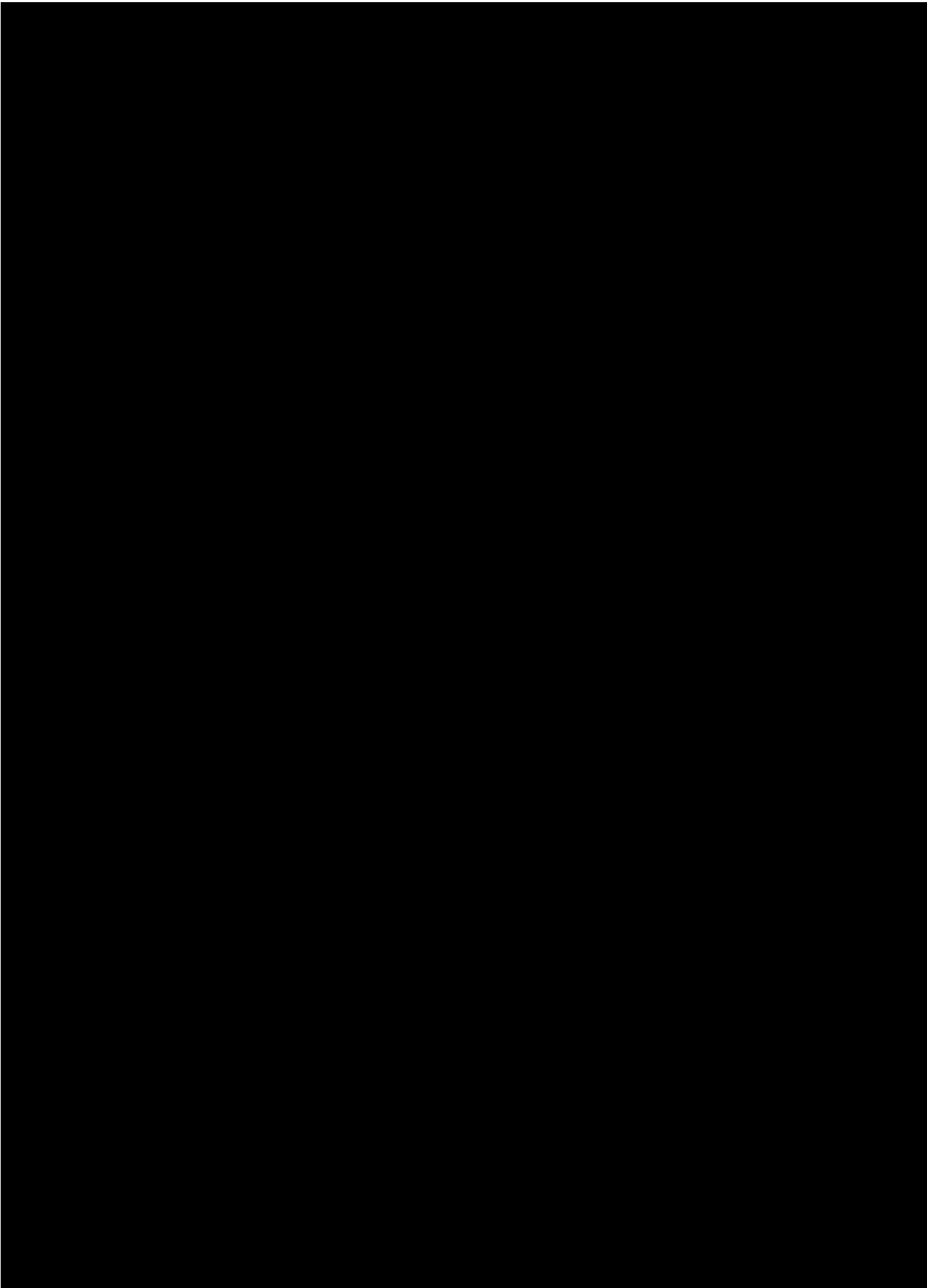


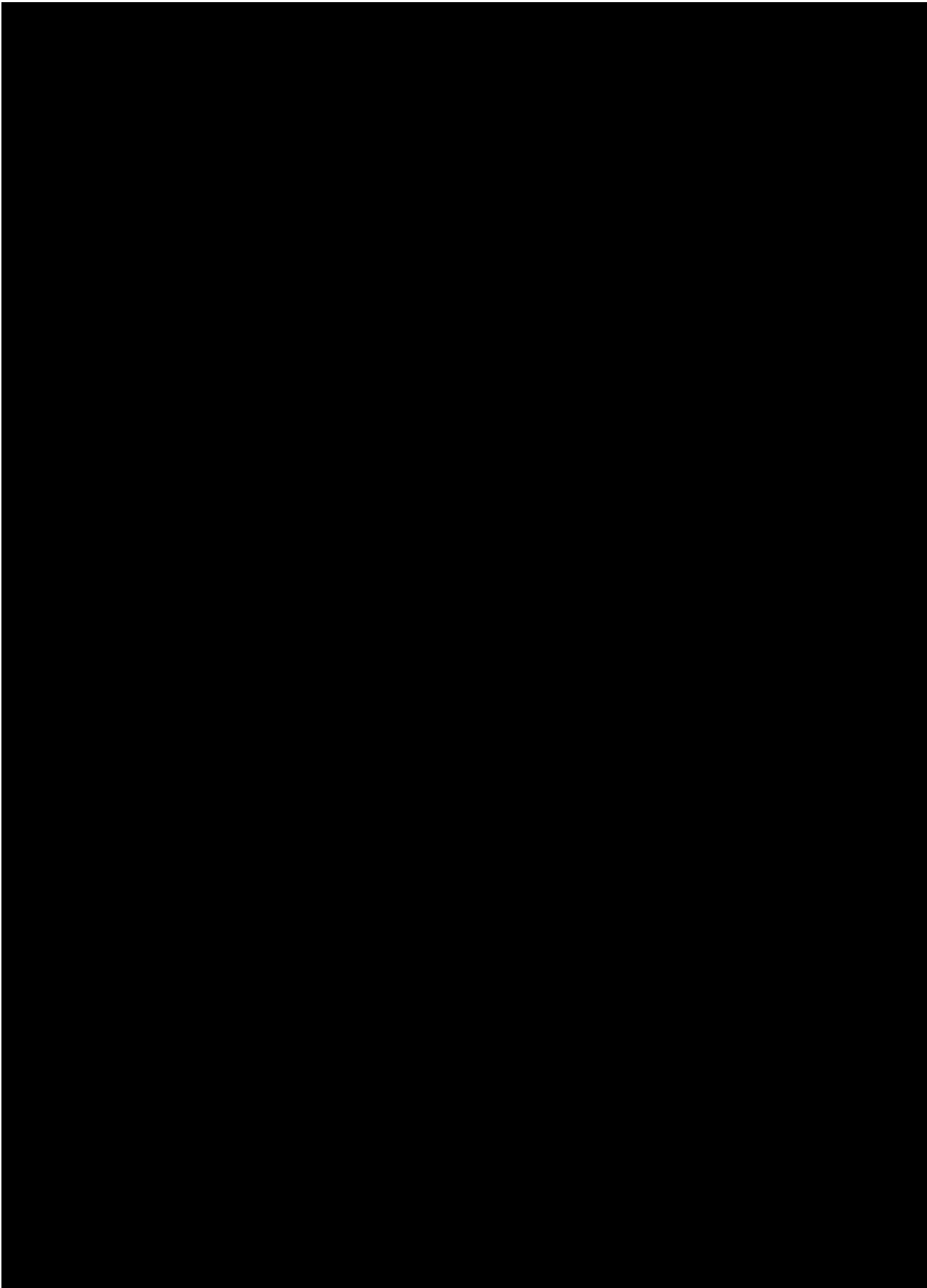


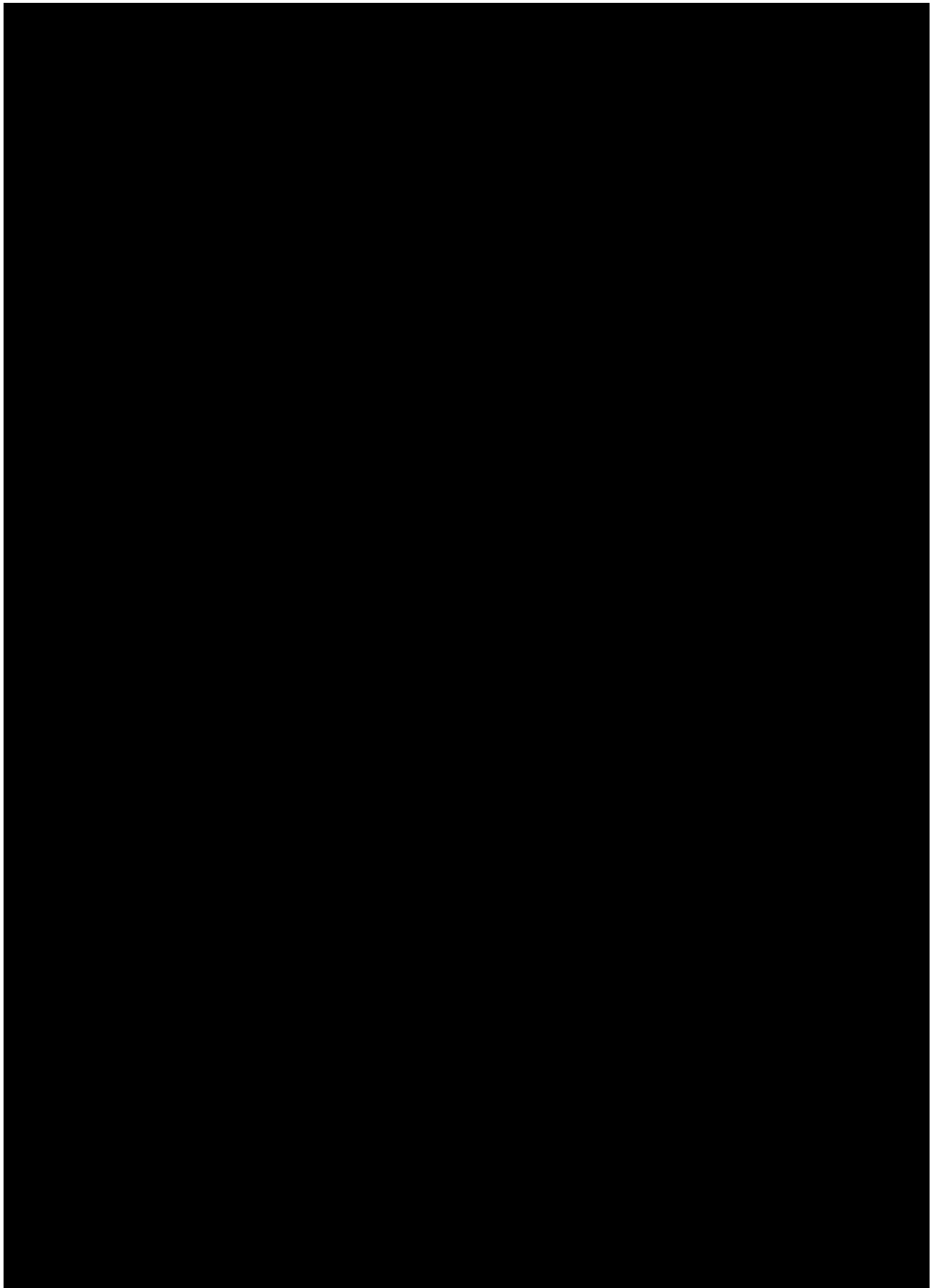


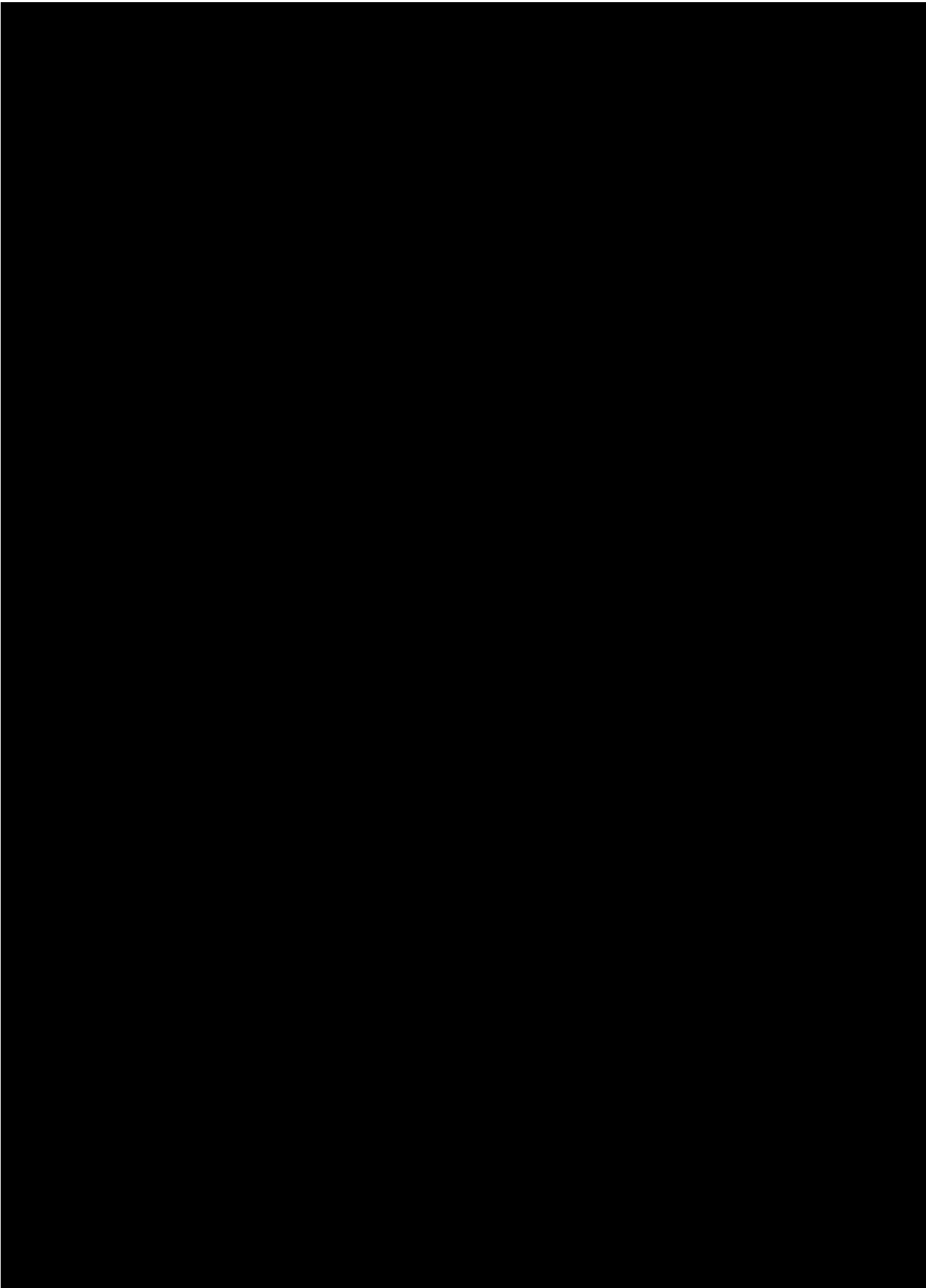


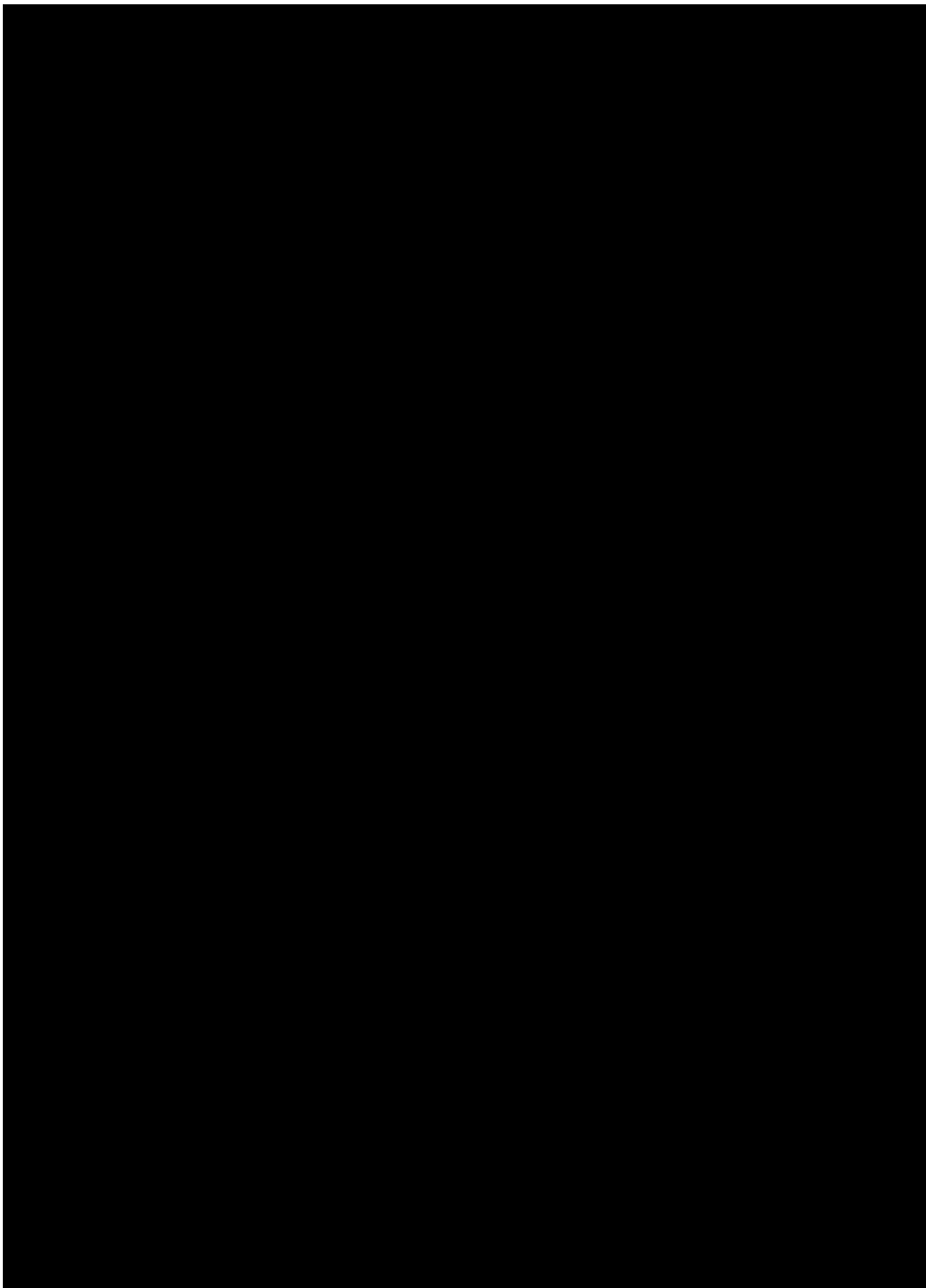


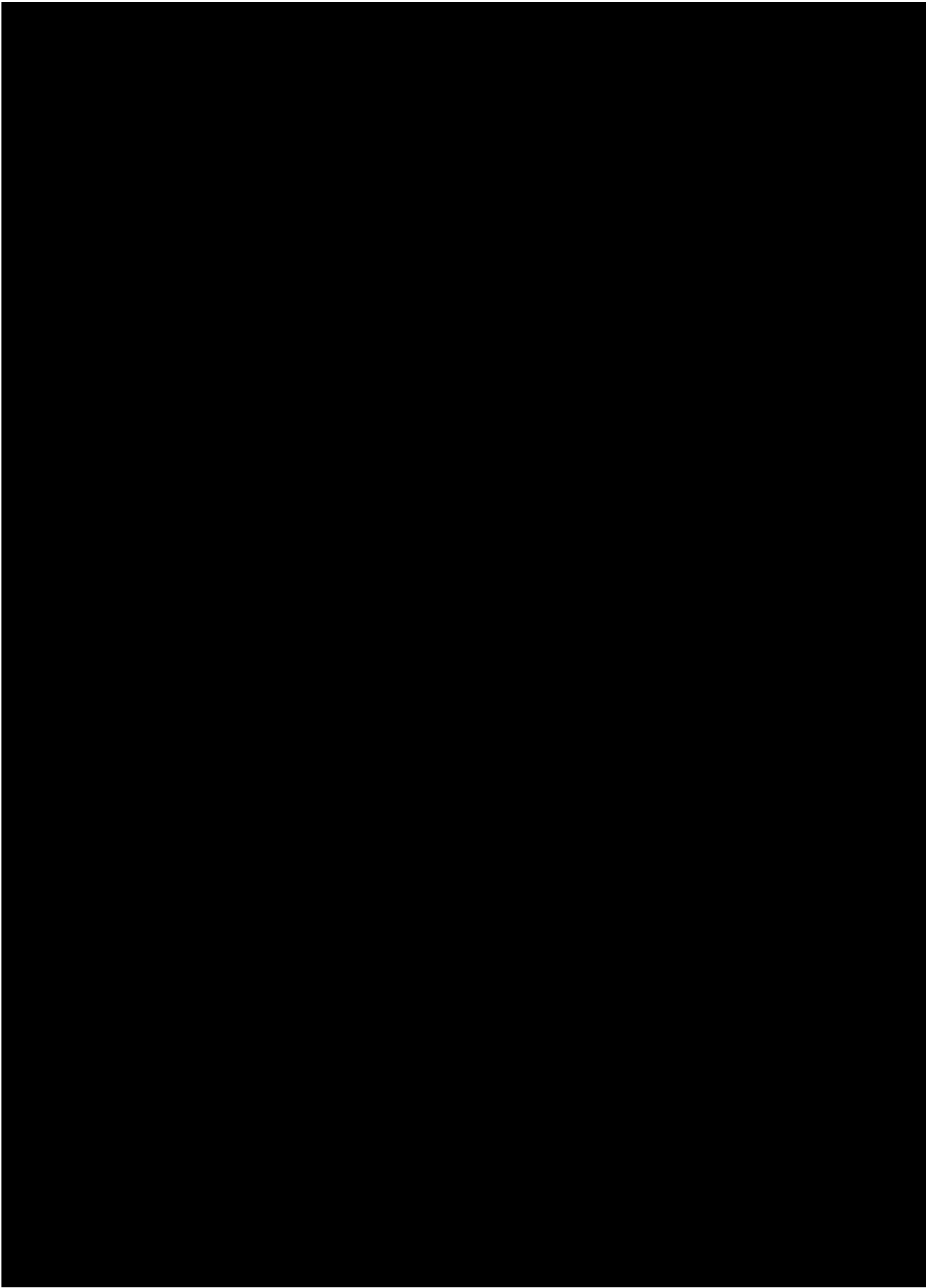


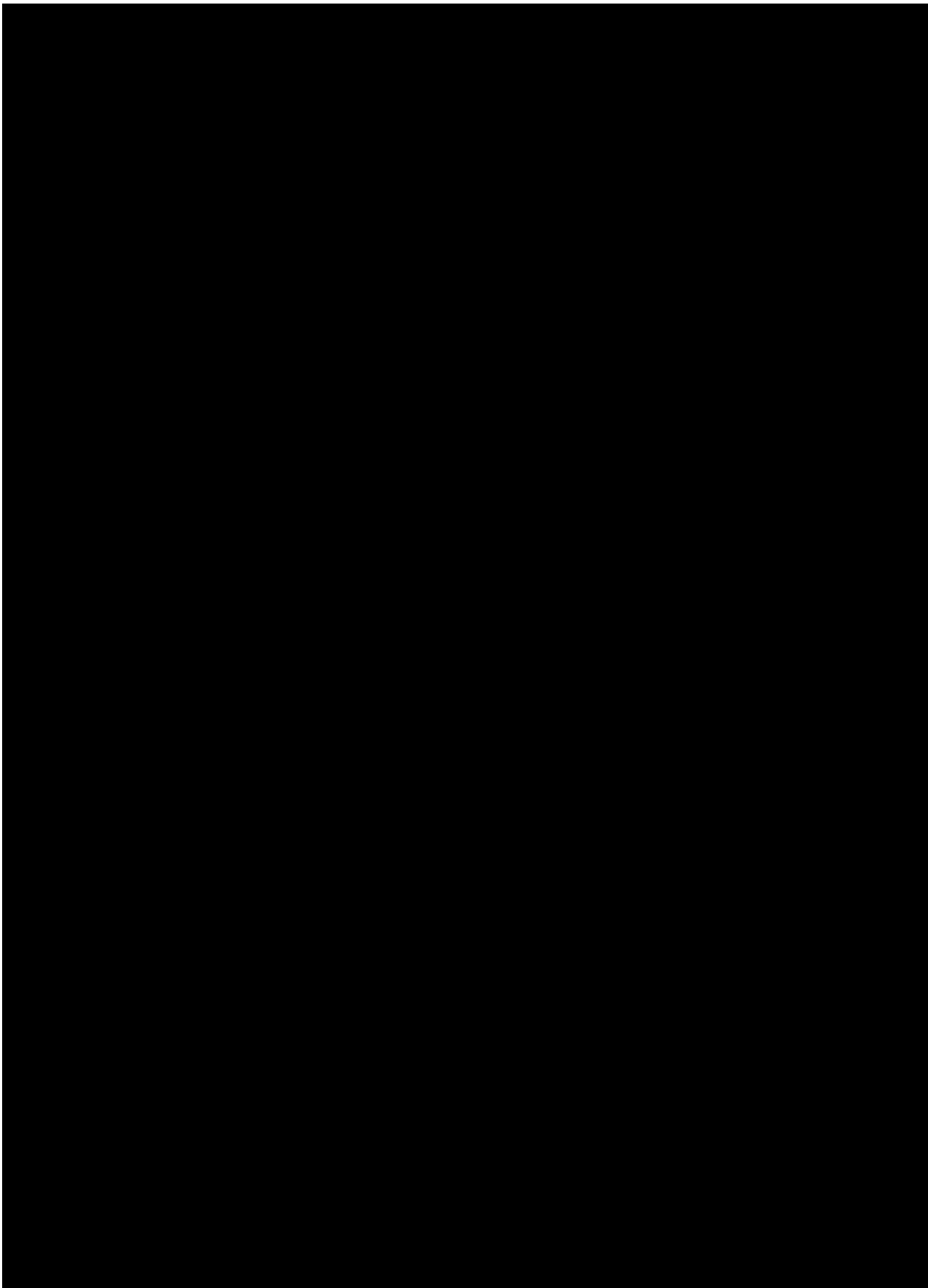


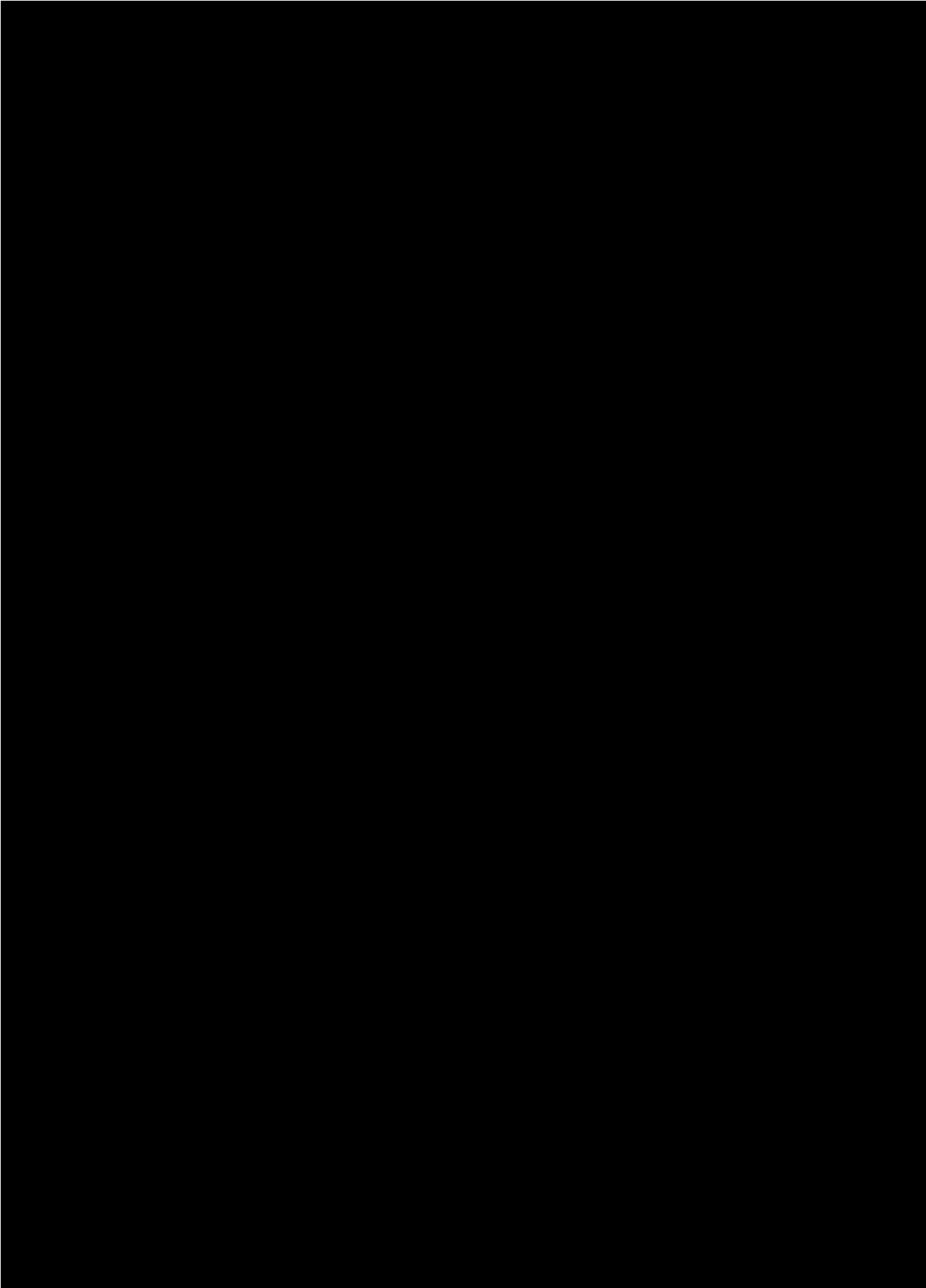


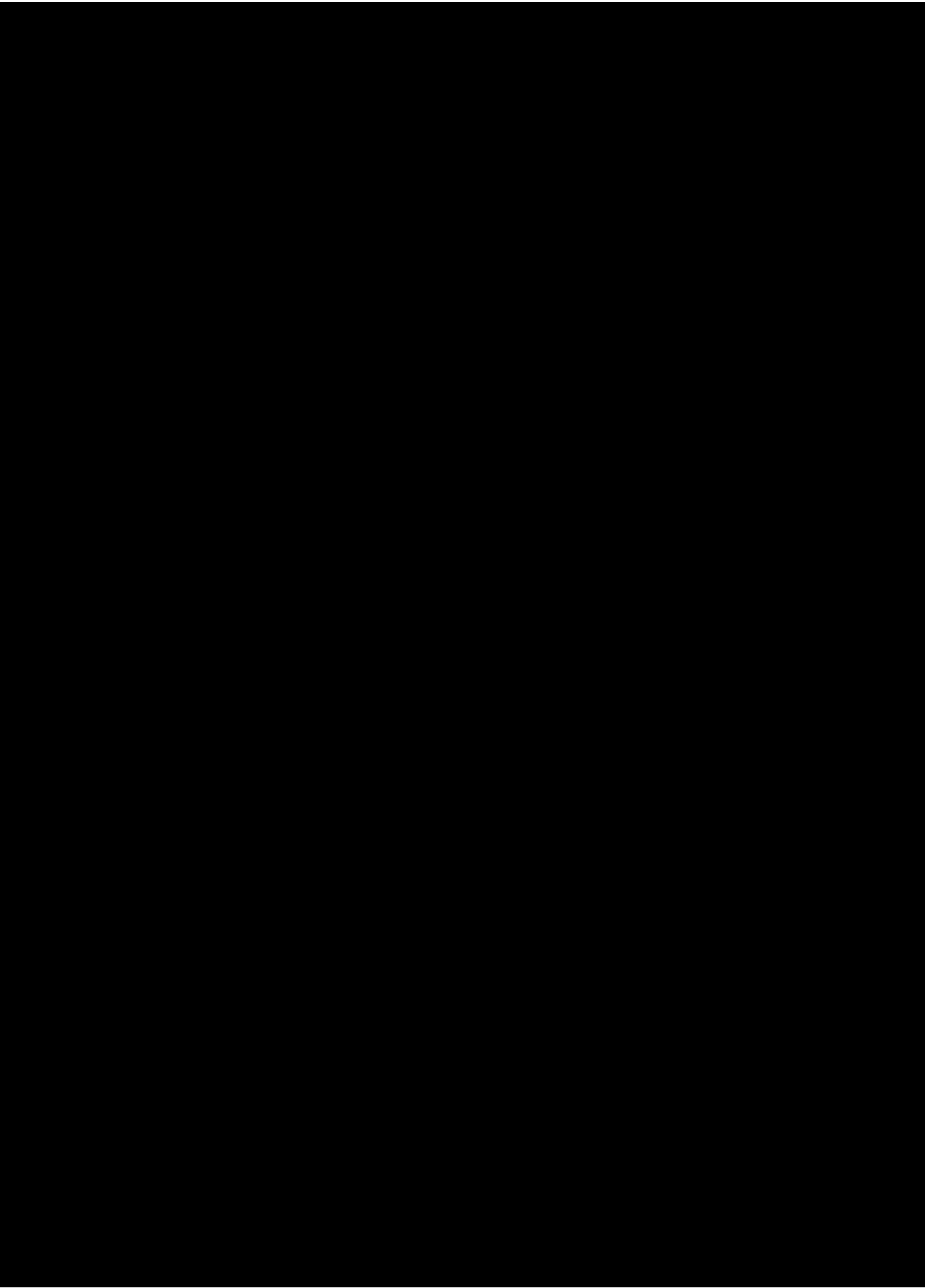


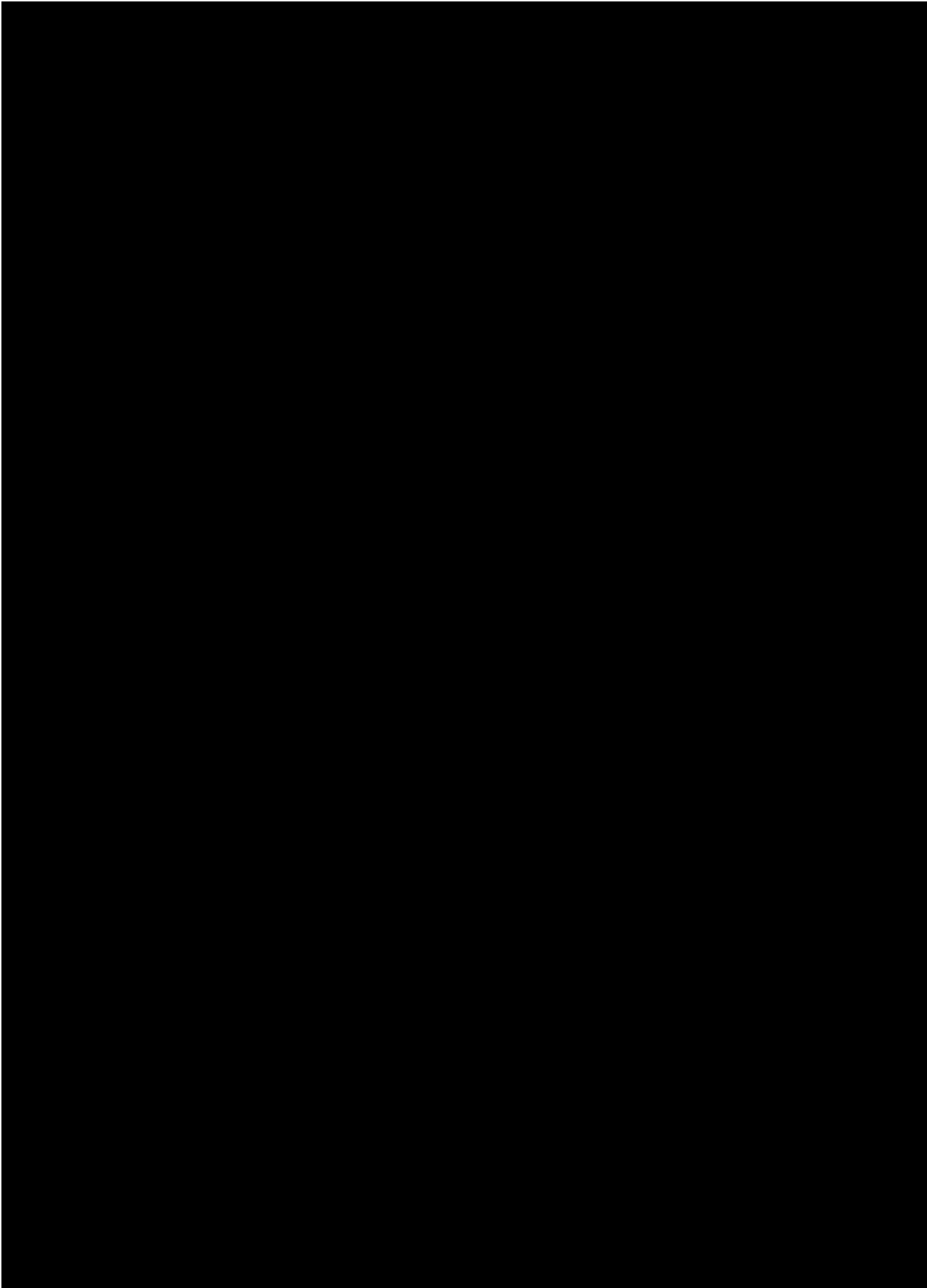


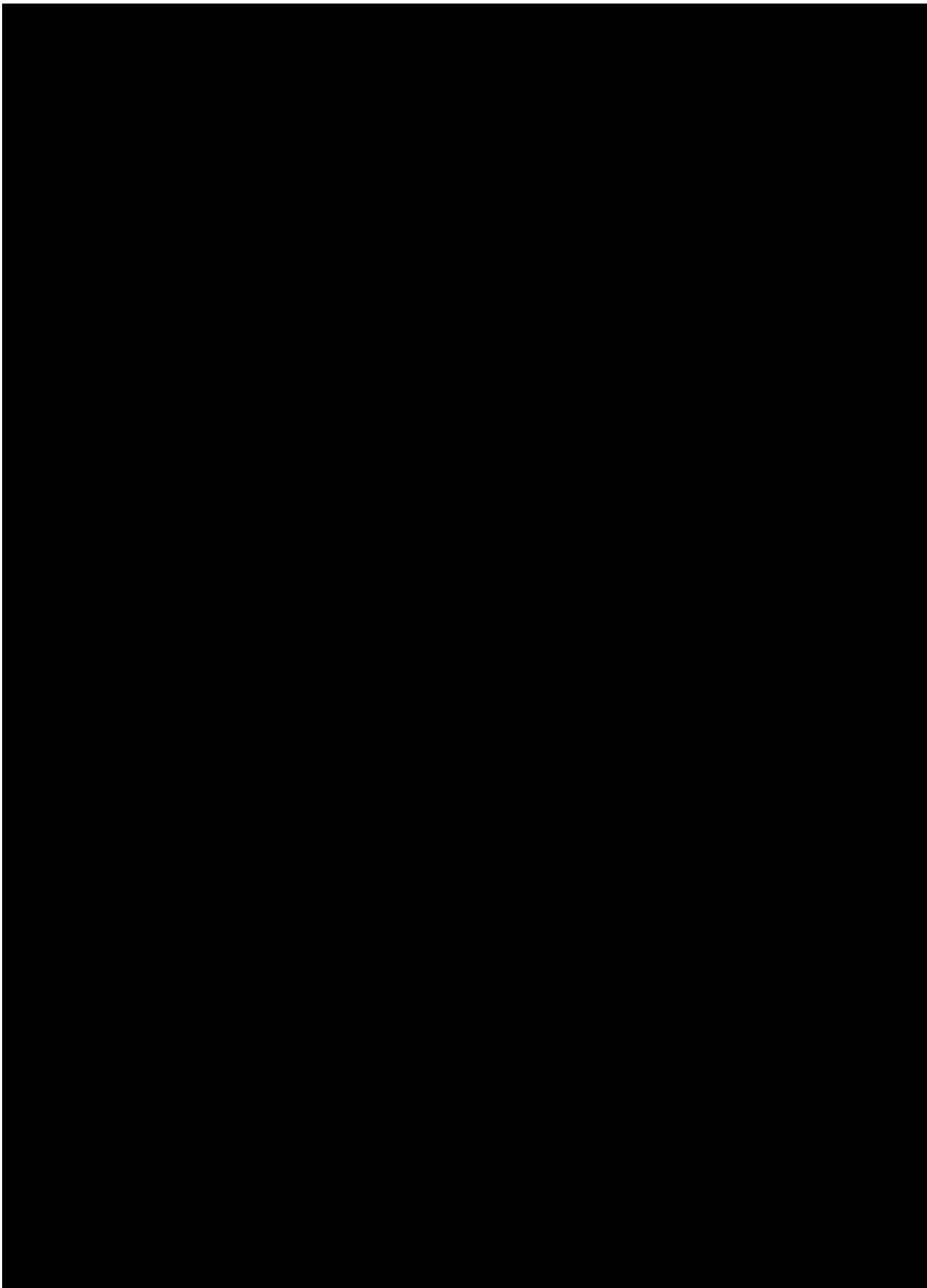


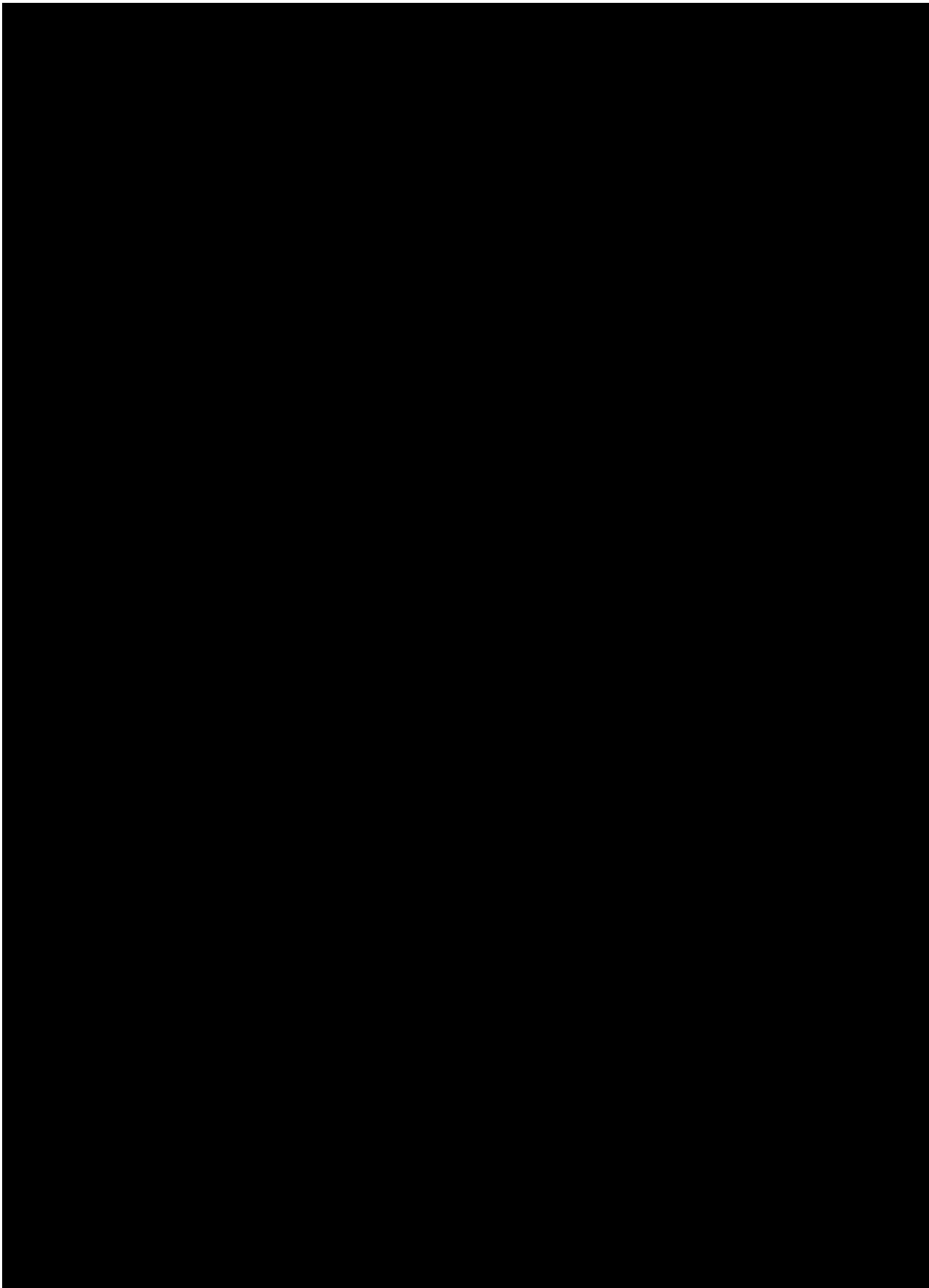


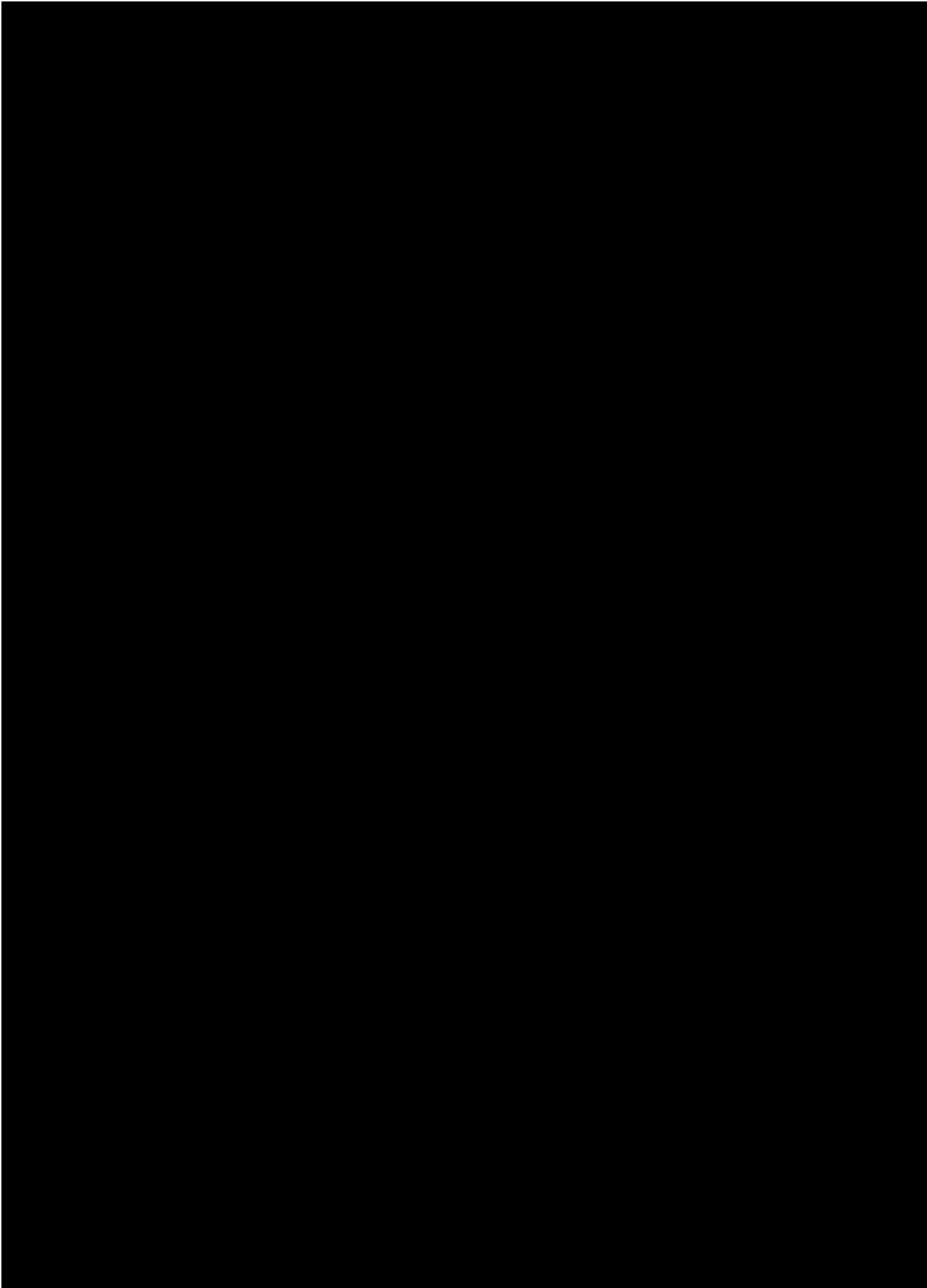


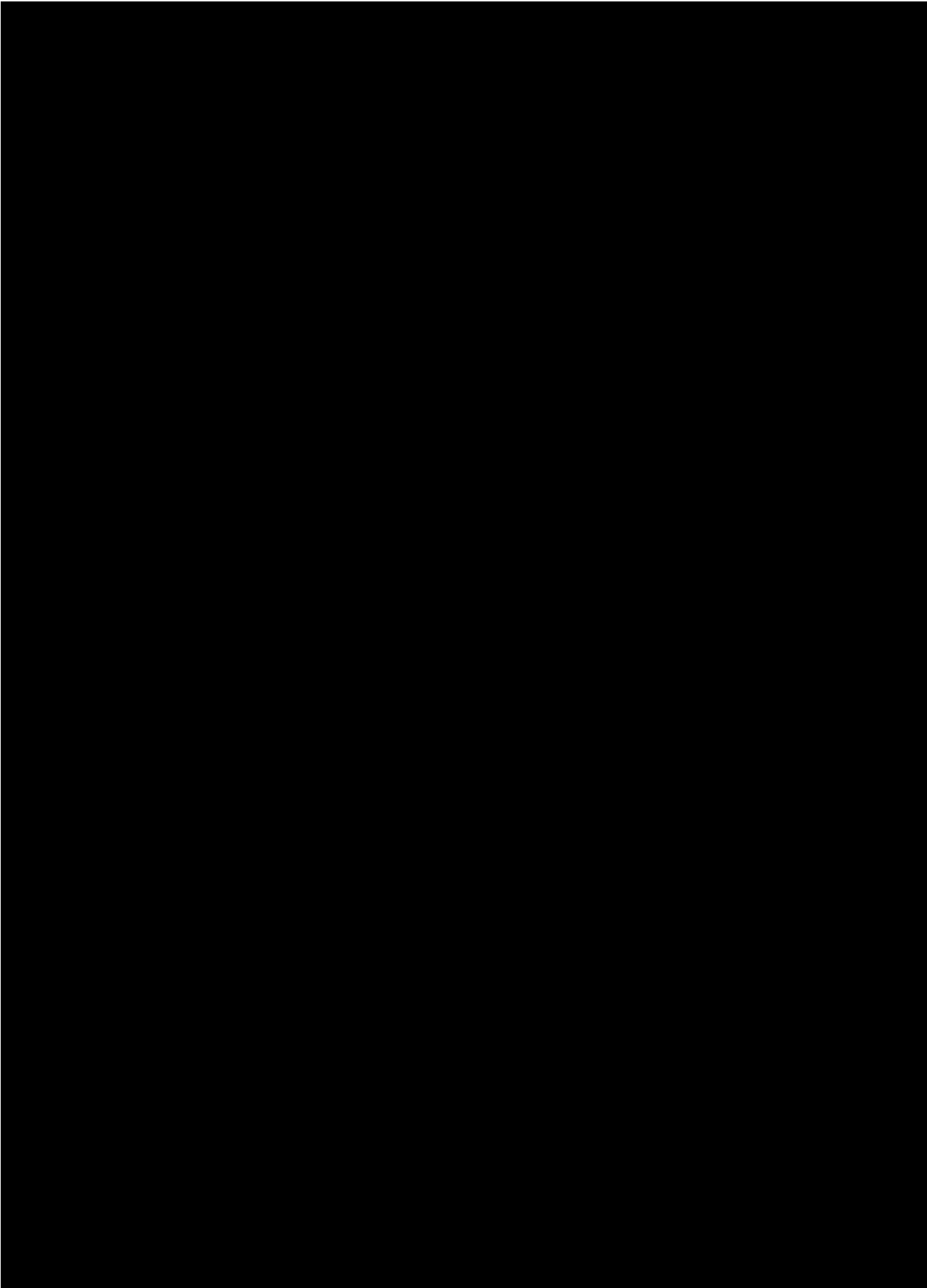


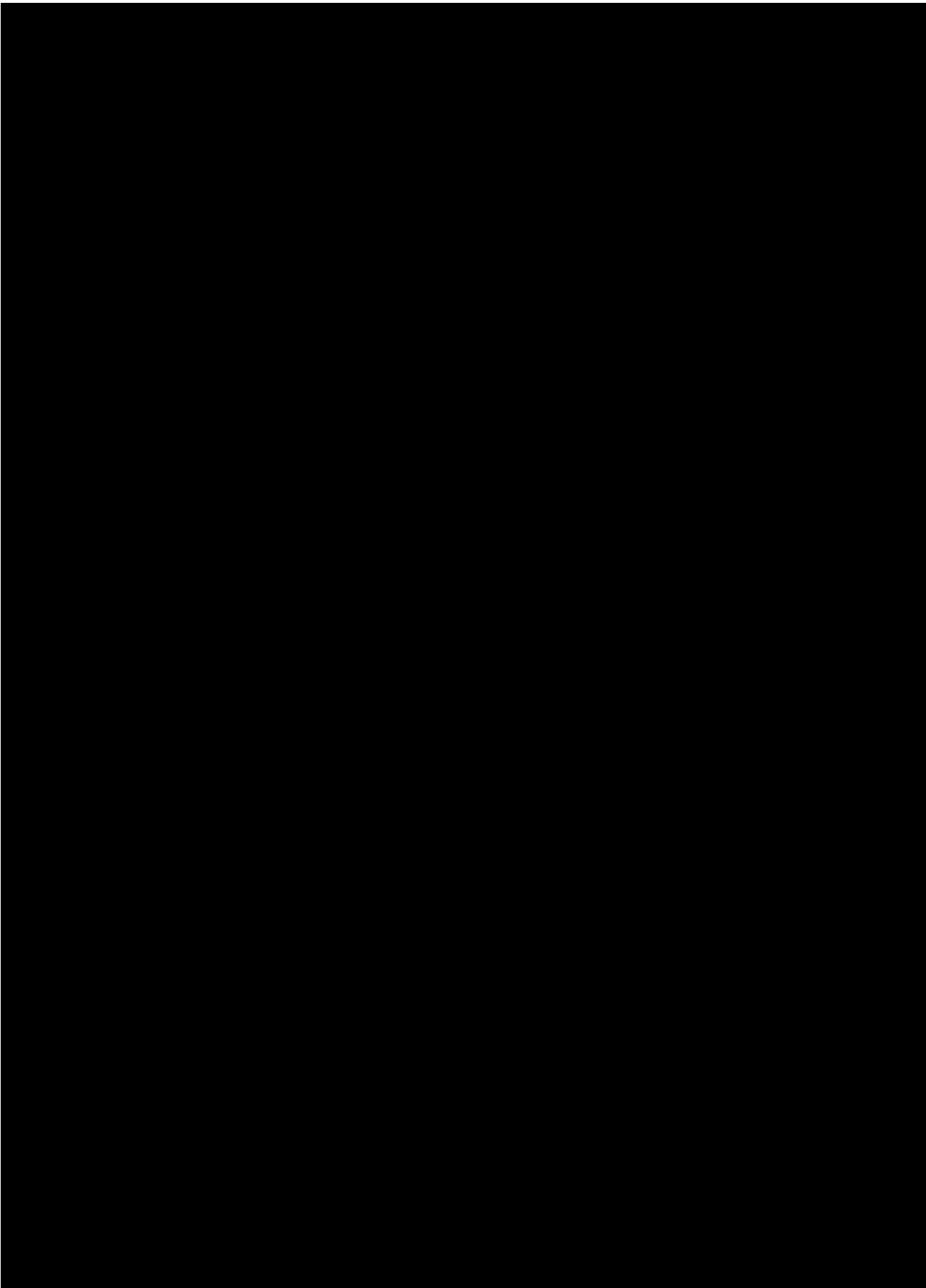


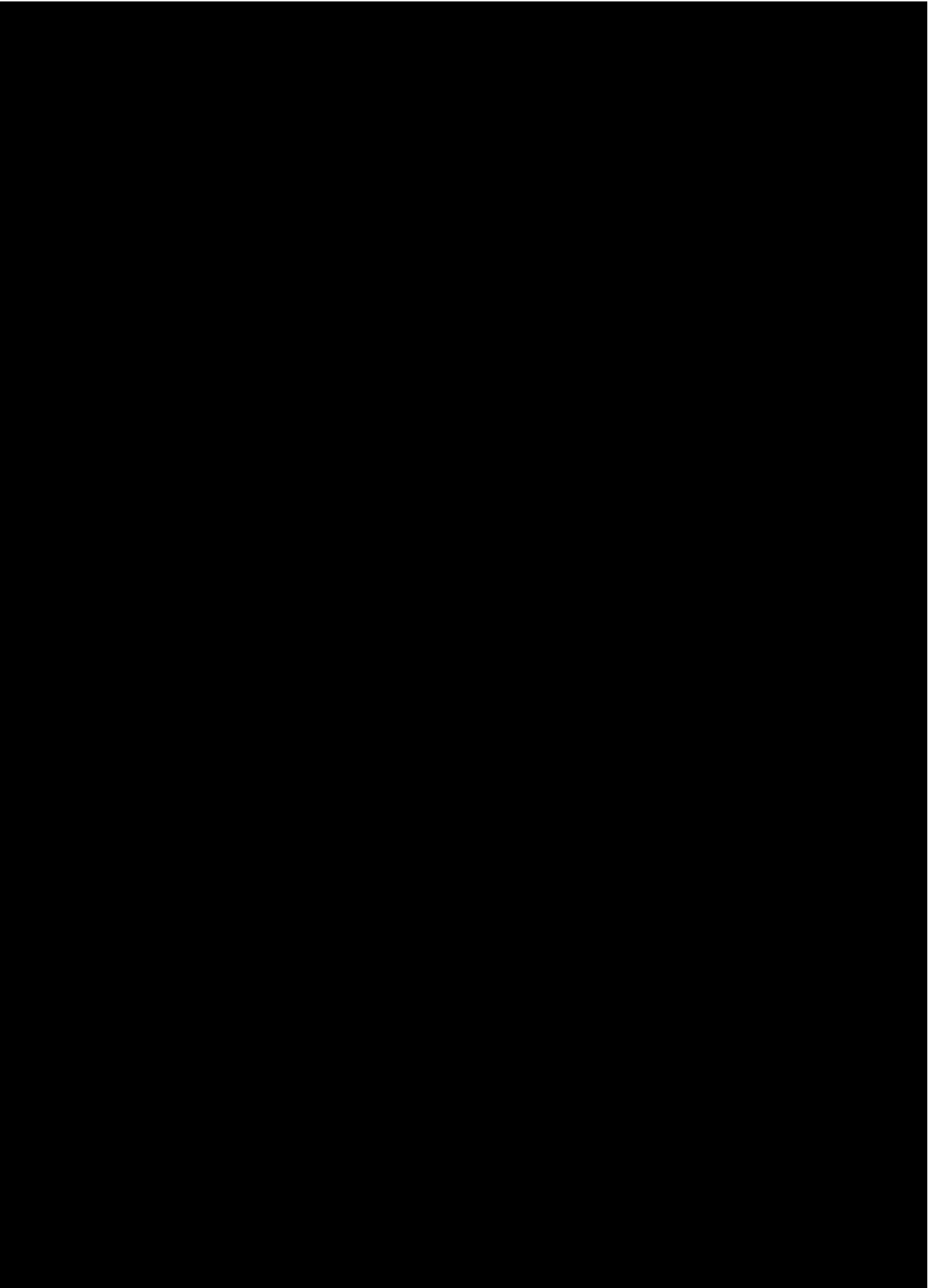


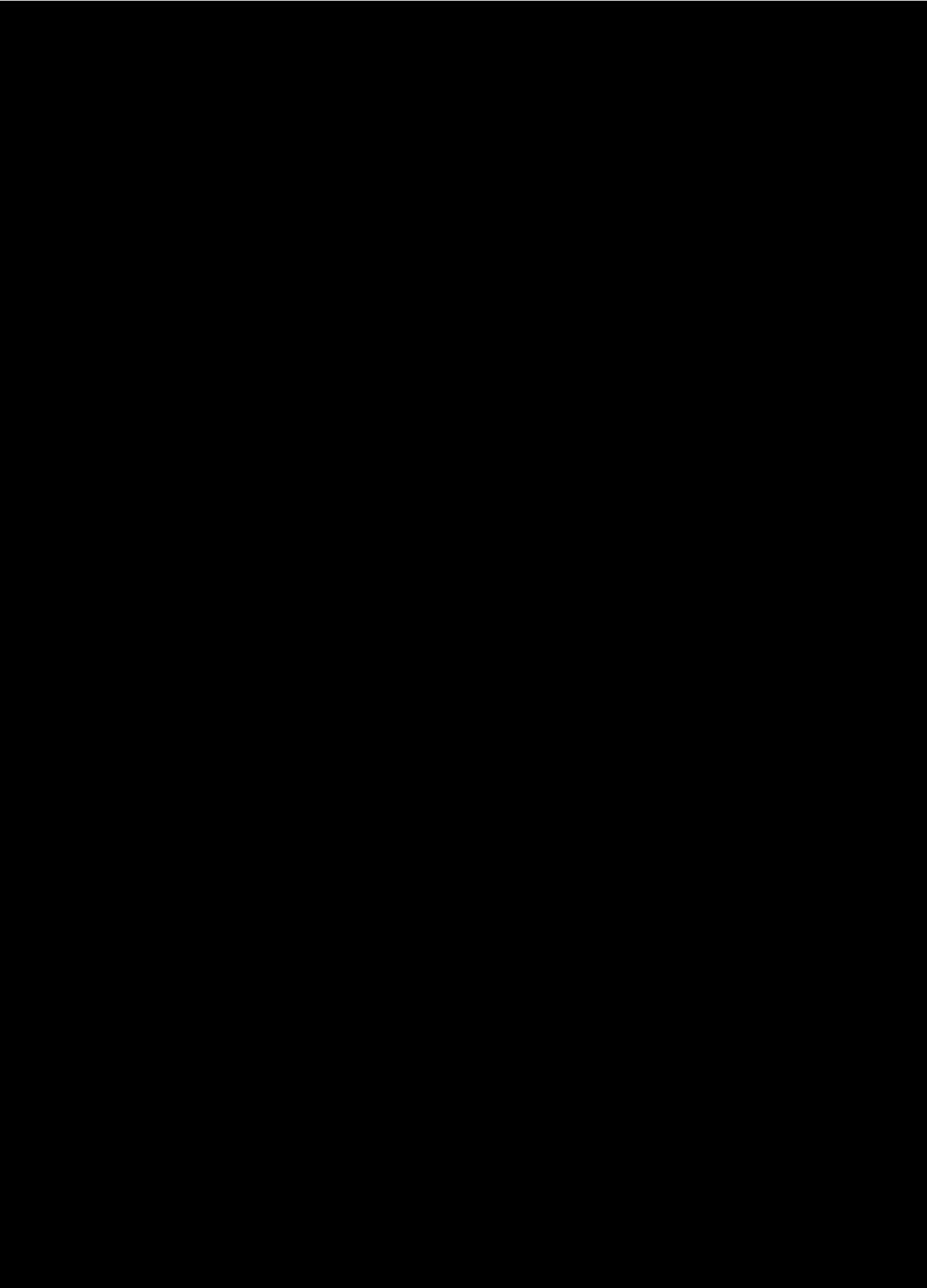


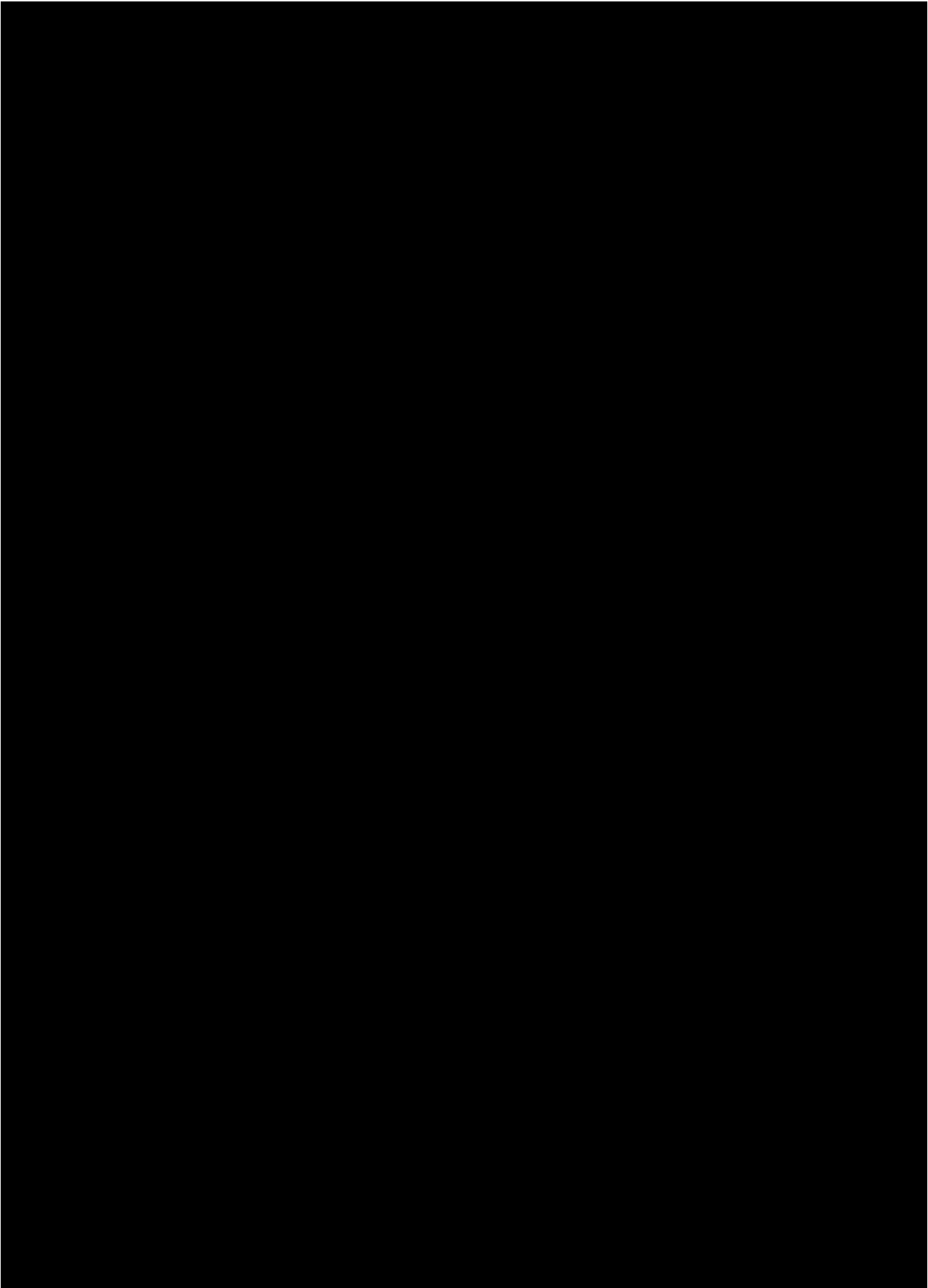


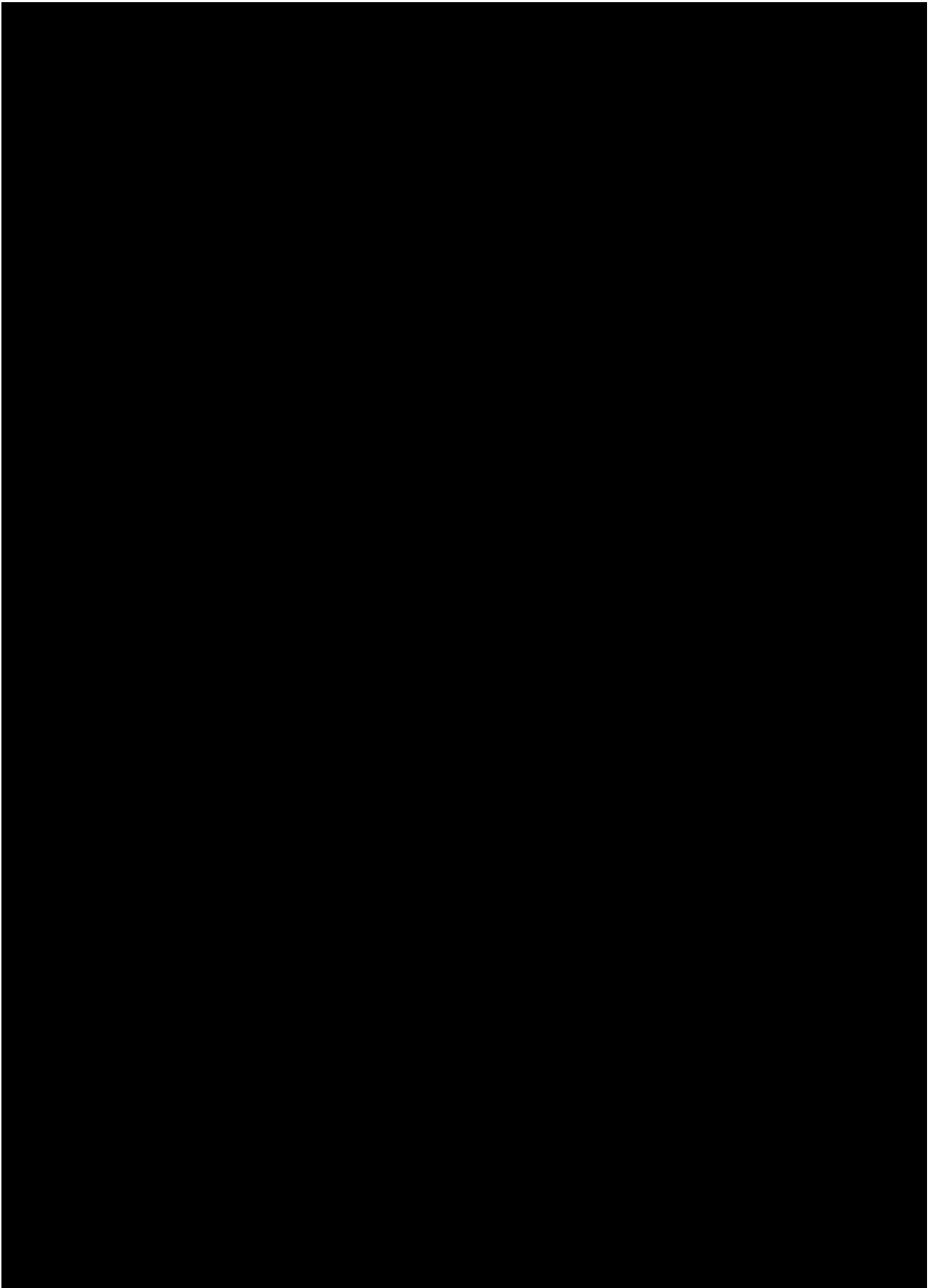


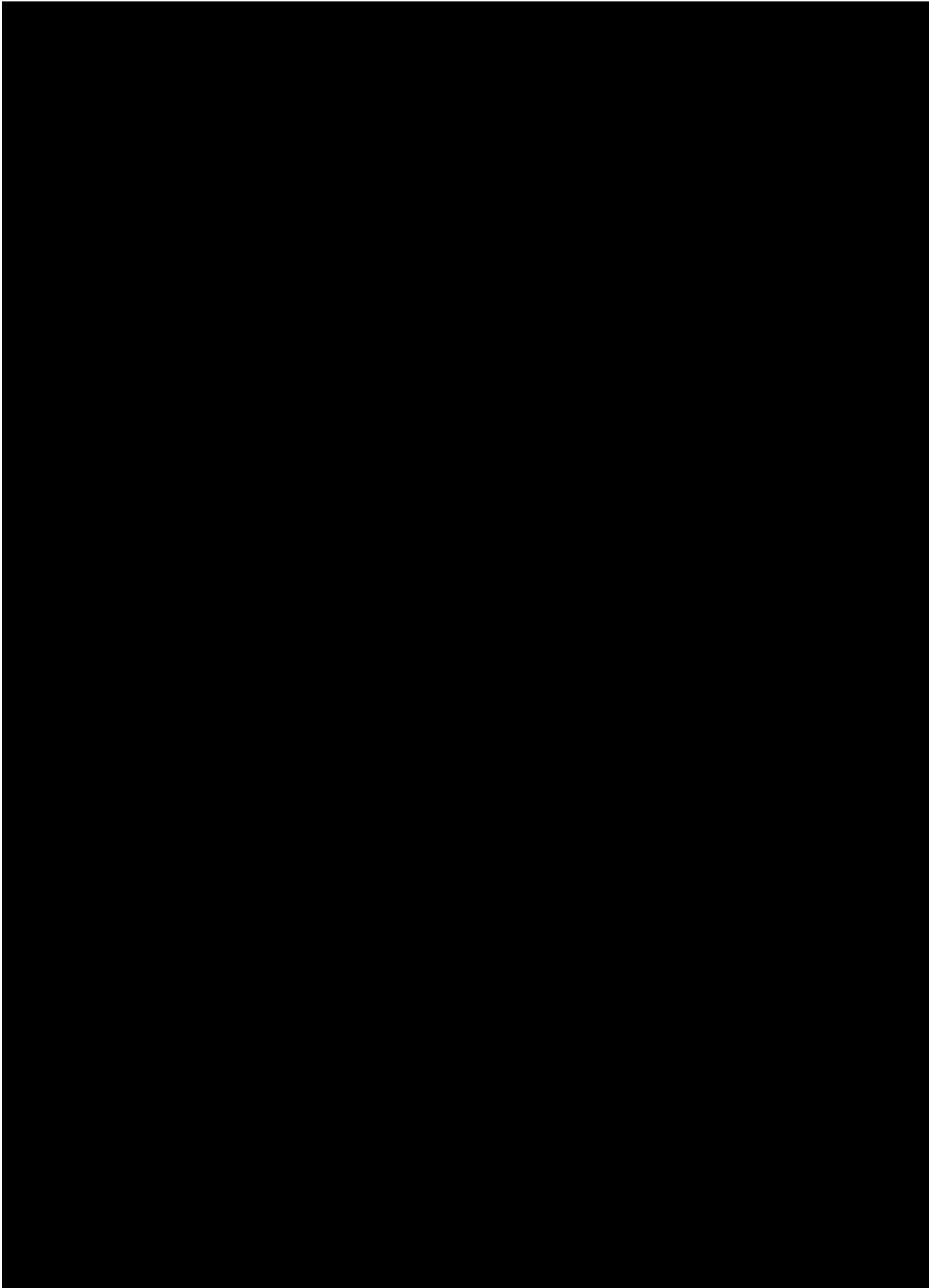


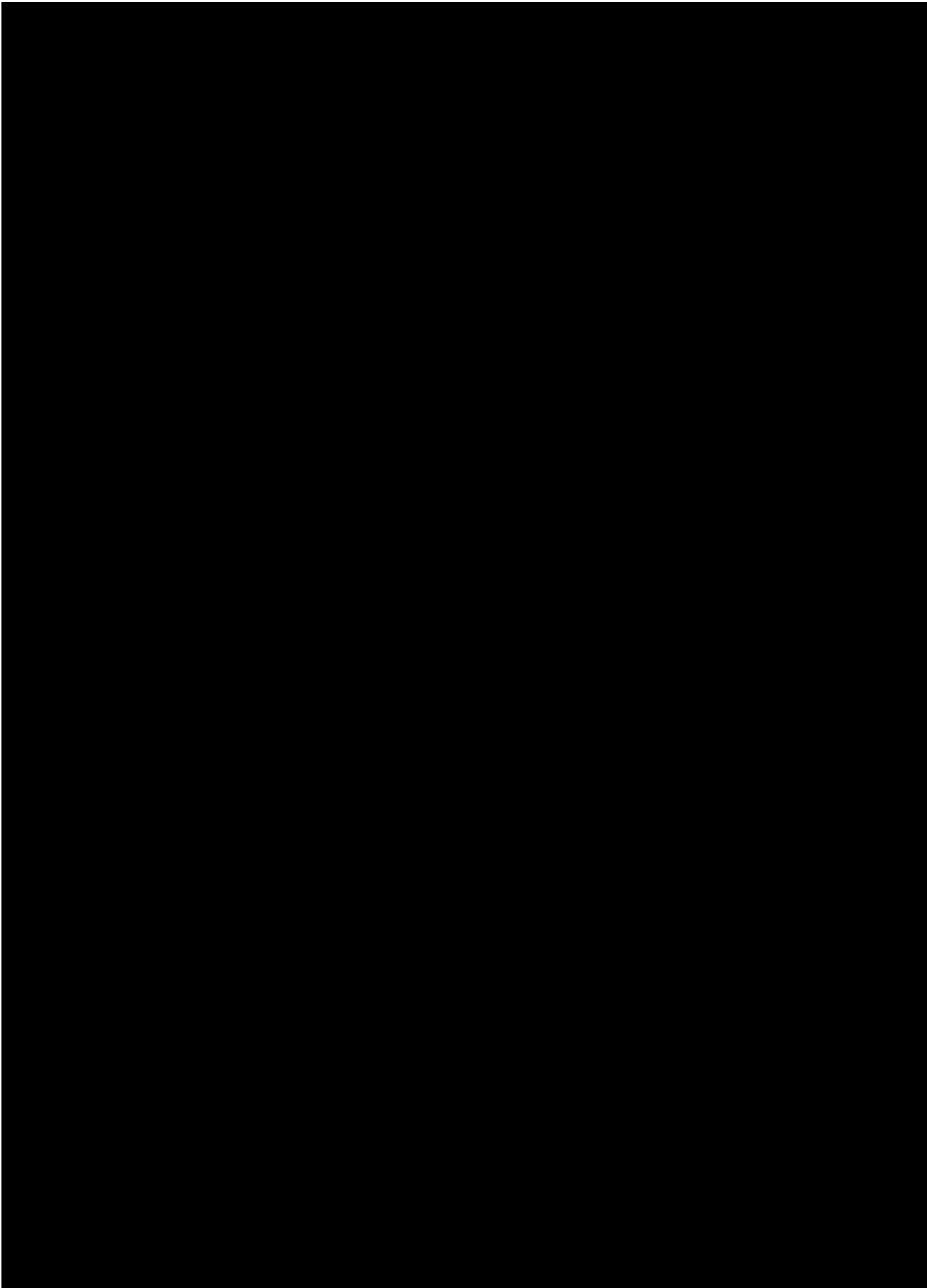


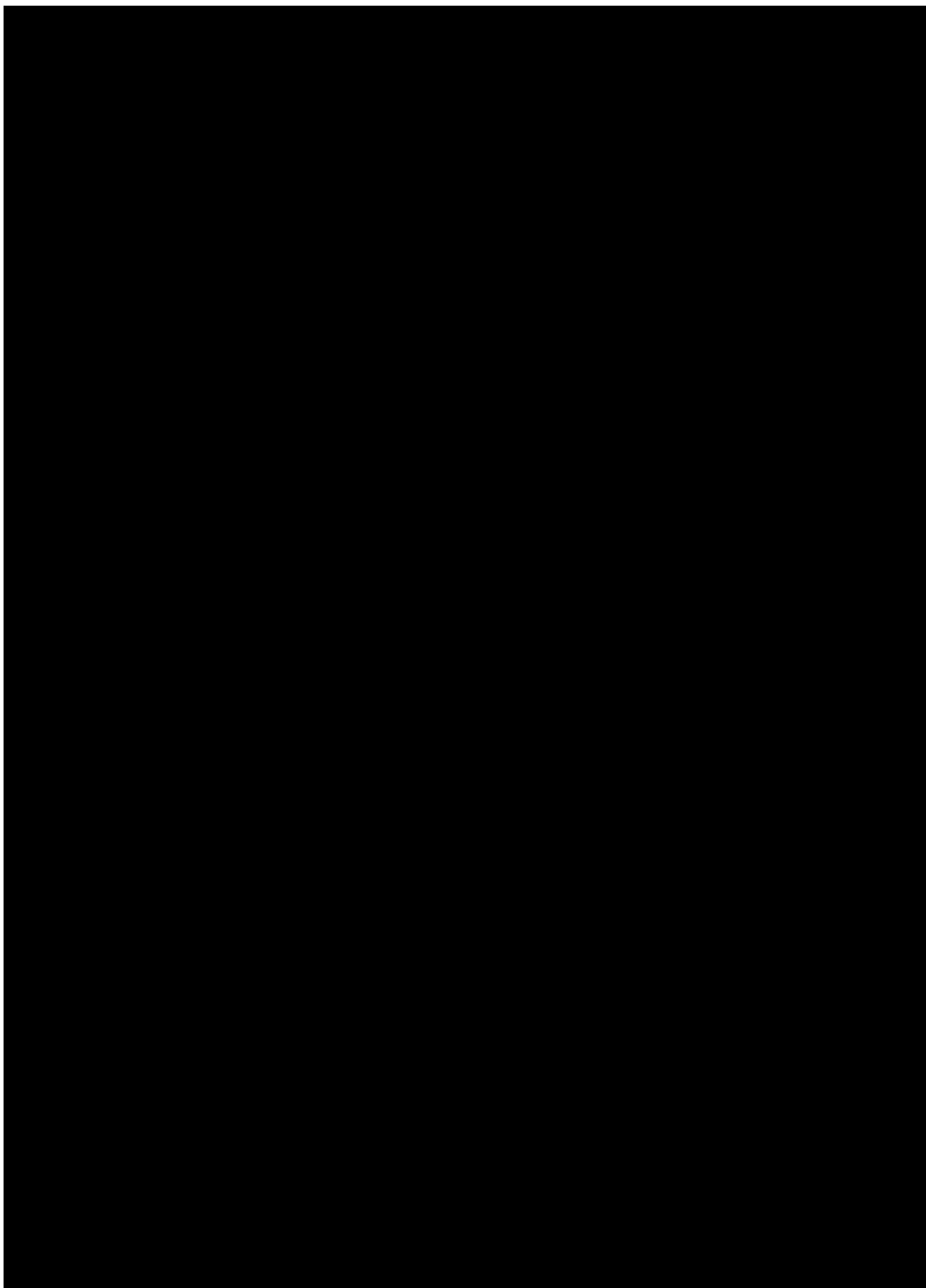


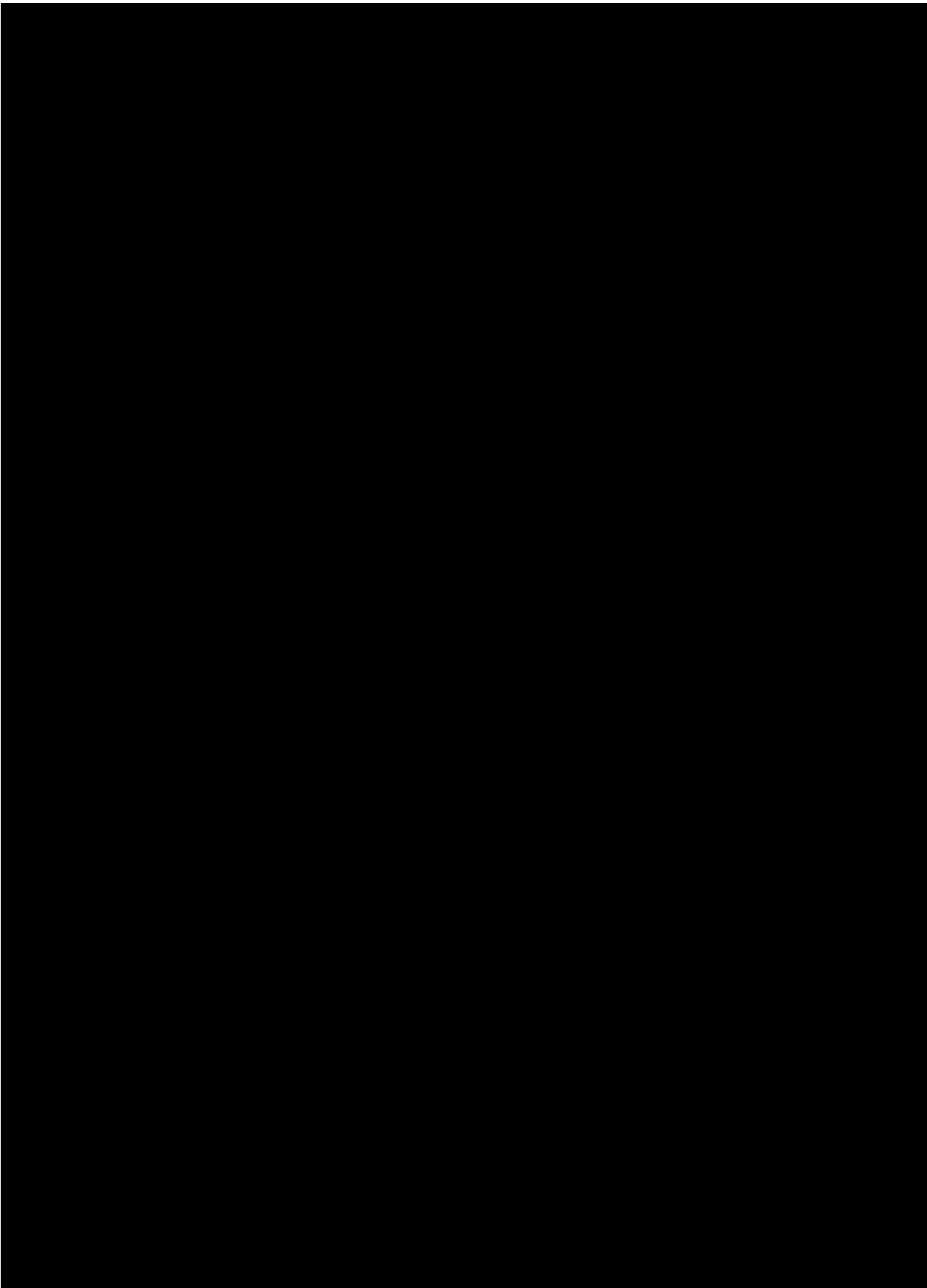


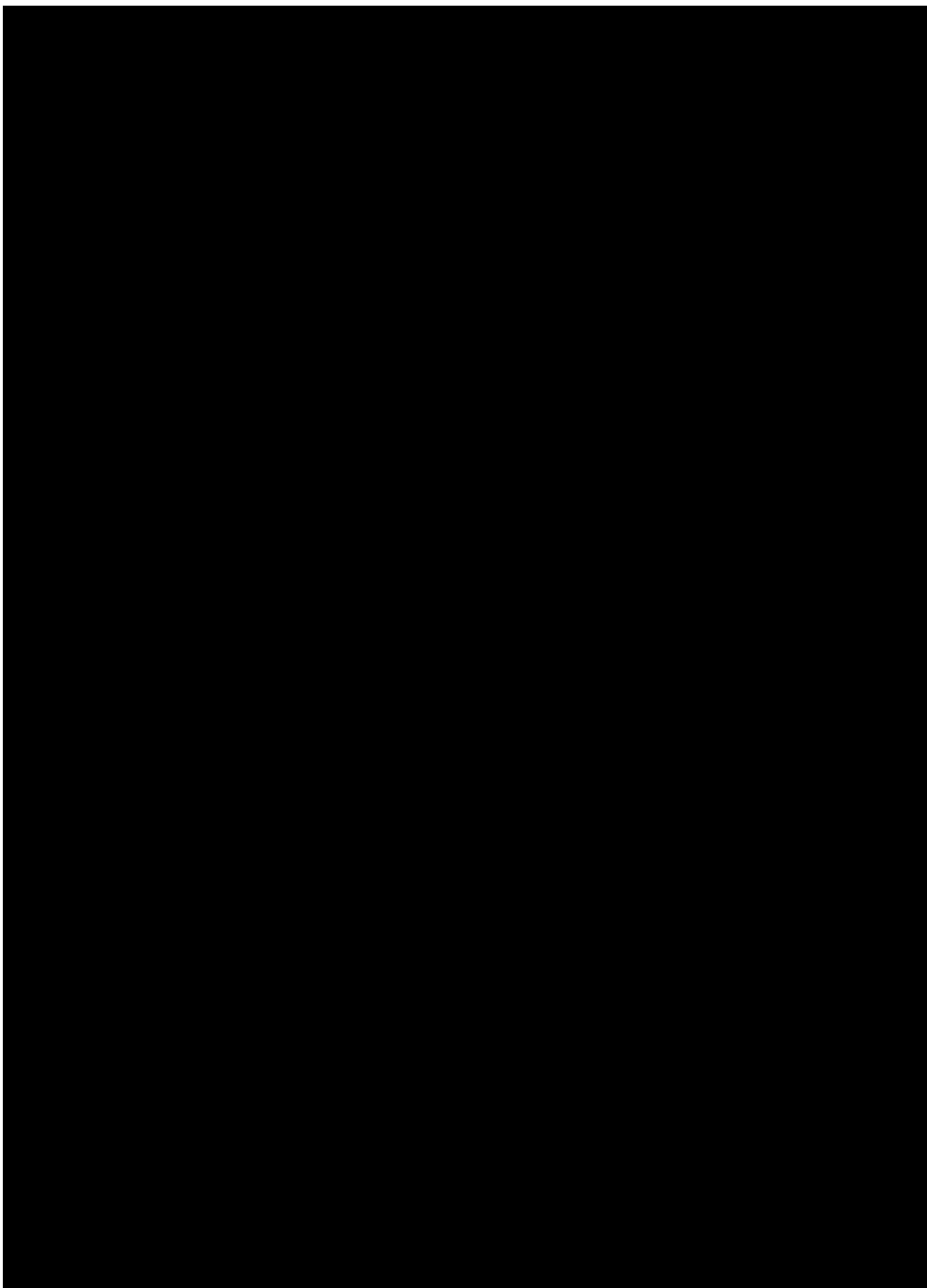


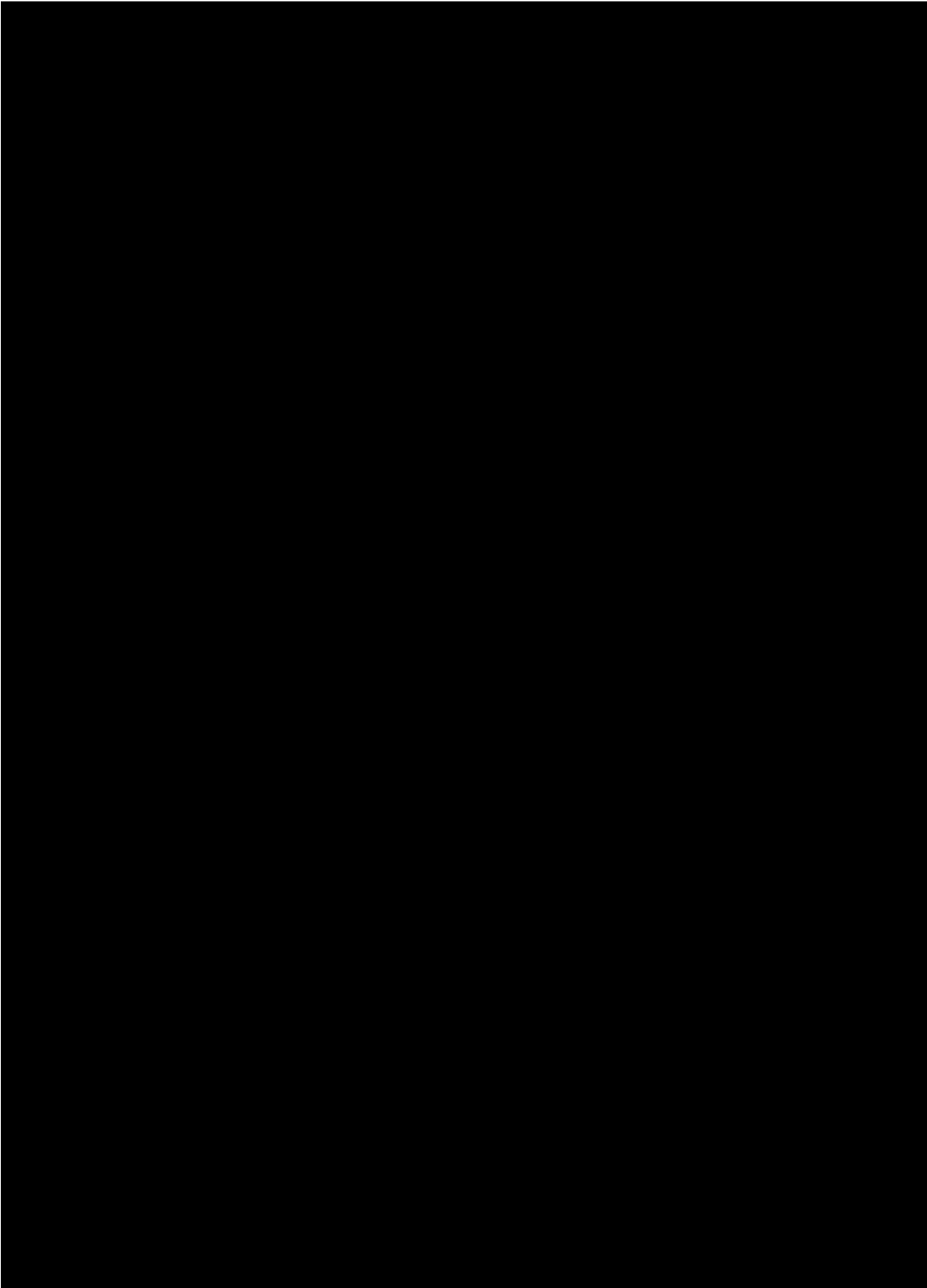


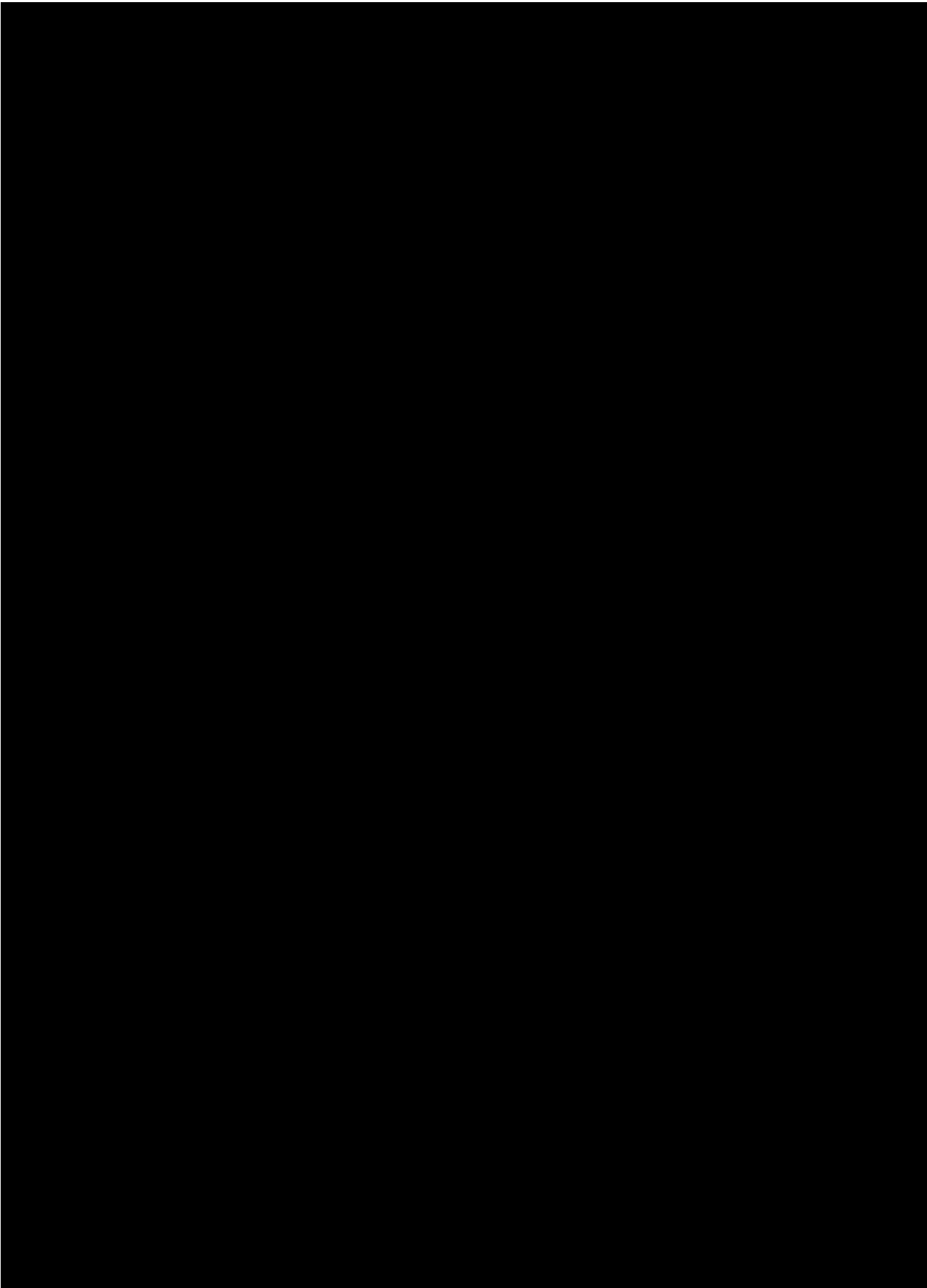


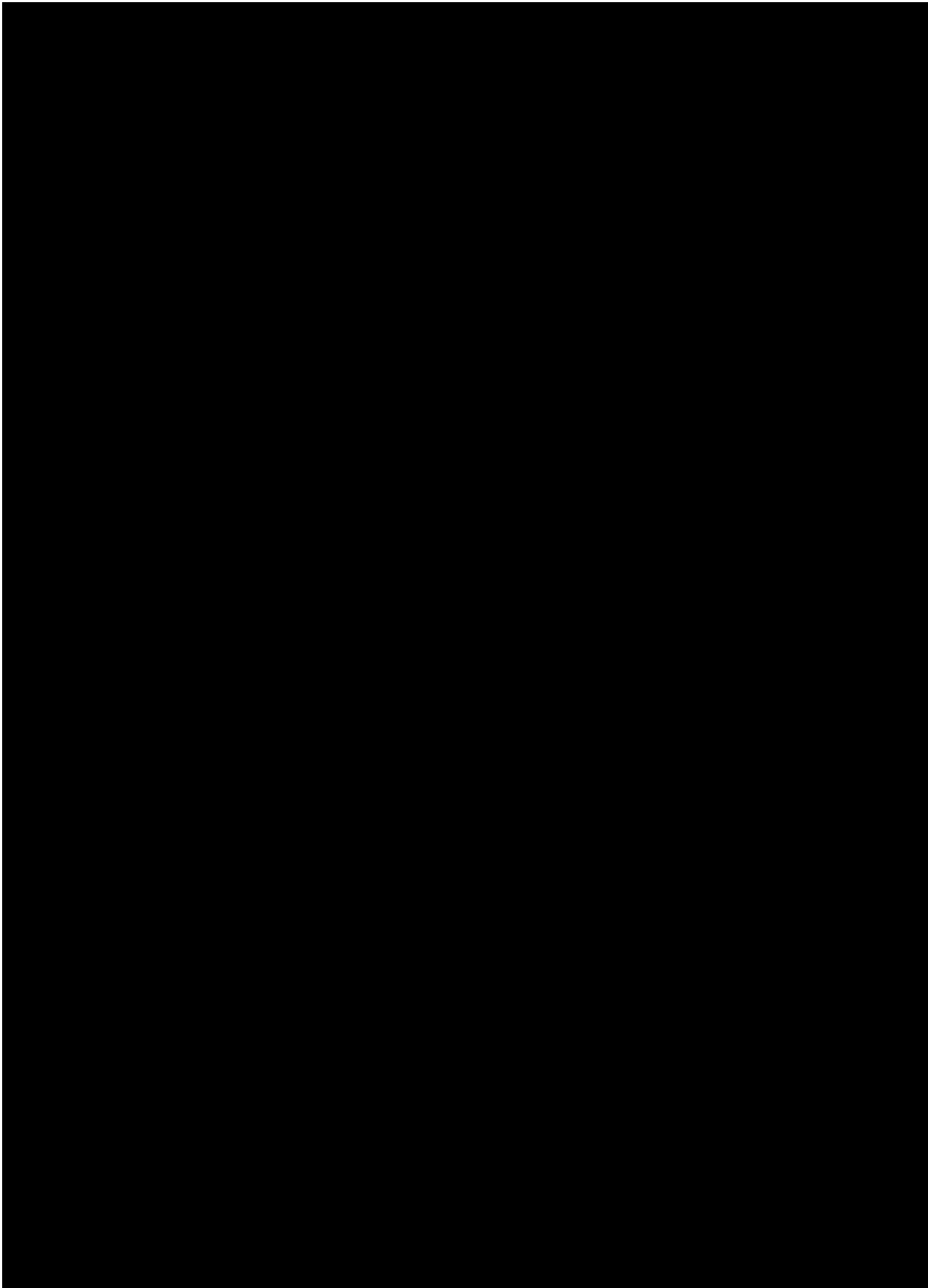


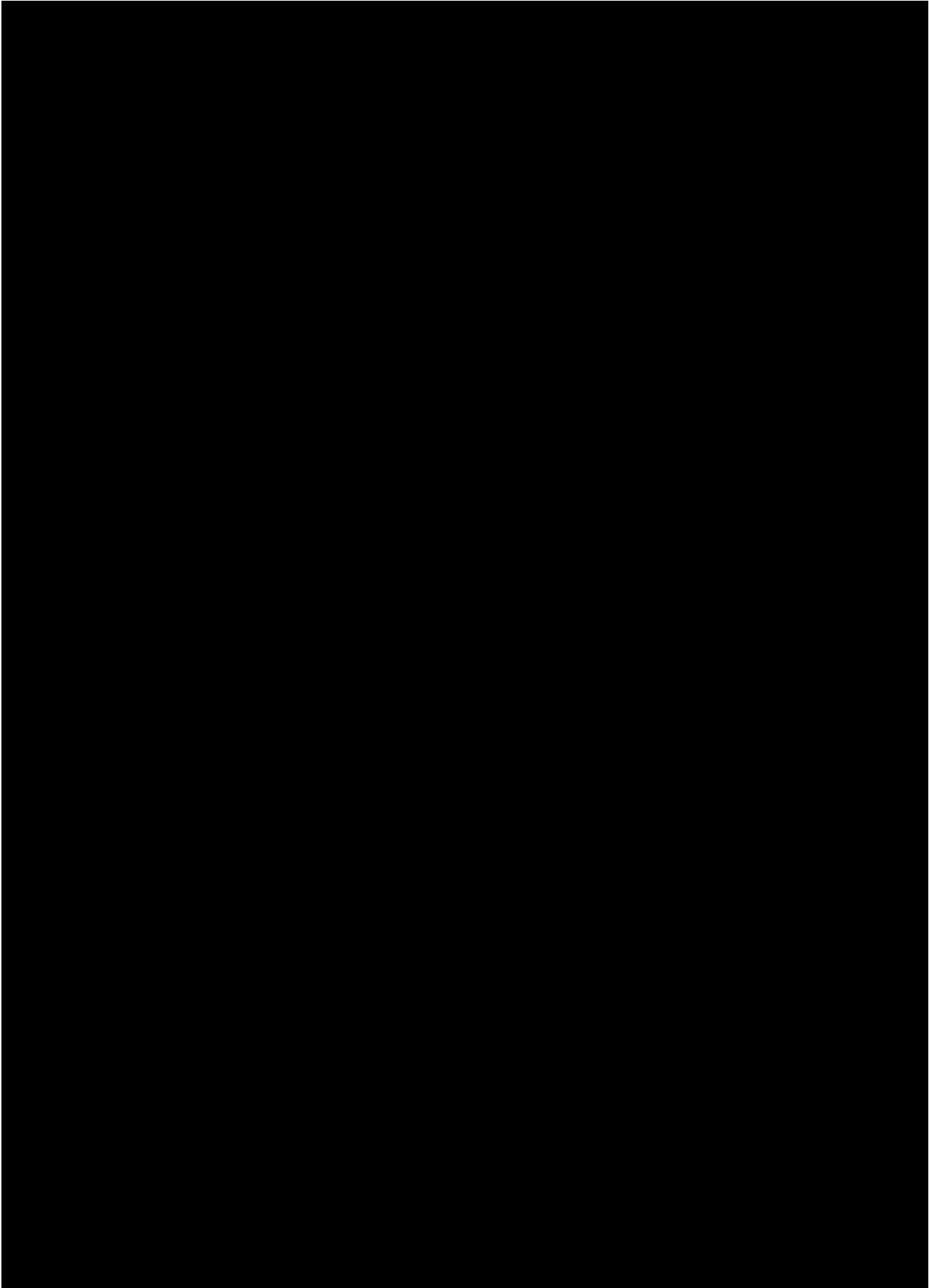


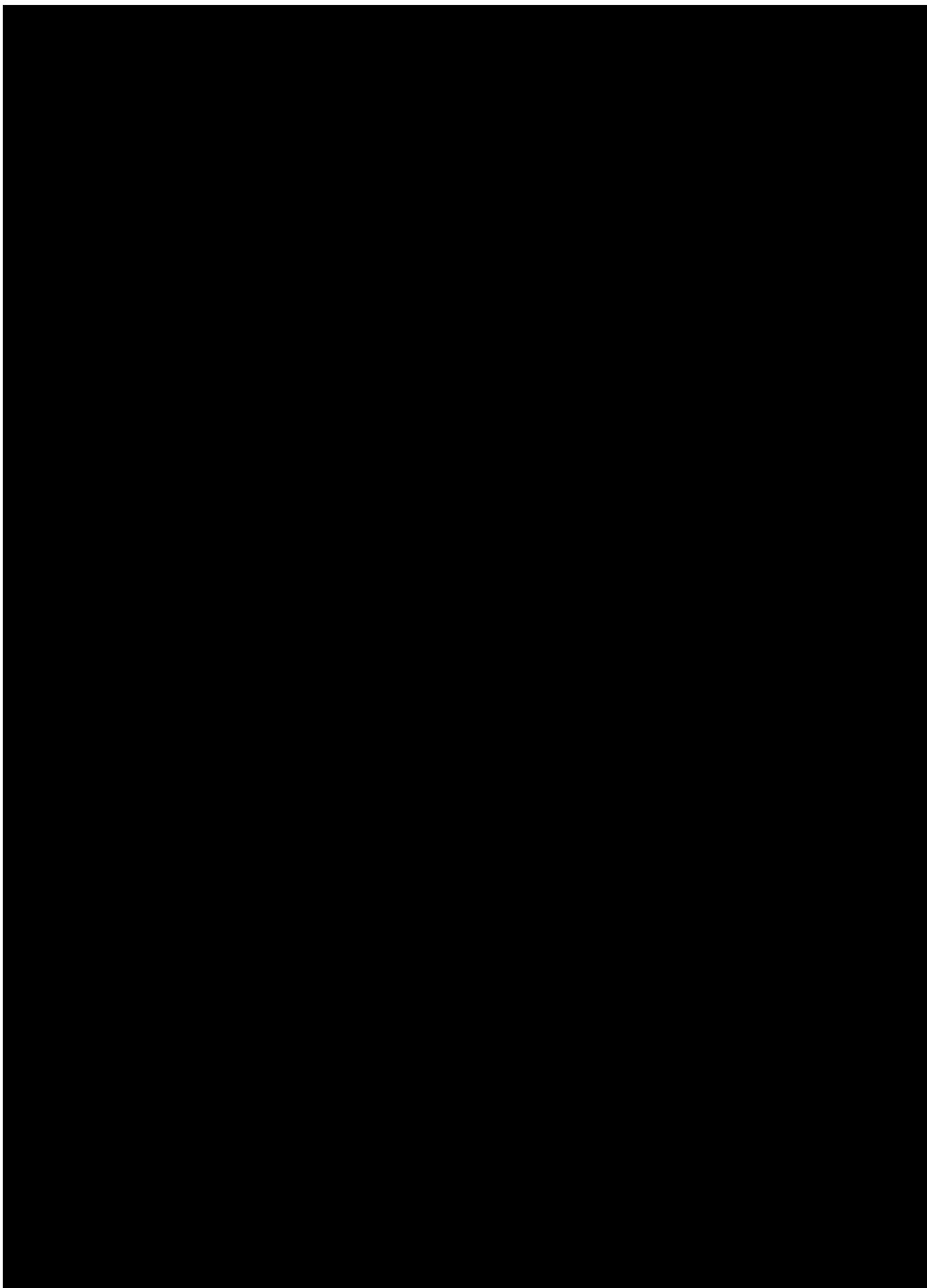


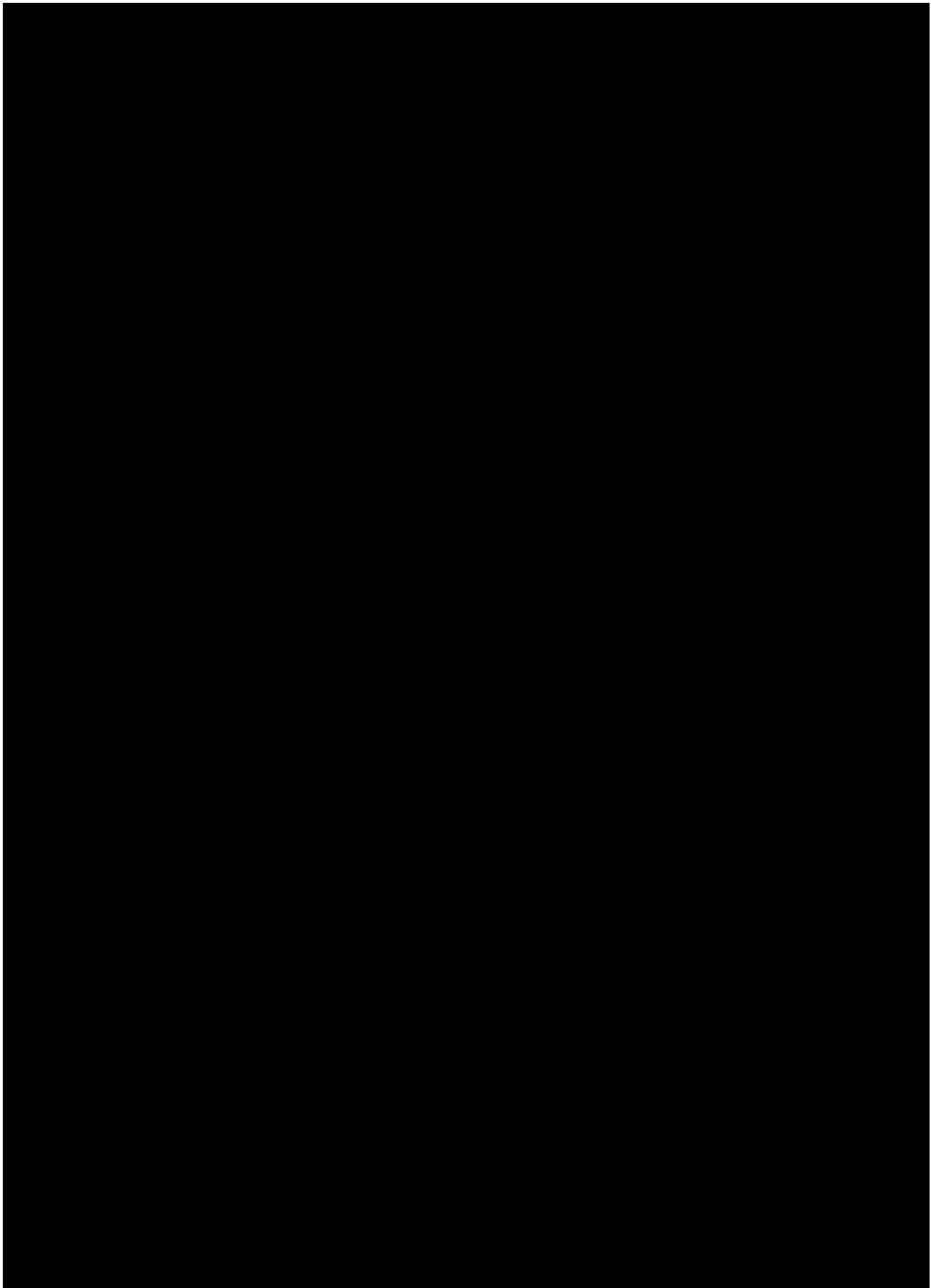


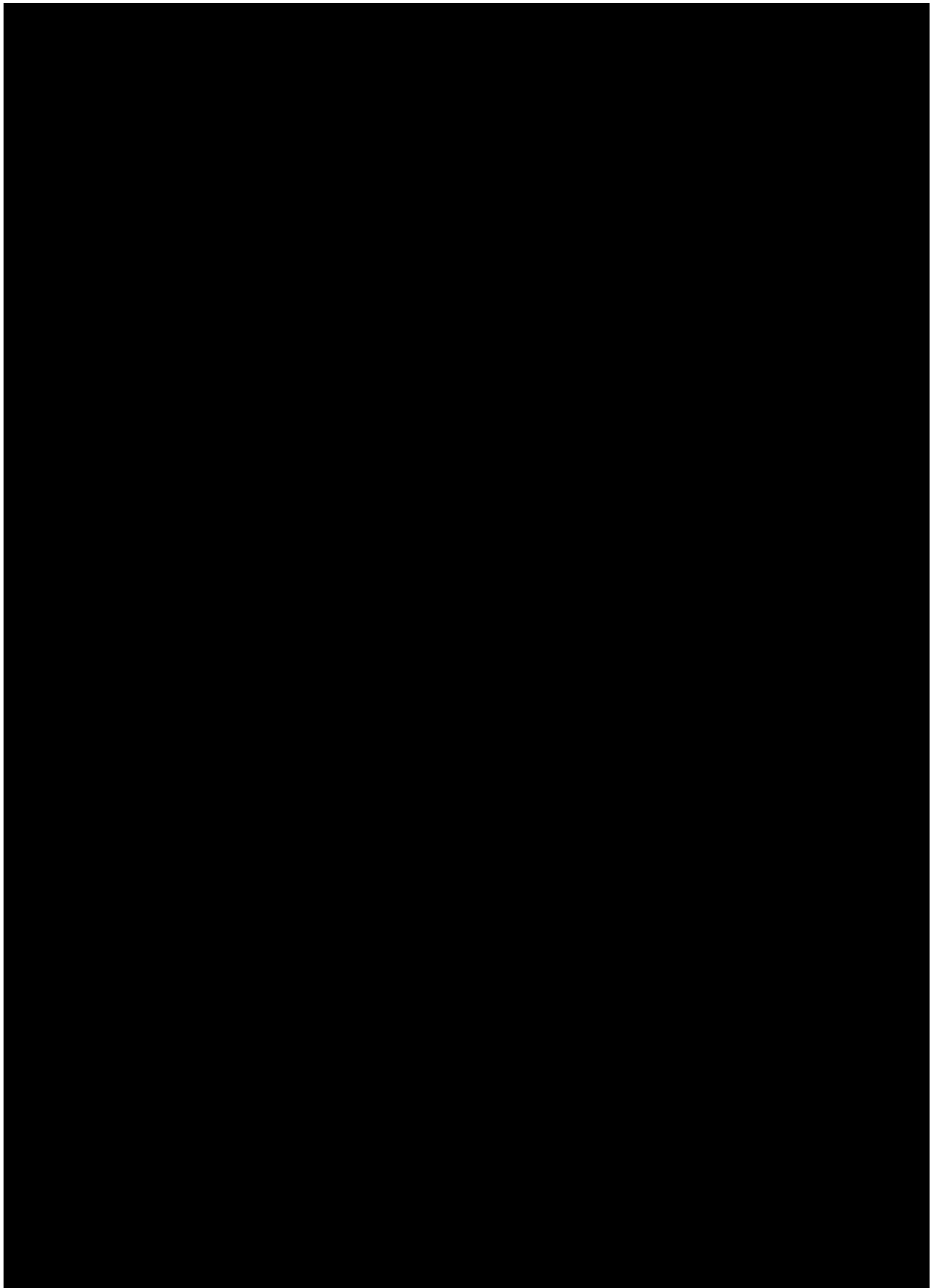


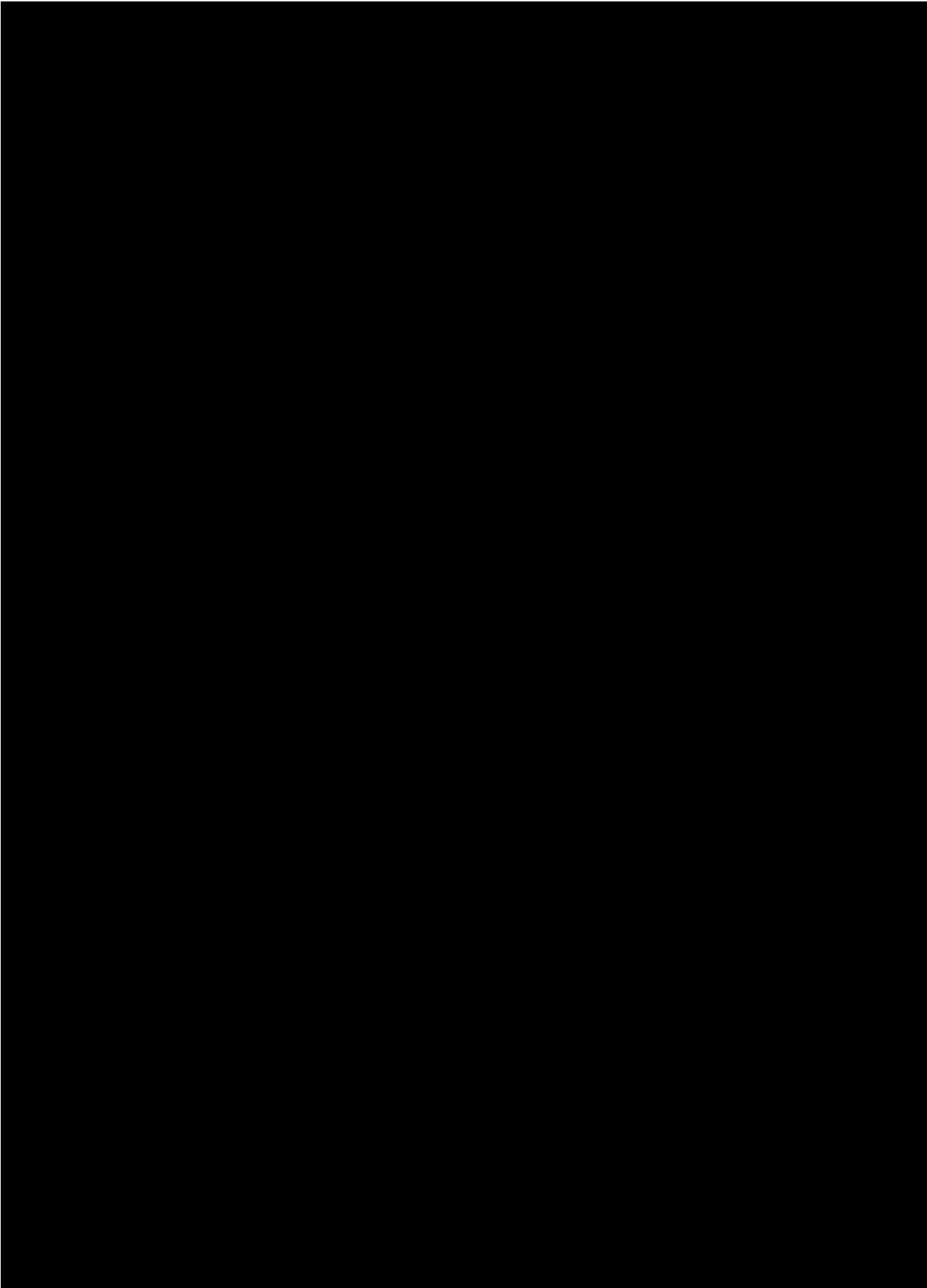


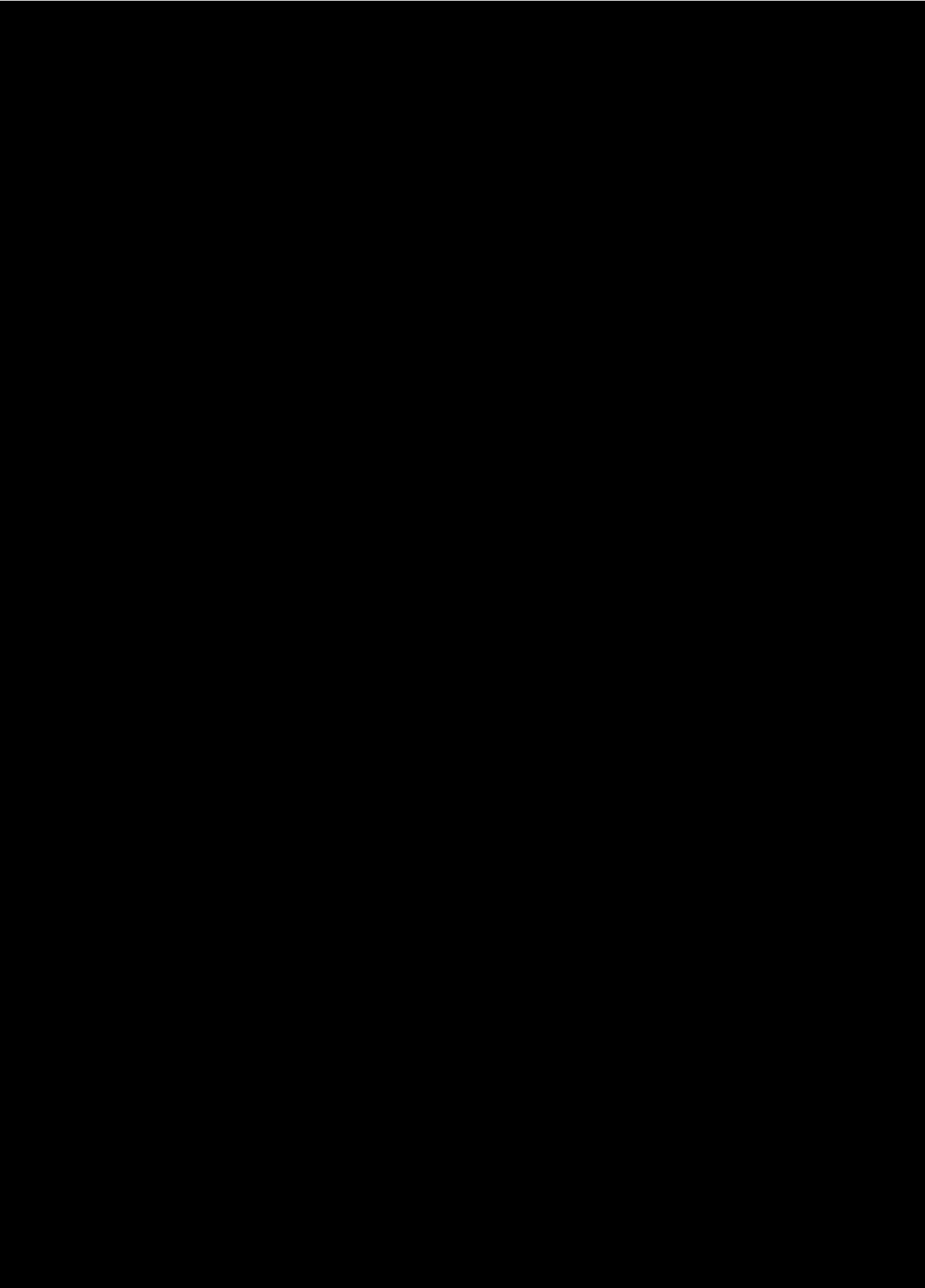


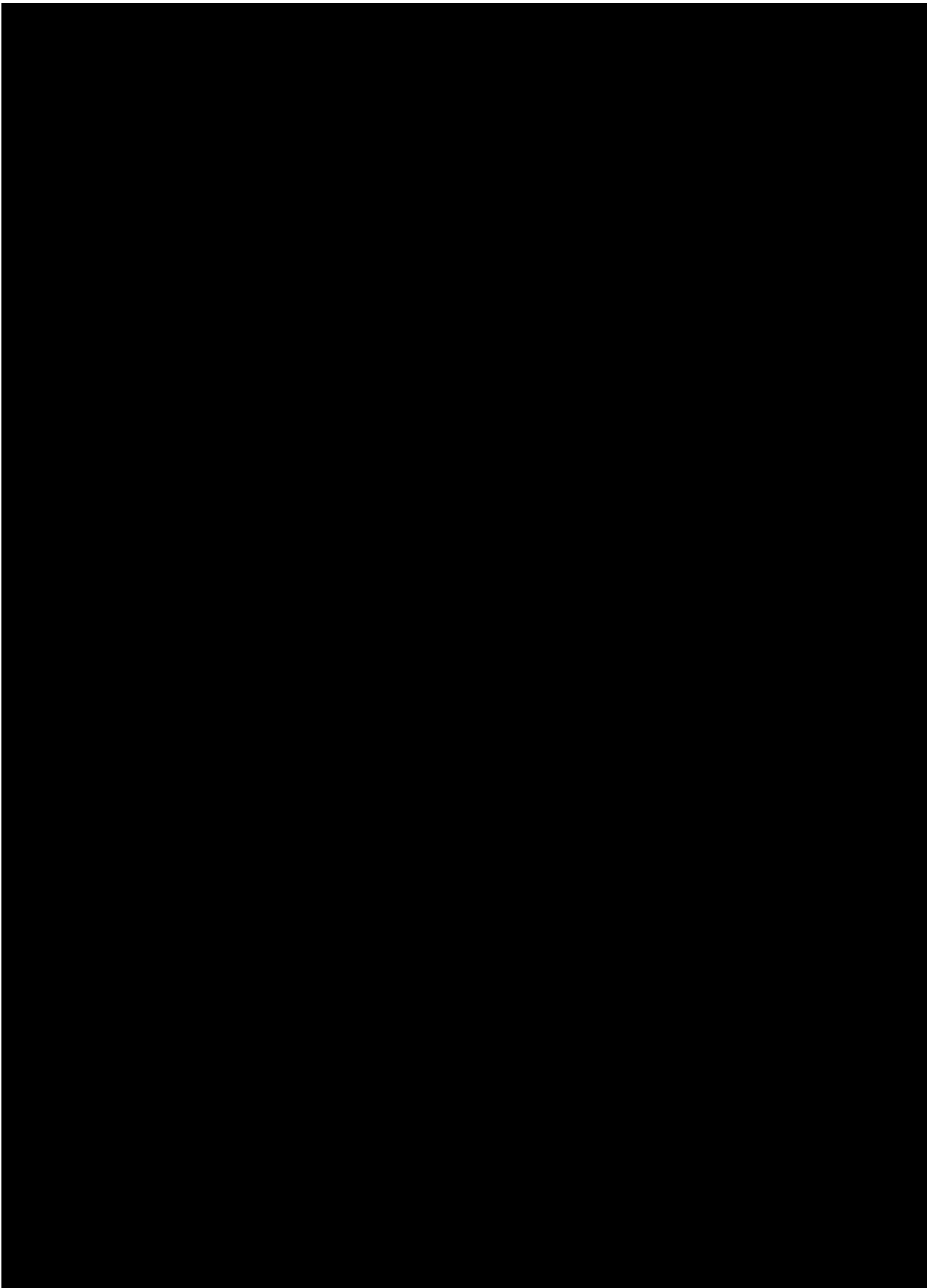


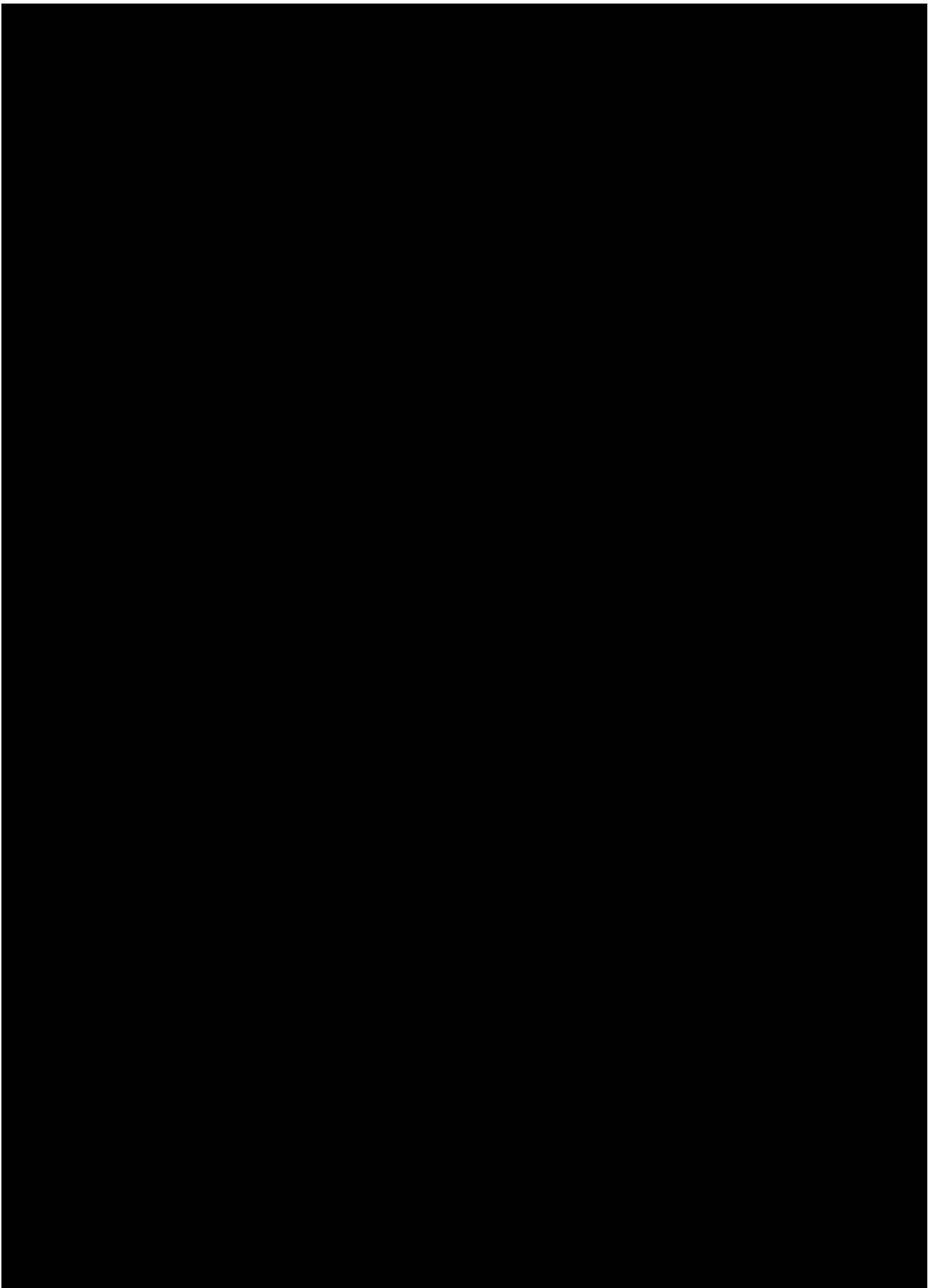


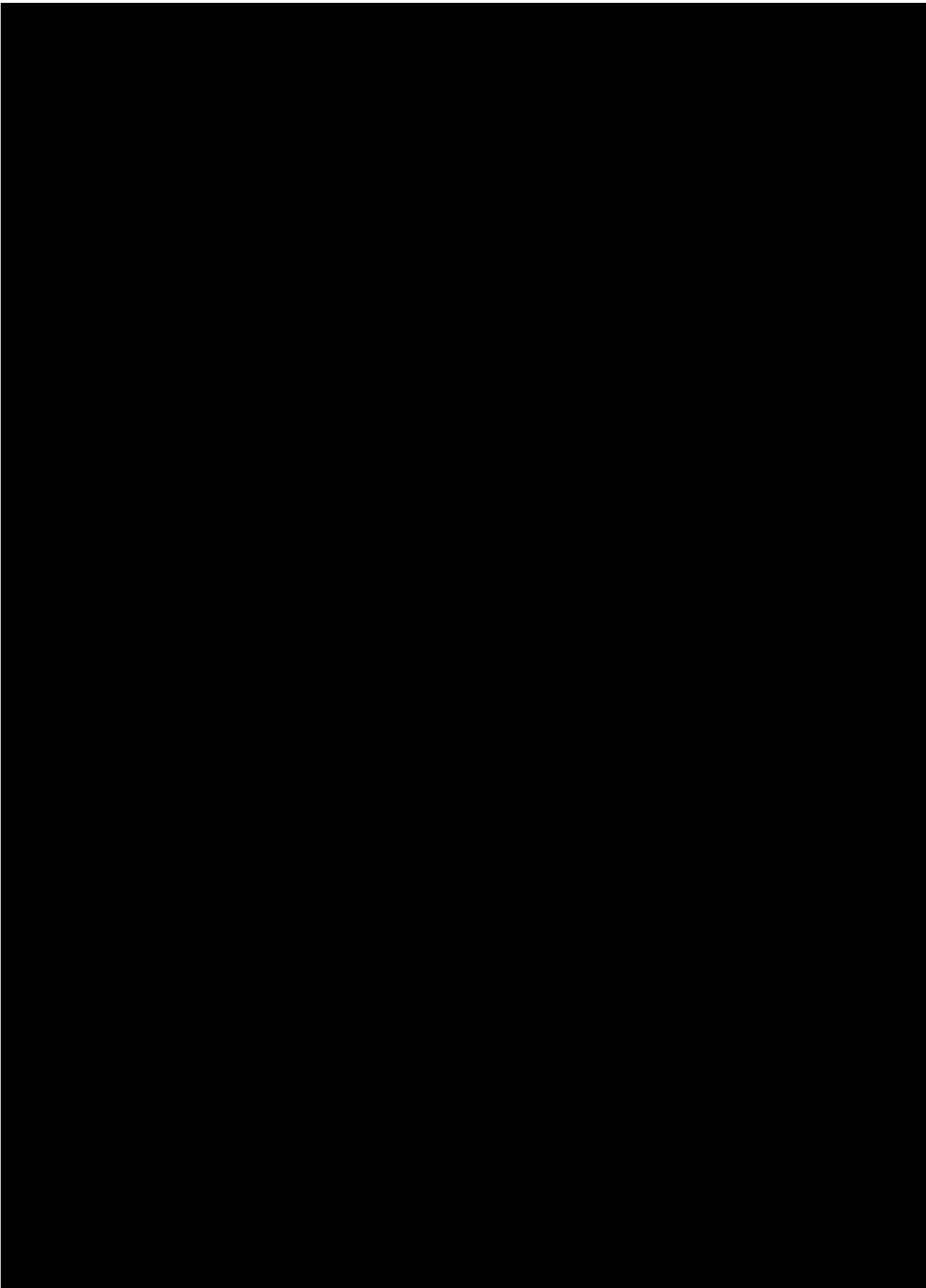


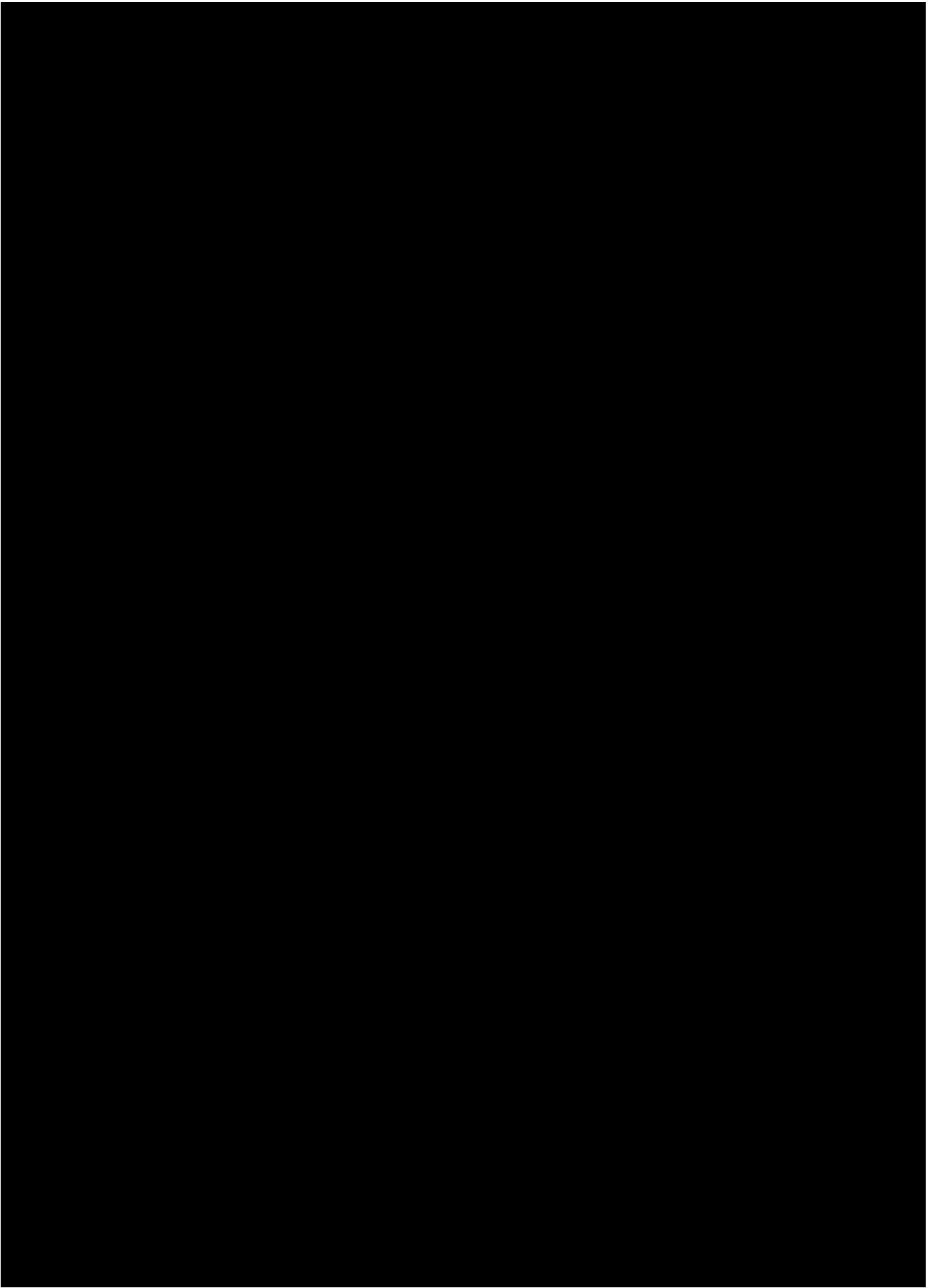


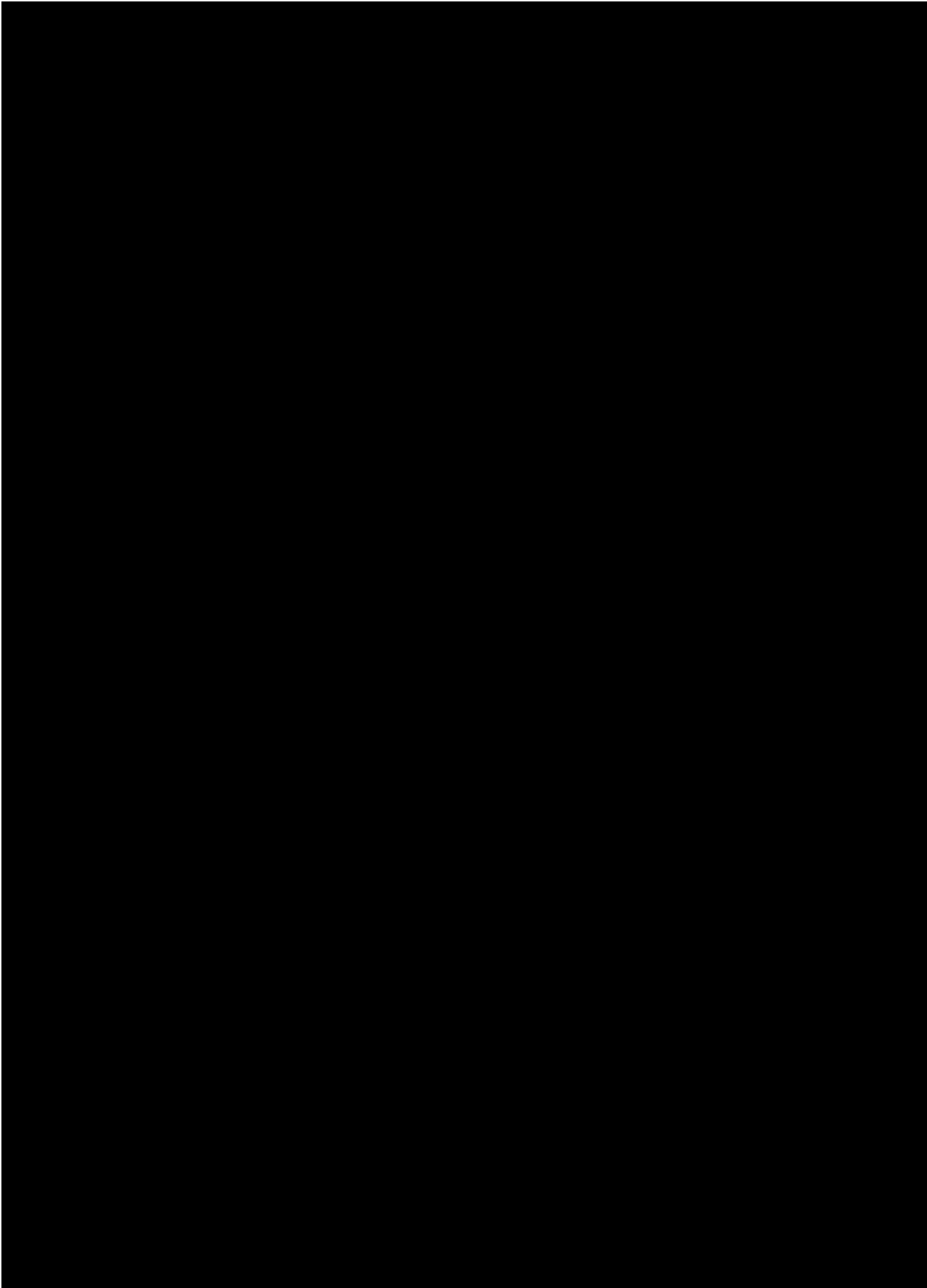


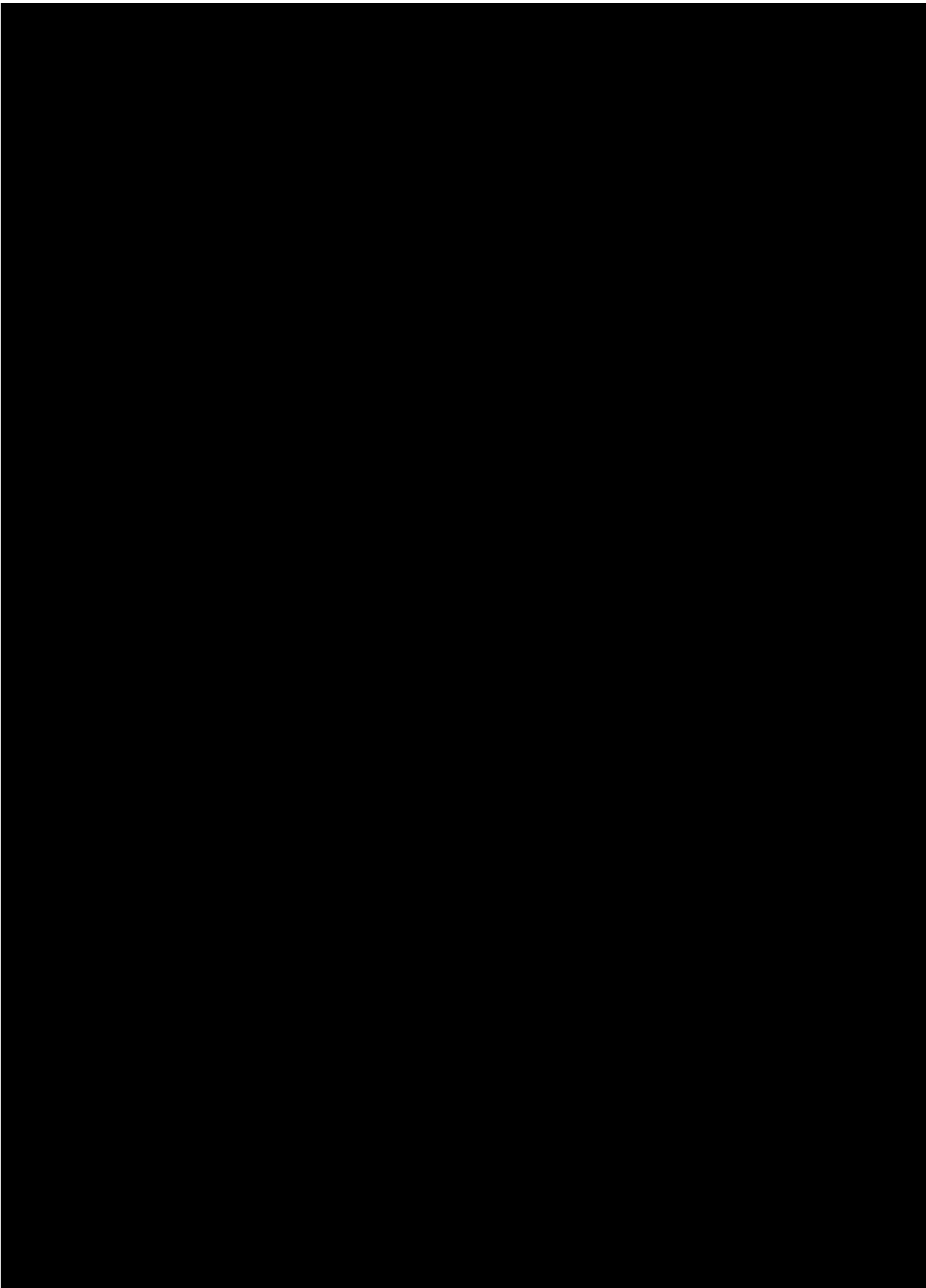


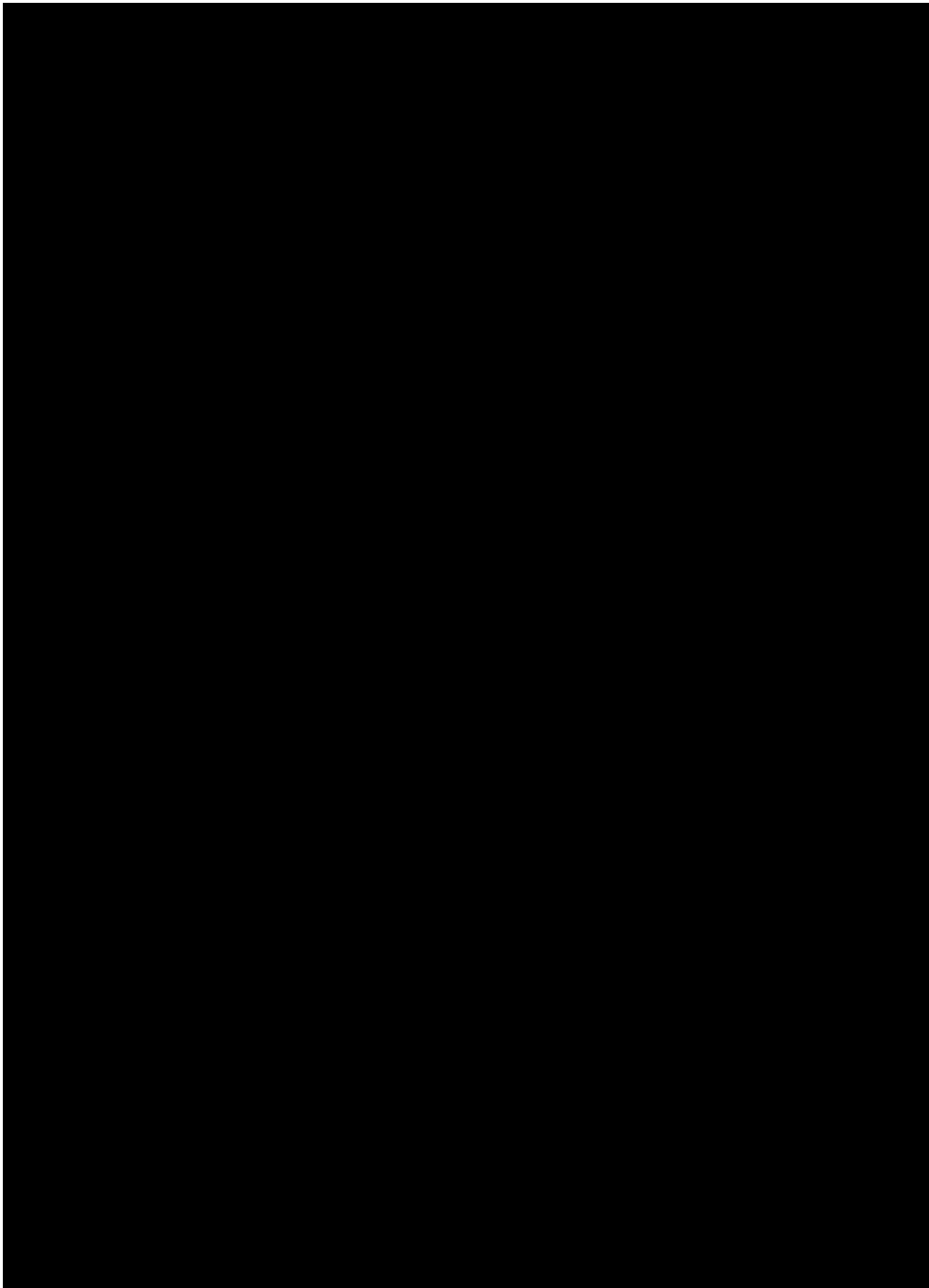


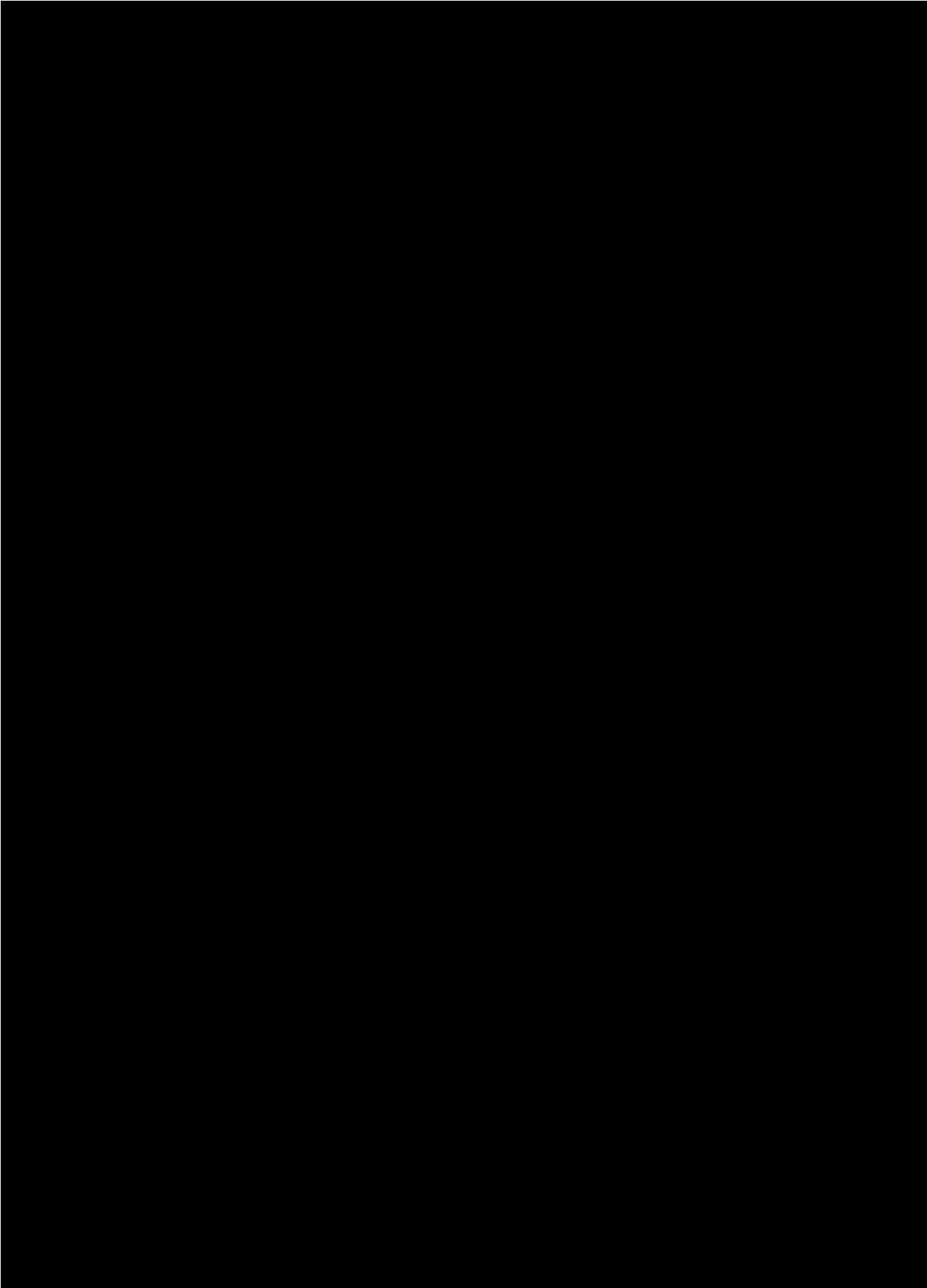


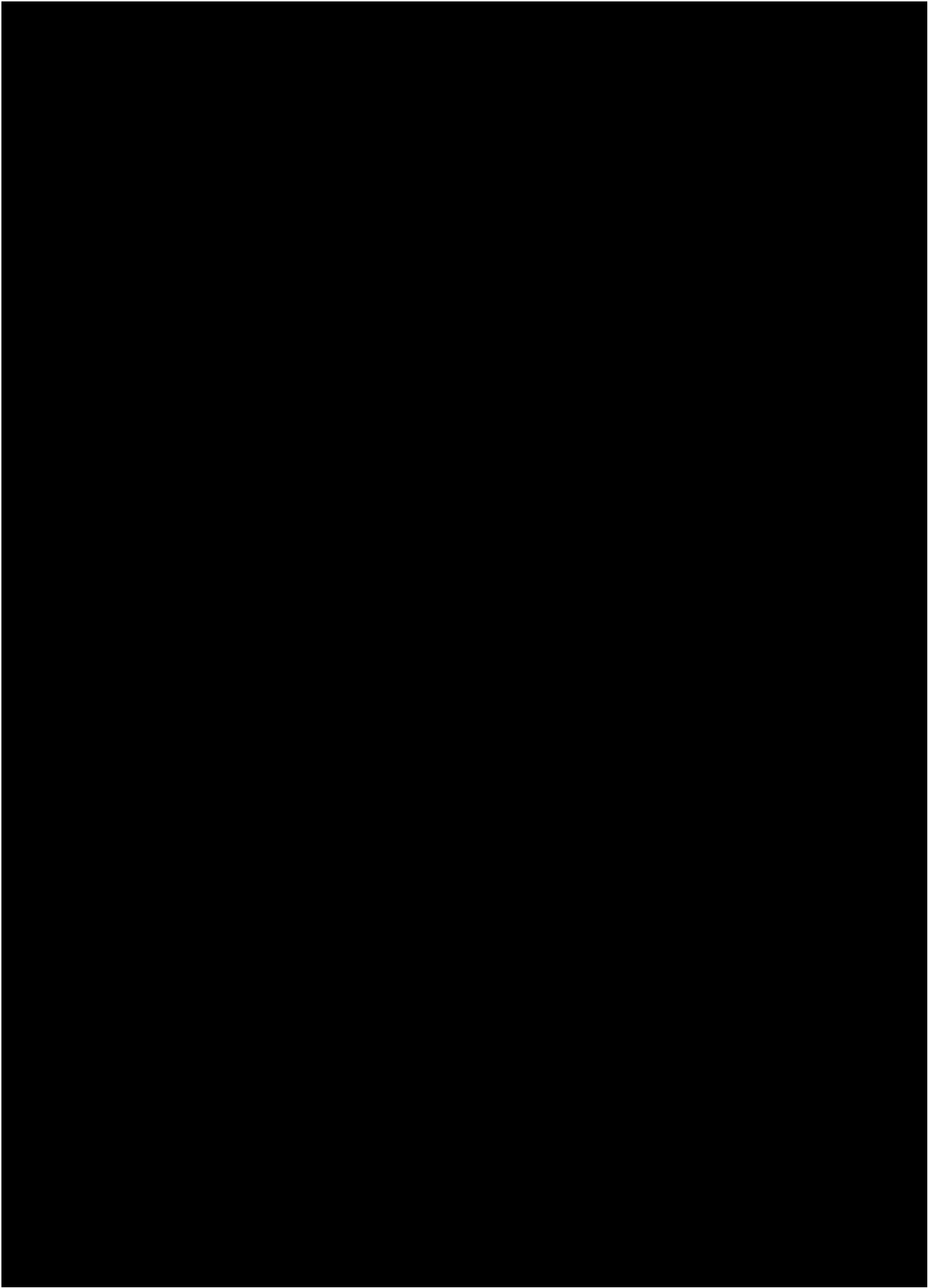


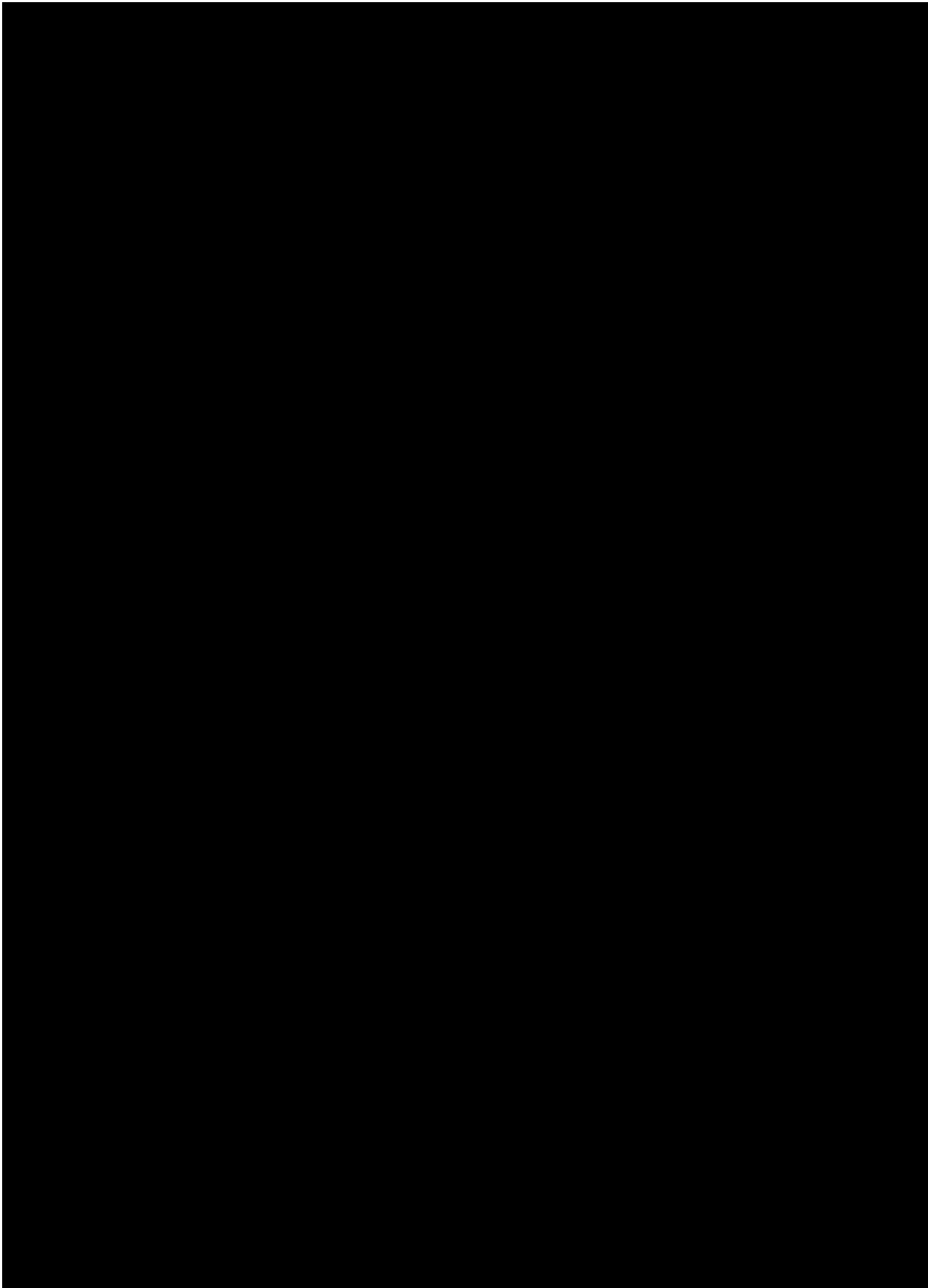


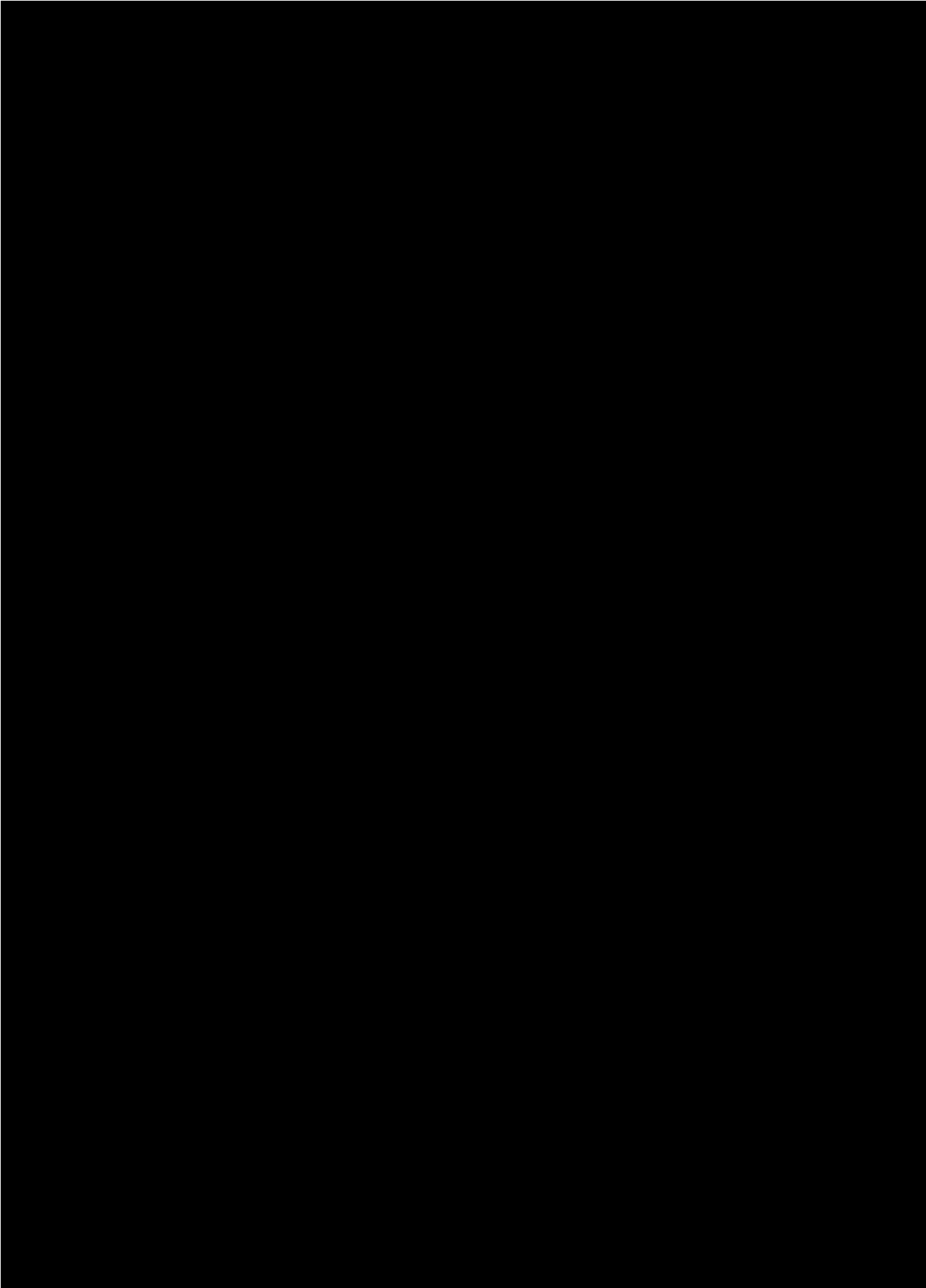


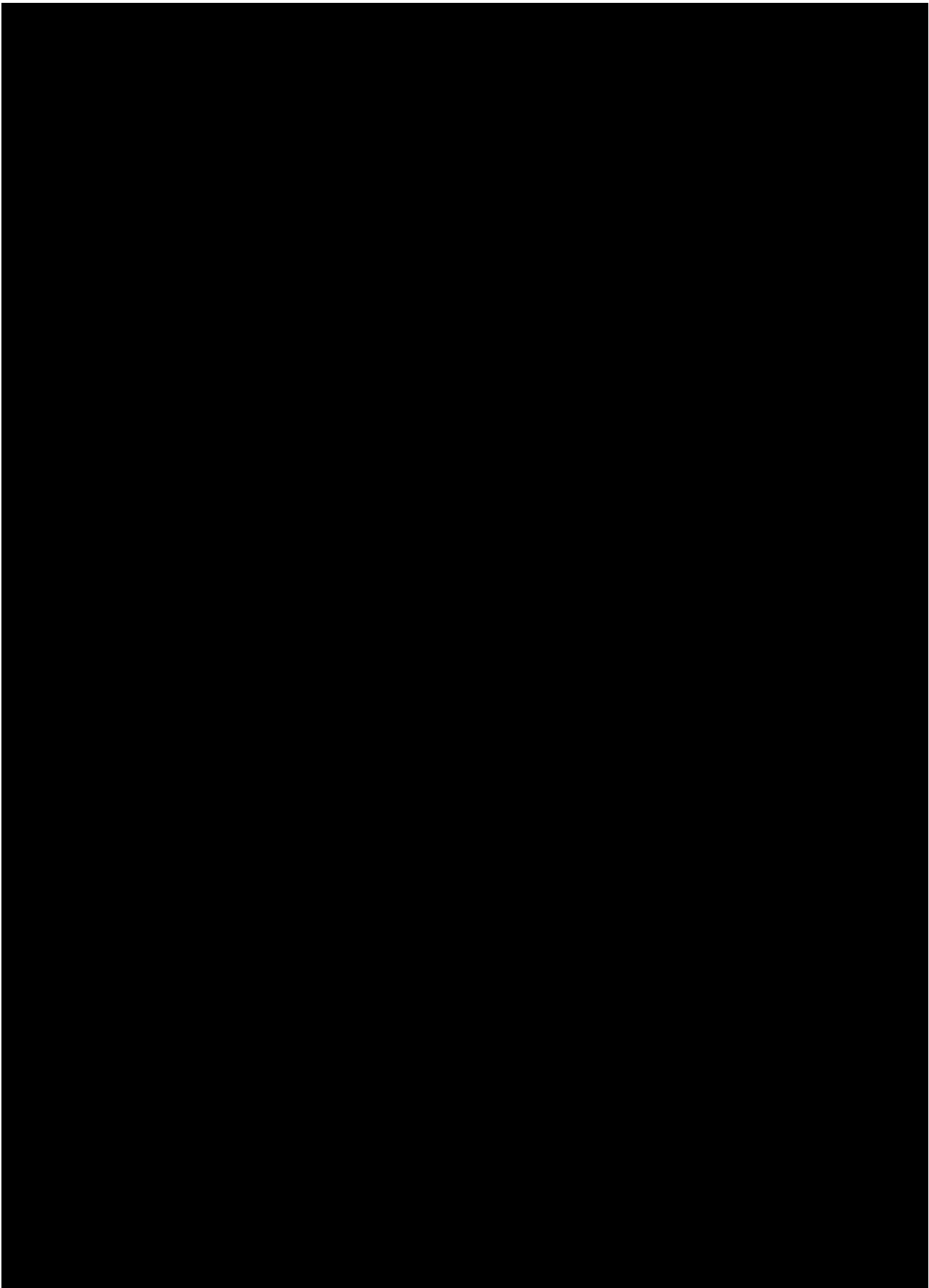


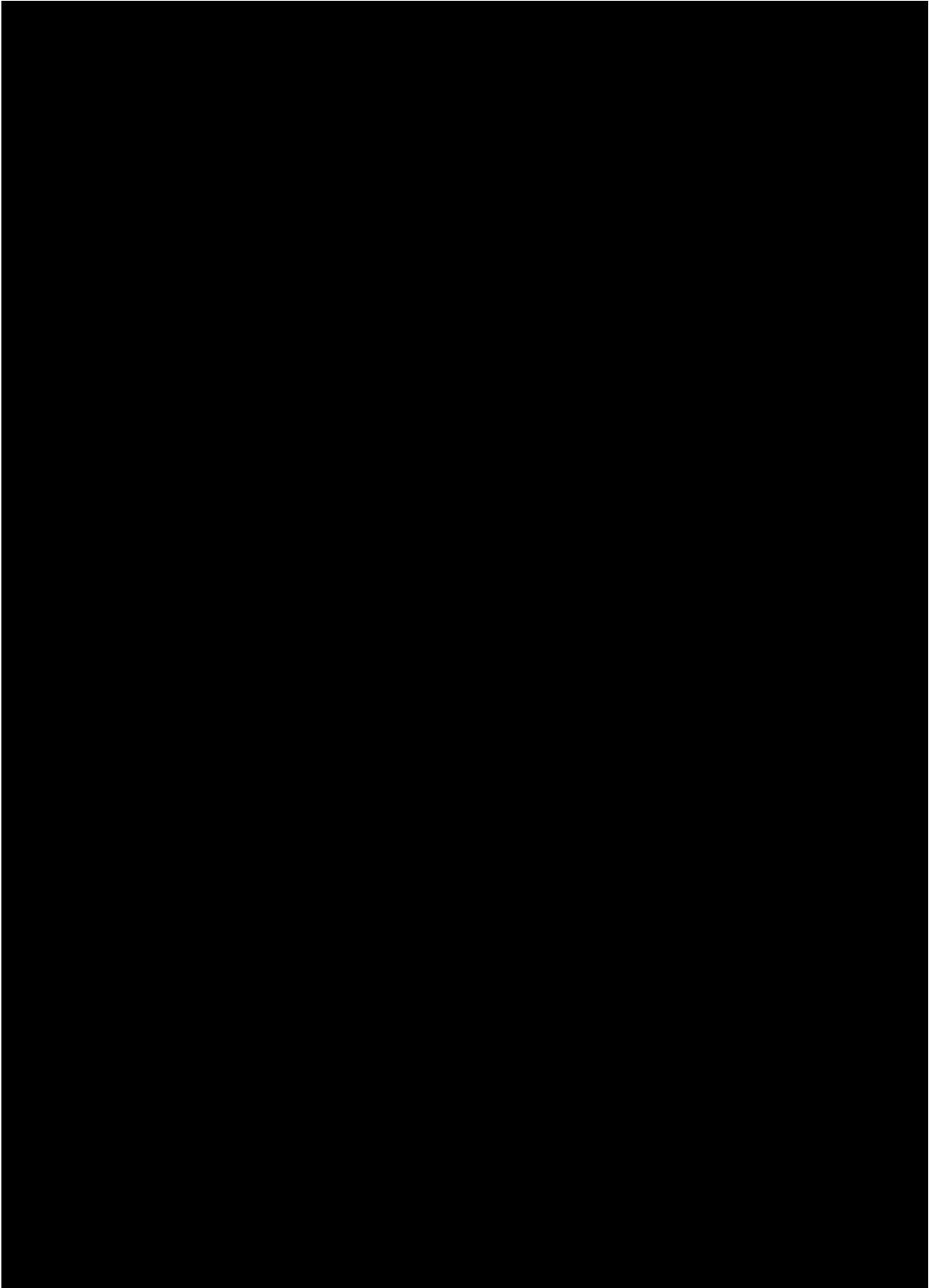


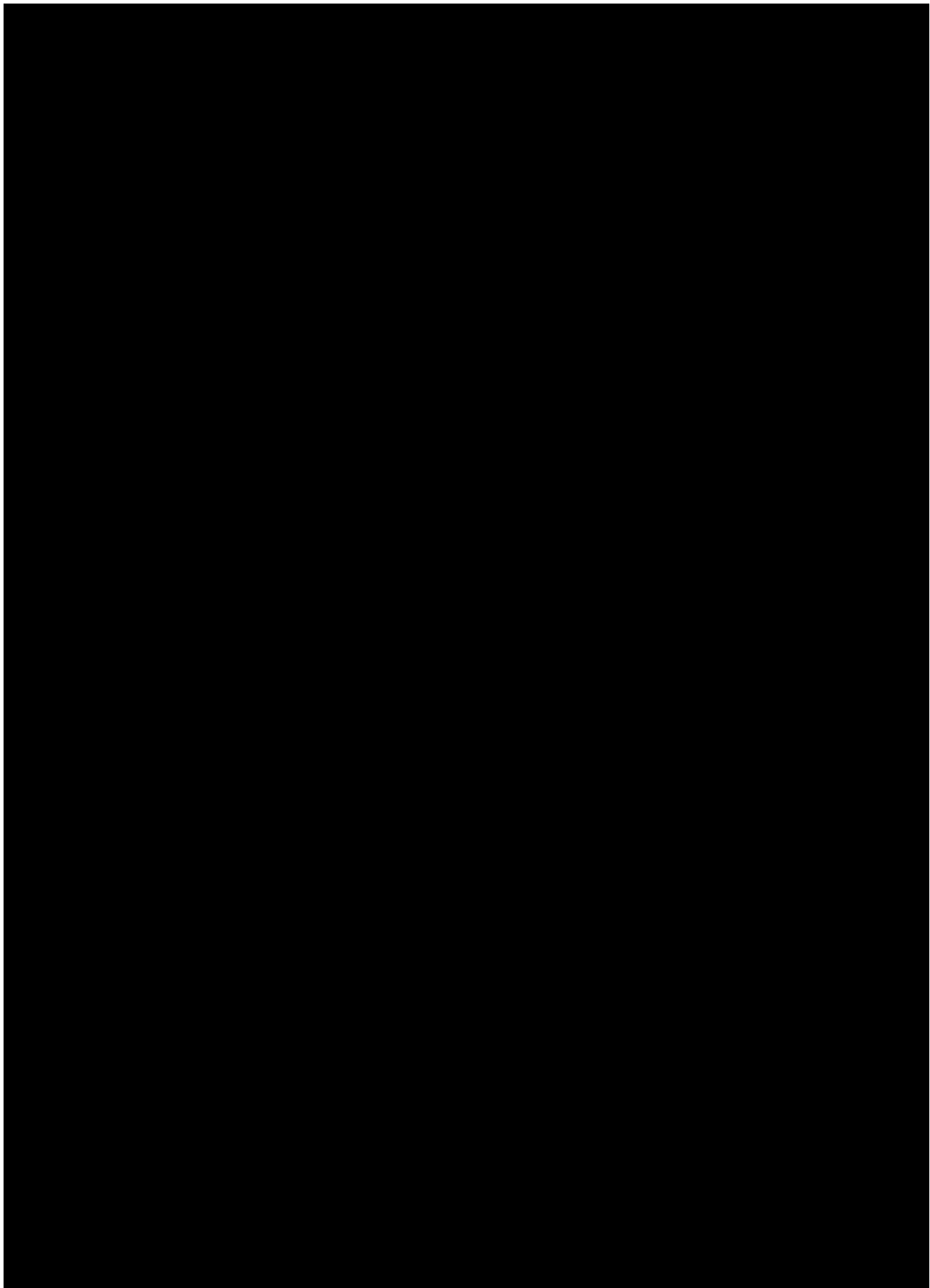


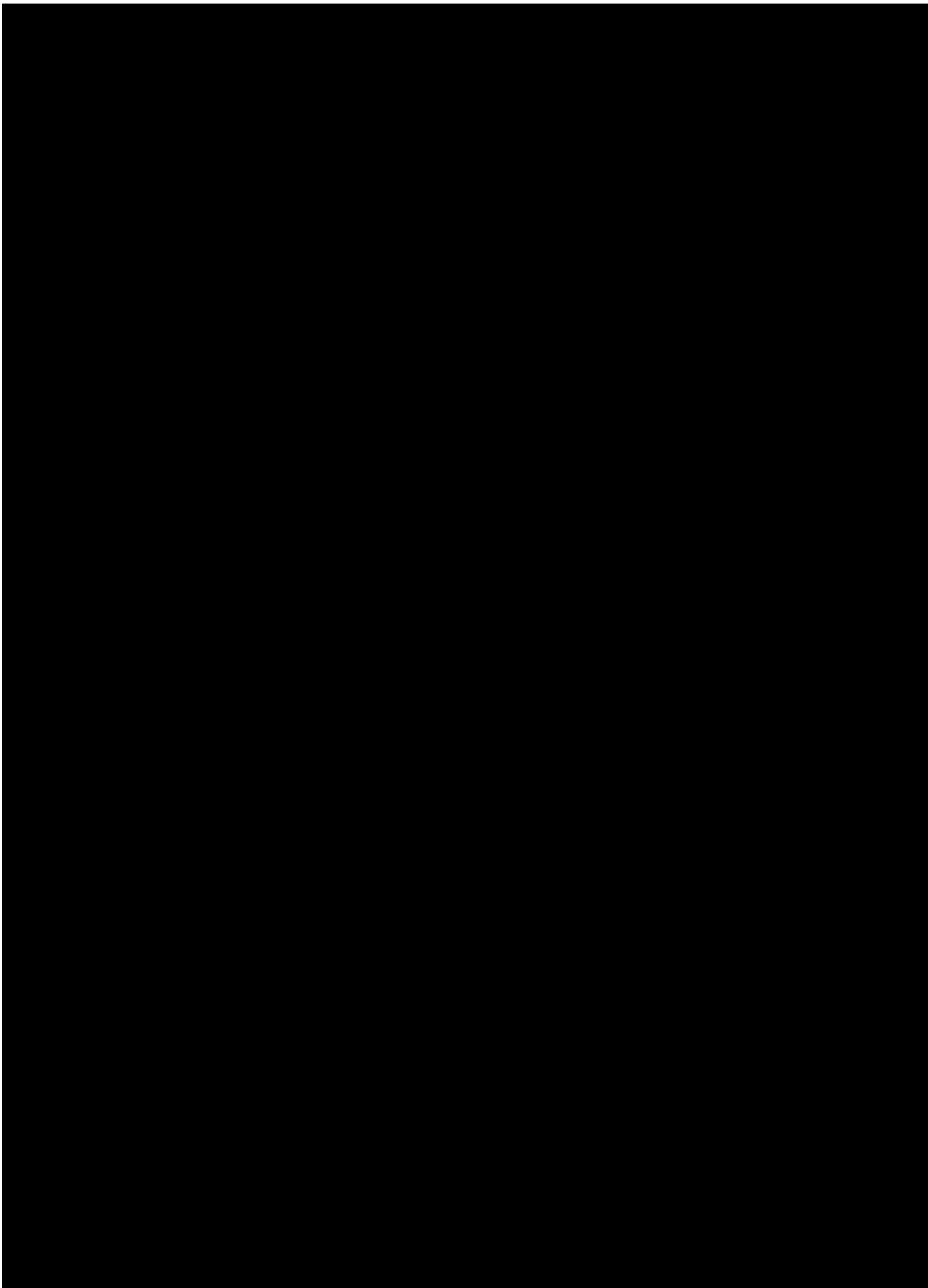


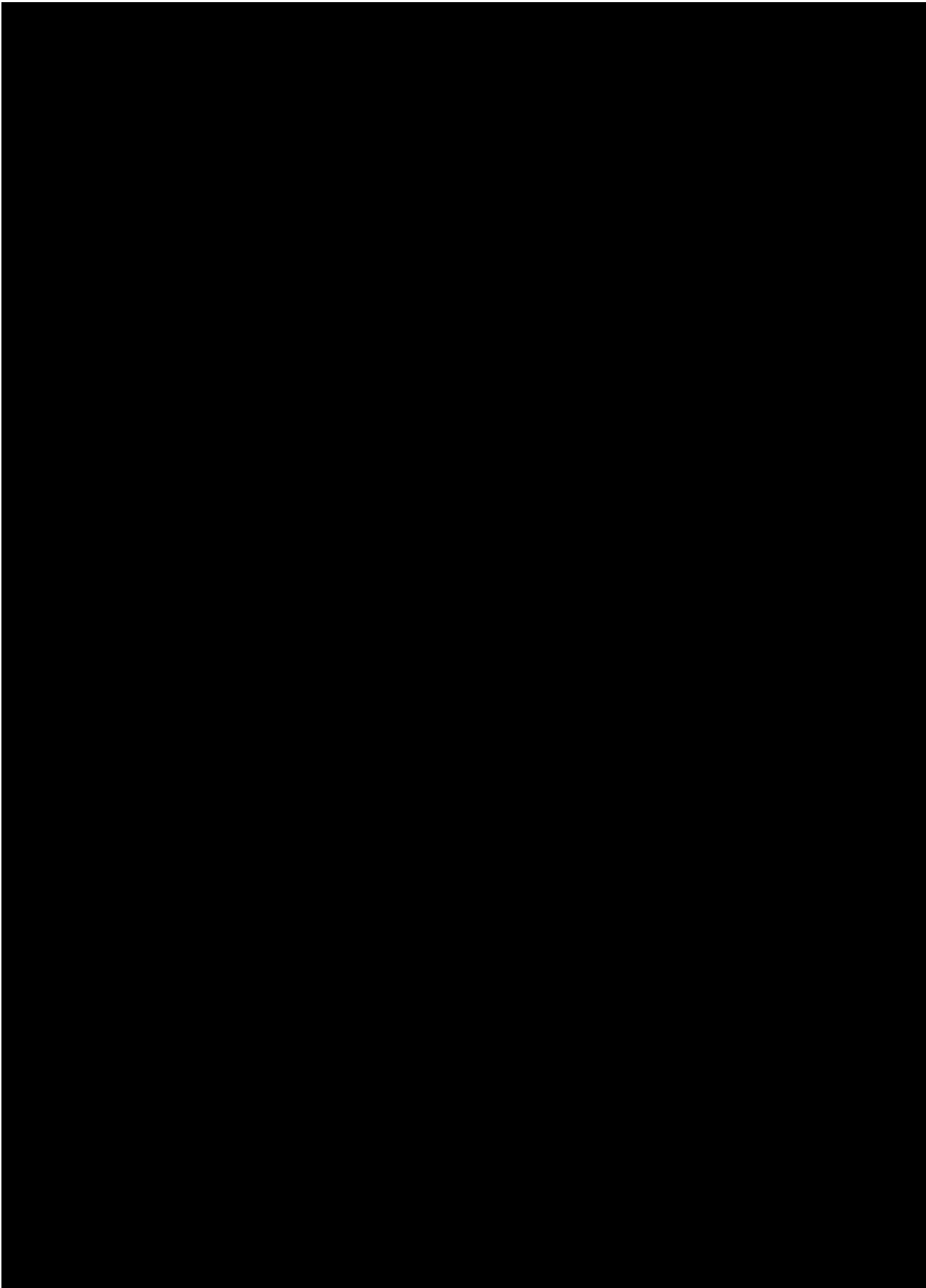


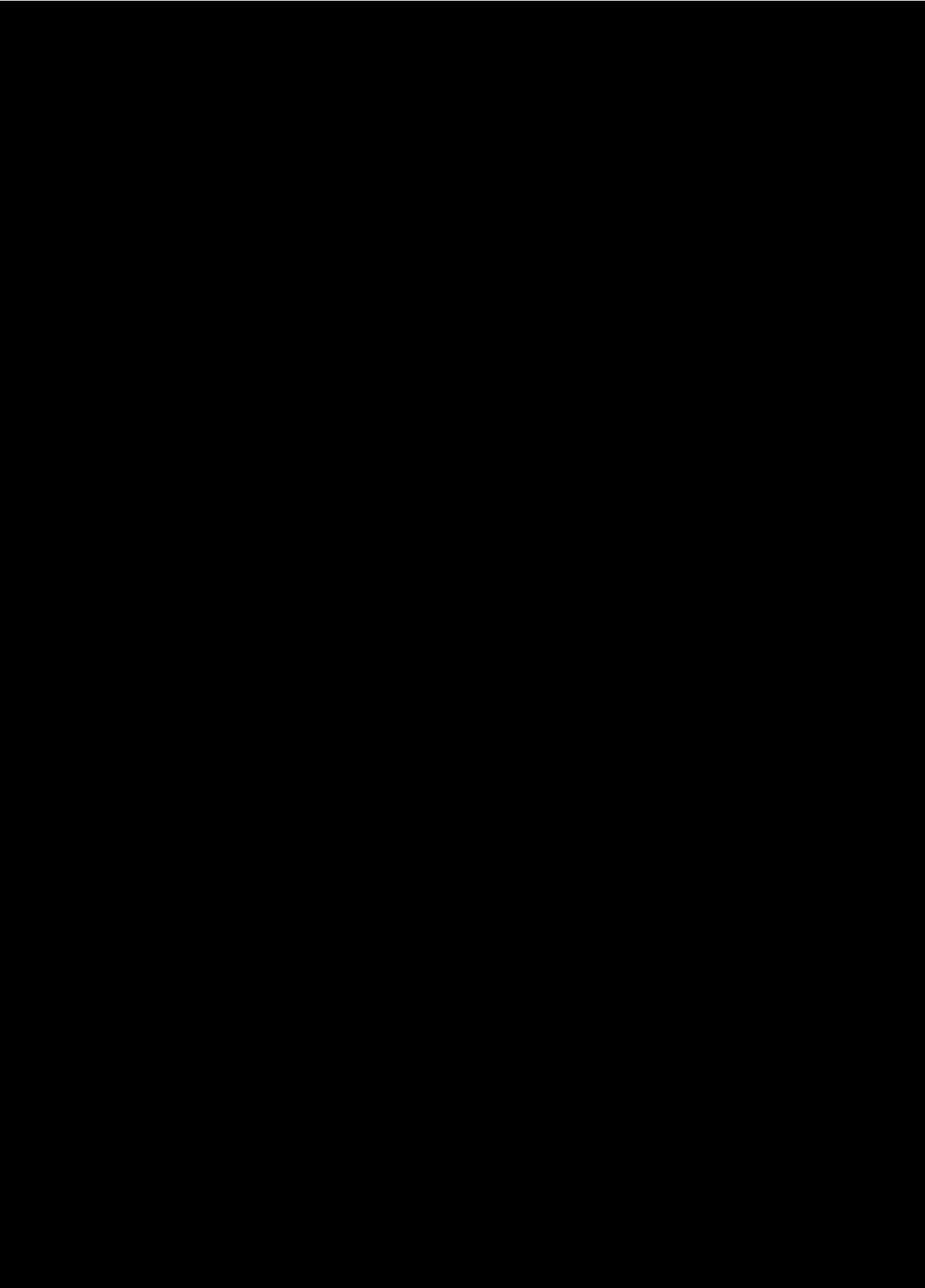


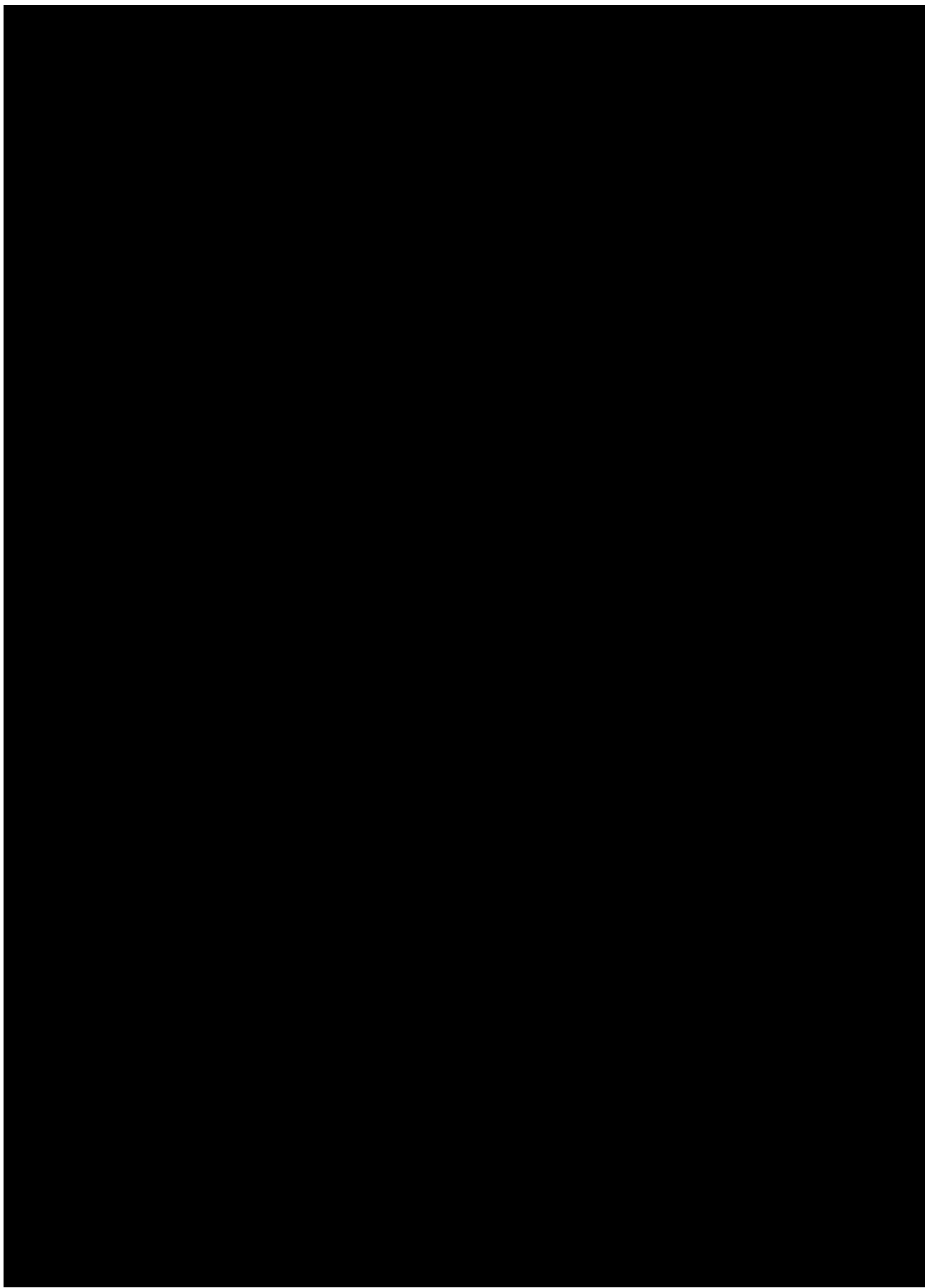


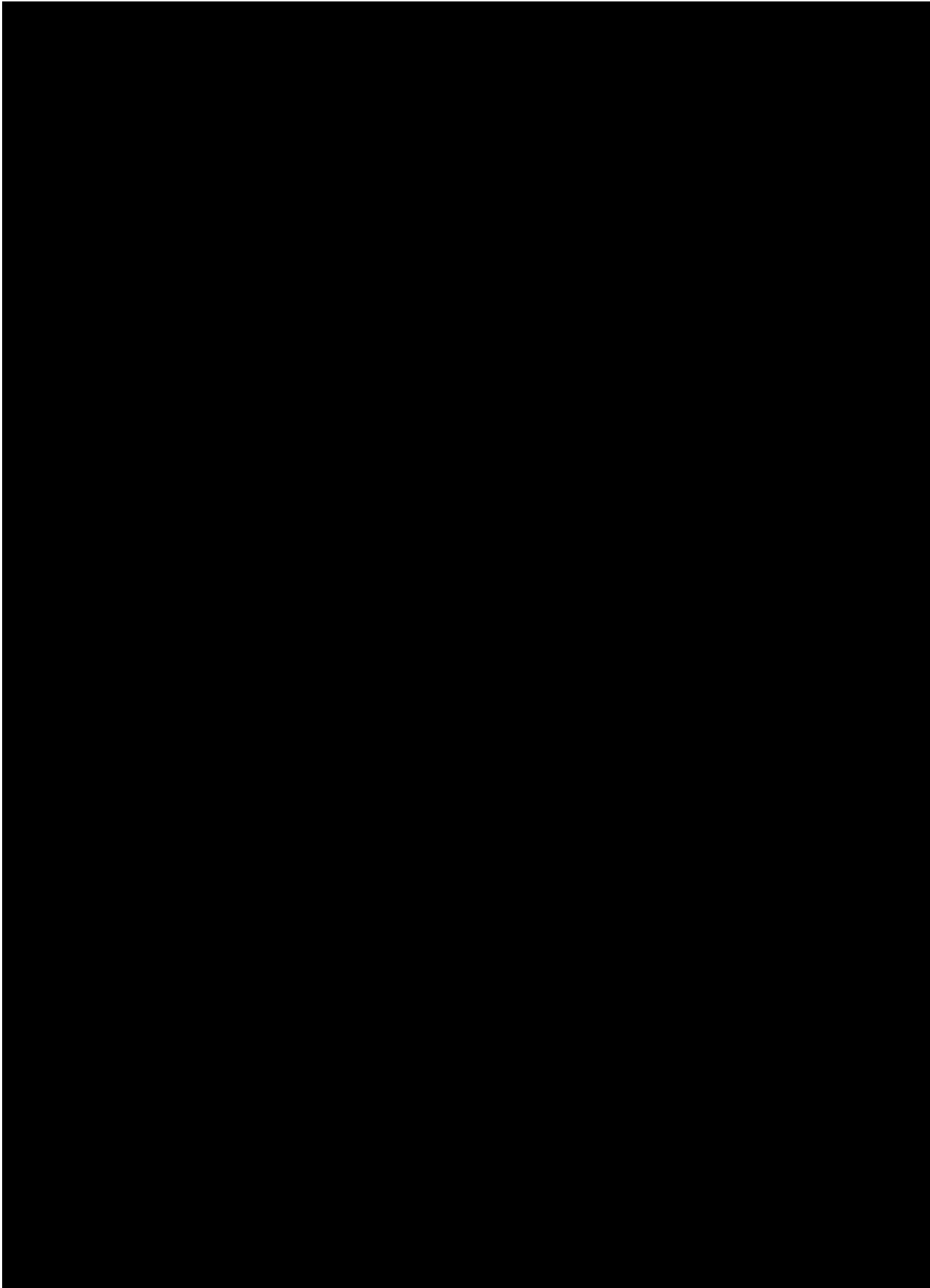


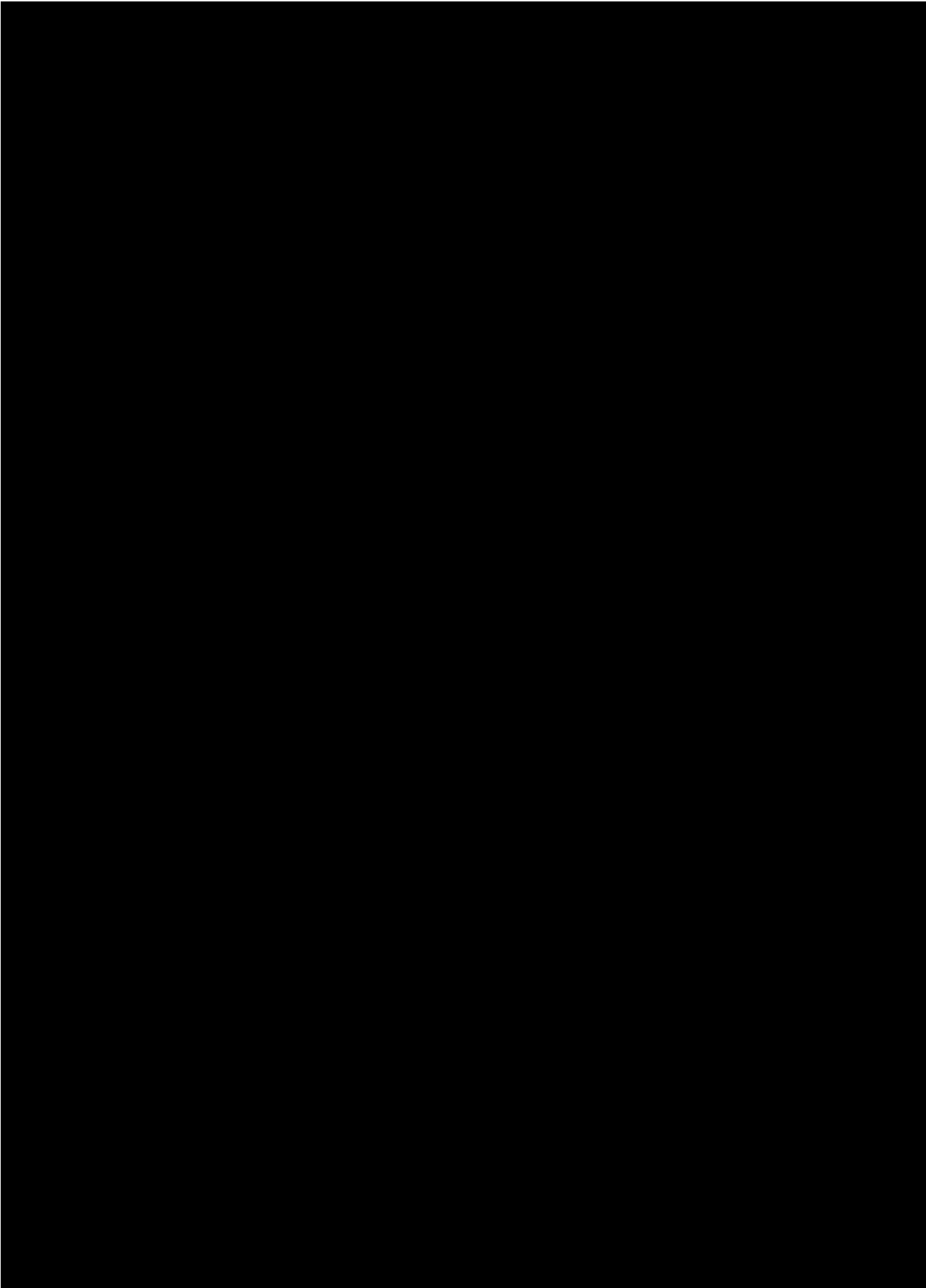


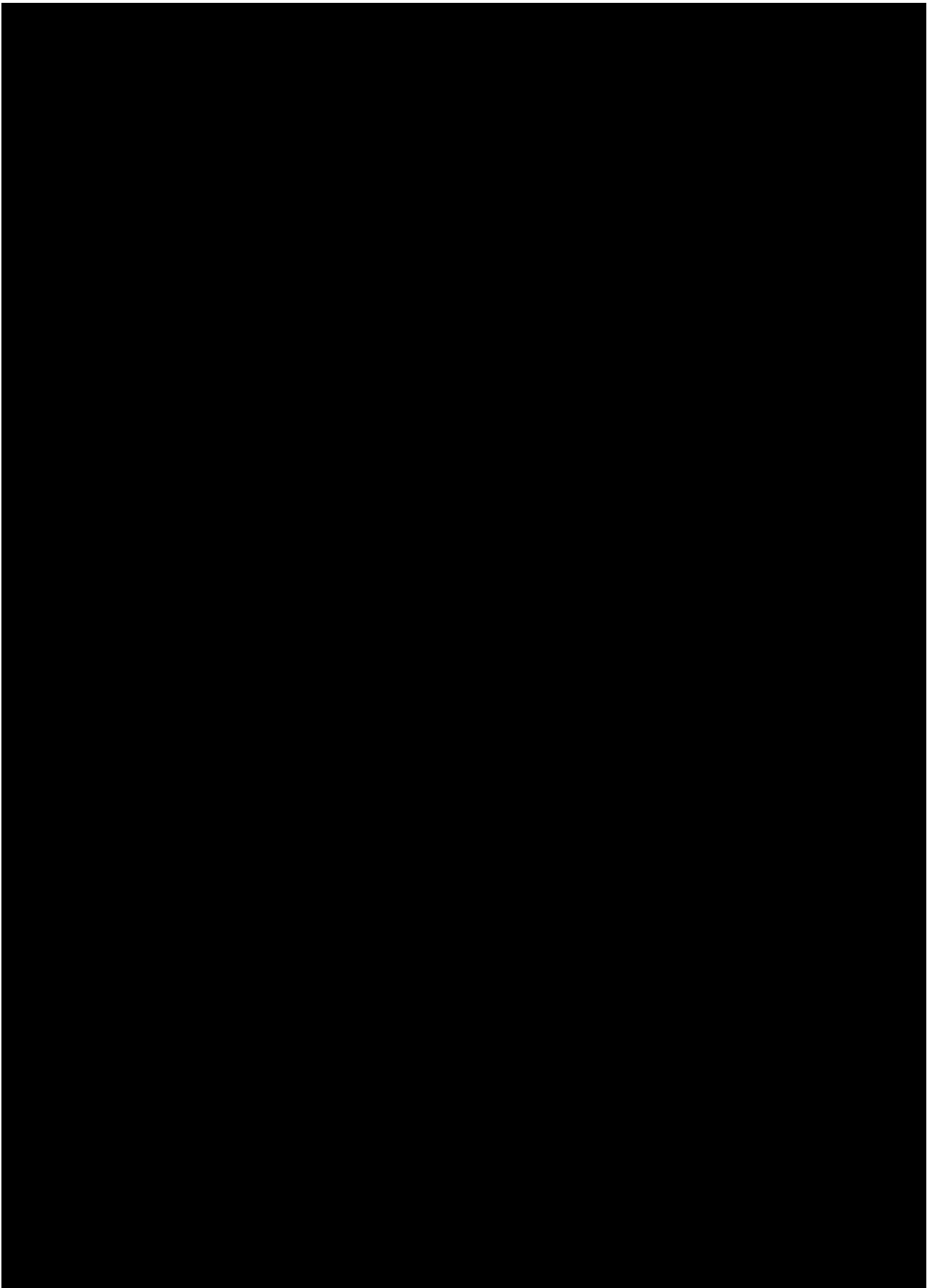


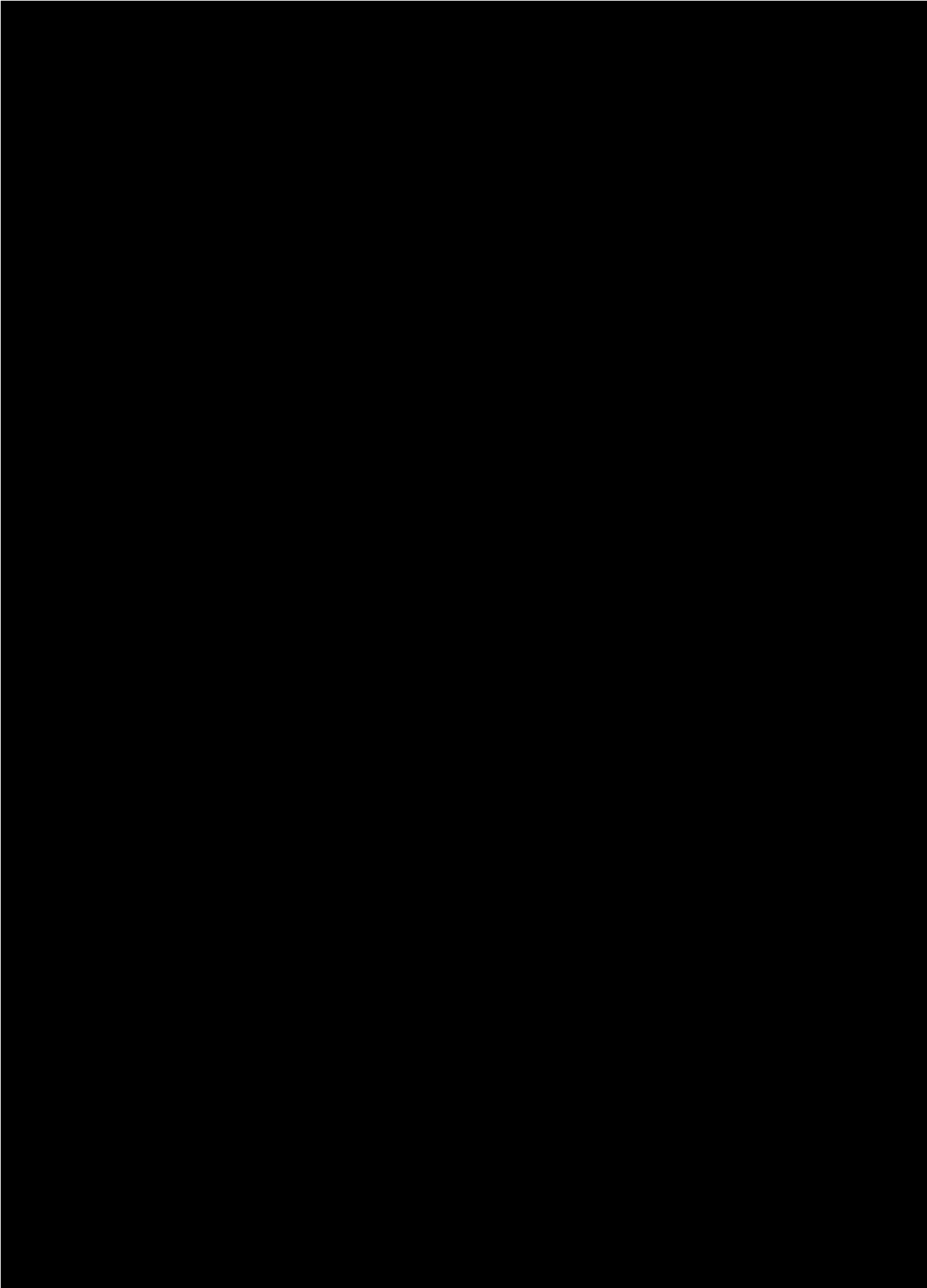


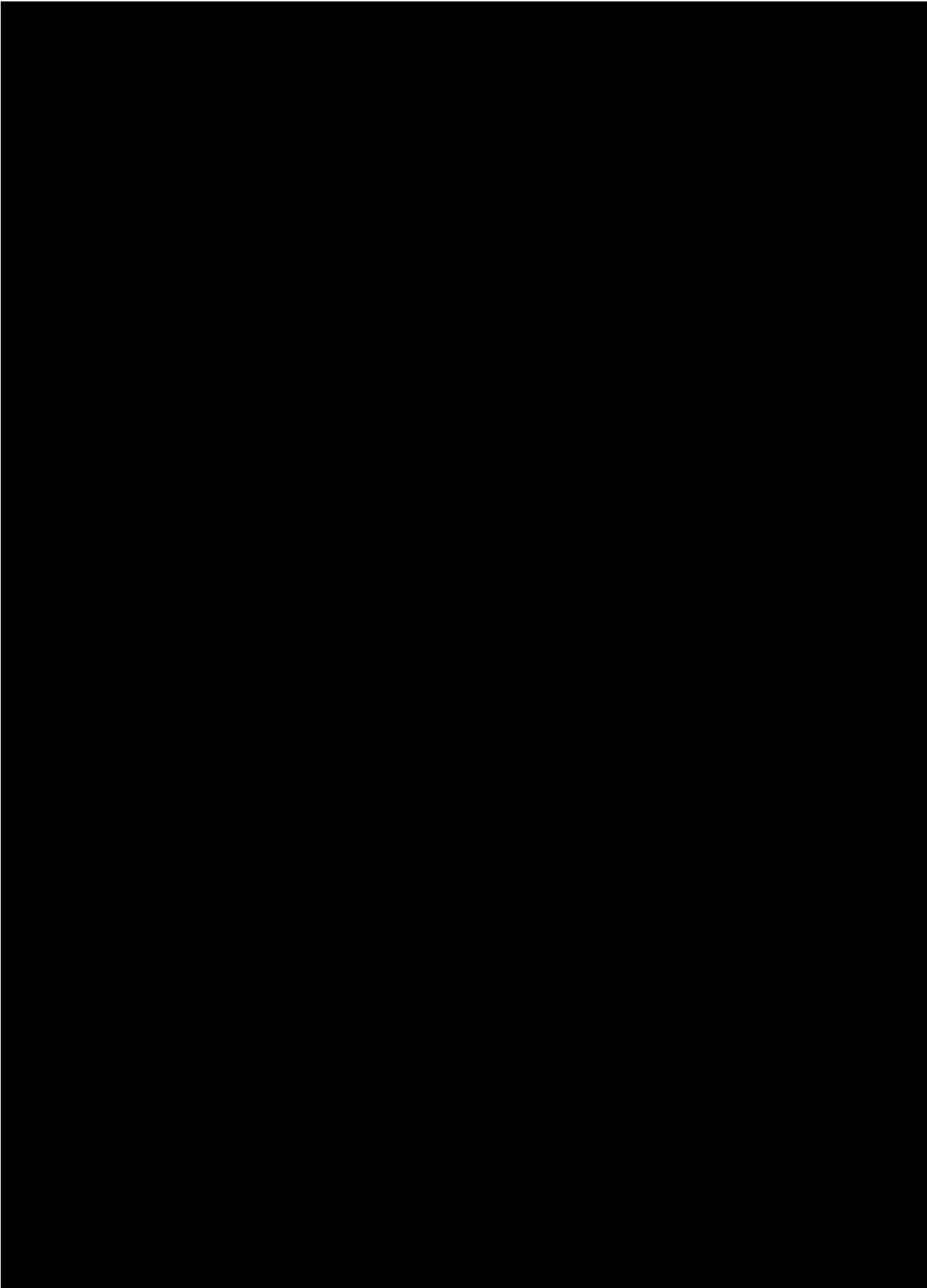


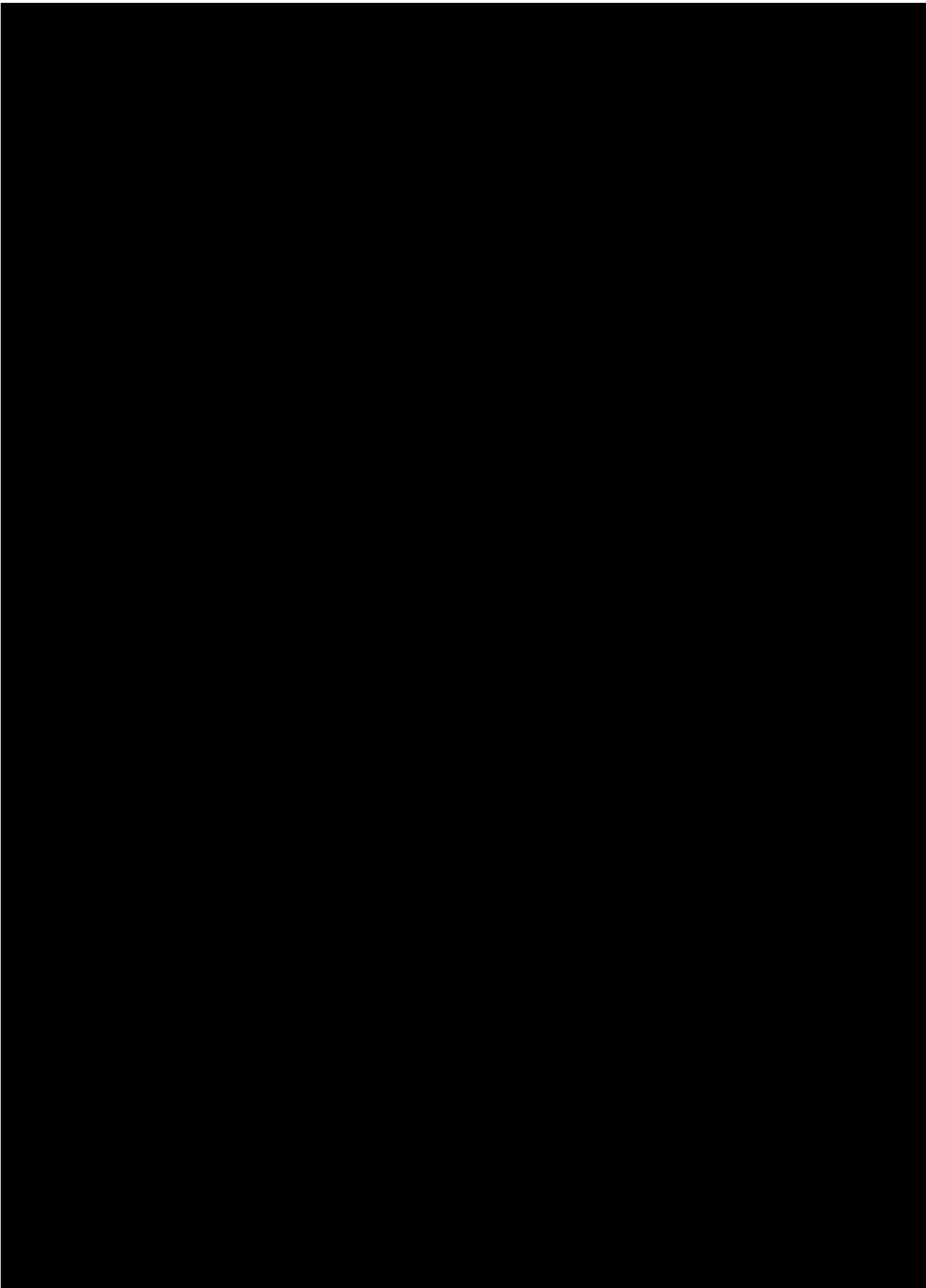


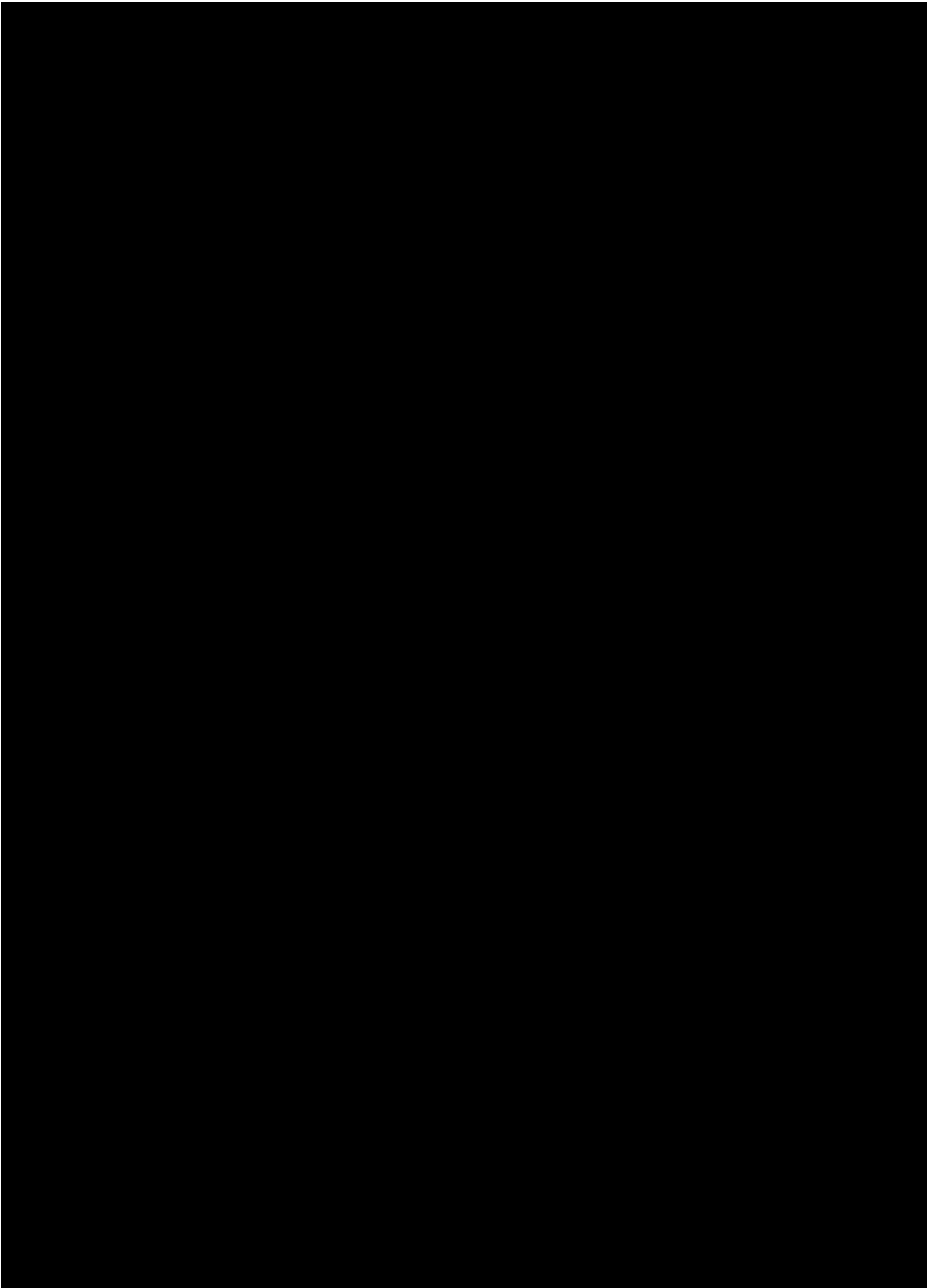


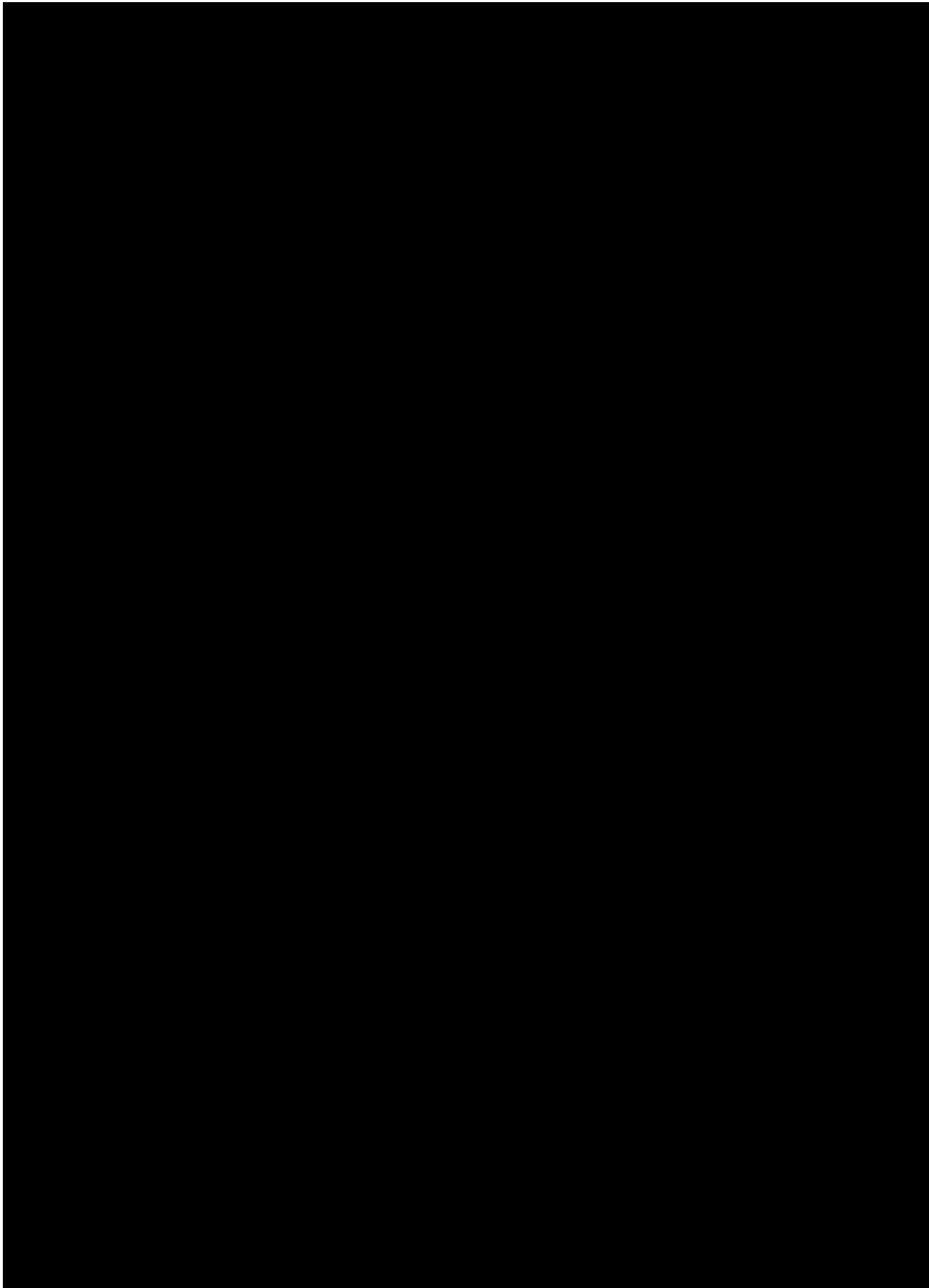


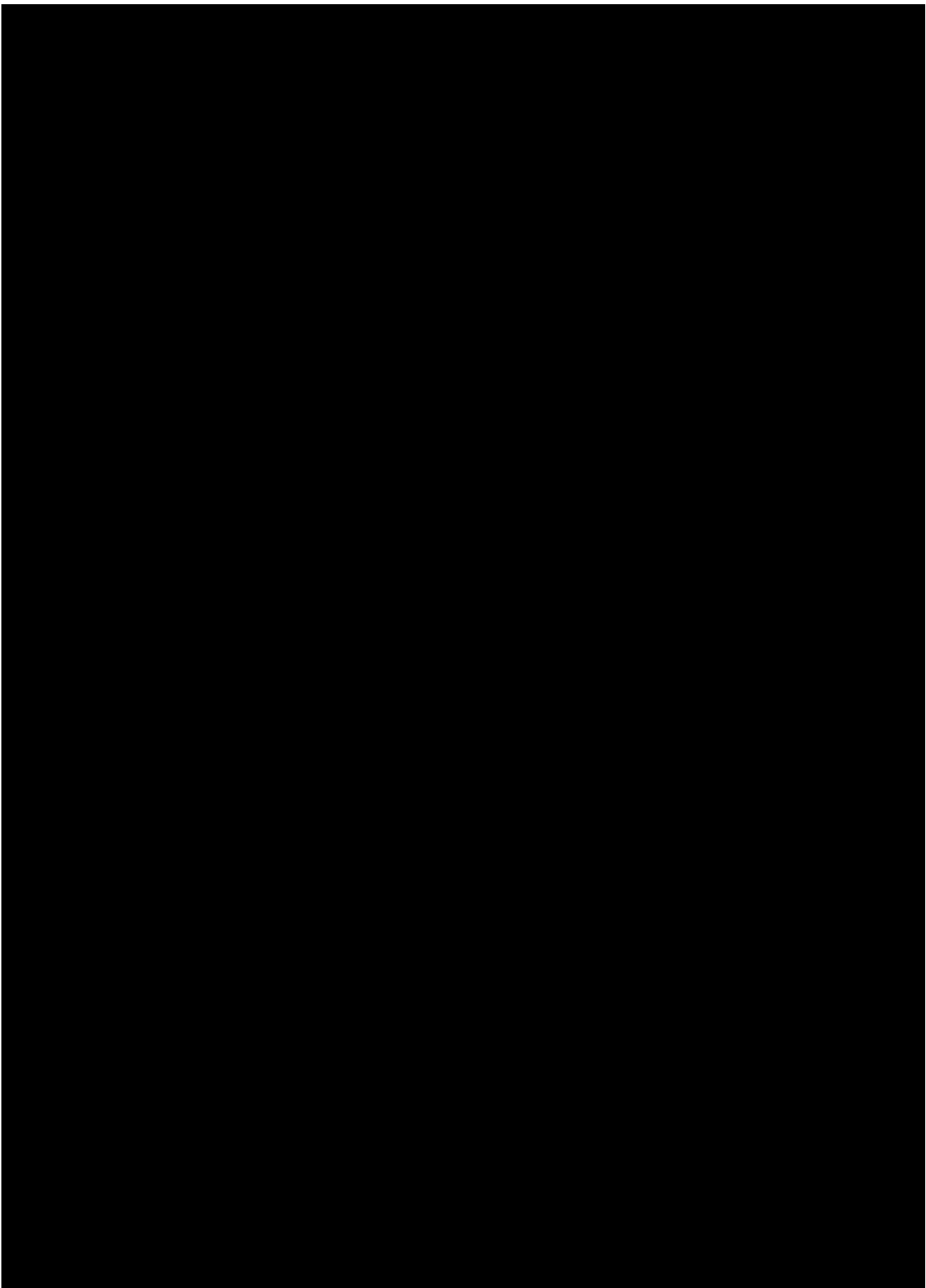


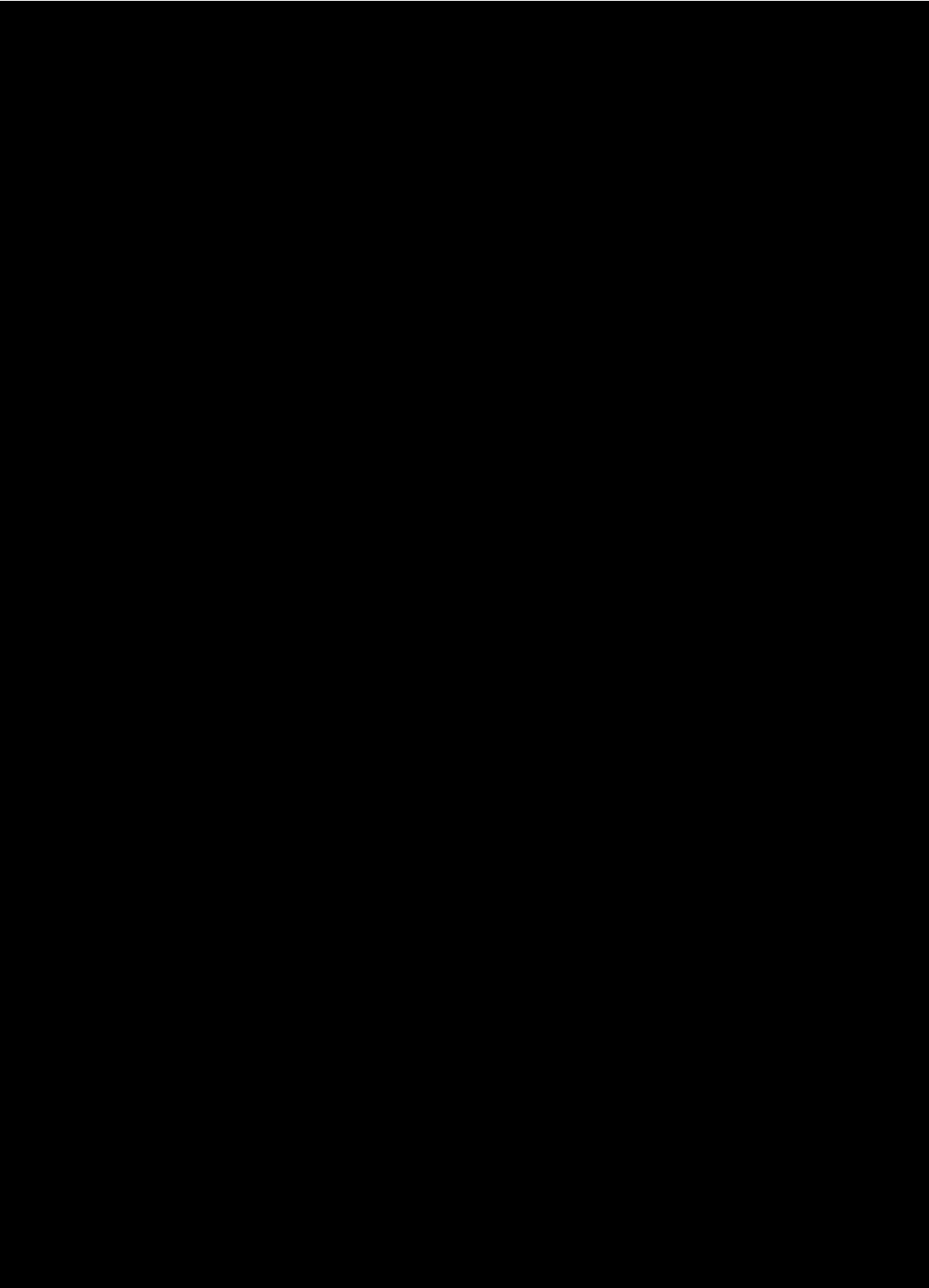


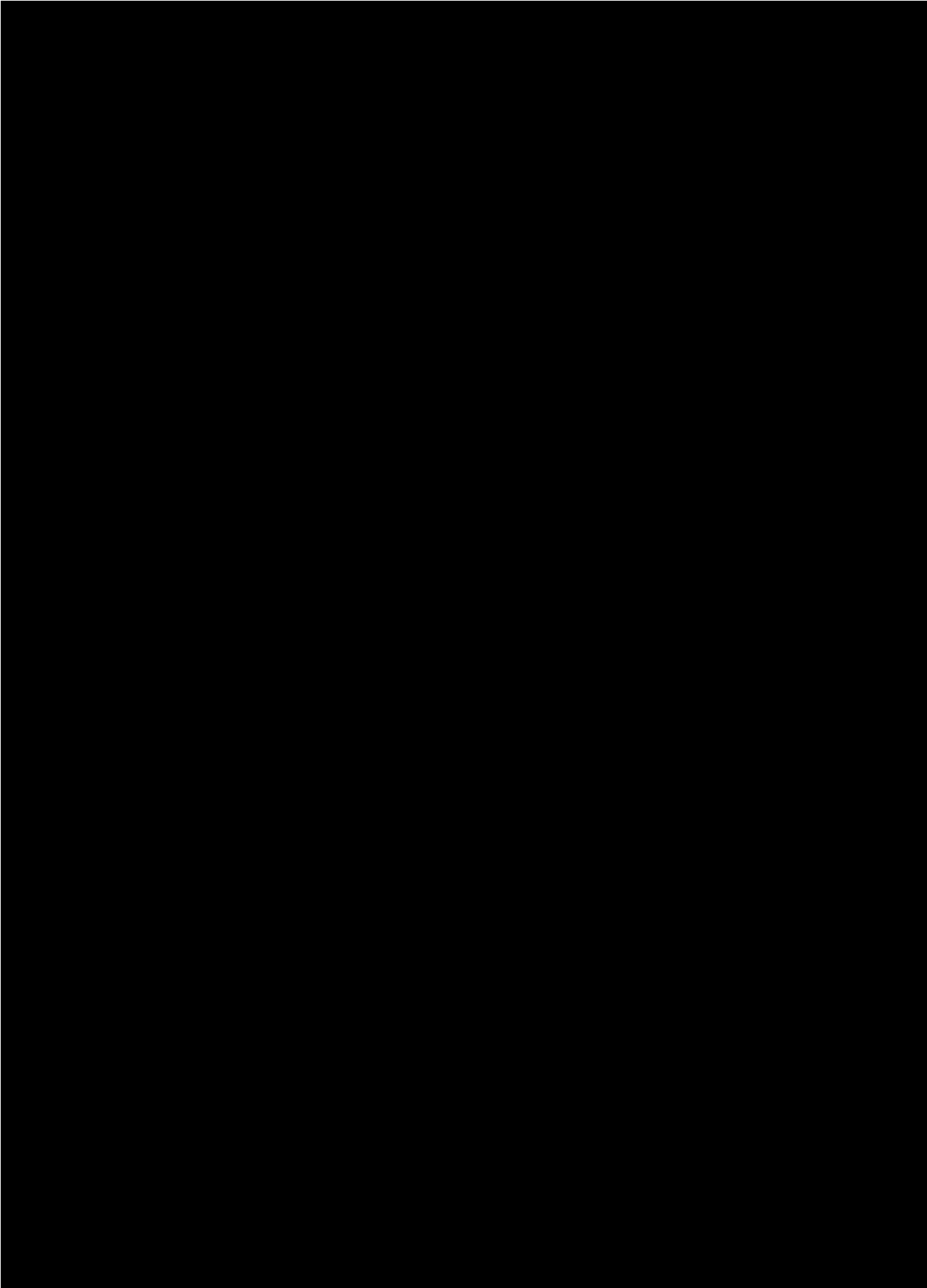


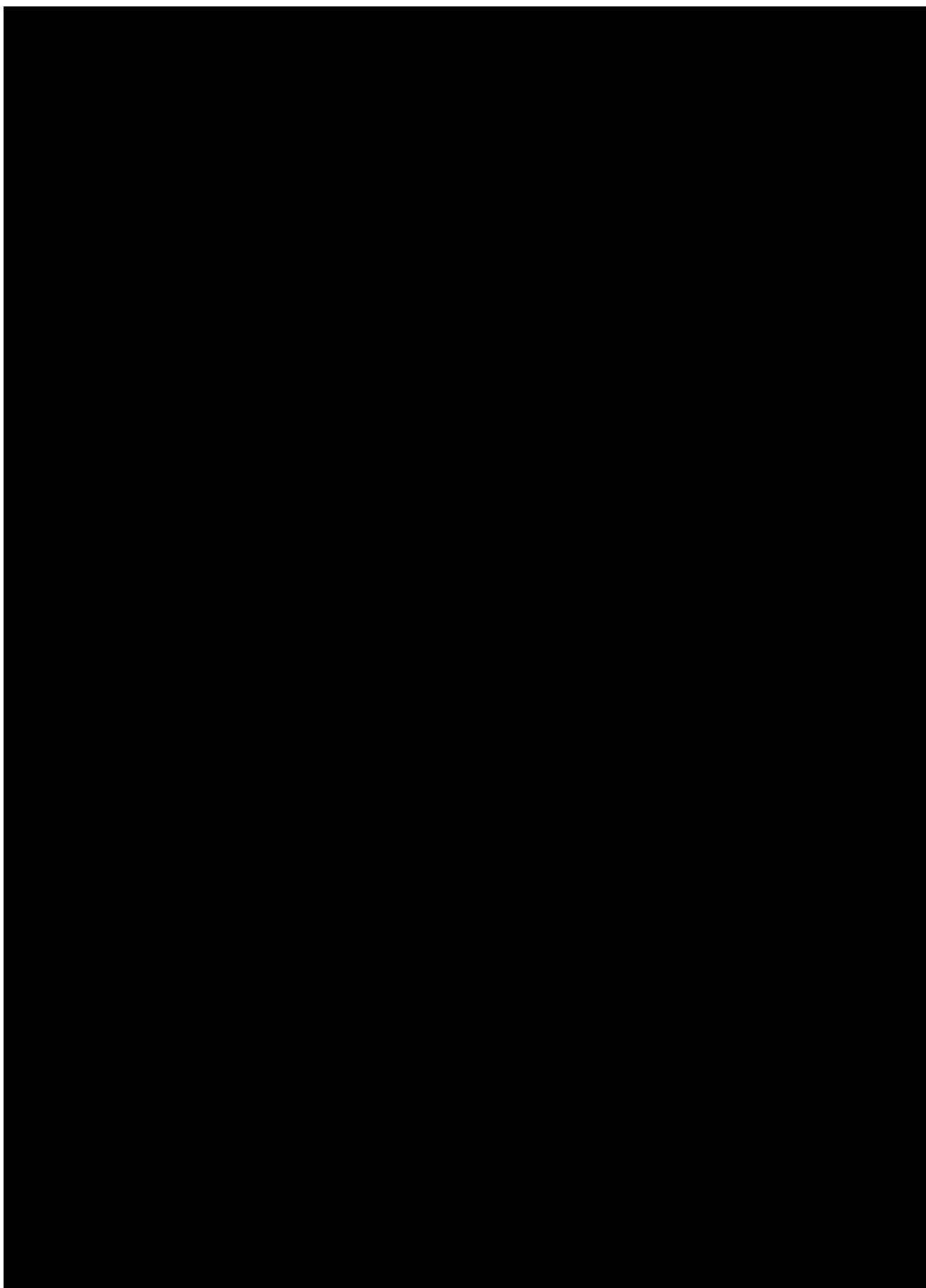


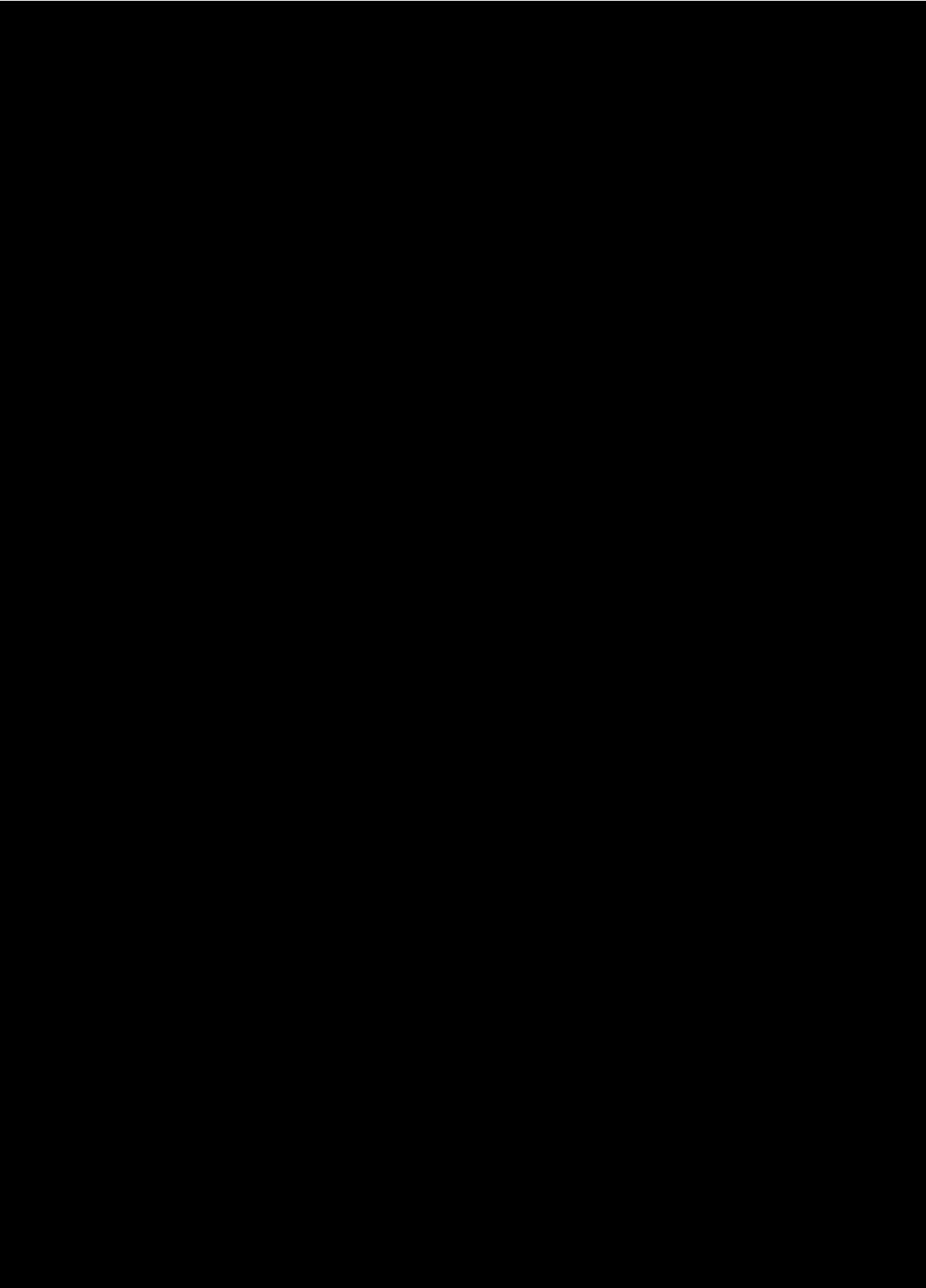


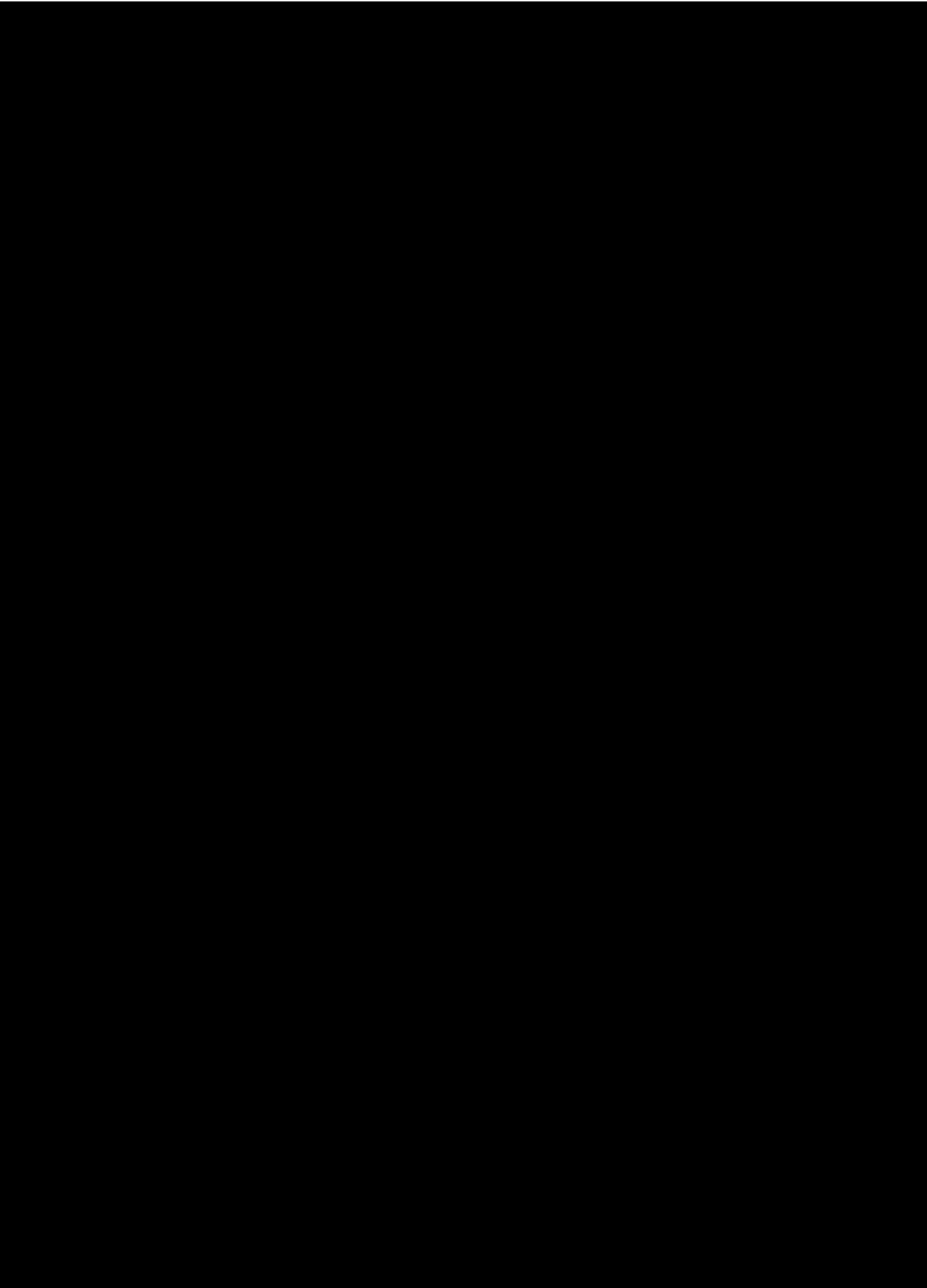


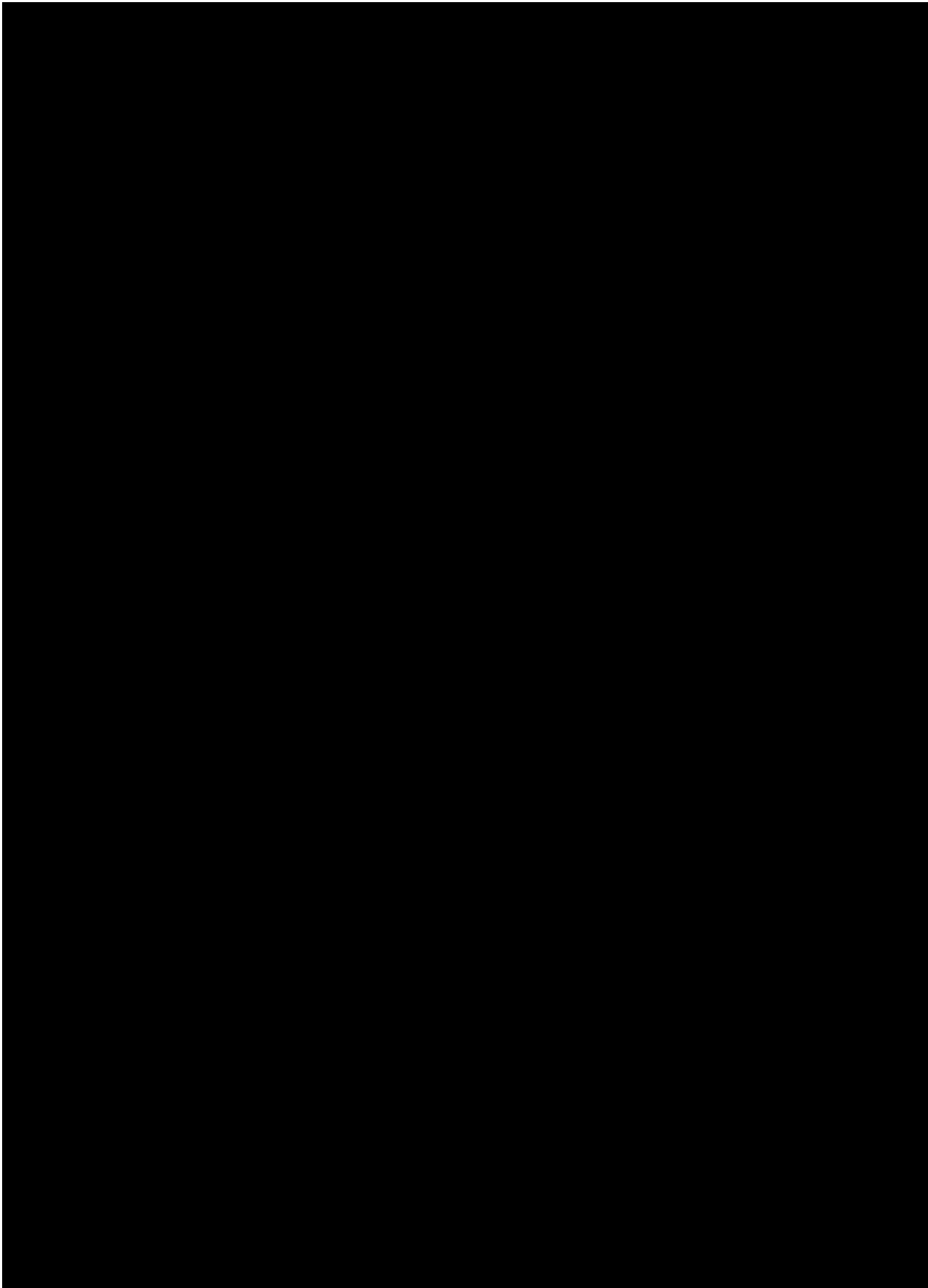


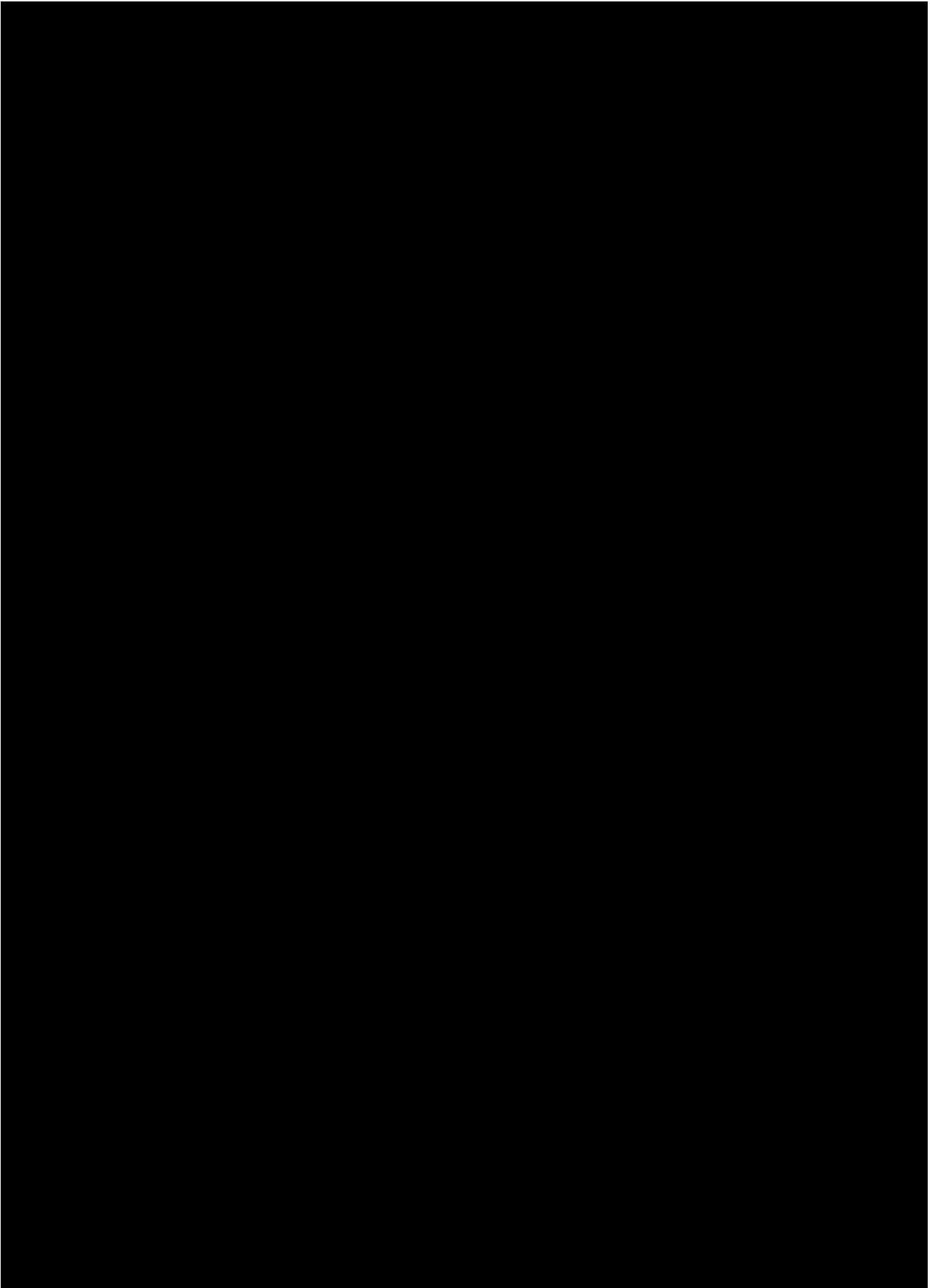


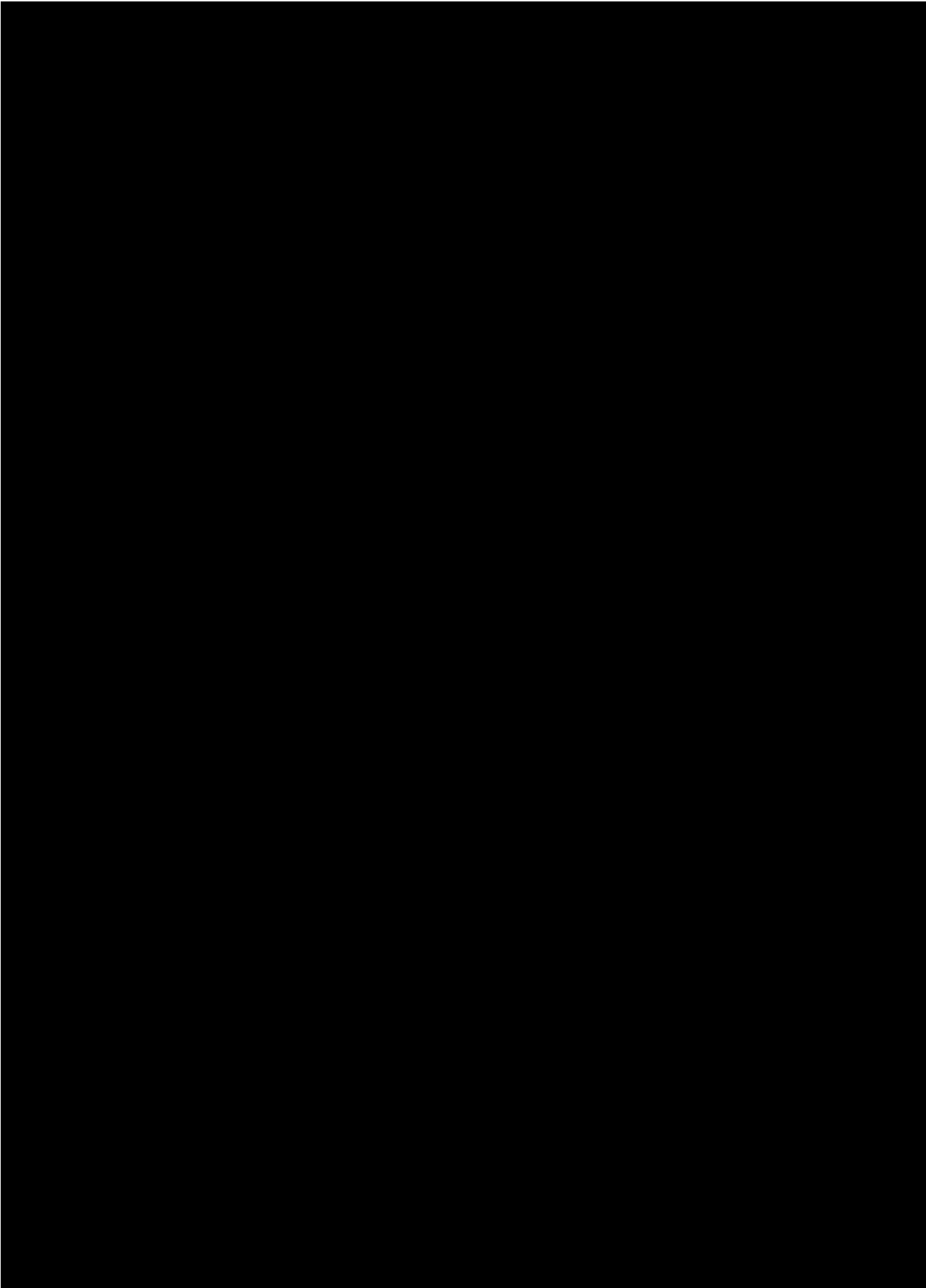


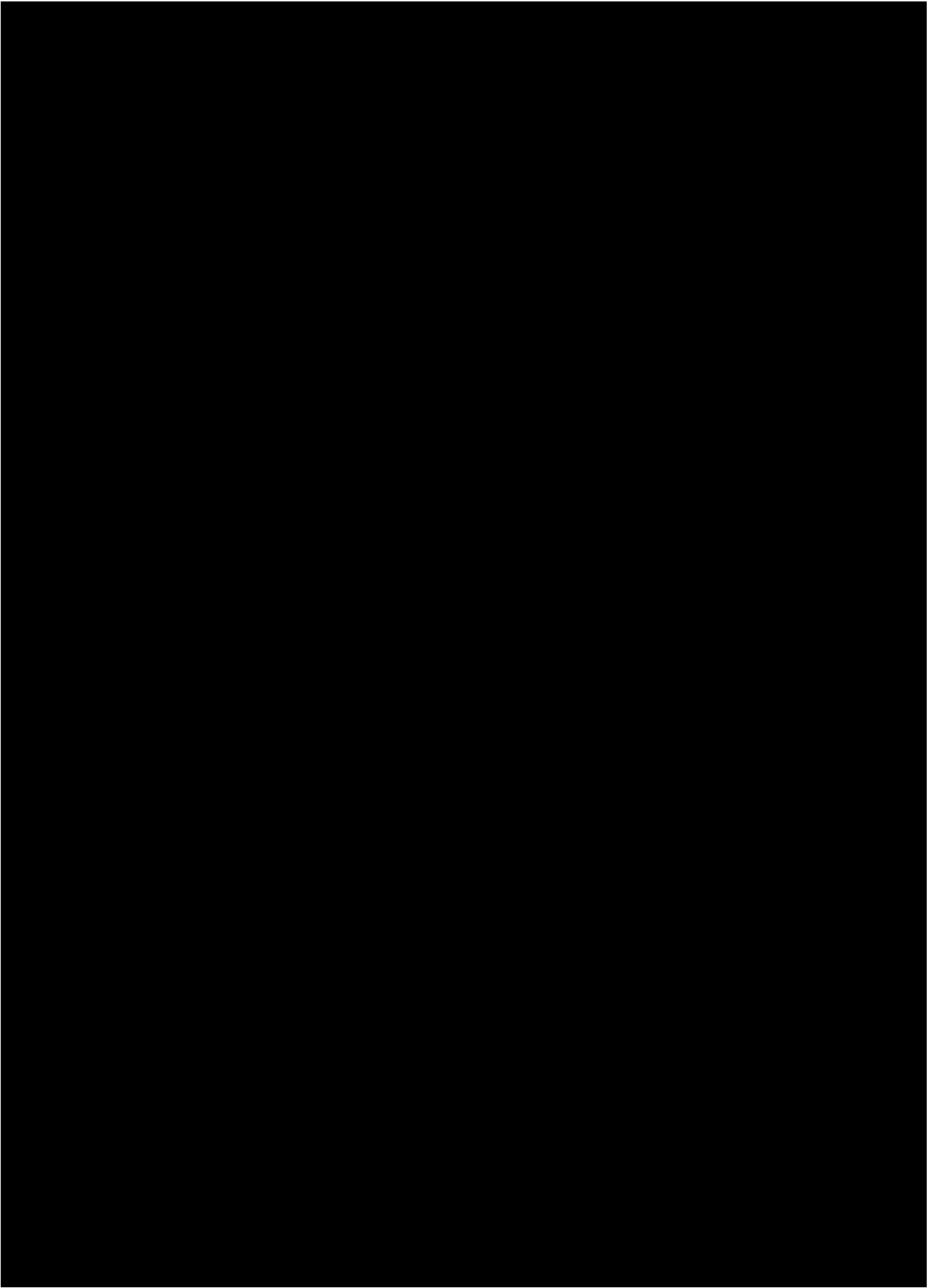


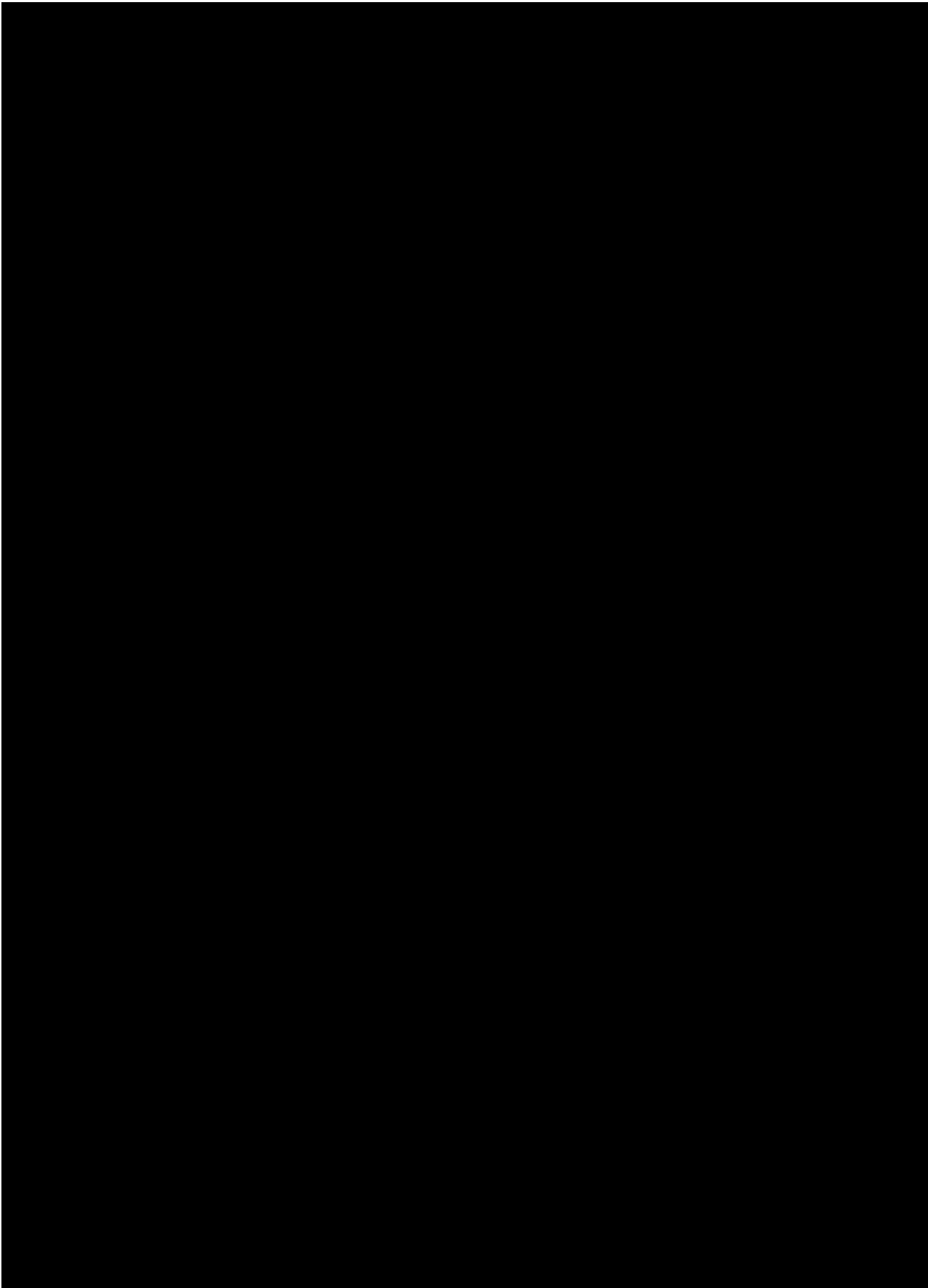


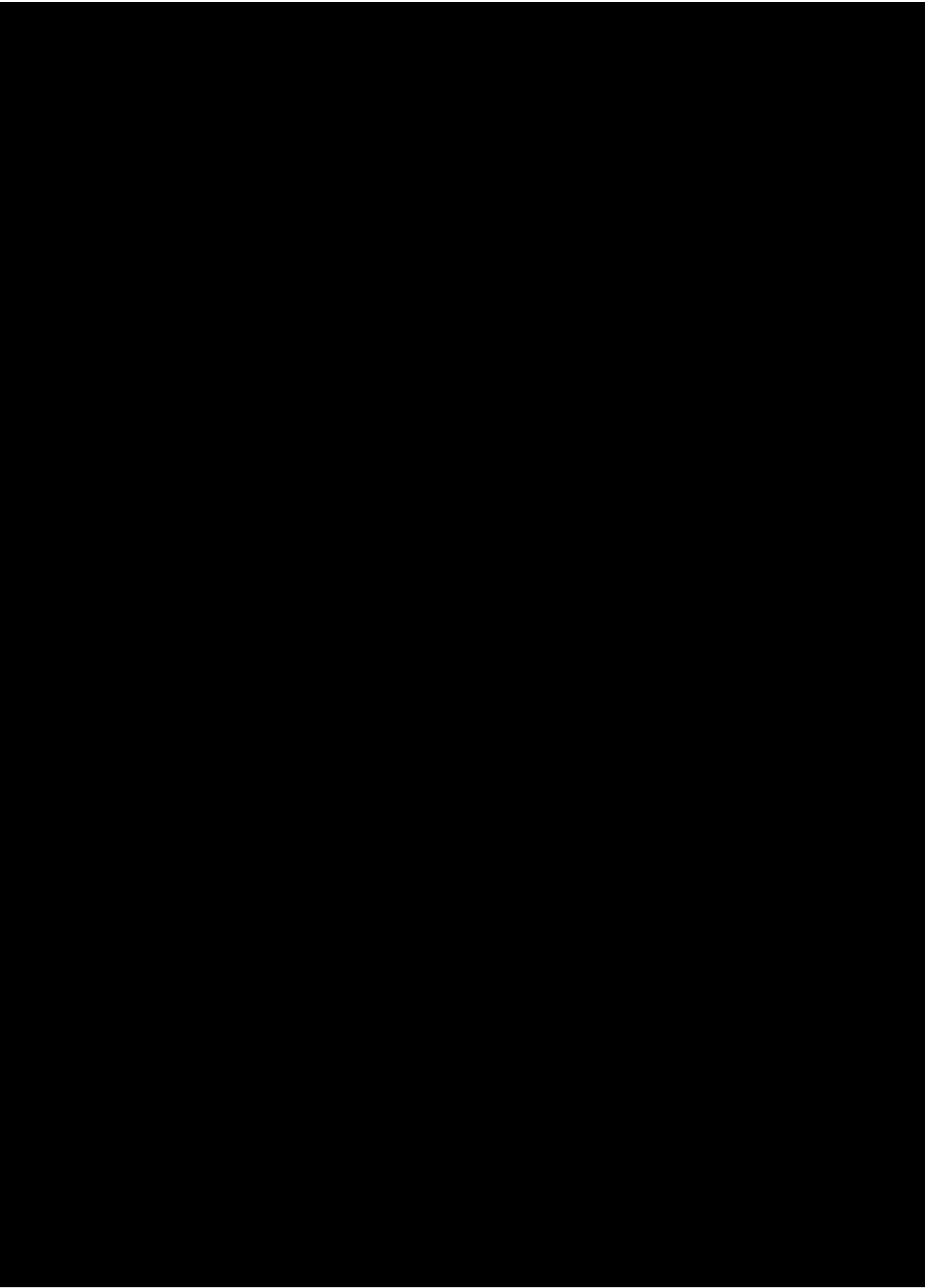












5. MOTによるサポートレター

MOTの技術担当副大臣のMr. Nguyen Ngoc Dongが発行した、実証事業で計画している Vung Ro 4 トンネル補修・補強事業に対する準備活動を許可した、サポートレターを以下に示す。次ページに和訳（参考）を併せて示す。

BỘ GIAO THÔNG VẬN TẢI

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc

Số: 7368 /BGTVT-KHCN

V/v: cho phép thực hiện dự án thí điểm sửa chữa hầm đường sắt sử dụng phương pháp AGF và phương pháp bơm phụt vật liệu gốc Urethane của Nhật Bản.

Hà Nội, ngày 06 tháng 7 năm 2017

Kính gửi: Tổng công ty Đường sắt Việt Nam.

Bộ Giao thông vận tải nhận được văn bản số 1651/ĐS-QLHT ngày 09/6/2017 của Tổng công ty Đường sắt Việt Nam về việc cho phép thực hiện dự án thí điểm sửa chữa hầm đường sắt sử dụng phương pháp kiên cố địa tầng toàn hầm (All Ground Fastener - AGF) và phương pháp bơm phụt vật liệu gốc Urethane của Nhật Bản. Sau khi xem xét, Bộ GTVT có ý kiến như sau:

1. Thống nhất về chủ trương cho phép triển khai dự án thí điểm sửa chữa hầm đường sắt sử dụng phương pháp AGF và phương pháp bơm phụt vật liệu gốc Urethane của Nhật Bản.

2. Giao Tổng công ty Đường sắt Việt Nam là đầu mối, phối hợp với Cơ quan hợp tác quốc tế Nhật Bản và các cơ quan, đơn vị liên quan để thực hiện công tác chuẩn bị dự án, lập hồ sơ dự án hỗ trợ kỹ thuật theo quy định tại Nghị định số 93/2009/NĐ-CP ngày 22/10/2009 của Chính phủ ban hành Quy chế quản lý và sử dụng viện trợ phi chính phủ nước ngoài và Thông tư số 07/2010/TT-BKH ngày 30/3/2010 của Bộ KH&ĐT hướng dẫn thi hành Nghị định số 93/2009/NĐ-CP ngày 22/10/2009 của Chính phủ. Báo cáo kết quả về Bộ Giao thông vận tải để xem xét, quyết định.

Yêu cầu Tổng công ty Đường sắt Việt Nam triển khai thực hiện./

Nơi nhận:

- Như trên;
- Bộ trưởng (để b/c);
- Thứ trưởng Nguyễn Ngọc Đông ;
- Các Vụ: HTQT, KHĐT, KCHTGT;
- Lưu VT, KHCN.

KT. BỘ TRƯỞNG
THỨ TRƯỞNG


Nguyễn Ngọc Đông

日本語訳（参考）

交通運輸省

ベトナム社会主義共和国

独立 - 自由 - 幸福

7368/ĐS- QLHT 号

ハノイ、2017 年7 月06 日

日本の AGF 工法及びウレタン系
薬液注入工法によるトンネル掘
削工事に関するパイロット案件
実施許可申請

ベトナム鉄道総公社 殿

日本の AGF（All Ground Fastener-AGF）工法及びウレタン系薬液注入工法によるトンネル掘削工
事の安全性向上に関するパイロット案件実施許可について、2017 年 6 月 09 日に、交通運輸省はベ
トナム鉄道総公社による申請書 1651/ĐS-QLHT 号を受領しました。本申請書を検討後、交通運輸省
は以下のように、意見がある。

1. 日本の AGF 工法及びウレタン系薬液注入工法によるトンネル掘削工事に関するパイロット事業
実施許可の主張を統一する。
2. ベトナム鉄道総公社が主導機関として独立行政法人国際協力機構及び関連する機関と協力し、案
件への準備や、海外非政府組織援助の管理及び使用規定に関する 2009 年 10 月 22 日付政府政令
93/2009/NĐ-CP 号、及び海外非政府組織援助の管理及び使用規定に関する 2009 年 10 月 22 日付
政府政令 93/2009/NĐ-CP 号を投資計画省による実施ガイドラインに関する通知 07/2010/TT-BKH
号に基づいて、技術補助案件書の作成などを行うことになる。ベトナム鉄道総公社は交通運輸省
に本案件の結果を報告すること。

ベトナム鉄道総公社は本案件を実施する責任を担う。

宛先:

- ベトナム鉄道総公社;
- 大臣（報告のために）
- Nguyễn Ngọc Đông 副大臣
- 各務: HTQT、KHĐT、 KCHTGT;
- 留: VT、KHCN

**大臣代筆
副大臣**

Nguyễn Ngọc Đông

6. 環境社会配慮チェックリスト

【調査名】ベトナム国 AGF工法及び薬液注入工法によるトンネル掘削工事の安全性向上及び既存トンネル長寿命化に関する案件化調査

【実施者】株式会社亀山・株式会社カテックス、共同企業体

【調査対象国・地域】ベトナム国（北部、中部、南部地域等）

【調査期間】2017年1月～調査終了2017年12月

分類	環境項目	主なチェック事項	Yes: Y No: N	具体的な環境社会配慮 (Yes/Noの理由・根拠、緩和策等)
1 許認可・説明	(1)EIAおよび環境許認可	(a) 環境アセスメント報告書（EIAレポート）等は作成済みか。 (b) EIAレポート等は当該国政府により承認されているか。 (c) EIAレポート等の承認は付帯条件を伴うか。付帯条件がある場合は、その条件は満たされるか。 (d) 上記以外に、必要な場合には現地の所管官庁からの環境に関する許認可は取得済みか。	(a) N (b) N (c) N (d) N	(a) 既存トンネル補修・補強工事のため、EIAレポートの作成義務はない。 (b) 作成義務がないため、承認の必要もない。 (c) 付帯条件はない。 (d) 取得の必要はない。
	(2)現地ステークホルダーへの説明	(a) プロジェクトの内容および影響について、情報公開を含めて現地ステークホルダーに適切な説明を行い、理解を得ているか。 (b) 住民等からのコメントを、プロジェクト内容に反映させたか。	(a) Y (b) N	(a) ステークホルダーはMOT（運輸交通省）及VNR（ベトナム国鉄）だが、説明して合意済である。 (b) 工事実施現場付近に住民は存在しない。
	(3)代替案の検討	(a) プロジェクト計画の複数の代替案は（検討の際、環境・社会に係る項目も含めて）検討されているか。	(a) Y	(a) 作成済。
2 汚染 対 策	(1)大気質	(a) 対象となるインフラ施設及び付帯設備等から排出される大気汚染物質（硫黄酸化物（SOx）、窒素酸化物（NOx）、煤じん等）は当該国の排出基準、環境基準等と整合するか。大気質に対する対策は取られるか。 (b) 宿泊施設等での電源・熱源は排出係数（二酸化炭素、窒素酸化物、硫黄酸化物等）が小さい燃料を採用しているか。	(a) N (b) N	(a) 対象インフラからは大気汚染物質は排出されない。 (b) 既存の宿泊施設を利用する。
	(2)水質	(a) インフラ施設及び付帯設備等からの排水または浸出水は当該国の排出基準、環境基準等と整合するか。	(a) N	(a) 実証事業で使用するウレタン系注入剤が排水に混ざる可能性があるが、この材料に対する「ベ」国基準は存在しない。しかしながら、工事実施時には日本で採用されているガイドラインを使用して、排水に混入しないかを確認する計画を実施する。
	(3)廃棄物	(a) インフラ施設及び付帯設備からの廃棄物は当該国の規定に従って適切に処理・処分されるか。	(a) Y	(a) VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、適切に処理される。
	(4)土壌汚染	(a) インフラ施設及び付帯設備からの排水、浸出水等により、土壌・地下水を汚染しない対策がなされるか。	(a) Y	(a) 排水にウレタン系注入剤が混入しないかを確認するための計画を、日本のガイドラインに従い実施する。
	(5)騒音・振動	(a) 騒音、振動は当該国の基準等と整合するか。	(a) Y	(a) VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、整合する。
	(6)地盤沈下	(a) 大量の地下水汲み上げを行う場合、地盤沈下が生じる恐れがあるか。	(a) N	(a) 生じる可能性はない。
	(7)悪臭	(a) 悪臭源はあるか。悪臭防止の対策はとられるか。	(a) N	(a) 悪臭元はないため、対策は不要。
3 自然 環 境	(1)保護区	(a) サイトは当該国の法律・国際条約等に定められた保護区内に立地するか。プロジェクトが保護区に影響を与えるか。	(a) N	(a) 影響は与えない。
	(2)生態系	(a) サイトは原生林、熱帯の自然林、生態学的に重要な生息地（珊瑚礁、マンダローブ湿地、干潟等）を含むか。 (b) サイトは当該国の法律・国際条約等で保護が必要とされる貴重な種の生息地を含むか。 (c) 生態系への重大な影響が懸念される場合、生態系への影響を減らす対策はなされるか。 (d) プロジェクトによる水利用（地表水、地下水）が、河川等の水域環境に影響を及ぼすか。水生生物等への影響を減らす対策はなされるか。	(a) N (b) N (c) N (d) N	(a) 含まない。 (b) 含まない。 (c) 懸念されない。 (d) 及ぼさない。
	(3)水象	(a) プロジェクトによる水系の変化に伴い、地表水・地下水の流れに悪影響を及ぼすか。	(a) N	(a) 及ぼさない。
	(4)地形・地質	(a) プロジェクトにより、サイト及び周辺の地形・地質構造が大規模に改変されるか。	(a) N	(a) 改変されない。

分類	環境項目	主なチェック事項	Yes/No/N	具体的な環境社会配慮 (Yes/Noの理由・根拠、緩和策等)
社会環境	(1) 住民移転	(a) プロジェクトの実施に伴い、非自発的住民移転は生じるか。生じる場合は、移転による影響を最小限とする努力がなされるか。 (b) 移転する住民に対し、移転前に補償・生活再建対策に関する適切な説明が行われるか。 (c) 住民移転のための調査がなされ、再取得価格による補償、移転後の生活基盤の回復を含む移転計画が立てられるか。 (d) 補償金の支払いが移転前に行われるか。 (e) 補償方針は文書で策定されているか。 (f) 移転住民のうち特に女性、子供、老人、貧困層、少数民族・先住民等の社会的弱者に適切な配慮がなされた計画か。 (g) 移転住民について移転前の合意は得られるか。 (h) 住民移転を適切に実施するための体制は整えられるか。十分な実施能力と予算措置が講じられるか。 (i) 移転による影響のモニタリングが計画されるか。 (j) 苦情処理の仕組みが構築されているか。	(a)N (b)N (c)N (d)N (e)N (f)N (g)N (h)N (i)N (j)N	(a)非自発的住民移転は生じない。 (b)非自発的住民移転は生じない。 (c)非自発的住民移転は生じない。 (d)補償金は生じない。 (e)補償金は生じない。 (f)非自発的住民移転は生じない。 (g)非自発的住民移転は生じない。 (h)非自発的住民移転は生じない。 (i)非自発的住民移転は生じない。 (j)非自発的住民移転は生じない。
	(2) 生活・生計	(a) プロジェクトによる住民の生活への悪影響が生じるか。必要な場合は影響を緩和する配慮が行われるか。	(a)N	(a)生じない。
	(3) 文化遺産	(a) プロジェクトにより、考古学的、歴史的、文化的、宗教的に貴重な遺産、史跡等を損なう恐れはあるか。また、当該国の国内法上定められた措置が考慮されるか。	(a)N	(a)損なう恐れはない。
	(4) 景観	(a) 特に配慮すべき景観が存在する場合、それに対し悪影響を及ぼすか。影響がある場合には必要な対策は取られるか。 (b) 大規模な宿泊施設や建築物の高層化によって景観が損なわれる恐れがあるか。	(a)N (b)N	(a)及ぼさない。 (b)恐れはない。
	(5) 少数民族、先住民	(a) 少数民族、先住民の文化、生活様式への影響を軽減する配慮がなされているか。 (b) 少数民族、先住民の土地及び資源に関する諸権利は尊重されるか。	(a)N (b)Y	(a)影響はない。 (b)影響がないので、現状の通りである。
	(6) 労働環境	(a) プロジェクトにおいて遵守すべき当該国の労働環境に関する法律が守られるか。 (b) 労働災害防止に係る安全設備の設置、有害物質の管理等、プロジェクト関係者へのハード面での安全配慮が措置されるか。 (c) 安全衛生計画の策定や作業員等に対する安全教育（交通安全や公衆衛生を含む）の実施等、プロジェクト関係者へのソフト面での対応が計画・実施されるか。 (d) プロジェクトに関係する警備要員が、プロジェクト関係者・地域住民の安全を侵害することのないよう、適切な措置が講じられるか。	(a)Y (b)Y (c)Y (d)Y	(a)VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、守られる。 (b)VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、配慮される。 (c)VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、対応される。 (d)VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、適切な措置が講じられる。
その他	(1) 工事中の影響	(a) 工事中の汚染（騒音、振動、濁水、粉じん、排ガス、廃棄物等）に対して緩和策が用意されるか。 (b) 工事により自然環境（生態系）に悪影響を及ぼすか。また、影響に対する緩和策が用意されるか。 (c) 工事により社会環境に悪影響を及ぼすか。また、影響に対する緩和策が用意されるか。	(a)Y (b)Y (c)N	(a)VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、緩和される。 (b)悪影響はないが、その互証のため、日本のガイドラインに従って、配水の計画を実施する。 (c)悪影響は及ぼさない。
	(2) モニタリング	(a) 上記の環境項目のうち、影響が考えられる項目に対して、事業者のモニタリングが計画・実施されるか。 (b) 当該計画の項目、方法、頻度等がどのように定められているか。 (c) 事業者のモニタリング体制（組織、人員、機材、予算等とそれらの継続性）は確立されるか。 (d) 事業者から所管官庁等への報告の方法、頻度等は規定されているか。	(a)Y (b)Y (c)Y (d)Y	(a)VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、実施されることに加え、日本のガイドラインに従って排水の計画を実施する。 (b)VNRの工事実施基準に定められている。 (c)VNRの工事実施基準に従い工事計画を作成し、VNRから承認を得た計画で実施するため、確立される。 (d)VNRの工事実施基準に規定されている。
留意	他の環境チェックリストの参照	(a) 必要な場合、道路、鉄道、橋梁に係るチェックリストの該当チェック事項も追加して評価すること（インフラ施設に関連して、アクセス道路等が設置される場合等）。 (i) 電話線敷設、鉄塔、海底ケーブル等については、必要に応じて、送電電圧・配電に係るチェックリストの該当チェック事項も追加して評価すること。	(a)N (i)N	(a)工事用の道路・鉄道・橋梁は設置・変更されない。 (i)発電機を利用するため、送電線は設置しない。電話線・海底ケーブルは敷設しない。
	環境チェックリスト使用上の注意	(a) 必要な場合には、越境または地球規模の環境問題への影響も確認する（廃棄物の適正処理、酸性雨、オゾン層破壊、地球温暖化の問題に係る要素が考えられる場合等）。	(a)N	(a)越境または地球規模の環境問題が発生する可能性はない。

注1) 表中「当該国の基準」については、国際的に認められた基準と比較して著しい乖離がある場合には、必要に応じて対応策を検討する。
 当該国において現在規制が確立されていない項目については、当該国以外（日本における経験も含めて）の適切な基準との比較により検討を行う。
 注2) 環境チェックリストはあくまでも標準的な環境チェック項目を示したものであり、事業および地域の特性によっては、項目の削除または追加を行う必要がある。

7. 英文要約

Summary

Chapter 1 Current Situation of the Country

1-1 Political and Socio-economic Situation of the Country/area

Socialist Republic of Vietnam has an area of 330,000 km² (which is equivalent to the area of Japan excluding Kyushu), a population of 92.5 million people, and a GDP per capita of 2,073 dollars, advancing from low-income country to middle-income country. While conventional sewing industry continues to expand, direct investment in electronics industry is increasing, as Canon and Samsung Electronics triggered many electronics subcontractors to expand their business to Vietnam, the country's industry is becoming more and more sophisticated. As a result, supporting industries have also grown, and the country is advancing from a less-developed country to a more-developed country.

The Doi Moi policy, adopted in 1986, began to show successful results from around 1989, and they recorded 9%+ level of annual economic growth from 1995 to 1996. Subsequently they experienced Asian economic crisis which temporarily slowed the growth, the average annual economic growth rate from 2000 to 2010 achieved as high as 7.26%, partly owing to steady increase in foreign direct investment. The country has become (low-order) middle income country in 2010.

1-2 Development Issues of Target Field in the Country/area

Development issues of target field in the country/area are as below.

Issue (1) - 1

Since mountainous region of Vietnam belongs to "Trans Vietnam orogenic belt" and contains extremely unstable strata, it is concerned that more accidents may happen due to low safety during tunnel excavation work.

Issue (1) - 2

Construction methods to deal with fracture zones and water leakage are not common. Consequently, ad hoc measures are used, which causes negative effects on the construction period, cost and quality of tunnel excavation work.

Issue (2)

Most of the existing tunnels have more than 70-year service period and aging is still progressing.

Issue (3)

Staff of the project management side (government side, mainly PMU), i.e. project owner, lacks expertise and technical capabilities for construction management and quality control, and they are not able to adequately judge the construction methods and other decisions.

1-3 Development Plan, Relevant Plans, Policies (Including Policy on Foreign Capital) and Legislation

(1) Development Plans

i) National Expressway Network Development and Plan

Vietnam national expressway network plan of total 5,873 km with 22 routes is based on the traffic demand forecast in socio-economic development (target year 2020 and concept after 2020).

ii) Adjustment Plan for Road Transport Development

It is Development plan for road transport infrastructure which is the fundamental driver for socio-economic

growth. In addition to industrialization and modernization, it aims to develop inter-regional and international networks and contribute to national security.

iii) North-South Tunnel Rehabilitation Plan

Rehabilitation plan for 22 deteriorated tunnels out of the 39 tunnels managed by VNR. Approximately 5 billion yen is under application to the Ministry of Finance as repair and reinforcement budget by 2020, about 50% of which are to be allocated to tunnel repair and reinforcement work.

(2) Legislation

i) Legislation on Safety

Study team found there is no laws and regulations on safety regarding new construction of tunnel and inspection/rehabilitation of existing tunnels in Vietnam.

ii) Legislation on PPP Project

Vietnamese government issued “The Decree on Public-Private Partnership Investment Form” (Decree No. 15/2015/ND-CP), new regulation for PPP investment, on 4th February 2015, which was effected on 10th April 2015.

1-4 Analysis on Preceding ODA Projects in Target Field in the Country and Other Donors

Preceding Japanese ODA projects include “Hanoi-Ho Chi Minh City Railway Bridge Rehabilitation Project (1)(2)(3)”.

1-5 Analysis on the Business Environment in the Country

(1) Restraint Measures and Preferable Treatments for Establishing a Company with Foreign Investments

The law No. 67/2014/QH13 on investment clearly defines the areas where investment and business operation is prohibited, and business operation investment is approved with conditions. Manufacturing and construction industries which local manufacturing and sales using the technology that this study proposes does not belong to either prohibited or conditionally approved area.

(2) Points to Remember When Opening Local Representative Office

Any Japanese companies with more than 1 year business operation in Japan can establish a representative office in Vietnam. However, the business contents are restricted to the communication with the headquarters, promoting the projects in Vietnam, managing the contracts with Vietnamese partners, market surveys for the purpose of supplying products and services in Vietnam, etc.

Chapter 2 Characteristics of the Products and Technologies and Foreign Business Development Policy of the Proposing Company

2-1 Advantages of the Proposed Products and Technologies of the Company

(1) AGF Method

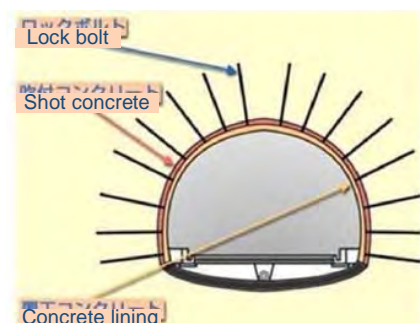


Figure NATM method
(Source: Study team)

AGF method is one of the excavating methods of rock grounds such as mountain tunnels, to excavate the parts where the ground (rock) is weak due to weathering or cracking. Currently NATM method accounts for more than 80 % of market share for the mountain tunnel construction, around 90 % of which apply AGF method to some or all part. AGF method is especially preferred in the fracture zone (rock ground with a certain depth and cracked by the fault) and tunnel portals (near the tunnel entrance). As the effects of application, the ground strength is improved, the risk of collapse is minimized, and water leakage by spring water is prevented. As a result of these effects, it is possible to increase the safety of the construction site, minimize the construction delay and additional cost. It also enables easier prediction of the effect and assures stable level of quality.

(2) Chemical Injection Method

Many of the existing tunnels in Vietnam are constructed by France before the world war, with sheet pile excavation which was used before NATM became common. Sheet pile method uses sheet piles to support the ground, instead of shot concrete, and pour lining concrete over the sheet piles. Therefore this method tends to allow voids between the sheet piles and concrete. Chemical filling injection method is able not only to fill up the smallest part of the voids by adjusting foaming rate strength of the filling material, but also to show sufficient strength. Consequently, it can assure improving the strength and realizing long-lasting effects as well.

Silica resin based filling materials can realize stable construction regardless of the ground conditions. For the back-filling where the ground condition cannot be clearly checked, urethane based materials work stably.

2-2 The Position of Overseas Development in the Proposing Company's Business Strategy

Kameyama Co., Ltd., representative of the proposing company, currently produces drilling bits and steel pipes applied for the excavation of weak ground including AGF method, primary processing of the products are conducted in Vietnam. Although secondary processing is currently conducted in Japan, it plans to develop manufacturing capability in Vietnam through Verification Survey of JICA ODA project, and increase the production ratio within Vietnam. By doing this, it aims to strengthen price competitiveness in selling in and out of Vietnam (outside Japan). Katecs Co.,Ltd., the JV company, is examining the possibility of chemical materials manufacturing and selling in ASEAN countries considering tariff liberalization.

2-3 Proposing Company's Expected Contribution to Japan's Regional Economy through Overseas Development

[New staff Recruitment for Overseas Development]

To cope with increasing production for AGF method and chemical filling injection method in Vietnam, technical trainers and production managers etc. will be dispatched to Vietnam. These staff members, or supplementary staff members, will be employed newly in Japan.

[New Staff Recruitment for Production Expansion]

Production of the parts relating to the technologies which should be kept in the company will remain in Japan. The staff members to deal with this production expansion will be newly employed in Japan.

[Sales Increase in Domestic Supply Chain]

The expansion of the production will contribute to the increase in sales of the suppliers (such as Sun kiko Co., Ltd. and Fukunetsu Co.,Ltd.).

[New Research in Non-profit Organization Clinical Institute for Tunnels and Tunneling]

In order to promote AGF method overseas, new study subject about technical solutions in Vietnam which has complex ground condition is proposed for Non-profit organization clinical institute for tunnels and tunneling.

Chapter 3 Study Results on the Products and Technologies which can be used in ODA Projects and their Feasibility

3-1 Verification Measures of the Products and Technologies which can be used in ODA Projects and their Feasibility

(1) AGF Method

Table Conformity Verification Measures of the Products and Technologies to the Local Condition (AGF Method)

Measures	Objectives	Items
Interview to the relating authorities	Confirming existence of conforming excavation sites or tunnels and their conditions Request of site inspection as necessary	Existence of fracture zone and spring water Current countermeasures Possibility of the site facility
Inspection of new tunnel construction site	By inspecting new tunnel construction site, confirm the applicability of AGF and other relating methods. Examine the feasibility of implementation of verification survey.	Confirming water leakage and ground condition Confirming the environment inside the tunnel Relationship between the implementing agency and the government
Inspection of existing tunnels with extremely bad condition	By inspecting existing tunnels with extremely bad condition, confirm the applicability of AGF and other relating methods.	Confirming the condition of water leakage Confirming the condition of lining concrete Confirming the environment inside the tunnel

(Source: Study team)

(2) Chemical injection method

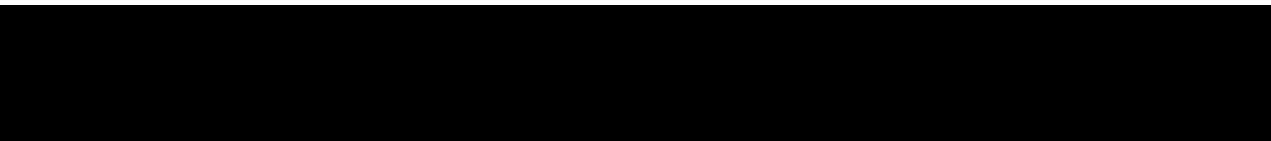
Table Conformity Verification Methods of the Products and Technologies to the Local Condition (Chemical Injection Method)

Measures	Objectives	Items
Interview to the relating authorities	Confirming existence of conforming excavation sites or tunnels and their conditions Confirming the regulations for conformity Request of site inspection as necessary	Existence of fracture zone and spring water Current countermeasures Possibility of the site facility
Inspection of new tunnel construction site	By inspecting new tunnel construction site, confirm the applicability of repair work using chemical injection and other relating methods to the lining concrete just after the completion of construction.	Confirming water leakage and ground condition Confirming the environment inside the tunnel
Inspection of existing tunnels with	By inspecting existing tunnels with extremely bad condition, confirm the applicability of repair work	Confirming the condition of water leakage

extremely bad condition	using chemical injection and other relating methods. Examine the feasibility of implementation of verification survey.	Confirming the condition of lining concrete Confirming the environment inside the tunnel Relationship between the implementing agency and the government
-------------------------	------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------

(Source: Study team)

3-2 Results of the Conformity Verification of the Products and Technologies to the Local Condition



3-3 Confirmation of Product and Technical Needs of the Country

(1) AGF Method

Study team found many of the tunnel excavation sites as well as existing tunnels which need large scale rehabilitation have water leakage. For these excavations and rehabilitations, it's difficult to control the quality and work schedule with conventional cement-based grouting materials, it's also difficult to cope with unexpected situation and security is hardly assured. As new tunnel design is expected to increase in Vietnam in the near future, the demand will also increase. Study team concludes 3 main target areas of AGF method as below:

- ① Repair & reinforcement works of existing tunnels which are managed by VNR
- ② New road tunnel construction projects
- ③ New canal tunnel construction projects

(2) Chemical Injection Method

It's found that many of the existing tunnels in Vietnam are suffered from water leakage, some of them are extremely severe. Leakage volume increases especially in rainy season, and there are tunnels, mainly those managed by VNR, that conventional repairing with cement-based grouting material is not sufficient. As the total number of tunnels is very small compared with Japan: 39 managed by VNR, and 3 by DCIC, it's certain there will be more and more demand on tunnels for the development of future expressway network, high speed railways, by-pass of major arterial roads, etc. Main target areas of repair methods using urethane based grouting are two as below:

- ① Repair & reinforcement works of existing tunnels managed by VNR
- ② Turbine chambers and connecting tunnels of existing hydro power plants

3-4 Confirmation of Effectiveness and Applicability of the Products and Technologies for Development Issues of the Country

Based on the conformity verification of the proposed products/technologies to the local condition and needs confirmation, study team examined effectiveness and applicability for development issues of the country and concludes as below:

- ① Safety improvement in new tunnel construction site

- ②Reduction of work period and cost of tunnel excavation in difficult condition, improvement of construction quality
- ③Realization of preventive maintenance in existing tunnels
- ④Preparation of the guidelines and manuals for design and construction, human resource development capable of selecting appropriate method

Chapter 4 ODA Project Formation

4-1 Outline of ODA Project Formation

(1) Outline of the Project

[Project Name] Verification Survey with the Private Sector for Disseminating Japanese Technologies for High Quality and Safe Tunnel Drilling and Reinforcing Method by Reinforcing and Water-Cutting the Bedrock with AGF Method and Urethane Injection

[Project Scheme] Verification Survey

[Objectives of the Project]

- Improving construction safety and quality, reducing risk during construction and public expenditure, using AGF method in new tunnel construction.
- Hazardous condition of Vung Ro 4 tunnel is resolved and railway traffic safety is secured in north-south railway. Safety in railway operation is improved by applying same measures to existing tunnels with similar safety condition.
- At the same time, substantially improving the soundness of existing tunnels of VNR, to extend the service life, and allow conserved budget to other infrastructure development.
- Due to increasing number of technical staff familiar with the construction methods, improvement of construction safety and quality, reduction of project cost, early starting of service.

(2) Activities

- ① Verification of easiness of construction, safety and reliability of AGF method in unstable tunnel face with water leakage
- ② Verification of water proof performance and high quality of urethane based grouting in the existing tunnels with severe water leakage
- ③ Acquiring technical certifications (TCVN) for AGF method and water proof method using urethane based grouting
- ④ Developing Japanese style service life extension plan for the existing tunnels under VNR
- ⑤ Preparation of manuals and guidelines for AGF method and water proof method using urethane based grouting
- ⑥ Promotion of AGF method and urethane based grouting widely with their performance, easiness of construction/workability, safety, etc., through seminars etc.
- ⑦ Technical transfer to the staff relating to tunnel, mainly engineers of Vietnam Railways

(3) Proposed Counterpart

Ministry of Transport (MOT)

(4) Target Area and Proposed Site for Product/technology Application

Proposing companies suppose No. 19 Vung Ro 4 tunnel on north-south railway managed by VNR as the possible site for verification project. AGF method will be applied to reinforce the ground of the 12m-long section of this tunnel where the lining concrete is the most damaged, followed by lining concrete removal and re-casting.

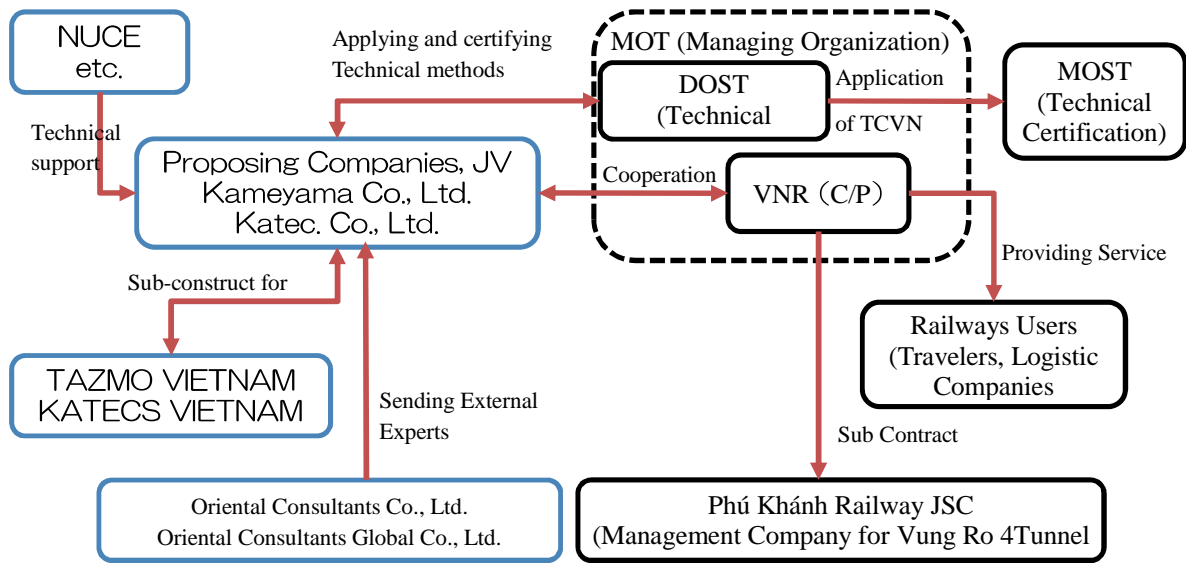
For repairing other sections with water leakage, water proof method using chemical grouting will be applied.

4-2 Specific Cooperation Plan and Expected Development Effect

Objectives:	
<ul style="list-style-type: none"> • Improving construction safety and quality, reducing risk during construction and public expenditure, using AGF method in new tunnel construction. • Hazardous condition of Vung Ro 4 tunnel is resolved and railway traffic safety is secured in north-south railway. Safety in railway operation is improved by applying same measures to existing tunnels with similar safety condition. • At the same time, substantially improving the soundness of existing tunnels of VNR, to extend the service life, and allow conserved budget to other infrastructure development. • Due to increasing number of technical staff familiar with the construction methods, improvement of construction safety and quality, reduction of project cost, early starting of service. 	
Outcomes	Activities
Outcome 1 Verification of easiness of construction, safety and reliability of AGF method in unstable tunnel face with water leakage	1-1 Verification of the ground reinforcement effect in unstable tunnel cross section with water leakage in Vung Ro 4 tunnel pilot verification project.
	1-2 Verification of the easiness of construction, safety and quality improvement in unstable tunnel face with water leakage in Vung Ro 4 tunnel pilot demonstration.
Outcome 2 Verification of water proof performance and high quality of urethane based grouting in the existing tunnels with severe water leakage	2-1 Verification of the water proof performance in the leakage sections in Vung Ro 4 tunnel pilot verification project.
	2-2 Verification of the quality in Vung Ro 4 tunnel pilot verification project
Outcome 3 Acquiring technical certifications (TCVN) for AGF method and water proof method using urethane based grouting	3-1 Application to the technical certification for AGF method to MOST (Ministry of Science and Technology) and obtain conditional certification.
	3-2 Application to the technical certification for water proof method using urethane based grouting to MOST (Ministry of Science and Technology) and obtain conditional certification.
Outcome 4 Developing Japanese style service life extension plan for the existing tunnels under VNR	4-1 Development of service life extension plan of the existing tunnels using inspection results of VNR.
	4-2 Support to secure necessary budget and make specification, using developed service life extension plan.
Outcome 5 Preparation of manuals and guidelines for AGF method and water proof method using urethane based grouting	5-1 Prepare guidelines and manuals for the design and construction using AGF method
	5-2 Prepare guidelines and manuals for repair method using urethane based grouting.
Outcome 6 Dissemination of AGF method and urethane based grouting widely with their performance, easiness of construction/workability, safety, etc., through seminars etc.	6-1 Promotion through the seminars using the outcome of the pilot verification project.
	6-2 Networking with the seminar attendees considering post-project business expansion.
Outcome 7 Technical transfer to the staff relating to tunnel, mainly engineers of Vietnam Railways	7-1 OJT during the pilot verification project.
	7-2 Training in Japan

(Source: Study team)

[Project Implementation Organizations Chart] (draft)



(Source: Study team)

4-3 Possible Collaboration with Other ODA Projects

Survey team could not identify any on-going ODA projects including new tunnel construction to which AGF method can be applied. Although there are subway construction projects in both Hanoi and Ho Chi Minh which contain new tunnel construction plans, they are urban tunnel construction and AGF method which is mainly used for mountain tunnel can be hardly used in general. However, since AGF method has experiences used for urban tunnel in Japan, It is required to proposing companies to keep an eye on the situation and possibly start marketing when necessary.

Survey team could not identify ODA projects including repair/reinforcement using chemical grouting method either. However, if there is deterioration with water leakage in tunnels developed by ODA in the future, chemical grouting method can be applied for repairing, therefore proposing companies will continue collecting information on existing tunnels and explore possible application project.

4-4 Issues and Countermeasures in ODA Project Formation

i) Procurement of Applicable Drilling Machines for AGF Method

In order to implement VNR tunnel rehabilitation using AGF method, drilling machine which can run on the rail called rail jumbo is the most suitable. However, it's impossible to select appropriate performance and size of rail jumbo out of wide range of choices, like in Japan, in Vietnam where new tunnel construction is very seldom.

Therefore it's planned that second-hand rail jumbo is procured in Japan and brought to the site for construction. Other construction equipment will be basically procured (leased) locally. It's the new experiment to procure urethane based grouting injector locally.

ii) Construction Work Implementation in Mid-night Limited Time When Train does not Operate

In order not to affect train operation schedule, there are only 4 to 5 hours secured for repair work. Since planned pilot verification project section is as short as 12 m, with total tunnel length of no more than 368.5 m, it can be

controlled by using phased construction etc., with carefully examined construction schedule. The details will be coordinated in planning and design phase of the pilot verification project.

iii) Increase of Spring Water in Rainy Season

Survey team identified water leakage from lining concrete of the target tunnel. The water volume is expected to increase in rainy season, however, the volume varies year by year and volumes in past years were not recorded, so the work plan needs to be developed based on the assumption. This may lead to necessity of increase chemical grouting than initially planned during the execution of chemical injection method. Based on construction experiences in Japan and the interview from the Vietnam Railways engineers, survey team considers it can be adequately handled.

4-5 Measures to Deal with Social and Environmental Considerations

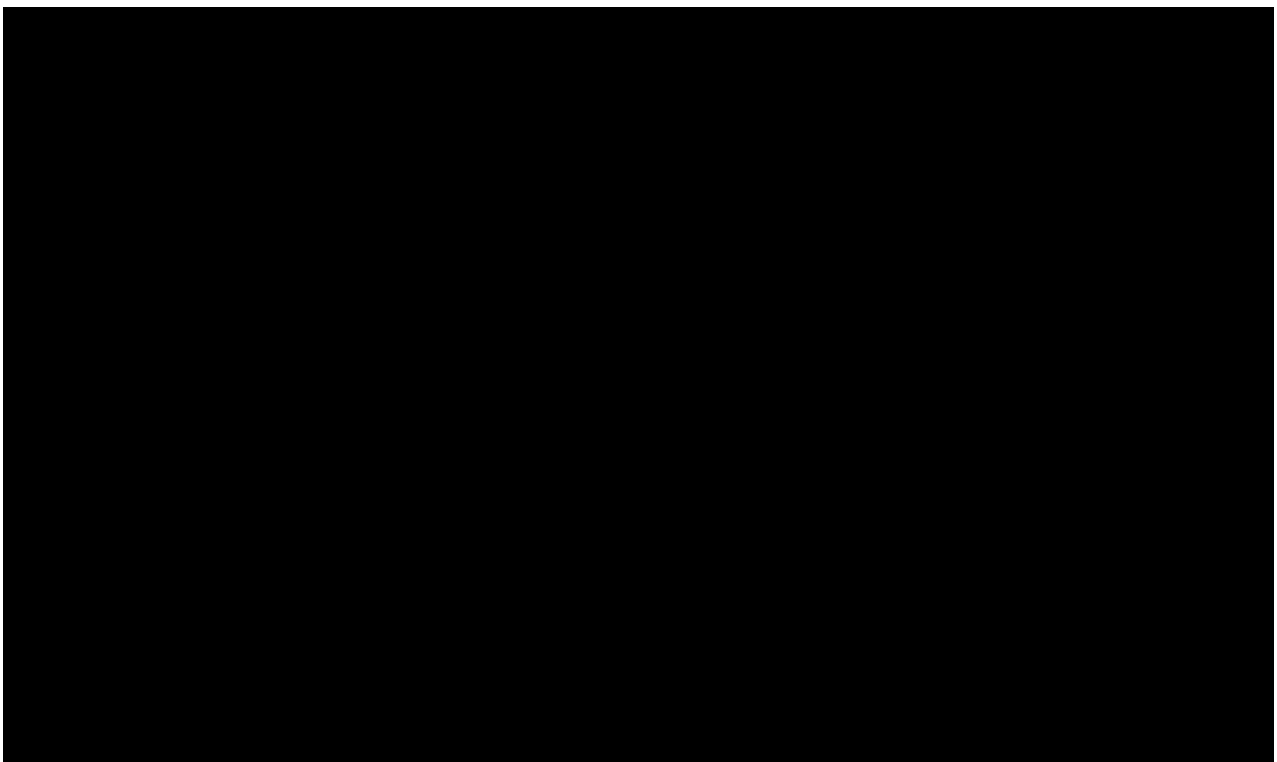
For social and environmental considerations, since pilot project is repair/reinforcement of the existing tunnel, the impact is expected to be smaller than new tunnel construction, as originally planned verification project. Both AGF method and chemical injection method inject urethane based grouting materials such as silica resin into the ground, and there are a small portion leaked into the drainage water, as well as affecting the ground condition, therefore appropriate treatment is necessary. For this issue, there is a construction guideline defined by Japan Highway Public Corporation, and it's planned to conform to the guideline.

Since urethane based material is not introduced in Vietnam, there is no documents like construction standard in Vietnam.

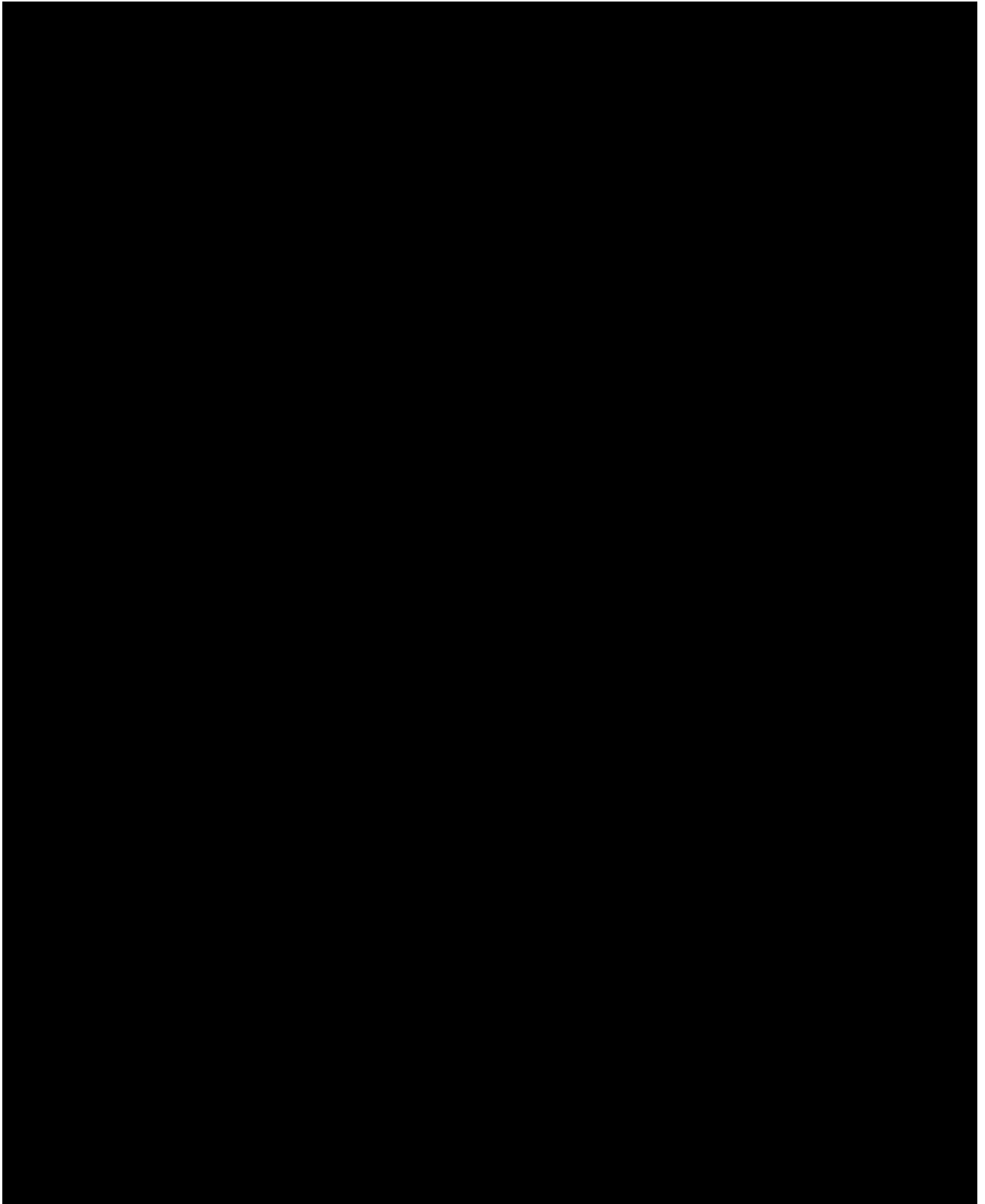
Chapter 5 Business Development Plan

5-1 Result of Market Analysis

(1) AGF Method



5-2 Estimated Business Plan and its Development Impact



5-3 Risk and Countermeasures in Business Development

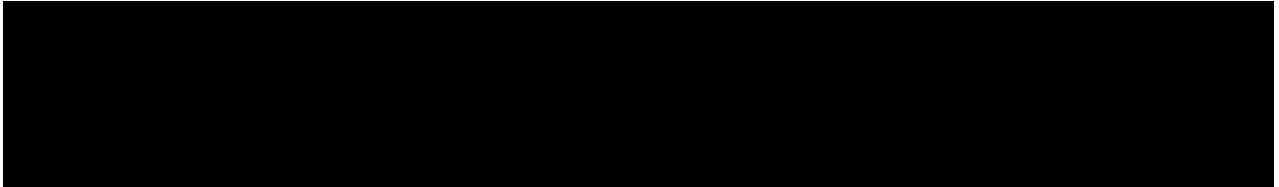
(1) Risk and Countermeasures in Social and Economic Aspect

Vulnerability of exchange rate and increase inflation rate are the most effective economic risks. Both risks need to be treated by following methods, (1) ordering with certain size and (2) shortening the order and payment dates.

Financial risks cannot be solved by certain countermeasure and needs to be treated by several methods.

Vietnam has unique country risk as socialist country, such as sudden change in legal aspects. Therefore gathering information from various organizations, such as embassy of Japan, JICA, JETRO, OCG representative office, and etc. are continuously required.

(2) Risk and Countermeasures in Copyright Aspect



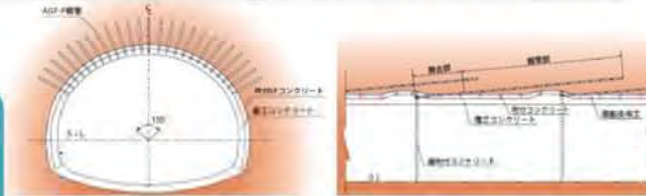
(3) Risk and Countermeasures in Environmental and Social Considerations

AGF method itself does not impact to neither social nor environmental conditions. However, tunnels newly construction projects does impact to both social and environmental conditions, such as changing habitants' lifestyle, delay of implementation, polluting the natural environment, and etc. Therefore, it is requested to establish the procedure not to impact negatively to the tunnel construction project by applying AGF method by introducing Japanese regulations related to environmental protection when applying the technical specification.

Feasibility Survey with the Private Sector for Utilizing Japanese Technologies in ODA Projects In Vietnam, “Feasibility Survey for Improving Safety of the Tunnel Excavation Works and Extending Service Life of the Existing Tunnel by AGF Method and Injecting Urethane Chemical”

SMEs and Counterpart Organization

- Name of SME: Kameyama Co., Ltd. Katecs Co.,Ltd.
- Location of SME: Fukuoka Pref. Japan, Nagoya, Japan
- Survey Site·Counterpart Organization: Central Vietnam, MOT



AGF Drilling Method

Concerned Development Issues

- Lack of safety in tunnel construction with high possibility of accident.
- Very limited drilling method in the section with soft bedrock and underwater stream causes negative impact in construction period, cost, and quality.
- Considerable numbers of the existing tunnels are very old.
- Lack of knowledge and experience to select appropriate drilling method.

Products and Technologies of SMEs

- AGF Drilling Method:
It is a drilling method to support NATM drilling method in the section that bedrock is soft, with cracks, or/and with underground water stream. It previously grouts formable Silica Resin to strengthen and improve cut-off performance of underground water.
- Filling Void behind Tunnel Lining Wall by Injecting Silica Resin:
This technology is one of the applications of tunnel repairing methods utilizing Silica Resin used in AGF drilling method. Silica resin with foaming agent can refill the void behind tunnel lining wall just by injecting without giving high pressure, and strength can be controlled widely and easily.

Proposed ODA Projects and Expected Impact

Proposed ODA Project

- Pilot project of drilling tunnel in tunnel construction by AGF drilling method
- Pilot project of repairing void for the existing tunnel
- Seminar to enhance the understanding of safety in tunnel construction
- Obtain certificate from official authority (MOST)
- Technical transfer of utilizing proposed products and technologies to Vietnamese engineers and officers.

Expected Impact

- Verification of easiness of construction and safety of AGF drilling method in spring and fracture zone.
- Verification of waterproof function and high quality of Urethane Injection at heavy water leakage.
- Improve acknowledgement of quality, easiness of construction and safety of AGF method and Urethane injection through the Seminars.
- Obtaining official certificate of AGF method and Urethane injection.
- Skill and knowledge of proposed products, technologies, and construction method will be transferred.