DPS FRAMEWORK SCHEDULE 4: LETTER OF APPOINTMENT AND CONTRACT TERMS

Part 1: Letter of Appointment

Dear ██████████,

Letter of Appointment

This letter of Appointment dated Friday, 7th January 2021, is issued in accordance with the provisions of the DPS Agreement (RM6018) between CCS and the Supplier.

Capitalised terms and expressions used in this letter have the same meanings as in the Contract Terms unless the context otherwise requires.

Order Number:	PS21194 - Job Transition Pathways and Future Skills Needs in Sectors Undergoing Structural Changes - RAF058/2122
From:	The Department for Business, Energy & Industrial Strategy (BEIS) 1 Victoria Street, London, SW1H 0ET **("Customer")**
To:	PricewaterhouseCoopers LLP, 1 Embankment Place, London, United Kingdom, WC2N 6RH **("Supplier")**

Project Start Date	Friday, 7th January 2022
Project Expiry Date	Friday, 6th May 2022

Services required:	Set out in Section 2, Part B (Specification) of the DPS Agreement and refined by: the Customer's Project Specification attached at Annex A and the Supplier's Proposal attached at Annex B.

Contract Charges (including any applicable discount(s), but excluding VAT):	£159,221.00 excluding VAT.
Insurance Requirements	Additional public liability insurance to cover all risks in the performance of the Contract, with a minimum limit of £5 million for each individual claim. Additional employers' liability insurance with a minimum limit of £5 million indemnity Additional professional indemnity insurance adequate to cover all risks in the performance of the Contract with a minimum limit of indemnity of £1 million for each individual claim.

Liability Requirements	**Suppliers' limitation of Liability** (Clause 18.2 of the Contract Terms);
Customer billing address for invoicing:	All invoices should be sent to should be sent to finance@services.uksbs.co.uk or Billingham (UKSBS, Queensway House, West Precinct, Billingham, TS23 2NF)

GDPR	Contract Terms Schedule 7 (Processing, Personal Data and Data Subjects) applies.

FORMATION OF CONTRACT

BY SIGNING AND RETURNING THIS LETTER OF APPOINTMENT (which may be done by electronic means) the Supplier agrees to enter a Contract with the Customer to provide the Services in accordance with the terms of this letter and the Contract Terms.

The Parties hereby acknowledge and agree that they have read this letter and the Contract Terms.

The Parties hereby acknowledge and agree that this Contract shall be formed when the Customer acknowledges (which may be done by electronic means) the receipt of the signed copy of this letter from the Supplier within two (2) Working Days from such receipt

For and on behalf of the Supplier:

For and on behalf of the Customer:

Name and Title:

Name and Title:

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Date:

Date:

11 January 2022

11 January 2022

Customer Project Specification

Introduction

The rapidly changing labour market and ageing workforce means that a growing proportion of the workforce will be required to transition between occupations and sectors over the coming decade. We are commissioning this research to provide evidence on the types of skills and qualifications which will be needed to allow workers to move into growing occupations from at-risk occupations. We acknowledge that there are other key barriers preventing movement between sectors and occupations (e.g., perception, time to train), but this research focusses primarily on skills as a barrier. There are also a wide variety of trends that will impact the labour market over the coming decade, we have picked two to focus on; Automation as it is so widespread and will have large impacts across the economy, and Net Zero as it is a key BEIS priority and will similarly have widespread impacts on the types of jobs that are required in the economy and the skills needs of the future. This research will provide useful evidence for adult skills policy.

Background

The changing labour market

The labour market is undergoing structural changes as a result of a series of trends which are impacting the demand for different occupations and skills, one of the largest and most pervasive of which is automation. Covid-19 and the "Net Zero" carbon emissions transition have accelerated these trends and, as a result, skills needs are changing rapidly.

Around one-tenth of the workforce are in occupations that are likely to grow as a percentage of the workforce and around one-fifth are in occupations that will likely shrink. – (NESTA)[1]. Modelling by the McKinsey Global Institute (MGI) on the effects of technology adoption on the UK workforce[2] shows that up to 10 million people, or around 30 percent of all UK workers, may need to transition between occupations or skill levels by 2030. And this trend has accelerated according to Mckinsey, who say that "as many as 25 percent more workers may need to switch occupations than before the pandemic".

This matter because it can lead to unemployment, skills mismatch, and reduced productivity. Issues of information asymmetry, financial barriers to entry and exit for workers, and geographic immobility can hamper labour market reallocation, so there is a role for government to promote occupational mobility.

These changes are particularly large in certain key sectors. The chosen sectors (see below) have high proportions of jobs which are at risk of automation or the transition to Net Zero and are all undergoing large structural changes.

Net Zero is predicted to cause large structural changes in a number of sectors. Modelling from Place-Based Climate Action Network[3] estimates that one in five jobs will be impacted

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[1] https://www.nesta.org.uk/report/the-future-of-skills-employment-in-2030/
[2] https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-women-at-work-in-the-united-kingdom
[3] https://pcancities.org.uk/tracking-local-employment-green-economy-pcan-just-transition-jobs-tracker

by the move to Net Zero either through increased demand or significant change through upskilling or reskilling.

Pre-existing skills mismatch

Skills mismatches (shortages and gaps) already exist in the labour market. According to the Open University's Business Barometer, more than two-thirds (68%) of employers have struggled to find the right skilled workers over the past 12 months and the skills gap costs organisations £4.4 billion, in recruitment fees, temporary staffing, increased salaries, and hiring at a lower level then bringing employees up to speed. This has a significant impact on productivity and reduces the earning potential of workers.

This is a larger issue in some sectors than others. CIPD (2018) found that retail and manufacturing were 2 out of the top 4 sectors with the highest self-reported skill mismatches.

With regards to net zero, analysis from Nesta (2020) suggests current participation in adult learning in the most emission-intensive industries can be lower than in greener sectors. Workers with the lowest qualifications are currently the least likely to get access to training, which is often more available to staff who are already highly skilled, and in mostly greener sectors (Nesta, 2020).

BEIS role in supporting workers and employers to transition

Government has a key role in shaping the short- and long-term skills and labour strategy, especially in the context of BEIS policy leads such as Net Zero, high-growth sectors, the Innovation Strategy, and the upcoming Sector Visions. Skills is one of the three pillars of the Plan for Growth. One of the priorities identified by the Green Jobs Task Force's report was "A just transition for workers in the high-carbon economy" and this project will provide key evidence to help facilitate this. Many workers will need to retrain and almost all will need to upskill to keep up with these trends.

Furthermore, government has a key role to provide support and guidance to employers to help them reskill and upskill their workforce for the needs of the future.

Aims & Objectives of the Project

What is the proposed work?

The proposed work builds on the current understanding of the likely impacts of key trends on demand for different occupations within a set of priority sectors to analyse how easily the current workforce (and particularly those in "at-risk" occupations) can move into safer and future growth occupations and identify the implications for the designing of skill policy to facilitate this. It will consider how employers and workers can be supported in this area.

Chosen trends:

- Automation
- Net Zero

Proposed sectors of interest:

- **Retail**
- **Manufacturing** – including automotive (including Infra for charging EVs, maintenance of EVs), aerospace and steel
- **Power** – including renewables (wind, solar, hydropower, tidal), nuclear, grid infrastructure, energy storage and smart systems technology, oil and gas, hydrogen and Carbon Capture Utilisation and Storage
- **Construction and buildings** – including retrofit, building fabric energy efficiency, modern methods of construction, heat pumps, smart devices and controls, heat networks and hydrogen boilers
- **Forestry and agriculture**– including nature restoration, tree planting, timber production, decarbonising agriculture, waste, and resource management/recycling

Optional Sectors if required

We would also like bidders to price for the possible addition of further sectors such that if they were needed we can call upon them at pre agreed rates. If including, we would like bidders to submit as a separate cost. Optional extra sector costs will not be evaluated.

Aims and Objectives

This project aims to contribute to the evidence base on the following question:

What are the transition pathways and skills gaps between the jobs which are at risk of future trends and jobs which are more resilient to future trends?

"Transition pathways" – the alternative occupations available for a worker to move into from a specific "at-risk" occupation, based on similar skill, work activities, knowledge, and qualification level requirements.

The four main research questions this project seeks to answer are:

- How will the trends of automation and Net Zero impact the chosen sectors? *(~10% of time)*
- Which occupations are predicted to grow and fall in demand over the coming decade in these sectors, based on quantitative analysis of previous trends and due to the two chosen trends? *(30%)*
- How will this affect skills needs in each sector? *(30%)*
- How can we use skill policy to maximise transitions out of at-risk occupations into 1) all other occupations and 2) growth occupations? Which skills/qualifications are most needed? What are the implications from this work for policy? *(30%)*

More detailed research questions:

- How will automation and Net Zero affect our sectors over the coming decade?
- What do these trends mean for occupational demand within these sectors? Which occupations are predicted to grow and fall in demand over the coming decade?

- Are there clear transition pathways out of at-risk occupations in transitioning sectors or are there limited opportunities? Are there particularly limited opportunities for workers in certain sectors/ occupations?
- Which specific skills would increase viable (and desirable (defined below)) transitions out of at-risk occupations to all other safer occupations? Which skills would increase viable (and desirable) transitions from at-risk occupations into growth occupations? Can we consider which qualifications would increase transitions the most too?
- What are the key skills needs in "growth" occupations of the future? How much do they differ from the skills needs of at-risk occupations?
- What are the types of skills which will be needed to transition the workforce? Are they predominantly soft skills? Technical skills? Sector-specific technical skills?
- What are the levels of skills that will be required? What are the levels of qualifications that will be required?
- What are the key barriers to movement between these occupations? Are they related to skills, qualifications, knowledge levels etc? We acknowledge that skills will only be one barrier preventing movement between occupations and sectors, what are the others?
- What are the sector and occupation specific skill interventions that would maximise the number of viable and desirable transitions out of at-risk jobs?
- How do these skills map onto relevant/courses qualifications?

Regional analysis:

- Which regions are "growth" and "at-risk" occupations predominantly located in?
- Applying a regional filter, how many of the transitions between at-risk and growth occupations are still viable? Or will they require relocation? (If not possible quantitatively this may need to be done qualitatively).
- Which are the regions which are particularly at risk? (Because they have high numbers of people in the at-risk occupations which have few viable transitions out of them?)
- How do barriers to transitions differ by region? Deep dive into a specific region?

Why is it required?

It is required for two main reasons:

1) **To facilitate productivity growth, we need to ensure that businesses can access the skills they need.** In order to do this, we need to understand what the skills needs of the future are and how they differ from skills needs now in order to ensure that there is the correct skills provision available. This is relevant to reduce:
   a. Skills gaps – There is already evidence of existing workers being under-skilled for the jobs they are in. As the skills required by employers continues to change rapidly the need to provide targeted upskilling opportunities to workers is becoming increasingly vital.
   b. Skills shortages – Without forecasting future trends, we will not be able to prepare for them. This risks business not being able to recruit workers with the skills they need and limits innovation and productivity growth. As some

occupations become obsolete and others grow in importance, targeted reskilling opportunities will be required to transition these workers.

2) **To minimise structural unemployment, and help displaced workers in transitioning sectors, we need to help people move out of declining occupations and into growing occupations.** In order to do this, we need to understand what these are and what barriers might exist between them.

Suggested Methodology

Total number of Focus Groups/academic roundtables	One per sector (preferred)
Total number of Case Studies	One per sector (preferred)

The focus groups/roundtables are a proposed method for providing a deep dive into each sector to build on quantitative analysis by adding expert opinions and qualitative analysis.

As well as engagement with BEIS teams (which is a key requirement), additional focus groups/academic roundtables would be welcomed with sector-experts to get their views on the trends and their impact on occupational demand in each of the key sectors.

The focus groups/academic roundtables should occur early on to 1) agree an approach to the work and 2) test the findings of part 1.

One case study per sector would also be welcomed, giving a deep dive into a specific occupation, or set of occupations to discuss how the trends may affect their demand. The regional angle would be particularly interesting here e.g., a certain high-risk occupation which is highly concentrated in a certain region.

Summary of proposed research methodology:

The idea behind this research project came from reports such as the NESTA report: Mapping Career Causeways[4]. and the WEF report: Towards a reskilling revolution[5]. The research is a more targeted application of the work in these reports, with the goal of driving policy recommendations for BEIS and wider HMG. It is important to undertake part 1 of the project in a way that allows an application of the skill similarity algorithms used in part 2, therefore consideration of the occupational taxonomy that will be used in part 2 is crucial before starting part 1.

1) **Develop a list of "at-risk" and "growth" occupations for each sector** which can be confidently predicted to fall/grow in demand within their sectors over the coming 10 years.

High employment occupations should be prioritised over those with limited employment, unless trends suggest they will grow rapidly in number of people employed in them.

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[4] https://www.nesta.org.uk/report/mapping-career-causeways-supporting-workers-risk/
[5] http://www3.weforum.org/docs/WEF_FOW_Reskilling_Revolution.pdf

For this part of the project, we would like two key labour market trends to be analysed in detail, in order to consider their impact on occupational demand in each sector. This should then be complemented with quantitative and qualitative research on overall trends in occupational demand in each sector.

Key trends to consider:
- Automation
- Net Zero

The focus of this analysis should be up until 2030 to match another research, but the most appropriate timescale is up to the contractor's discretion. We are also interested in how these trends will interact with each other.

Other evidence to bring in:
- Trends in employment or vacancy data suggesting growth/decline
- Employment projections (e.g., Working Futures)
- Evidence on sector-specific trends
- Engagement with sector experts (within BEIS/DfE and externally such as industry), drawing in relevant internal research (e.g., recent horizon scanning research).

The regional distribution of these occupations should also be analysed at this stage, at as granular level as possible, ideally at NUTS 2 level.

2) **Analyse the skill requirements and establish skills mismatches** which limit the number of viable and desirable transitions out of these "at-risk" occupations to 1) all other jobs and 2) "growth" occupations.

("Skills mismatches" here refers to differences in skill requirements between occupations, NOT between supply and demand as in the normal use of the term).

First, an analysis of what these occupational trends mean for skills needs in the sectors using a skills taxonomy which estimates the skills required by different occupations. This should include an understanding of the types of skills required by an occupation (e.g., management, digital, communication, compliance etc) and, where possible, the qualifications required.

Second, understanding possible transitions between occupations and skills mismatches. For this part the project could utilise a skill similarity algorithm (recently developed by a number of different organisations e.g., NESTA, Mckinsey) which maps the skills required by different occupations and generates "skill similarity matrices" between them e.g., here[6]. This considers skills, work activities, knowledge, and qualification levels to understand how similar two occupations are.

The focus of this part will be on identifying viable (roughly similar skill requirement) and desirable (i.e., Lower risk of automation, better pay) transitions out of at-risk jobs and into safer/growth jobs and **identifying the sector and occupation specific skill interventions that would increase the number of viable transitions.**

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[6] https://data-viz.nesta.org.uk/career-causeways/index.html

Where possible an understanding of where the at-risk occupations identified are located regionally should be included here to direct these skill policies to the right places. Ideally at NUTS 2 level.

To note: With regards the impact of net zero, through the work of the Green Jobs Taskforce[7] we have some evidence on those at risk and growth sectors and likely trajectory of jobs. Our focus would be getting the most from the transitions and advanced mapping between roles as part of the outputs from part 2 of the methodology.

Summary of how this work will inform policy:

The project's outputs will be used to inform a number of key policy areas to BEIS and wider government.

- BEIS has a role in supporting DfE in skills policy e.g., understanding skills needs across sectors, regions, and wider policy (e.g., Net Zero), the role of employers, supporting workers

BEIS works closely with DfE to build the evidence base and support the development of skills policy. This evidence will improve the evidence base and allow us to advise DfE more accurately. DfE have also shown an interest in understanding future skills needs in more detail. This work will add to their evidence base on this area.

- Work following recommendations from the Green Jobs Taskforce[8]:

Understanding the changing demand in occupations and skills needs in the transition to Net Zero was a key priority of the Green Jobs Taskforce which reported in July 2021. The evidence review and work of the Taskforce finds that the transition will not impact sectors equally. It is expected that:

- well established sectors such as offshore wind, buildings and construction, smart systems and electricity networks will experience significant growth
- nascent technologies such as hydrogen and CCUS are predicted to grow ahead of the transition; and
- sectors such as automotive, heating and cooling and those high carbon industrial sectors such as oil & gas, coal power and heavy industry will undergo extensive transformation.

Understanding of the skills base, the 'at-risk' and 'growth' occupations, and the similarity between them is vital. It means that the optimum transition pathways can be created out of at-risk occupations and into "green" jobs. These are key themes in the Taskforce recommendations; supporting those in the high carbon transition sectors and enabling clear career pathways for those who want to move into the green workforce.

- Plan for Growth[9] Sector Visions:

The Plan for Growth sets out the government's plans to support economic growth through significant investment in infrastructure, skills, and innovation. Any forward-looking sector

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[7] https://www.gov.uk/government/groups/green-jobs-taskforce
[8] https://www.gov.uk/government/groups/green-jobs-taskforce
[9] https://www.gov.uk/government/publications/build-back-better-our-plan-for-growth

strategy needs to consider key skills needs and the ability of the sector's workforce to transition to the jobs of the future. This project will provide sector-specific evidence on both helping sector teams to devise evidence-based policy proposals. One of the commitments for further action was for some "sector visions" which can draw from this evidence.

- Levelling Up

We want to identify regions with high numbers of at-risk and growth jobs, and through this identify regions which may benefit from targeted skill interventions or which may be at particularly high risk of future trends.

The project will also help HMG design a high-quality, responsive skills system by articulating skills needs and viable transitions.

BEIS has a key interest in this area.

The evidence will inform DWP (and National Careers Service) work on helping displaced workers back into work and enable more effective signposting of opportunities for "at-risk" workers.

This work will identify sectors and regions which are at particular risk of spikes in unemployment as a result of being highly reliant on "at-risk" occupations without many viable transitions out of them. This will provide recommendations for targeted policy to deal with these risk areas.

Finally, this work will support DWP's evidence base on in-work progression, following their recently commissioned report, providing evidence on transition pathways for workers in jobs at risk of automation and net zero into safer, better paid work.

Bids

We request that bids outline a method for answering the above research questions, roughly in line with our proposed methodology. We are happy to contractors to propose variations on the proposed detailed methodology below and offer it as a possible guideline for how this work would be done.

If the contractor is aware of other approaches, data sources, methodologies that would be better, we are very happy for them to be proposed.

In the bids we require a clear explanation of the methods that the contractor plans to undertake. In particular when doing any complex data science analysis of vacancy data, for example, how one might use vacancy data analysis to identify brown/green jobs, e.g., through a key word/ machine learning process.

We also request that bidders outline the key datasets that they will use in their work.

We will also expect to have discussions around compatibilities with the BEIS IT environment, for example coding languages. We will also want to ensure BEIS keep IP rights over the outputs and code specific to this project.

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Detailed proposed research methodology

Overview

The project will build on existing research into the risk of automation to bring new evidence to the question of which occupations are likely to grow and fall in demand over the next decade in key transitioning sectors.

In addition to this, this research will contribute to filling a key evidence gap in the move to the "Green Economy", identifying jobs which are at-risk, and likely to grow, because of the transition to net zero.

We are particularly keen to look at "at-risk" and "growth" occupations in key BEIS sectors undergoing significant structural change and for whom the skill mix of the workforce will need to change considerably. We propose a deep dive into occupations in these sectors:

Proposed sectors of interest:

- **Retail**
- **Manufacturing** – including automotive (including Infra for charging EVs, maintenance of EVs), aerospace and steel
- **Power** – including renewables (wind, solar, hydropower, tidal), nuclear, grid infrastructure, energy storage and smart systems technology, oil and gas, hydrogen and Carbon Capture Utilisation and Storage
- **Construction and buildings** – including retrofit, building fabric energy efficiency, modern methods of construction, heat pumps, smart devices and controls, heat networks and hydrogen boilers
- **Forestry and agriculture**– including nature restoration, tree planting, timber production, decarbonising agriculture, waste, and resource management/recycling

Optional Sectors if required

We would also like bidders to price for the possible addition of further sectors such that if they were needed we can call upon them at pre agreed rates. If including, we would like bidders to submit as a separate cost. Optional extra sector costs will not be evaluated.

There will be a need for the following detailed <u>steps</u>:

Part 1:

Identify a list of "at-risk" and "growth" occupations for each sector (focussed on the key trends identified but with consideration of other relevant evidence)

Analysis

The taxonomy used to define occupations within each sector will need to be carefully chosen prior to starting this analysis to ensure that it allows for merging of each of the lists below and also provides the right framework to complete the transitions work in part 2.

We propose developing 2/3 lists for each sector.

<u>Data driven list</u>
- A data driven list using a number of quantitative evidence sources e.g., Historical Employment growth and vacancy data and employment projections (e.g., Working Futures) to develop a composite measure for the **occupations which are most likely to grow and decline over the coming decade.**

<u>Risk of automation</u>
- An application of a method to estimate the "**risk of automation"** by occupation.
- This is to be used to identify "resilient" and "at-risk" occupations.
- It will also be used in part 2 when identifying desirable transitions (which are at lower risk of automation) out of at-risk occupations.

<u>The transition to net zero</u>
- An application of an approach to identify occupations which are likely to grow and decline due to the transition to **net zero** to identify a list of "growth" and "at-risk" occupations. This will require more in-depth analysis of the extent to which occupations are predicted to grow or decline due to the transition to net zero and the impact on labour markets and skills demands.

- Research from the recently published Green Jobs Taskforce report[10] presents the skills demand created by the transition as varying in three different ways as follows;
    - **Well-established green sectors which will experience significant growth** – for example offshore wind, electricity networks, smart system tech, buildings/construction (retrofit, building fabric energy efficiency, modern methods of construction)
    - **Green sectors that are predicted to grow ahead of the transition** – for example nascent technologies such as low-carbon hydrogen and CCUS; rapid development of proposed industrial clusters will create demand on jobs/skills in these growth sectors
    - **Sectors experiencing significant transformation –** for example with the move to Electric Vehicles the change in the automotive sector will create fast paced changing skills demands and in the heating and cooling sectors will see increased rapid demand for heat pump/heat network installation skills

- An approach to consider would be analysing online vacancy data to help identify relevant occupations, through techniques such as keywords and/or machine learning. For example, one approach could be to select a set of key words for an occupation and examine vacancy data to see how the vacancies were coded in SIC/SOC. If these aligned around modal codes then these could be used as a proxy for SIC and SOC codes for those sectors and occupations. For those which didn't align, another approach could be investigated.

- BEIS officials have developed a keyword/ML approach using web scraped data from Burning Glass to help identify trends in sectors that form part of the PM's Ten Point Plan for a Green Industrial Revolution, and these techniques may be of relevance to this skills project. BEIS will look to share details of this work as appropriate with the successful contractor.

- **The use of vacancy data could give indications of what the at risk and growth occupations and sectors are, but it could be helpful to augment this understanding further. Given the complexity and economy wide nature of the transition to net zero, it is likely that existing occupational classifications (e.g., SOC codes) may not map in a straightforward way to growing, transitioning, and declining areas of activity due to net zero. Work will be required to define an appropriate classification and system for**

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[10] https://www.gov.uk/government/publications/green-jobs-taskforce-report

quantifying these effects, and we welcome suggestions from bidding suppliers on the best way to approach this within the specified budget level, technical ability, and resource requirements. Potential methods to assess occupations at risk from net zero could include analysing existing greenhouse gas intensity of different types of economic activity (e.g., at SIC level there is relevant ONS data on emissions intensity[11]), and the potential ways in which such activity can/will be decarbonised (based on e.g., policy documents and technical/academic literature), and the key occupations related to that economic activity. Methods to identify occupations with potential to grow under net zero could likewise involve considering relevant sectoral pathways to net zero (pulling from e.g., public CCC and BEIS sources), and occupations in the UK's emerging low carbon and renewable energy economy. See here[12] for an example of existing work on this topic. The Green Jobs Taskforce report and annex to the report are also key sources of evidence in this space[13].

- Depending on the methodology used this may involve developing data driven list for sectors but then complementing that quantitative analysis with qualitative research and engagement with sector experts both internal and industry based.

These lists could then be merged to create the occupations used in part 2.

<u>Key elements</u>

A qualitative assessment should be taken of the findings based on an understanding of the existing literature and sector-specific reports, to ensure that the findings are in line with other evidence.

Projections such as DfE's "Working Futures" may provide useful evidence (especially since they provide sectoral breakdowns) and **historical vacancy data** may also provide an insight into trends in occupational demand. (<u>Data requirement:</u> BEIS has a licence for Burning Glass which can be used by the contractor for the purposes for this project subject to BEIS IT access conditions and procedures)

We propose that a list of criteria be developed to build a composite measure of each occupation's resilience to future trends. A "resilience/risk" scoring could then be given to occupations over a certain level of employment.

Mapping occupations to sectors

Mapping occupations onto sectors may present a challenge. A possible approach would be to map the occupational framework used onto SOC and then use publicly available census data[14] to map occupations onto sectors. Although for some occupations that are spread across sectors, a more detailed approach may need to be developed. Vacancy data may also provide a method for identifying occupations by sector.

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[11] https://www.ons.gov.uk/economy/environmentalaccounts/datasets/ukenvironmentalaccountsatmosphericemissionsgreenhousegasemissionsintensitybyeconomicsectorunitedkingdom/current

[12] https://pcancities.org.uk/tracking-local-employment-green-economy-pcan-just-transition-jobs-tracker

[13] https://www.gov.uk/government/publications/green-jobs-taskforce-report

[14] https://www.nomisweb.co.uk/census/2011/ct0144

The occupational taxonomy will need to be chosen such that it allows for the transitions work in part 2. Therefore, the occupational taxonomy should be the starting point, and then the "growth" and "at-risk" occupations within that should then be considered. This will allow the findings to be applied to the skill-similarity algorithms and transitions to be identified.

Data requirement: Access to a pre-existing skill taxonomy and employment data by occupation and sector or a method for mapping occupations to sectors. (e.g., Census data)

Engagement with BEIS teams

BEIS sector teams possess evidence and expertise on their sectors' labour markets which can be used alongside internal analysis to come to an agreement of the extent to which different occupations are at-risk of future trends and which we can confidently predict will grow in importance.

To complement the quantitative and qualitative analysis done by the contractor, **engagement with BEIS teams is very important.** This should be used to test findings and ensure they are in line with sector expert's views.

These occupations should therefore be **tested with the steering group** and we also propose engagement in the form of **workshops with sector teams, industry, and external academia** before being analysed for their skills needs and transition pathways.

Adjustments
It may be necessary to limit the number of occupations considered in order to meet project deadlines. In this case high-employment occupations should be prioritised over low employment occupations. The fast-growing occupations with lower current employment should also be considered.

A more detailed and comprehensive option would be to use expert roundtables and foresight workshops (as well as engagement with BEIS sector teams) to debate the future prospects (relating to each key trend) of a training set of X occupations and then apply machine learning to make predictions for all occupations. This method was used by Pearson & NESTA (2017) in their report Future of skills: employment in 2030.

Analyse these occupations by region.

"At-risk" and "growth" occupations should be analysed using existing employment data to locate them regionally at as granular level as is feasible, ideally at NUTS2.

An obvious challenge involved with this will be that it is impossible to know with certainty where *new* jobs will be located. Using trends in vacancy data may be a route to estimating this.

We also want to understand regions which contain a high number of these at-risk jobs and if these regions are different from those which contain many "growth" jobs.

It is expected that the impact of the transition will be felt differently spatially due to the locations of different sectors across the UK and the composition of the local labour markets that support them. This is discussed in Section 3 of the Green Jobs Taskforce report[15].

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[15] https://www.gov.uk/government/publications/green-jobs-taskforce-report

A targeted analysis of where the jobs identified as likely to grow due to the transition to net zero are located is also key due the importance of place and its part in the Government's levelling up agenda.

Possible extension (if feasible within budget and timelines): Analyse these occupations in relation to diversity and *protected characteristics*

The Public Sector Equality Duty requires public authorities to have due regard to the need to advance equality of opportunity and foster good relations between persons who share a "relevant protected characteristic" and persons who do not. The list of relevant protected characteristics is as follows: age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, sex, and sexual orientation. See here for details[16].

The Green Jobs Taskforce has also highlighted key considerations around diversity (or lack thereof) in growing green/ net zero aligned sectors, particularly in relation to sex/gender and race/ethnicity.

In this context, analysis of occupations in relation to diversity (through statistical and/or qualitative evidence sources) by some or all of these characteristics (especially sex/gender and race/ethnicity) could potentially be valuable for this research, although this is considered a potential extension rather than a core requirement.

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Part 2: Establishing skills mismatches

Analyse skills needs and apply skill similarity algorithms to establish transition pathways out of at-risk occupations and skill mismatches which limit these. Provide detailed sector- and occupation–specific skill policy recommendations.

This is the most important part of the project, and the eventual findings should provide **detailed, actionable sector and occupation specific skill policy recommendations** to maximise transitions out of "at-risk" occupations, including where possible, a mapping of skill needs to existing courses/qualifications or proposals for new courses/qualifications. Where possible regional specific skill policy recommendations should be included.

NESTA's Mapping Career Causeways report found that, on aggregate, a group of core skills would increase transitions across all at-risk workers e.g., management skills. We want a targeted version of this recommendation, to occupations, sectors and (where possible) regions.

Analyse skills needs of "at-risk" and "growth" occupations and compare

An analysis and description of the types of skills needed in "at-risk" and "growth" occupations. We are interested in trends that can be drawn out from this work and also in where these skills needs are located/likely to be located regionally. This will be drawn from the chosen skills taxonomy and we require some aggregate skills trends to be drawn out on groups of skills that are growing and declining in demand, including the levels and types of these skills.

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[16] https://commonslibrary.parliament.uk/research-briefings/sn06591/

We are interested not only in the type of skills but also the qualifications needed in the different occupations. ESCO and ONET provide detailed taxonomies of the skills, knowledge, work activities and qualifications that are required by different occupations. These could be used to analyse the differences between the growth and at-risk occupations.

*O*NET is a digital database that was developed with support from the US Department of Labor's Employment and Training Administration. The database provides detailed information for over 900 US occupations. It consists of standardised descriptors of occupational requirements and worker attributes, including skills and knowledge required, how the work is performed and typical work settings. Information in the database is publicly accessible and is continually updated using input from occupational experts, job holders and job postings. O*NET is widely used by researchers to address labour market issues, such as the effects of automation on employment and the changing nature of task requirements.*

*The European Commission's ESCO represents a major public effort to systematise occupational information across Europe.20 ESCO is an ontology that maps relationships between skills, qualifications, and occupations. Following several years of expert collaboration and public consultations, the first full version of ESCO was released in October 2017. Similar to O*NET, ESCO is open to the public.*

*In order to use these together a cross-walk would need to be developed to map between O*NET occupational codes and those in ESCO.*

Other frameworks may be used, but these are provided as a possible approach to take.

Identify viable and desirable transition pathways out of at-risk occupations and evaluate these

Look at transition pathways from at-risk occupations to 1) All other, safer (lower risk of automation) occupations 2) Growth occupations and evaluate these.

This should include a breakdown of viable (similar skill requirements) and desirable transitions (lower risk of automation and better pay).

Definitions:
Viable transition – with the current skills required of the previous occupation, the worker could move into the new occupation.
Desirable transition – The new occupation has a lower risk of automation and better pay.

Provide a sense check of the findings (see below).

We are requesting a visual representation of possible pathways from jobs identified as at risk of automation or net zero to potential viable future options, for example produced by NESTA here[17].

Establish skills mismatches

A) Establish skills mismatches for transitions out of at-risk occupations to all other jobs.

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[17] https://data-viz.nesta.org.uk/career-causeways/index.html

B) Establish skill mismatches for transitions out of "at-risk" occupations and into "growth" occupations.

This will only be a proxy as the skills required by an occupation vary and are not always matched to the holder of that occupation. But for the purposes of this research, we want to use a taxonomy that defines occupations by skills needs as a proxy for the skills that the holders of those occupations possess.

An application of a skill similarity algorithm to these at-risk occupations to **identify viable and desirable transitions**. *Viable – Similar skill requirement. Desirable – Lower risk of automation, better pay.*

Data requirement: To understand the average pay for different occupations, access to a source of earnings by occupation data may be necessary. The Annual Survey of Hours and Earnings (ASHE) is the most comprehensive source of information on the structure and distribution of earnings in the UK. ASHE provides information about the levels, distribution and make-up of earnings and paid hours worked for employees in all UK industries and occupations. This data is publicly available via the ONS.

<p align="center">***</p>

SENSE CHECK
We propose a qualitative assessment of the viable and desirable transitions identified to check the extent to which these theoretical transitions are possible in practice. This should include consideration of:

- *Regional distribution of occupations. Are the proposed transition occupations prevalent in the same regions? (employment and vacancy data may inform this).*
- *Working patterns – are these transitions into occupations with similar working patterns? E.g., full-time, part-time etc*
  - *Role type – are the proposed transitions into roles which are likely to be permanent or transitory? E.g., building flood defences is temporary.*
- *Possible extension: are there potential barriers to these transitions due to factors related to protected characteristics under the Equality Act and PSED? (e.g., due to structural social factors, unequal access to training, and/or discrimination)? (see https://commonslibrary.parliament.uk/research-briefings/sn06591/ for a full list of such characteristics)*

<p align="center">***</p>

An analysis of the occupations which are both "at-risk" and have few viable transitions out of them by region. This will identify where the occupations which are most in need of targeted support are.

An analysis of the sector and occupation-specific skills gaps which limit the number of viable and desirable transitions out of these occupations. Clear sector and occupation specific policy recommendations based on these.

E.g., the Mapping Career Causeways report found that on aggregate a group of core skills would increase transitions across all at-risk workers e.g., management skills.

Here we require an analysis of the key skills which would increase viable/ desirable transitions out of these jobs. From this analysis, a set of targeted skill policy recommendations should be developed that will help workers in transitioning sectors to gain

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the skills they need for the future. This should include a consideration of the types of training/ qualifications/ courses that could provide these skills and potential barriers to people developing these skills.

Mapping of skills to relevant courses/qualifications.
If possible, a mapping of the learning outcomes from relevant courses or qualifications onto the skills gaps would enable the identification of existing qualifications and courses that could be used to fill skills gaps. OFQUAL may be a useful source of these.

To note: With regards the impact of net zero, through the work of the **Green Jobs Taskforce**[18] we have some evidence on those at risk and growth sectors and likely trajectory of jobs. Our focus would be getting the most from the transitions and advanced mapping between roles as part of the outputs from part 2 of the methodology.

Possible extension (if feasible within budget and timelines) – What are the other key barriers to movement between occupations?

- Barriers caused by differing employment certification standards

We are interested in understanding the possible barriers to transitioning to new occupations caused by the presence of differing standards across sectors and qualifications. In the absence of a common certification framework across sectors there could be issues when moving between some occupations in key sectors identified by BEIS. This is an important issue to explore, and we welcome ideas from bidders on ways to approach this.

- Time/cost to acquire new skills

- Other key barriers such perception of occupations/sectors, ability to work flexibly, commute times etc.

We are interested in the extent to which skills are the key barriers to occupational switching, or whether there are other important barriers that limit people from changing occupations. These may be best drawn out in the case studies.

Deliverables

Interim outputs/ deliverables: (by January 2022)

Three essential meetings with the steering group:

1) Preliminary meeting(s) to discuss scope, objectives, timelines, approach, and priorities. Sector teams/ others to share relevant analysis/ evidence as background material. (November 2021)

2) To test the findings of Part 1 of the research on "growth" and "at-risk" occupations (December 2021)

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[18] https://www.gov.uk/government/groups/green-jobs-taskforce

3) To test findings of Part 2 of the research and receive comments. (January 2022)

There may be a need for more meetings depending on the progress made.

If **focus groups/ academic roundtables** are conducted then this should happen before the interim report. The contractor can decide whether these would be best placed before the analysis to test the approach to identifying growth/at-risk occupations, or after to test the findings, or both.

An **interim report** of findings and analysis, for comment and discussion, is expected <u>before the end of January.</u>

<u>Key final outputs/deliverables: (by March 2022)</u>

A targeted application of skill-similarity algorithms to understand viable and desirable transition pathways between "at-risk" and "growth" occupations in key sectors demonstrated through a **visual representation** of possible pathways from jobs identified as at risk of automation or the transition to net zero to potential viable future options. This will include occupations where the inclusion of cross-cutting or core skills will enable more options.

A **quality assured written report** providing insights into skills gaps in these key sectors that may present barriers to the transitions of at-risk workers into 1) all occupations at lower risk of automation and 2) "growth" occupations.

This **report** should include a discussion of the type and levels of skills/qualifications/training predicted to be required which will be used to develop **a set of policy recommendations**, at the occupational, sectoral (and where possible - regional) level, on how best to prepare the workforce for future changes and maximise viable transitions by linking key skills gaps with relevant available qualifications, training, and retraining opportunities. This should include ideas for who to target and how to improve take up/investment in training.

A **quality assured set of the data** that has been pulled together to undertake the quantitative side of the analysis.

A **workshop** held by the contractor to disseminate the research findings internally, which includes all key stakeholders.

A **power point presentation** summarising the research and the key findings, which BEIS officials can use to disseminate the findings across the department and to OGDs.

A **copy of any source code developed for this project plus documentation**, where possible code should be developed in Python or R using versions and packages compatible with the BEIS IT environment.
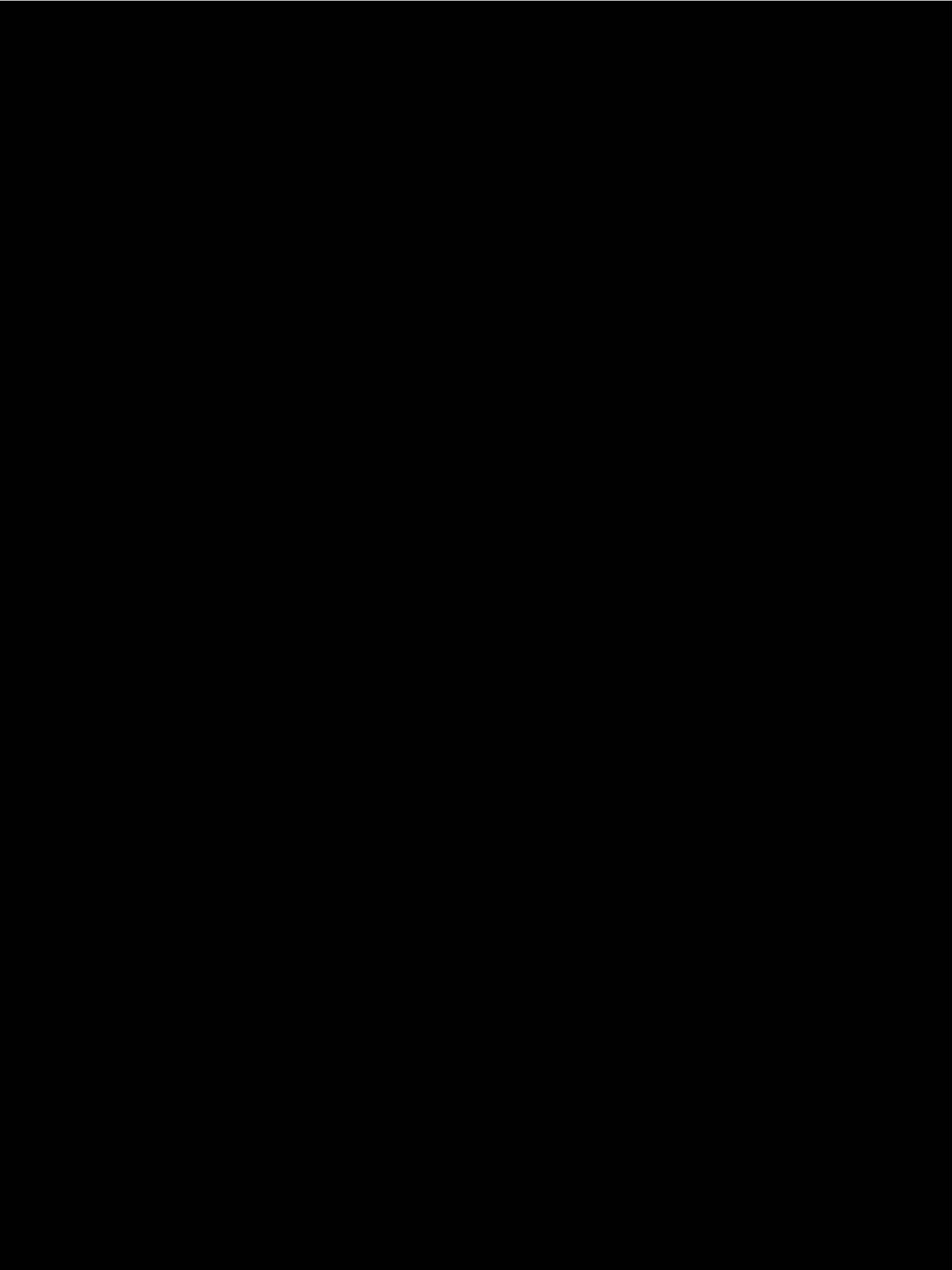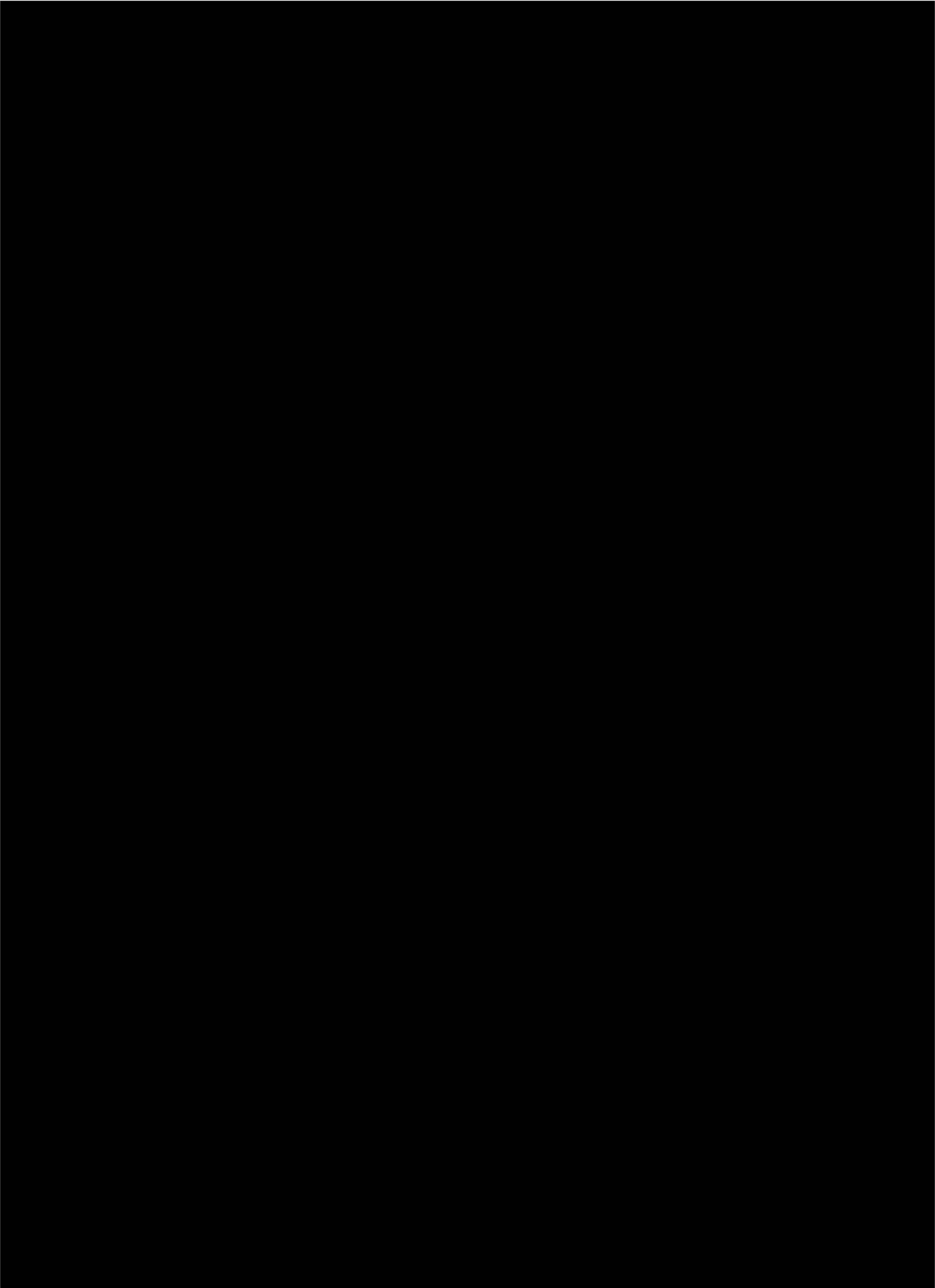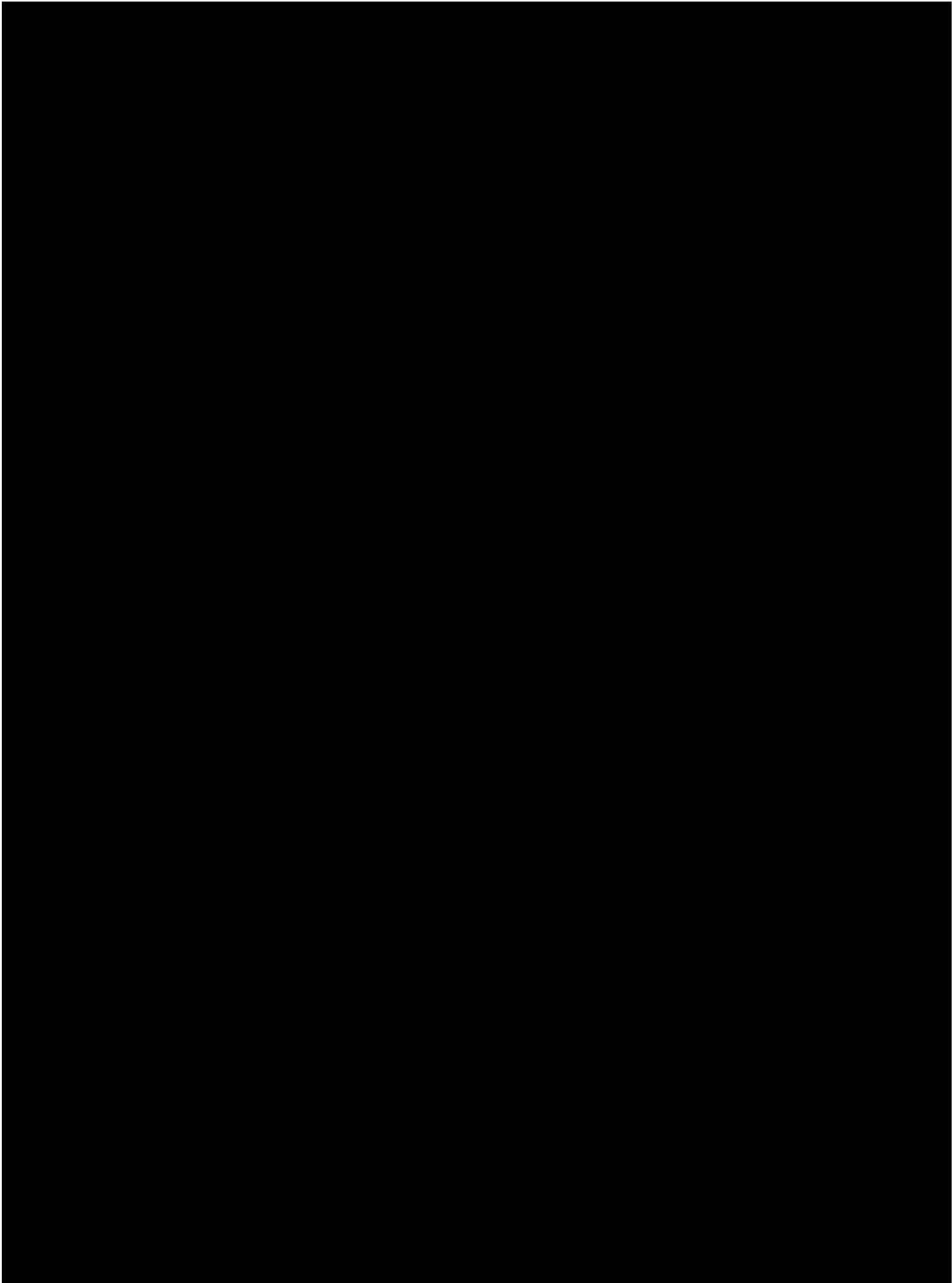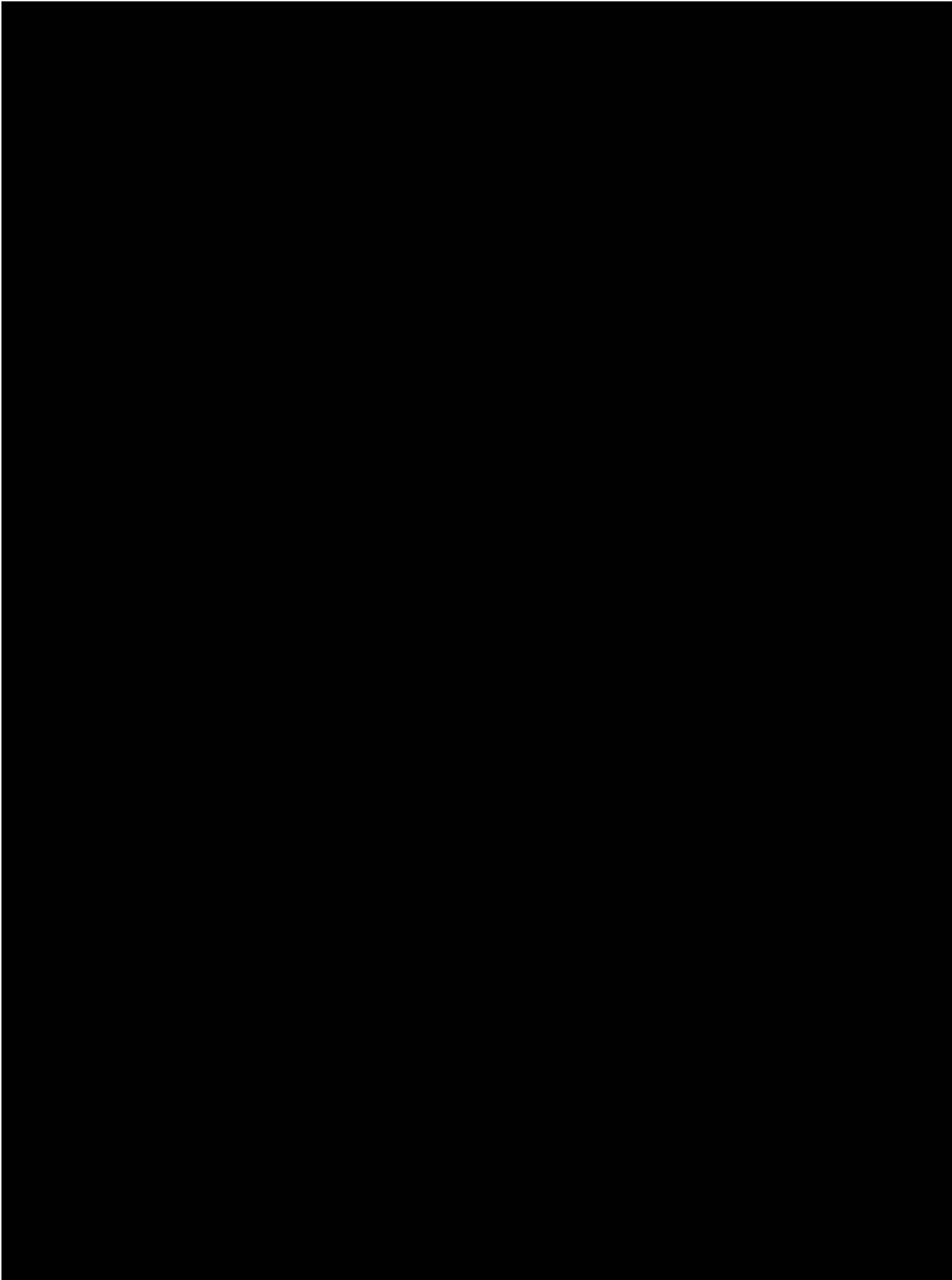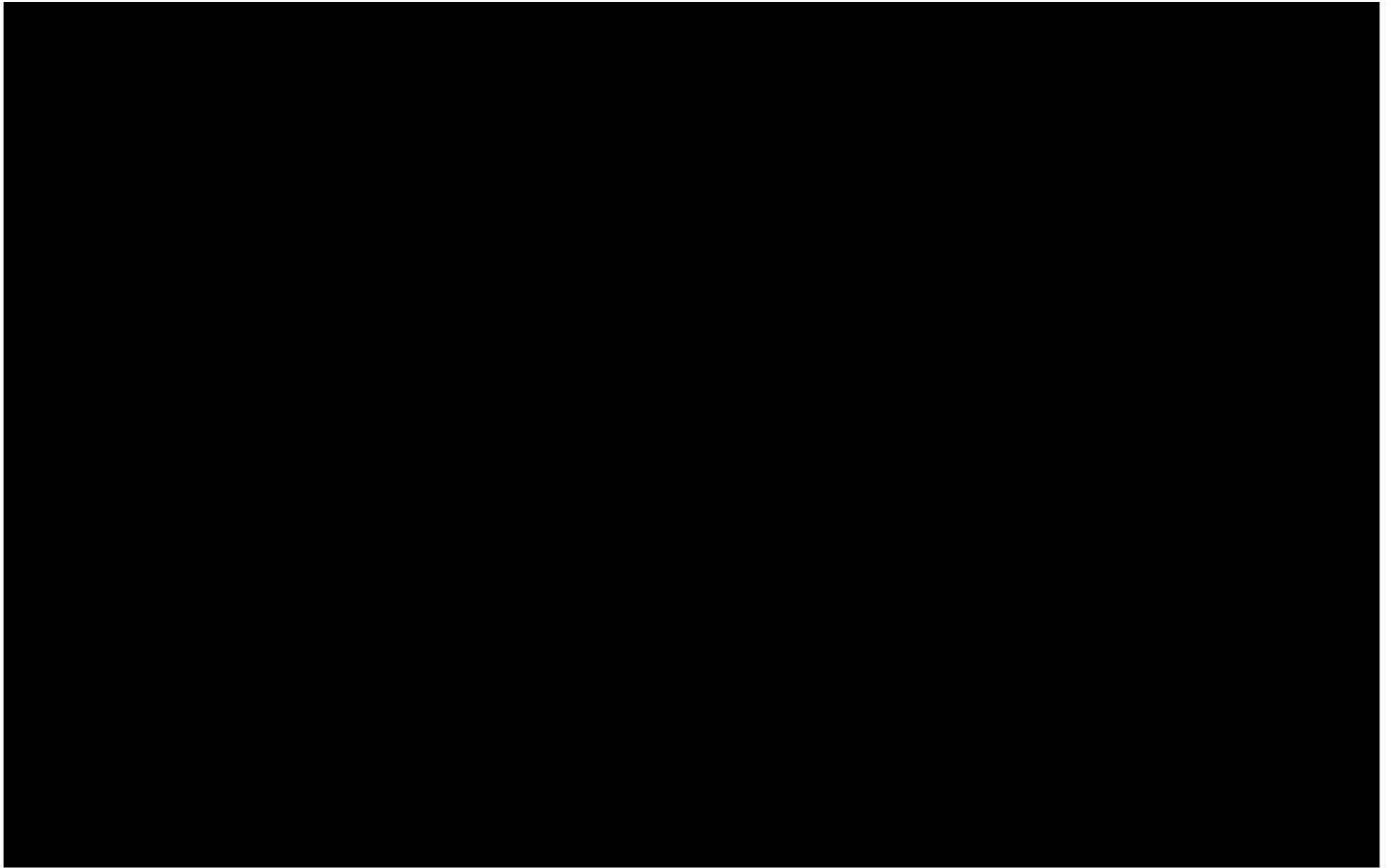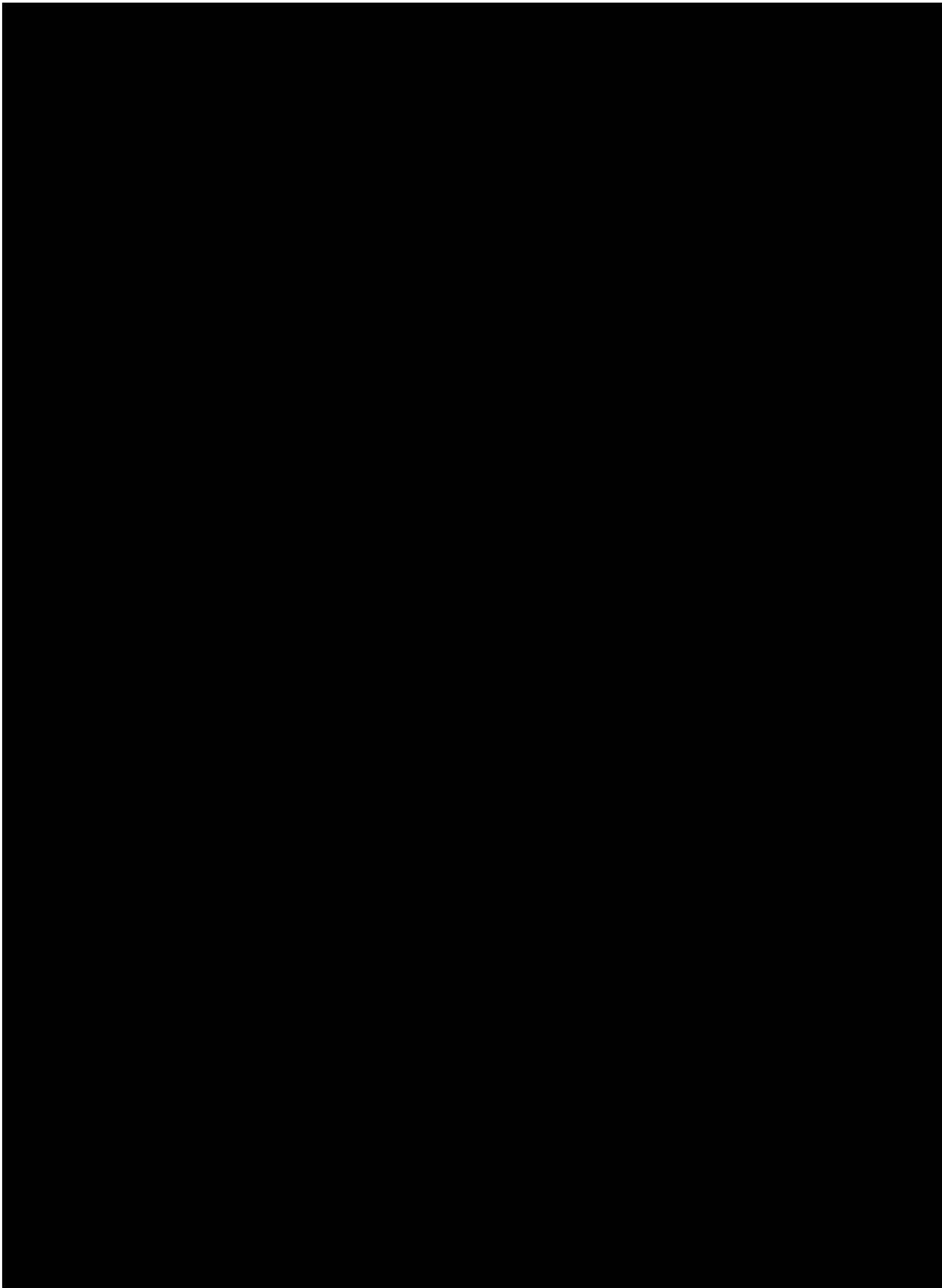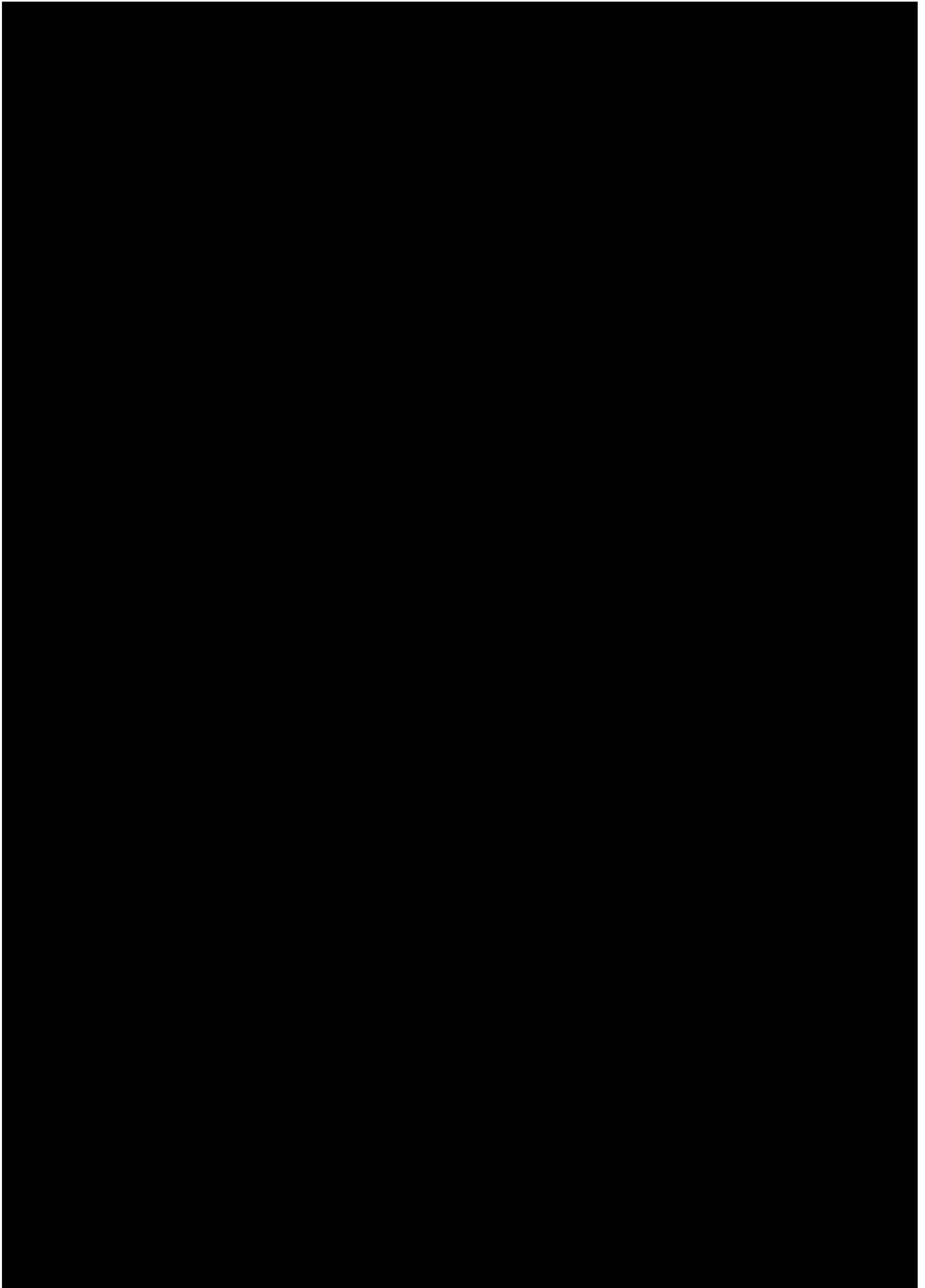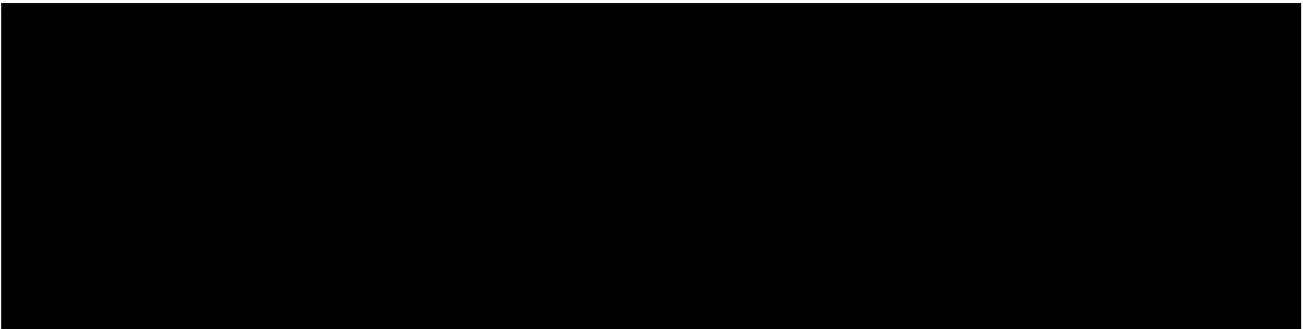
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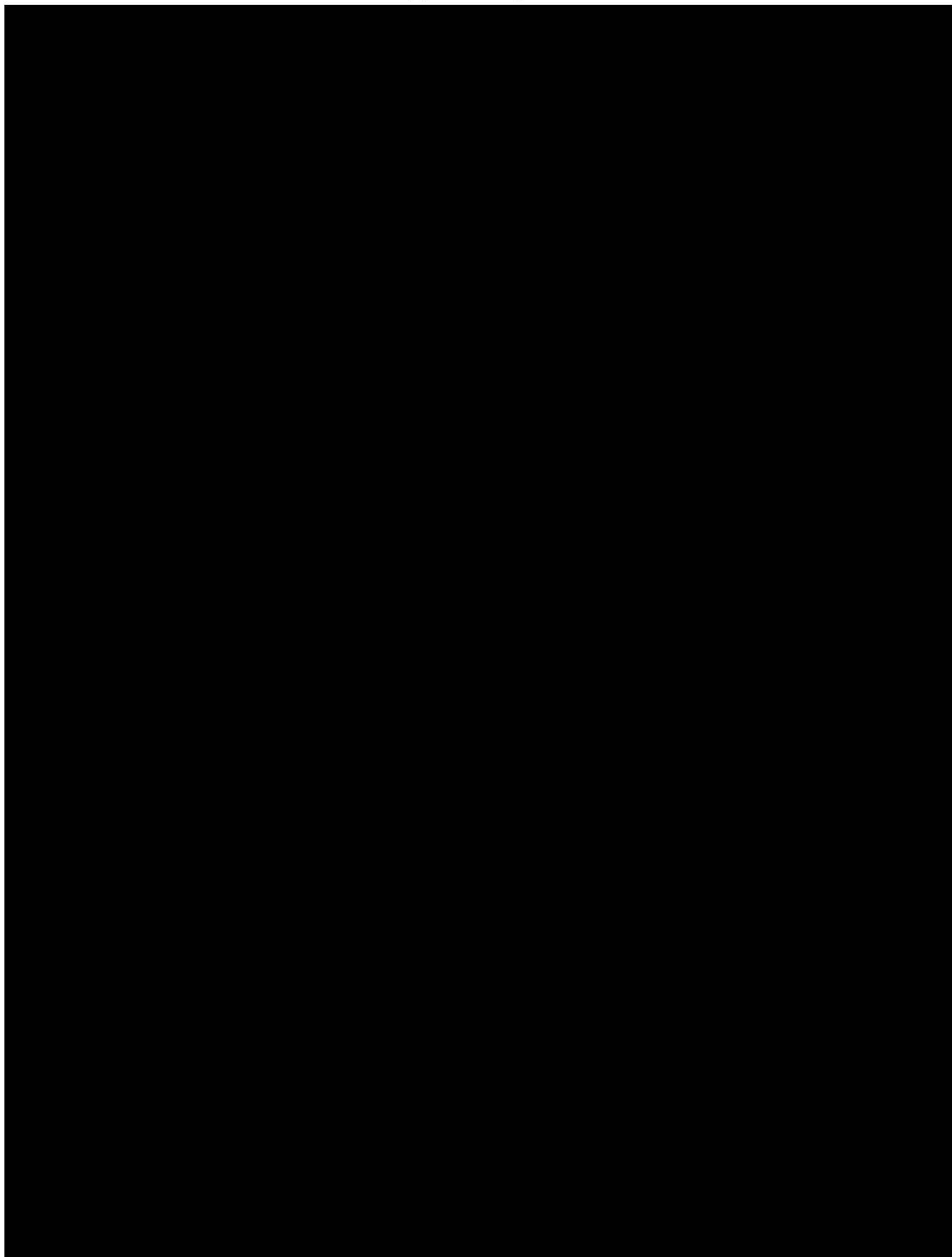
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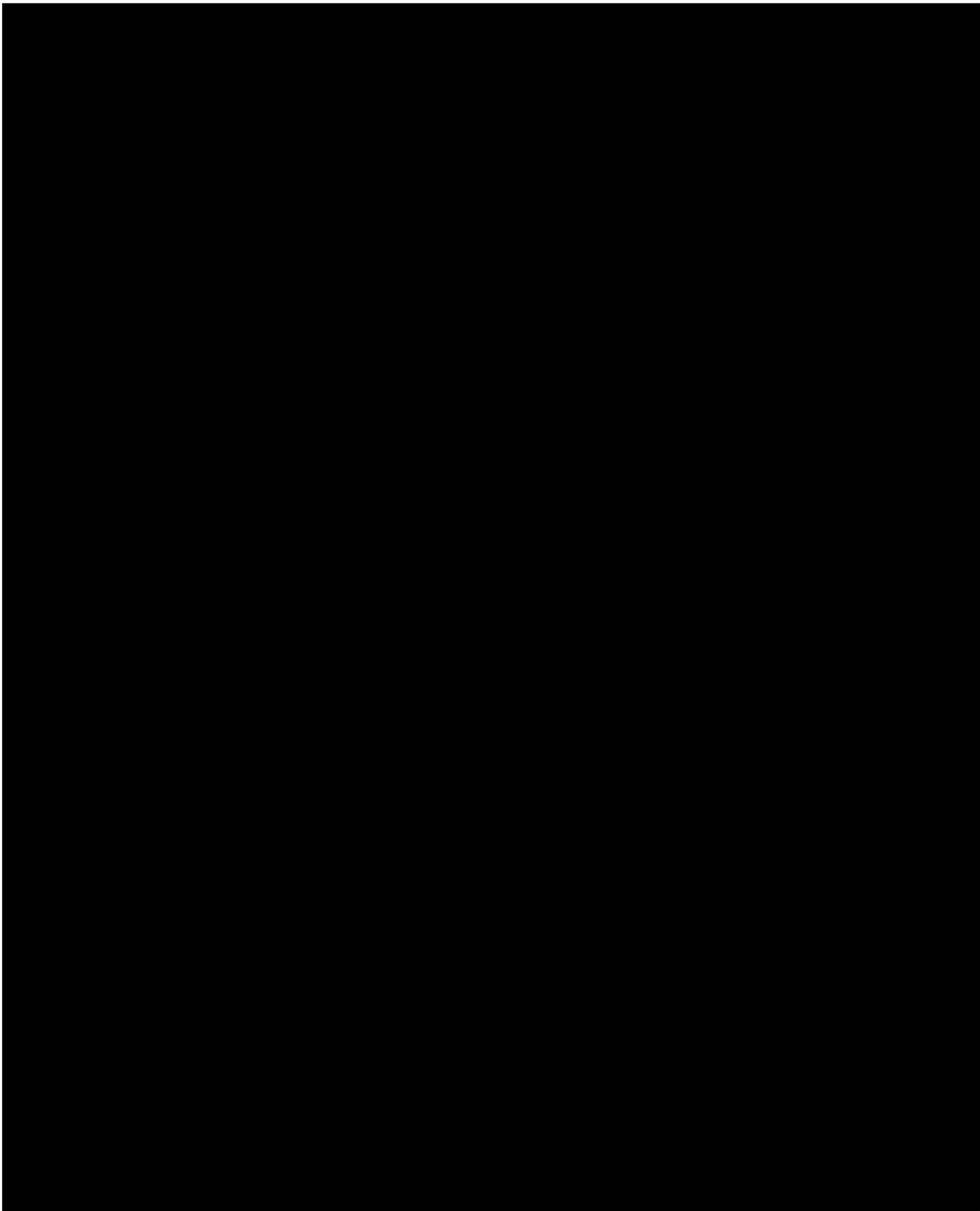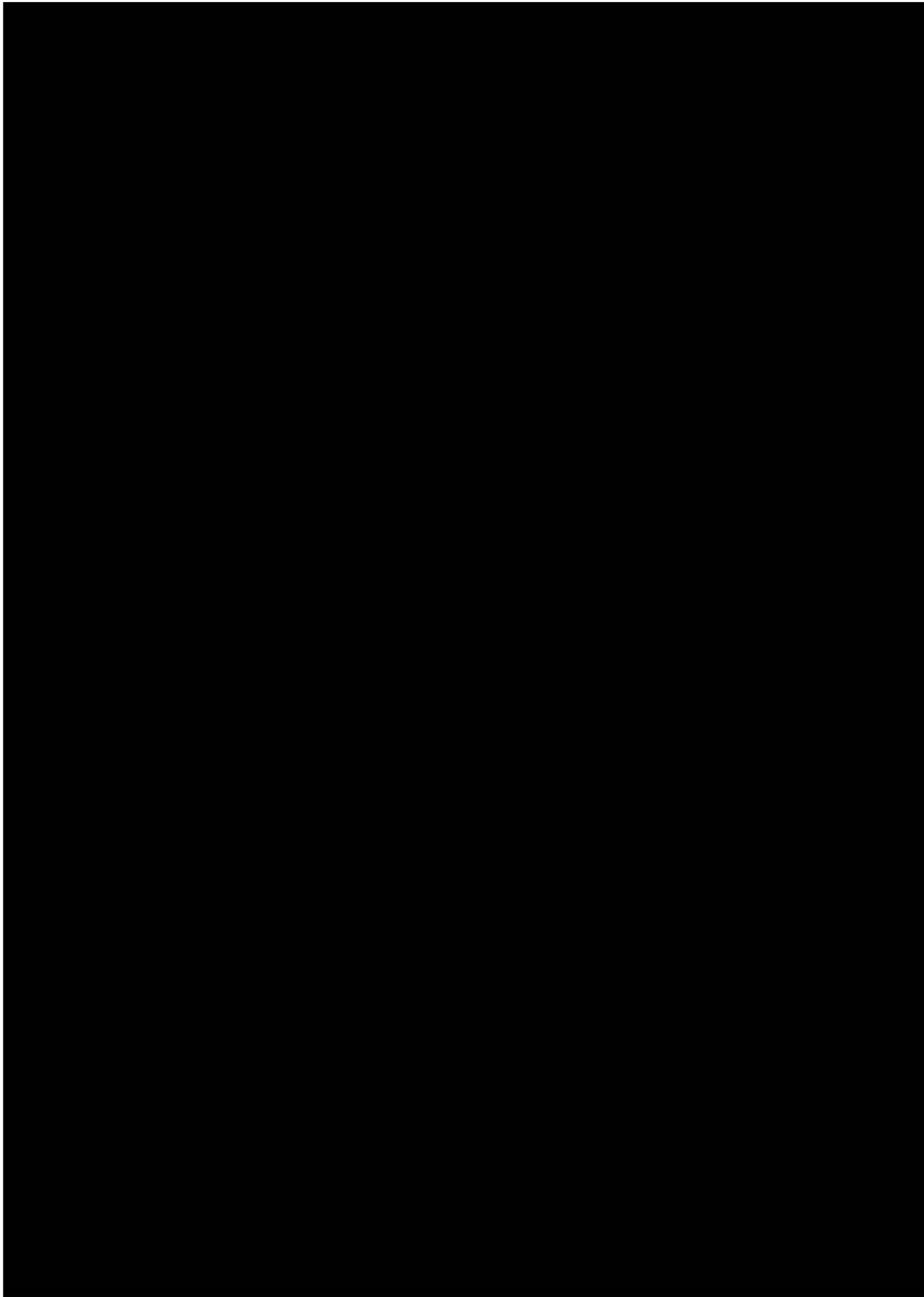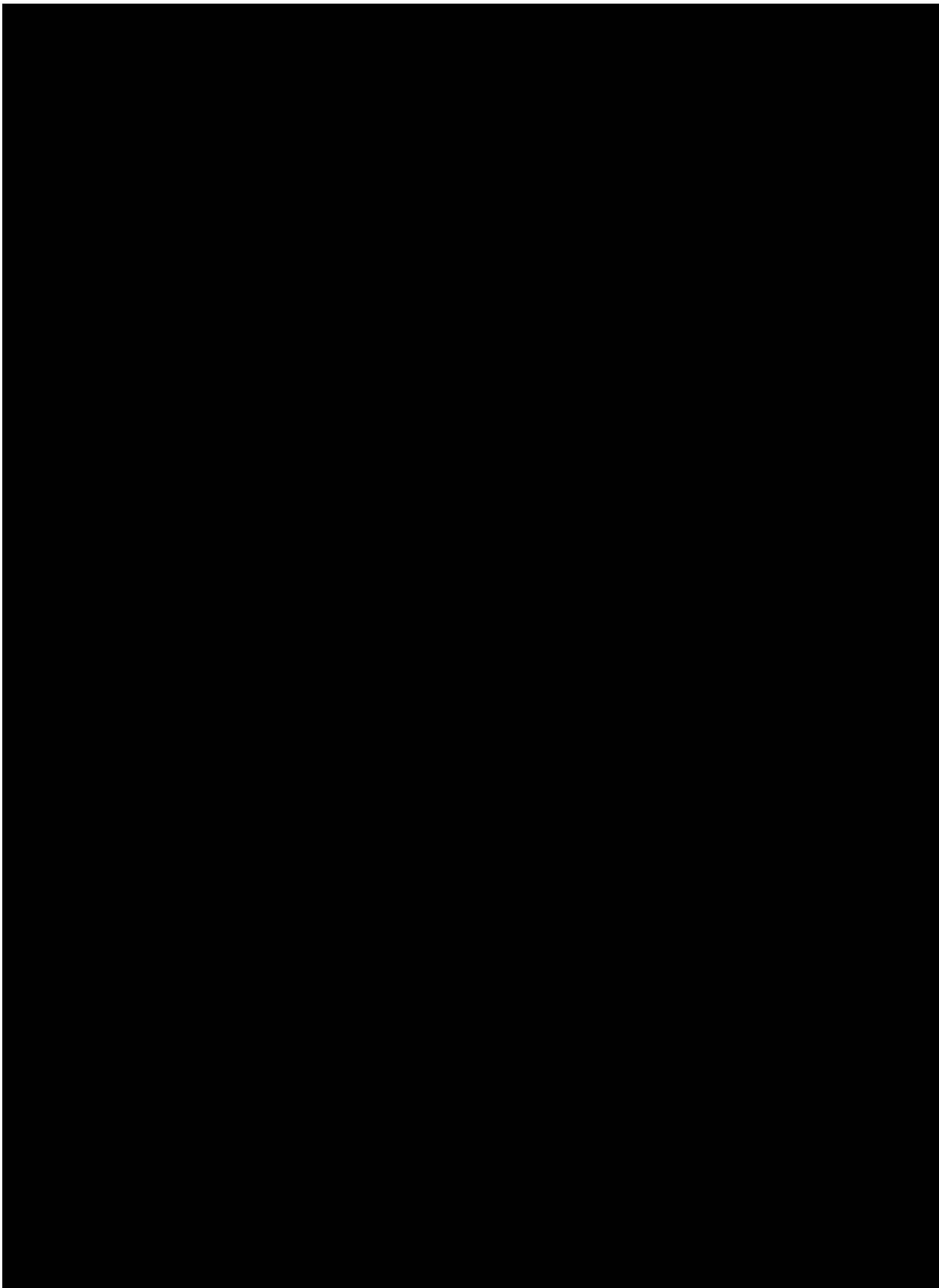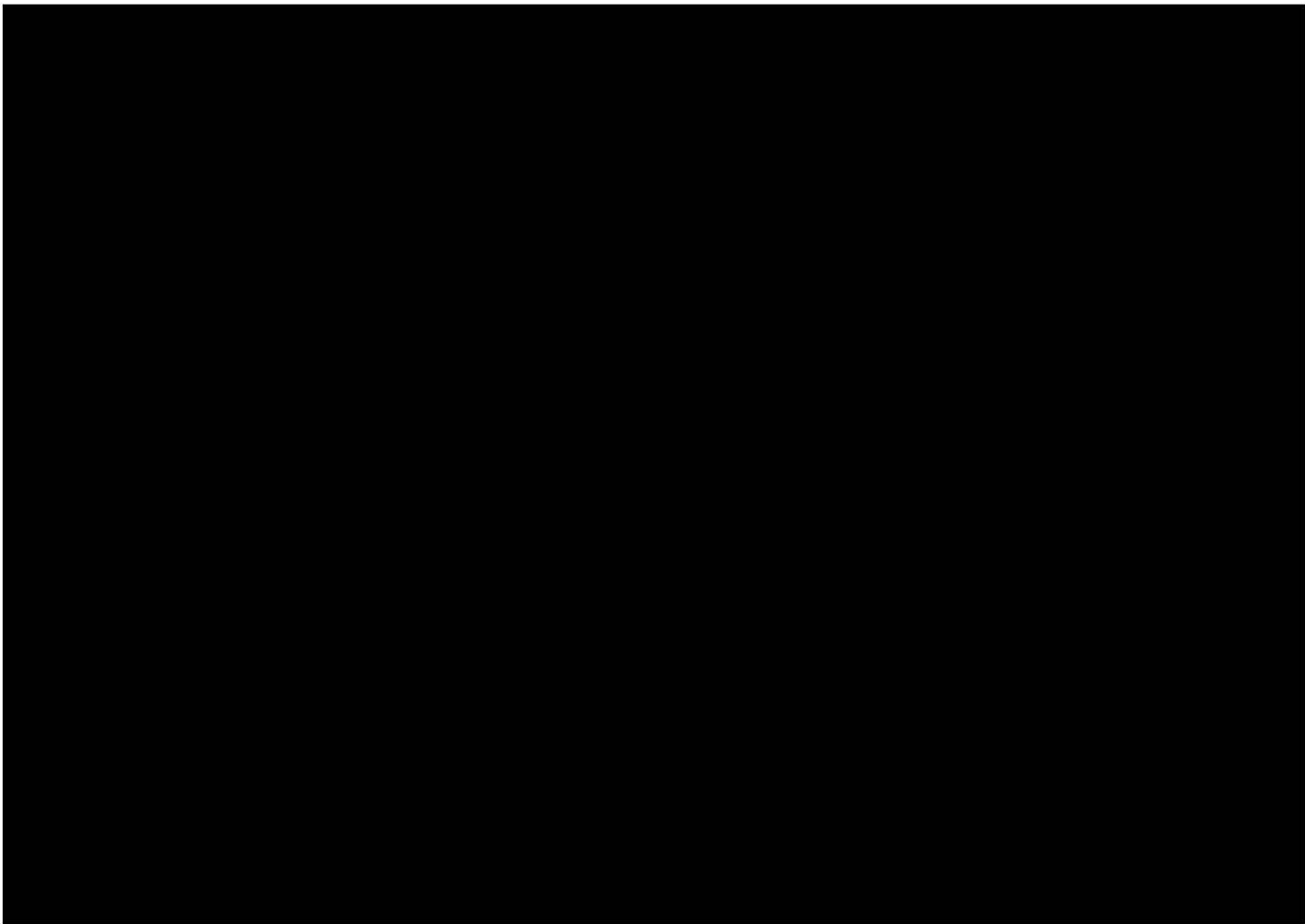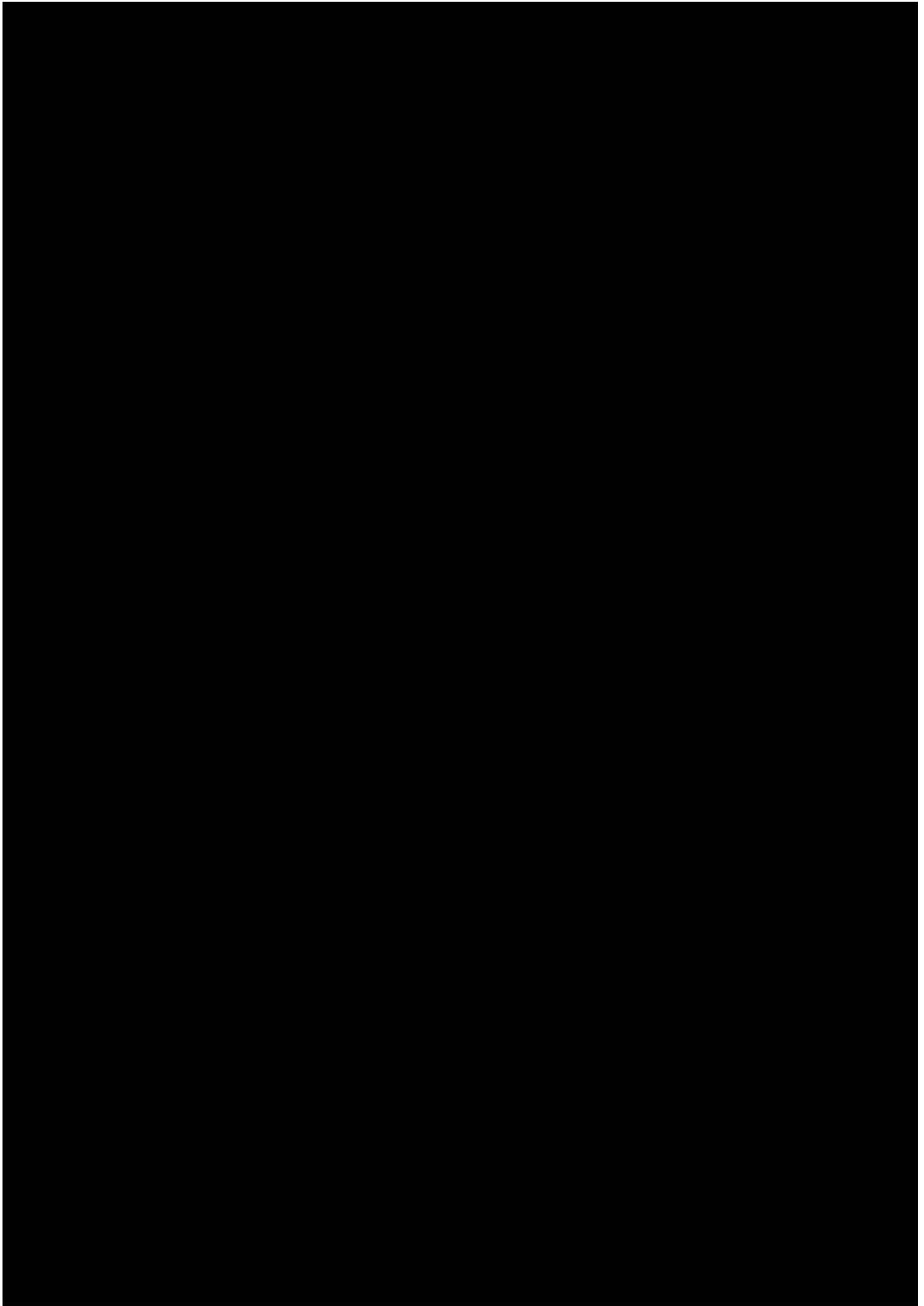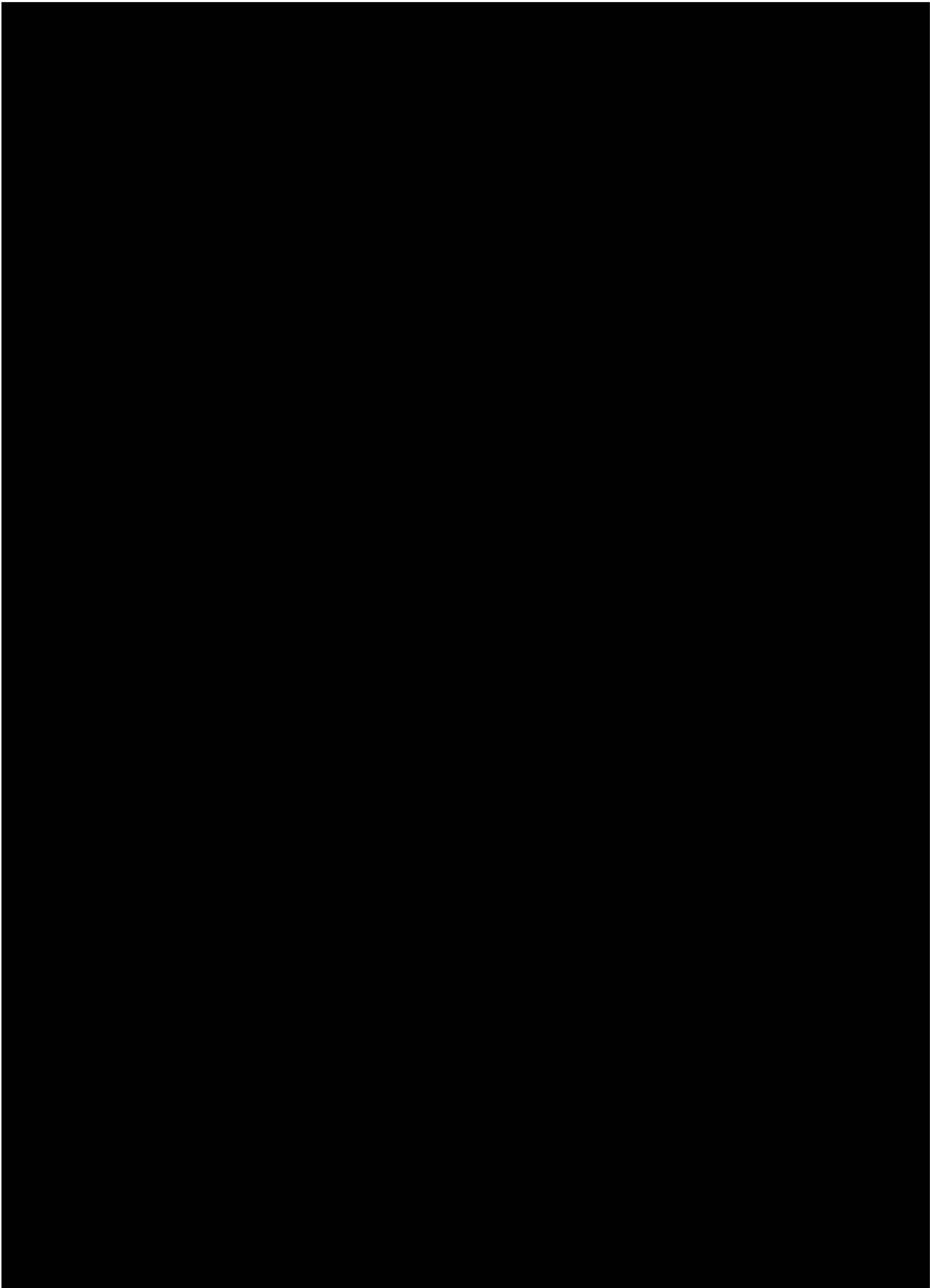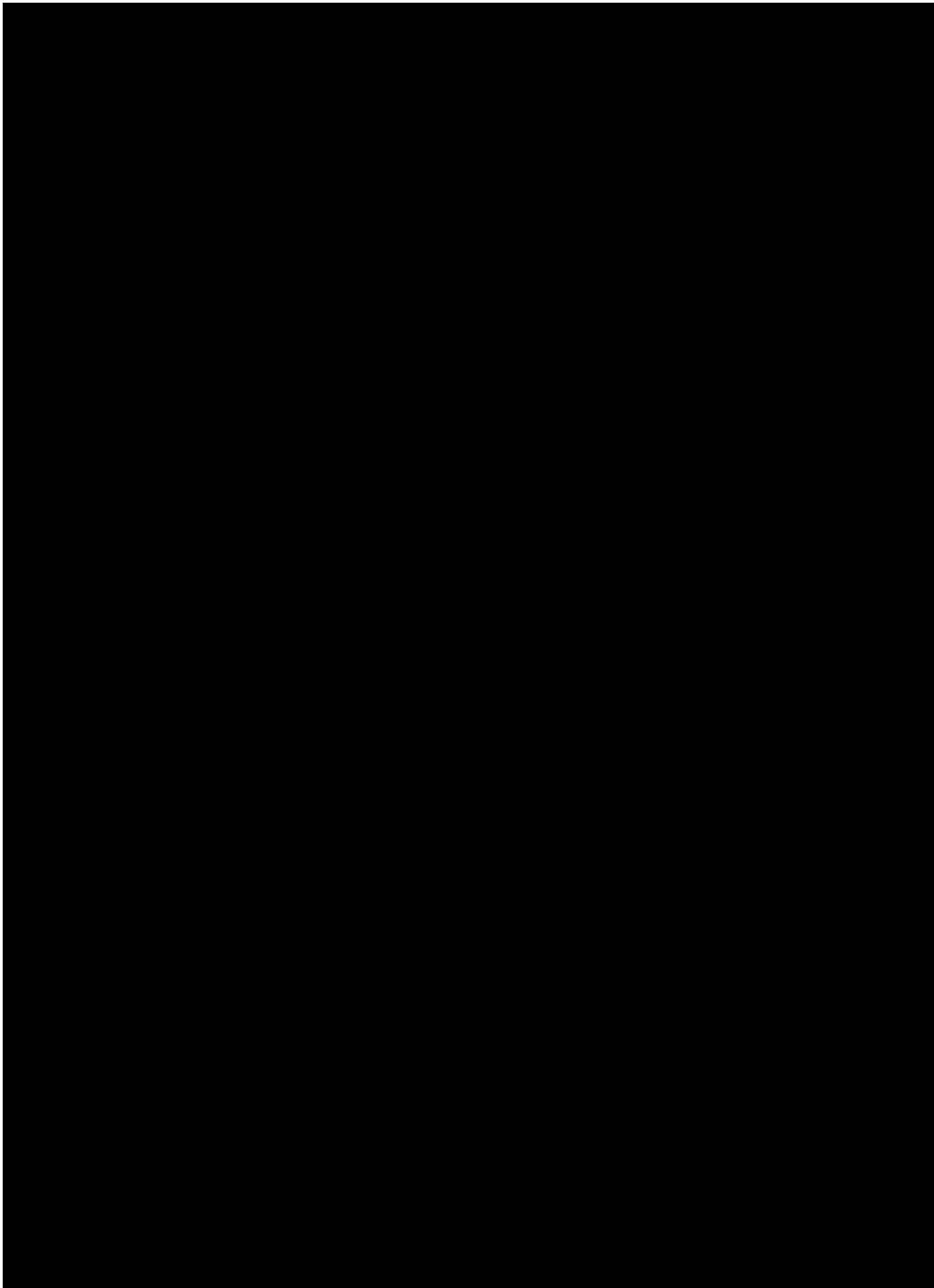
Part 2:   Contract Terms

Contract Terms v6.0