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MEMORANDUM

Date: 23 February 2017 (Revised document to the MEMORANDUM from 13 January 2017)

To: Christa Henager – EHSR Manager Eastern Mediterranean Major Projects, Noble Energy Inc.
Ido Ben-Zion – EHS Manager Israel, Noble Energy Mediterranean Ltd.
Orna Primor – Environmental Engineer, Noble Energy Mediterranean Ltd.
Gil Zeidner – Environmental Specialist, Noble Energy Mediterranean Ltd.

From: Debbie Fawcett – Project Scientist, CSA Ocean Sciences Inc.
John Tiggelaar – Project Scientist, CSA Ocean Sciences Inc.
Yossi Azov, Ph.D. – Director, Marine Ventures International

Re: Environmental Impact Document, Leviathan Development Drilling EIA – Amendment
Including Comments by the Ministry of National Infrastructure, Energy and Water Resources
and Ministry of Environmental Protection

Marine Ventures International (MVI) and CSA Ocean Sciences Inc. (CSA) are submitting this amendment to Noble Energy to address the Ministry approval of the Leviathan Development Drilling EIA received on 15 November 2016 (**Table 1**).

Table 1. Noble Energy's / CSA Ocean Sciences Inc.'s responses to comments by the Ministry of National Infrastructure, Energy and Water Resources (MNIWR) and the Ministry of Environmental Protection (MoEP) on the Leviathan Development Drilling Environmental Impact Analysis (EIA).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
1	K General Requirements		Since the document does not set out the confidential information that constitutes a commercial secret, it is clear that the document does not contain confidential information and it can be published, as is. A clarification of this is required.	Confidential information will be identified by Noble Energy and is not intended to be published. A separate "censored" version of the EIA will be provided at a later date for publication.	Acceptable	The "censored" version of the Drilling EIA will be submitted to MNIWR / MOEP with this Amendment to the Environmental Document.
2			Confirmations of the provision of raw data and samples from the background survey to the National Archive at IOLR are missing. You are requested to complete this. Furthermore, you are requested to provide the results and data from the various analyses that were performed during the background survey in excel files to the Ministry of National Infrastructure, Energy and Water and to the Ministry for Environmental Protection.	The raw data was submitted to MNIWR on August 21 2016 (as EXCEL files). Infauna samples will be shipped to the National Archive and confirmation of provision will be provided in a separate submittal.	Unacceptable. You are requested to provide the data directly to IOLR in accordance with the instructions for provision of data to the National Archive, which are on our Ministry's website. With respect to this issue, a separate notice will be sent to you in the future, and you must prepare for the provision of this data at a later time as well.	The raw data was submitted to IOLR on 29 November 2016. The infauna samples were shipped to the National Archive and it is anticipated to be received by the end of January 2017.
3		Figures 1-5 to 1-14	These sketches show that the location of the drilling is initial and that slight changes in the location might be possible. It is necessary to set out the maximum distance from the initial location that will be defined as constituting a slight change.	The maximum distance from the initial location that will be defined as constituting a slight change is 500 m radius from proposed well location.	Acceptable.	-----
4	1.3.5	Figures 1-5 to 1-14	These sketches are illegible. Files must be provided at a high enough quality so that the data and the legend are clear and legible. At the end of section 1.4.2 it says that Noble Energy will submit a full set of the maps, in full size, as an appendix to the Environmental Document. This set of maps was not submitted.	Attachment 1 hold high resolution graphics for Figures 1-5 through 1-14.	The sketches are still low quality. Figure 1-6 is illegible, even in the digital copy. Please update this in the amendment to the Environmental Document. We request that you yourselves make sure, before submitting sketches, that all of the writing on them is legible.	Refer to Attachment 1 for high-resolution graphics of Figures 1-5 through 1-14.
5	1.4	1.4 Geological, Seismic and Sedimentological Characteristics	The geological background that was set out with respect to the Leviathan Field is very feeble and only contains shallow stratigraphy, with the entire description being based on a seismic interpretation only. The requested information relates mainly to what was asked in section 1.4.5 of the guidelines. The response set out in the document is based on seismic and not on other existing information from the bores drilled in the field, similar bores to which are planned for development, including a detailed stratigraphic-lithological description of cutting, cores, tests etc. from the Leviathan 1-4 drillings.	Further information will be provided in a separate submittal. The information is Noble Energy proprietary and was submitted to Israel Oil Commissioner on 23 October 2016.	Acceptable.	-----

Table 1. (Continued).

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6	1.6.1	1.6.1	<p>The authors of the document conclude that due to the low and uniform variety of species found in the background survey and in the drilling surveys, it is reasonable to presume that there is no unique fauna in the field. This conclusion is problematic, since most of the fauna in the survey was not identified to a species level and sometimes not even to a family level. If, for instance, there is a rare species of clam in the site, it is cataloged as a "clam" along with common species and it has no impact on the calculation of species variety. The conclusions that can be drawn from the existing information must be adhered to and far-reaching declarations regarding the rarity of species, that are not scientifically grounded, must be avoided.</p> <p>On p. 37-1, in the final paragraph, it says that no hard bed sites were found in the field. Section 4.6.2.5 says that the video surveys did not find any hard beds. On the other hand, the background survey report that was prepared for the purpose of writing the environmental document (Ref. 4) states, in section 5.2, that a number of video surveys were performed at five sites with hard beds and potential for biological activity, which were located in the seismic surveys. These findings show that there is potential for the existence of hard bed fauna habitats in the field, contrary to what the environmental document states, i.e., that the field contains a uniform soft bed habitat only.</p>	<p>In the EIA, we do not make the assumption that the Leviathan Field is devoid of unique or rare fauna. The EIA states that diversity indices and organism densities are based on calculations of the data which do not indicate the field-wide presence of rare species in high abundances.</p> <p>No hard beds with biological sensitivity were identified at the five locations that were surveyed. Prior to drilling Noble Energy will submit the location of the hard bed sites that were found within 1 Km from the proposed drilling sites, marked on the map.</p>	Acceptable.	-----
7			<p>The location of the hard bed sites that were found, and those that were surveyed, must be marked on the map. Furthermore, photographs must be submitted, together with the raw material of the videos taken at these sites. The findings of these surveys must be addressed in the relevant chapters of the Environmental Document.</p>	<p>No hard beds with biological sensitivity were identified at the five locations that were surveyed. Prior to drilling Noble Energy will submit the location of the hard bed sites that were found within 1 Km from the proposed drilling sites, marked on the map.</p>	Acceptable. This issue was looked at the meeting when we reviewed the videos that were conducted in the context of supplementation of the necessary information.	-----

Table 1. (Continued).

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8					The response of the Antiquities Authority is lacking.	The letter from the Israeli Antiquities Authority (dated 10 February 2016) was provided as Appendix F of the Environmental Document. This letter is provided in Attachment 9 .
9					You stated that the hard bed sites that are located 1 km from the drilling site would be set out on the map in the lead-up to the drilling. For the avoidance of doubt, it is emphasized that if there is a hard bed site that is at a distance of less than 1 km from the drilling site, a video survey must be conducted of it in order to ensure that it is not a sensitive habitat. You are requested to provide our firm with the aforesaid data so that if a sensitive site is found within a 1 km range of the drilling site, it will be possible to prepare and to adjust the location of the drilling site so as to be at least 1 km away from the sensitive site.	Reference Attachment 10 . As part of the drilling approval and the discharge permit of each well, a 'safe zone' for discharges of excess water based mud and excess brine will be defined. Maps that indicate 1km radius from the safe zone and any sonar contact within this radius will be provided. In case that the sonar contact will be identified within 1km radius as mentioned above, a video survey will be conducted. If a sensitive habitat will be found, adjustment of the drilling location will be done. A visual inspection of two sonar contacts that are located within 1 km of LEV 5 was done on January 31 st 2017. One of the sonar contacts was identified as an anthropogenic debris and no physical object was identified in the area of the second sonar contact.
10		Figure 1-25, on p. 1-38	In the background survey, it was found that within the area of Square E09, there is a high concentration of infauna so that this is apparently a biologically unique zone. This region can also be seen on map 25-1 on page 1-38, in the Environmental Document. This site appears to have potential for the presence of a unique habitat and recommendations with respect to it must be included in Chapter 5, both with respect to future drillings and the passage of pipelines.	Infaunal density within E09 is greater than found throughout the Leviathan Field, although it is important to note that organism density in the deep sea can be patchy and it is possible that the density observed is not representative of the entire E09 grid cell or the Leviathan Field as a whole. In the case of future development in grid cell E09, further measures will be taken to ensure that this is not a unique habitat.	Acceptable. Reference to the issue in the Environmental Document – Chapter 5 must be added.	Reference Attachment 14 (Section 5.2.4).

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11		1.6.2.4. Fish	<p>There is no mention of what fish were found in the background survey or in the previous surveys that were conducted in the Leviathan field. And the fish that were found in the Tamar field, where the conditions are supposed to be similar, are also not mentioned in this document, despite the fact that the information is in Noble Energy's possession. This information must be completed and the ecological needs of the fish found in the background survey and in previous surveys must be emphasized as well. For instance, the halosaurs which were found in the background survey of the Tamar field feed on the fauna in the soft seabed, so that it must be noted that harm to the infauna means harm to the principal source of food of these fish.</p>	<p>During previously conducted pre-drill surveys at Leviathan-3, Leviathan-4, Leviathan-5, ML-1X, Dalit-Deep, and Leviathan-Deep, as well as during post-drill surveys at Leviathan-2 and Leviathan-4, fish fauna was found to be sparse. The most common fish observed was the tripodfish (<i>Bathypterois</i> sp.) which feeds on benthopelagic copepods and epibenthic amphipods or mysidacea (Carrasson and Matalanas, 2001). Other observed fish included halosaurs (<i>Halosaurus</i> sp.), phycid hake (Family Phycidae), and catsharks (Family Scyliorhinidae). Halosaurs feed on polychaetes, sipunculids, and crustaceans, phycid hakes typically feed on benthic crustaceans and mollusks, and catsharks are typically opportunistic hunters, preying on crustaceans, mollusk, and other fishes (Fish Base, 2016). Therefore, harm to the benthic environment will impact the primary food source for the fish observed in the survey.</p> <p>Fish observed in the Tamar Field were similar, with the most commonly observed fish being the tripodfish (<i>Bathypterois</i> sp.) and the halosaur (<i>Halosaurus</i> sp.).</p>	<p>This answer is acceptable. It must be inserted into the Amendment to the Environmental Document, both in the chapter describing the existing situation and in the chapter setting out environmental impacts.</p>	<p>Reference Attachment 11 (Section 1.6.2.4) and Attachment 13 (Section 4.6.2.3).</p>
12	1.6.5	1.6.3. Impact on fishing	<p>Indeed, drilling in the field is not supposed to affect fishing, since there is no fishing in the region of the Leviathan field. However, it is hard to ignore the fact that the significance of production drilling is that pipelines will be laid and facilities will be constructed on the shelf, in areas where there is fishing. The document must state that the issue of the impact of overdevelopment of fishing will be discussed in depth in the Environmental Document for the pipelines and the gas treatment facility.</p>	<p>Noble Energy is in agreement that drilling in the field is not likely to affect fishing, since there is no fishing in the region of the Leviathan Field.</p>	<p>The issue of the impact of overdevelopment on fishing will be discussed in the Environmental Impact Assessment for Installation, Operation, and Maintenance of Pipelines and Submarine Systems for Leviathan Field Development.</p>	<p>Reference Attachment 11 (Section 1.6.3).</p>

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13		Table 1-13 Habitats and infrastructure along the Israeli coastline	The basis for Noble Energy's atlas for classification of the coastal segments in accordance with environmental sensitivity, as quoted in the heading of the table, must be noted.	The environmental sensitivity index (ESI) data presented in Section 1.6.4 and Table 1-13 was prepared by MoEP, not Noble Energy. The reference for the ESI data will be corrected to: [MoEP] Ministry of Environmental Protection 2006. Atlas of Israel coastal sensitivity to oil pollution in the Mediterranean. Marine and Coastal Environment Division, Jerusalem, State of Israel.	Acceptable.	-----
14		1.7.2 Sediment Quality	It is not clear what samples were used to determine the Levantine Basin mean. If these are only samples that were taken prior to development or at test points, then there is no problem comparing them. If they are the sampling points, including the points that were affected by the drillings, then this mean is meaningless. In this case, the fact that a particular value is lower than the mean does not mean that it is not contaminated. A clarification must be given for the drillings on the basis of the findings of which the Levantine Basin mean was set.	The Levantine Basin mean was calculated from only pre-drill and environmental baseline surveys conducted by CSA for Noble Energy in the eastern Mediterranean Sea offshore Israel. These surveys were performed between 2012 and 2014 and were designed to include sites that were not expected to have been impacted by development. It is important to note that sampling data from post-drill surveys or locations impacted by development were excluded from the calculation of the Levantine Basin mean for the reasons outlined by the Ministry. Analytical concentrations within 2.5 standard deviations generally fall within the 99% confidence limit of the survey area data and can be regarded as ambient concentrations that were not significantly different from each other.	This answer is acceptable. This explanation must be inserted into the Amendment of the Environmental Document.	Reference Attachment 11 (Section 1.7.2).
15	1.8 Culture and heritage sites	1.8	This section mentions 397 items that were identified on the seabed and that meet the criteria that were prescribed. Of these, 38 items were defined as potential antiquity sites. It is unclear why the reference to the items that were identified on the seabed is to potential antiquity sites rather than to potential habitats of hard seabed fauna. All of the sites must be marked on a map (with special marking for targets that are higher than 0, i.e., that protrude above the seabed) at a radius of 1 km around every drilling and the auxiliary pipelines thereto. If there is a site within this range, an ROV video must be taken and in the meantime, it must be treated as a potentially sensitive habitat.	No hard beds with biological sensitivity were identified at the five locations that were surveyed. Prior to drilling Noble Energy will submit the location of the hard bed sites that were found within 1 Km from the proposed drilling sites, marked on the map.	Acceptable. This issue was looked at the meeting when we reviewed the videos that were conducted in the context of supplementation of the necessary information.	-----
16					The response of the Antiquities Authority is lacking. Please complete this.	The letter from the Israeli Antiquities Authority (dated 10 February 2016) was provided as Appendix F of the Environmental Document. This letter is provided in Attachment 9 .

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17		Section 1.13 Leviathan 2	The document says that there is no indication of toxic concentrations of pollutants as a result of the leak. We should just note that the water quality surveys done in the saltwater pools that came about showed high concentrations of methane which might be toxic, and a number of dead fish were found in the caldera.	Noted.	This explanation must be inserted into the Amendment of the Environmental Document.	Reference Attachment 11 (Section 1.13).
18		Table 2-2, line 9 (second last line)	This says that there are no fish breeding zones. See the comment on section 1.6.2.4, fish, above. Once the information required in that section is completed, the table should be amended if necessary.	No information is available on specific spawning habitats within the Leviathan Field for Bathypterois sp., Halosaurus sp., phycid hakes (Family Phycidae) or catsharks (Family Scyliorhinidae). Porcu et.al. (2010) identifies Bathypterois mediterraneus as being a hermaphroditic species about which little reproductive information is available. Many species of catsharks (Family Scyliorhinidae) are oviparous and lay eggs in egg cases, but reproductive strategies vary by species and region. No reproductive information was found for Halosaurus sp or phycid hakes in the Mediterranean Sea.	We do not accept that there are no breeding zones. An explanation for the lack of information regarding breeding zones and habits of fish found in the survey must be added. This correction must be inserted into the Amendment of the Environmental Document.	Reference Attachment 12 (Section 2.2.4).
19		2.3.2. Alternative drilling technologies	The alternative of use of technology enabling a reduction of discharges onto the seabed such as the riser-less mud recovery system must be examined. This method was mentioned in section 2.3.3.3 (despite the fact that this issue belongs to drilling technology and not to the choice of drilling mud for treating cutting discharge), and it was said that it was being tested by Noble Energy, but it was not put into the table of alternatives. According to the provisions of section 2.3.3.3, the research and analysis that were conducted by Noble Energy in this regard are due to end in September. We would ask to receive the summary report of this, and to conduct a discussion of it as soon as possible. We should emphasize that we see an advantage to using the RMR method, in terms of saving of drilling mud and as a result of that, reduction of emissions onto the seabed.	Noble Energy has no plans to use RMR. There are issues with the use of RMR from a dynamically positioned vessel due to the two separate attachment points at the seabed (Wellbore and RMR) and the ability of the rig to change heading and move off location to run riserless strings as well as an EDS system from the RMR riser. Typically, RMR operations are conducted from moored vessels. In addition the water depth at Leviathan means that the use of RMR is challenged by the amount of installed power required to be supplied from the rig in order to return drilling fluids to surface, and would require 2 to 3 inline pumps, which is currently right at the edge of the current performance envelope for the system.	This is acceptable pursuant to your letter of October 31, 2016. The update must be added to the Amendment of the Environmental Document.	The letter provided to MNIEWR on 31 October 2016 (Re: Riserless Mud Recovery on Leviathan) is included in Attachment 15 .

Table 1. (Continued).

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20	3.2.1.1		The Document does not contain any mention of the target of the drillings, although elsewhere in the document, it does say that the target strata are gas. It goes without saying that in the Impact Document that was submitted, the target strata for oil were not examined, in accordance with the development plan. If the development plan includes a change in targets, i.e., deeper targets for oil, it will be necessary to prepare another environmental document that is amended for the change in the development plan.	Noted. The target strata is gas. If an oil target is desired, an amendment to the environmental document will be provided at that time to address this change.	Acceptable.	-----
21		3.2.2 Drilling Platform	In Chapter 2, examination of alternatives for the drilling rig, it says that use of a rig with anchors is less suitable due to the environmental impact on the seabed. Later on, the Environmental Document is based on use of a DP Semisubmersible or a DP Drillship. Therefore, section 3.2.2 must set out explicitly that no use is to be made of drilling facilities that have anchors. After determining the tools / platforms that will be used for the drilling, and filling these in, the document must be amended accordingly.	The following is stated in Section 4.6.1.1, "Because a DP drillship or DP semisubmersible will be used, there will be no anchoring."	Acceptable.	-----
22	3.2.2.3	3.2.1	The number of drillings set out in Table 3-2, p. 3-4 (31) does not match the number of drillings set out in the development plan or that which is set out in the Document (29). A clarification of this must be set out and the paragraph before the table must be amended accordingly. Also, there is a typographical error in that paragraph. The reference is to Table 1-1 whilst the number of the table is 3-2.	The full development of the Leviathan Field is currently modeled to require approximately 29 producing wells, including two phases of construction. Table 3-2 includes the following: two (2) already existing but not producing wells (Leviathan-1 and Leviathan-2), initial eight (8) wells per Table 3-1; and twenty one (21) additional wells needed for production. The reference to "Table 1-1" is supposed to be "Table 3-1".	Acceptable.	-----

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23		3.2.3	It should be noted that the service ships must always be adjacent to the platform (24/7).	The Drilling vessel will have International Maritime Organization (IMO) required POB life boat capacity. Due to the non-harsh environment, Noble Energy does not believe there is a requirement for 24-hour standby vessel coverage.	Unacceptable. Please clarify whether the support will be provided by 4 service ships, one of which will be near to the platform 24/7. A brief description of the service ships must be completed as well.	<p>The following description refers to the drilling of Leviathan-5, Leviathan -7, and Leviathan-3 ST wells.</p> <p>The drilling program will be supported by three platform supply vessels (PSV) and one fast crew change vessel (FSV) operating out of the port of Haifa. The platform supply vessels have an overall length of 91 m, a design draft of 5.9 m and accommodations for 28 to 29 passengers. [REDACTED]</p> <p>The fast crew change vessel can carry 70 passengers and travels at a service speed of 27 knots. [REDACTED]</p> <p>Helicopter support will be provided by a Sikorsky S-76C++ owned by PHI, Inc. and operated by LAHAK out of Haifa Airport.</p> <p>Reference Attachment 16 for further information on each of the four service vessels to be used for the drilling of the Leviathan-5, Leviathan-7, and Leviathan-3 ST01 wells. Similar information will be provided for future wells (reference Table 3-1 in the Environmental Document) in separate submittals and when known prior to drilling. Standby cover will be provided by the supply vessels when available in the field. There will also be 24/7 coverage of helicopter medical evacuation services by LAHAK.</p>

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24	3.2.2.5, Prevention of oil outbreak	3.2.5 and Figure 3-6	Due to the uncertainty relating to the platform that will conduct the drilling, at the time of preparation of the Document, the information presented is general. This information must be completed as a condition of receipt of a drilling permit.	Noted.	The information about the platform which will perform the drilling activities must be provided.	Reference Attachment 17 .
25	3.2.2.6.4, Description of components of concretization materials		The Document contains no reference to this item.	Noted. This information will be provided in the Discharge Permit application.	Acceptable.	-----
26	3.2.2.6.5		No reference was found to the standards under which the tests of the drilling pipelines and the protection pipeline will be conducted.	Casings tests will be conducted as per 30 CFR 250.	Acceptable.	-----
27		3.2.6	The description in this Chapter relates to all of the drillings other than Leviathan 3 (sidetrack). The information for this drilling must be completed / clarified as well.	Reference Figure 3-8, Leviathan-3 As-Built Wellbore Schematic. Reference Attachment 2 for Figure 3-8a Planned Wellbore Schematic for Leviathan-3 ST01 Well.	Partially acceptable. The Environmental Document only contains an "as built" sketch, without a written explanation like those given for the rest of the drillings. Attachment 2 to the Response letter, Figure 3.8.a shows a planned drilling but does not have a written description. Please complete a written description of the existing situation and the planned situation.	Refer to Attachment 18 for a written description of the "as-built" wellbore schematic for the Leviathan-3 ST01 Well.
28		3.2.6.1, Design of protective pipeline	The details in this section include reference to proposed changes to the design of the casing of the proposed drillings, [REDACTED]	[REDACTED]	Acceptable.	-----

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29		3.2.7 Completion operations, Figures 3-11 to 3-13	An explanation of the material "Carbolite" and the method of installation of sand screens must be submitted.	Carbolite is a high-performance, low-density ceramic proppant technology that has a bulk density and specific gravity similar to sand, yet delivers higher conductivity and flow capacity to enhance production. It is a product that is manufactured by Carbo Ceramics. During the open hole gravel pack phase of the completion, the Carbolite proppant is mixed in with the completion brine and displaced downhole. During the displacement, the completion brine circulates through the sand screen, leaving the Carbolite proppant in the well to act as the primary sand control barrier. The screen and proppant are sized to prevent the production of reservoir sand. The screen is also sized to prevent the return flow of the proppant, thus leaving it in place in the wellbore. The screen joints are deployed in the well, similar to the way casing and tubing joints are made up and deployed. They are made up and assembled on the rig floor as part of the gravel pack assembly. Once all the joints and connections are made up, the gravel pack assembly is deployed on drill pipe. Once on depth, the gravel pack packer is pressure set and the gravel pack service tool is released. At this point the well is ready to begin pumping the open hole gravel pack treatment. After all of the proppant is in place, the well is circulated clean and the service tool pulled from the well, leaving the gravel pack assembly, screen and proppant in the well as the primary sand control method.	Acceptable.	-----

Table 1. (Continued).

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30	3.2.2.8, Production Tests	3.3	The particulars of the indicators that are to be examined do not include details of the reasons for setting these indicators, mainly on the basis of the information that is available from existing drillings (Leviathan 1-4). The existing information must be completed: A description of the composition and quantity of gas and liquids expected to be obtained in the production test drillings and in the production drillings that are planned on the basis of the information available from the Leviathan 1-4 drillings, including gas (hydrocarbons, hydrogen sulfide, nitrous gases and any other gases so that the analysis makes up 100%); liquid hydrocarbons (condensate and petroleum); water (full and detailed analyses of produce water).	The Leviathan gas composition from previously captured gas samples is presented in Attachment 3 . Quantities of gas and liquids expected to be obtained during the production well test flow back are currently not known. The quantity and volume requirements are generally determined during the planning of the well operations, based on the assets need of information. Exact quantities are currently not known.	Partially acceptable. The data must be presented for each drilling separately, together with the averages for them, including a standard deviation. Furthermore, an up-to-date report of each drilling must be submitted to both Ministries, with an emphasis on H ₂ S.	Reference Attachment 19 . Noble Energy will provide MNIWR / MOEP with gas composition and H ₂ S level for each well drilled.
31		3.3.1 Production Tests	This section provides that the estimated time duration for the production test is 49.5 hours. The situation in which an extended production test is required and the possible environmental impacts of such a situation, must be addressed as well.	<p>The production test time estimate of 49.5 hours was provided as an approximate estimate based off of past Tamar experience. The intent is to not have an extended well test, but to purely unload the well and prepare it for production. No extended well test is expected.</p> <p>Possible scenarios that could impact the time estimate and extend the flow test:</p> <ul style="list-style-type: none"> · Operational concerns / issues / delays; · The well does not unload or clean up as quickly as expected; · Pressures seen during well test do not match expectations and additional flow time is required to obtain data; and · Reservoir quality seen in the reservoir does not match expectations and additional flow time is required to obtain data. <p>In most scenarios, an extension of the production well test by a maximum of 24 hours should be sufficient.</p> <p>Additional environmental impacts from an extended well test will likely be limited to additional air emissions from flaring. However, due to the temporary nature of the potential time extension of the well test, additional air emissions will be likely be insignificant.</p>	Acceptable.	-----

Table 1. (Continued).

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32		page 3-25, second paragraph	It is noted, in general terms, that all produced water, brine or condensate obtained during the course of the production tests will be collected, filtered, tested and discharged into the sea in accordance with Noble Energy's acceptable standards. Liquids that do not meet the standards must be collected and sent to an approved onshore facility. There are no details as to which tests are to be performed on the above materials prior to their discharge or what Noble Energy's standards are for discharging them into the sea. There are no details of the duration of time for performance of the production tests nor the wells at which the production tests will be performed.	Noble Energy will follow the Gulf of Mexico CFRs. Monitoring Records Section of NPDES Reporting Oil and Grease Testing: A sample of workover / completion fluids that are discharged must be submitted to the laboratory for oil and grease testing for each job, and if the job continues into another calendar month, once per month. The permit limit is exceeded if a single (acute) sample exceeds 42 mg/l (ppm). For those results less than 42 mg/l, but more than 29 mg/l, then additional samples must be taken to average down so that the monthly result will be less than 29 mg/l. United States EPA regulations: The EPA overboard discharge (NPDES) ... produced water discharges have limitations in the parameters of oil and grease, and toxicity. The oil & grease limitations are: <ul style="list-style-type: none"> • 42 mg/L (ppm) daily maximum ; and • 29 mg/L (ppm) monthly average. 	As you noted, the standard for offshore discharge is compliance with the qualities for general oil – 29 mg/L on average and 42 mg/L maximum according to the accepted CFR in the Gulf of Mexico. There is no reference to the conducting of tests on the platform, which may need to be performed several times a day, and on the basis of which it will be possible to make a decision as to whether to discharge into the sea or not (as will also be set out in the Discharge Permit). In addition, we wish to note that you must prepare for being required, in the context of the Offshore Discharge Permit, inter alia, to comply with a threshold pH value that will be examined in a field test on the Platform. The response that was given in the clarifications that were provided, in the demand for completions, refers to the rest of the section, which is only the question of the air. No response was found to the requirement to complete the information dealing with offshore discharge under Section 3.7, and there was no response to the statement that condensate must not be discharged into the sea under any circumstances. Please complete this.	Noted. This information will be provided in the Discharge Permit application. No condensate will be discharged into the sea under any circumstances.
33			Section 3.7, which deals with discharge into the sea, contains no reference to this source. The information regarding discharge from the production tests, as set out above, must be completed. It must also be clarified that condensate must not be discharged into the sea under any circumstances. A statement must be included to the effect that prior to conduct of the production tests, it will be necessary to update and complete the discharge permit. As for emissions into the air as a result of the production tests, it must be noted that at least one month prior to effecting the production tests, Noble Energy shall submit a “flare operation plan” to the Ministry for Environmental Protection, in accordance with the guidelines of the Air Quality Department at the Ministry for Environmental Protection.	Noted. A “flare operation plan” will be submitted at least one month prior to effecting the production tests. This plan will be provided in a separate submittal and will be in accordance with the guidelines of the Air Quality Department of MoEP.		

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
34	3.4	3.5. Air quality	<p>The emissions expected from the oil based (TCC) drilling mud cutting discharge treatment system and if necessary, the measures that are planned to be taken to reduce such emissions must be reviewed. Note whether any transfer of liquids from the well via the gas separator is planned when using oil-based drilling mud and what emissions into the air are expected during such process.</p> <p>The emissions expected from the storage containers of the hazardous materials on the drilling platform, including the drilling mud pools, must be reviewed.</p>	<p>The only emissions expected from the TCC process will be from a standard diesel engine.</p> <p>Emissions from the mud gas separator are expected to be minimal and will only constitute gas entrained in the mud and derived from the drilled cuttings during normal drilling operations. Emissions are not anticipated from the storage of hazardous materials in sealed containers and the mud pits.</p> <p>The TCC operation is temporary, short and conducted according to best available practices.</p>	Acceptable.	-----
35	3.4.2		Clarification is required as to whether the values presented in this section PM refer to all particles or, as is required in the guidelines, to PM ₁₀ .	BOEM's air emissions calculations procedures were utilized to determine total emissions. Based on BOEM's guidelines, it is assumed that PM = PM ₁₀ = PM _{2.5}	Acceptable.	-----
36	3.6	3.7.2 Offshore discharges due to drilling operations and completion of drillings	General remark: In all of the tables that set out discharge quantities, the data must be set out in cubic meters as well, and inter alia, in the following tables: 3-15, 3-18, 3-21, 3-23, 3-24, 3-40.	Revised Tables with quantities presented in cubic meters are presented in Attachment 4 .	Acceptable. The updated Table 3-15 contains the chemical data based on work segments during the WBM stage (including data in cubic cm), as compared with the original table that was set out for the WBM stage in a consolidated form.	Noted.

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
37			<p>Pursuant to the provisions of this section, Noble Energy wishes to obtain approval to discharge cuttings into the sea continuously, after treatment of oil-based drilling mud surplus remaining on the cutting discharge in the Thermomechanical Cutting Cleaner (TCC), so that the concentration of the oil in the cutting discharge is not more than 1% on a dry-weight basis (second paragraph, p. 3-33). Oil-based mud must not be discharged into the sea in any circumstances. In the event that permission is not granted to discharge the cuttings into the sea, the cuttings will be removed to the shore (see separate reference to section 3.7.2.4). There is a general, theoretical description only of the cutting discharge treatment facility (the TCC facility), and only general reference to the monitoring and control activities of the facility to ensure compliance with a target of up to 1% oil (section 3.7.2.5, Appendix 1). The treatment facility includes grinding the cuttings (but it is not known to what size granule) whilst increasing the temperature (but it is not stated to what temperature). Through this action, inter alia, water from the cutting evaporates and condenses in an adjacent unit to obtain recovered water, which is discharged into the sea together with the cutting discharge.</p>	<p>Reference Attachment 5 - TCC Treated MOB M Cuttings Settling Velocities by Size Class. The mill operates at approximately 240 °C to 260 °C. The mill temperature is controlled by varying the speed of the TCC feed pump. Temperature transmitters are fitted to the mill which is monitored by the PCL. The PCL controls via a PID loop which activates a hydraulic proportional valve which controls the TCC feed pump. The system regulates the flow of drill cuttings into the mill chamber maintaining the mill temperature at a defined set point. If the PLC via the temperature transmitters read mill temperature to be raising above the set point, it will increase the speed on the TCC feed pump, increasing the amount of feed material to the mill, thereby cooling the mill chamber. Once the PLC via the temperature transmitters reads decreasing mill temperature it will proportionally slow down the feed rate of drill cutting, allowing the temperature to rise again. The TCC mill temperature set point is determined by the properties of the base oil. The set point is set above the vaporization point of the base oil to ensure all hydrocarbons are removed from recovered solids.</p>	<p>See the comment in the next section regarding approval of the discharge of cuttings: The approval for use of TCC and the discharge of cuttings into the sea, if requested, will be granted subject to the experience that will accrue from the first drilling that will use TCC, and an analysis of the data (offshore discharge, monitoring of the environment).</p>	<p>Noted.</p>
38			<p>With respect to the intention to use MOB M and to discharge the cuttings into the sea, a decision on this will be made after the completions of the Environmental Document and the application for a Discharge Permit for Tamar 8 are received (letter of the NMEPU, MoEP of July 14, 2016, 7298W-NBL-TAMAR-8-EIA), and in light of the actual performances of the TCC facility, the results of the tests, achievement of a target of less than 1% of oil and the monitoring findings at the end of the drilling and verification of the dispersal model in the Tamar 8 drilling. The tests of the cuttings that will be discharged into the sea shall include, inter alia: The size of the particles in the discharge and the physical and chemical attributes of the material being discharged.</p>	<p>Noted. No further action is required.</p>	<p>In the Tamar-8 drilling, it was decided not to use TCC. So too, in the Leviathan-3, Leviathan-5, and Leviathan-7 drillings, TCC will not be used either. Therefore, the approval for use of TCC and the discharge of cuttings into the sea, if requested, will be granted subject to the experience that will accrue from the first drilling that will use TCC, and an analysis of the data (offshore discharge, monitoring of the environment).</p>	<p>Noted.</p>

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
39		3.7.2.1	The drilling of the new wells, Leviathan 5-10, shall be effected using a combination of water based mud (WBM) and mineral oil based mud (MOBM). The sidetrack of Leviathan 3 will be drilled using water based drilling mud. Completion of the drilling of Leviathan 4 does not require the use of drilling mud.	A water base drill-in fluid will be utilized and will be the same as the other Leviathan developments wells, no MOBM is currently planned for Leviathan-4.	The answer is unclear: Will all of the drillings included in stage A of the Leviathan-5 to Leviathan-10 Development Plan only be effected with WBM and not with MOBM? A clarification must be added in this regard and it must be noted which of the drillings are going to be drilled with water based mud and which are planned, at this stage, to be drilled with mineral oil based mud as well.	For Leviathan-5 through Leviathan-10 wells, the riserless sections [REDACTED] will be drilled with WBM. After running the BOPs / riser and wellbore circulation is established back to the drilling rig, all subsequent intervals [REDACTED] will be drilled with MOBM.
40		3.7.2.2	Discharges from the operations to drill the new wells include the discharge of drilling mud (in stage A below), cutting discharge and left-over cement in accordance with the drilling plan, [REDACTED] All of the chemical and offshore discharge data, as well as a summary of the data about the materials must be submitted in tables, including in excel format.	Noted. This information will be provided in the Discharge Permit application.	It was noted that this information would be set out in the context of the Discharge Permit. However, data was set out in Attachment 4 (Table 3-40 – Discharge Data) and in Attachment 6 (Chemical Data). With respect to the chemical data table in Attachment 6, a legend must be added for the colors that were used in the table.	An updated table (chemical data) with legend is provided in Attachment 6 .
41					The data was not submitted in an Excel table as appears in the instructions. Please complete this.	The native Excel files for the tables previously provided in Attachment 4 (Discharge Data) and Attachment 6 (Chemical Data) were provided to the Ministry on 15 December 2016.

Table 1. (Continued).

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42			<p>This data, with an emphasis on the Leviathan 5-10 wells, relates to discharge from a single well: Stage A, before installation of the riser pipeline and installation of the BOP, [REDACTED]. At this stage, the water based drilling mud (WBM) and cutting discharge are discharged / dumped around the bore on the seabed. [REDACTED].</p> <p>[REDACTED] During this stage, the drilling mud and cutting discharge are loaded onto the platform. The drilling mud is separated from the cutting discharge using sieves (we don't know what size) and is put back into the process. The table describing the stages of the drilling operations (Table 3-14) must be expanded so as to include: Columns for setting out quantities. Offshore discharge of mud and cuttings (presented in cubic meters), the length of each segment, the depth of the well beneath the seabed, TVD, MD, BML, BWD and the total quantity of mud to be discharged into the sea in stage A, the total quantity of cutting discharge in stage A and the total quantity of cutting discharge in stage B.</p>	<p>Noted. This information will be provided in the Discharge Permit application.</p>	<p>It is acceptable that the information requested in this section regarding offshore discharges for each segment be submitted in an application for discharge permit. However, the information requested regarding the drilling plan must be completed: the length of each segment, the depth of the drilling beneath the seabed, TVD, MD, BML, BWD. This information must be set out in Table 3.14.</p>	<p>Reference Attachment 20.</p>
43			<p>The following abbreviations must be added to the glossary of abbreviations: TVD, MD, BML, BWD.</p>	<p>TVD - True Vertical Depth MD - Measured Depth BML - Below Mud Line BWD - Below Water Depth</p>	<p>Acceptable.</p>	<p>-----</p>
44			<p>[REDACTED]</p>	<p>[REDACTED]</p>	<p>Acceptable.</p>	<p>-----</p>

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
45		Table 3-14 and Table 3-15	Ensure that the data in Table 3-15 matches the data in Table 3-14. Furthermore, the chemicals used in the brine and the chemicals in the WBM, and total consumption, discharge, must be set out separately.	Table 3-14 provides the breakdown of the well intervals and includes: hole diameter, interval duration, cuttings discharge (volume and rate), drilling fluid (volume and rate), mud type, and release location. Table 3-15 provides the further details (chemical breakdown) of the brine and WBM. Brine is water with NaCl. WBM is all the products listed in Table 3-15, including NaCl. The chemicals used in the WBM and brine is the type of information that will also be provided in the Discharge Permit application.	Acceptable.	-----
46		3.7.2.3, Appendix H.	Chemicals / information sheets (MSDS) / balance – summary of information sheet data in a table – this is set out in part in Appendix H with respect to information about toxicology / degradability / bio-accumulation; there is no summary of all of the total quantity of the materials and chemicals consumed. The summary table in Appendix H must be resubmitted, including completion of the information on toxicology, degradability and bio-accumulation.	Reference Attachment 6 - Ecological Information. Provides the following information: CAS number, name of material, concentration (%), toxicological, ecotoxicity, degradability, bio-accumulation, UN number, clarification, and PLONOR.	Acceptable.	-----
47			It is also necessary to set out which materials are new materials which have not yet been approved for offshore discharge.	Currently, all chemicals planned for Leviathan will have been utilized on Tamar-8. Any changes, or additions, will be addressed in the discharge and toxins permits.	Acceptable.	-----
48			In addition, a summary table setting out the quantities of each of the materials consumed / discharged into the sea must also be submitted.	Noted. This information will be provided in the Discharge Permit application.	Unacceptable. A summary table must be submitted in the context of the Amendment to the Environmental Document. The information set out regarding discharges may be submitted at the discharge permit stage.	All information regarding discharges was sent to MOEP on 28 September 2016 and amendments to the discharge permit application. Refer to Attachment 4 for discharge data, including an updated Table 3-40. Refer to Attachment 26 for Leviathan-5, Leviathan-7, and Leviathan-3 expert opinion on increased WBM discharge.

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
49		Table 3-15, 3-16, 3-32, section 3.7.2.4	<p>Barite is used as a component of the drilling mud. [REDACTED]</p> <p>[REDACTED]</p> <p>According to examinations conducted in the past on the barite that was used in previous exploration / production drillings, it was found that barite can contain high concentrations of heavy metals and that there is a high level of difference in the metal content. The only metals for which criteria have been set in barite are mercury (less than 1 mg/ kg) and cadmium (less than 3 mg / kg). Table 3-32 sets out the metal content of barite based on tests that were performed at Tamar SW.</p>	Heavy metals analysis of the barite will be provided in a separate submittal once material is sourced for Leviathan.	Unacceptable. You are required, now, in the context of the current discharges, to act to find a source of barite with reduced heavy metal content. The metal content of the barite (loads for offshore discharge) must be set out on the basis of the existing information. In the context of the offshore discharge application you will be asked to set out the actions that you took in order to find barite with reduced metal content.	Reference Attachment 21 and Table 3-New in Attachment 4 .
50			In the context of the application for discharge permit for the Tamar 8 drilling, Noble Energy reported its intention to use barite that exists in Israel which originates from Turkey, and that it would collect a number of samples of the barite in order to conduct a metal analysis from each bore, and in total. The application also stated that if additional barite is required during the course of the drilling, an effort would be made to purchase barite that contains a low concentration of metals from each bore, and in total.	Noted. No further action is required.		
51			The results of updated analyses of metal content of barite must be presented together with the quantity of metals (kg) which shall be discharged / dumped into the sea from this source.	Heavy metals analysis of the barite will be provided in a separate submittal once material is sourced for Leviathan.		

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
52		3.7.2.4	<p>MOBM-based cutting dispersion model – was effected in the context of the Environmental Document (Appendix K). This model was run in winter conditions (December-February) and in summer conditions (July-September). No significant difference was found between the seasons for dispersal of cuttings, except only at a layer thickness of less than 1 mm. According to the results of the model, the impact of discharging cuttings is in the range of 1 km around the drilling site. The assessment of the authors of the Document is of a significant impact at a coverage thickness of 54 mm, which is up to 27 meters from the wellhead (hazardous effects level of 50%), and a low impact at a coverage thickness of 6.3 mm, which is at a distance of 55 meters from the wellhead (hazardous effect level of 5%). Ensure compatibility between the data appearing in Appendix K and the description on page 3-42, in the third and fourth paragraphs. In the monitoring that is conducted at the end of the drilling, the coverage data and the area in fact impacted must be taken into account in comparison with the findings of the model. Updated guidelines will be given in light of the experience that is accrued at Tamar 8, if the discharging of cuttings after treatment in the TCC facility is allowed.</p>	<p>Data appearing in Appendix K regarding muds and cuttings modeling is consistent with the information presented on Page 3-42 of the EIA.</p> <p>The following is noted: post-drill monitoring must take into account the findings of the model in comparison with the coverage data and the area impacted.</p> <p>In Section 3.7.2.4 (Page 3-42), "ha" needs to be replaced with "km" in the section titled "Surface Discharges from the Drilling Rigs".</p>	<p>Acceptable. Since the drilling at Tamar-8 and the drillings at Leviathan-5 and Leviathan-7 will not use TCC, but rather removal to the shore, the comparison of the monitoring data with the results of the model will be effected in the first drilling that will be used in the facility.</p>	-----
53		3.7.2.5	<p>The proposed tests are on the basis of the previous permits that used water based drilling mud only. The monitoring and control plan shall be examined and set in the offshore discharge permit and in accordance with the sources of discharge that are approved.</p>	<p>Noted. No further action is required.</p>	<p>No comments.</p>	-----
54			<p>Toxicity tests and adaptation of them to conditions in Israel (Appendix L) – the proposal regarding toxicity tests is acceptable. However, two types of toxicity tests should also be performed on the produced water, since these are done in Israel – cytotoxicity (harm to living cells) and genotoxicity (harm to DNA). See also the comment on section 5.2.5, point four, below.</p>	<p>Noted.</p>	<p>No comments.</p>	-----

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
55	3.6.1.13.9 Sketches, notation of physical data of units of production / process / treatment and return of drilling mud ...		The Document contains no reference to this item.	Noted. This information will be provided in the Discharge Permit Application. Additionally, this will be provided in a separate submittal.	Acceptable.	Reference Attachment 22 .
56		Table 3-33	The table sets out the metal content of the cutting discharge based on data from Tamar SW, where the drilling was effected using WBM. It must be clarified whether, and how the data regarding metal content in the cutting discharge from Tamar SW is relevant to the Leviathan drilling and whether a change is expected in the metal content after treatment in the TCC facility, when MOBMs is used in the Leviathan wells.	According to Section 3.7.2.6 of the EIA, data on the chemical characteristics of Leviathan Field drilling mud and cuttings discharges are not available. However, data from the Tamar SW-1 well in the Tamar Field are considered representative since this was the most recent well drilled in the area and it has virtually the same objectives as the upcoming Leviathan wells proposed in this EIA. The metal content is not expected to change between the use of WBM and MOBMs. It is also not expected to change after treatment in the TCC facility.	No comments. Note that the comparison with Tamar SW is only relevant to the two first segments of the drilling.	-----
57		Table 3-34	The table sets out data regarding radioactive substance content in the drilling mud and in the cutting discharge. The data that is set out originates in the Tamar SW drilling, where the entire drilling was effected using WBM. Since the radioactive substance content is correlative to the structure of the geological strata and not to the composition of the drilling mud, details and reasons should be given as to why the radioactive substance content at Tamar SW is relevant to the Leviathan drillings.	As noted in Table B-1 (page B-27), "Data presented from the Tamar Field are considered representative" as they are drilled into the same geologic structures, to the same depth, with the same reservoir fluid content. Therefore, it is anticipated that radioactive substance content will be similar for the Leviathan wells as Tamar SW.	Acceptable.	-----
58		3.7.3	Upon selection of the drilling platform, the following data must be submitted: Discharge (Table 3-35) and bilge discharge data: Updated capacity data must be submitted for all sources of discharge during ongoing operation, with details of the method of controlling the quantities as well.	Noted. This information will be provided in a separate submittal when the drilling rig has been selected.	It is necessary to complete the data when the platform that is going to complete the drillings is selected, and if the platform for completion of the drillings themselves is not the Atwood Advantage, the data shall be submitted in the application for discharge permit.	Noted.

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
59			<p>Sanitary effluents: The method of operation of the treatment facilities must be described, along with a schematic drawing of the facilities; attach the results of the lab tests on effluent quality.</p> <p>Gray water: Note whether there is an oil separator in the kitchen. Furthermore, clarify that use will only be made of biodegradable detergents which are suitable for seawater (relevant to gray water). Take into account sampling of gray water in the discharge permit (a sampling tap will be required).</p> <p>Cooling Water: Set out whether use will or will not be made of cooling water and set out the capacity data.</p>	Noted. This information will be provided in the Discharge Permit application.		
60			Desalination (RO) concentrate: The details of the desalination plant must be updated along with details of whether any additives are used in this plant and up-to-date capacity data must also be presented.			
61			Washes from equipment areas: Describe the oil and water separation treatment facility and the method of controlling the quality of the water prior to discharging it into the sea.			
62			For example, the data in Table 3-35 refer to the SEDCO platform, and the team on Atwood Advantage is expected to be significantly larger.			
63			Note: Bilge – This may be discharged into the sea, subject to compliance with a threshold value of no more than 15 mg/L of mineral oil and constant monitoring of mineral oil.			

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
64		3.7.3.1 and 3.7.3.2	The method of discharge of the various sources (depth and diameter of the pipeline from the platform) depends on the drilling rig (except for discharge onto the seabed, which depends on the technology), with respect to the following sources of discharge: cutting discharge, sanitary effluent (black water), gray water, organic kitchen waste, RO concentrate, cooling water, bilge, production tests (see reference to discharge from production tests in section 3.3.1 above). The document was prepared before the platform was selected. However, for instance, the discharge pipeline data from the Atwood Advantage platform is set out for the sources of discharge from ongoing operations, including pipeline diameter and pipeline depth. The data regarding the method of discharge must be filled in, in detail, after selection of the drilling platform – the information may be submitted in the application for offshore discharge permit.	Noted. This information will be provided in the Discharge Permit application.	If the platform for performance of the drillings is not the Atwood Advantage, the data will be submitted in the context of the application for discharge permit.	Noted.
65		Table 3-40	Table 3-40 sets out a summary of discharge data (from drilling operations and ongoing operations) for a single well. Table 3-40 must be updated so as to include a column setting out total discharge quantities from all wells and to set out quantities in cubic meters as well. The total quantities must also be set out in accordance with removal targets – including quantities of WBM and cutting discharge that will be left on the seabed, around the well-head (stage A), total quantity of drilling discharge after treatment (stage B), quantity of cement, brine at the end of the drilling, etc.	Revised Tables with quantities presented in cubic meters are presented in Attachment 4 .	Cooling water and upper drainage water data set out in Table 3-40 – at the individual drilling level (and on the basis of which data for all of the drillings is calculated), is substantially different (more than 2 degrees) from the Tamar 8 data that was set out in the Offshore Discharge Permit. Note that with respect to drain water, it is clear that the season of the drilling is related, in terms of rainwater, but the table contains no reference to that. This must be checked and completed (cooling water and drain water). With respect to the rest of the sources of discharge, note that the discharge data set out for Tamar 8 and Leviathan is not identical, but it is within the same range.	Refer to Attachment 4 for an updated Table 3-40.
66	3.8.4	Figure 3-19, p. 3-55.	This figure is illegible. Please provided it at a high enough quality so that the data and the legend are clear and legible.	Please refer to Attachment 7 - Proposed TA Well Barrier Schematic.	Acceptable.	-----

Table 1. (Continued).

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67		4.3 Running of model to predict oil spill dispersion, figures 4-2, 4-3, 4-4.	Comments in the context of use of the OSCAR model and the requirement to fill in the environmental document were provided to you on July 26, 2016. Furthermore, figures 4-2 to 4-4 are illegible – please increase the resolution and increased the size of the drawings. After receipt of the above clarifications and completions, our final response to this chapter of the Environmental Document will be submitted.	The OSCAR model was not used in the drilling EIA. Figures 4-2, 4-3, and 4-4 show the MEDSLIK model results. A high resolution of the Figure and a full description of the modeling results can be found in Appendices M and N of the EIA.	Acceptable.	-----
68		Tables 4-7 & 4-8	The basis for Noble Energy’s atlas for classification of the coastal segments in accordance with environmental sensitivity, as quoted in the heading of the table, must be noted.	The environmental sensitivity index (ESI) data presented in Section 1.6.4 and Table 1-13 was prepared by MoEP, not Noble Energy. The reference for the ESI data will be corrected to: [MoEP] Ministry of Environmental Protection 2006. Atlas of Israel coastal sensitivity to oil pollution in the Mediterranean. Marine and Coastal Environment Division, Jerusalem, State of Israel.	Acceptable.	-----
69		Figures 4-5 and 4-6	The legend of these figures is illegible. Please increase the resolution.	Reference Attachment 8 .	Acceptable.	-----
70		4.6.2.4	The reference in Chapter 4 to objects found in the side scan sonar is as though it referred to antiquities sites only. There is no certainty that these are not hard seabed fauna habitats, which might contain rare species. Until clarification of the relevant descriptions in a supplementary analysis, objects that protrude above the seabed must be treated as potential habitats in the Environmental Impact Chapter as well. With respect to that, the visual	No hard beds with biological sensitivity were identified at the five locations that were surveyed. Prior to drilling Noble Energy will submit the location of the hard bed sites that were found within 1 Km from the proposed drilling sites, marked on the map.	Acceptable. This issue was looked at the meeting when we reviewed the videos that were conducted in the context of supplementation of the necessary information.	-----
71					The response of the Antiquities Authority is lacking.	The letter from the Israeli Antiquities Authority (dated 10 February 2016) was provided as Appendix F of the Environmental Document. This letter is provided in Attachment 9 .

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
72		4.6.2.4 (cont'd)	examination of all of the items that were identified, and that are located at a distance of less than 1 km from a bore or other planned infrastructure, must be completed.		You stated that the hard bed sites that are located 1 km from the drilling site would be set out on the map in the lead-up to the drilling. For the avoidance of doubt, it is emphasized that if there is a hard bed site that is at a distance of less than 1 km from the drilling site, a video survey must be conducted of it in order to ensure that it is not a sensitive habitat. You are requested to provide our firm with the aforesaid date so that if a sensitive site is found within a 1 km range of the drilling site, it will be possible to prepare and to adjust the location of the drilling site so as to be at least 1 km away from the sensitive site.	Reference Attachment 10 .
73		4.6.2.5	The choice of high quality barite must be added (low concentration of heavy metals).	Heavy metals analysis of the barite to be provided in a separate submittal once material is sourced for Leviathan.	Unacceptable – this does not relate to details of the composition of barite but rather, the requirement that it be high quality. You are already required, now, to act to find a source of barite with reduced heavy metal content.	Reference Attachment 21 .
74		4.6.3.2	Clarify whether these are the same measures for preventing impacts caused by the discharge of bilge water and deck drainage from both drillships and platforms.	The same measures apply to both drillships and platforms (i.e., semi-submersibles).	Acceptable.	----
75		5.1.1	It is set out that use will be made of a safety and environment management system and that the components [of it], and Noble Energy's systems will be integrated with those of the contractor (a third party) via a bridging document. A draft of this document must be provided after selection of the contractor.	Noble Energy will provide a copy of the bridging document following final rig selection.	The document has been submitted. A meeting was held on November 7, 2016 in which comments were made and the document must be completed in accordance with the summary of the meeting.	-----
76	5.5.1	5.2.1	There are no instructions for completion of the information after the drilling platforms are selected.	Reference response to Section 5.1.1. Noble Energy will notify the Ministry once the rig is selected. Noble Energy will submit an updated bridging document and an update discharge permit, as appropriate.	Acceptable. The estimated time for choosing the platform for completion of the drillings must be noted.	Reference Attachment 23 for the Bridging Documents between Noble Energy and Atwood Oceanics. The Attwood Advantage will be used to drill Leviathan-5, Leviathan-7, and Leviathan-3 ST. Similar bridging document will be signed for future wells and completions (reference Table 3-1 in the Environmental Document). At least six months are required to select a rig for completion.

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
77	5.5.4	5.2.4	There are no instructions for regions suspected of being potential habitats of hard bed fauna prior to conducting the examination and in the event that the examination required in section 4.6.2.4 above confirms such.	In the United States Gulf of Mexico, guidelines are presented in NTL 2009-G40 for Deepwater Benthic Communities (including chemosynthetic and deepwater coral communities). The guidelines prescribe separation distances of 2,000 ft (610 m) from each mud and cuttings discharge location and 250 ft (76 m) from all other seafloor disturbances.	Pursuant to the recommendations that were received in the strategic survey, the safety range must be set to 1,000 m from sensitive habitats. The proposed distance for the preservation of archeological monuments is acceptable.	Noble Energy will maintain a buffer of 1 km for well locations from hard bottom chemosynthetic habitats.
78	5.5.5	5.2.5	Post-Drilling Monitoring Plan: In order to examine the impact of the cutting discharge on the seabed, you are requested to submit a sampling and monitoring plan, which will provide a response to this, for approval.	Noted. This information will be provided in a separate submittal.	Acceptable. The submission time must be set out.	The Post-Drilling Monitoring Plan will be submitted prior to drilling.
79	5.5.6	5.2.5	There are no instructions for preparation of a long-term monitoring plan for follow up and control during the course of production. Please complete this.	Noted.	Acceptable. The submission time must be set out.	The long-term monitoring plan will be provided prior to start-up of production operations.
80		5.2.5 Fourth point	The proposal regarding toxicity tests is acceptable. However, two types of toxicity tests should also be performed on the produced water, since these are done in Israel – cytotoxicity (harm to living cells) and genotoxicity (harm to DNA). See also the comment on section 3.7.2.5 above.	Noted. Noble Energy will check if cytotoxic and genotoxic tests for marine organisms are being performed in Israel in commercial lab by standard procedures.	Acceptable.	-----
81	5.5.8	5.2.7	A. The guidelines for reduction / prevention of contaminant emissions into the air from the oil based drilling mud treatment facility (TCC) must be set out.	See response to 3.4. TCC is a closed system. Oil and water are flashed off, condensed, and collected. Recovered water is discharged along with the cleaned cuttings. Recovered oil is returned to the mud system. The only air emissions are from a diesel engine required to run the TCC. Drilling to track fuel usage and hours on the diesel engine.	Acceptable.	-----
82			B. If liquids are planned to be transferred from the well via a gas separator when using oil-based drilling mud, the guidelines for reduction / prevention of contaminant emissions into the air must be set out.	See response to Section 3.4.		
83			C. If emissions are expected from the storage containers of the hazardous materials on the drilling platform, including drill mud pools, the guidelines for reduction / prevention of emission of pollutants into the atmosphere must be set out.	See response to Section 3.4.		

Table 1. (Continued).

ITEM NO.	SECTION IN GUIDELINE DOCUMENT (5 October 2014)	SECTION IN ENVIRONMENTAL DOCUMENT	MNIEWR / MOEP REMARKS (24 August 2016)	NOBLE ENERGY / CSA RESPONSE (21 September 2016)	MNIEWR REMARKS TO CSA RESPONSE (15 November 2016)	NOBLE ENERGY / CSA RESPONSE (16 January 2017)
84		5.2.10	A guideline must be added for conducting checks on a daily basis to locate sources of dripping / leaks everywhere on the platform.	Normal maintenance rounds will be conducted by rig personnel as part of the normal maintenance procedure.	Partially acceptable. It must be set out explicitly that a daily check will be conducted, similar to that which is done on the Mari-B and Tamar platforms.	During the course of working assigned daily shifts, personnel of the drilling rig will observe their local working area for any leaks on the drilling rig and respond appropriately to address such leaks, if found.
85		5.2.11	Clarify what the safety zone is when the production tests are being conducted.	As submitted to the MOD, there is a 3 nautical mile exclusion zone around the rig during operations. This is sufficient for a safety zone during production testing.	Unacceptable. The distance of 3 miles represents a security zone and not a safety zone for the performance of tests. Please complete this information.	A safety zone of 500 meters will apply during all flaring operations. If a vessel is required to enter the 500 meter safety zone, they must first make contact with the rig's captain / OIM to receive approval.
86		5.2.12	Address the case of a fault on the TCC facility, or a deviation in the values defined in the discharge permit, and clarify whether the matter was coordinated with Ramat Hovav prior to receipt of the material, including reference to expected quantities.	The issue of material receipt due to a fault on the TCC facility, or a deviation in the values defined in the discharge permit was principally coordinated with Ramat Hovav. Detailed quantity information will be provided in the Discharge Permit application.	Unacceptable. When submitting the application to use the facility, please provide the consent of the site and/or sub-contractor who will receive the discharge.	-----
87	5.5.14		There is no reference to the emergency procedures in the event of loss of control of the well, including loss of control of the bore during the transition stage from the Messinian salt stratum to the formation beneath it.	Noble Energy has a salt exit procedure, similar to the GoM procedure, as well as, Atwood Oceanics' well control procedures.	Acceptable. Please provide our office with this procedure.	Reference Attachment 24 (Shallow Water Flow Contingency Plan) and Attachment 25 (Atwood's Well Control Handbook).
88	5.5.16	5.2.15	There is no reference to the instructions for the reports that are required to be given in the deeds of lease of the Leviathan Field. The reporting procedure shall be submitted for the inspection and approval of the Petroleum Commissioner. Instructions for reporting of faults and incidents: All events of oil spills and any incident involving hazardous materials, including cases of "almost incidents" must be reported and investigated, and the report must be submitted to the Commissioner and to Environmental Protection.	Noted. No further action is required.	The clarification is unclear. On the one hand, it is acceptable. But on the other hand, no additional action is required? Please clarify this.	Change sentence to "Noted". Noble Energy acknowledges your comment from 24 August 2016.
89	5.5.17		There is no reference to the instructions in the event of significant changes in the development plan, which require update of the Environmental Impact Document.	In the case of significant development changes that are not included in this document, an amendment to the environmental document will be provided to address the changes.	Acceptable.	-----

Attachment 1
High Resolution Figures from EIA

Figure 1-5: Bathymetric chart of the Leviathan Field. Proposed new wellsite locations are preliminary; final well locations may vary slightly.

Figure 1-6: Seafloor morphology chart of the Leviathan Field. Proposed new wellsite locations are preliminary; final well locations may vary slightly.

Figure 1-7a: Bathymetric map of existing Leviathan-3 drillsite with 2-km radius.

Figure 1-7b: Seafloor morphology map of existing Leviathan-3 drillsite with 2-km radius.

Figure 1-8a: Bathymetric map of existing Leviathan-4 drillsite with 2-km radius.

Figure 1-8b: Seafloor morphology map of existing Leviathan-4 drillsite with 2-km radius.

Figure 1-9a: Bathymetric map of proposed Leviathan-5 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-9b: Seafloor morphology map of proposed Leviathan-5 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-10a: Bathymetric map of proposed Leviathan-6 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-10b: Seafloor morphology map of proposed Leviathan-6 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-11a: Bathymetric map of proposed Leviathan-7 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-11b: Seafloor morphology map of proposed Leviathan-7 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-12a: Bathymetric map of proposed Leviathan-8 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-12b: Seafloor morphology map of proposed Leviathan-8 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

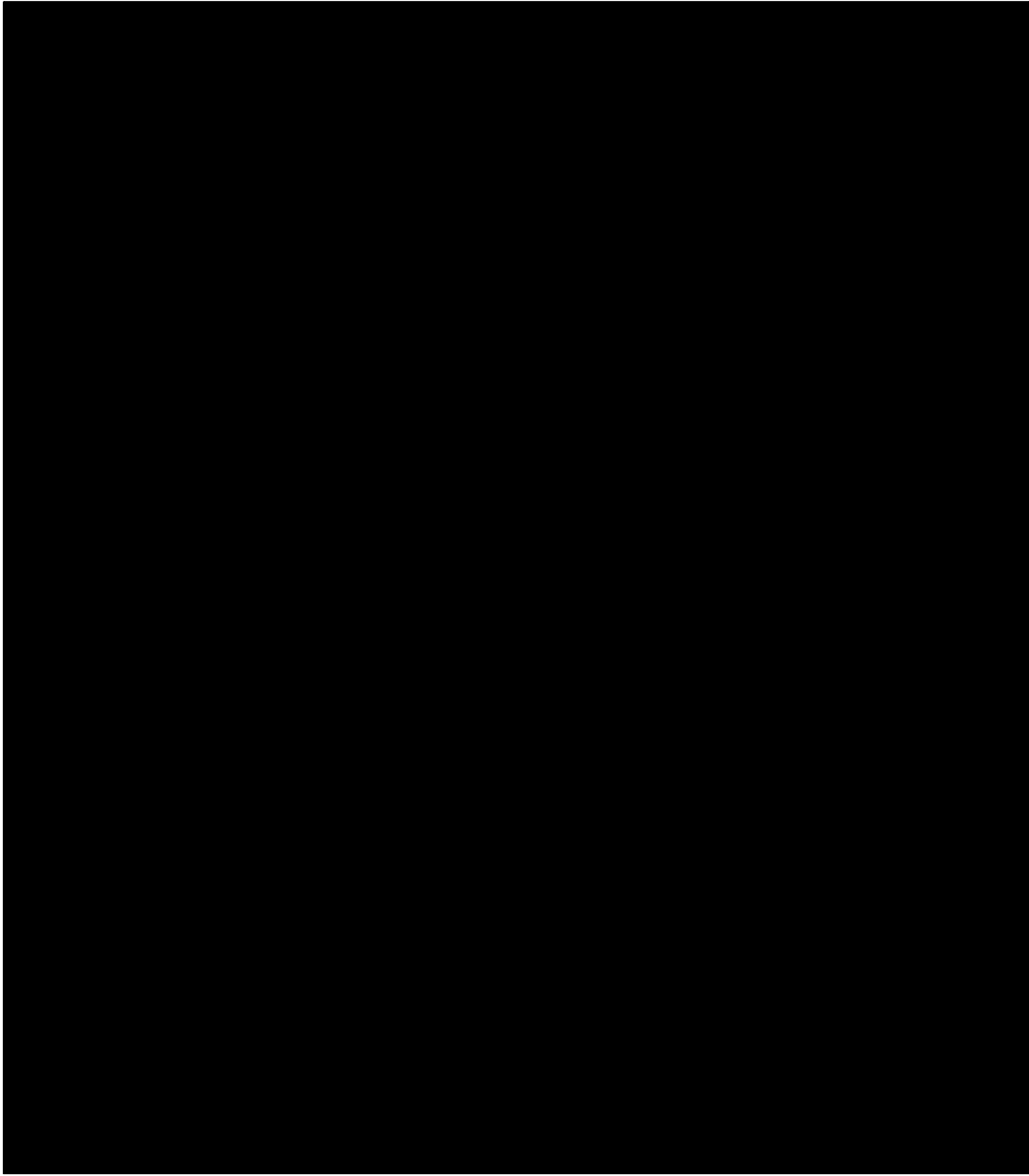
Figure 1-13a: Bathymetric map of proposed Leviathan-9 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-13b: Seafloor morphology map of proposed Leviathan-9 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-14a: Bathymetric map of proposed Leviathan-10 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Figure 1-14b: Seafloor morphology map of proposed Leviathan-10 drillsite with 2-km radius. Wellsite location is preliminary; final well location may vary slightly.

Attachment 2
Planned Wellbore Schematic for Leviathan-3 ST01 Well



Attachment 3
Leviathan Gas Composition

Attachment 4
Consumption and Discharge Data

Table 3-14. Drilling program for an individual Leviathan Field well (representative for Leviathan-5 through Leviathan-10 wells).

Section (Interval)	Hole Diameter (inches)	Interval Duration (days)	Cuttings Discharge		Drilling Fluid (Mud) Discharge		Mud Type	Release Location
			Vol. (m ³)	Rate (m ³ /day)	Vol. (m ³)	Rate (m ³ /day)		

BOP = blowout preventer; MOBM = mineral oil-based mud; N/A = not applicable; WBM = water-based mud.

Table 3-15-1. [REDACTED] total material consumed (and discharged) for an individual Leviathan Field well (representative for Leviathan-5 through Leviathan-10 wells).

Product	Function	Packaging	Amount Consumed (and Discharged)		
			lb	tons	m ³

Table 3-15-2. [REDACTED] total material consumed (and discharged) for an individual Leviathan Field well (representative for Leviathan-5 through Leviathan-10 wells).

Product	Function	Packaging	Amount Consumed (and Discharged)		
			lb	tons	m ³

Table 3-15-3. [REDACTED] total material consumed (and discharged) for an individual Leviathan Field well (representative for Leviathan-5 through Leviathan-10 wells).

Product	Function	Packaging	Amount Consumed (and Discharged)		
			lb	tons	m3

[REDACTED]

Table 3-18. [REDACTED] materials consumed, remaining in well, and discharged for the end-of-well brine discharge for an individual Leviathan Field well (representative for Leviathan-3 and Leviathan-5 through Leviathan-10 wells).

Product	Function	Packaging	Consumed			Remaining in Well			Discharged		
			lb	tons	m ³	lb	tons	m ³	lb	tons	m ³

Table 3-New. Metals Load of Barite for Leviathan Drilling – per well.

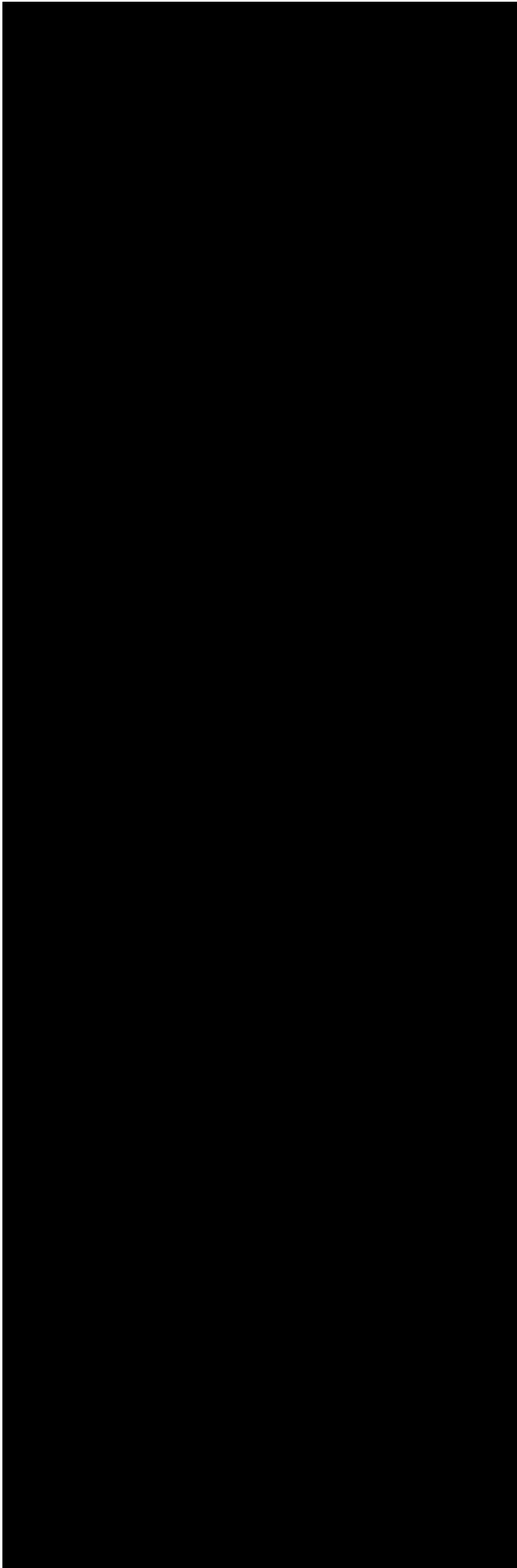
Metals Load of Barite for LEV Drilling – per well												
	WBM	Barite	Ag	As	Cd	Cr	Ni	Hg	Cu	Fe	Pb	Zn
	m ³	MT	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg

[Redacted]

Attachment 5
TCC-treated MOBМ cuttings settling velocities

Attachment 6
Chemical Data

Attachment 7
Proposed Well Barrier Schematic



Attachment 8
**Cumulative deposition thickness for drilling discharges from the Leviathan-9
drillsite**

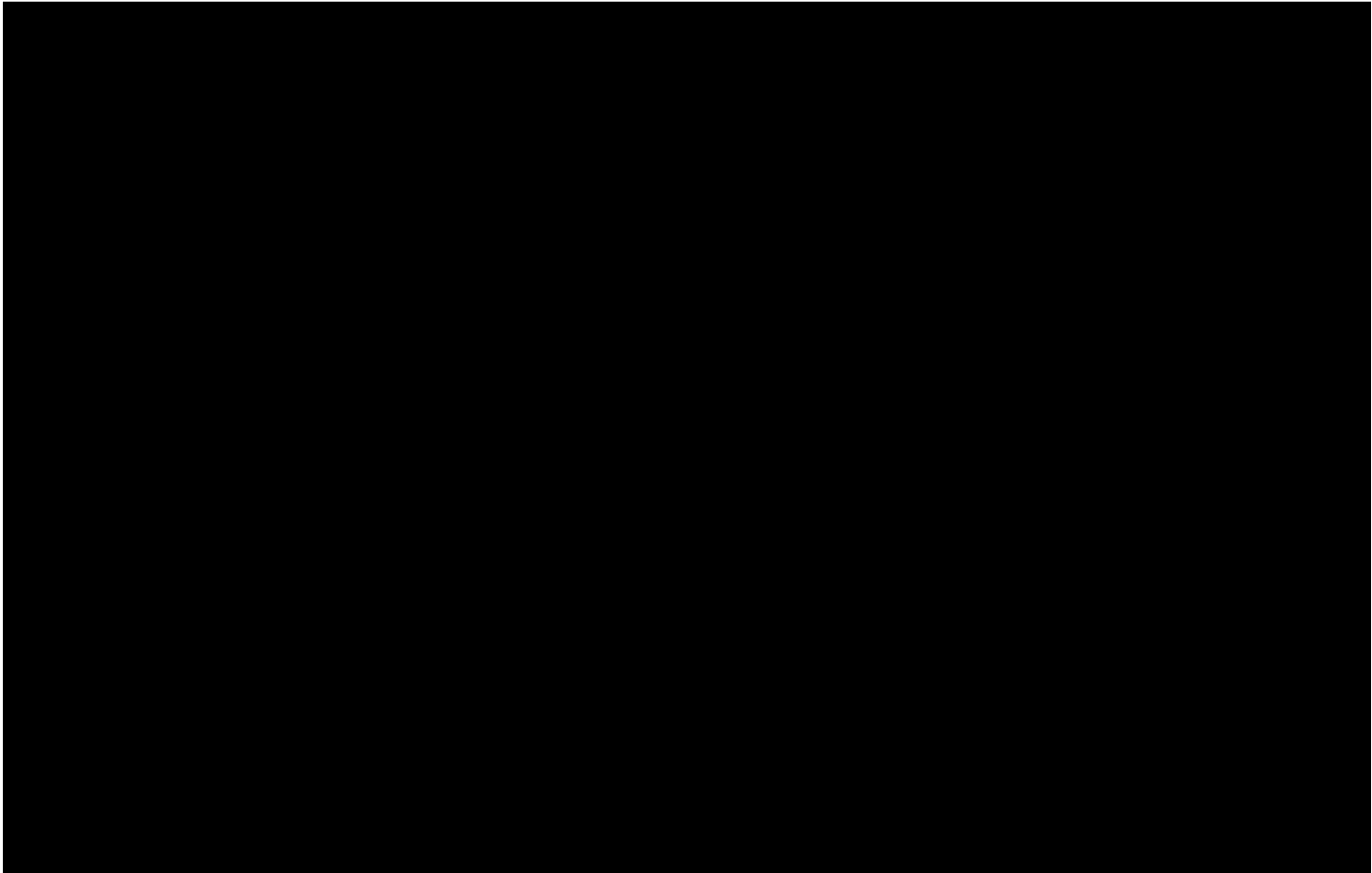


Figure 4-5. Cumulative deposition thickness for drilling discharges from the Leviathan 9 drillsite for the winter (December to February) scenario.

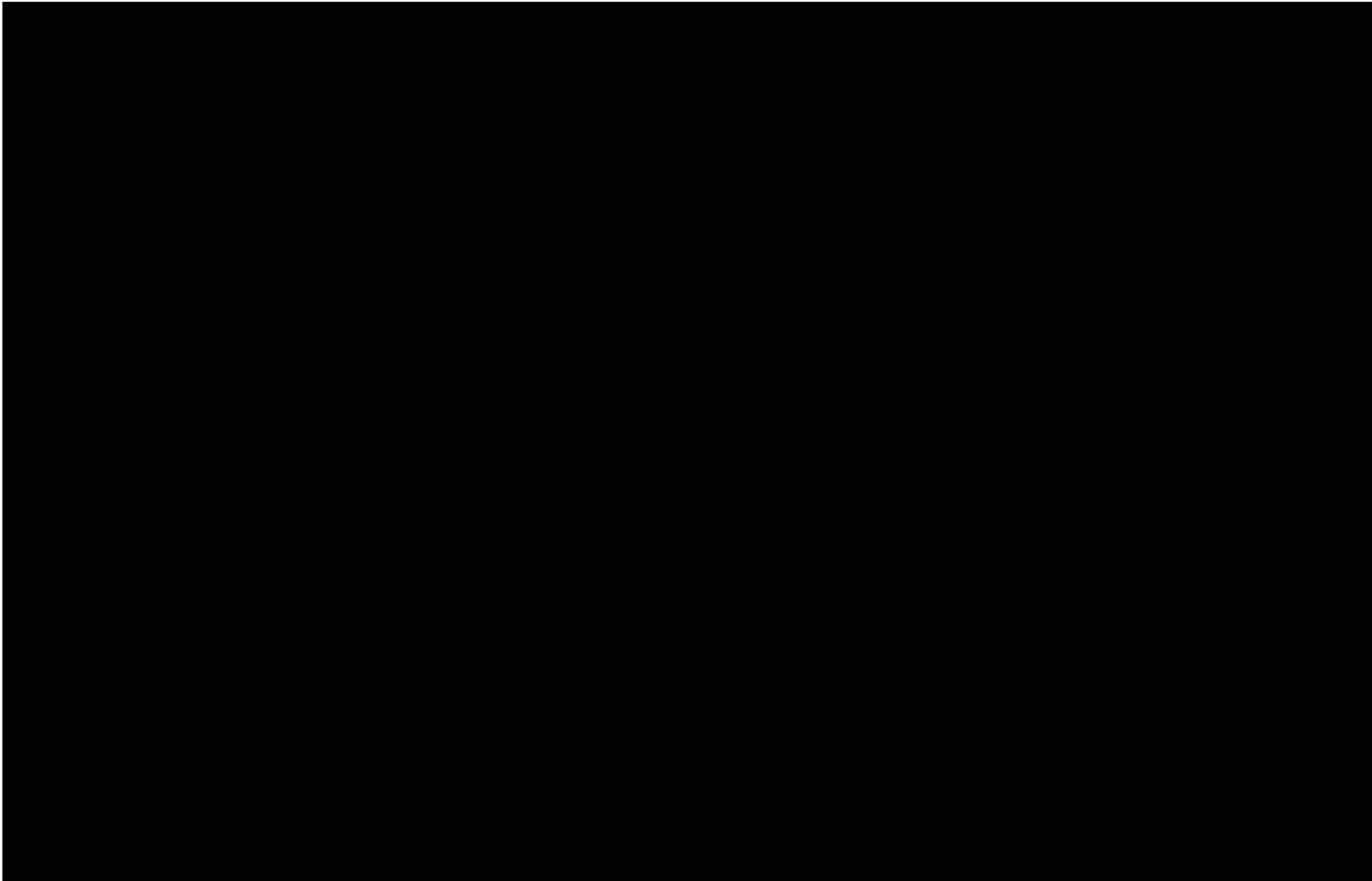
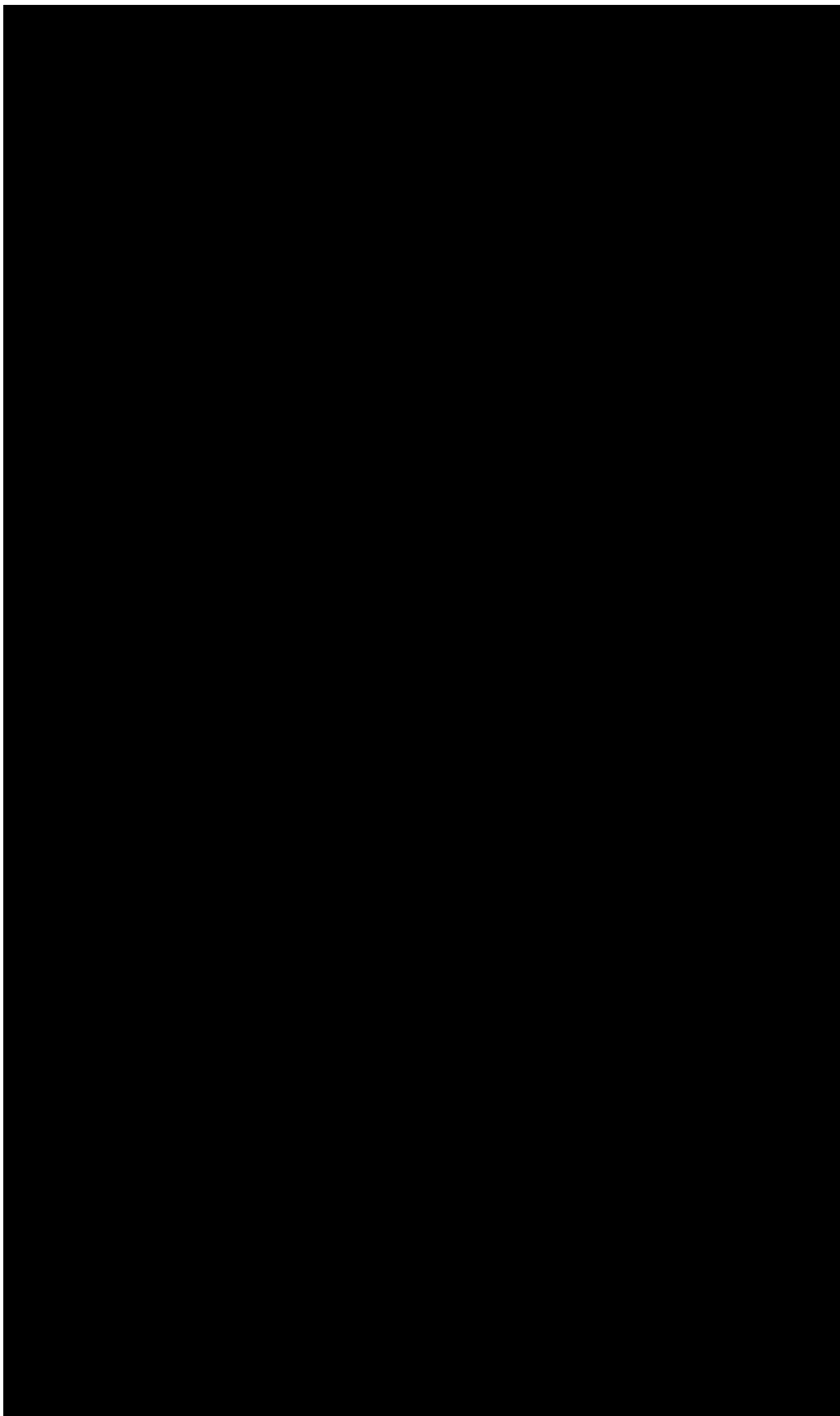
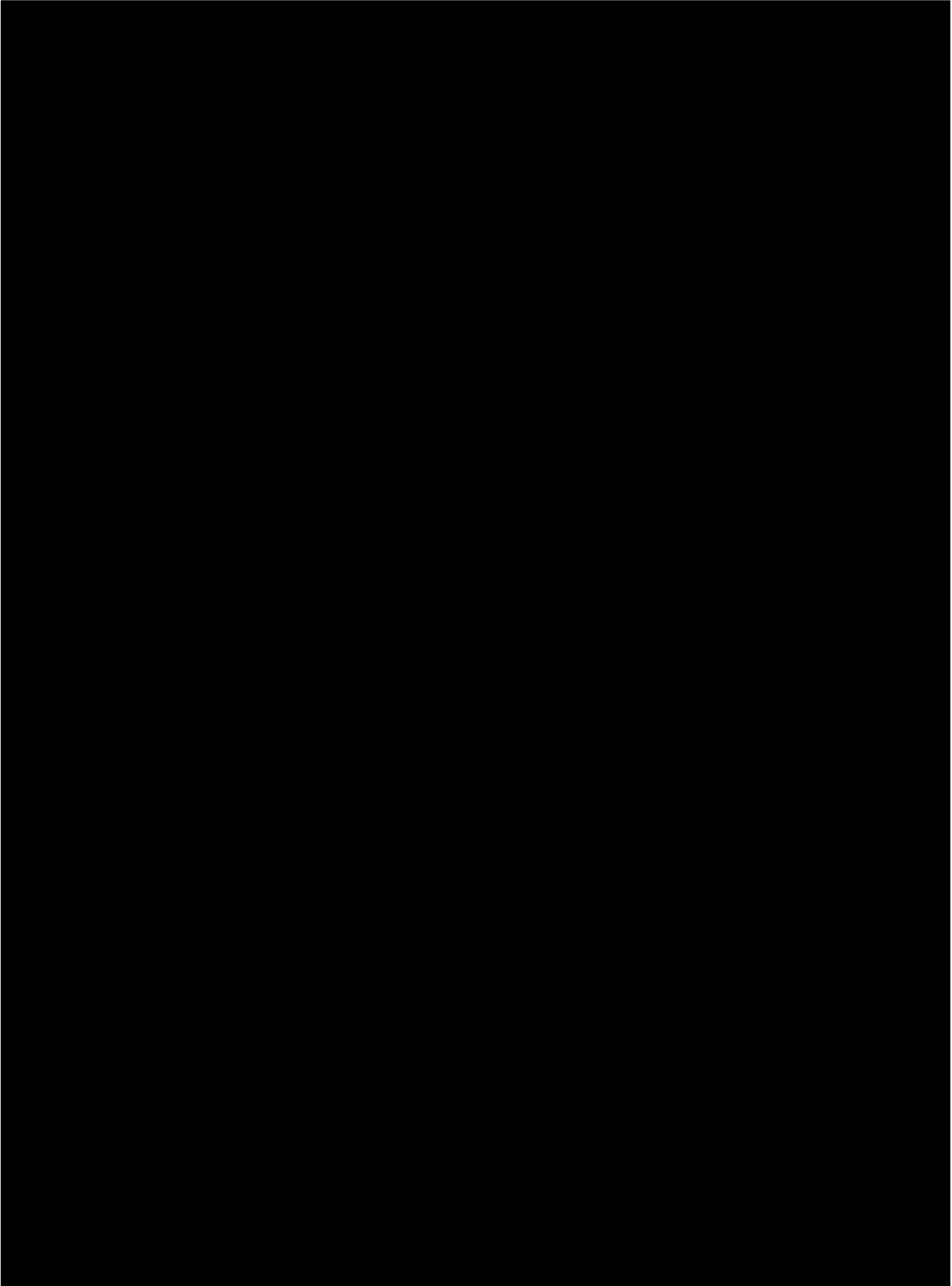
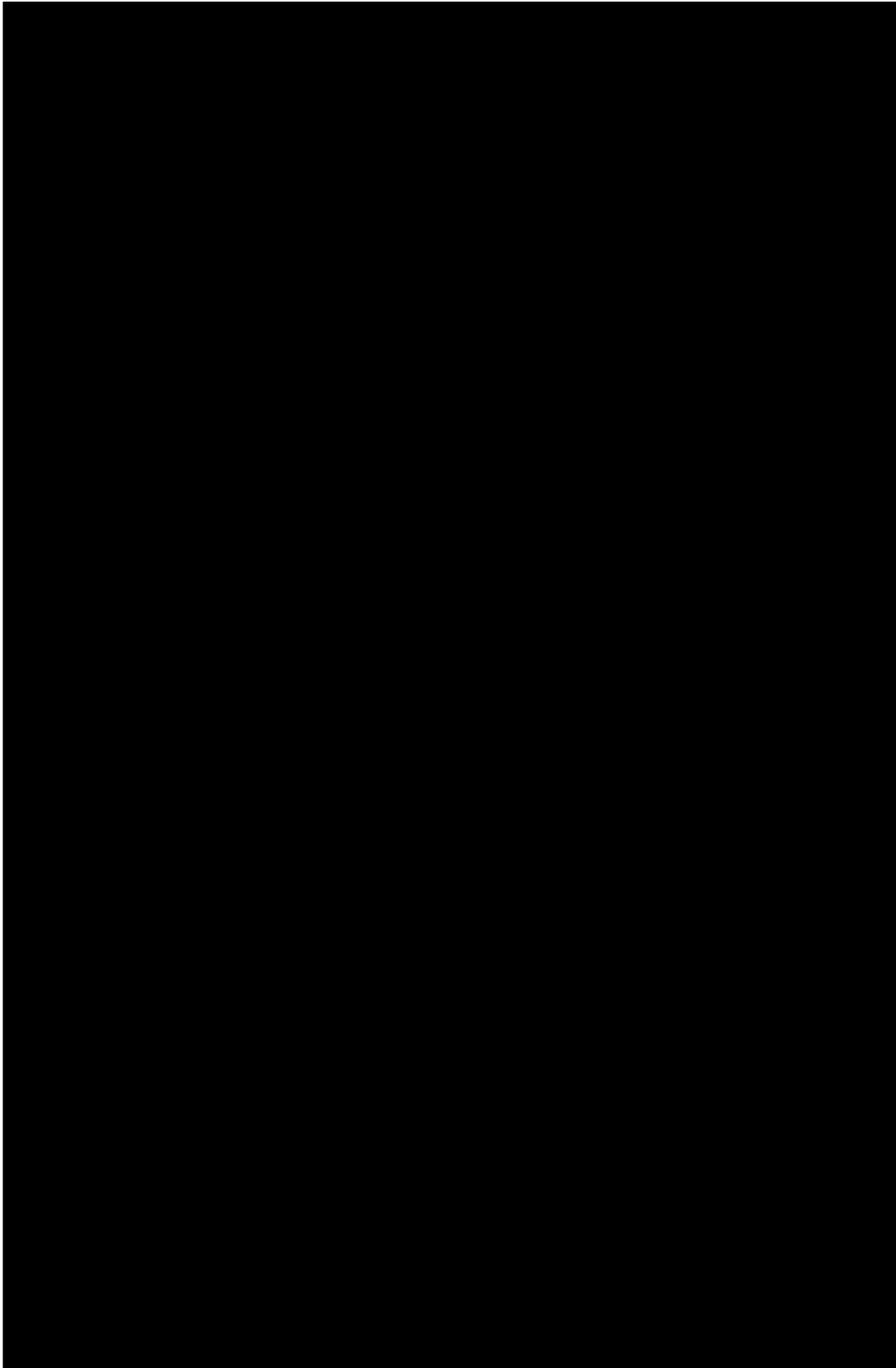


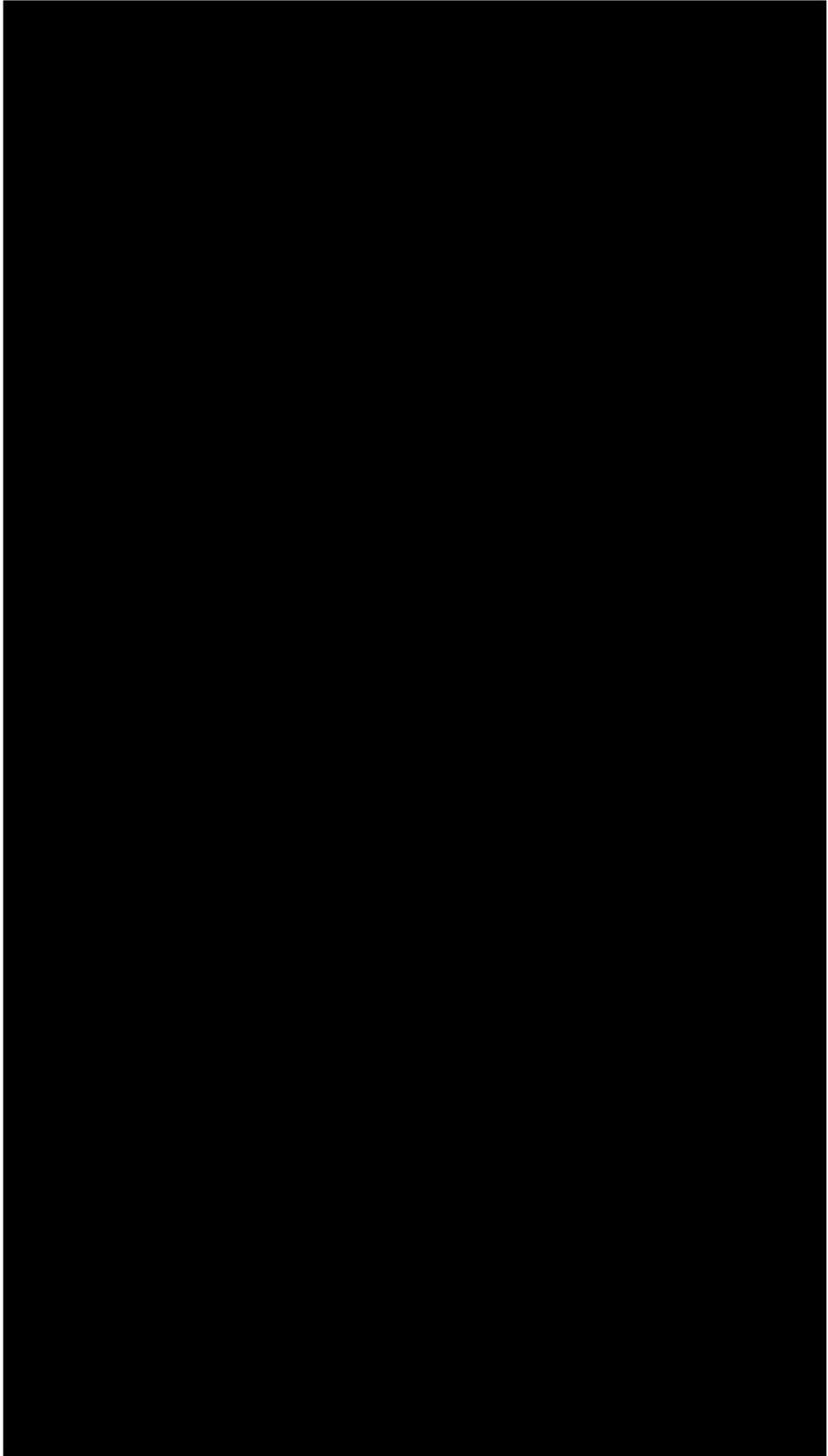
Figure 4-6. Cumulative deposition thickness for drilling discharges from the Leviathan 9 drillsite for the summer (July to September) scenario.

Attachment 9
Letter from Israeli Antiquities Authority









Attachment 10
Well Sites with 1km Buffer

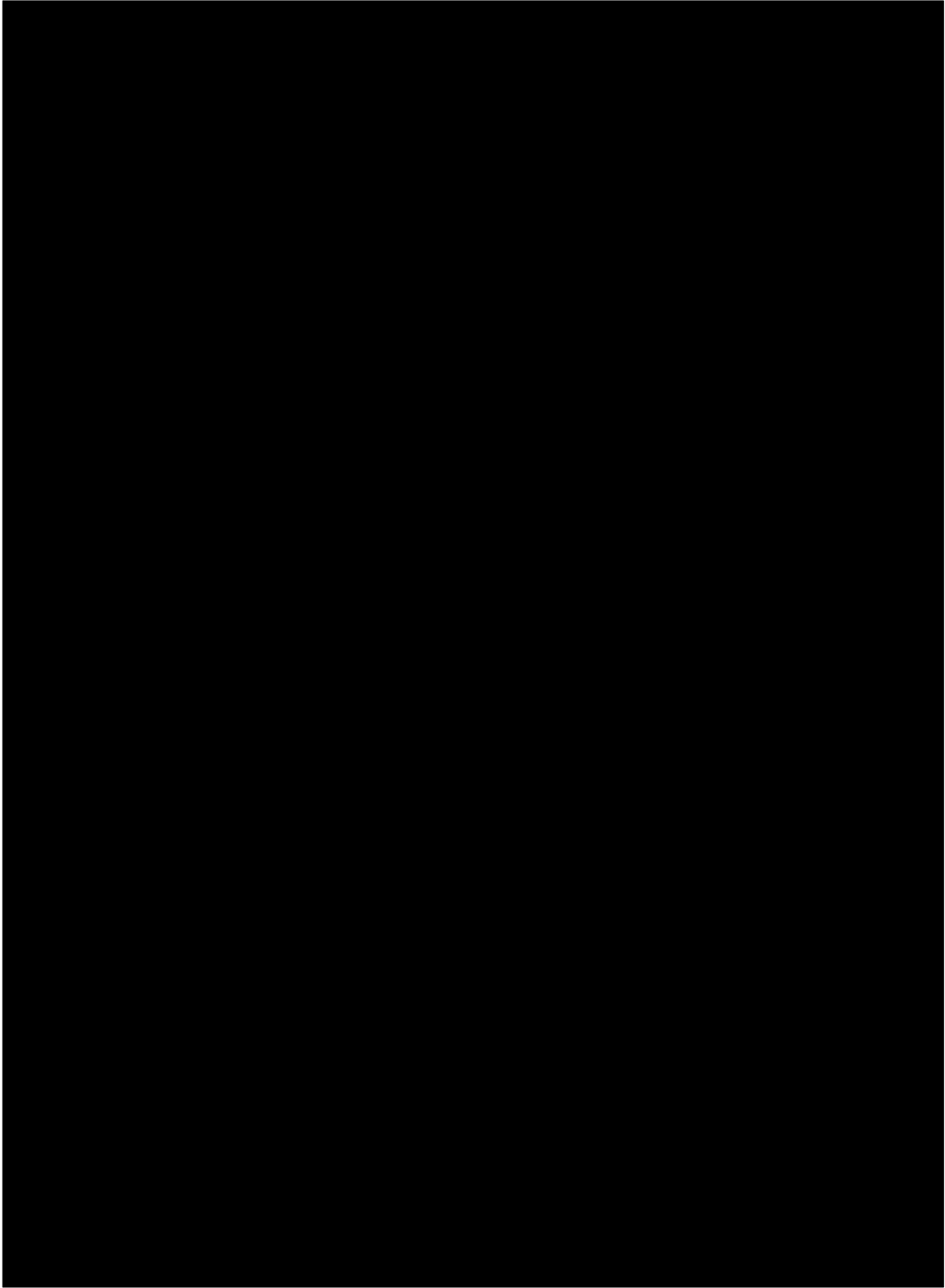
Figure 10-1: Side-scan sonar contacts within 1-km of wellsites Lev-4 and Lev-8

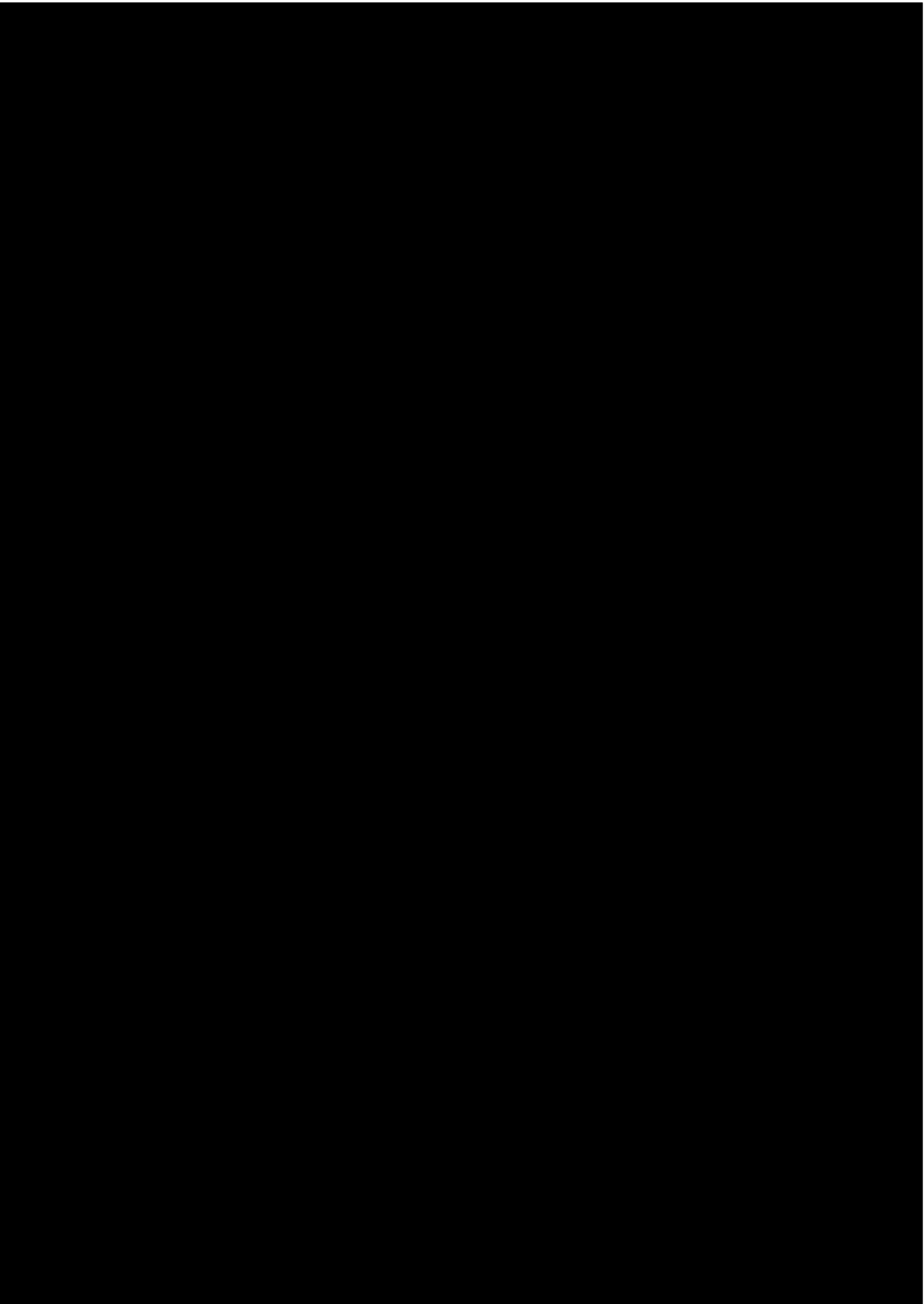
Figure 10-2: Side-scan sonar contacts within 1-km of wellsites Lev-9 and Lev-10

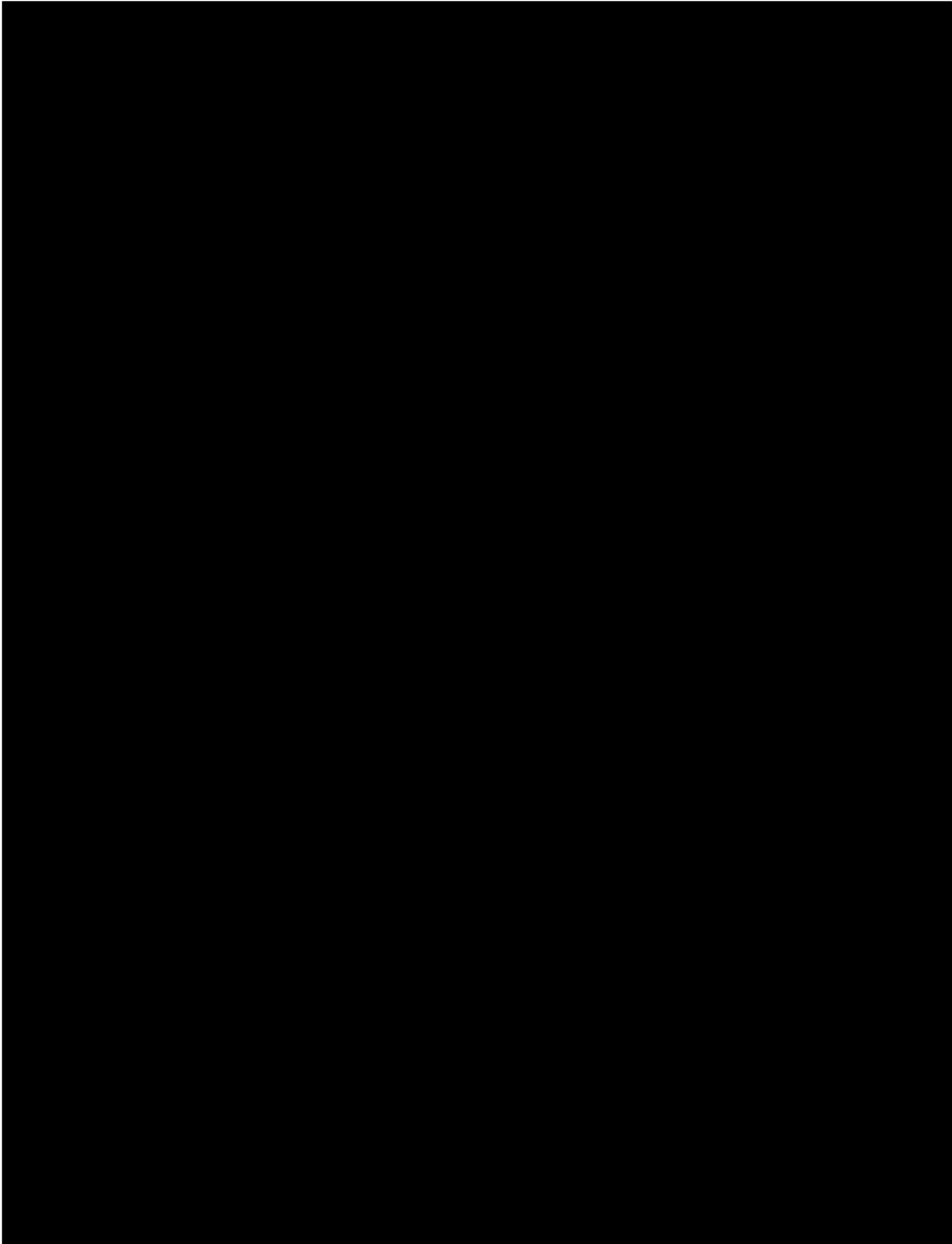
Figure 10-3: Side-scan sonar contacts within 1-km of wellsite Lev-5

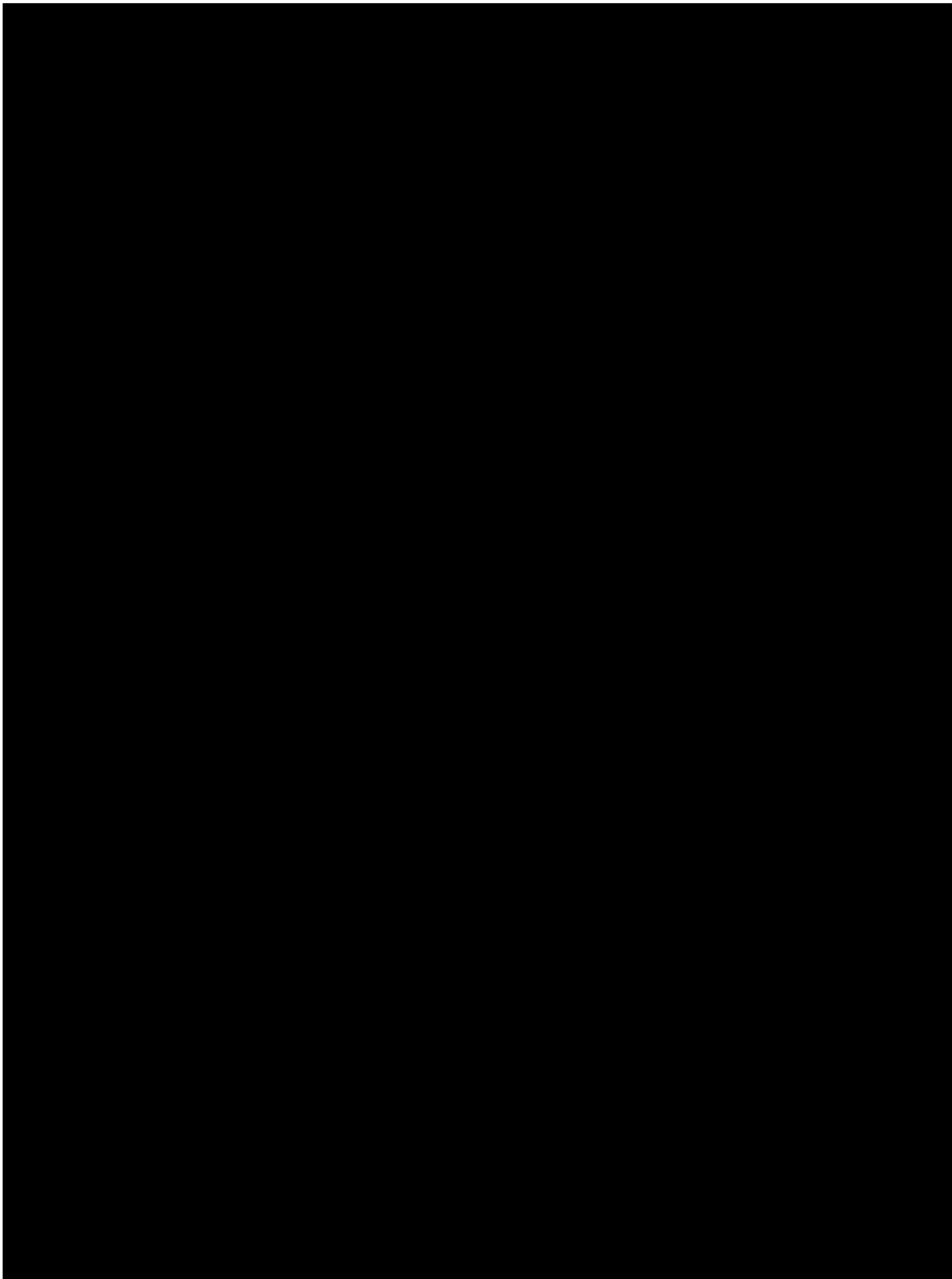
Figure 10-4: 1-km radius around wellsite Lev-3 showing no side-scan sonar contacts.

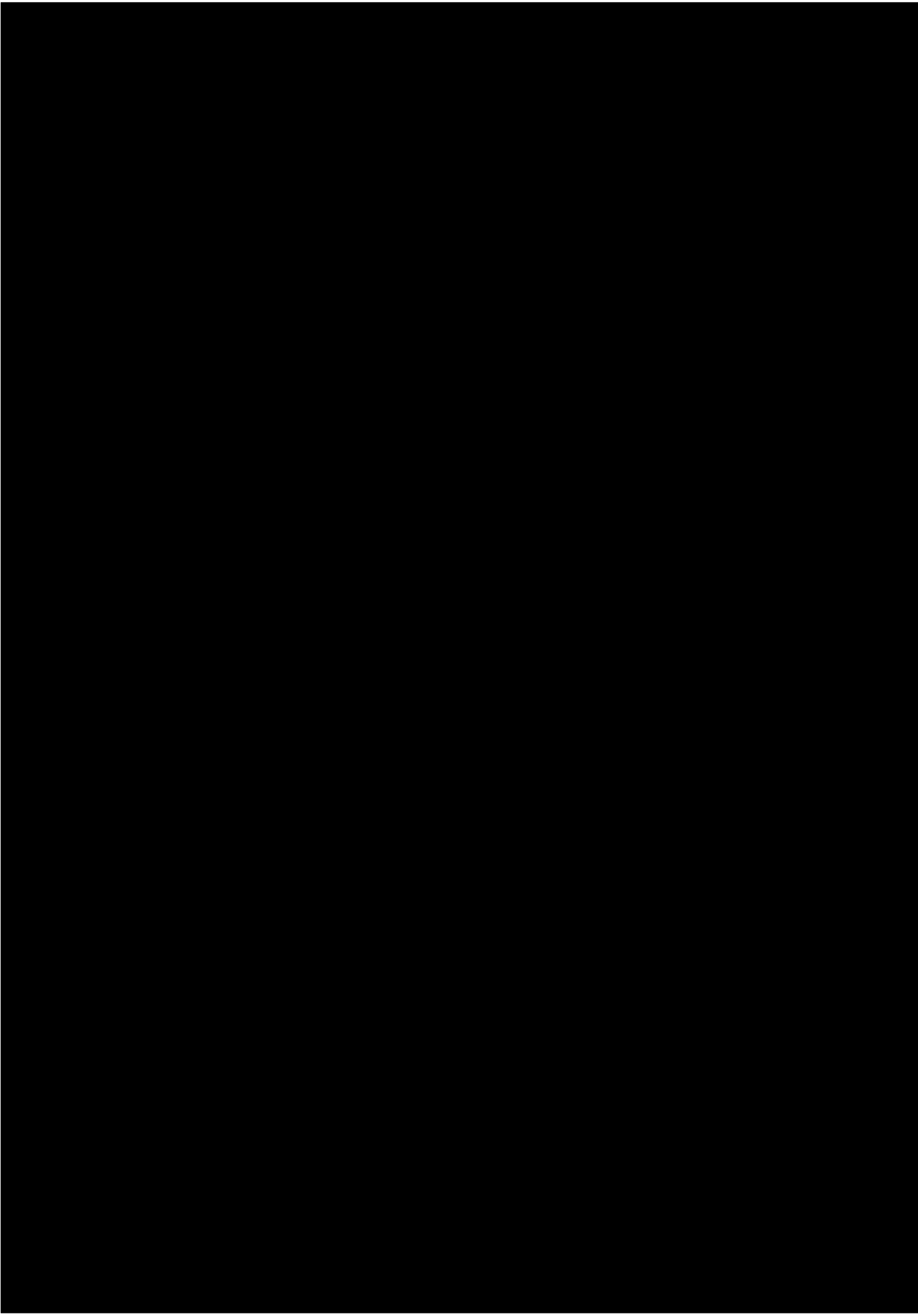
Figure 10-5: 1-km radius around wellsites Lev-6 and Lev-7 showing no side-scan sonar contacts











Attachment 11
Text Amendments to Chapter A of the Environmental Document

Section 1.6.2.4 Nature and Ecology (Fishes)

Added the following statement:

During previously conducted pre-drill surveys at Leviathan-3, Leviathan-4, Leviathan-5, ML-1X, Dalit-Deep, and Leviathan-Deep, as well as during post-drill surveys at Leviathan-2 and Leviathan-4, fish fauna was found to be sparse. The most common fish observed was the tripodfish (*Bathypterois* sp.) which feeds on benthopelagic copepods and epibenthic amphipods or mysidacea (Carrasson and Matallanas, 2001). Other observed fish included halosaurs (*Halosaurus* sp.), phycid hake (Family Phycidae), and catsharks (Family Family Scyliorhinidae). Halosaurs feed on polychaetes, sipunculids, and crustaceans, phycid hakes typically feed on benthic crustaceans and mollusks, and catsharks are typically opportunistic hunters, preying on crustaceans, mollusks, and other fishes (Fish Base, 2016). Therefore, harm to the benthic environment will impact the primary food source for the fish observed in the survey.

Fish observed in the Tamar Field were similar, with the most commonly observed fish being the tripodfish (*Bathypterois* sp.) and the halosaur (*Halosaurus* sp.).

Section 1.6.3 Fishing Areas and Landings

Added the following statement:

Drilling in the field is not likely to affect fishing. The issue of the impact of development on fishing will be discussed in the Environmental Impact Assessment for Installation, Operation, and Maintenance of Pipelines and Submarine Systems for Leviathan Field Development.

Section 1.7.2 Sediment Quality

Added the following statement:

The Levantine Basin mean was calculated from only pre-drill and environmental baseline surveys conducted by CSA for Noble Israel in the eastern Mediterranean Sea offshore Israel. These surveys were performed between 2012 and 2014 and were designed to include sites that were not expected to have been impacted by development. It is important to note that sampling data from post-drill surveys or locations impacted by development were excluded from the calculation of the Levantine Basin mean for the reasons outlined by the Ministry. Analytical concentrations within 2.5 standard deviations generally fall within the 99% confidence limit of the survey area data and can be regarded as ambient concentrations that were not significantly different from each other.

Section 1.13 Leviathan-2 Wellsite Monitoring Summary

Added the following statement:

The water quality surveys conducted at the saltwater pools showed high concentrations of methane within the pools which might be toxic, and a number of dead fish were found within the high salinity water at the caldera. Water quality data collected from the saltwater pool in 2015 indicate that methane concentrations did not increase, and may have slightly decreased, with respect to the February 2014 survey concentrations. The brine pool near the wellhead has gradually decreased in size, salinity and temperature are steadily approaching ambient conditions.

Attachment 12
Amendments to Chapter B of the Environmental Document

Section 2.2.4 Well Clearance and Environmental Sensitivity

Added the following statement:

There are no known fish breeding zones within the Leviathan Field. Tsikliras et al (2010) recently reviewed available literature and data concerning fish spawning in the Mediterranean Sea. They identified 511 spawning stocks from 168 species as spawning within the Mediterranean Sea. For the eastern Mediterranean including the Levantine Sea, 170 spawning stocks from 79 species were recorded, though none were identified as occurring within the Leviathan Field. Most of the spawning stocks occurred in coastal waters inshore of the Leviathan field. Species groups comprising these sites included porgies, searobins, herrings, anchovies, and flatfishes. No information was reported on deepwater demersal (e.g., halosaurus, catsharks, tripodfishes) or midwater (e.g, lanternfishes and bristlemouths) species such as those found in the area of Leviathan Field. Epipelagic fishes (e.g., dolphinfishes, tunas, swordfish) would also be expected in the Leviathan Area, Tsikliras et al (2010) noted that bluefin tuna will spawn in open waters throughout the Mediterranean but could not identify particular locations. Karakulak et al (2004) reported spawning by Bluefin tuna in the Levantine Sea north of Cyprus based on examination of fish landed by the fishery. Thus, although local species may spawn in the vicinity of the field, lack of detailed information precludes an in-depth analysis.

In the unlikely event that spawning occurs in the Leviathan Field, there could be minor, short term impacts from drillship presence (including noise and lights), effluent discharges; water intakes, a small diesel fuel spill, and a large oil spill.

References:

Tsikliras, A.C., E. Antonopoulou, K. I. Stergiou. 2010. Spawning of Mediterranean marine fishes. *Reviews in Fish Biology and Fisheries* 20: 499-538.

Karakulak, S., Oray, I., and A. Correiro, 2004. First information on the reproductive biology of the bluefin tuna (*Thunnus thynnus*) in the eastern Mediterranean. *Collect. Vol. Sci. Pap. ICCAT*, 56, 1158-1162.

Attachment 13
Amendments to Chapter D of the Environmental Document

4.6.2.3 Potential Impacts on Water Quality and Fishes

Added the following statement:

During previously conducted pre-drill surveys at Leviathan-3, Leviathan-4, Leviathan-5, ML-1X, Dalit-Deep, and Leviathan-Deep, as well as during post-drill surveys at Leviathan-2 and Leviathan-4, fish fauna was found to be sparse. The most common fish observed was the tripodfish (*Bathypterois* sp.) which feeds on benthopelagic copepods and epibenthic amphipods or mysidacea (Carrasson and Matallanas, 2001). Other observed fish included halosaurs (*Halosaurus* sp.), phycid hake (Family Phycidae), and catsharks (Family Family Scyliorhinidae). Halosaurs feed on polychaetes, sipunculids, and crustaceans, phycid hakes typically feed on benthic crustaceans and mollusks, and catsharks are typically opportunistic hunters, preying on crustaceans, mollusks, and other fishes (Fish Base, 2016). Therefore, harm to the benthic environment will impact the primary food source for the fish observed in the survey.

Fish observed in the Tamar Field were similar, with the most commonly observed fish being the tripodfish (*Bathypterois* sp.) and the halosaur (*Halosaurus* sp.).

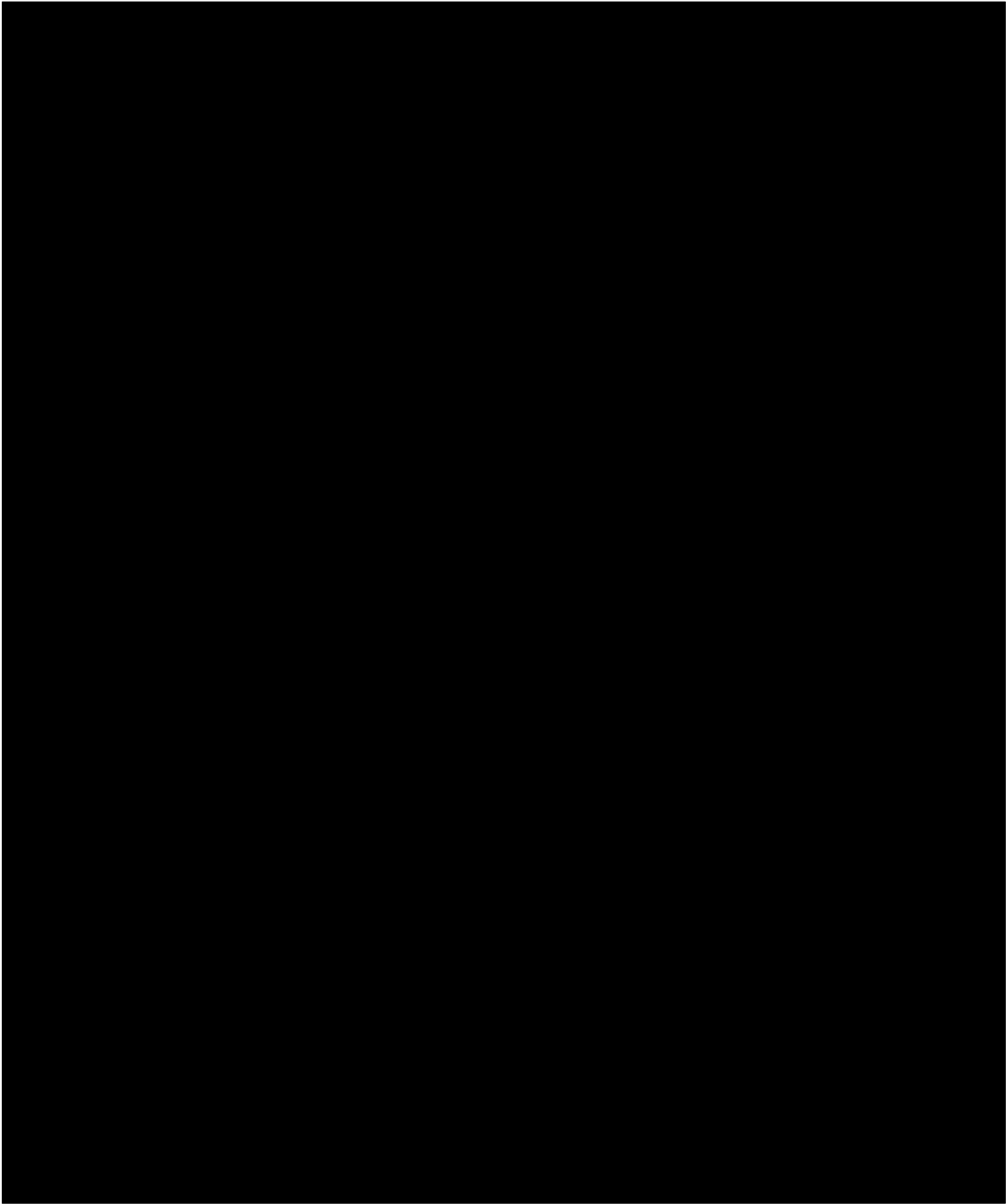
Attachment 14
Amendments to Chapter E of the Environmental Document

**Section 5.2.4 Preservation of Fauna and Flora, Including Pelagic Species
(Guidelines Section 5.5.4)**

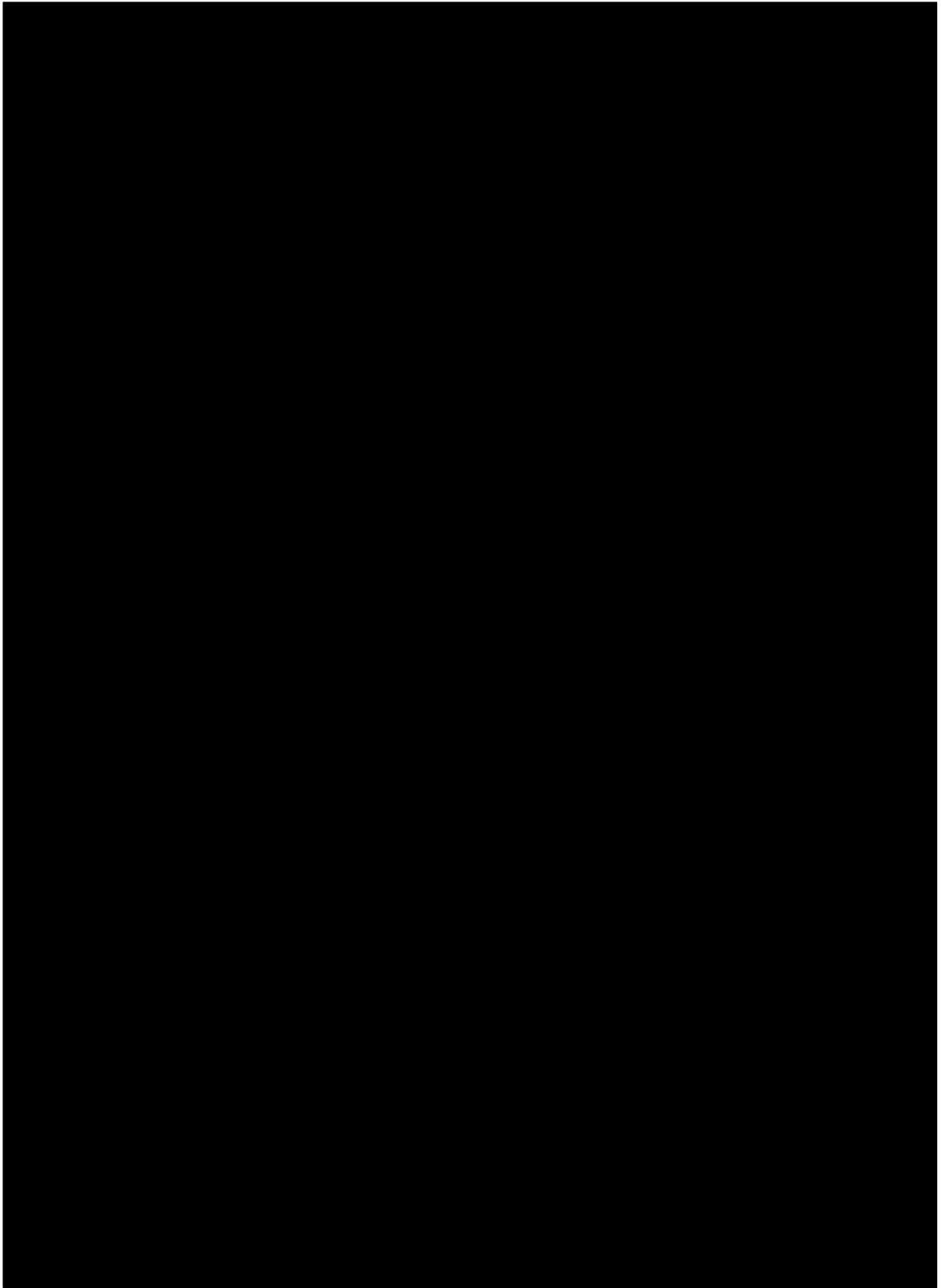
Added the following statement:

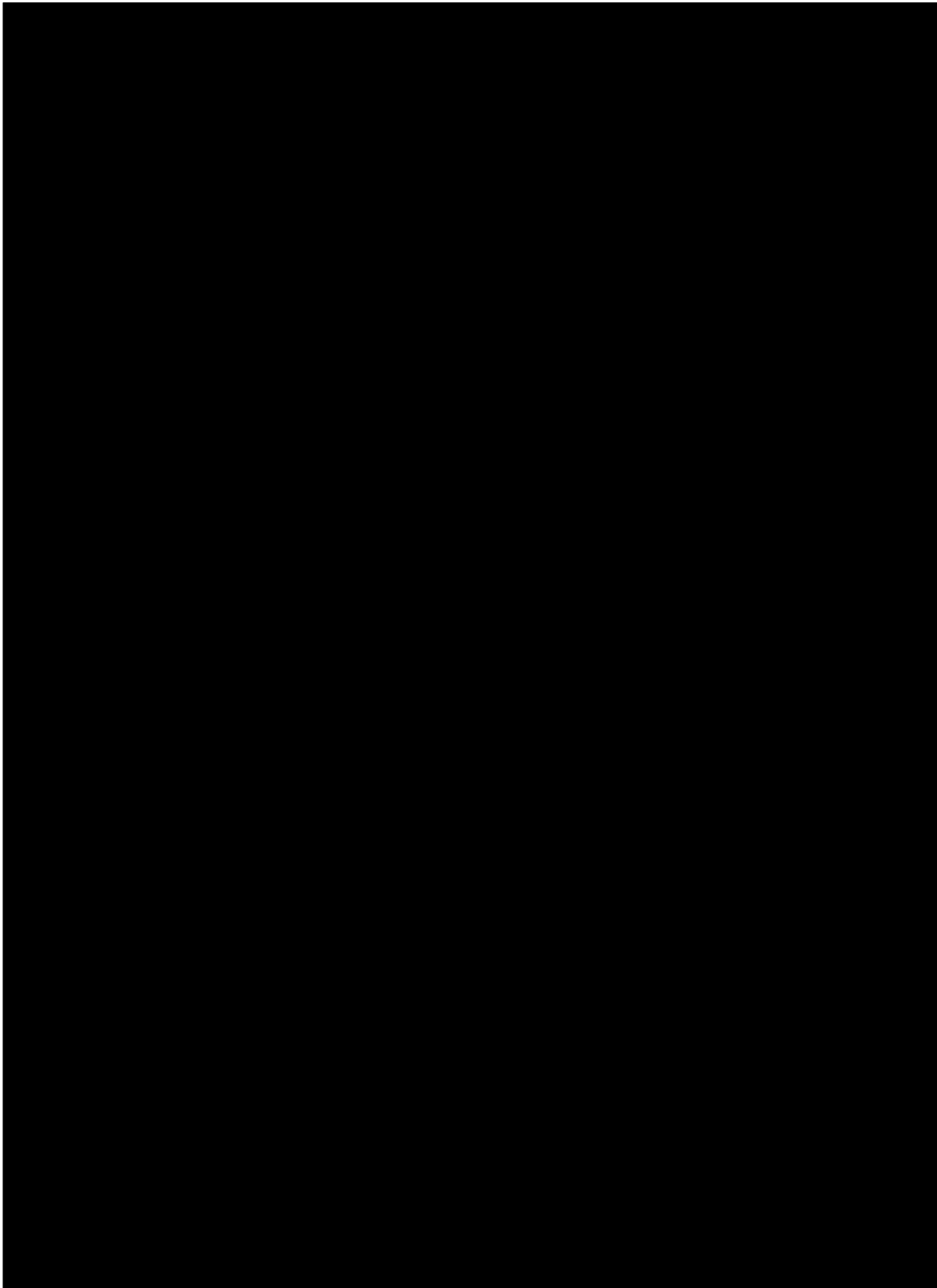
- Infaunal density within E09 is greater than found throughout the Leviathan Field, although it is important to note that organism density in the deep sea can be patchy and it is possible that the density observed is not representative of the entire E09 grid cell or the Leviathan Field as a whole. In the case of future development in grid cell E09, further measures will be taken to ensure that this is not a unique habitat.

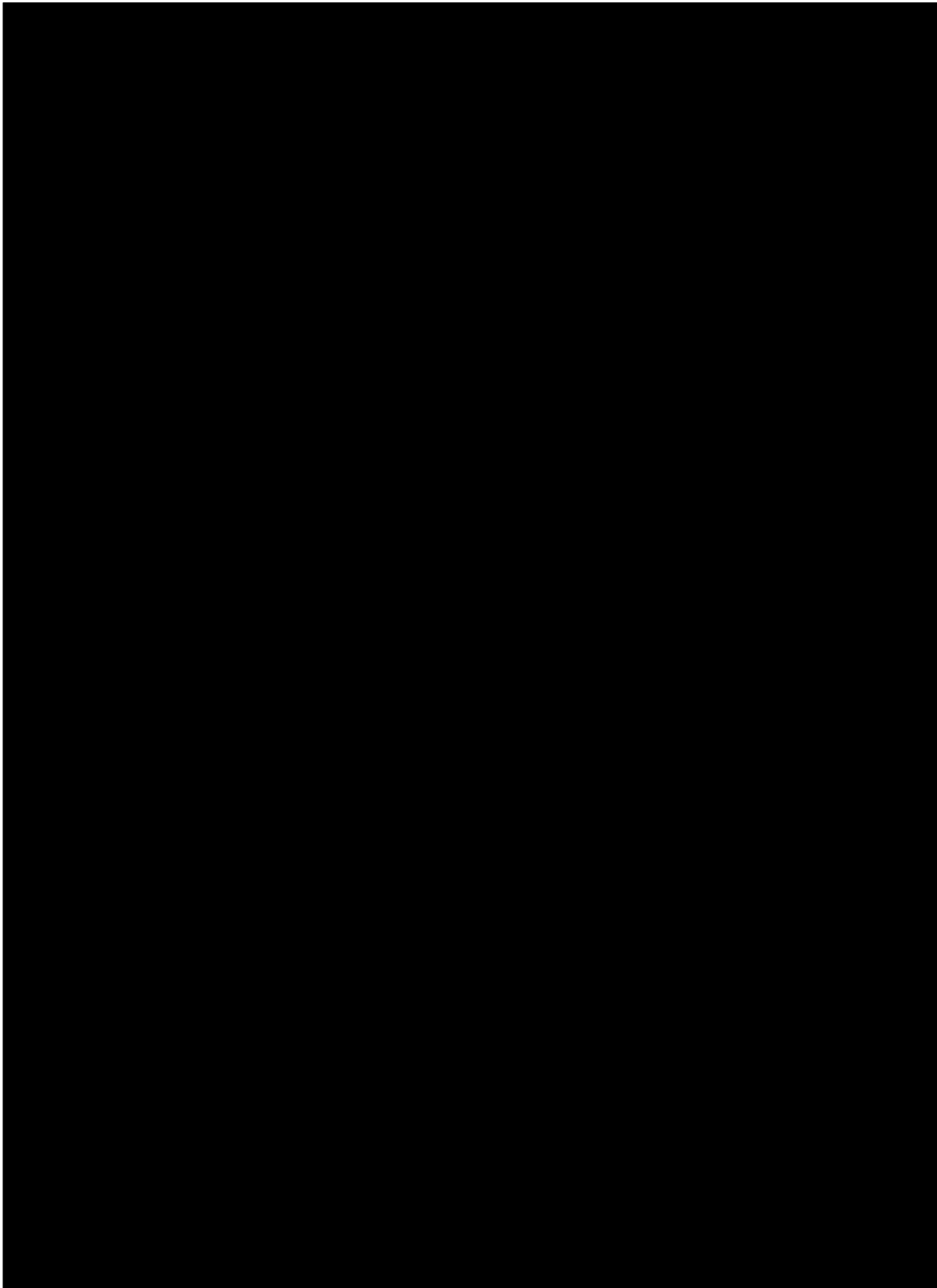
Attachment 15
Riserless Mud Recovery Letter

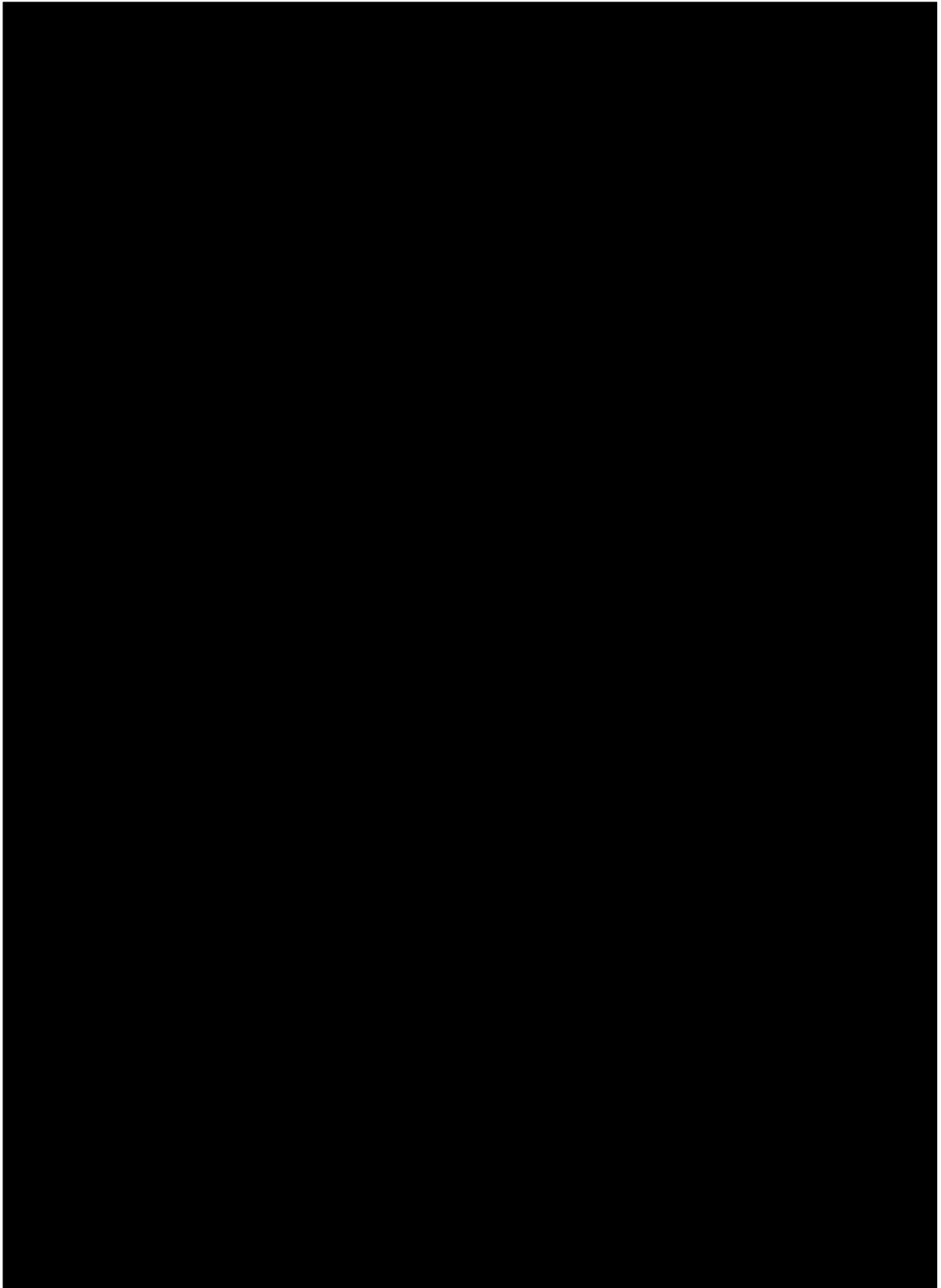


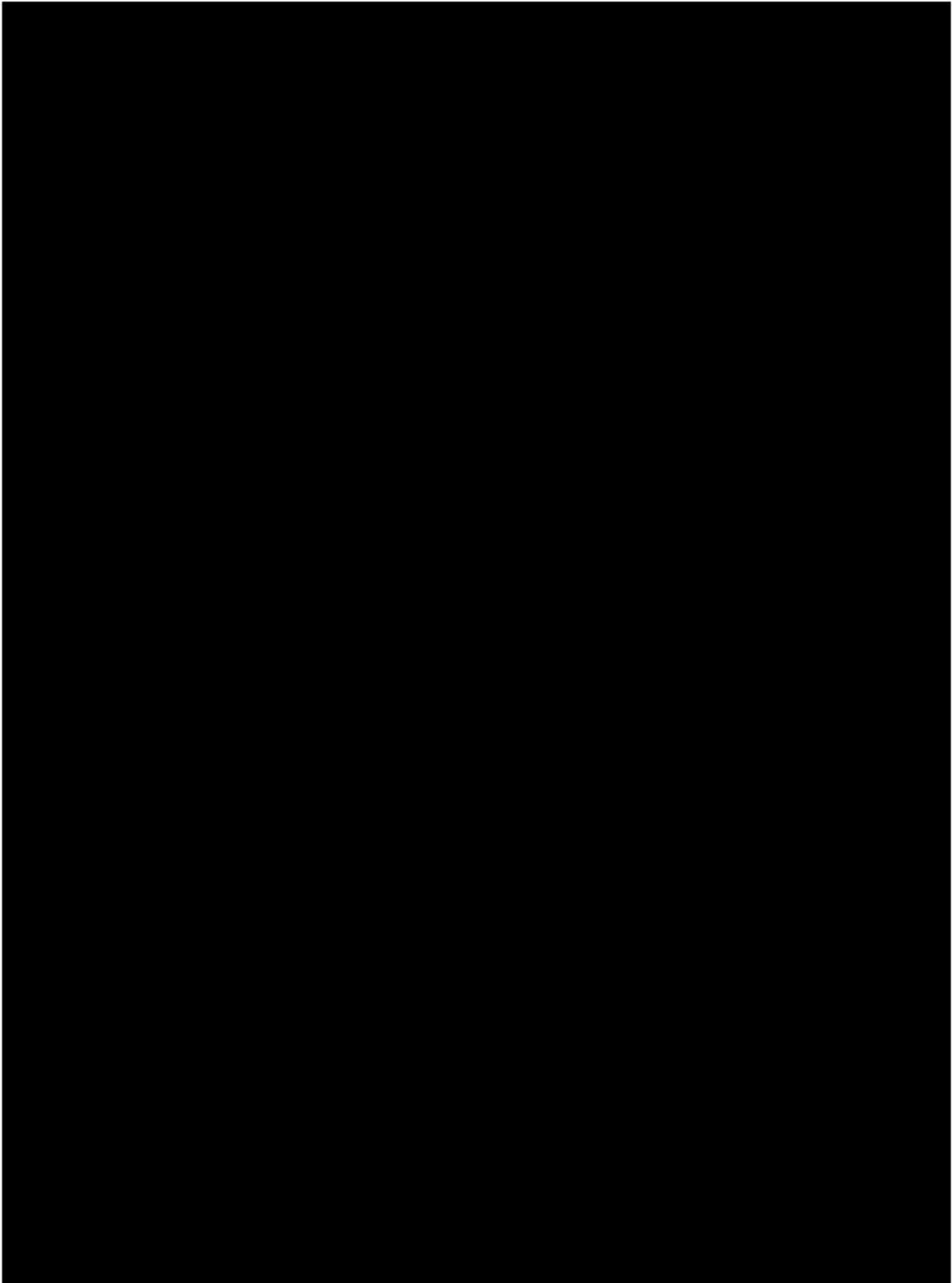
Attachment 16
Vessel Information

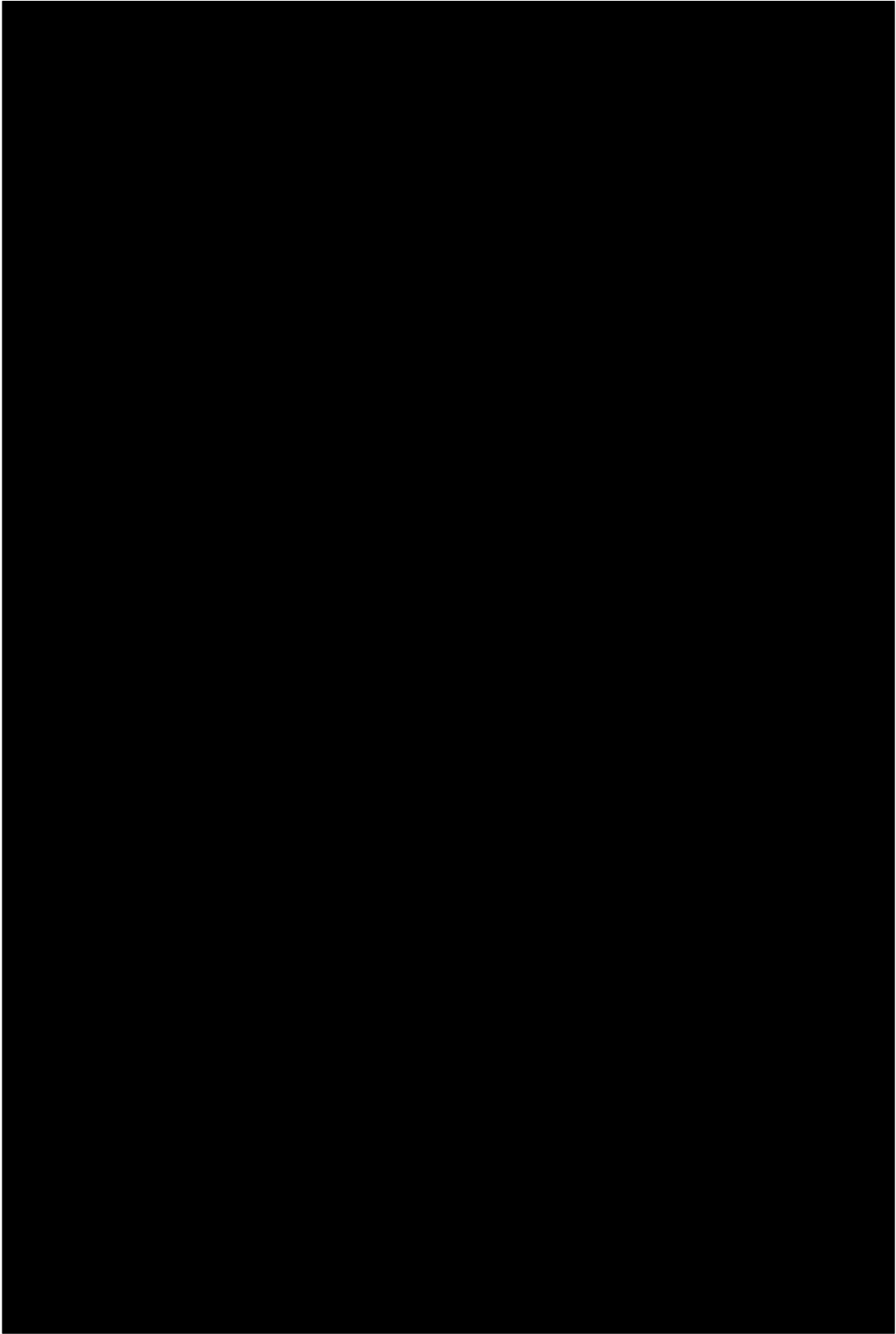


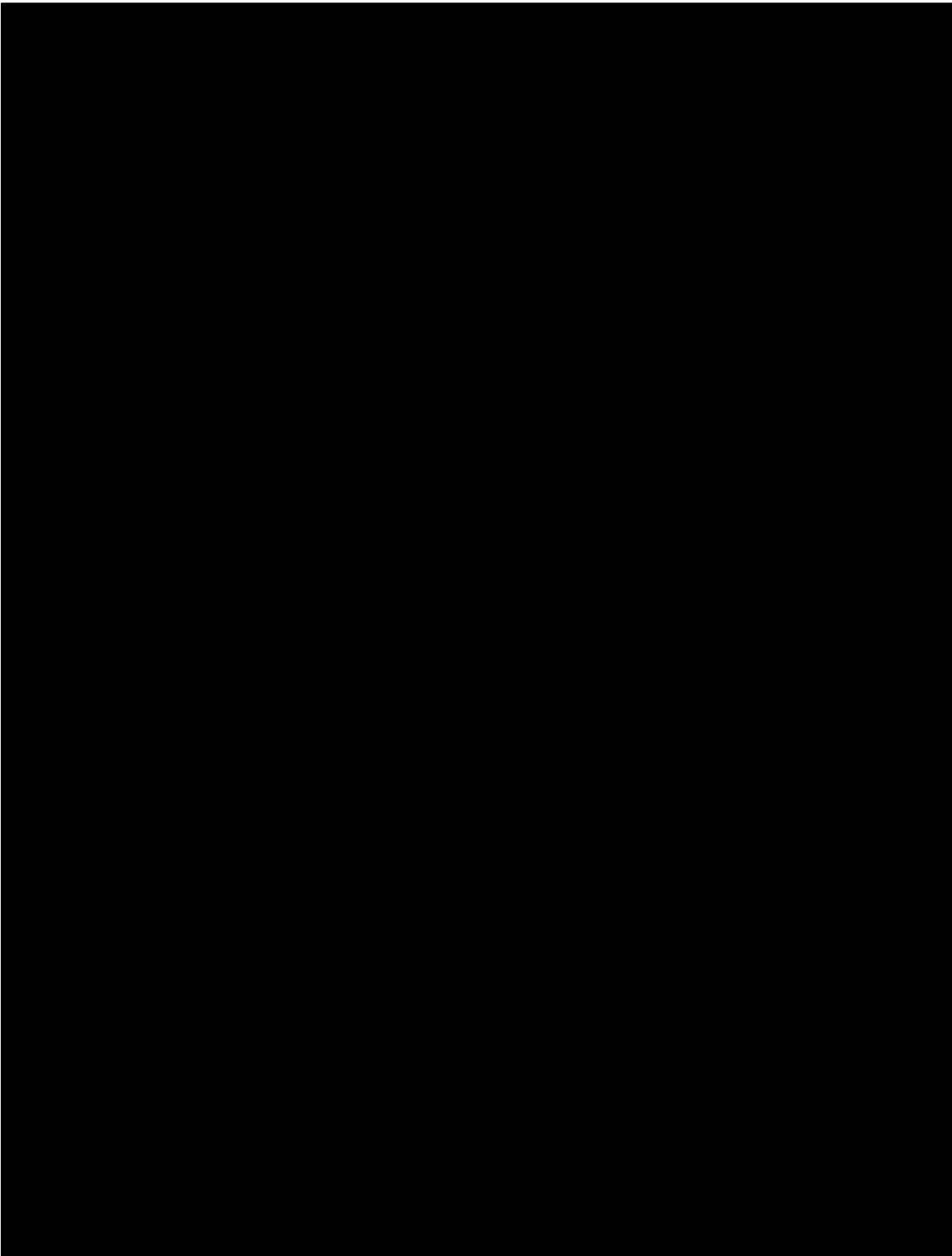


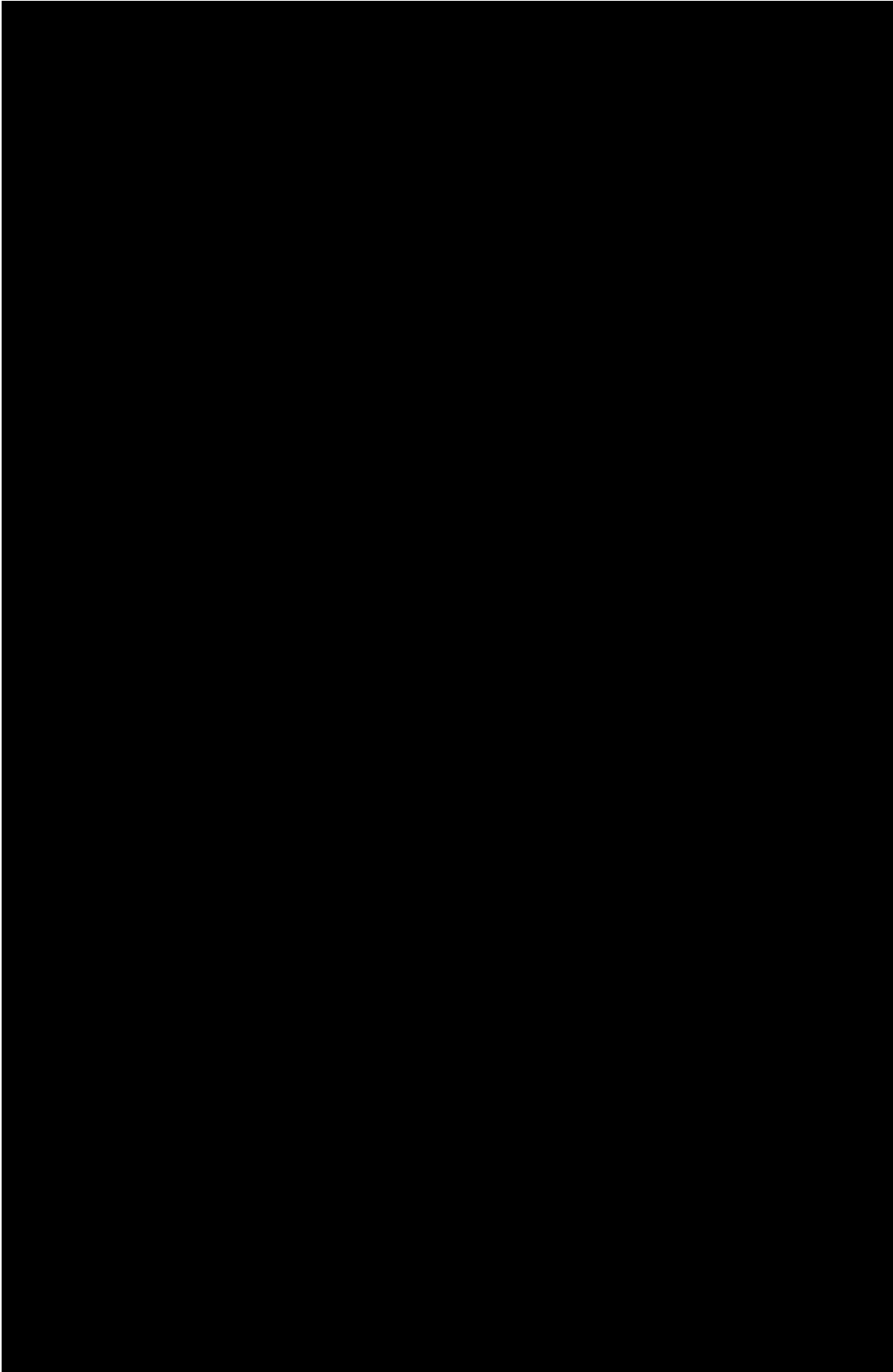


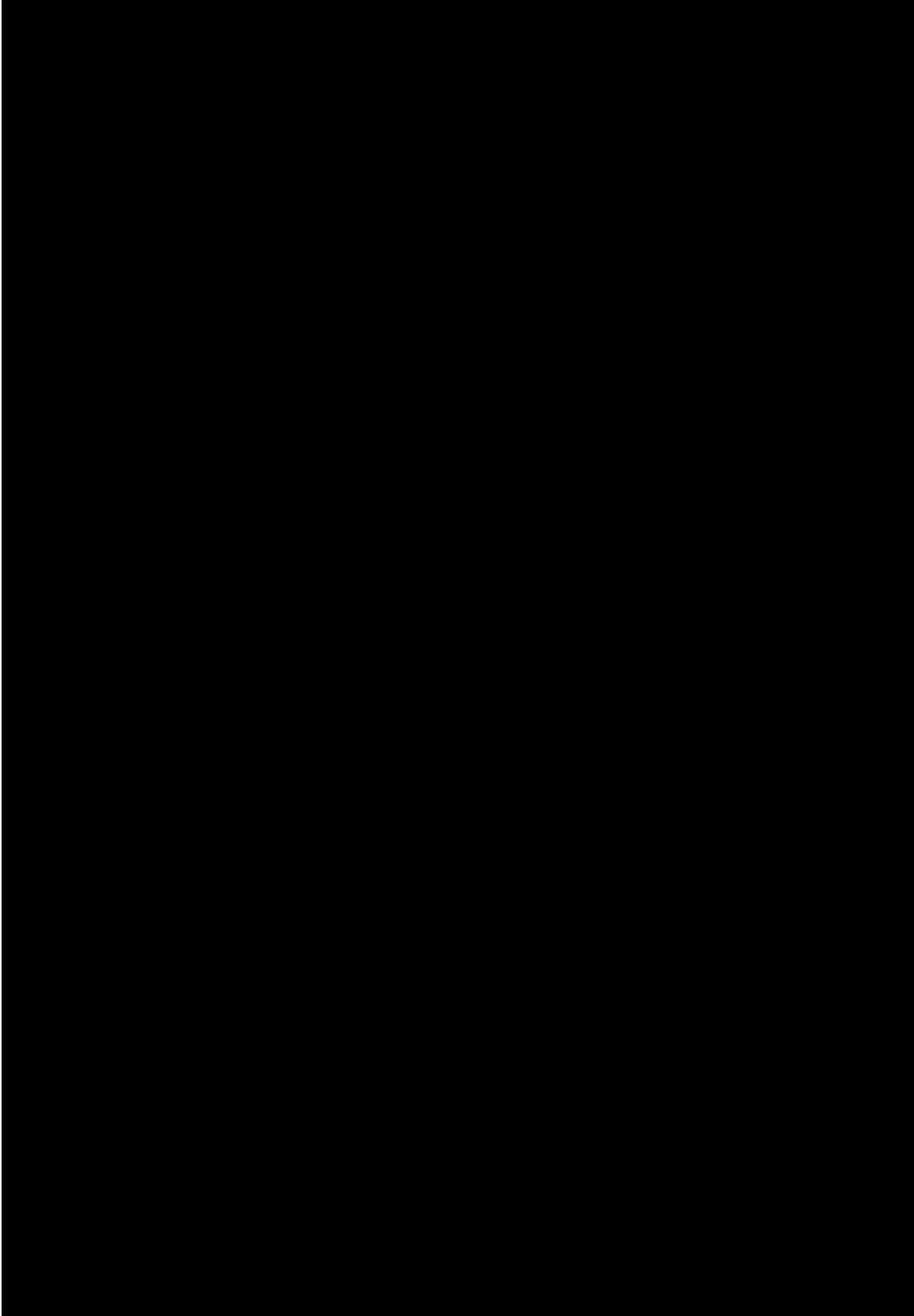


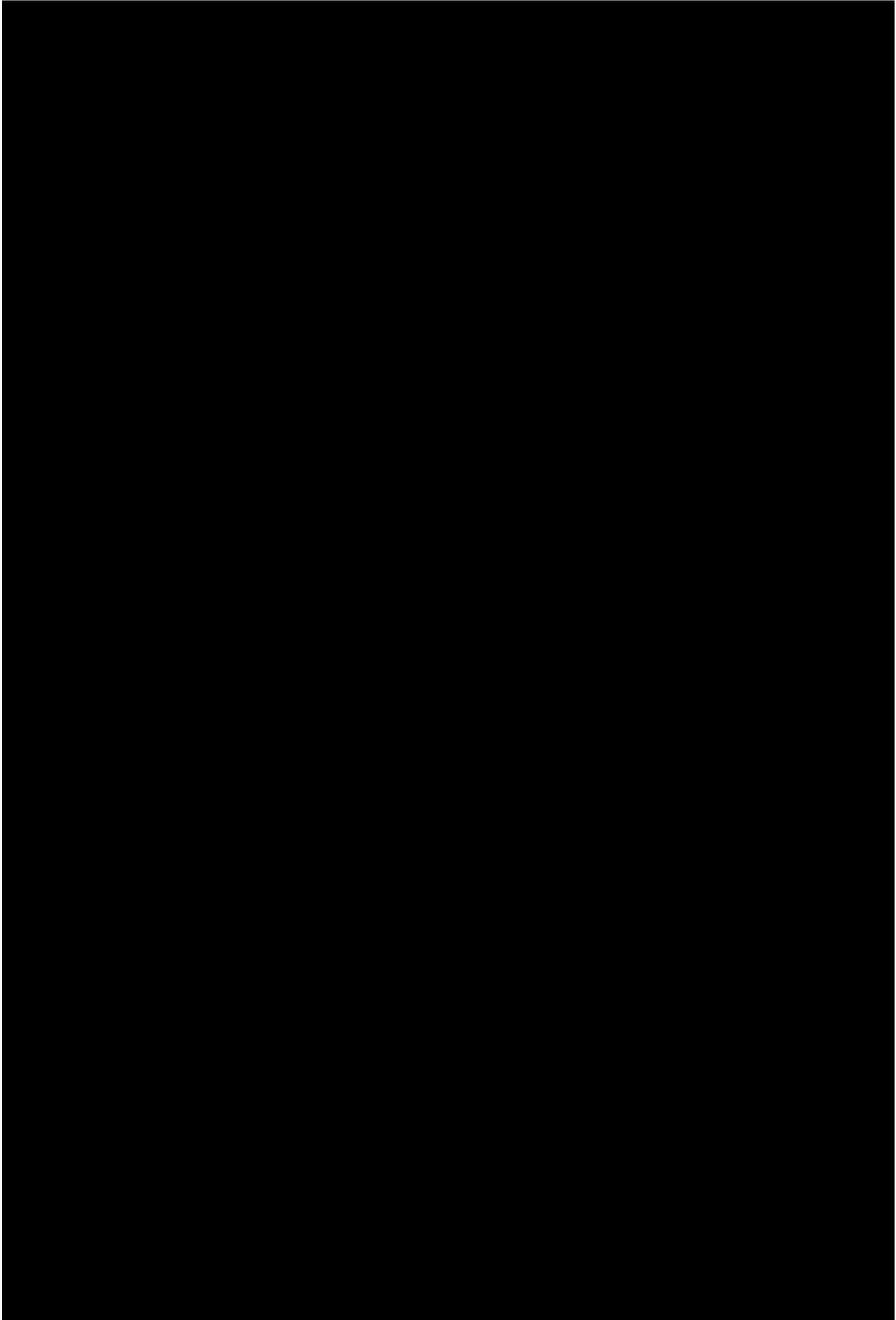


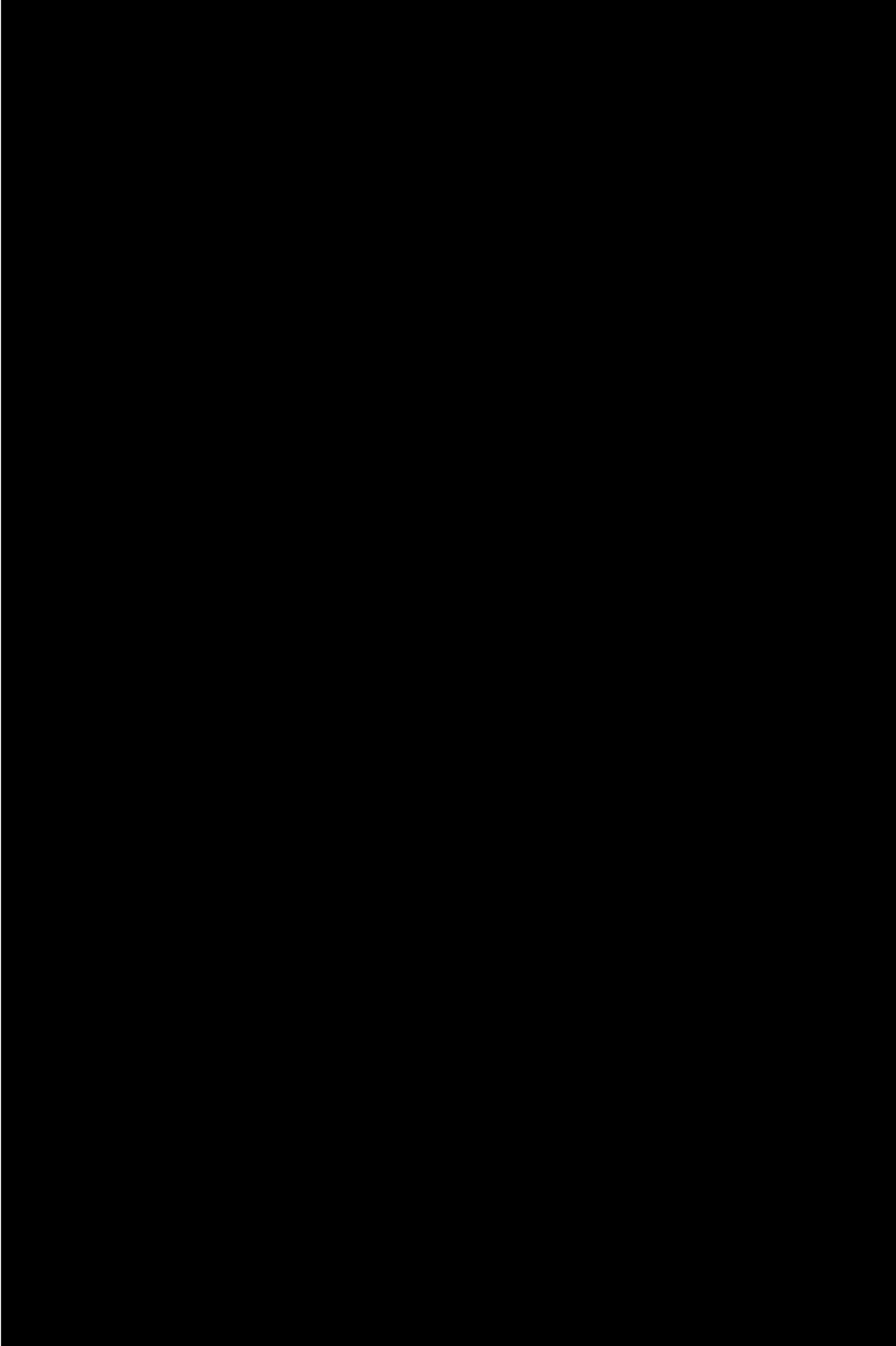


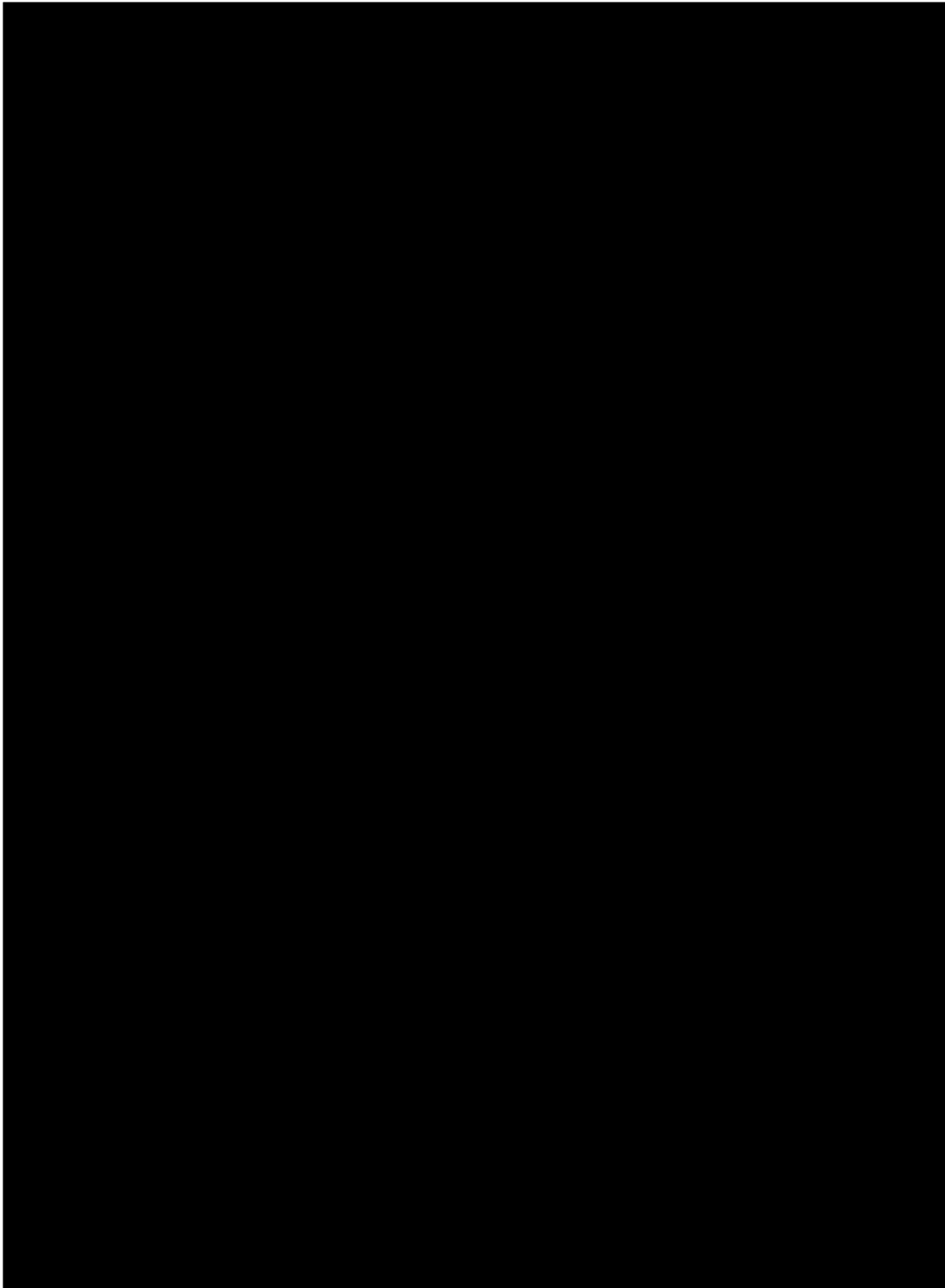


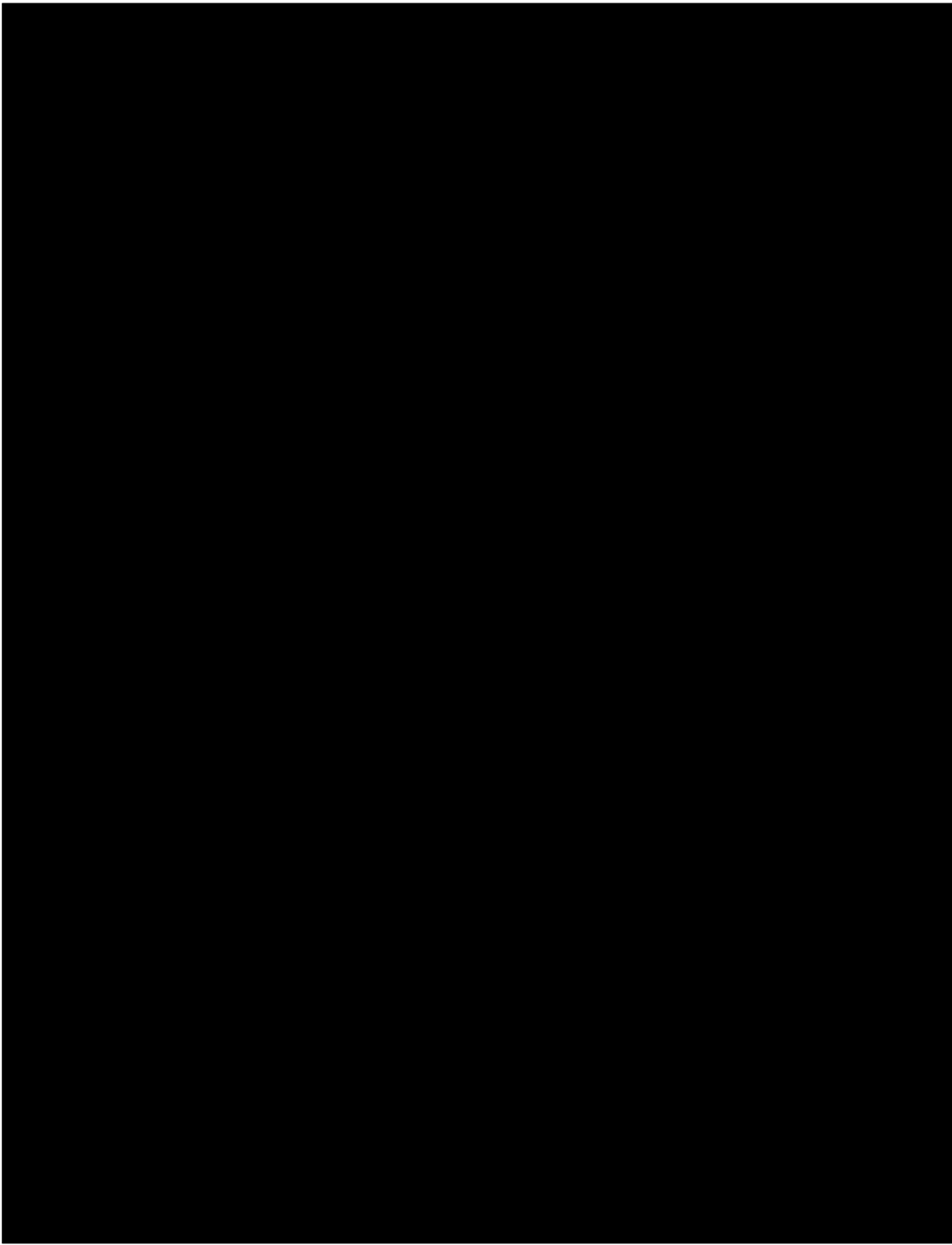


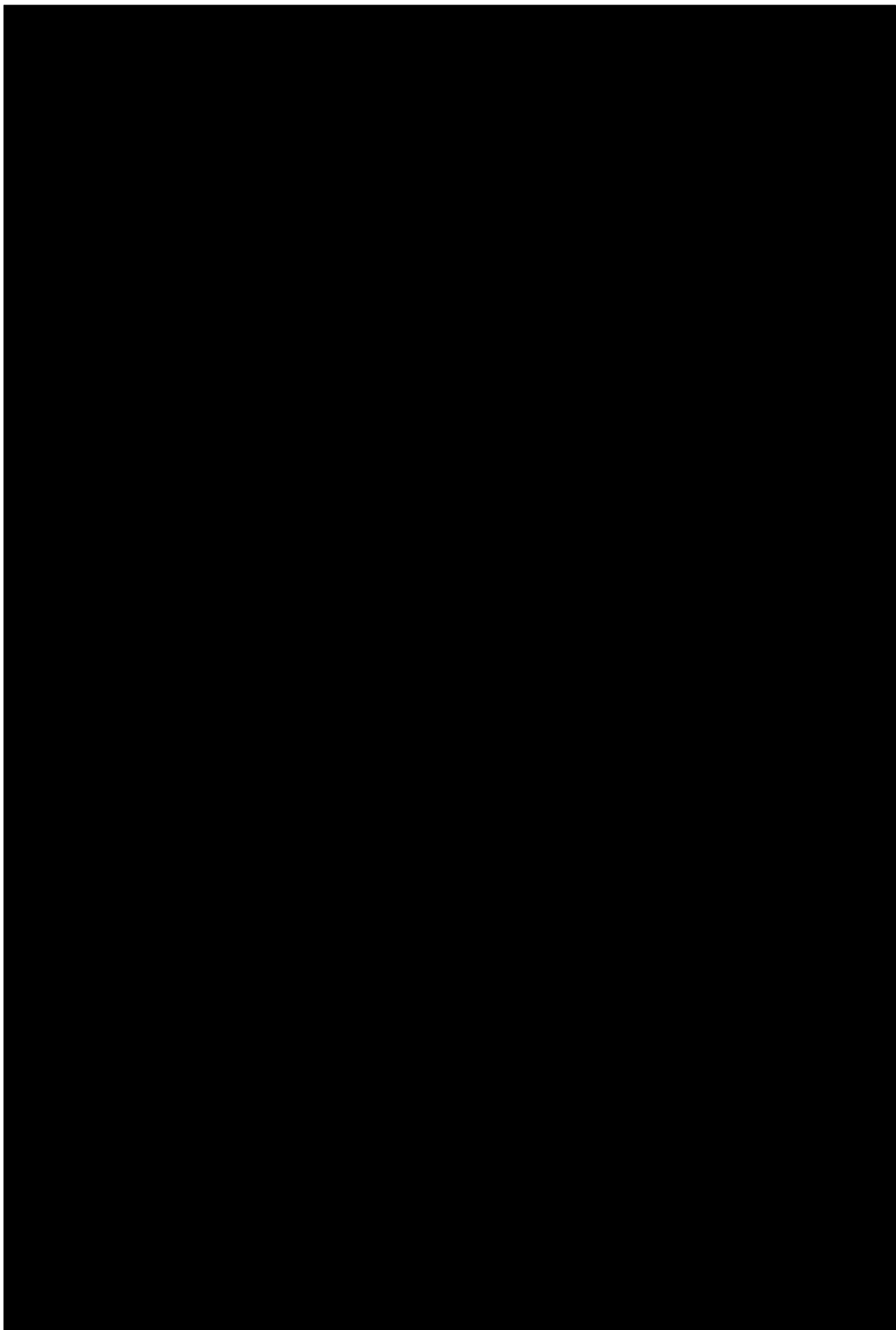


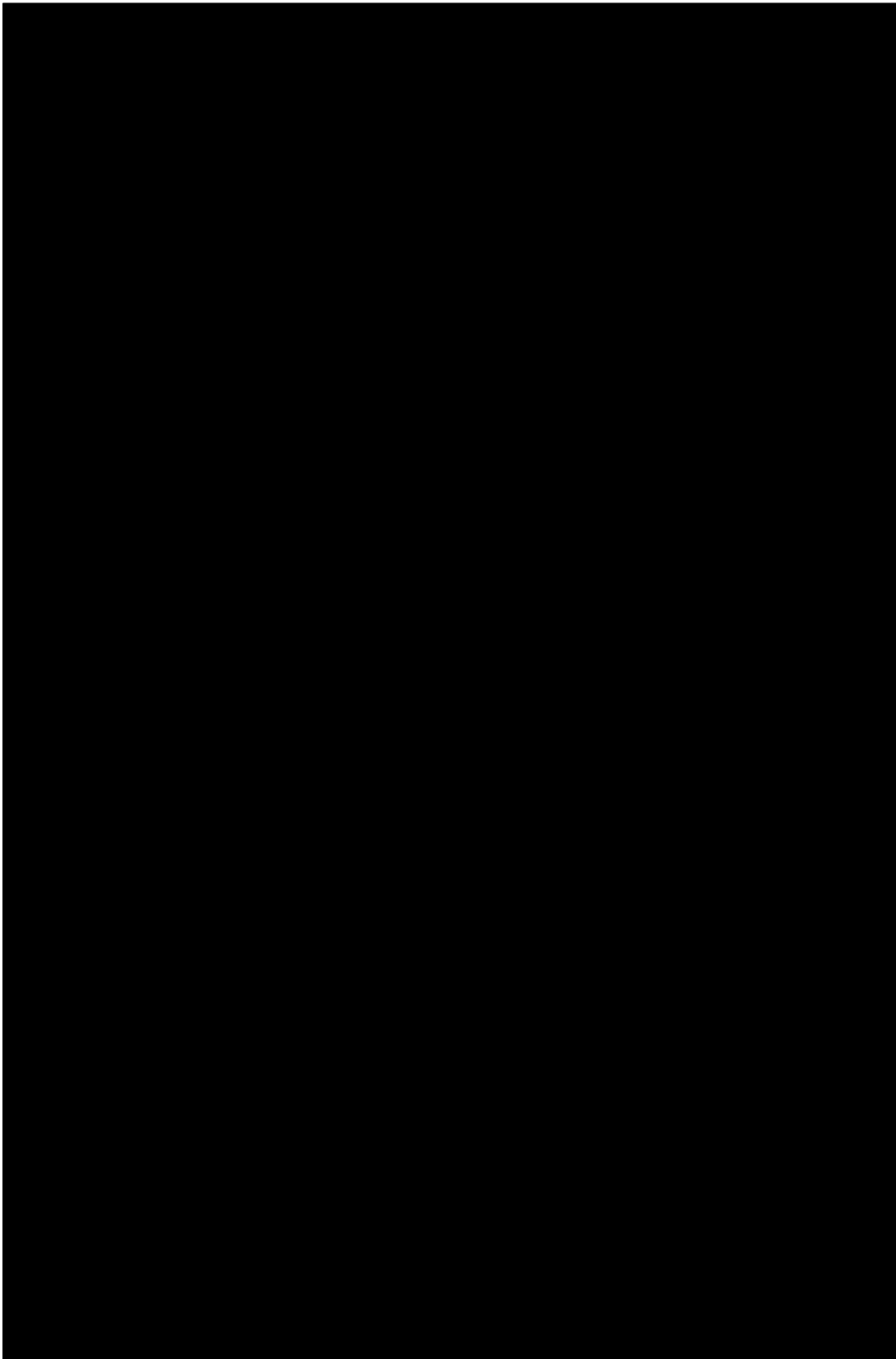


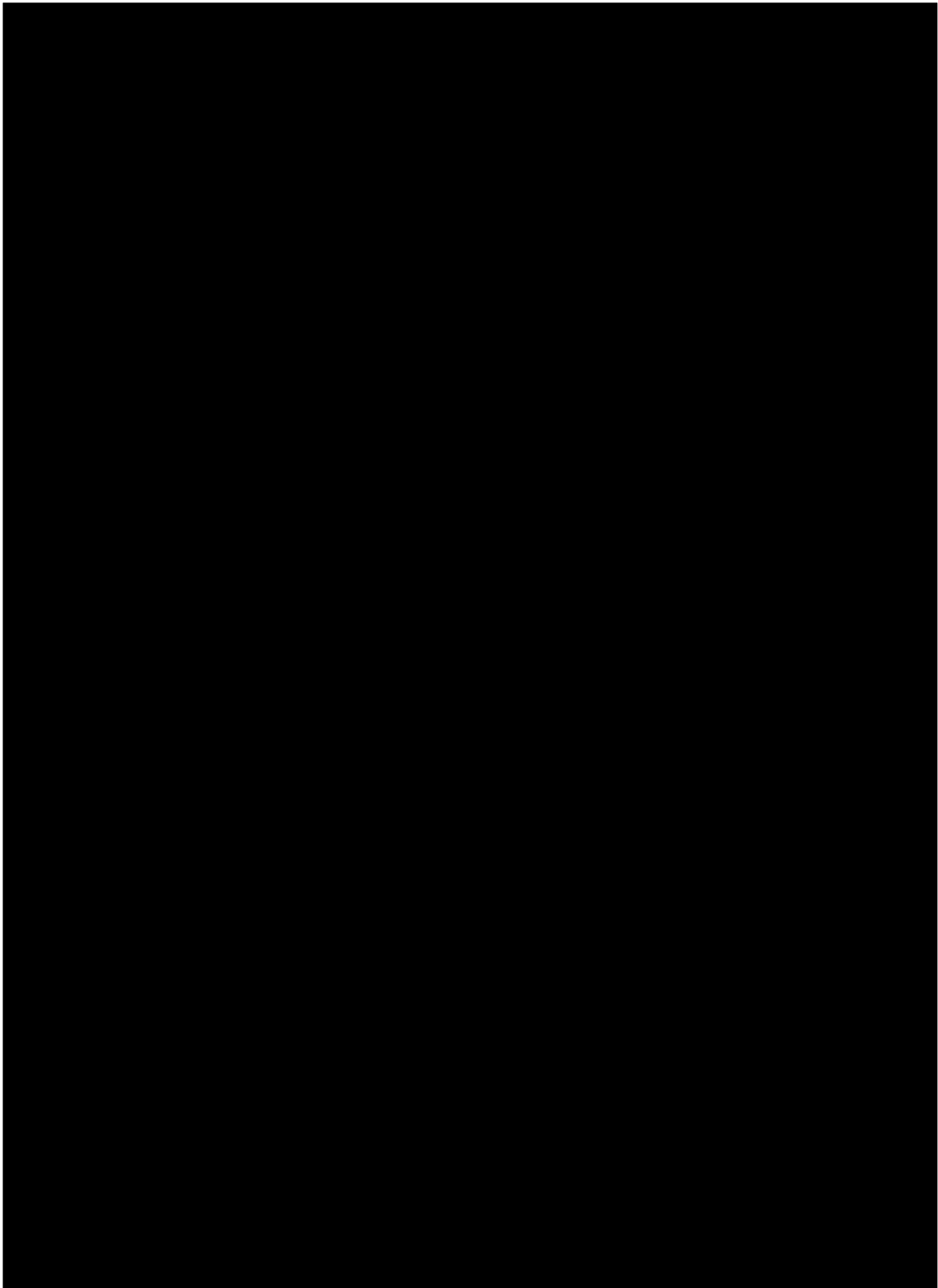












Attachment 17
BOP Information

3.2.5 Blowout Preventer

Noble Energy will use safe drilling practices during its activities in the Leviathan Field. Best industry practice will be used during all drilling phases (e.g., setting of BOP; cementing of concrete between bore and protective pipe). Noble Energy has selected the Atwood Advantage drilling rig for the drilling of Leviathan 5, Leviathan 7 and Leviathan 3 sidetrack. Their blowout preventer (BOP) stack was found to be fit-for-purpose for the Leviathan Field Development, as shown in **Table 3-3** and **Figure 3-6**. Similar information will be provided for the drilling rig for the future wells (reference Table 3-1) in a separate submittal and when known prior to drilling.

Table 3-3. Atwood Advantage Blowout preventer (BOP) stack manufacture, size and working pressure.

BOP Component	BOP Manufacture, Size and Working Pressure
[Redacted]	

Noble Energy and the rig’s owner will engage in a comprehensive inspection and testing of the rig’s subsea BOP system to ensure compliance with the U.S. Bureau of Safety and Environmental Enforcement (BSEE) regulations. The inspection and testing will be witnessed and certified by a third-party surveyor.

In deeper offshore operations with the wellhead just above the mudline on the seafloor, there are four primary ways by which the BOP can be controlled:

- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]

Attachment 18
Write up for Figure 3-8 “As-built” wellbore schematic for the
Leviathan-3/3ST01 well

Write up for Figure 3-8 "As-built" wellbore schematic for the Leviathan-3/3ST01 well

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

Attachment 19
Statistical Analysis of Leviathan Field Gas Composition

	Methane (C1 Content)	LPG, Ethan + Propane (C2 + C3 Content)	C4 Content	C6+ Content

	CO2 Content	N2 Content	Total Inerts (CO2 + N2 Content)	BTEX Content (ppmw)

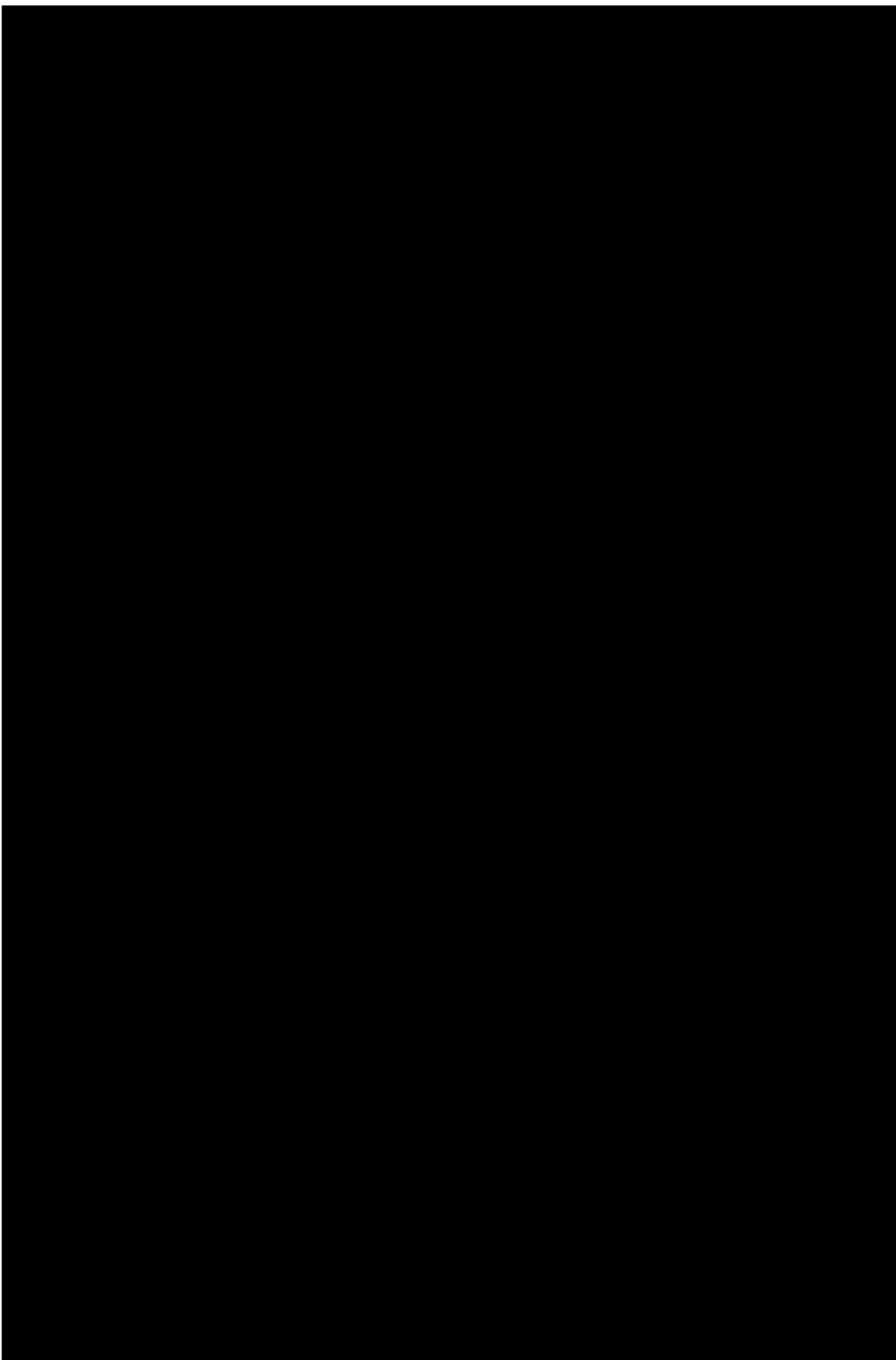
	Heating Value	H2S (ppm)

Attachment 20
Drilling Program for an Individual Leviathan Field Well

Drilling program for an individual Leviathan Field well (representative for Leviathan-5 through Leviathan-10 wells).

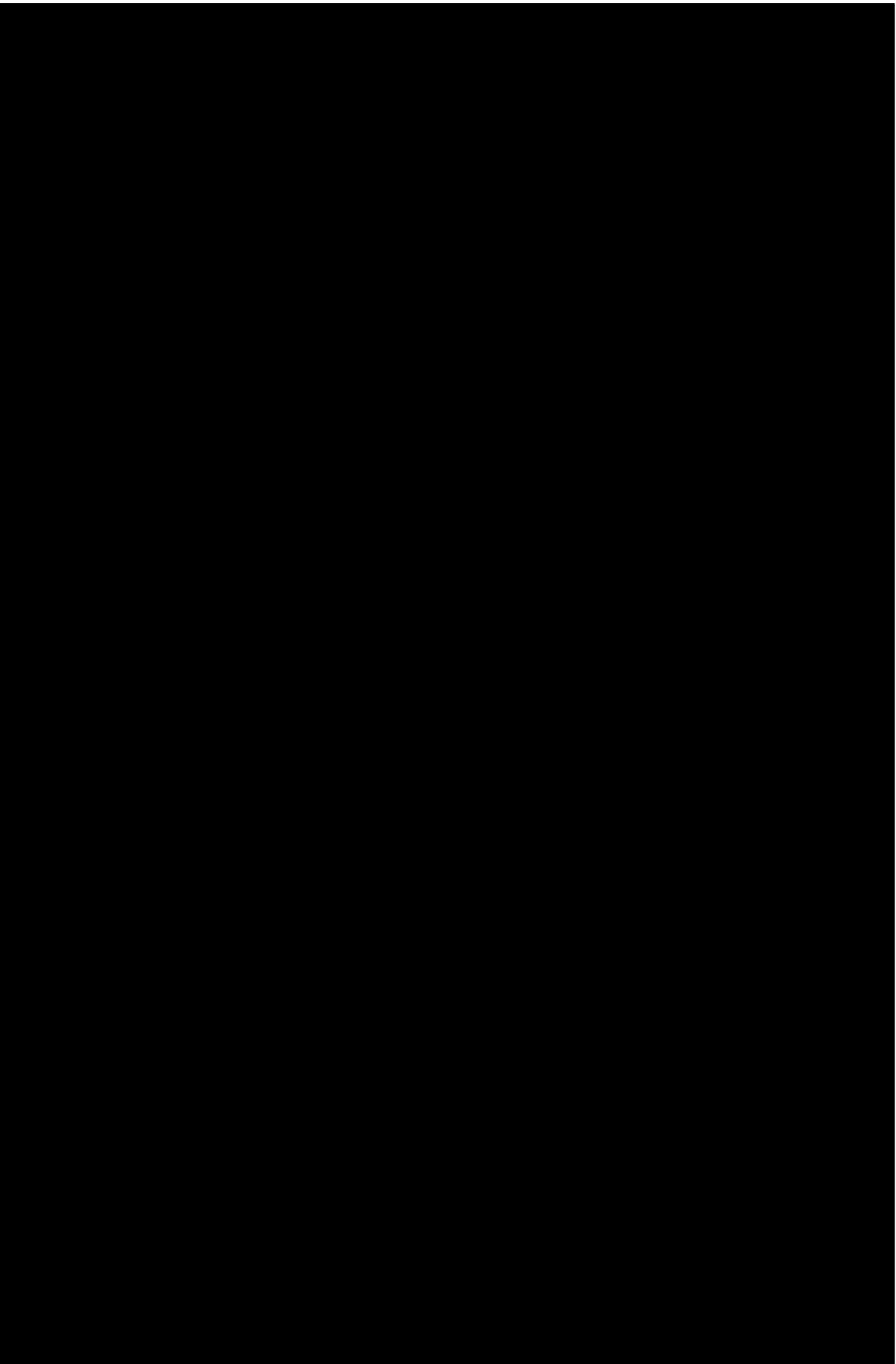
Section (Interval)	Hole Diameter (inches)	Interval Duration (days)	Depth,m MD-RKB	Depth,m TVD-RKB	Depth,m BWD	Depth,m BML	Cuttings Discharge		Drilling Fluid (Mud) Discharge		Mud Type	Release Location
							Vol. (m3)	Rate (m3/day)	Vol. (m3)	Rate (m3/day)		

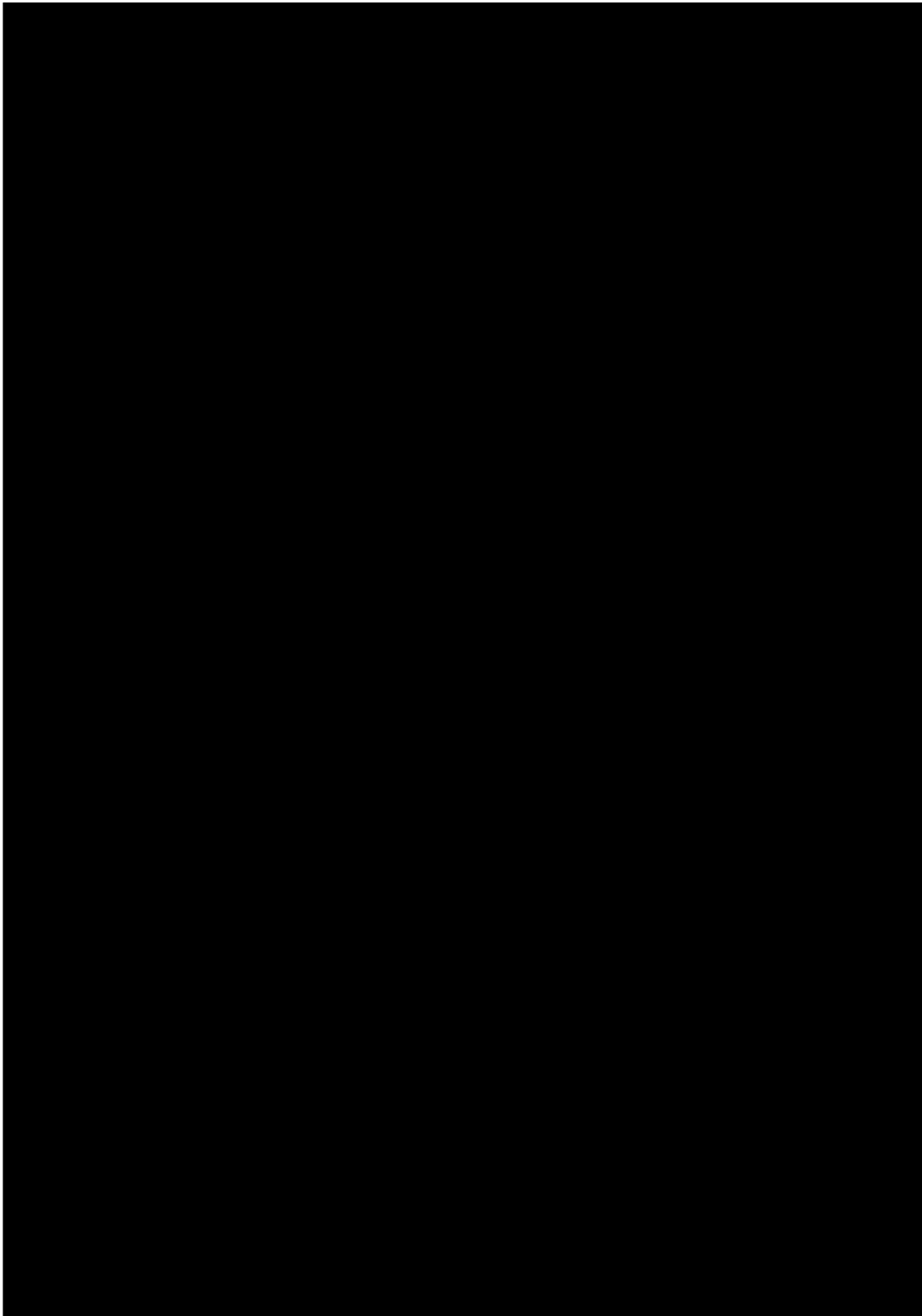
Attachment 21
Barite Analysis

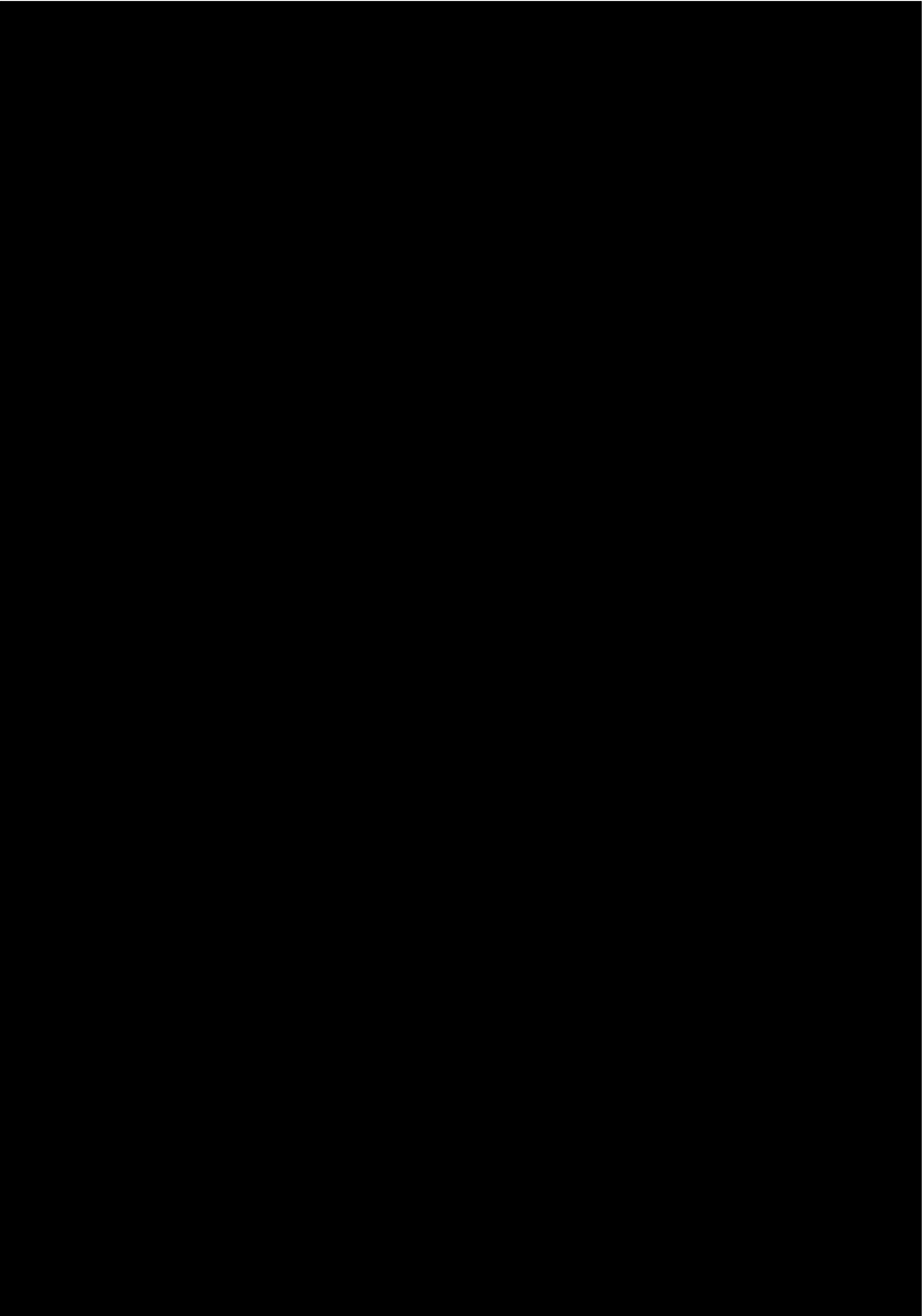


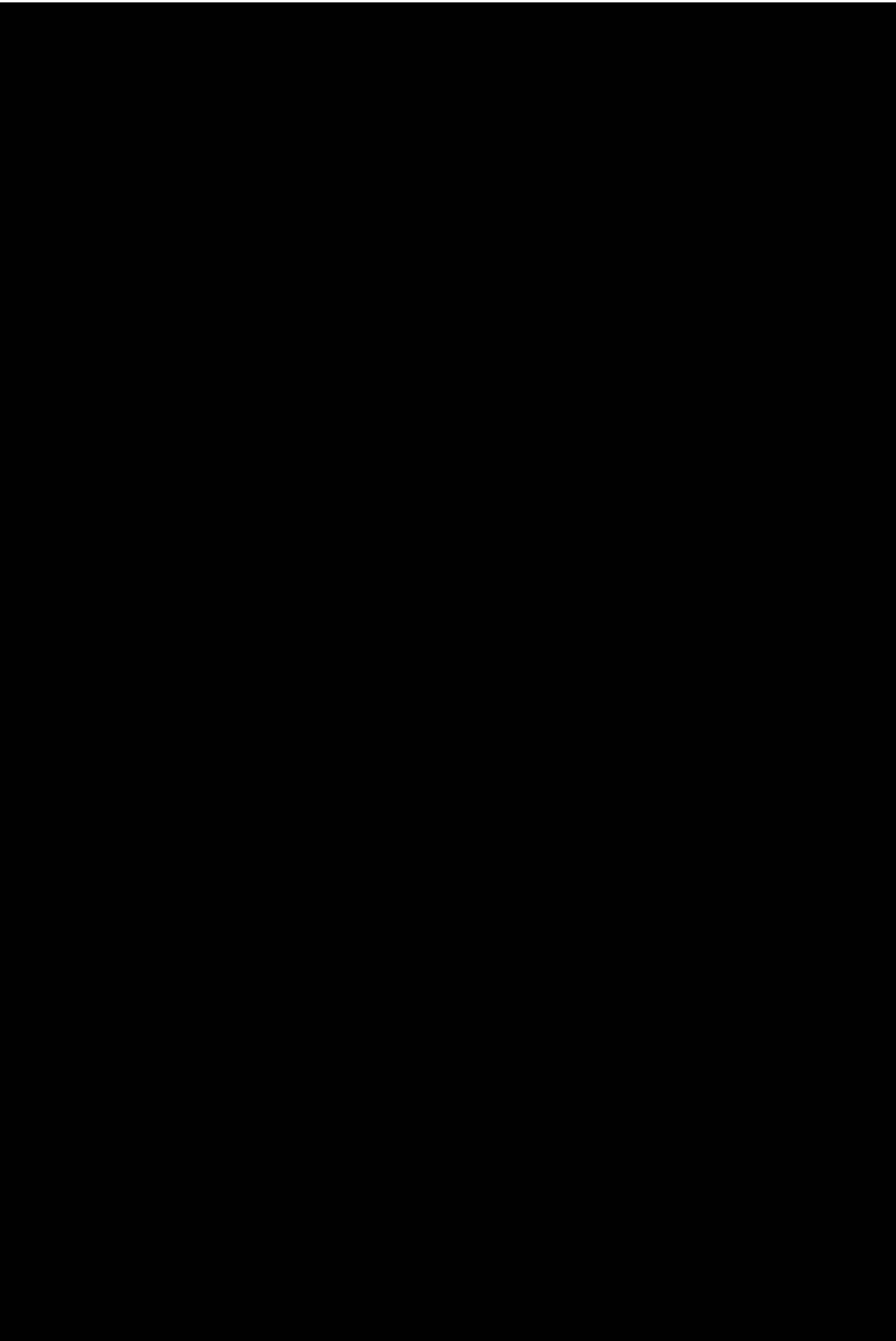


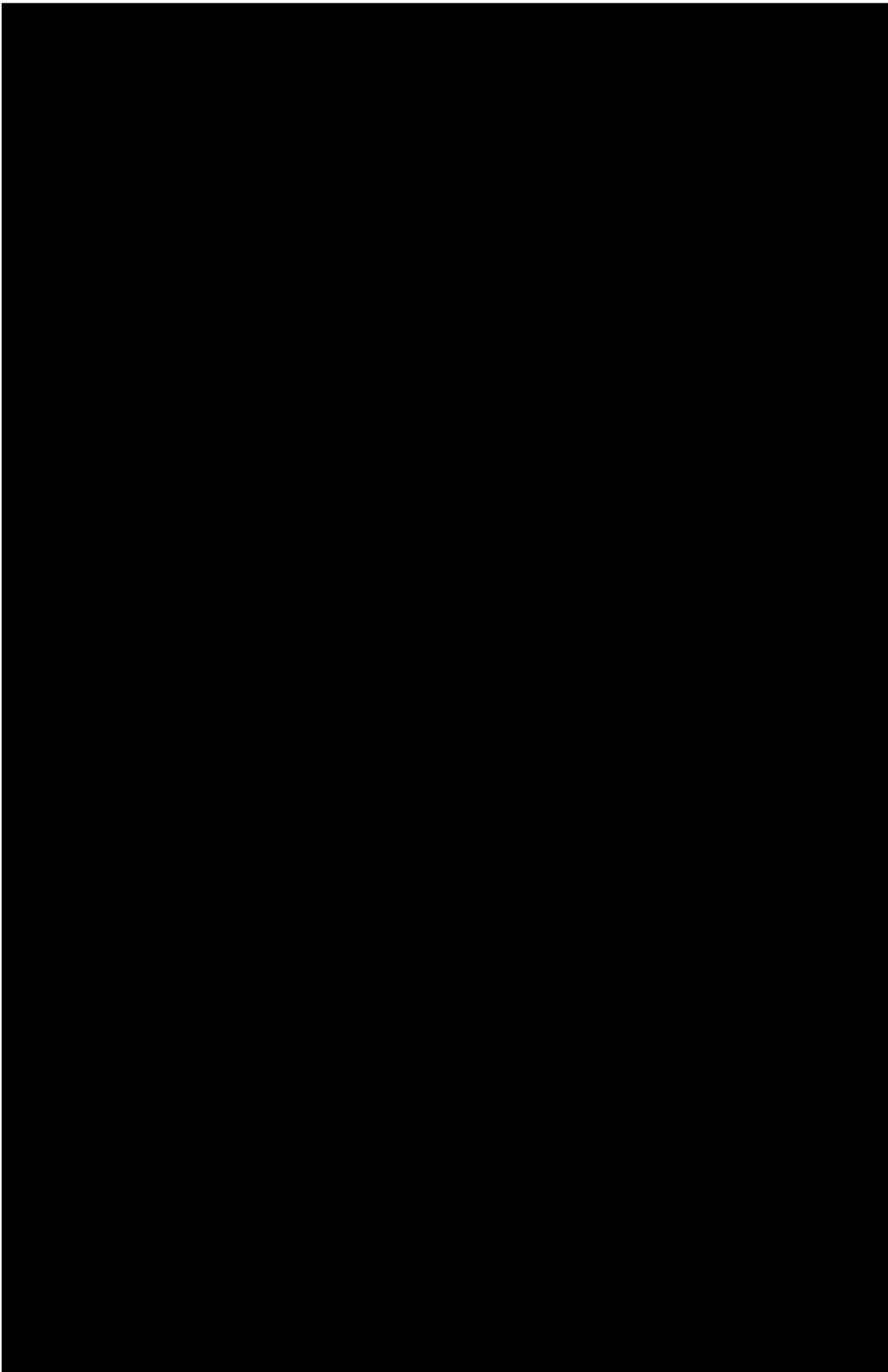
Attachment 22
TCC Report

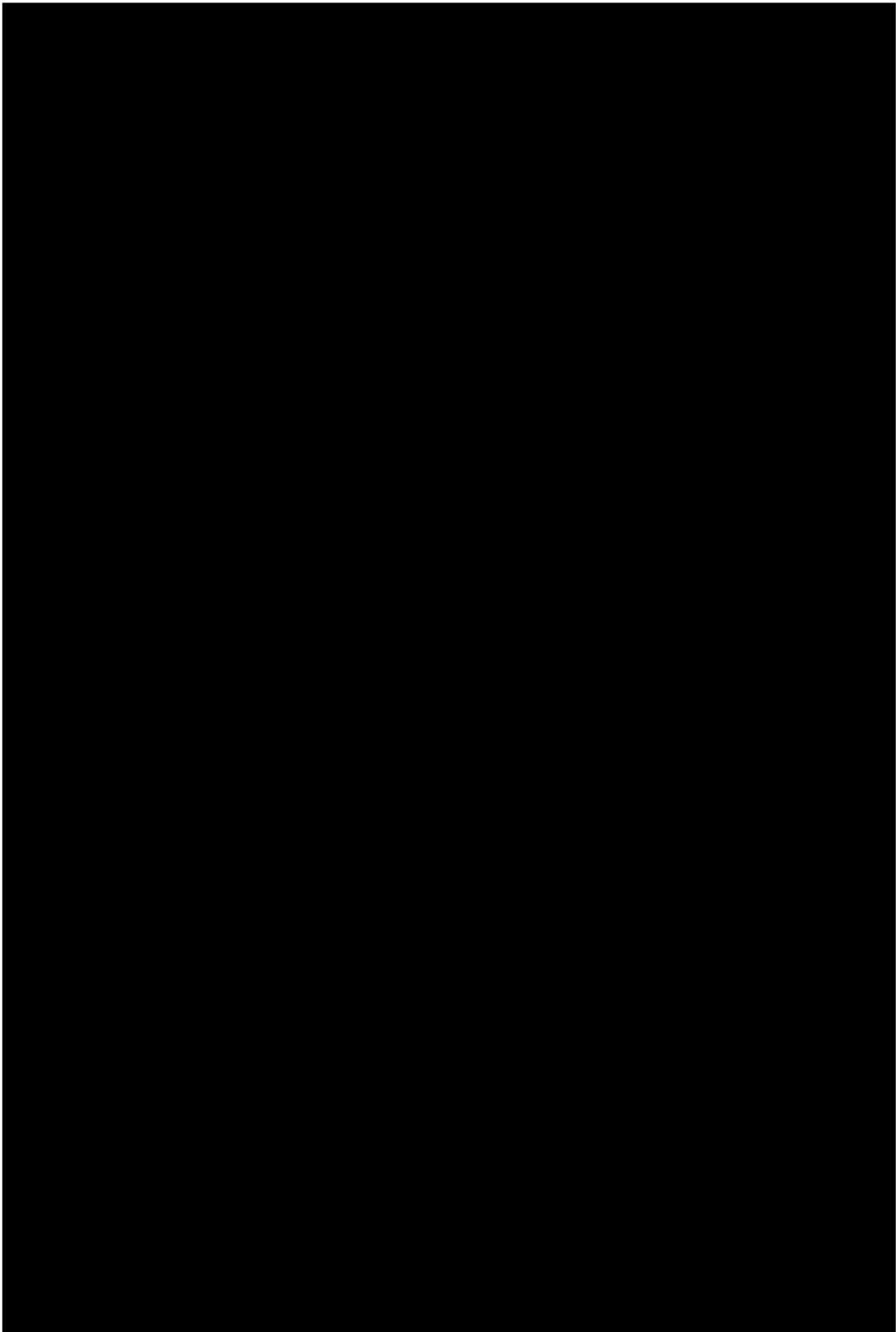


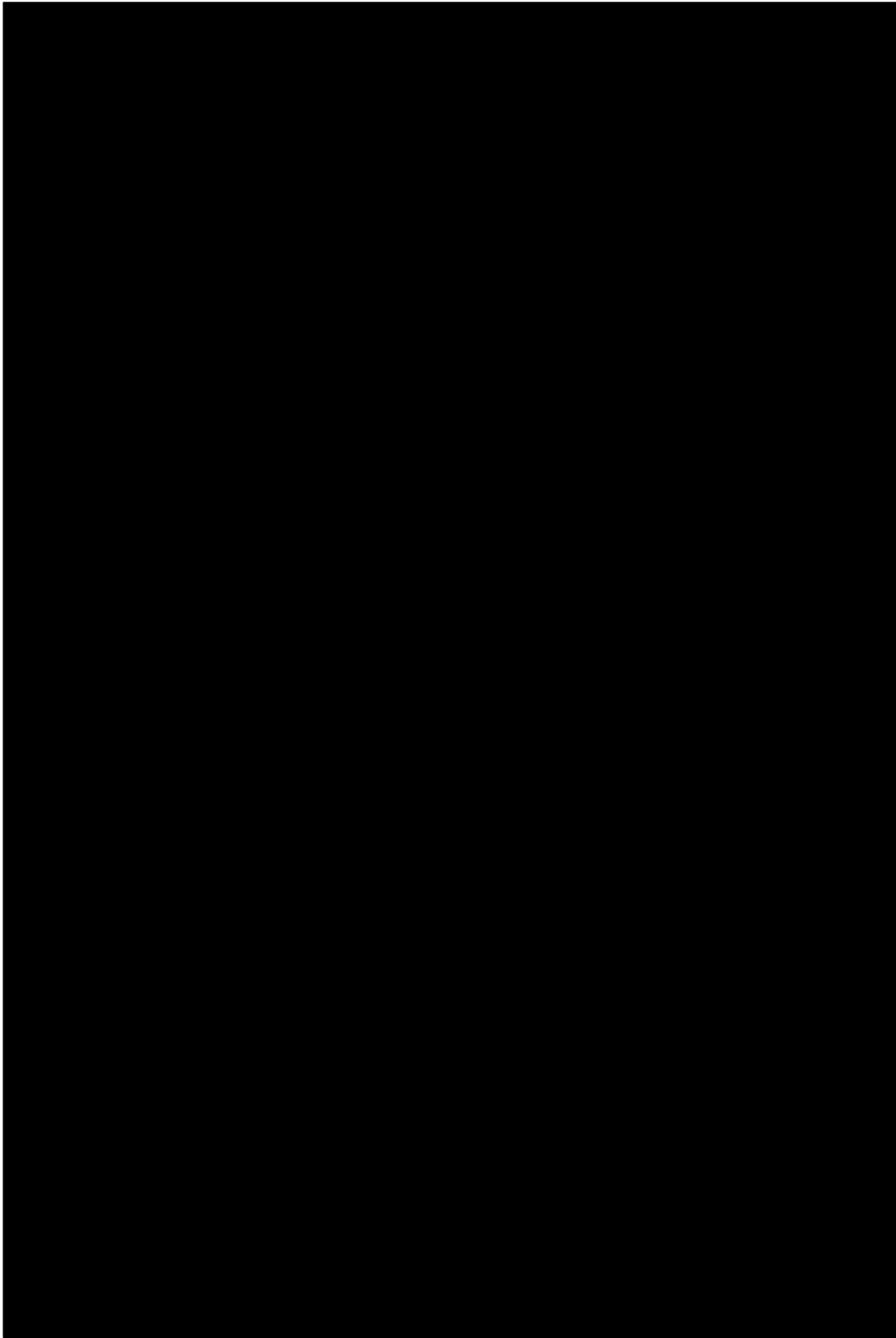


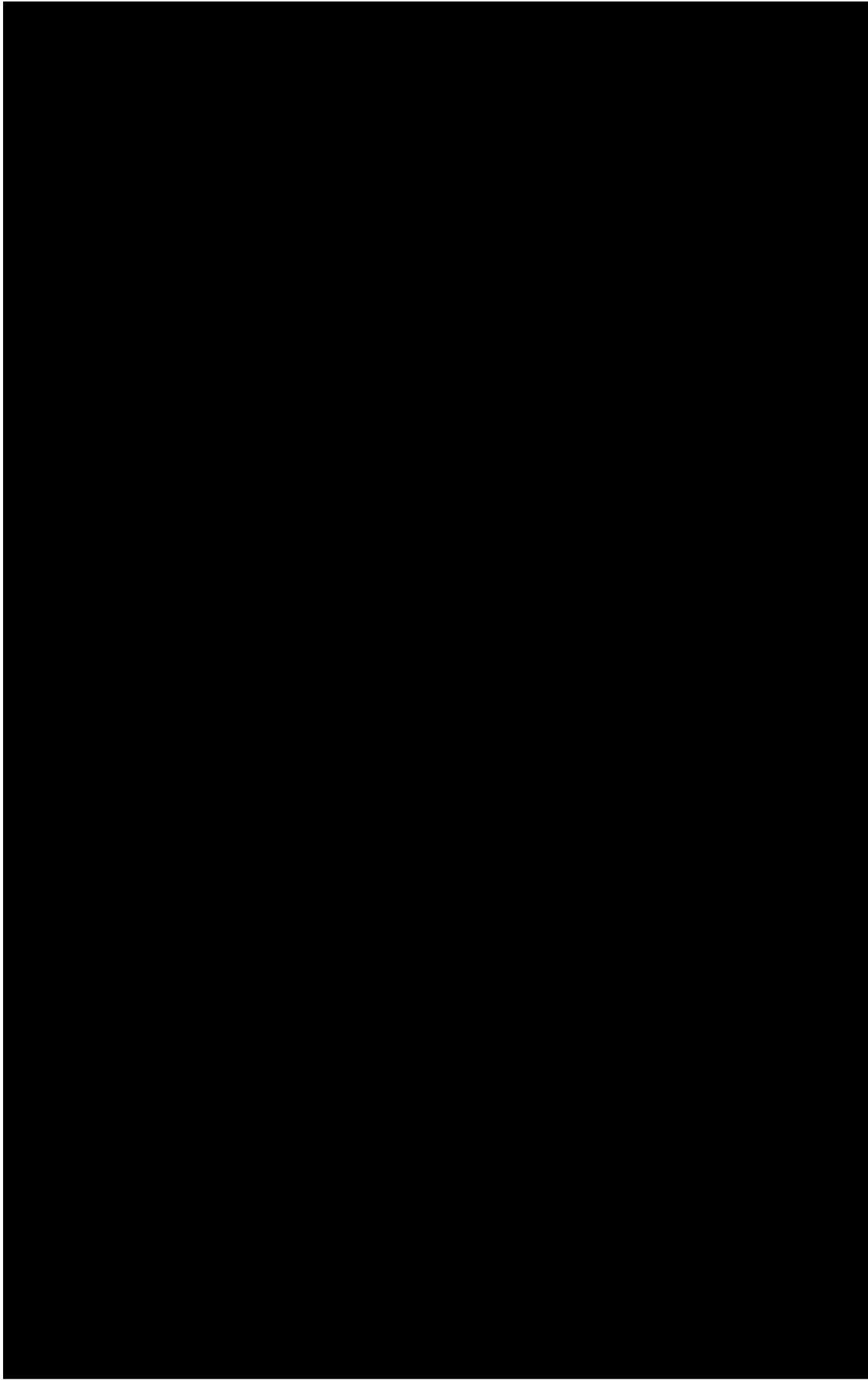


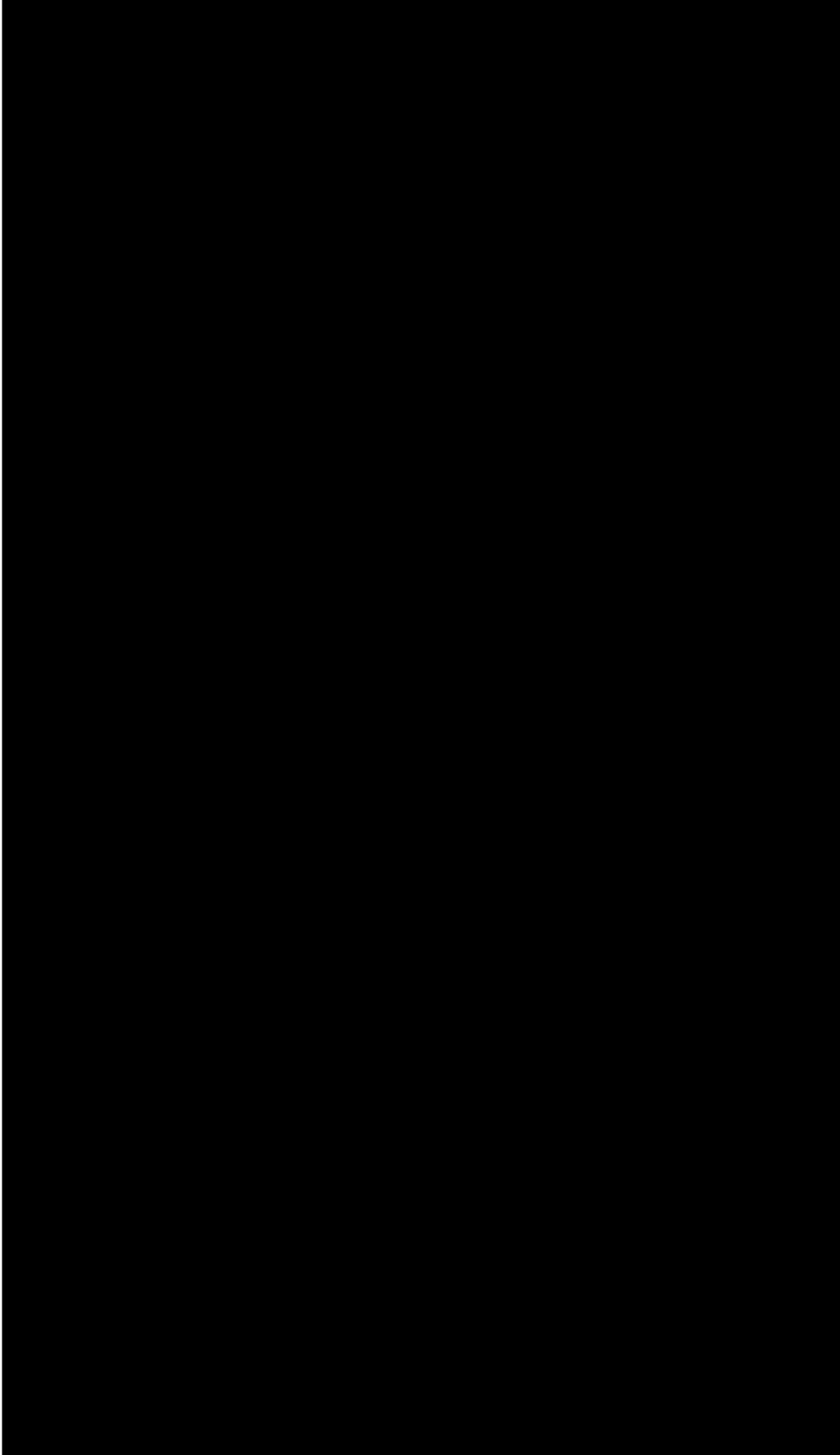


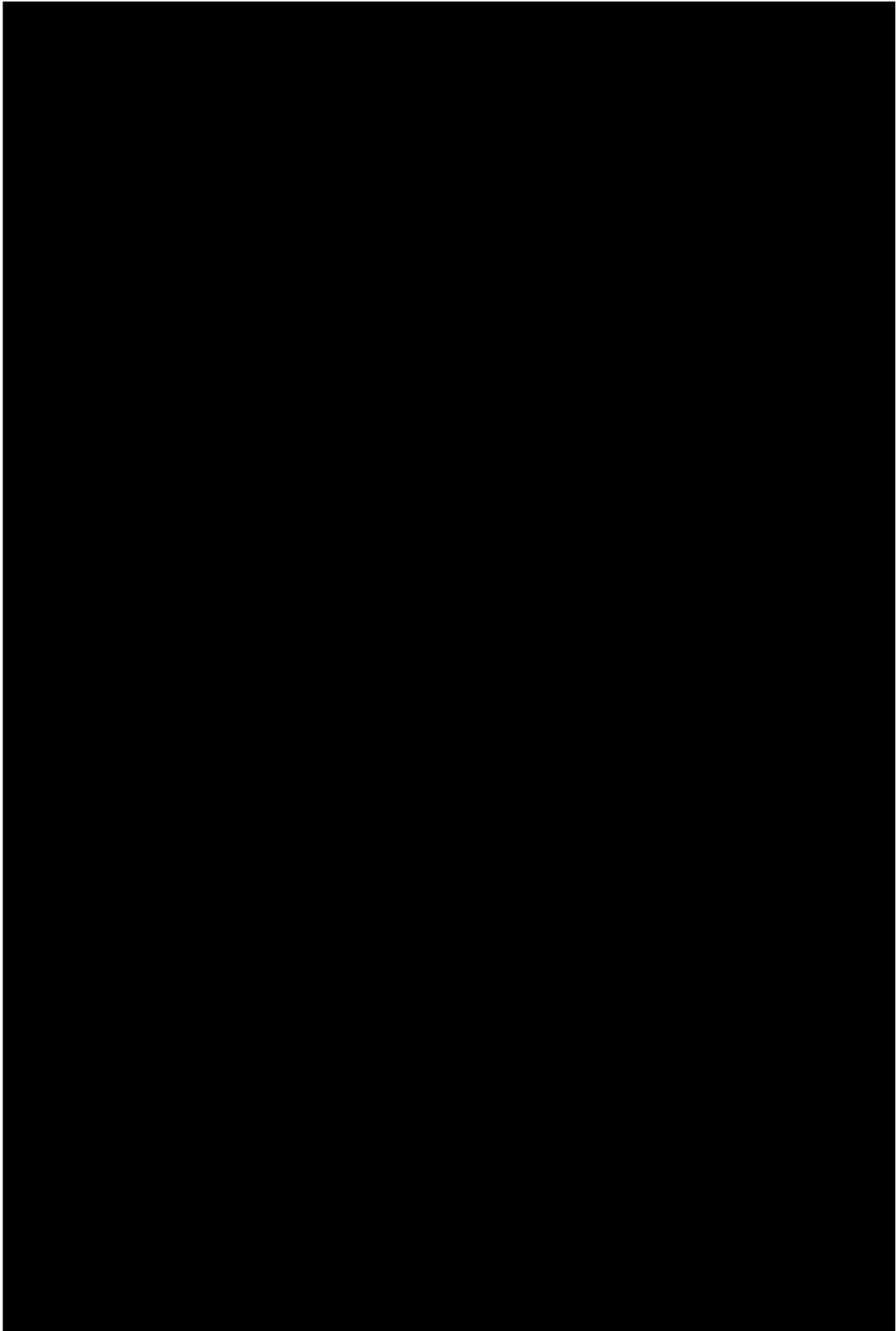


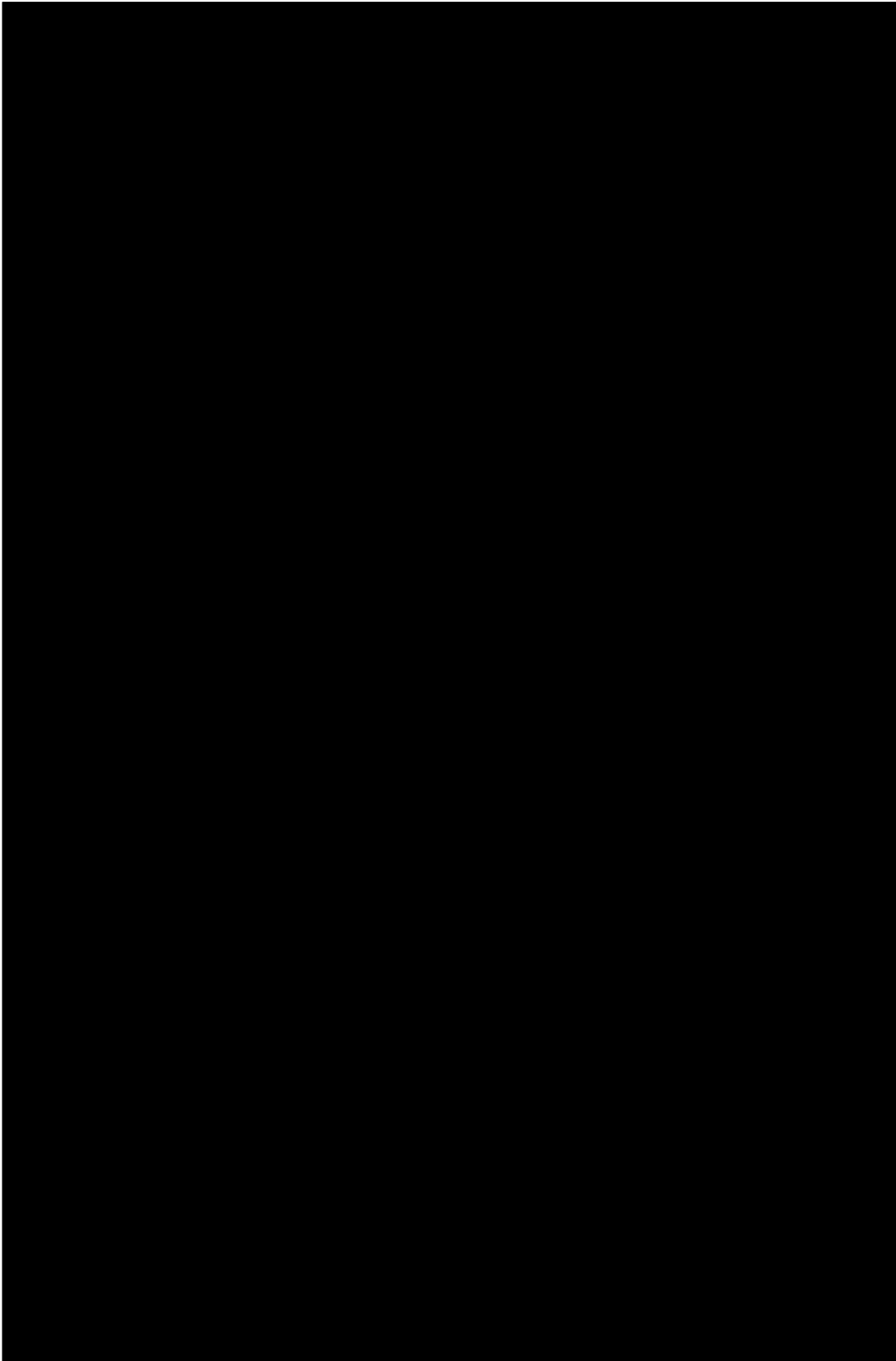


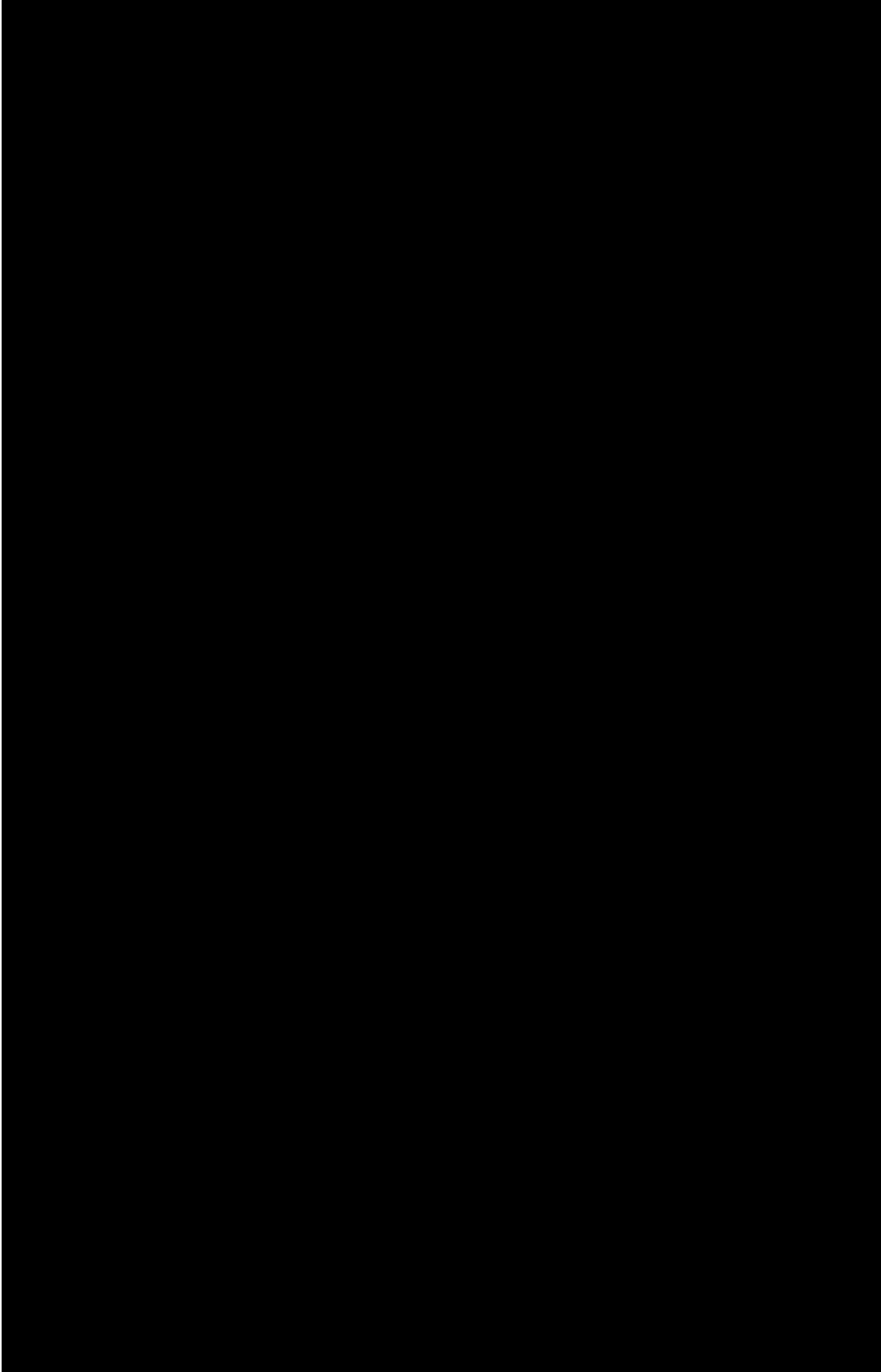


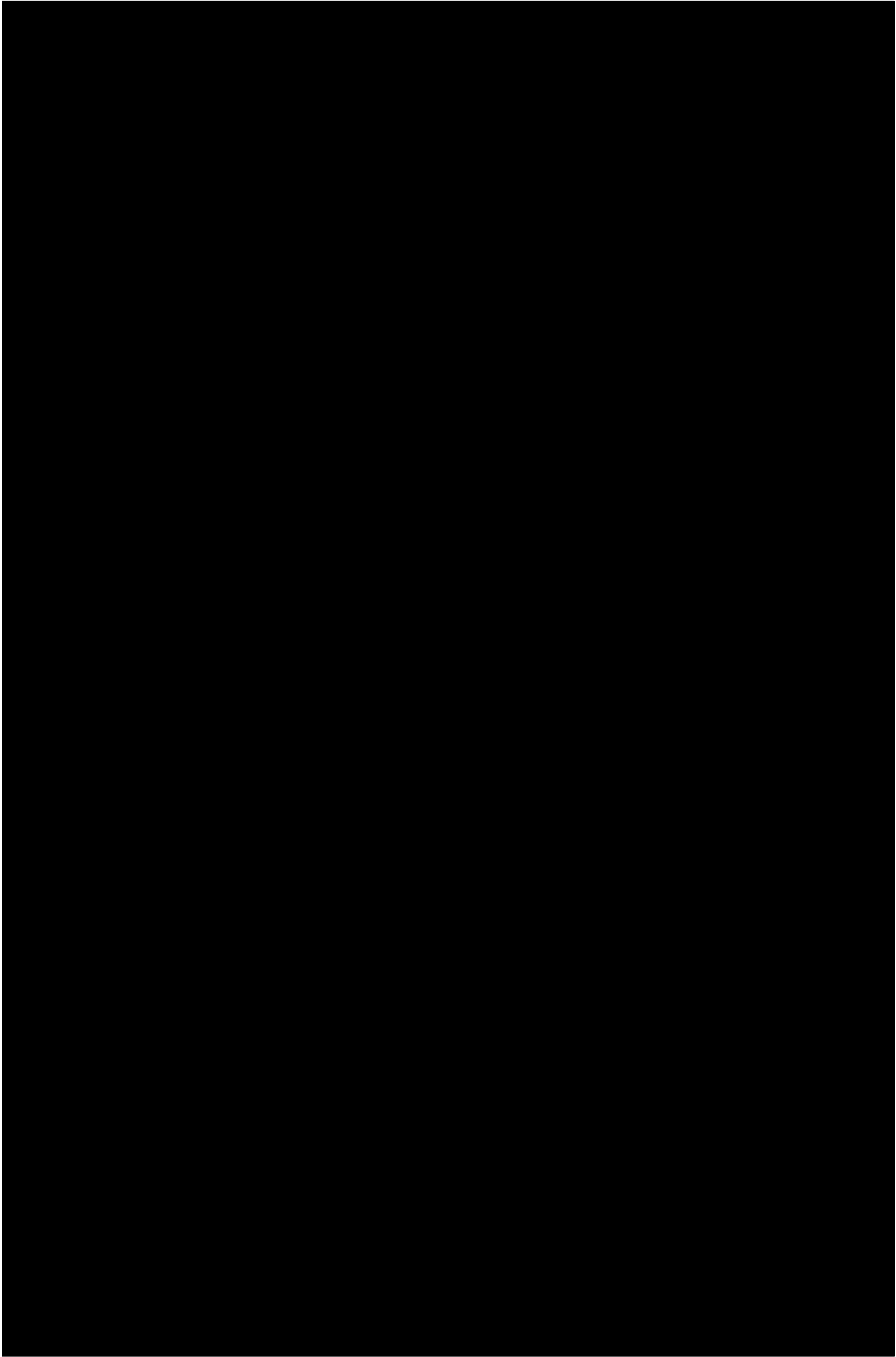


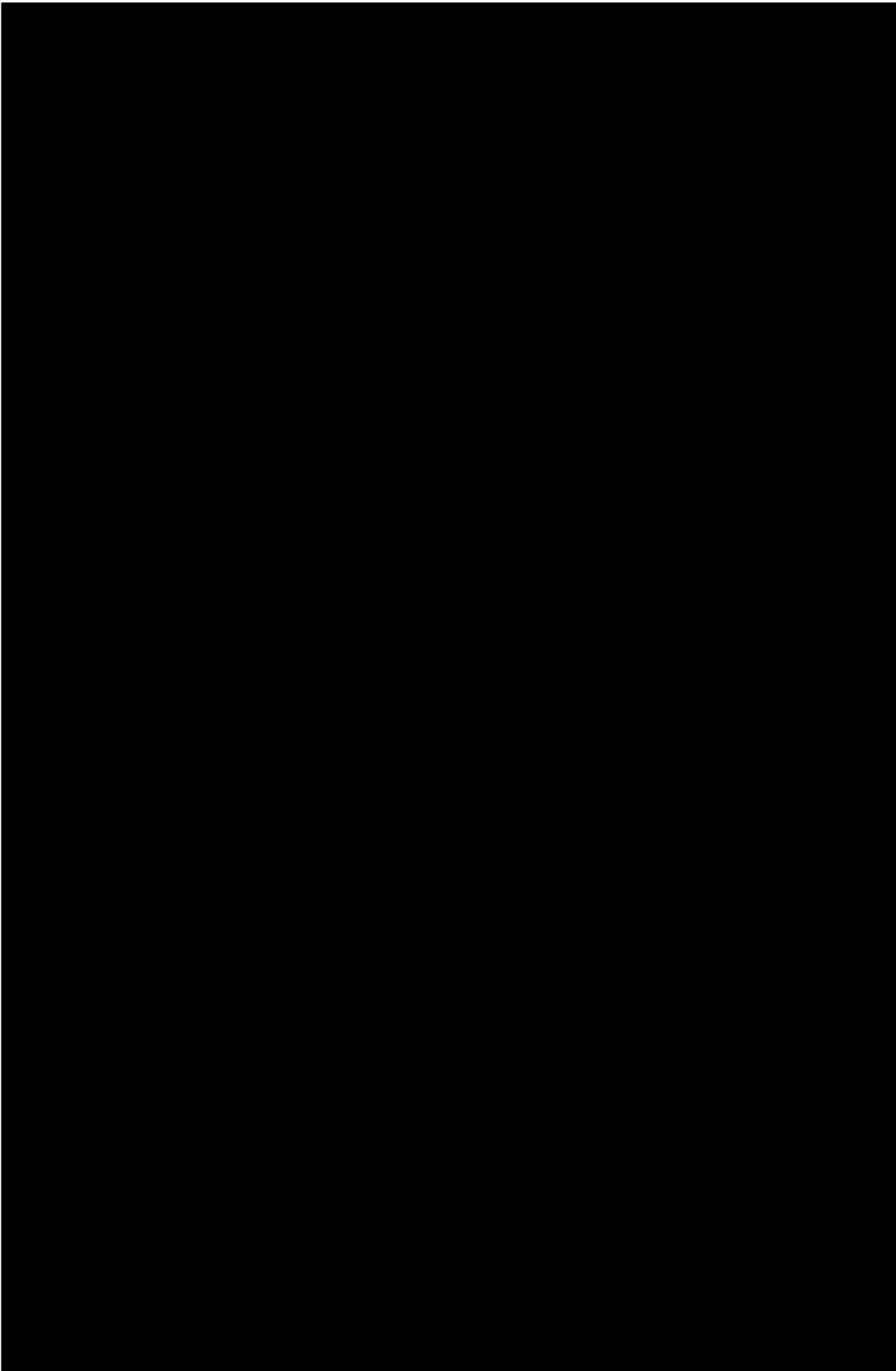


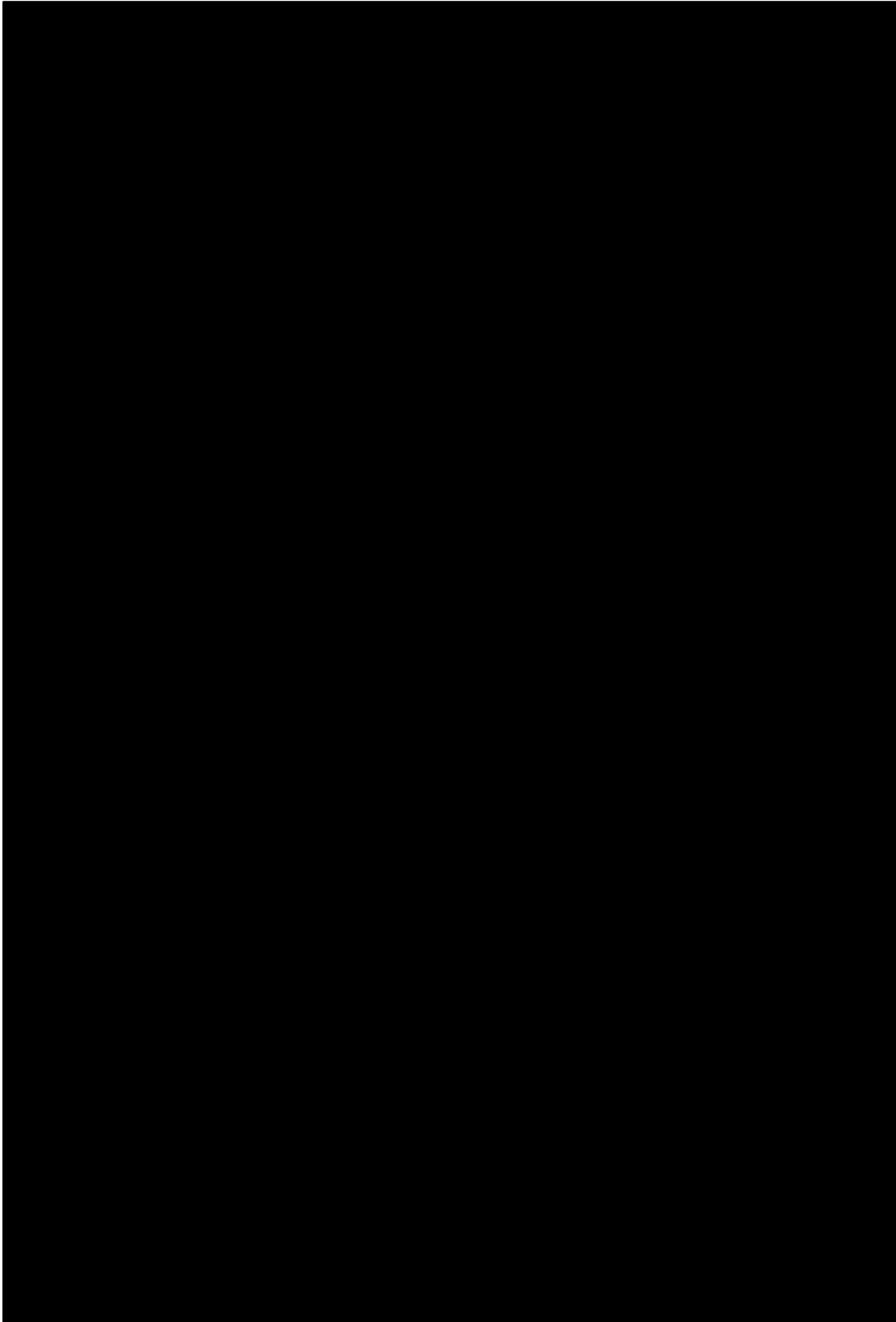


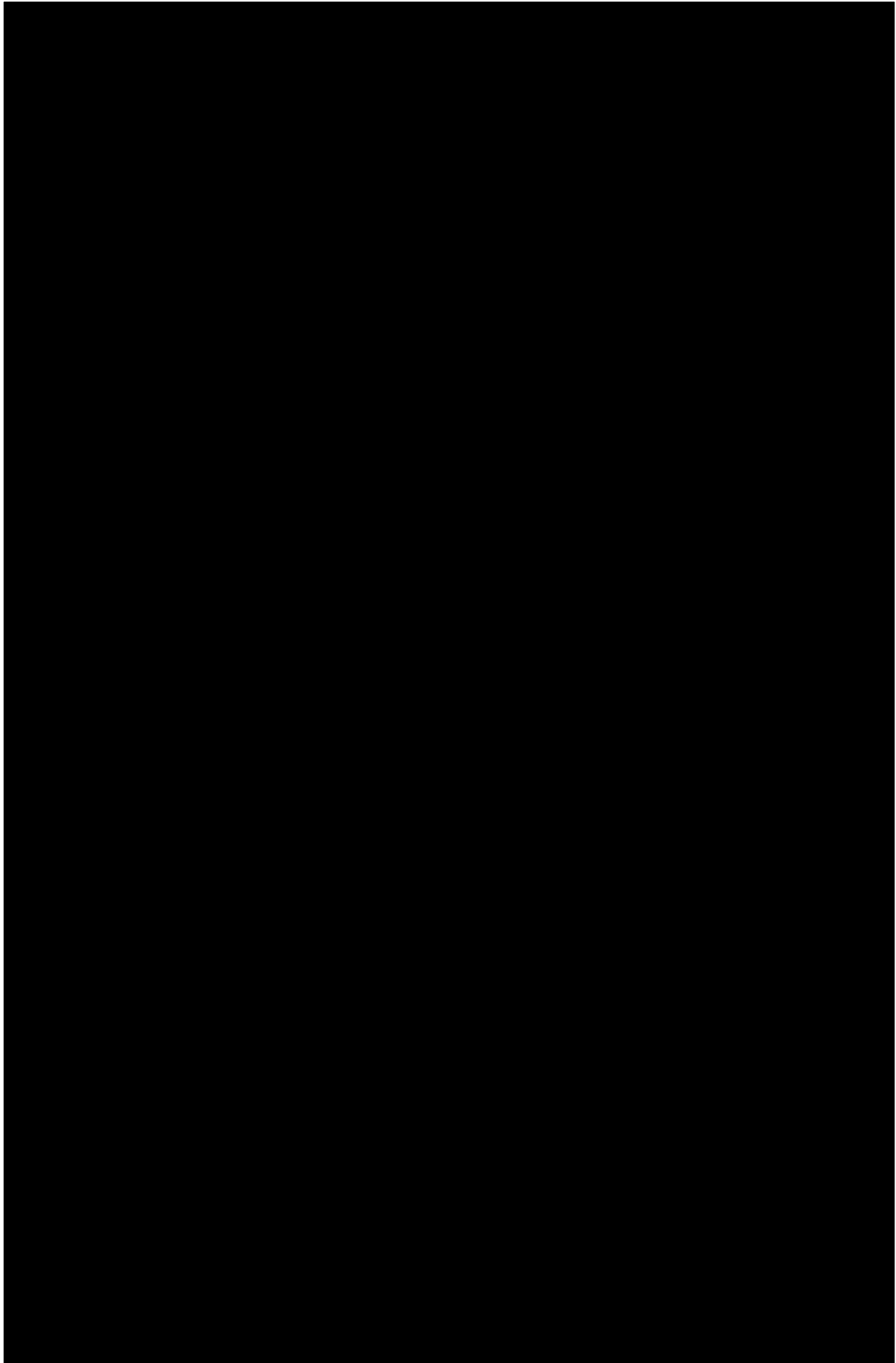


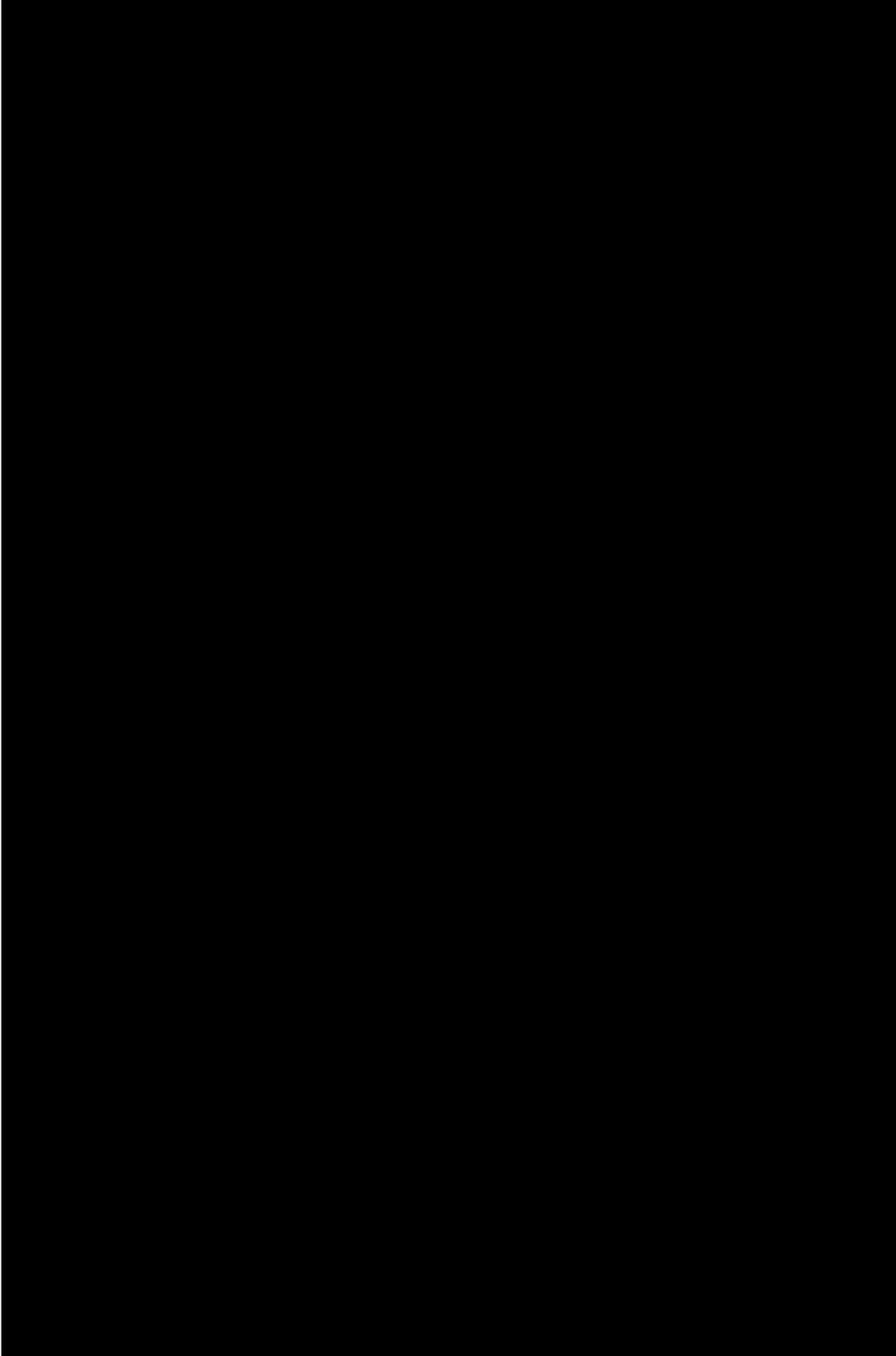


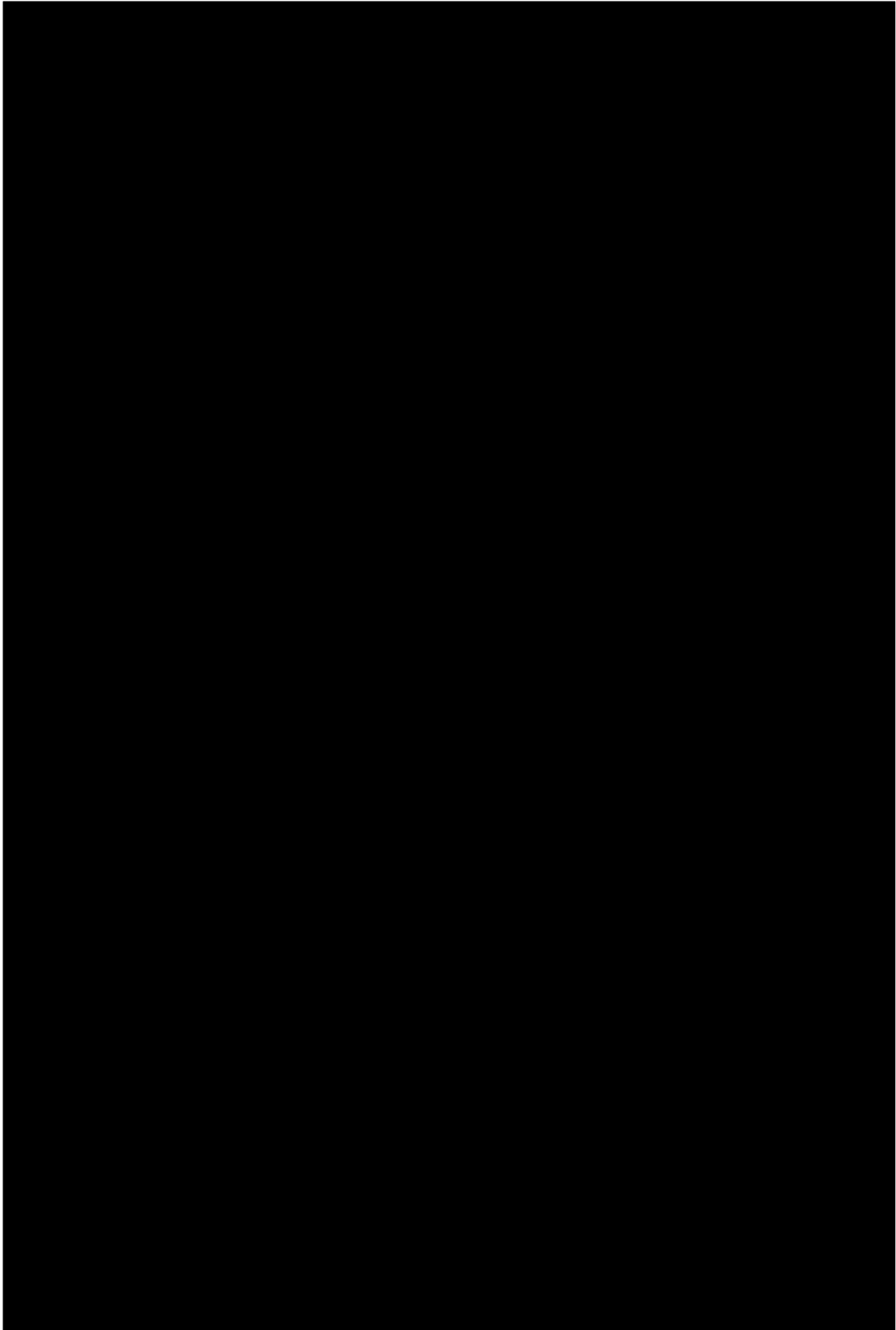


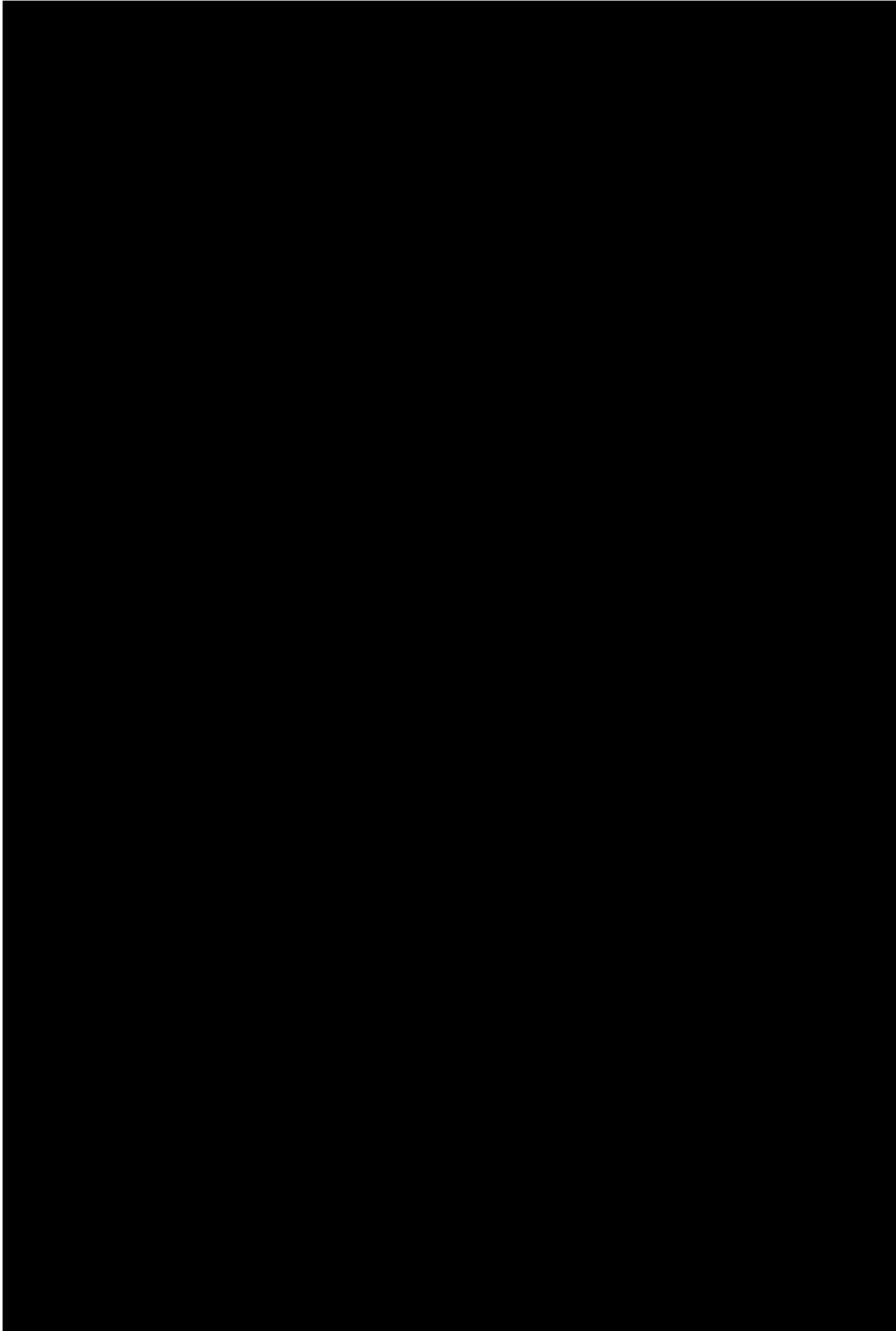


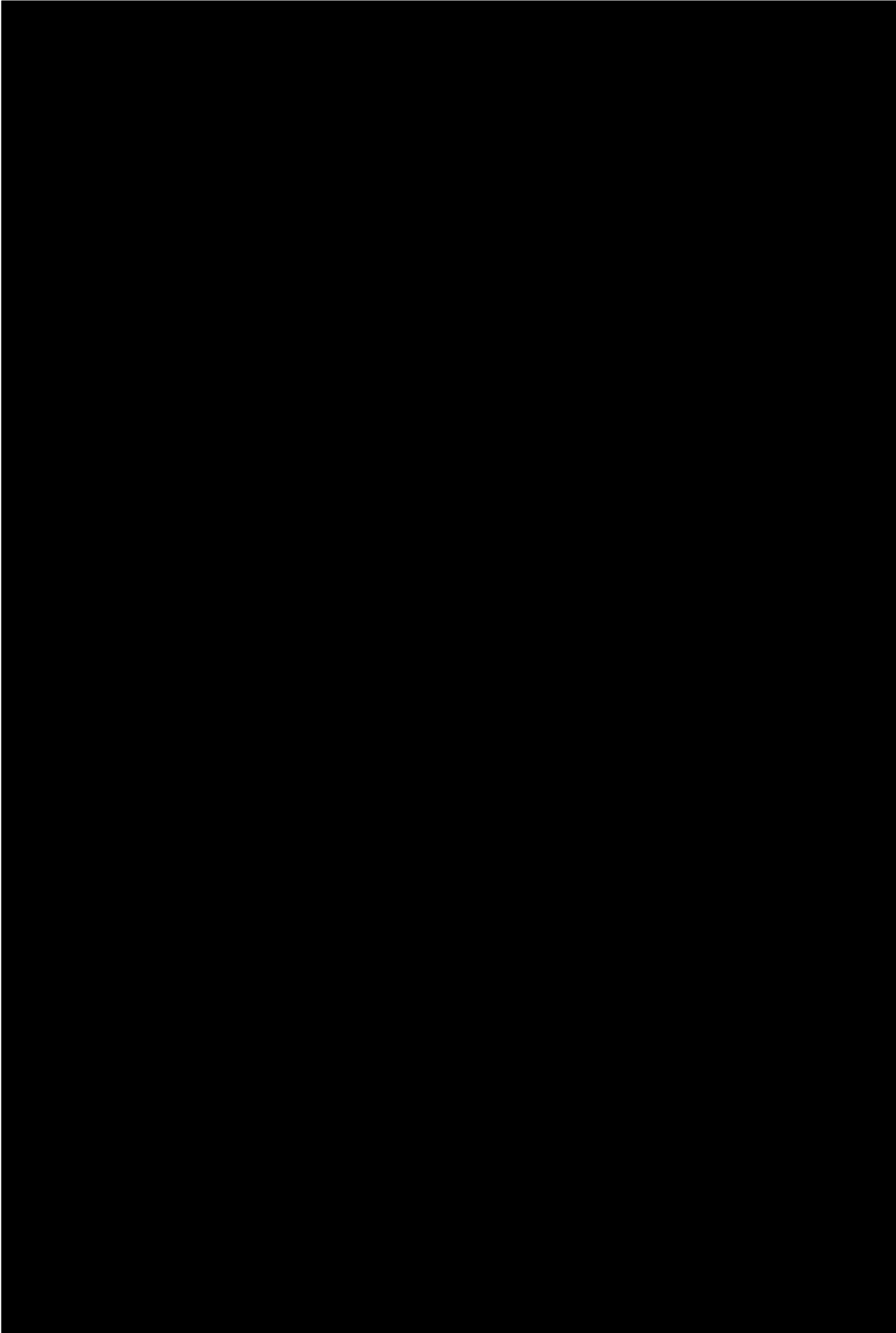


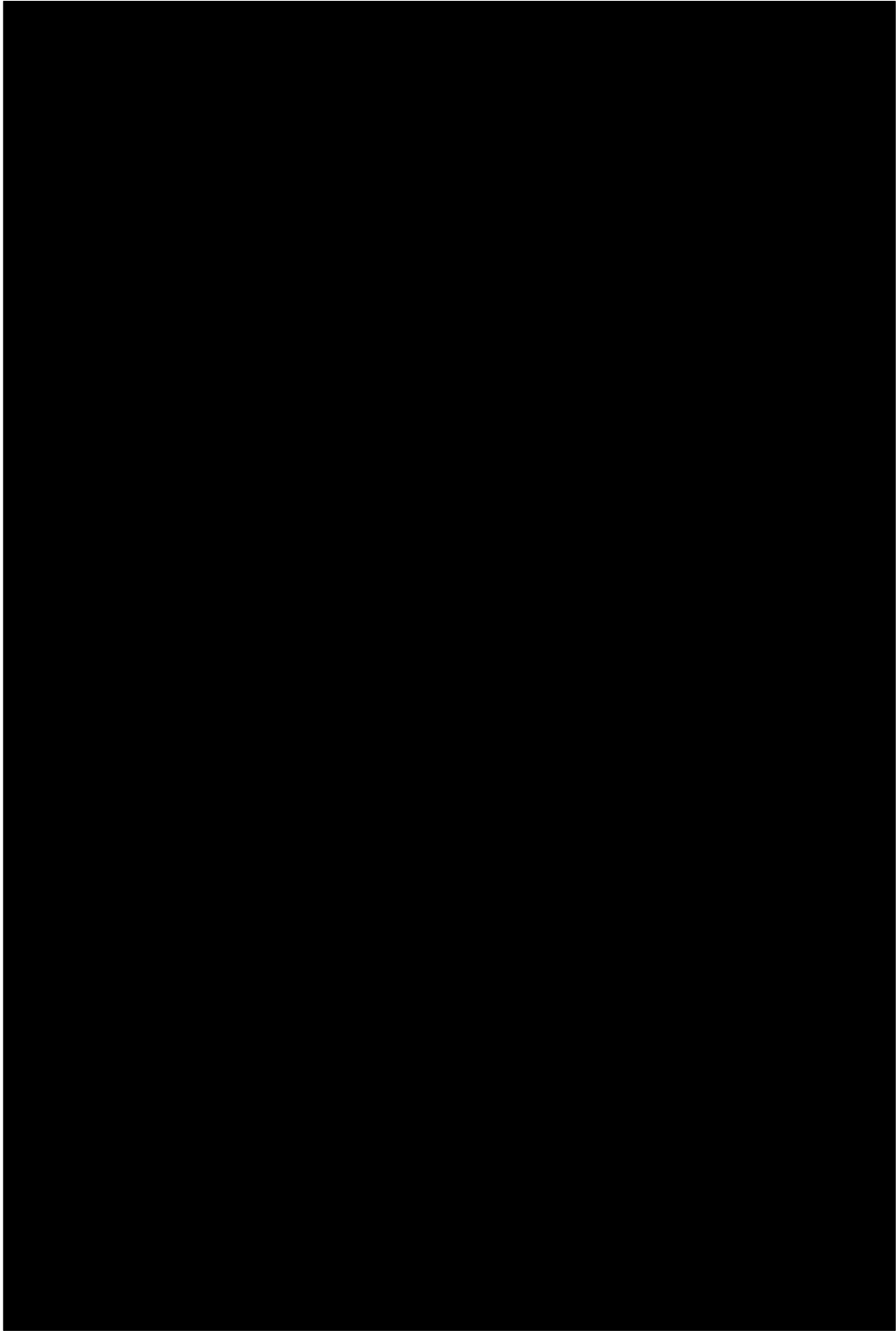


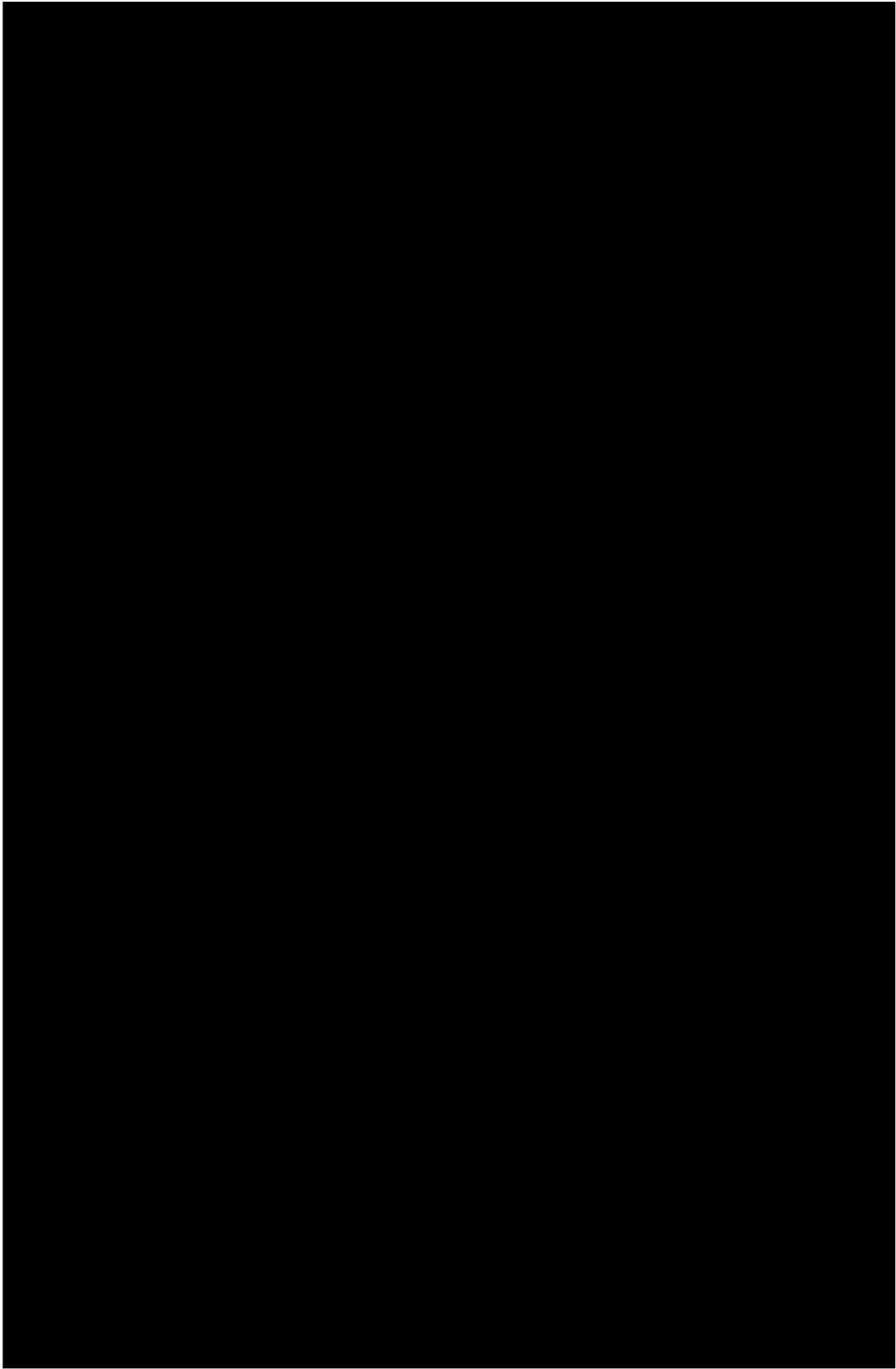


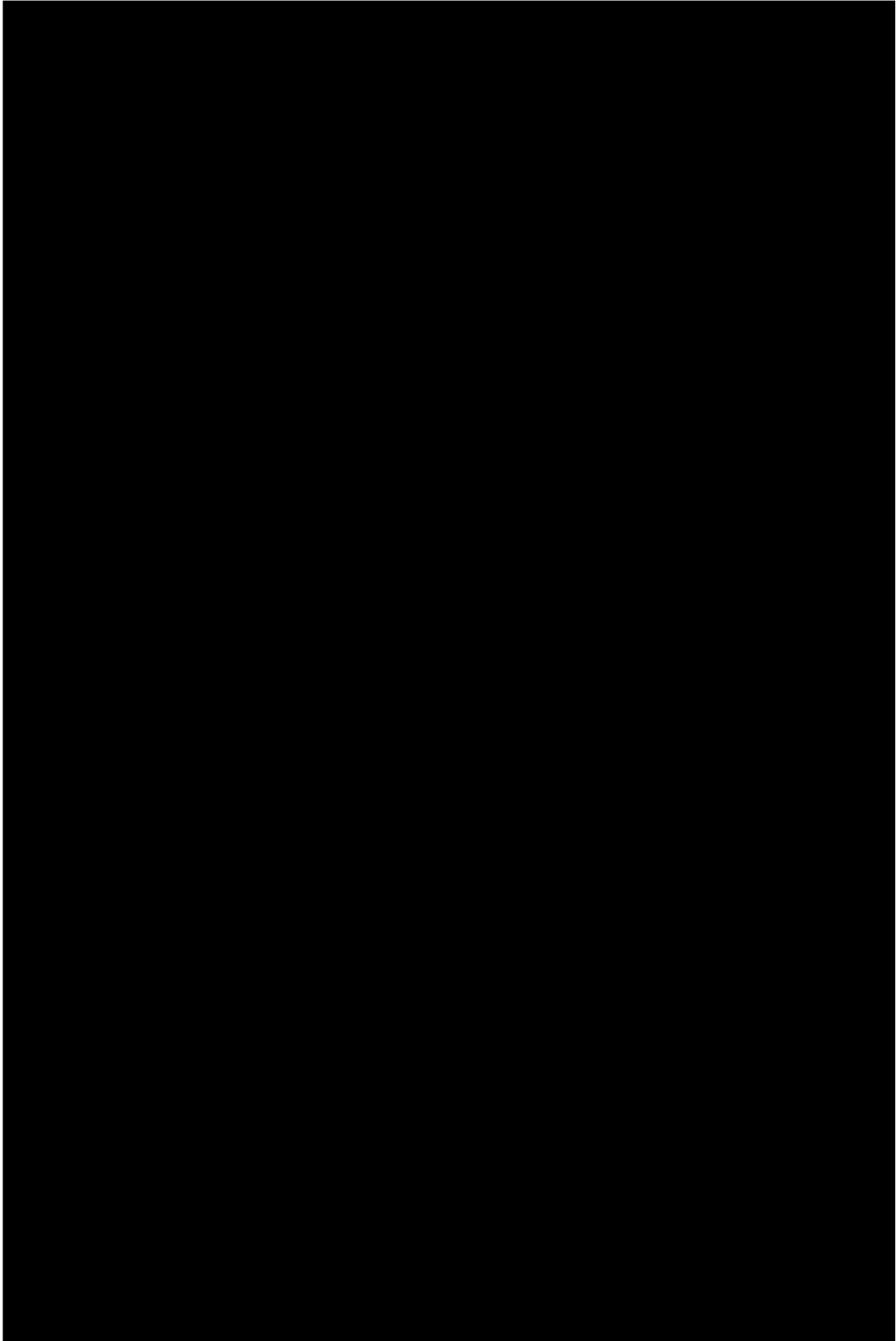


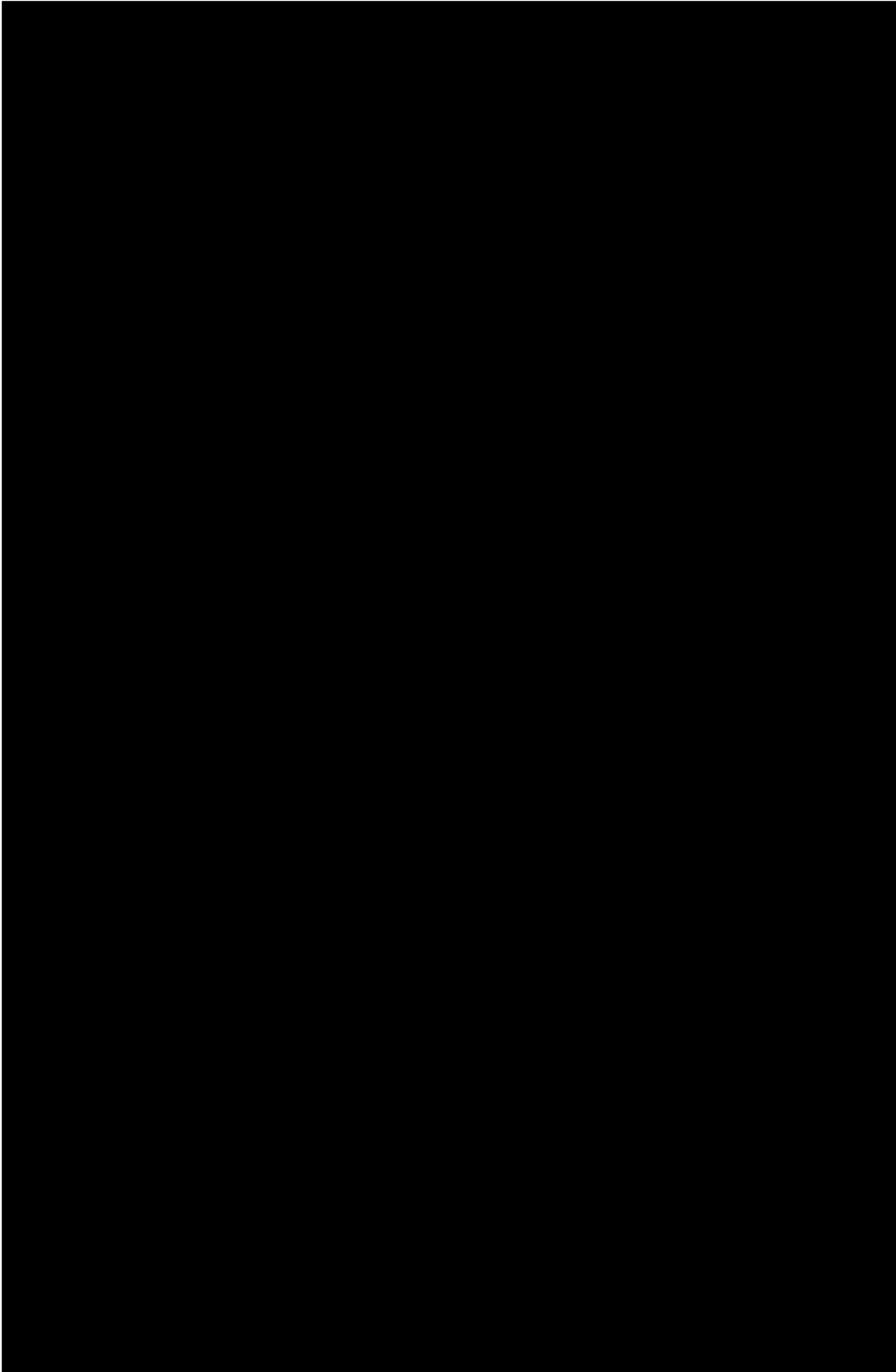


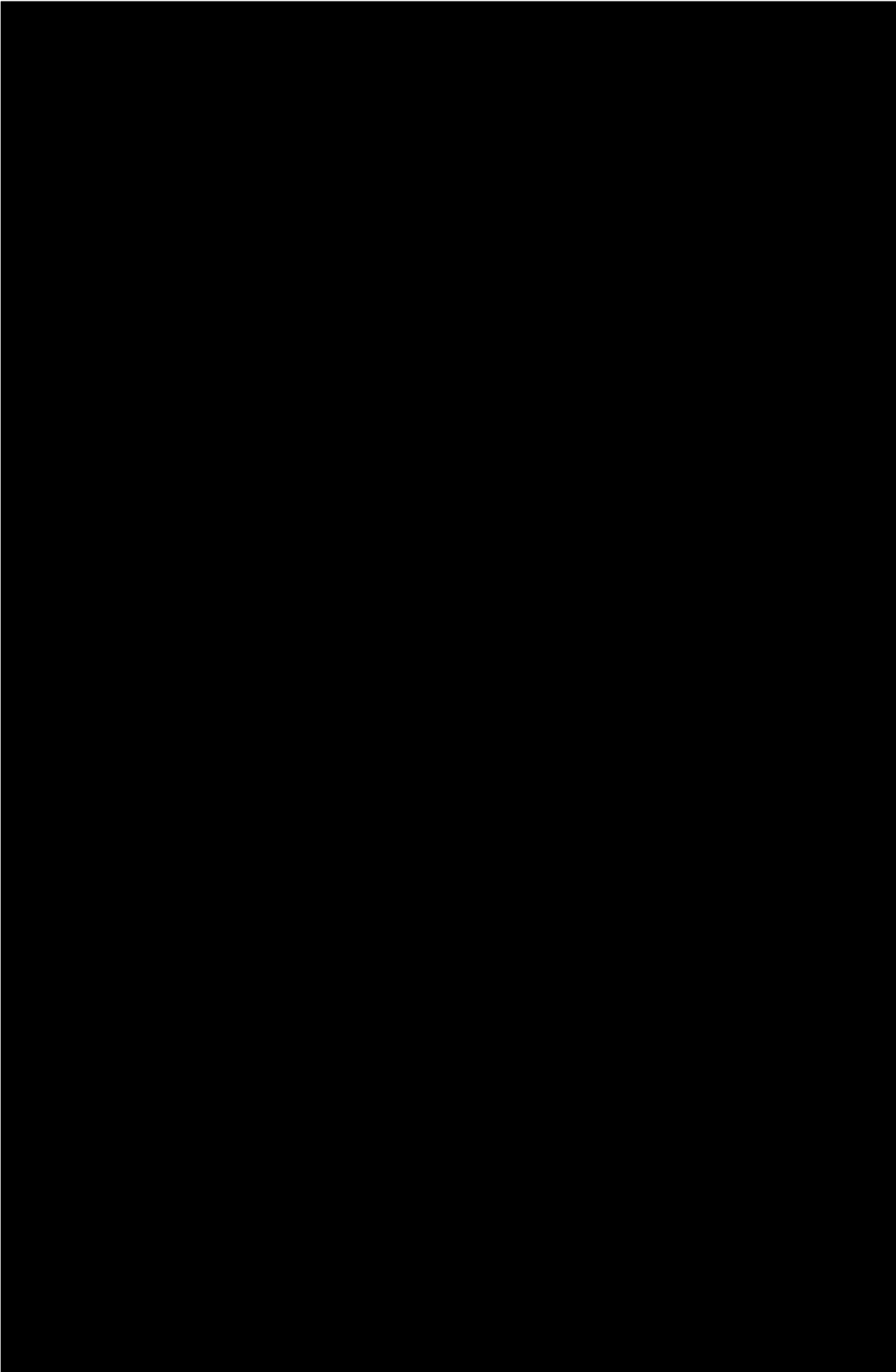


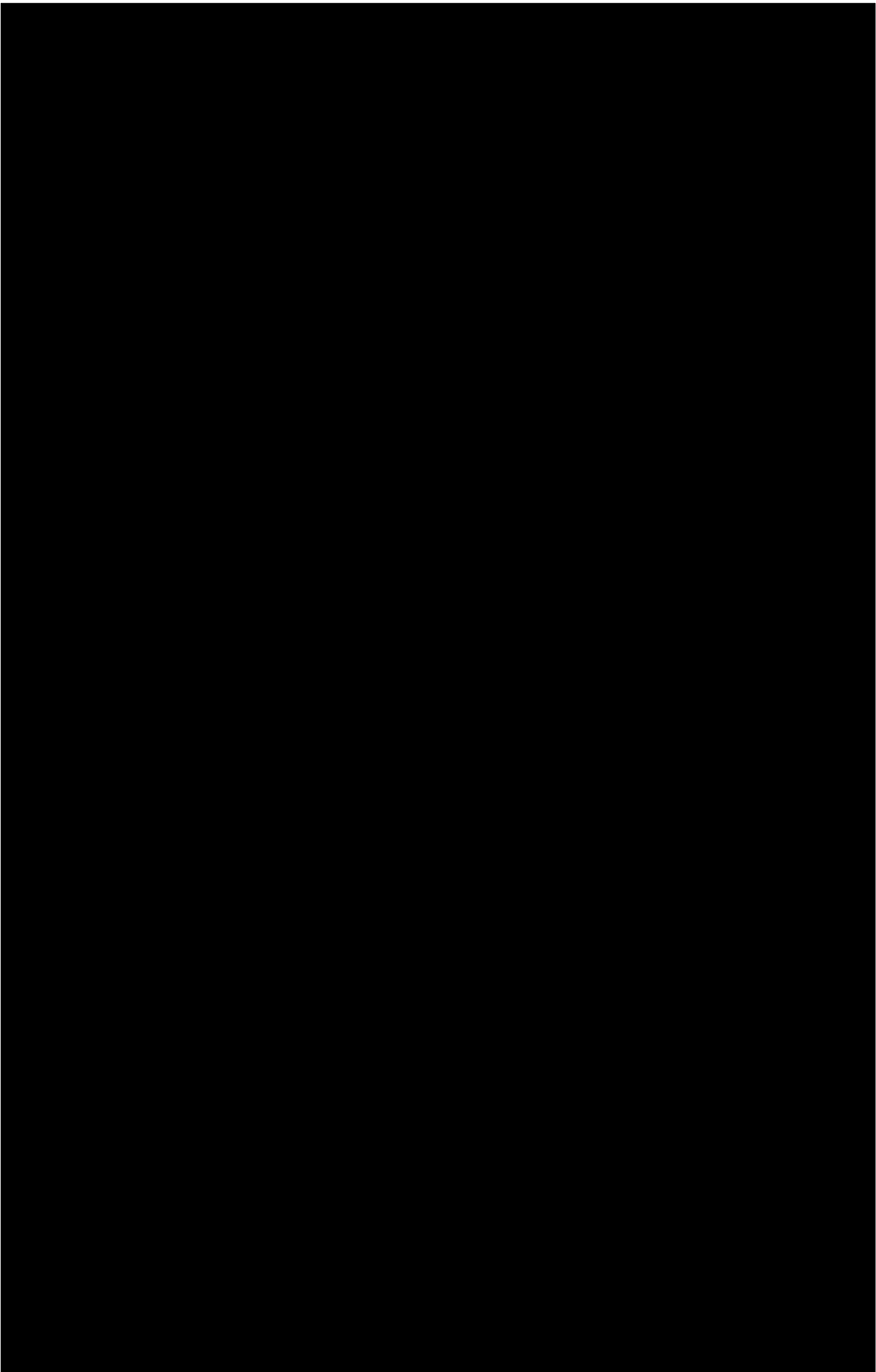


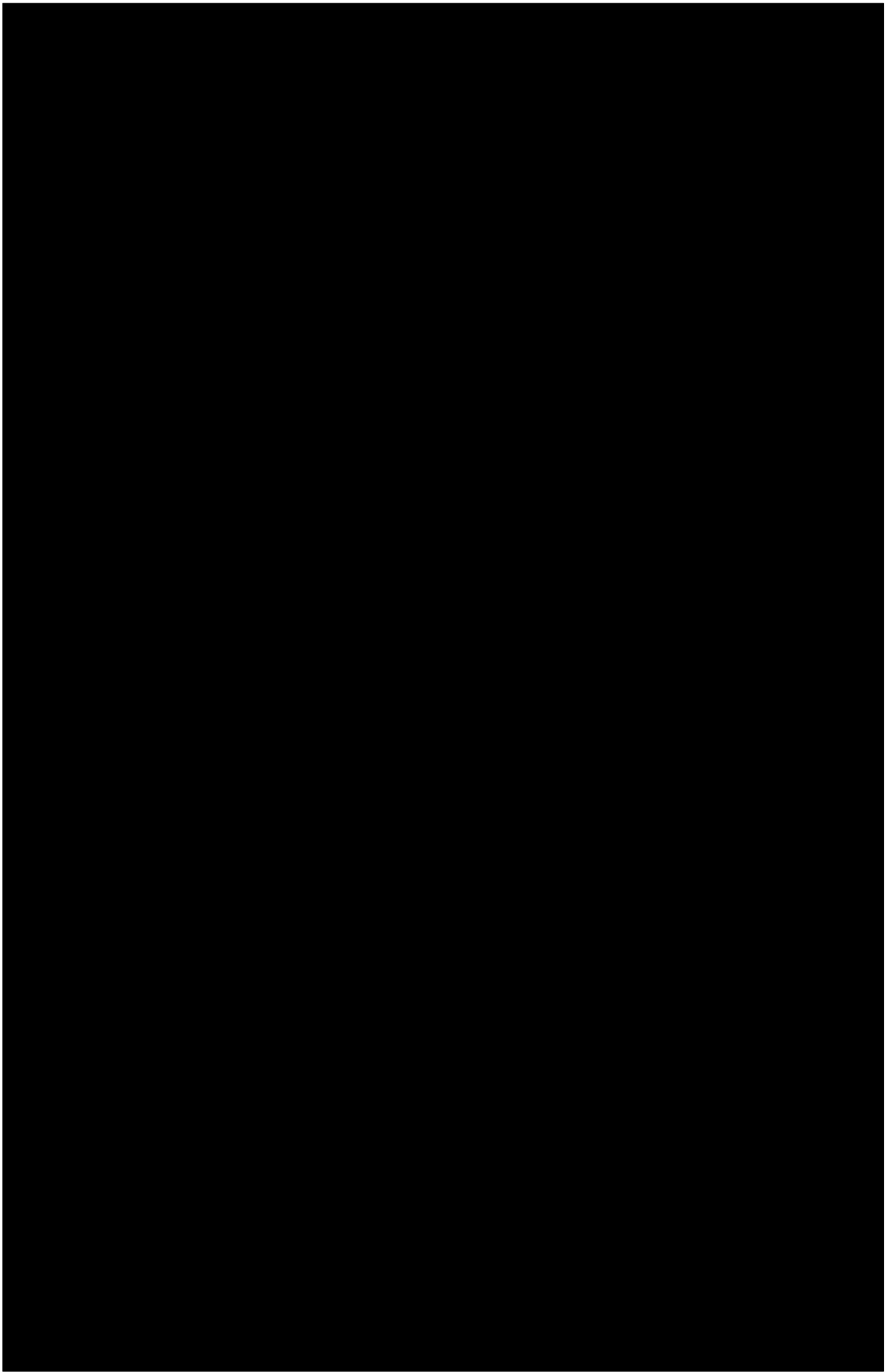


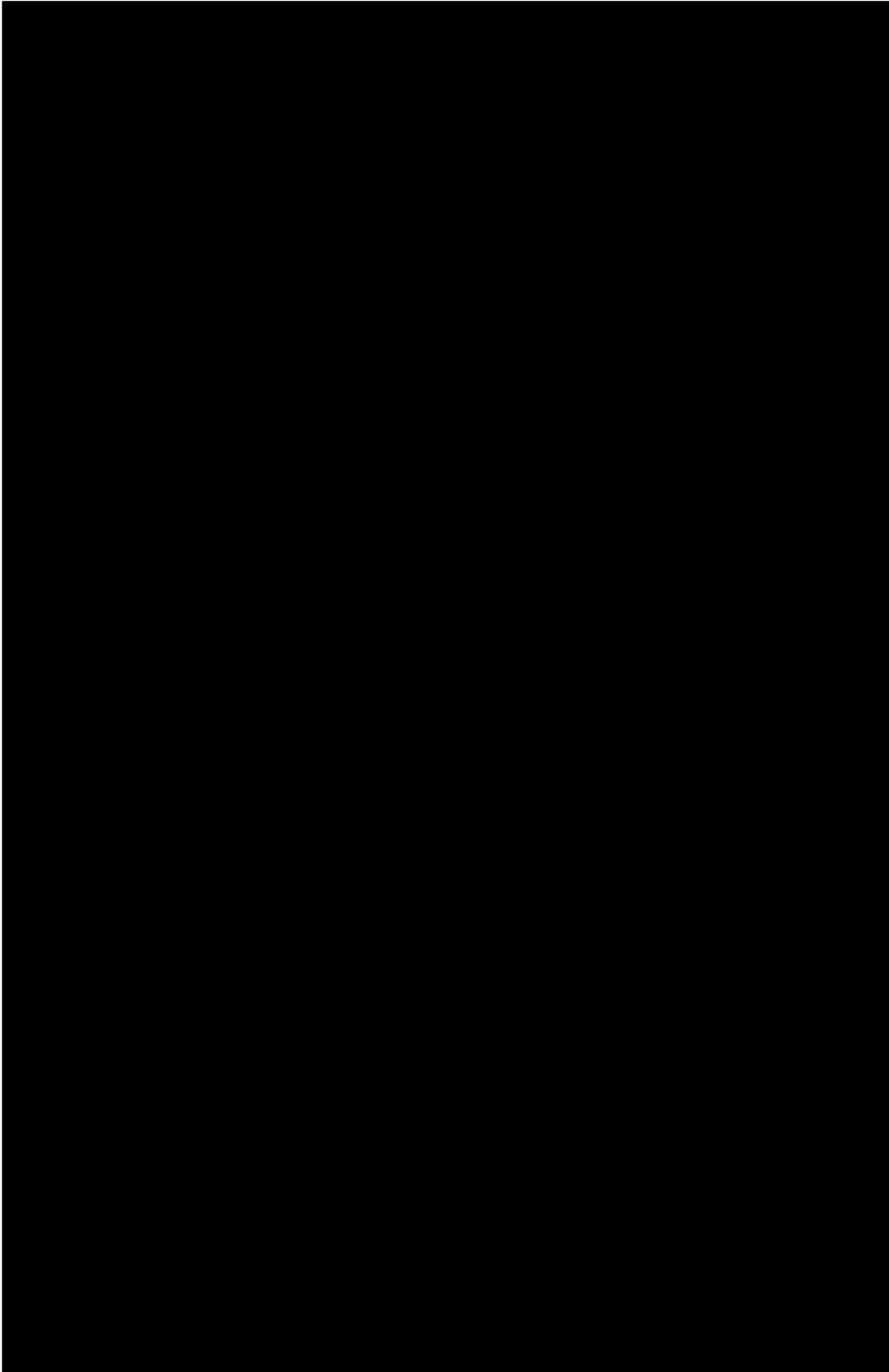


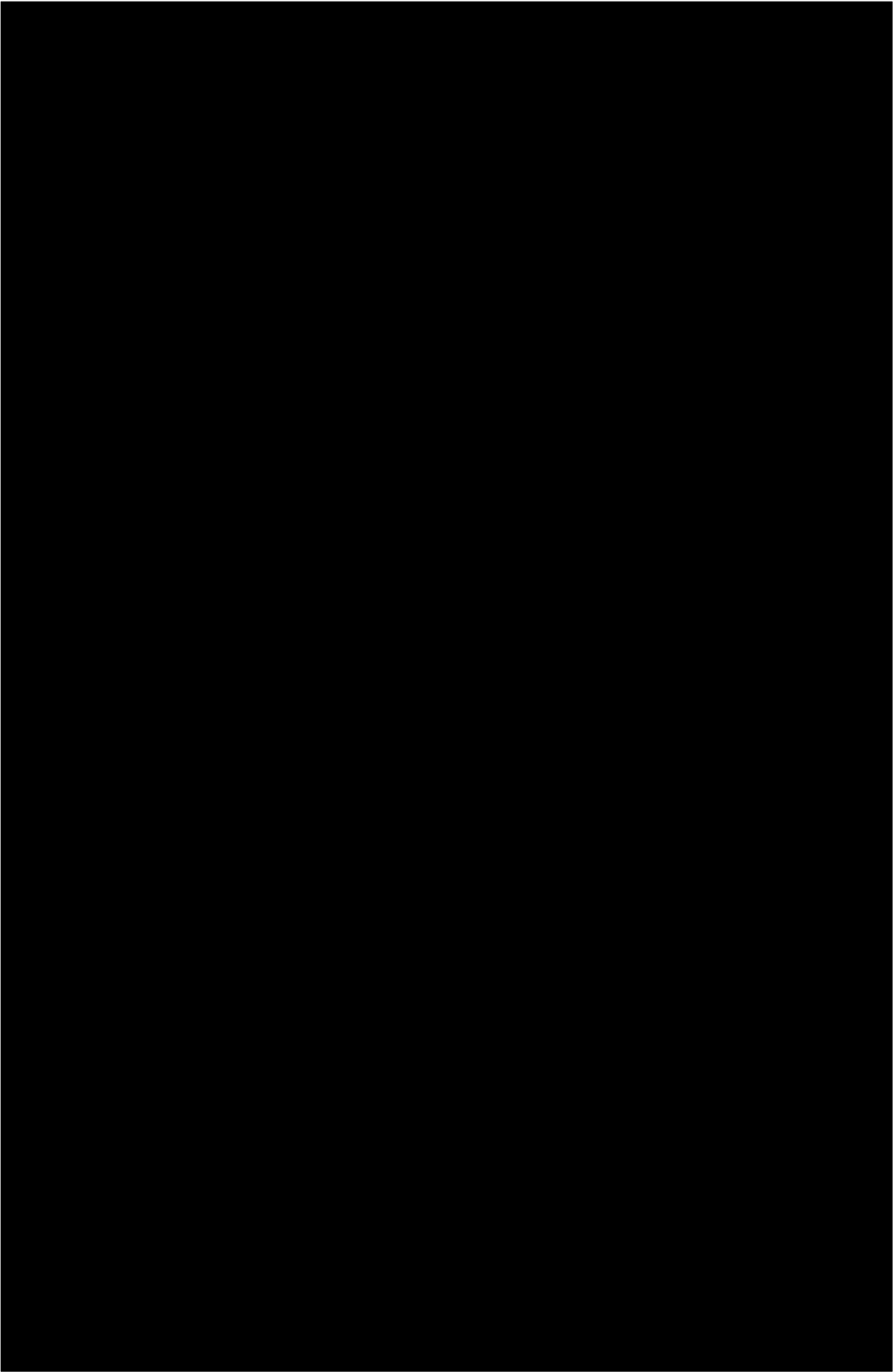


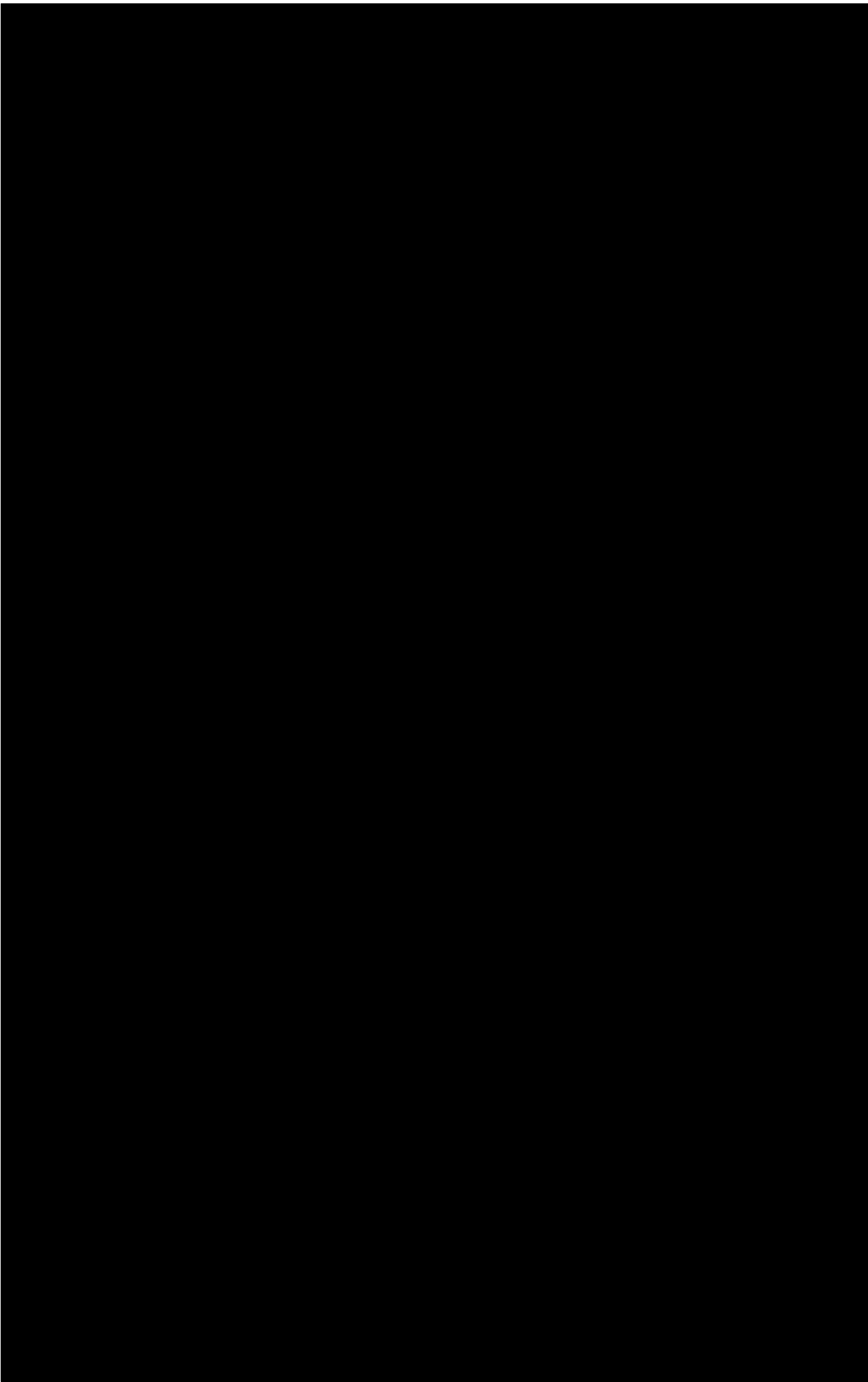


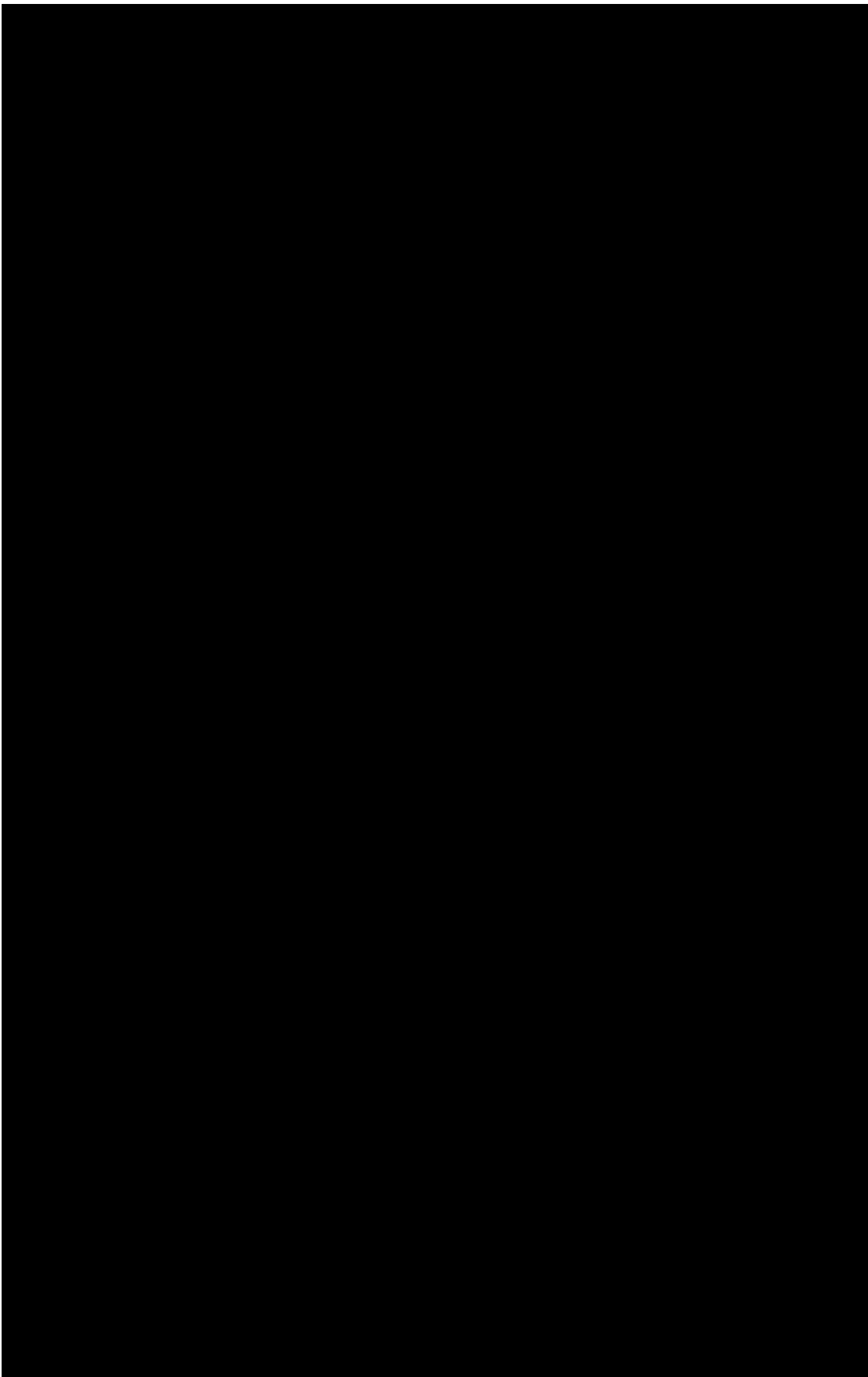


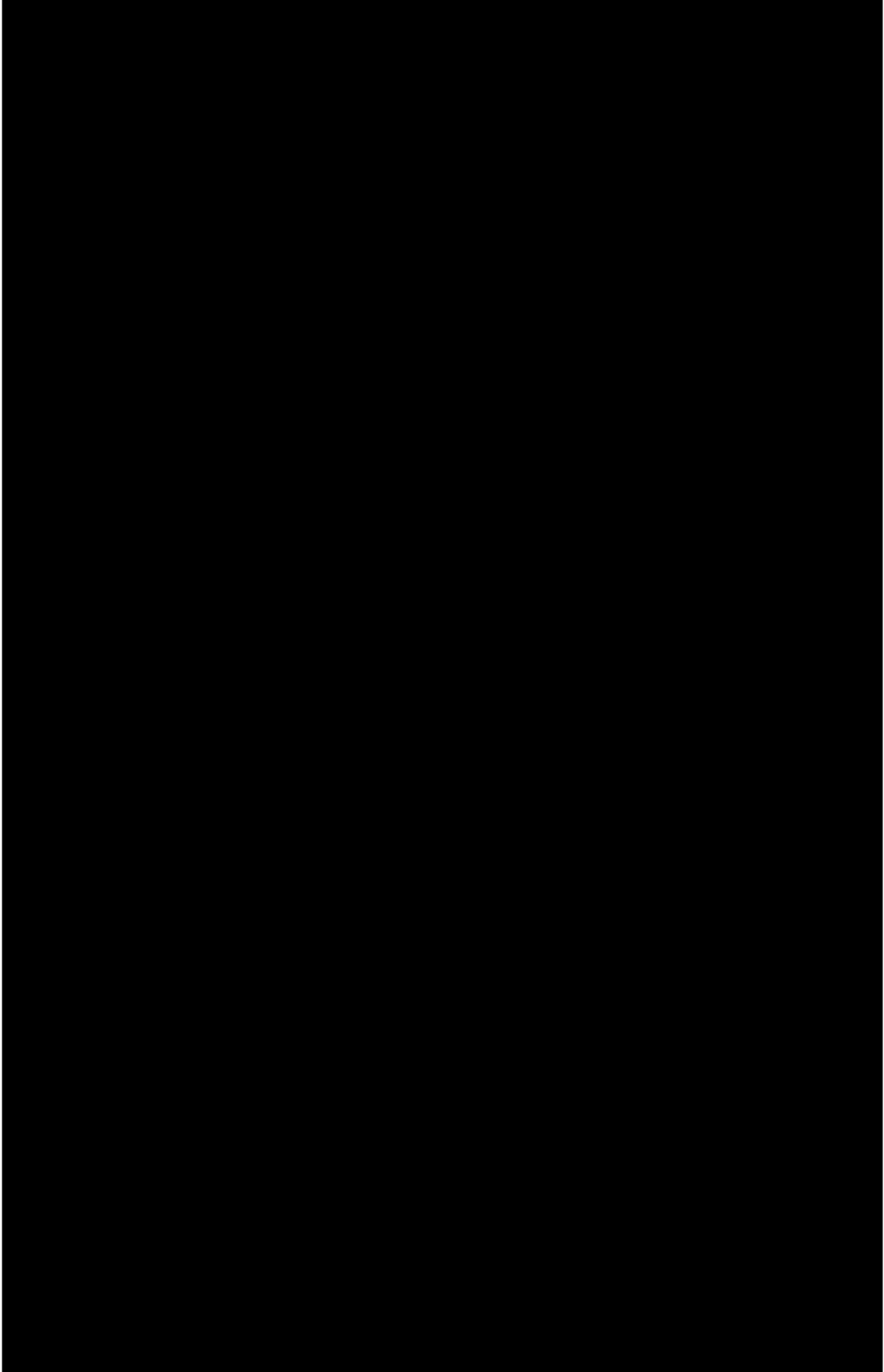


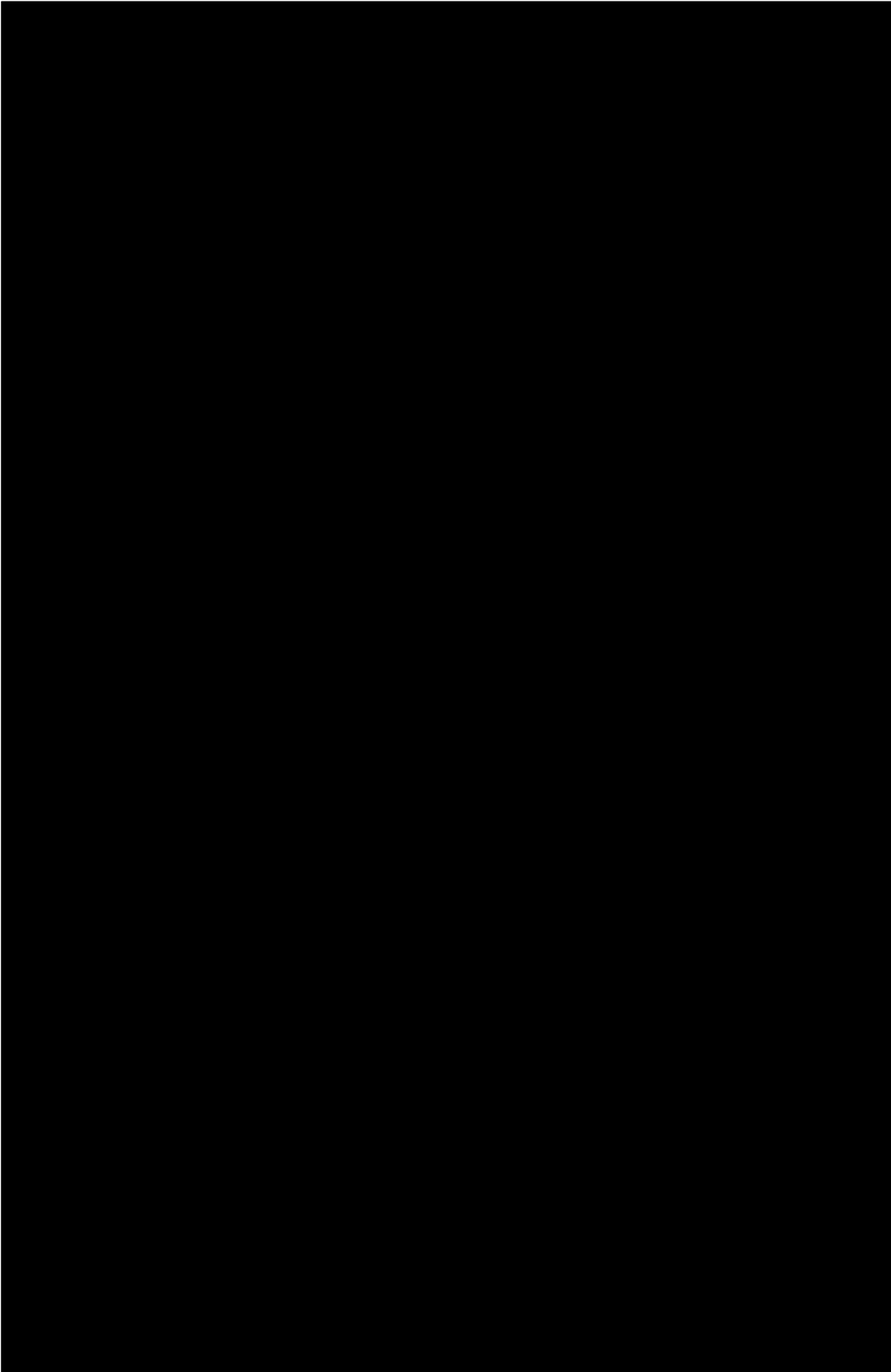


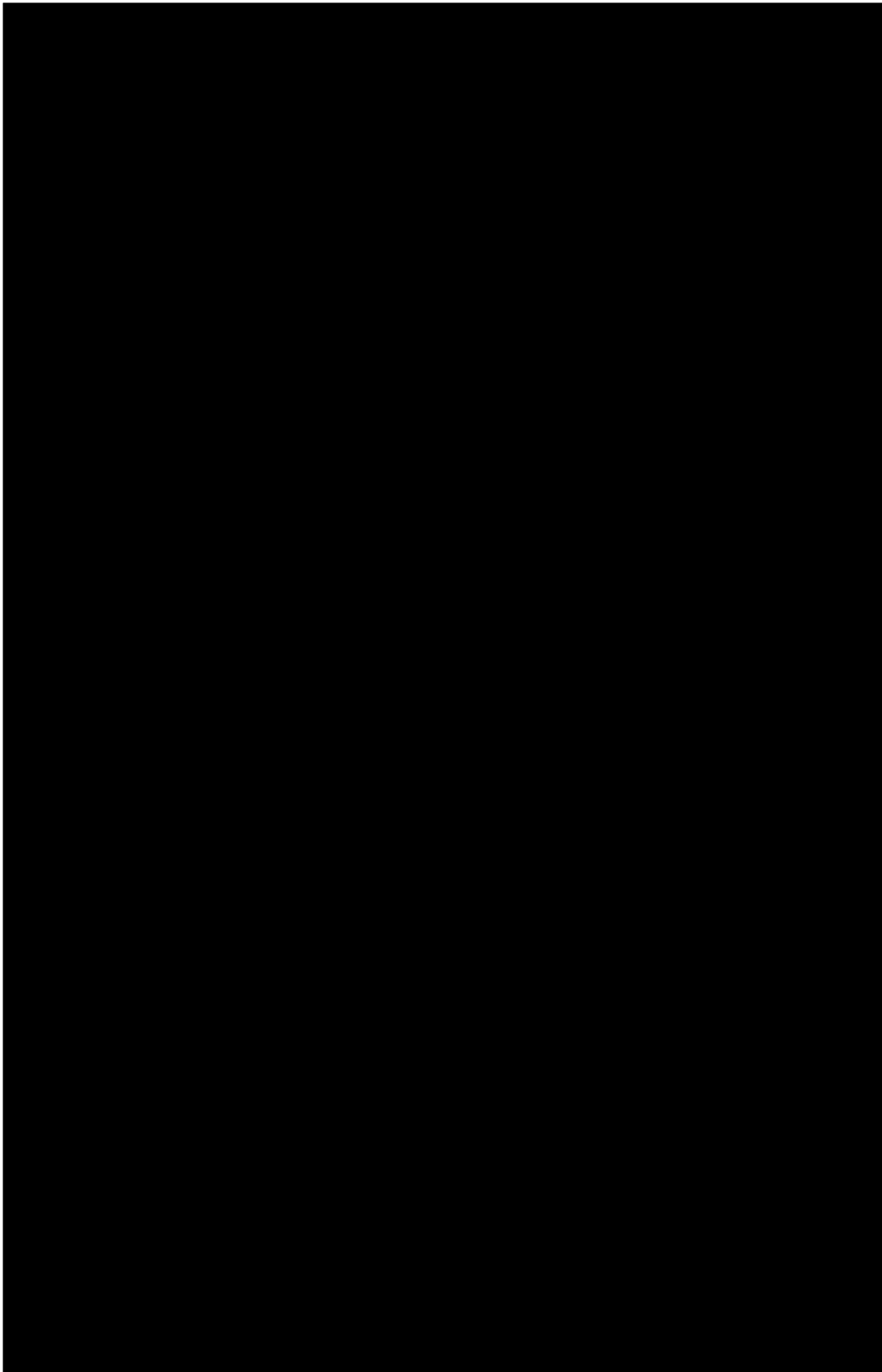


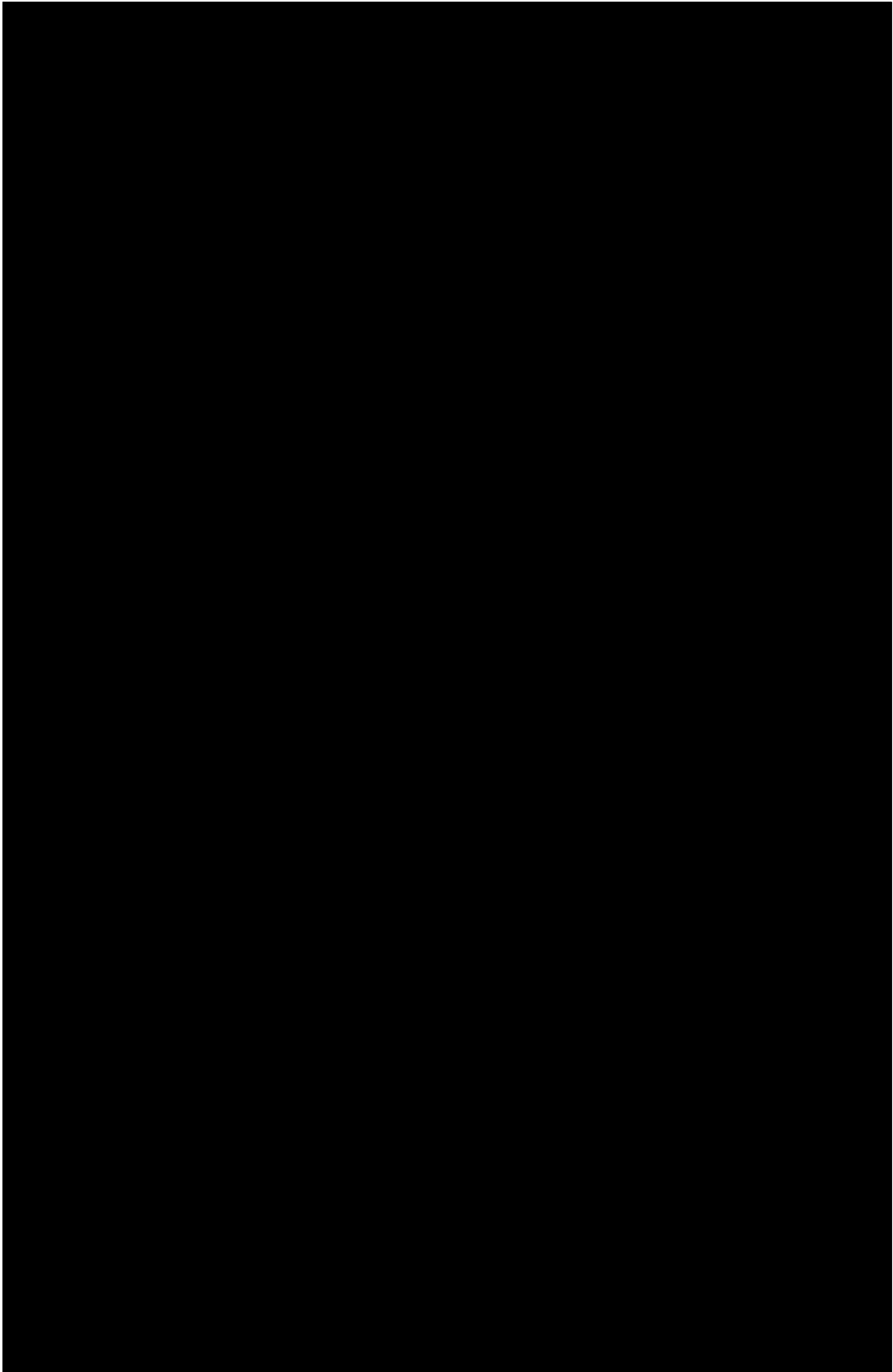


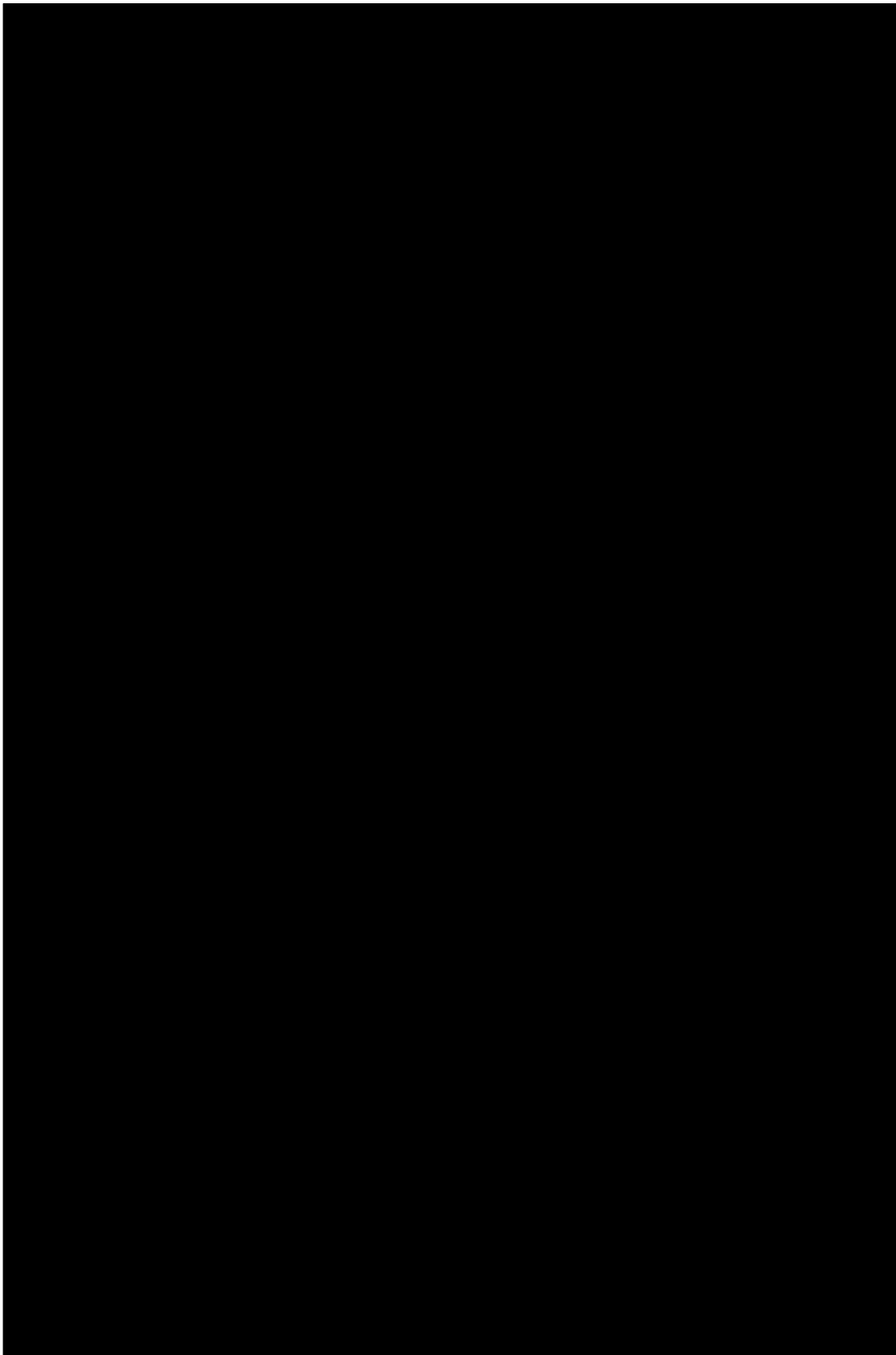


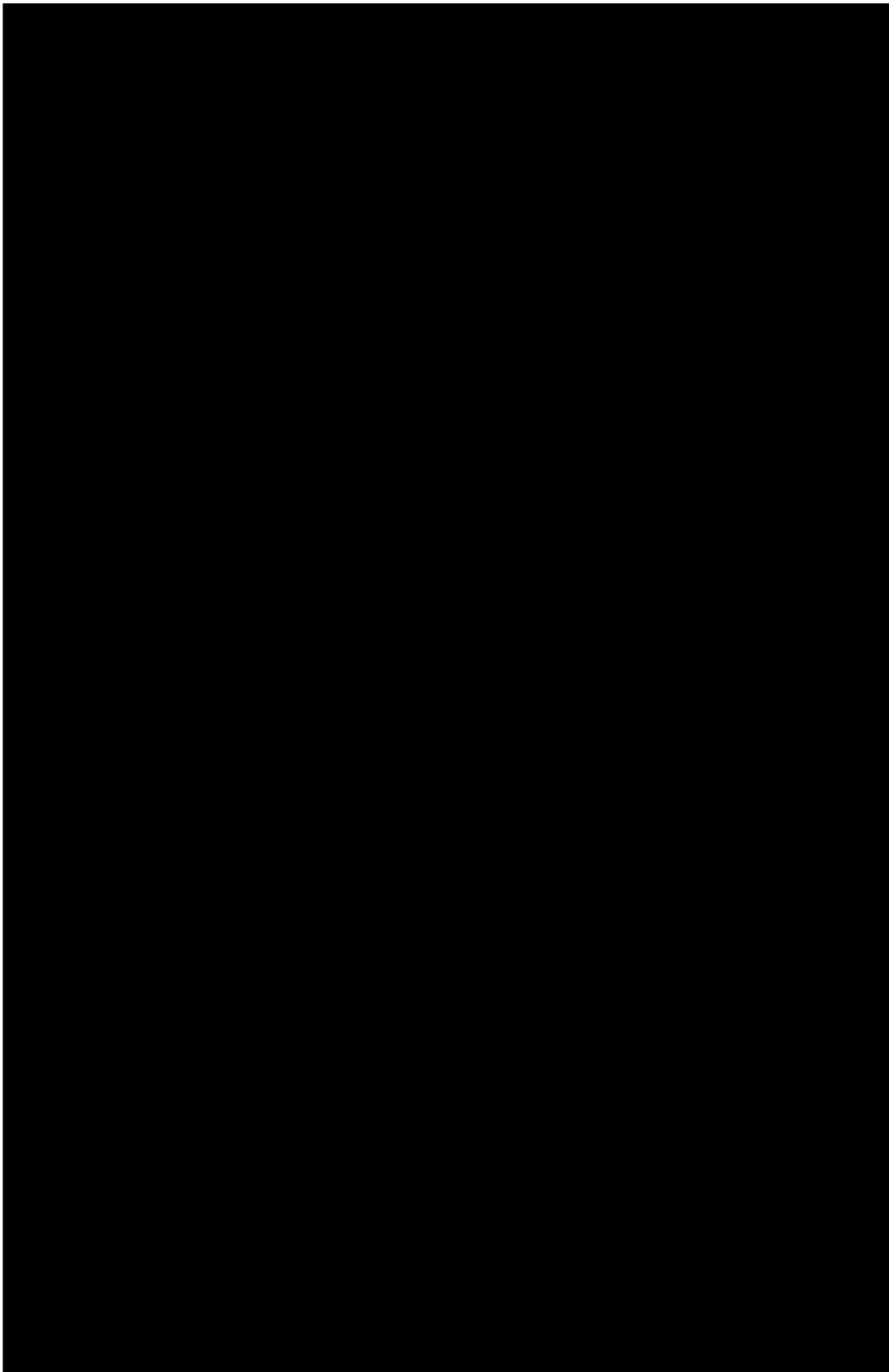


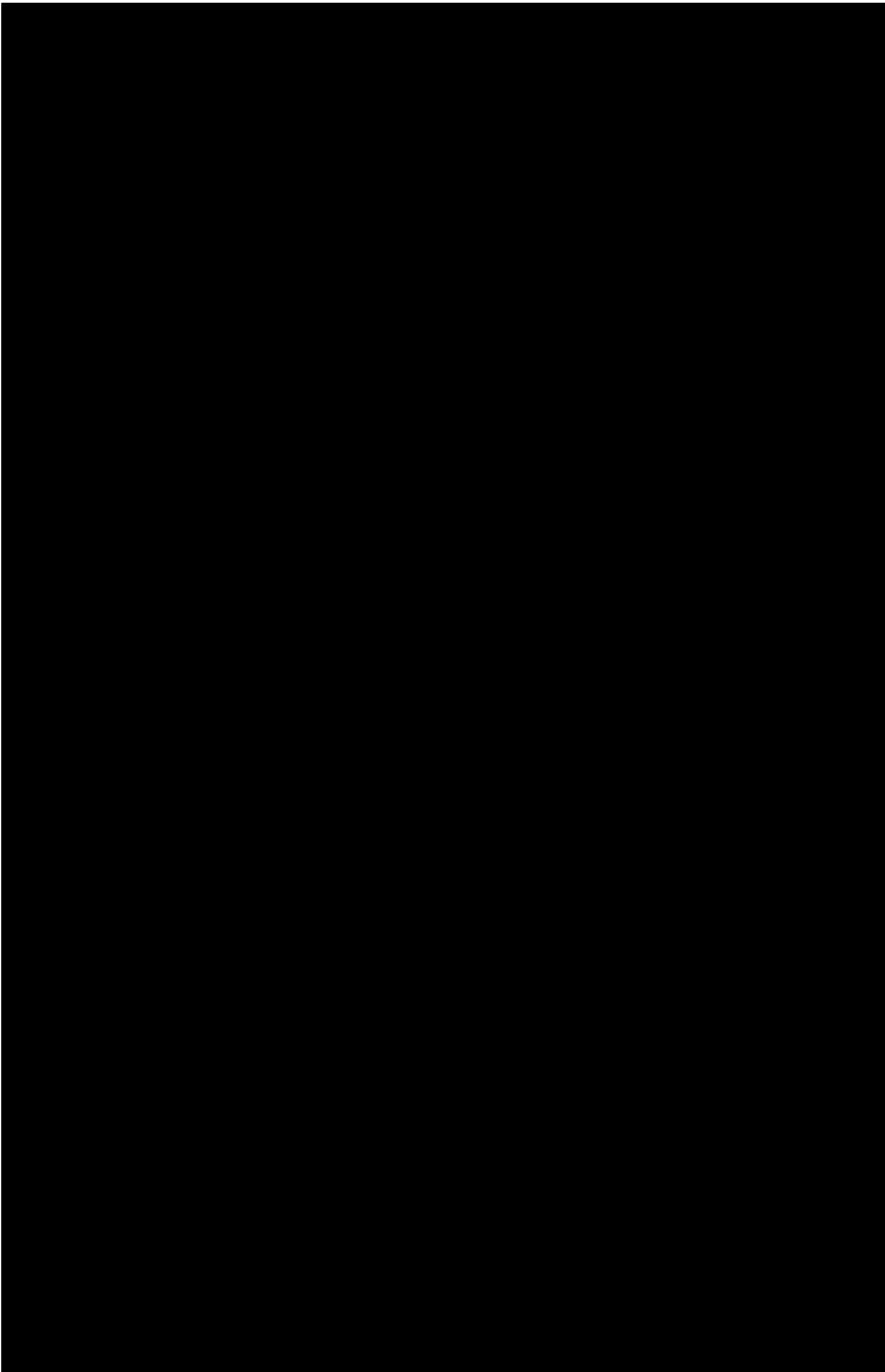


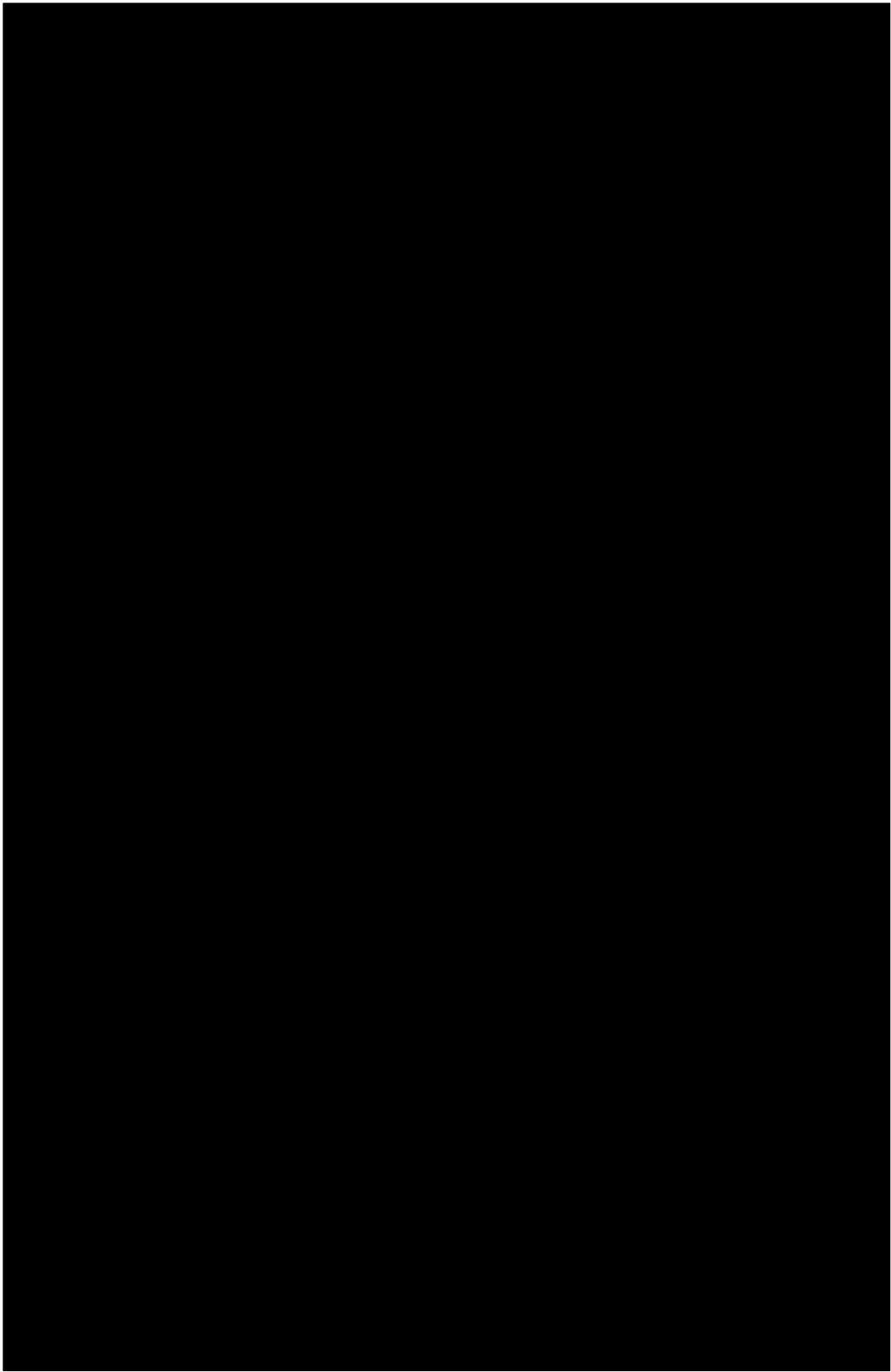


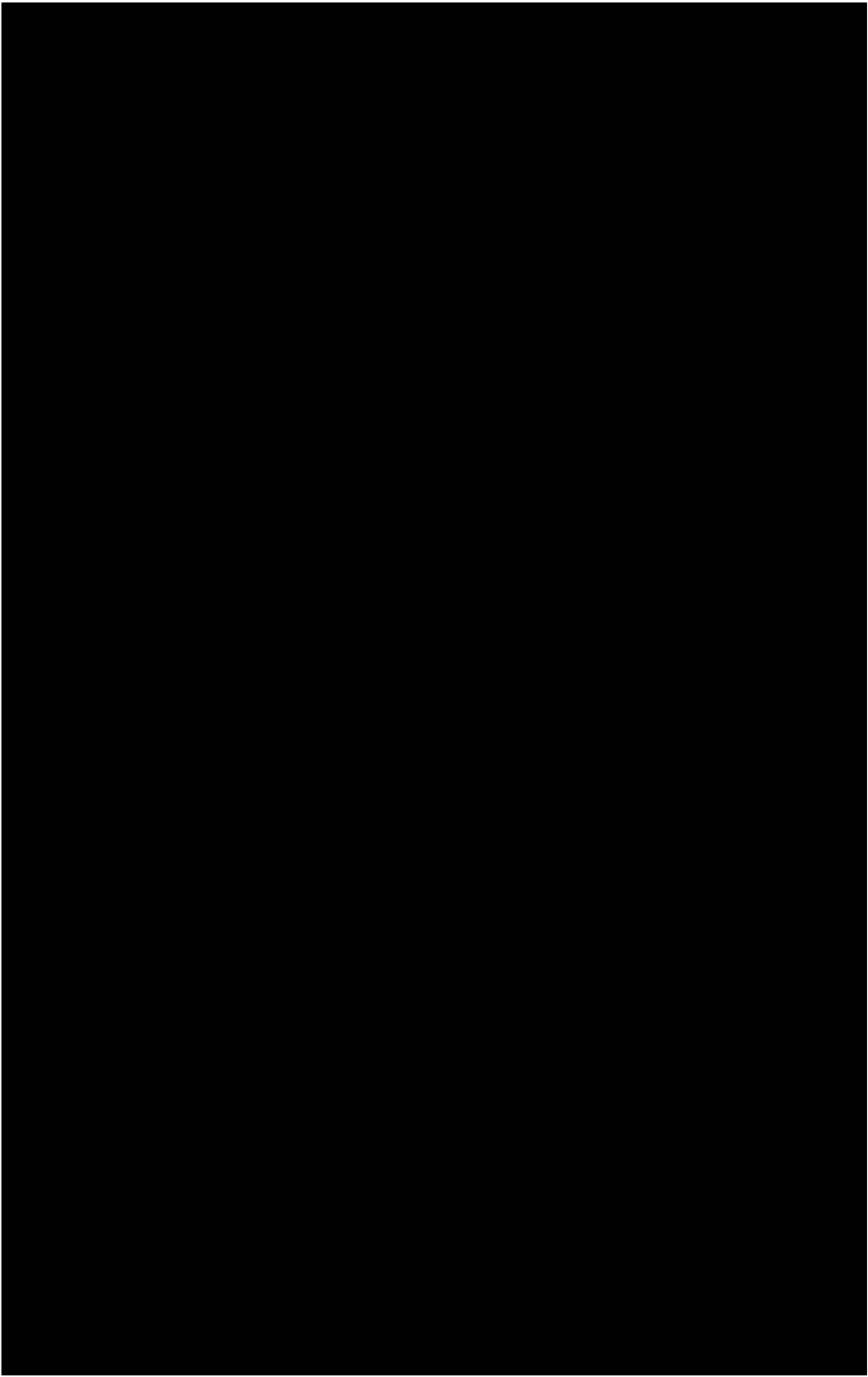


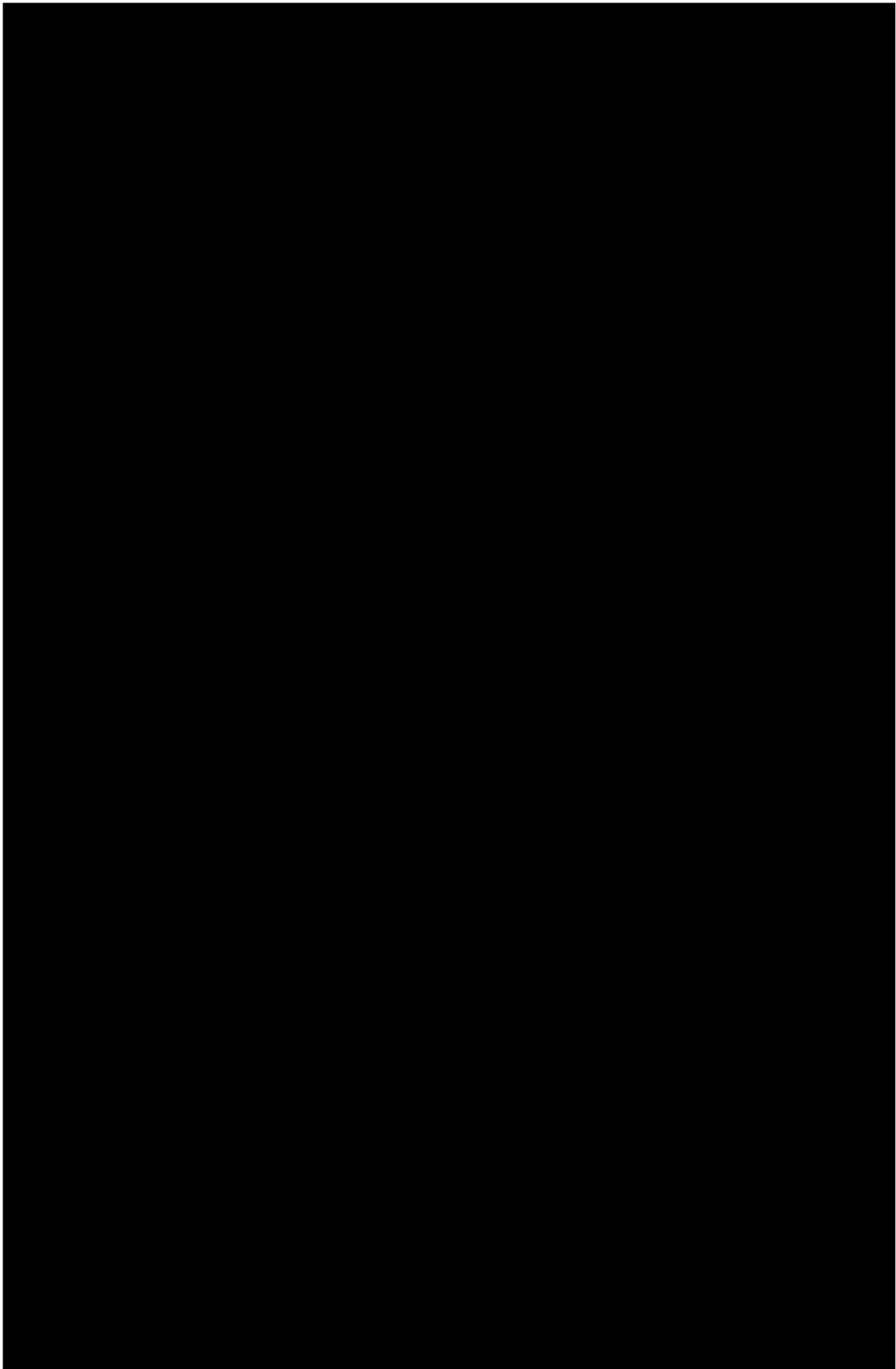


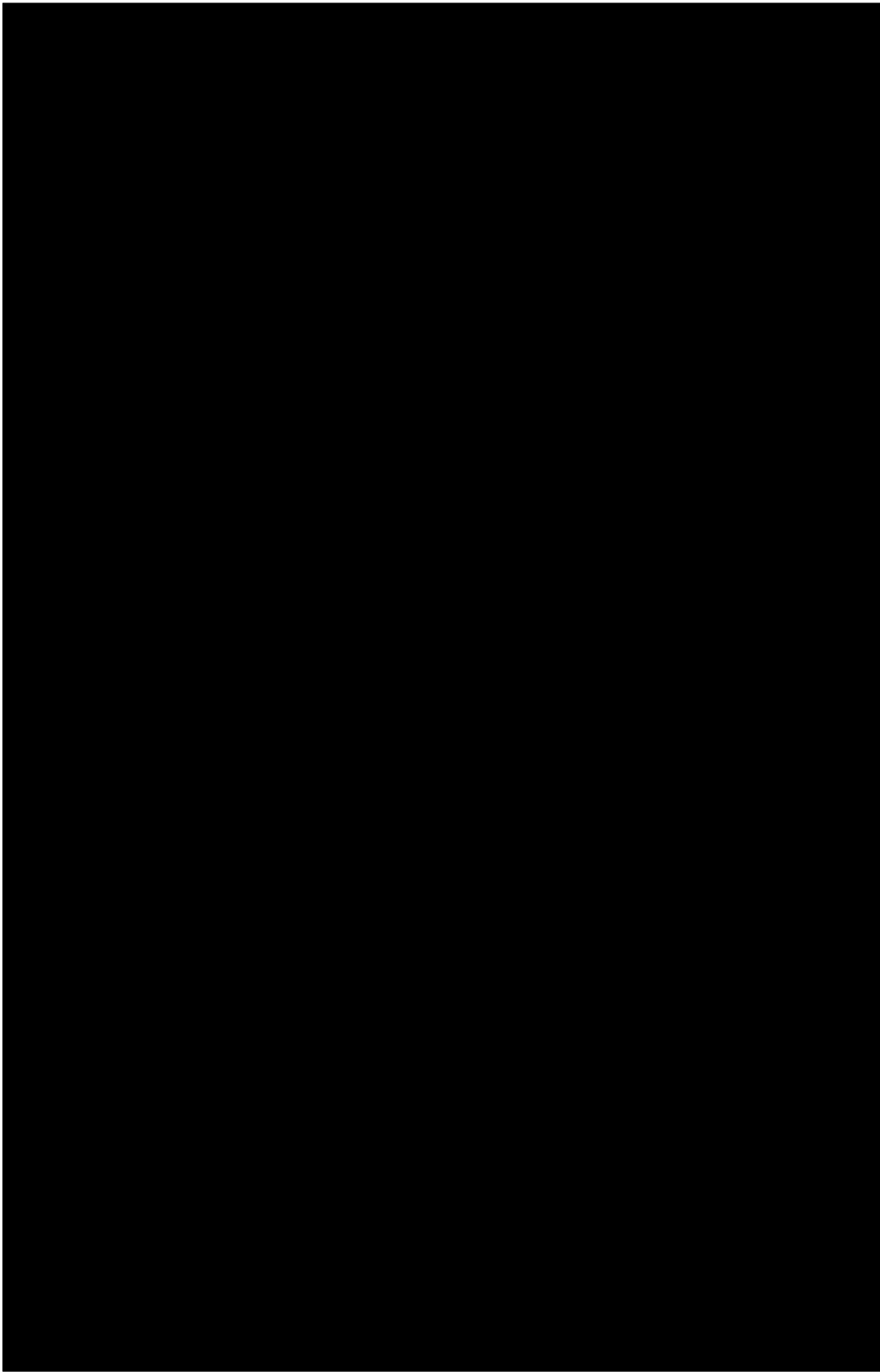


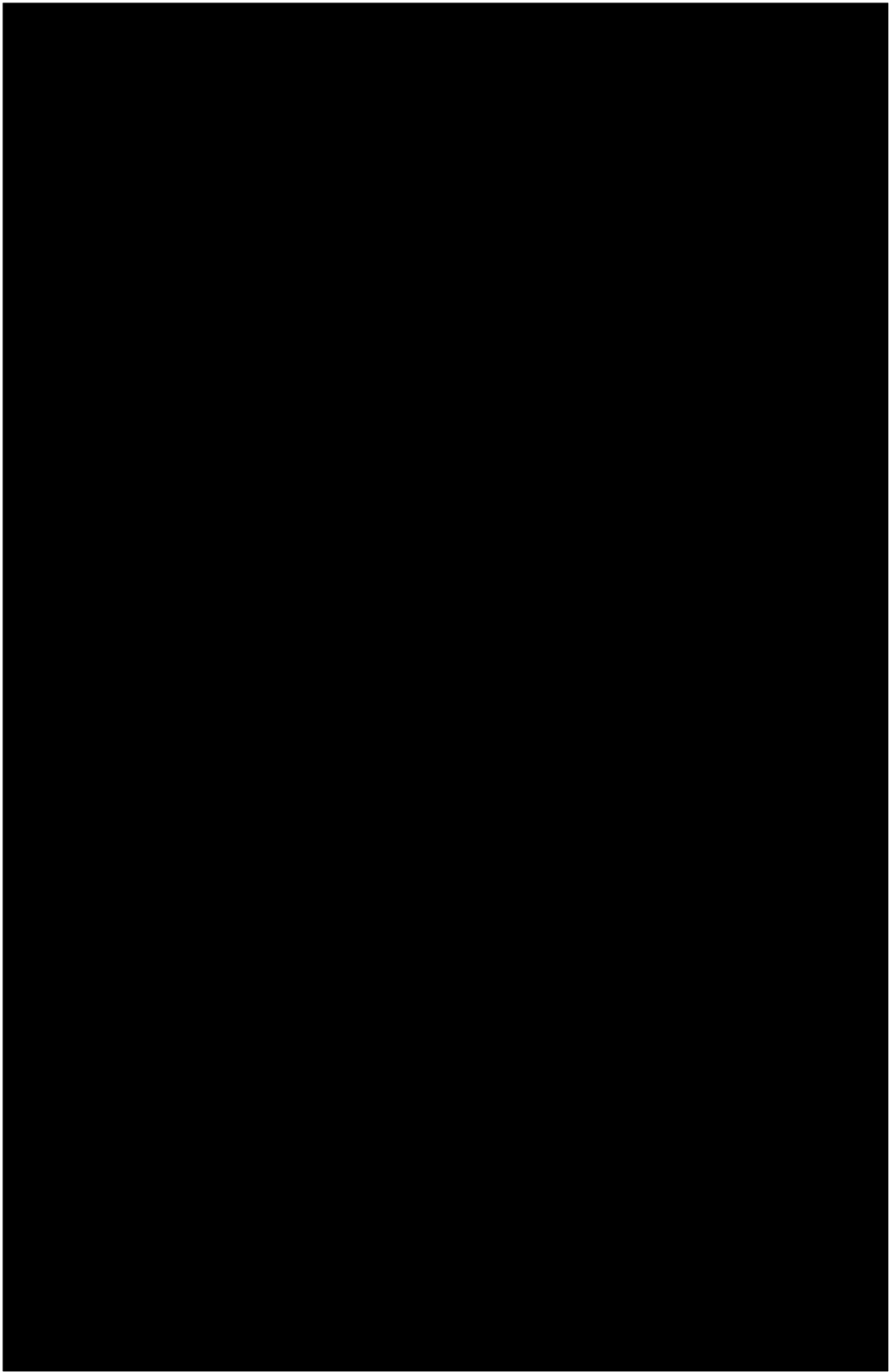


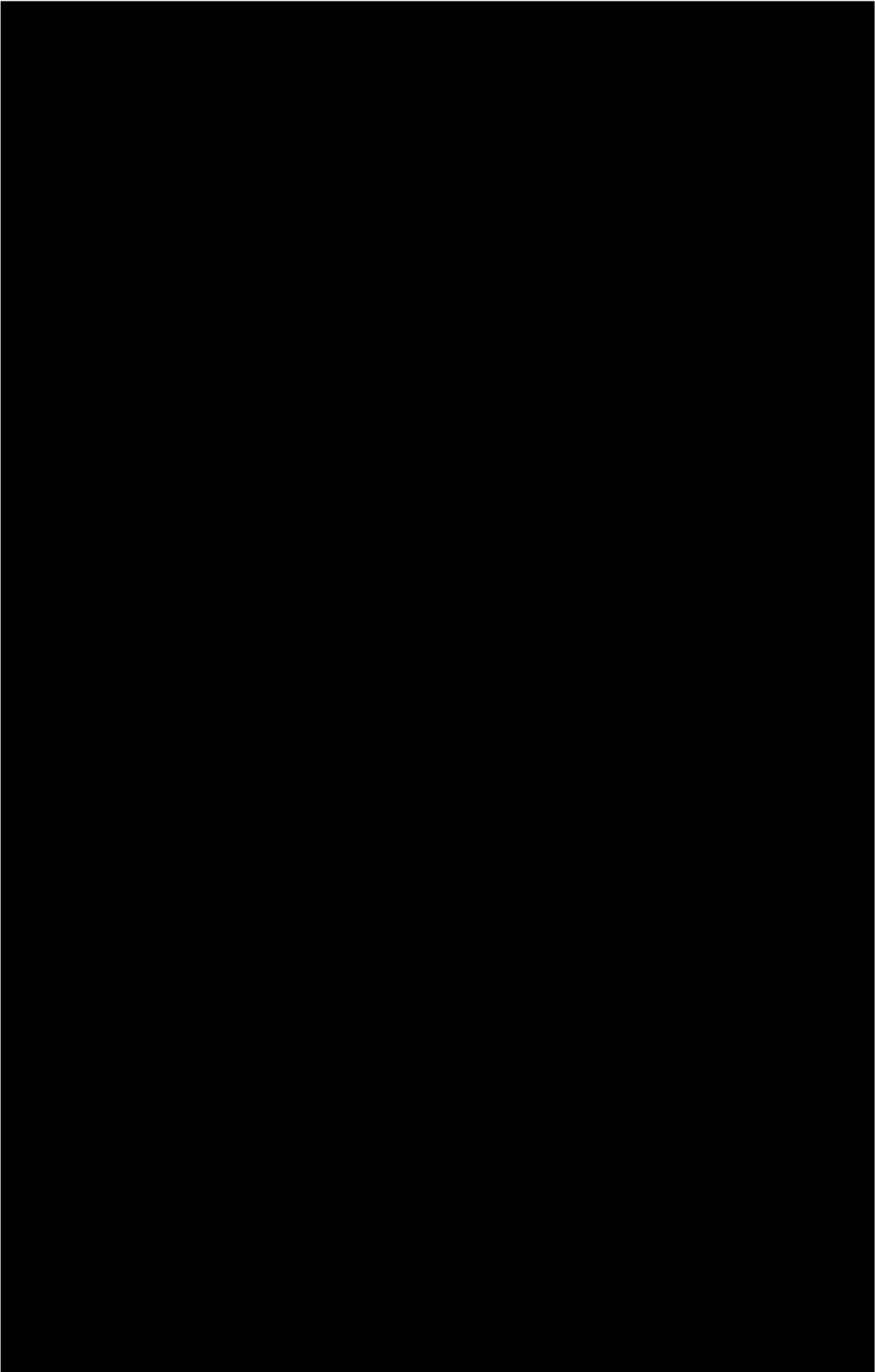


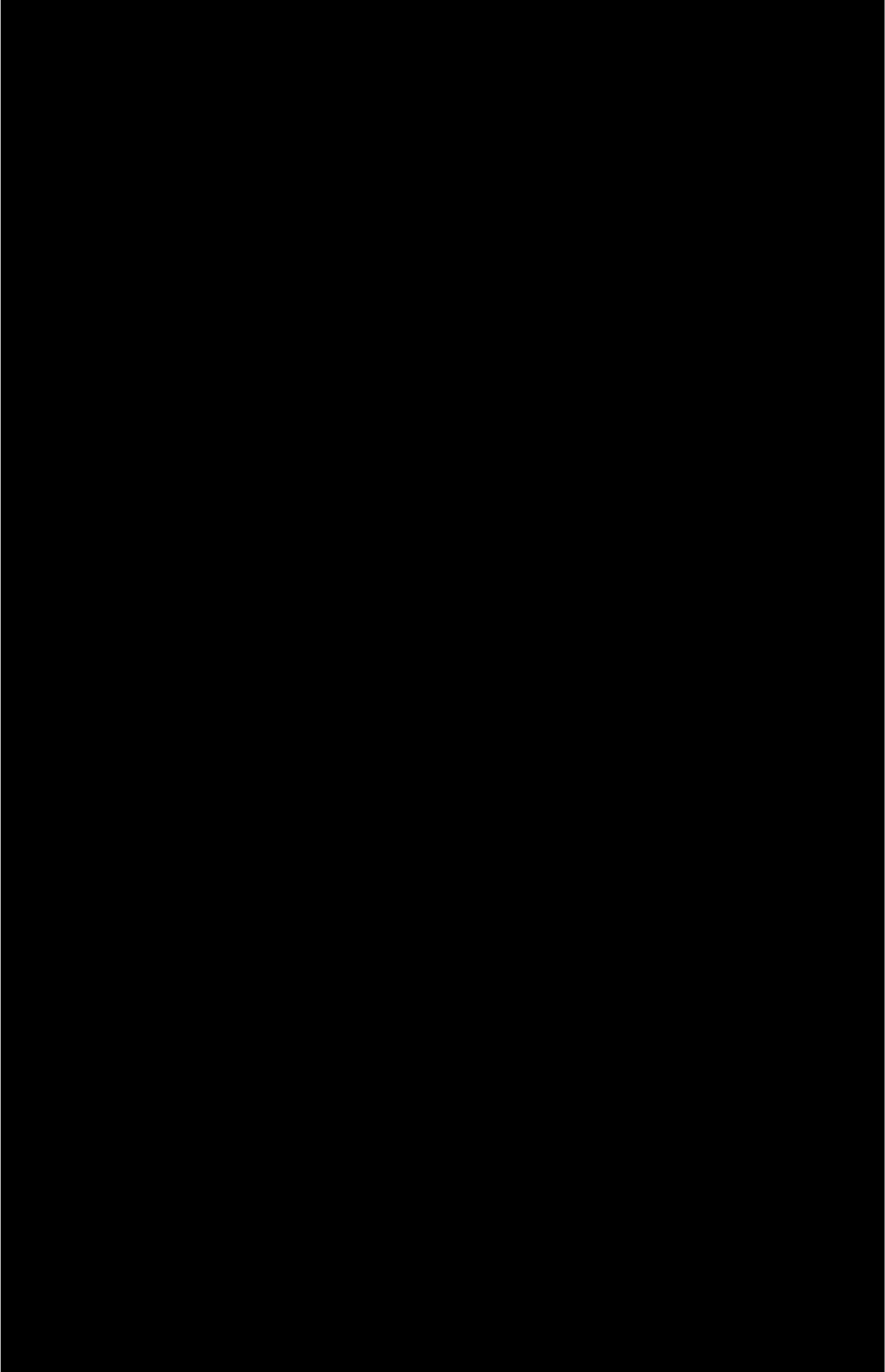


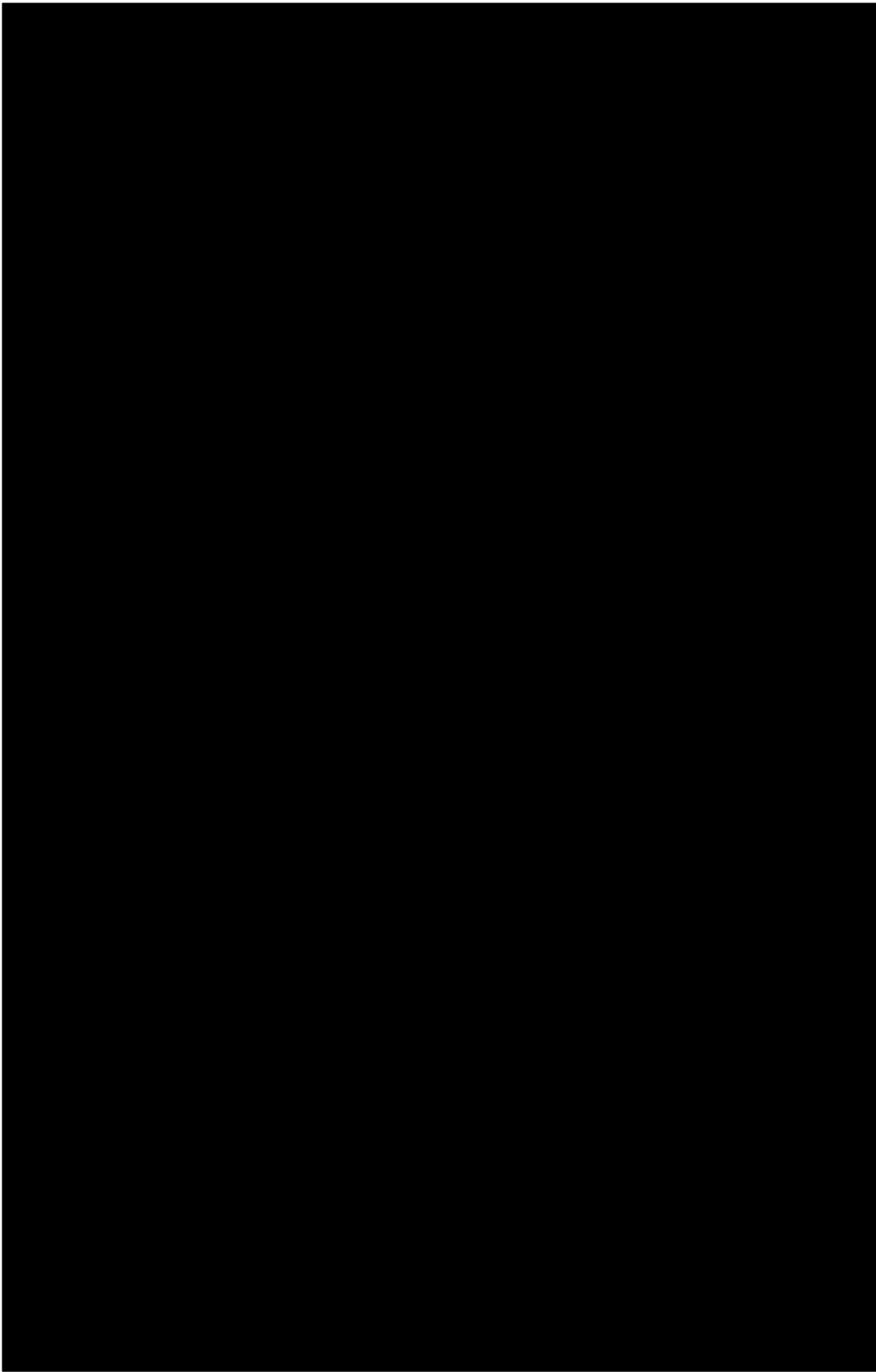


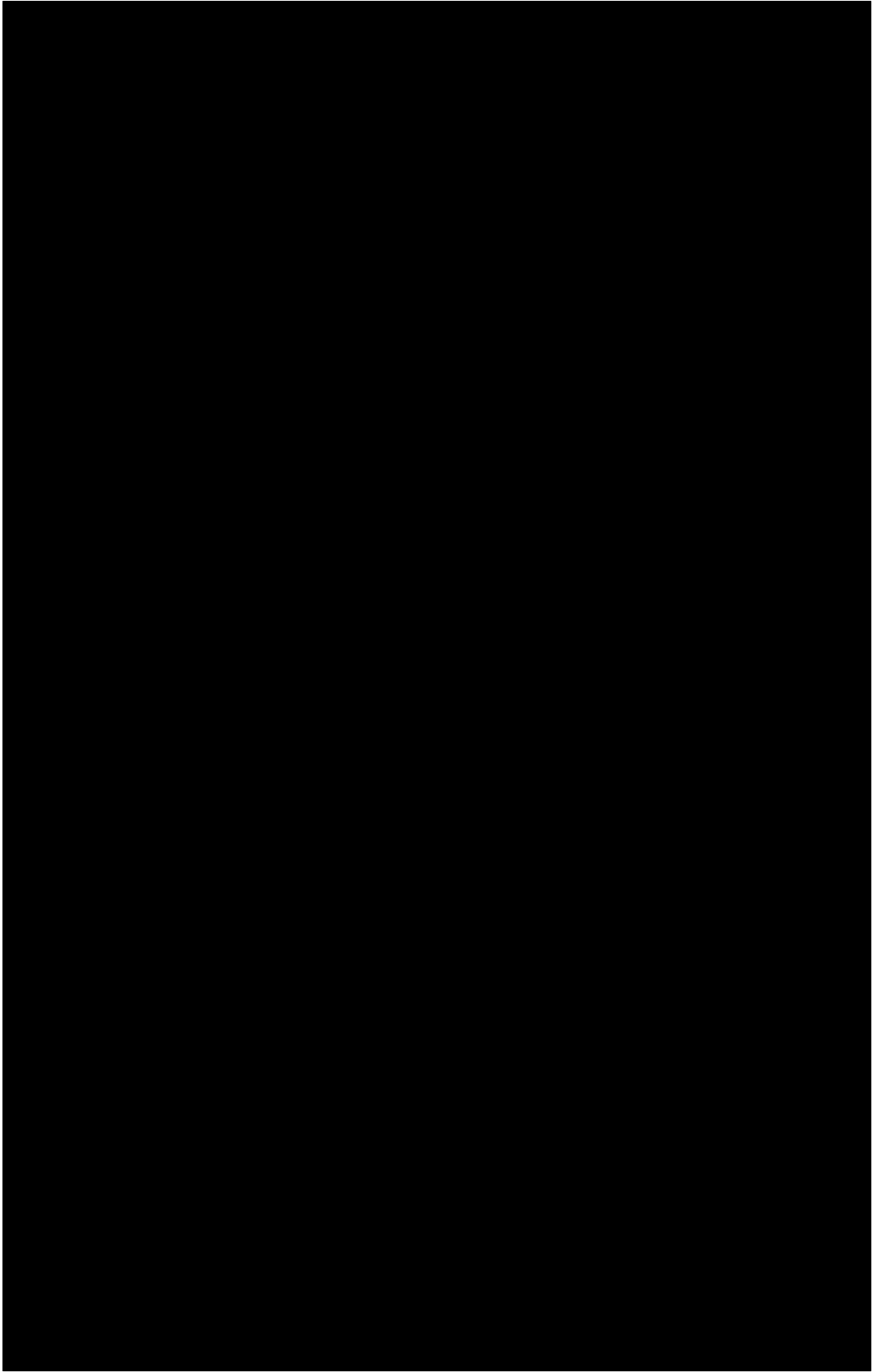


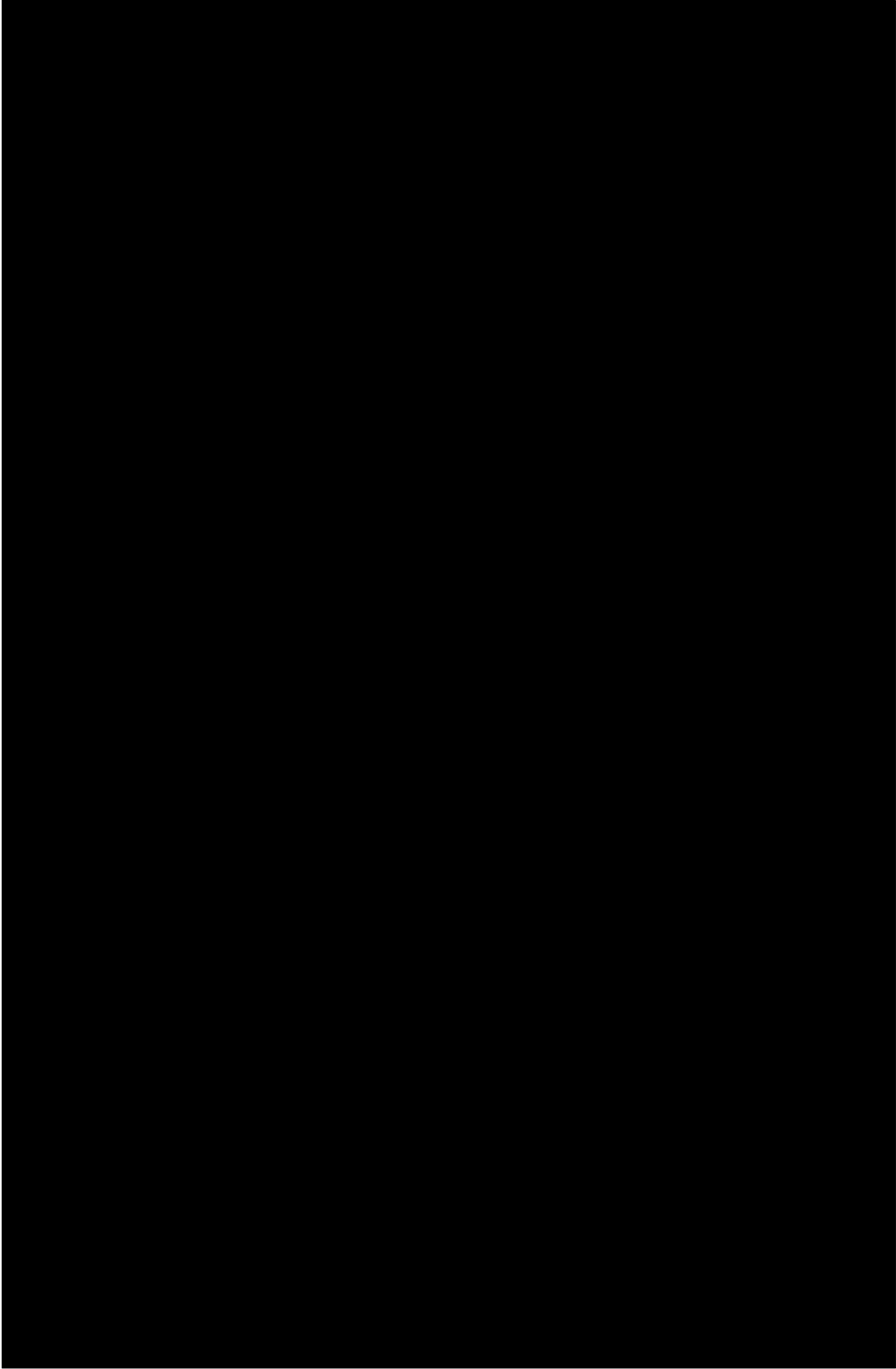


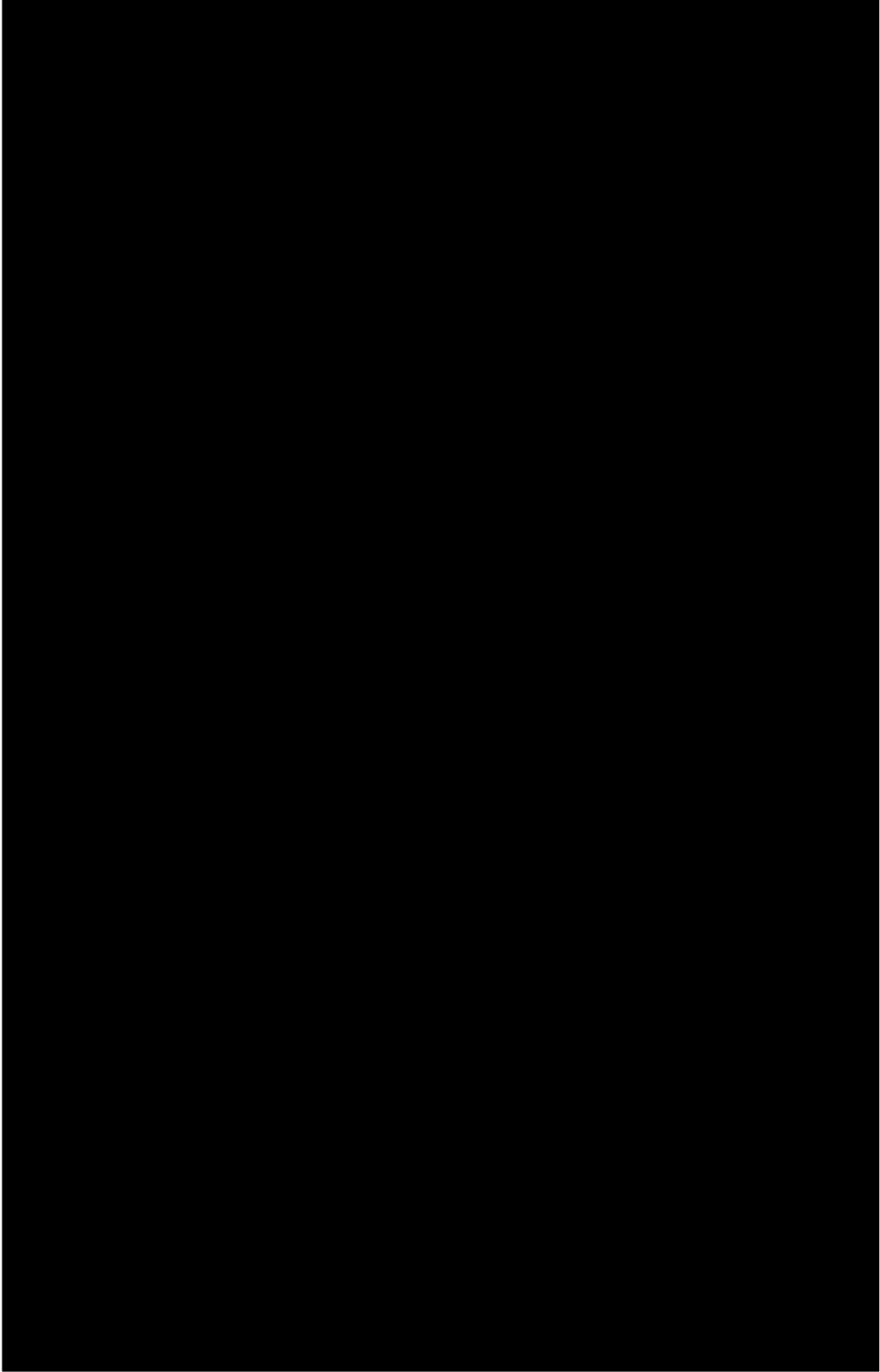


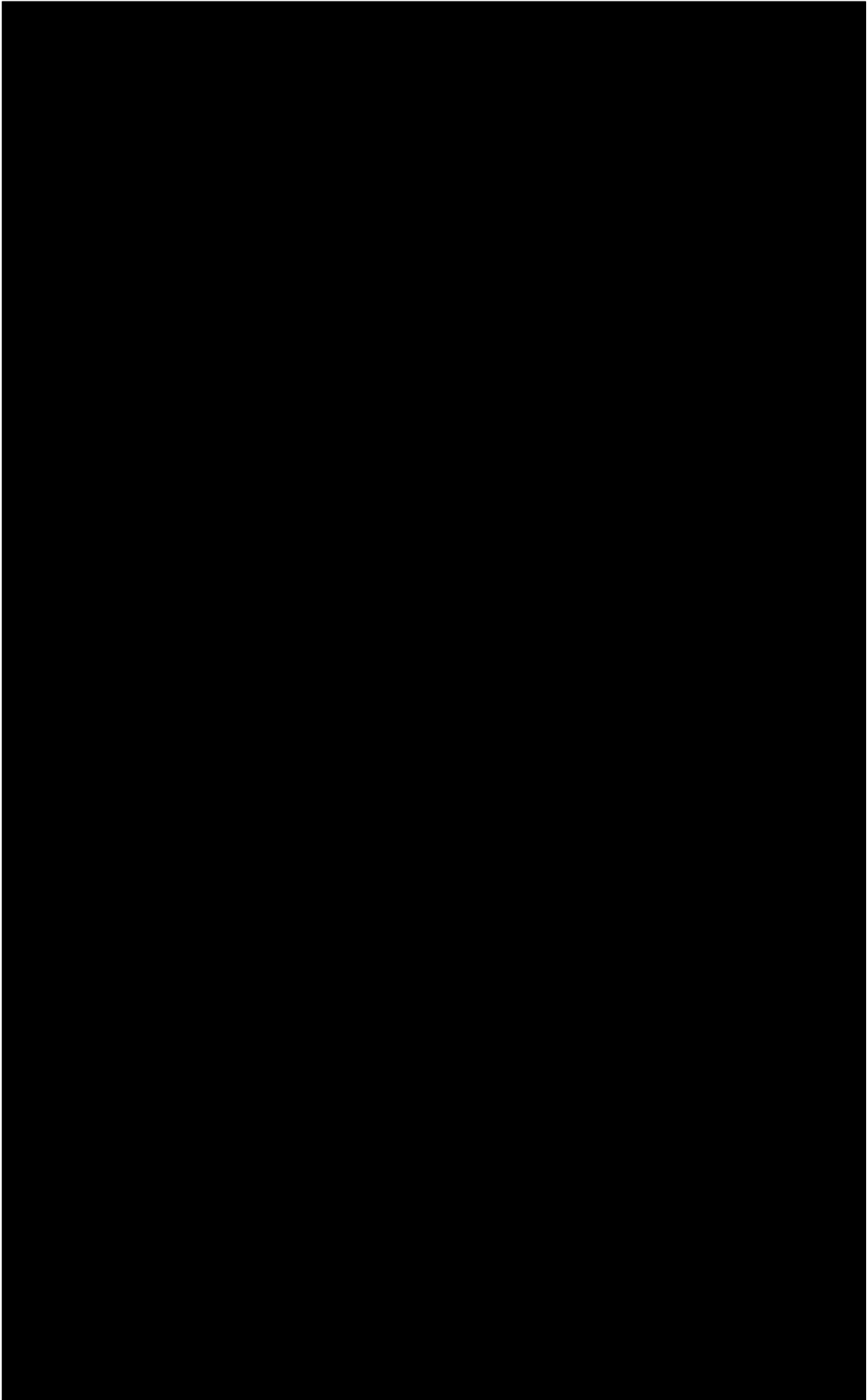


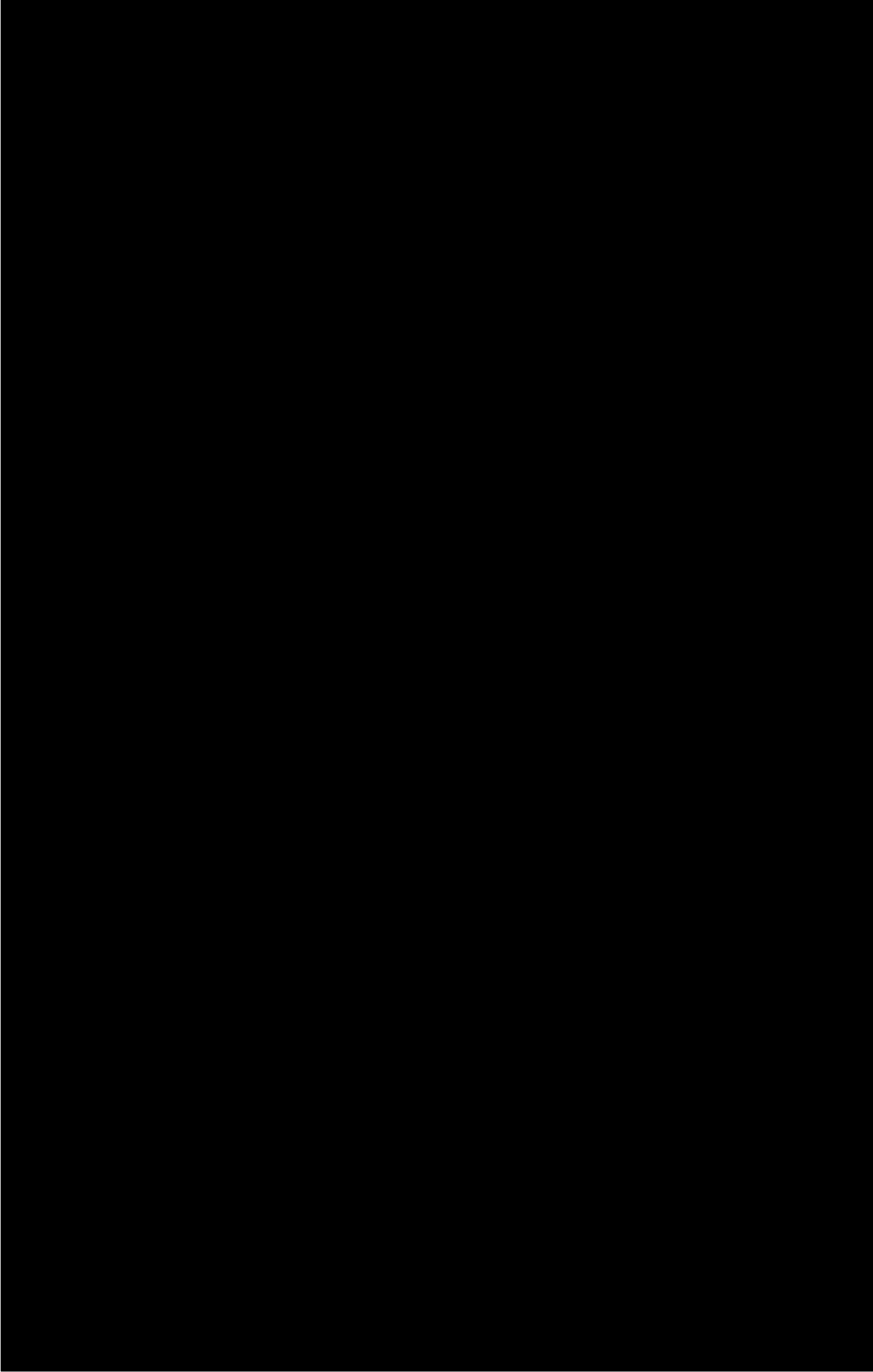


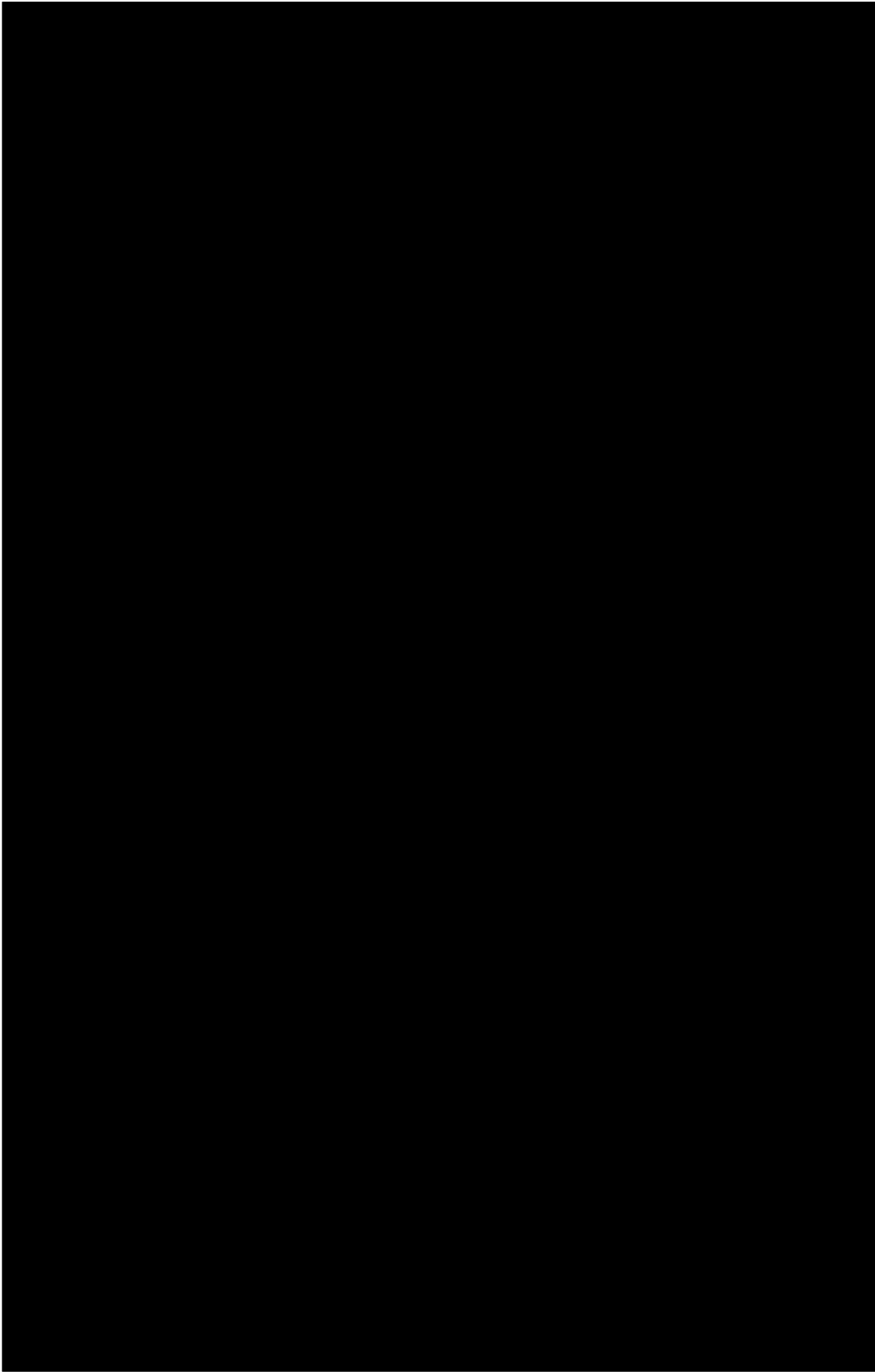


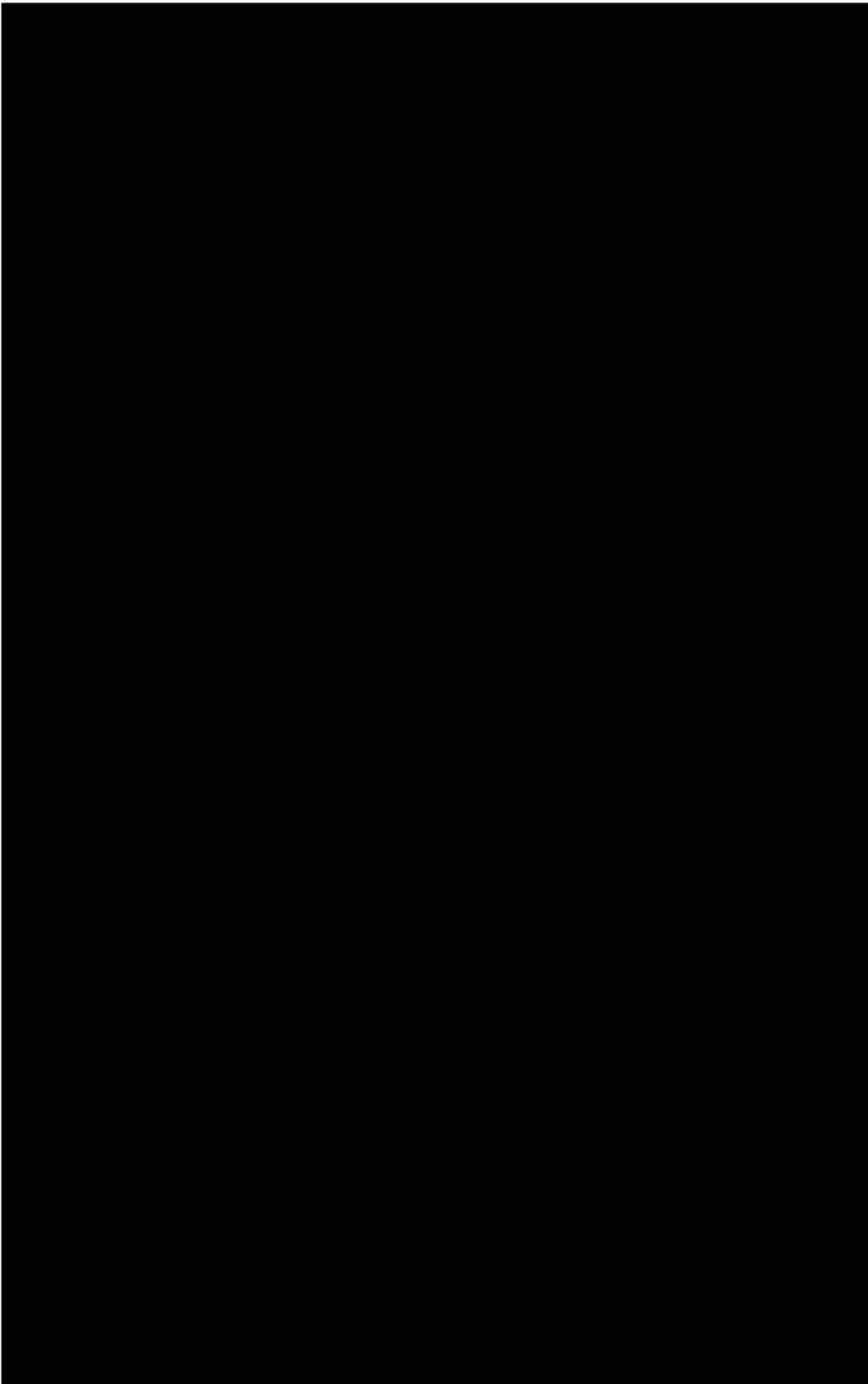


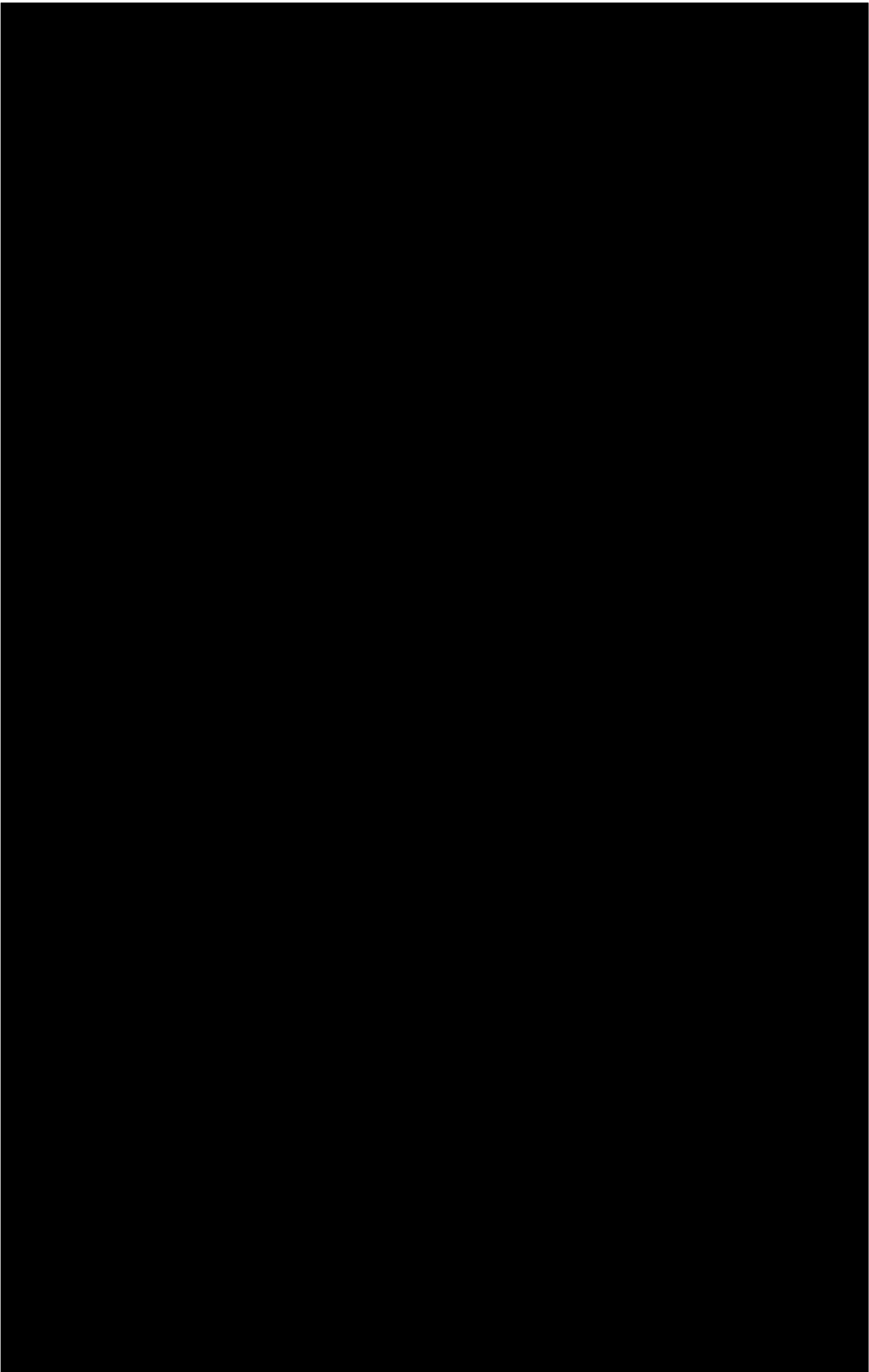


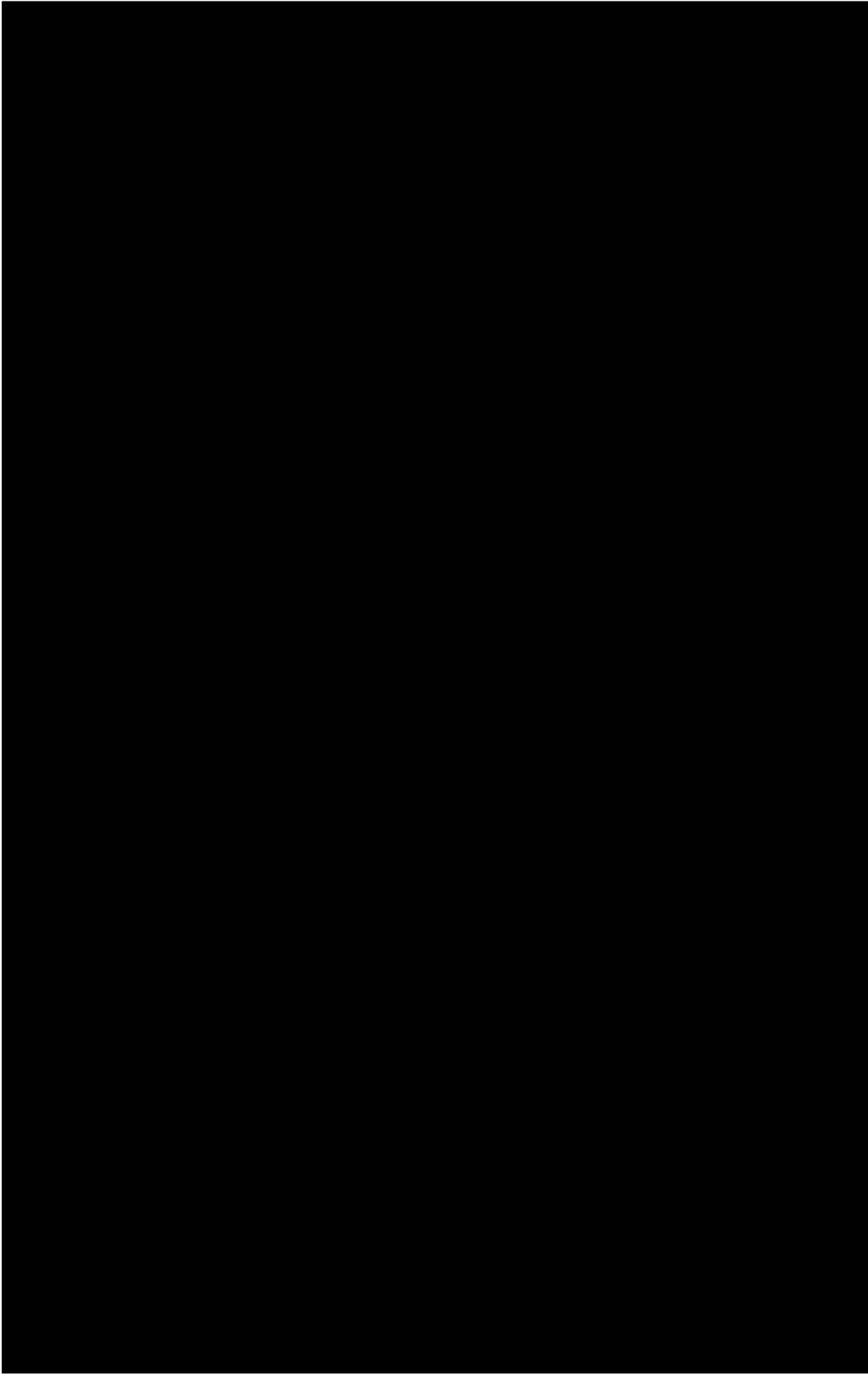


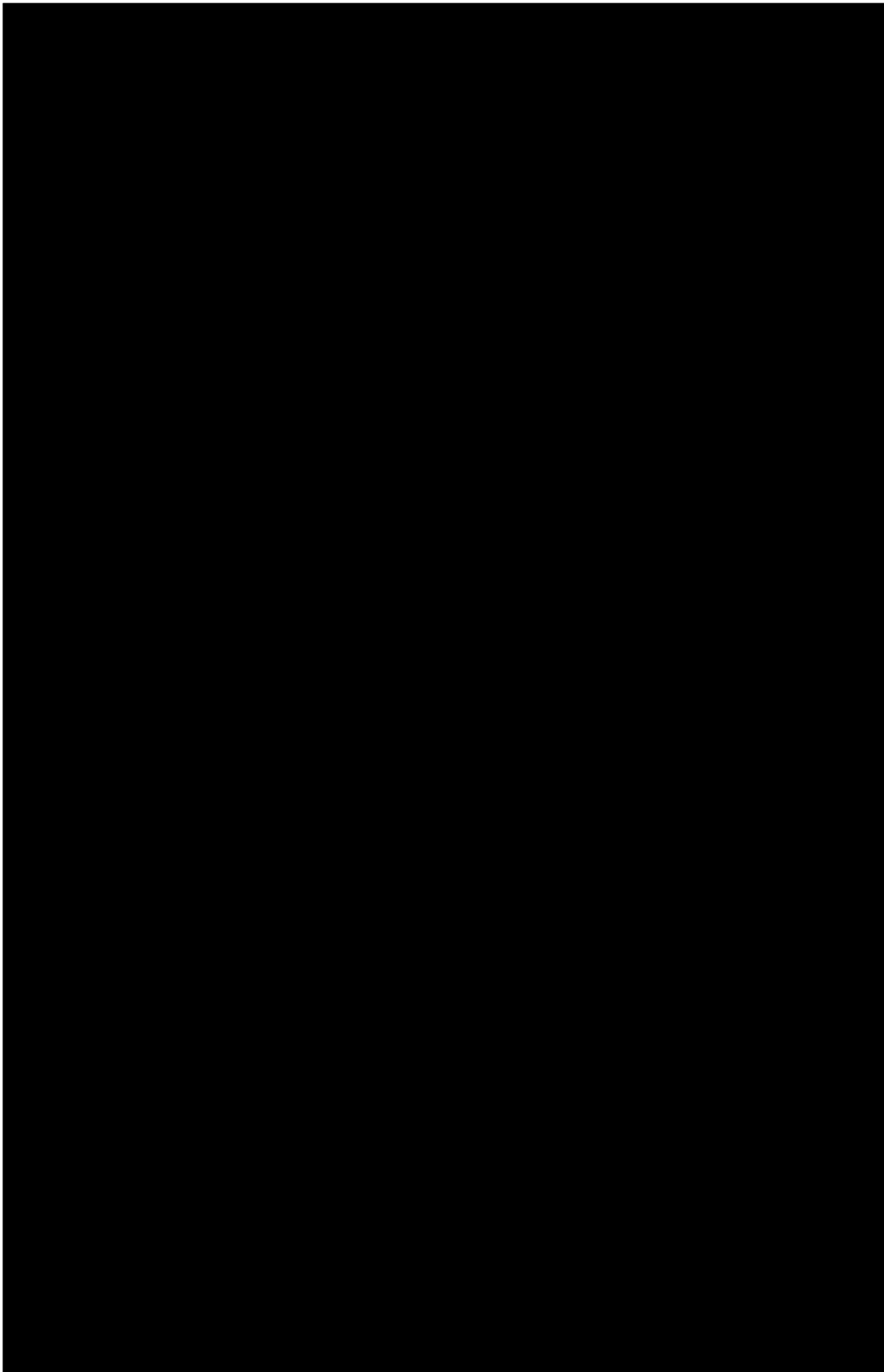


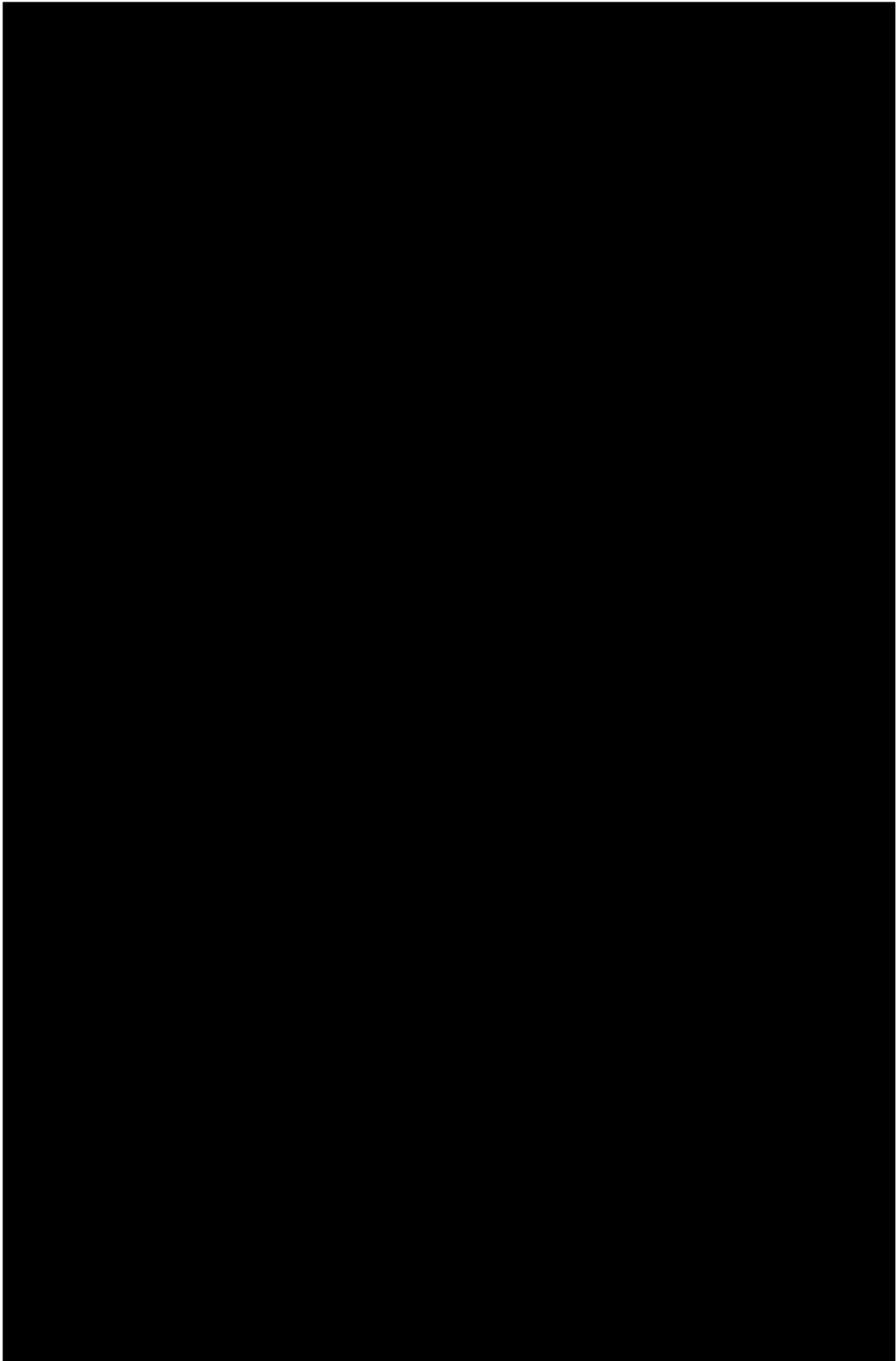


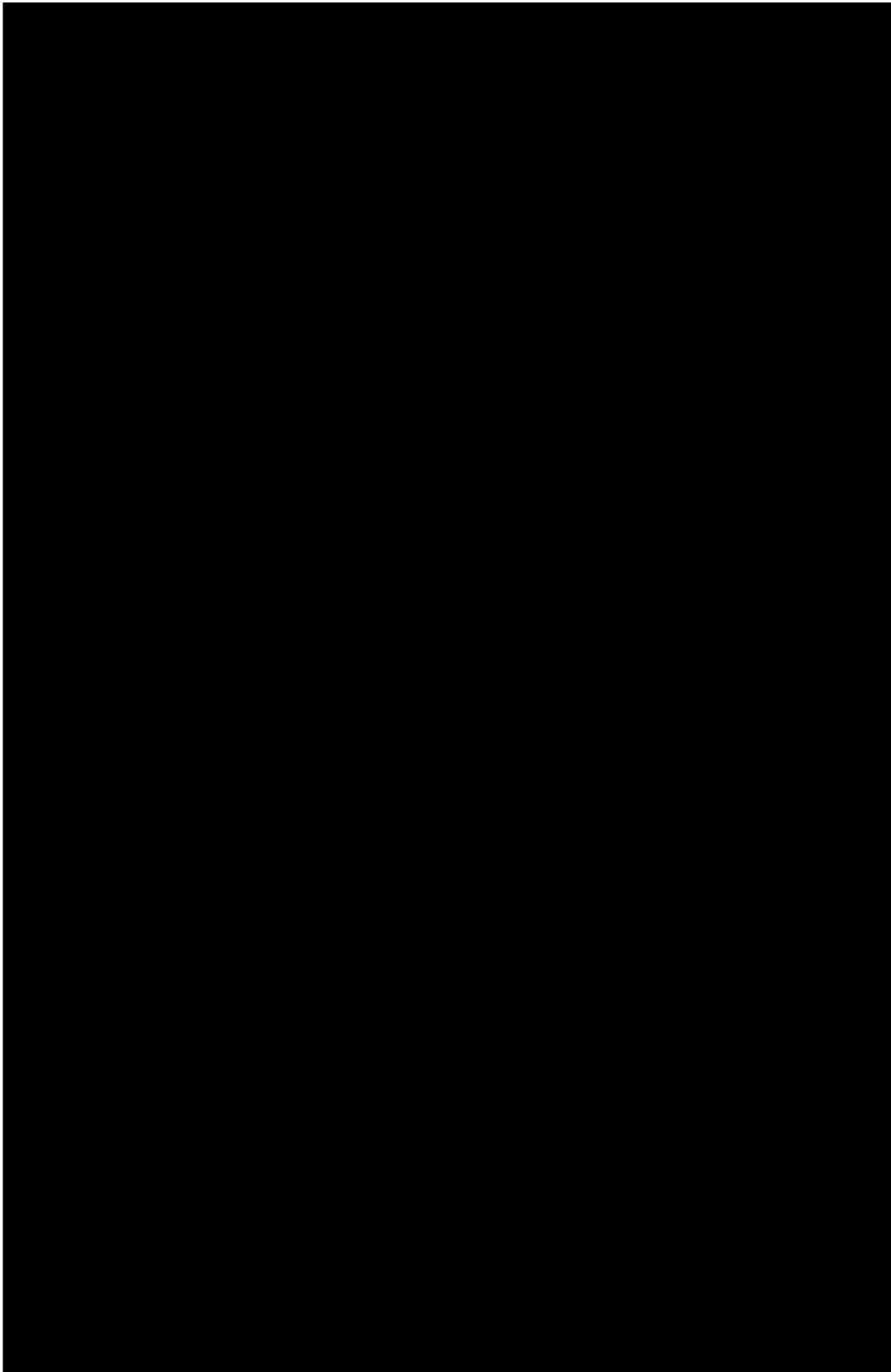


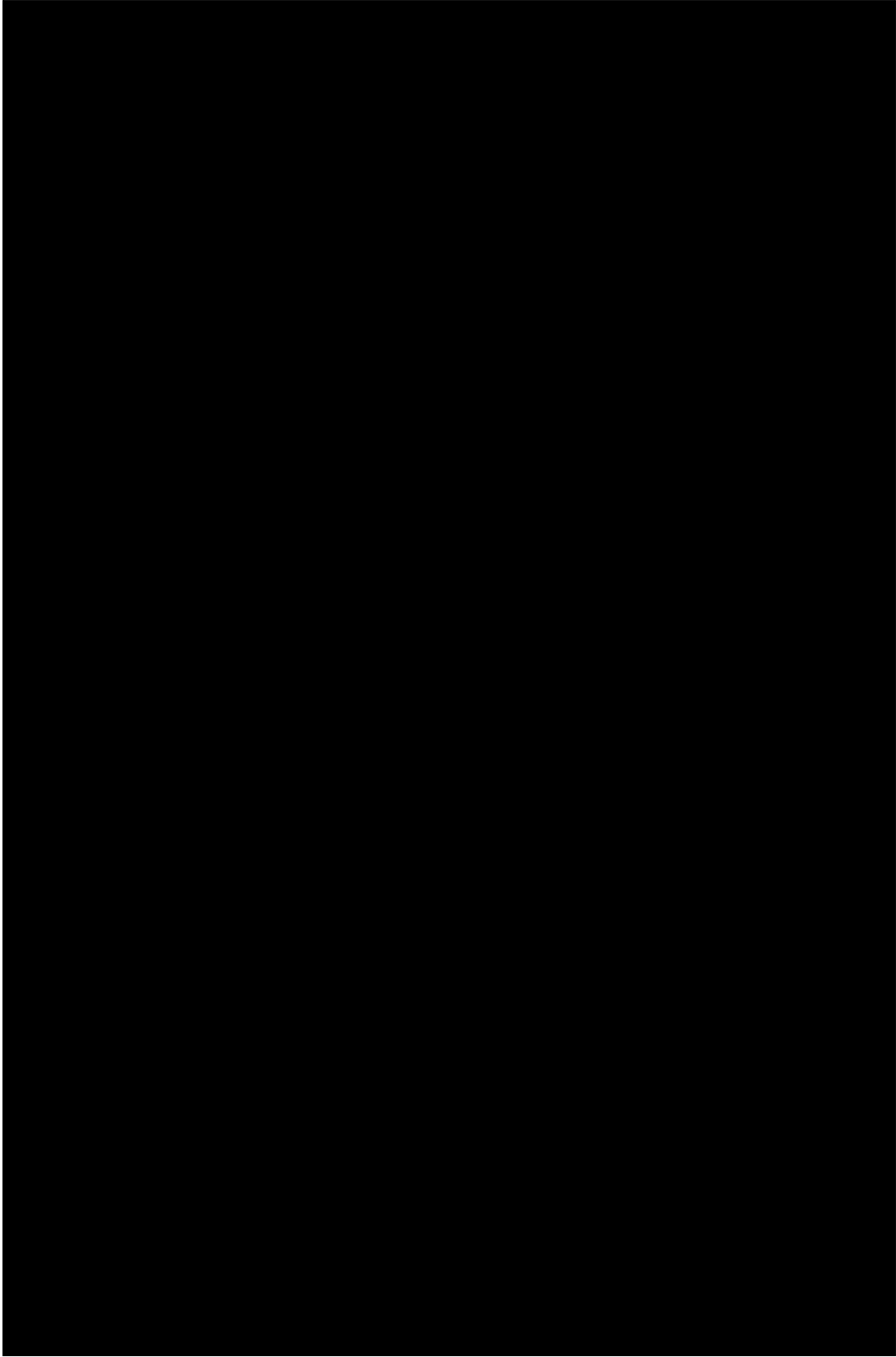


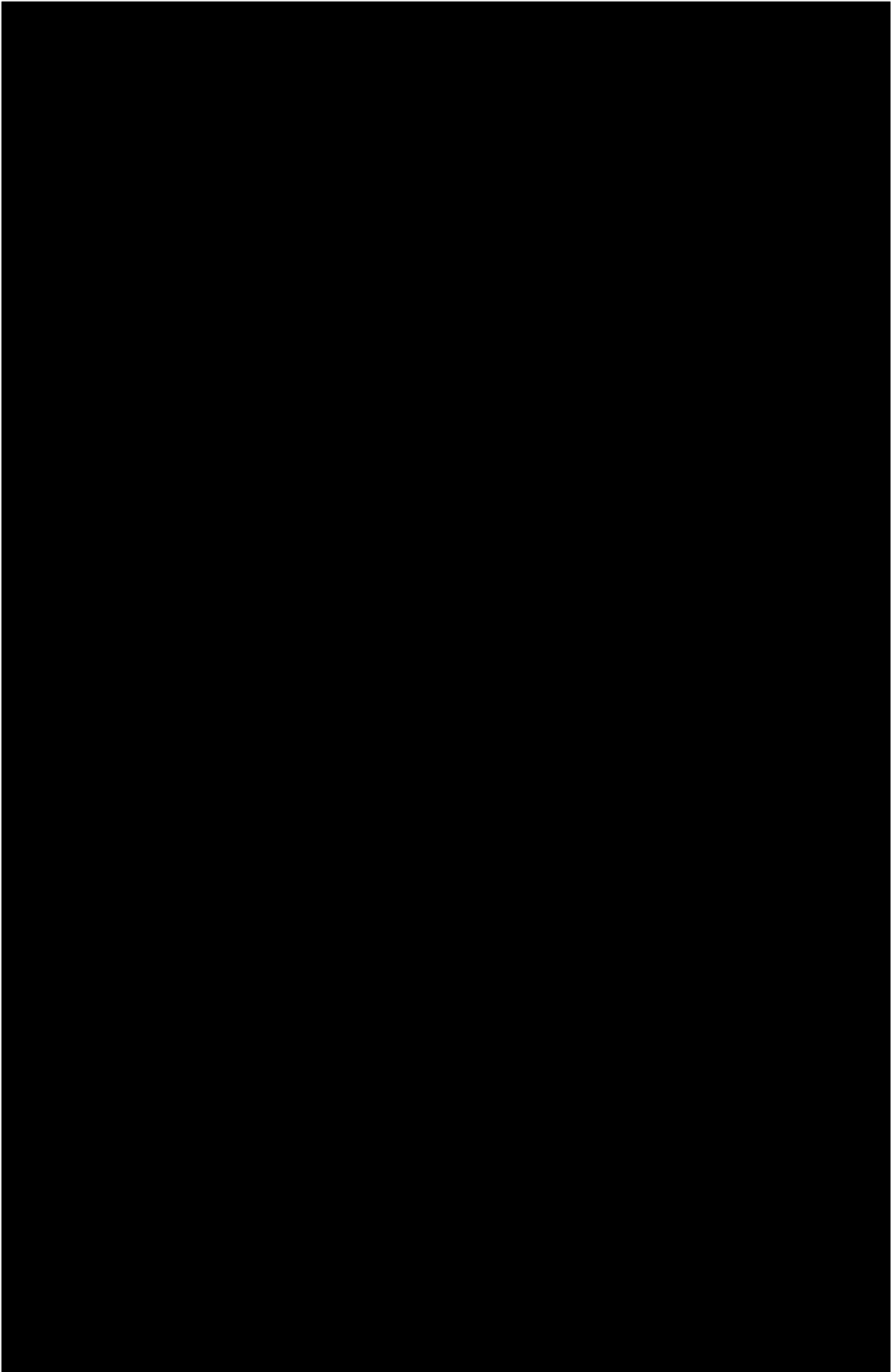


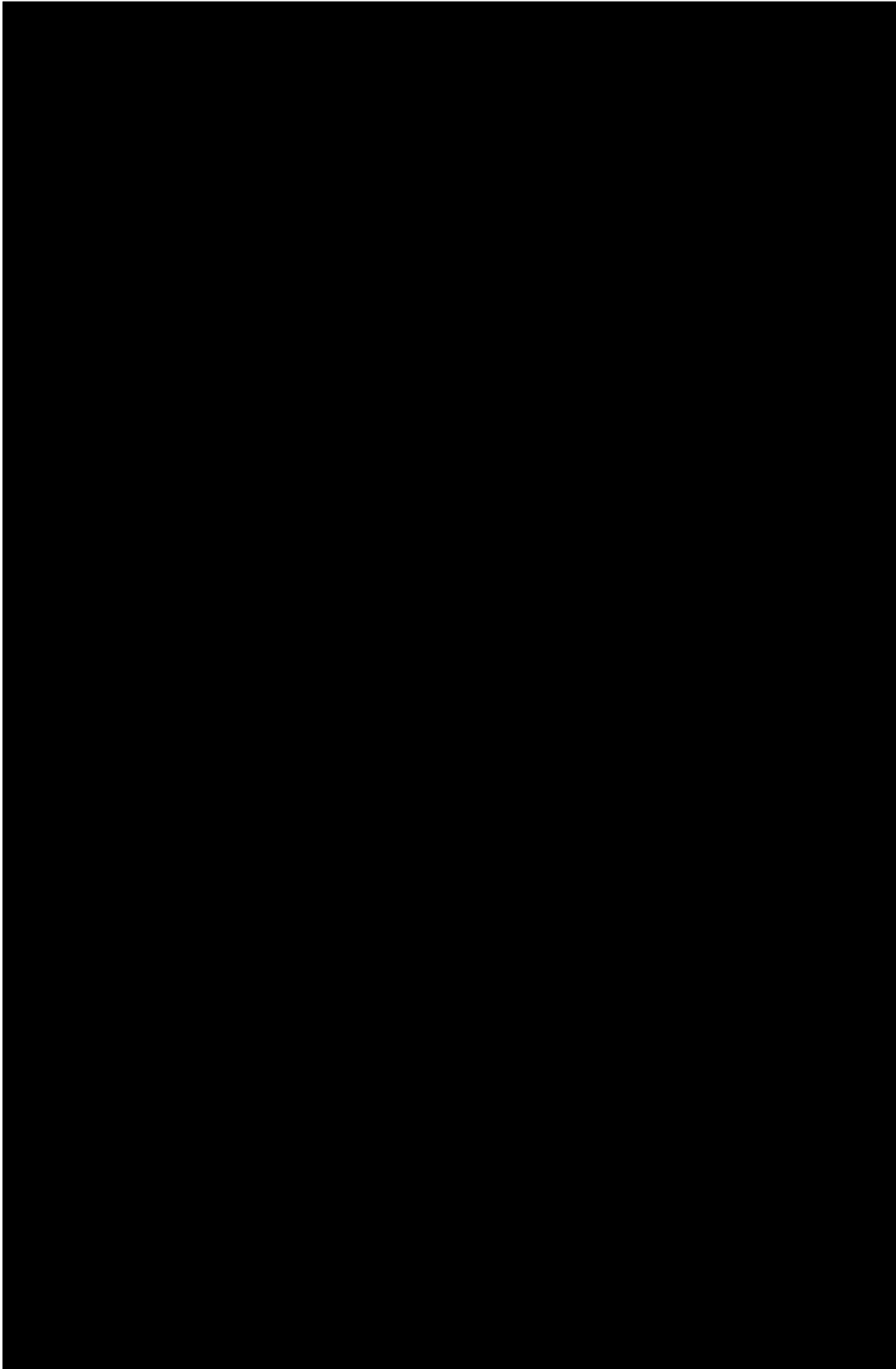


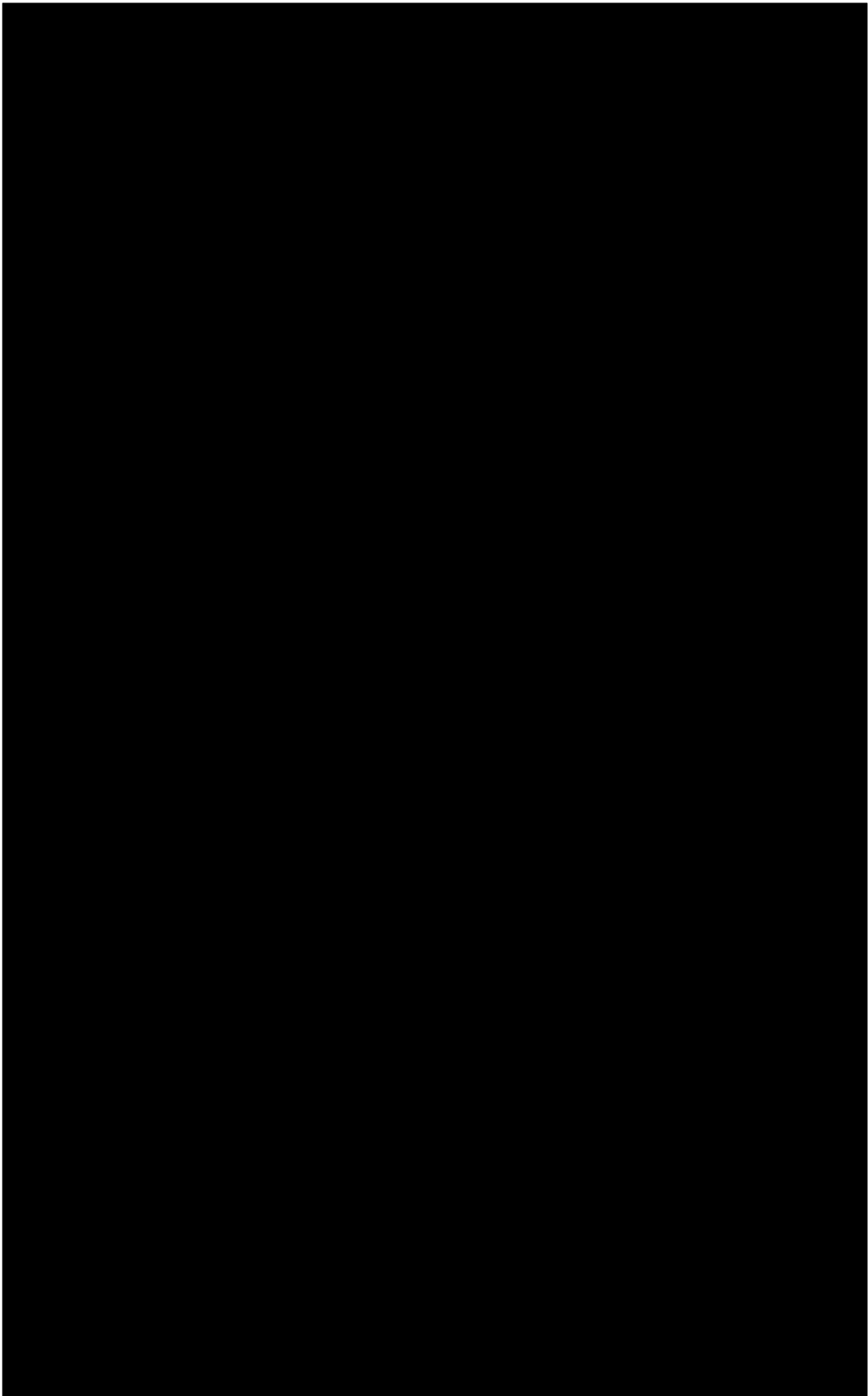


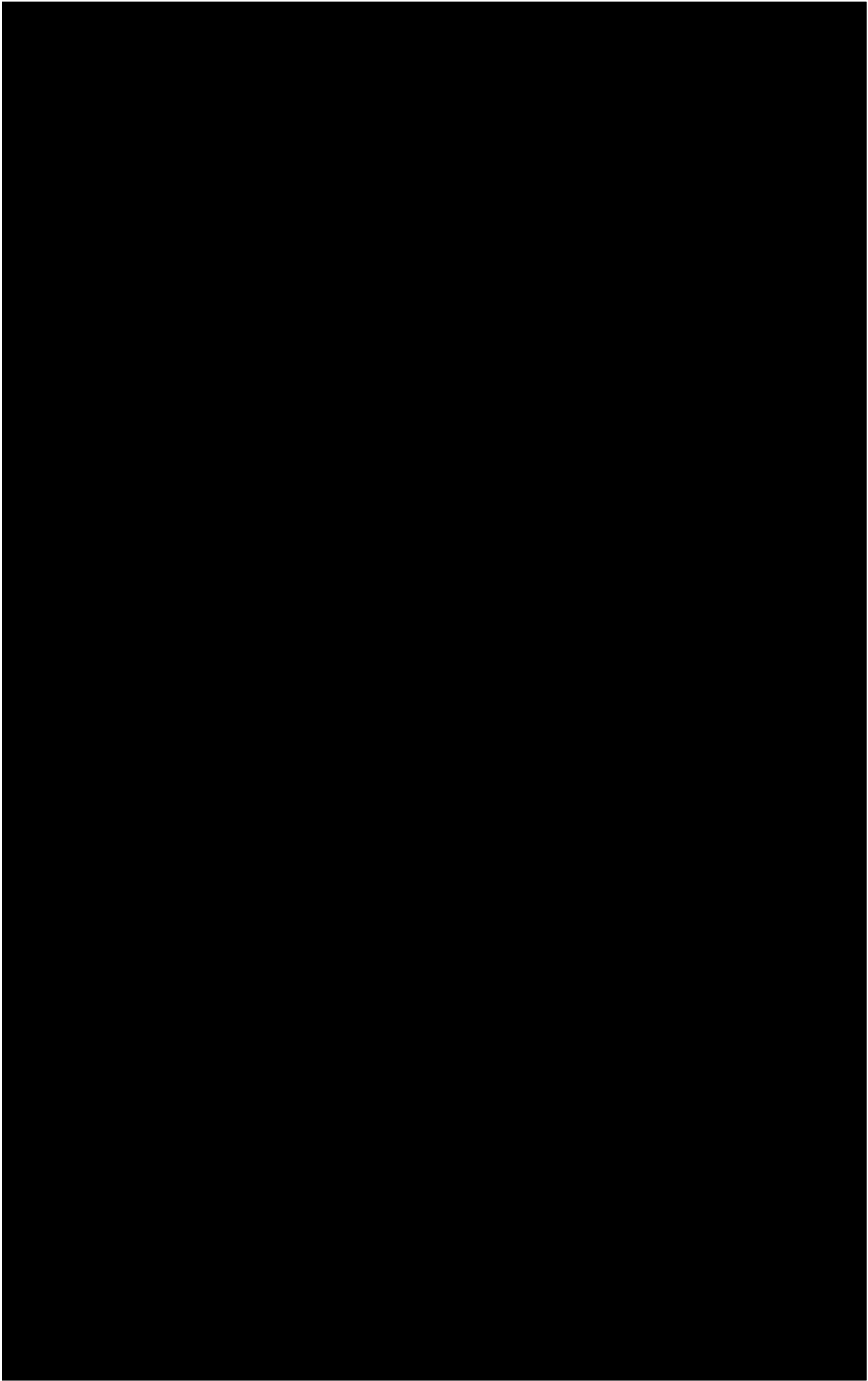


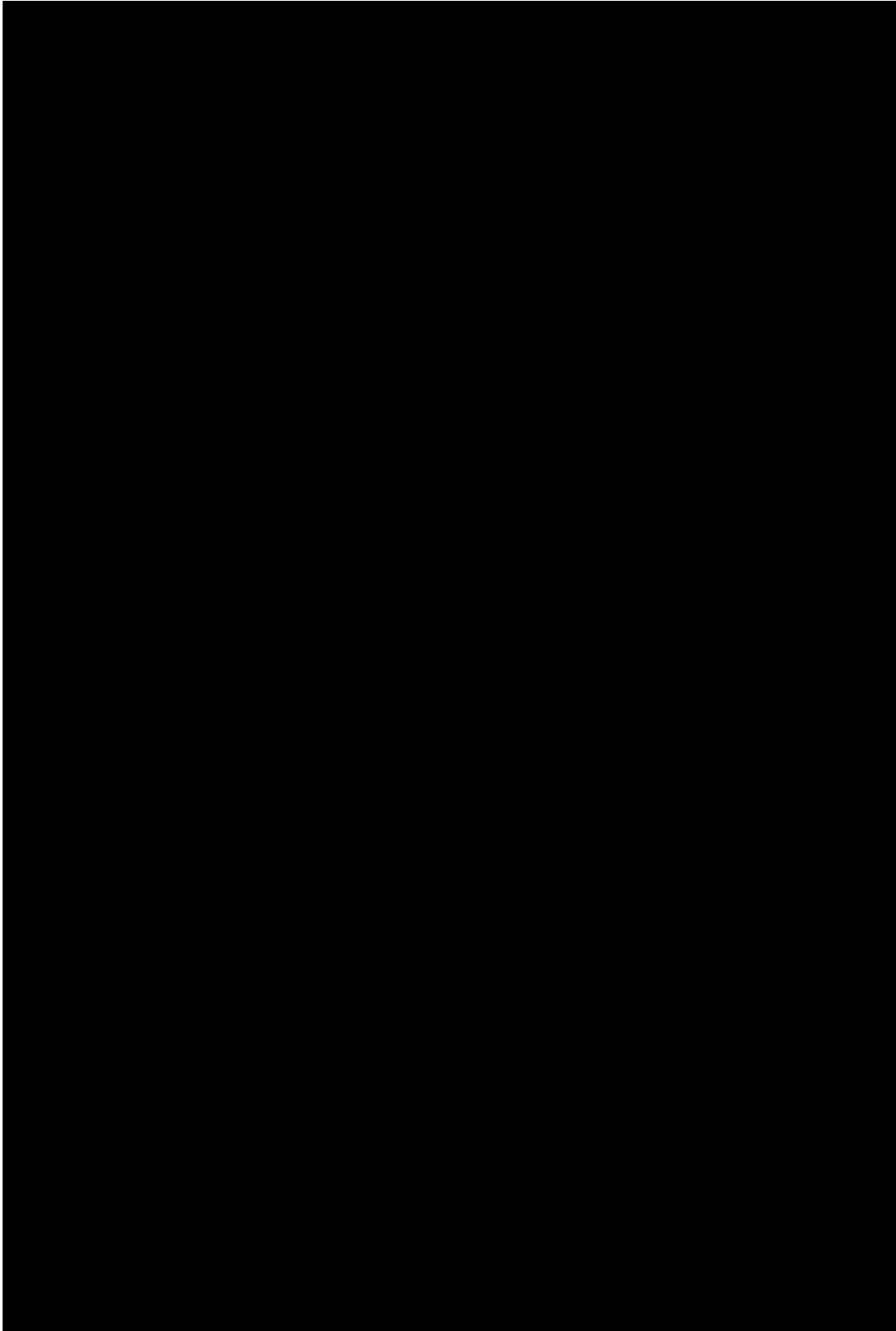


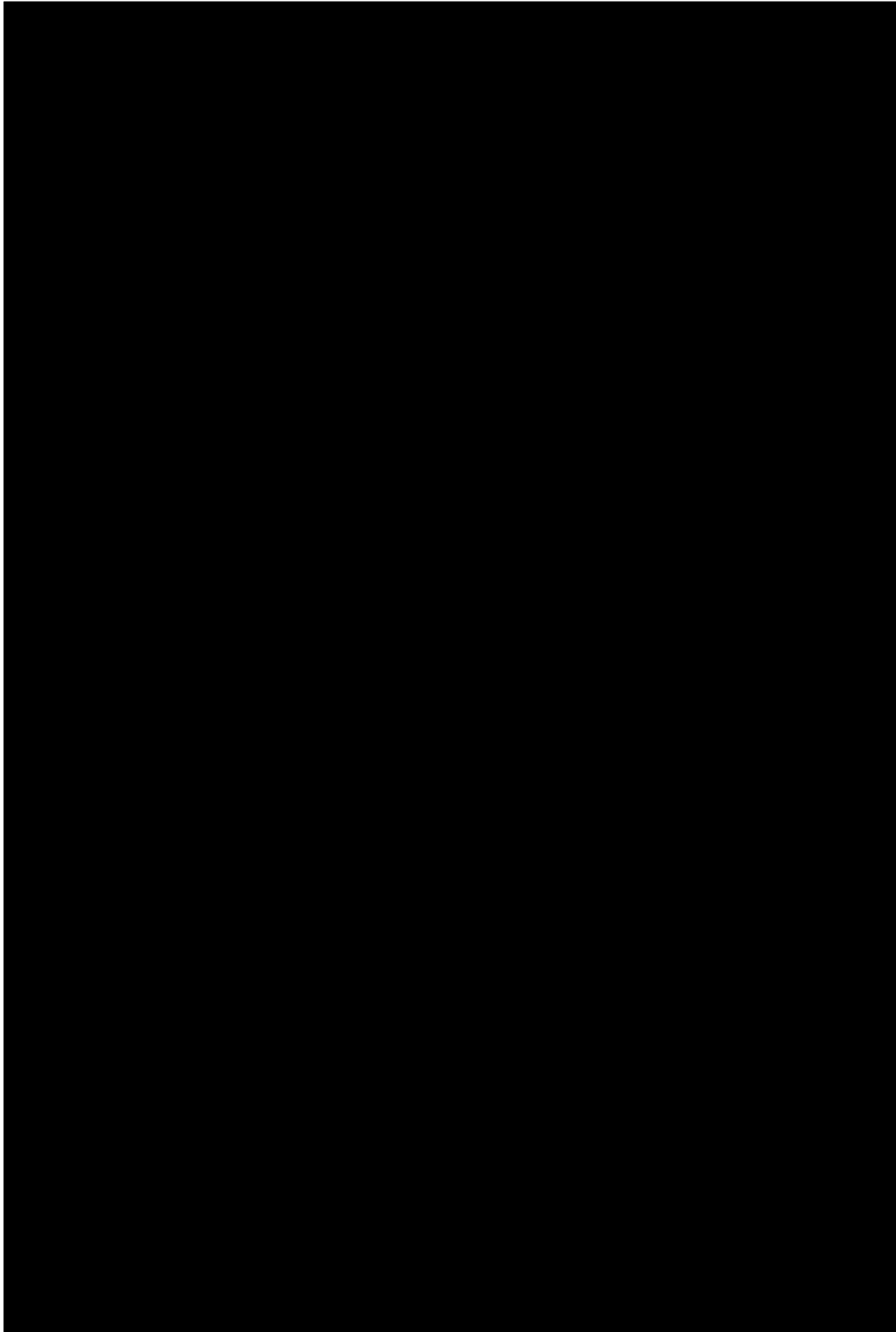


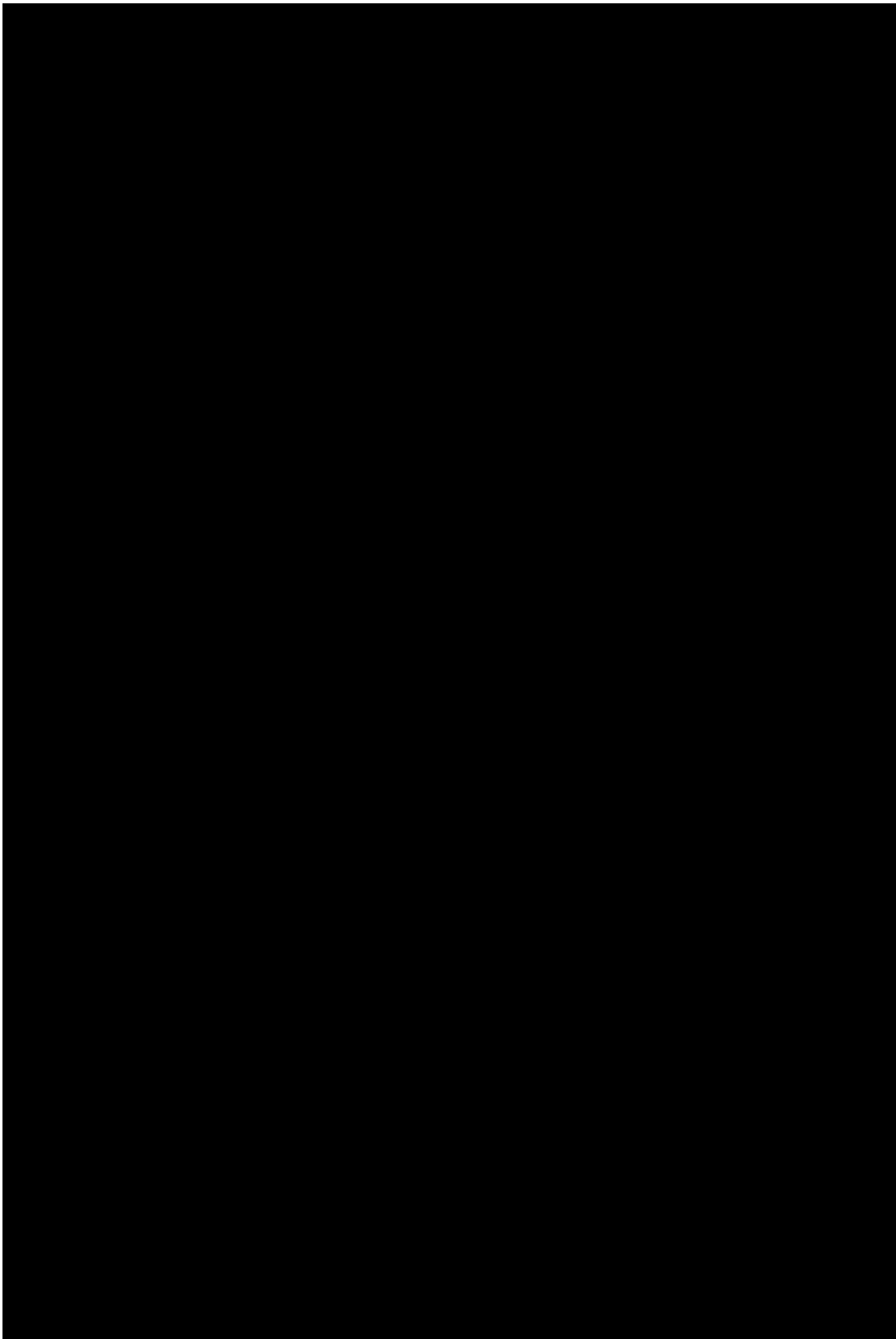


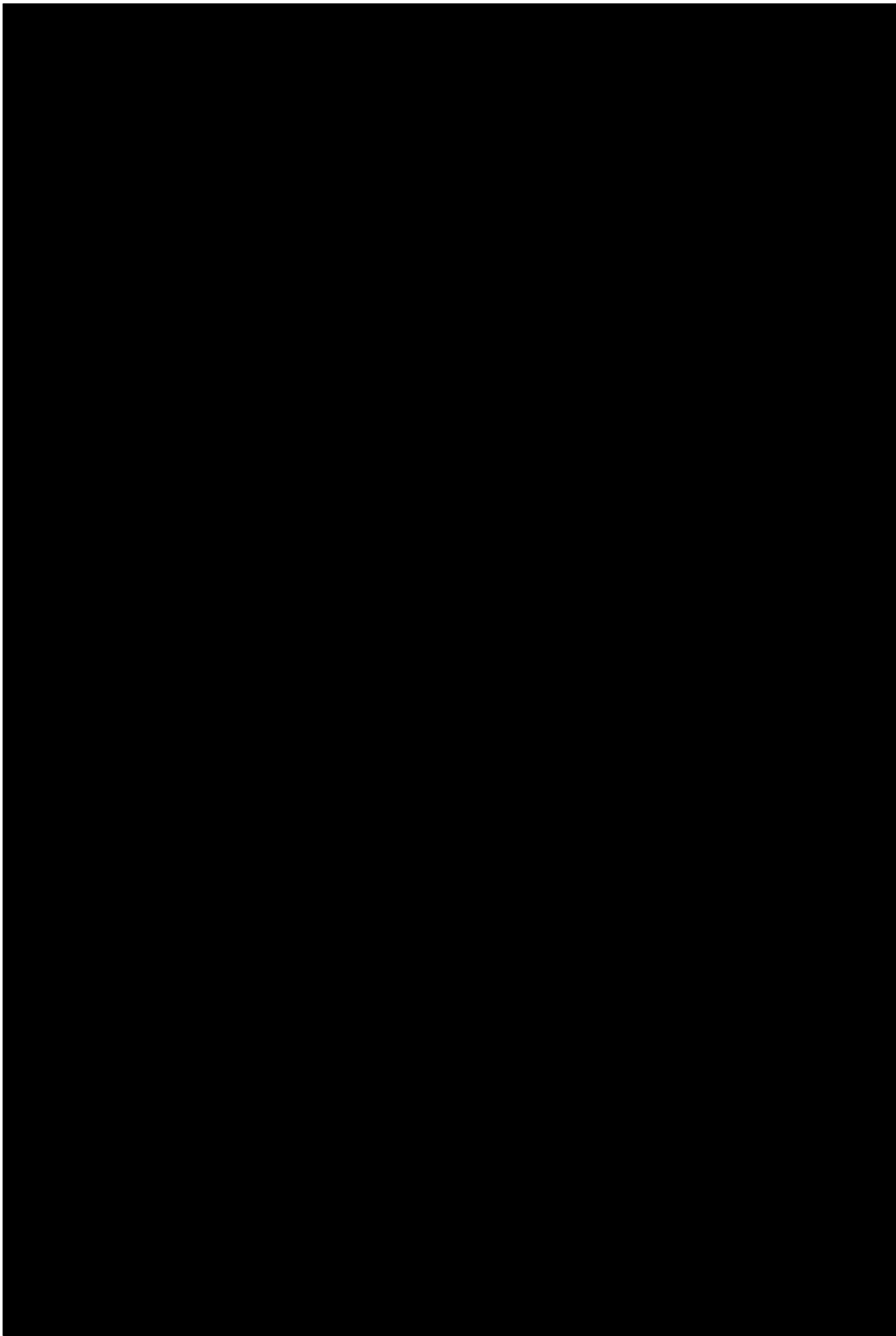


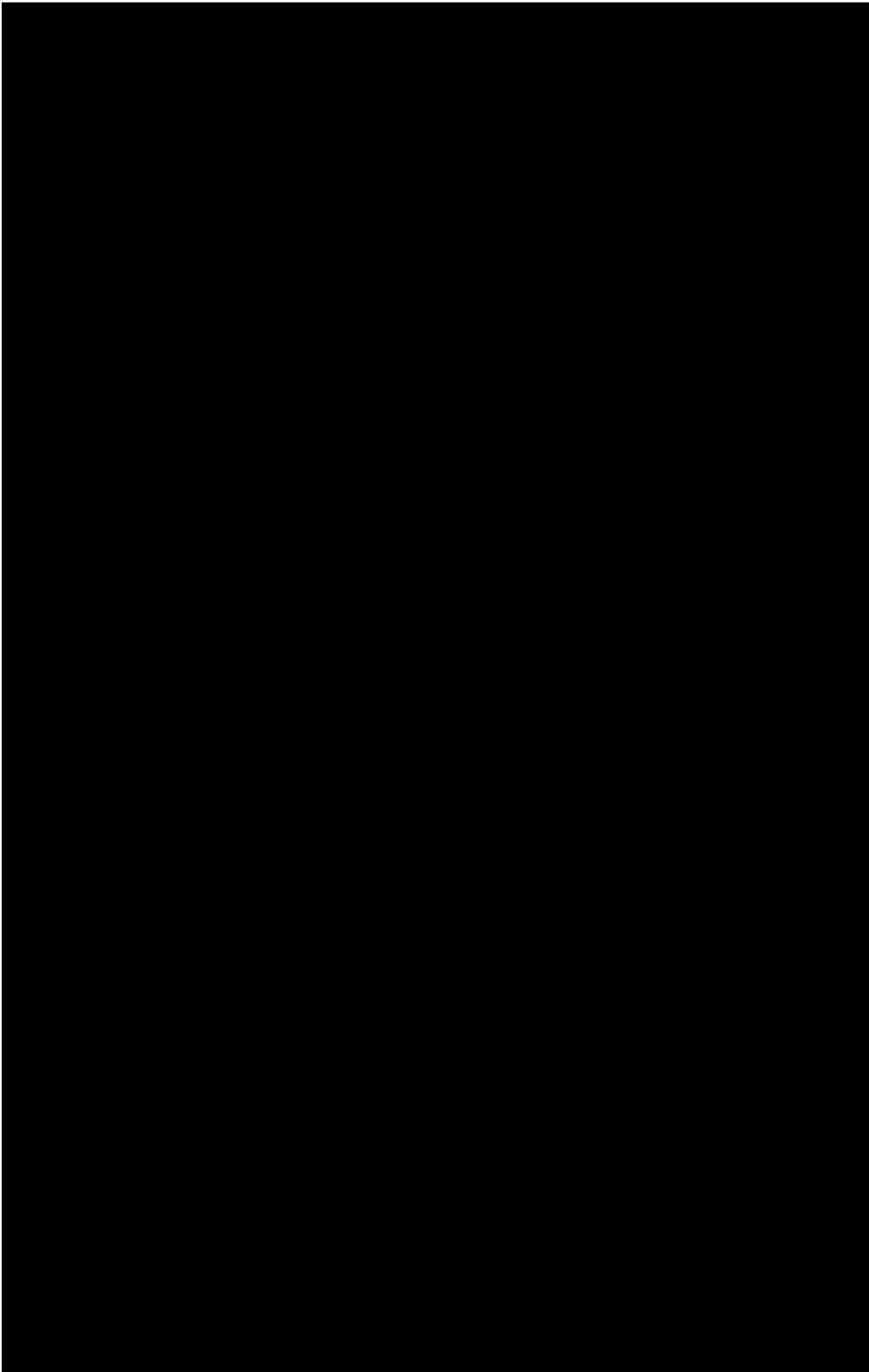


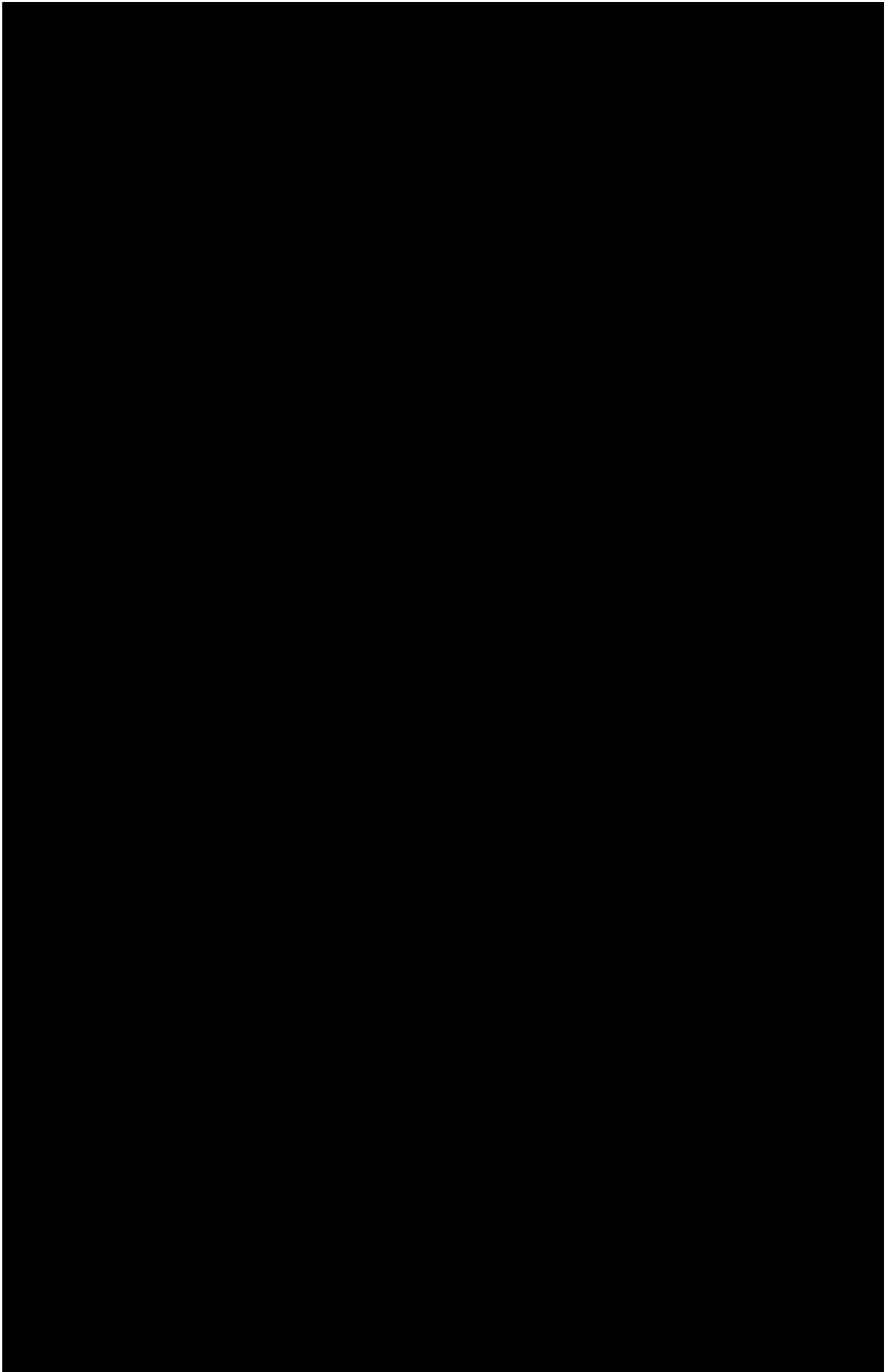


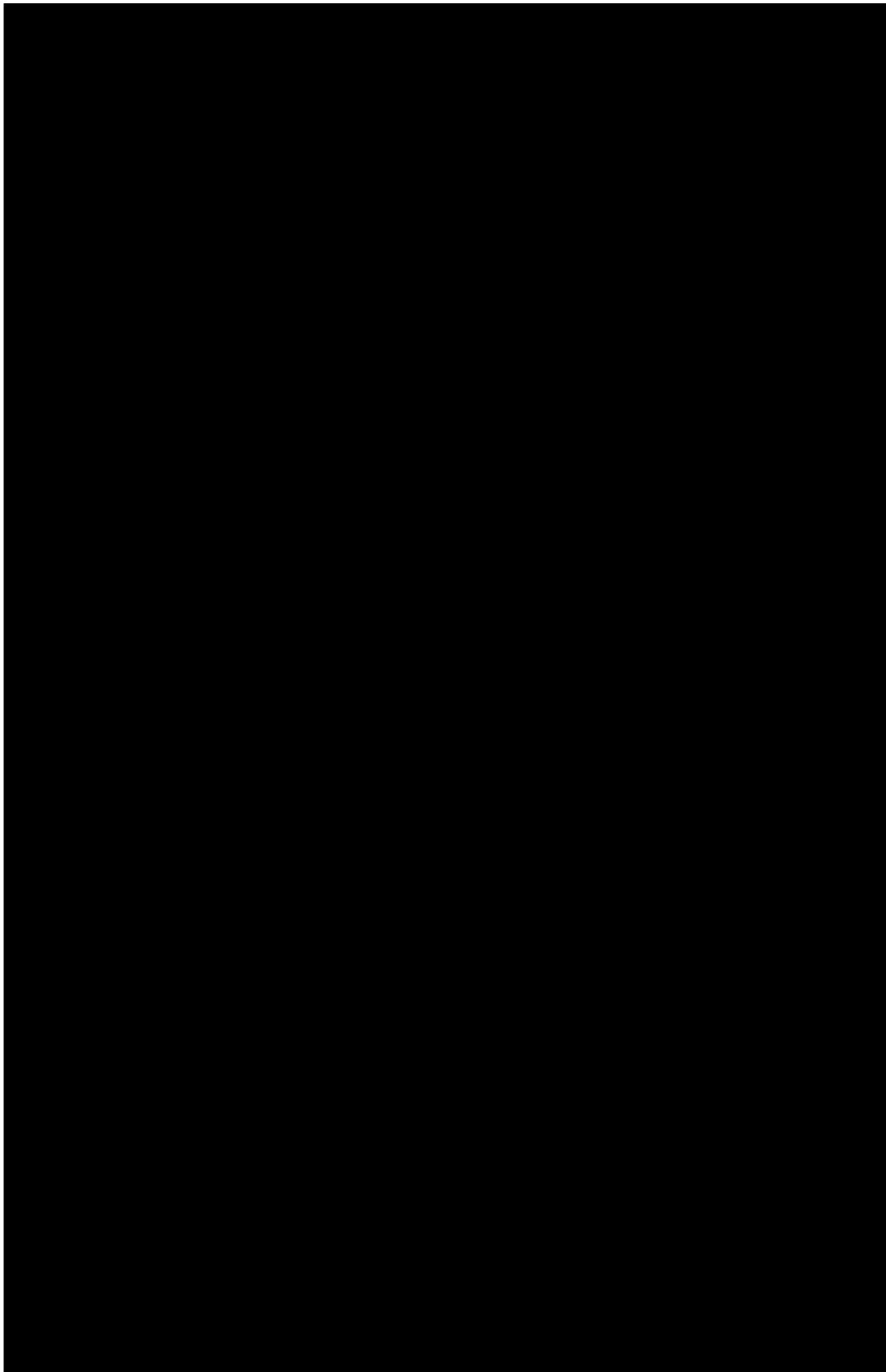


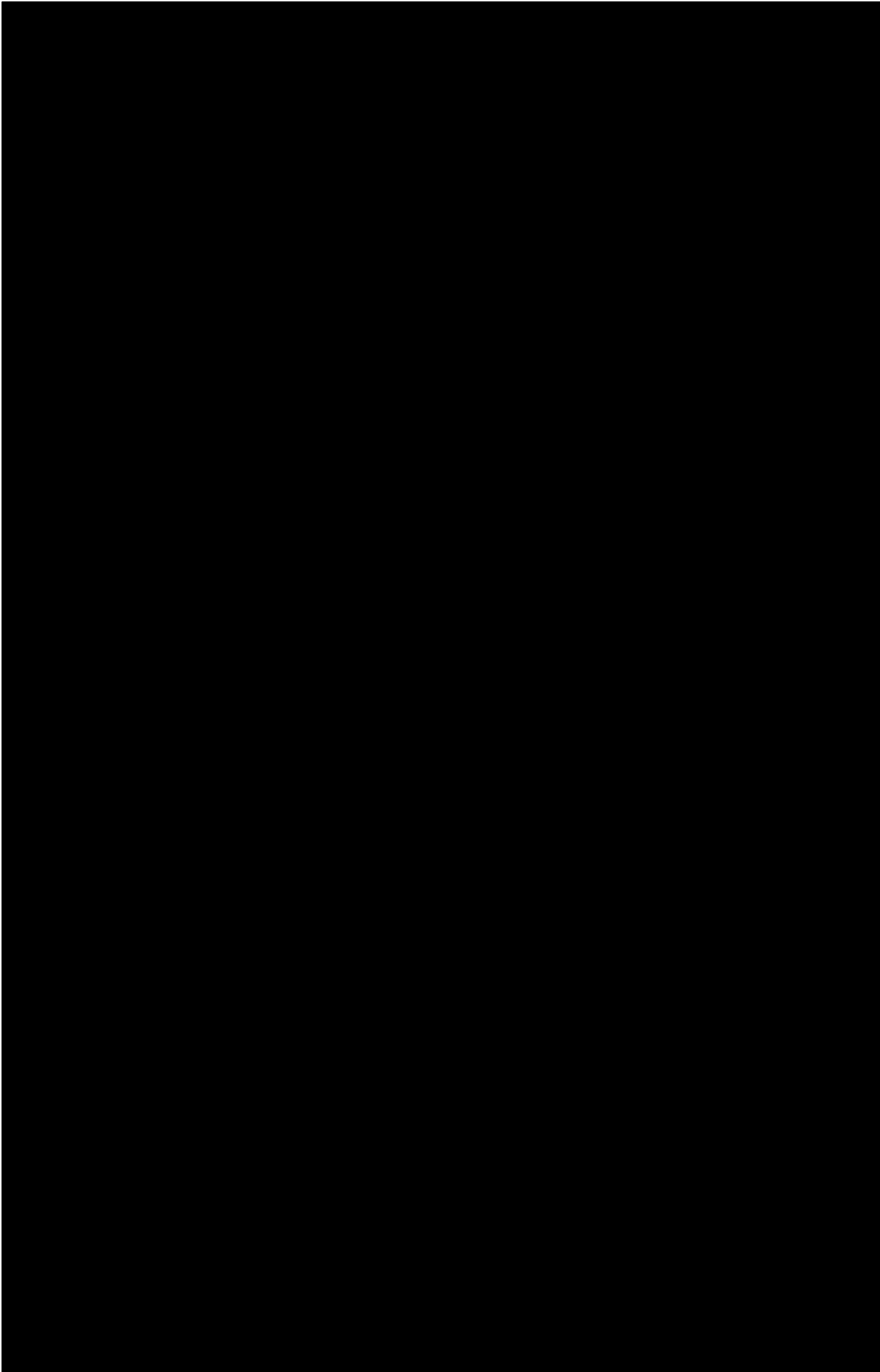


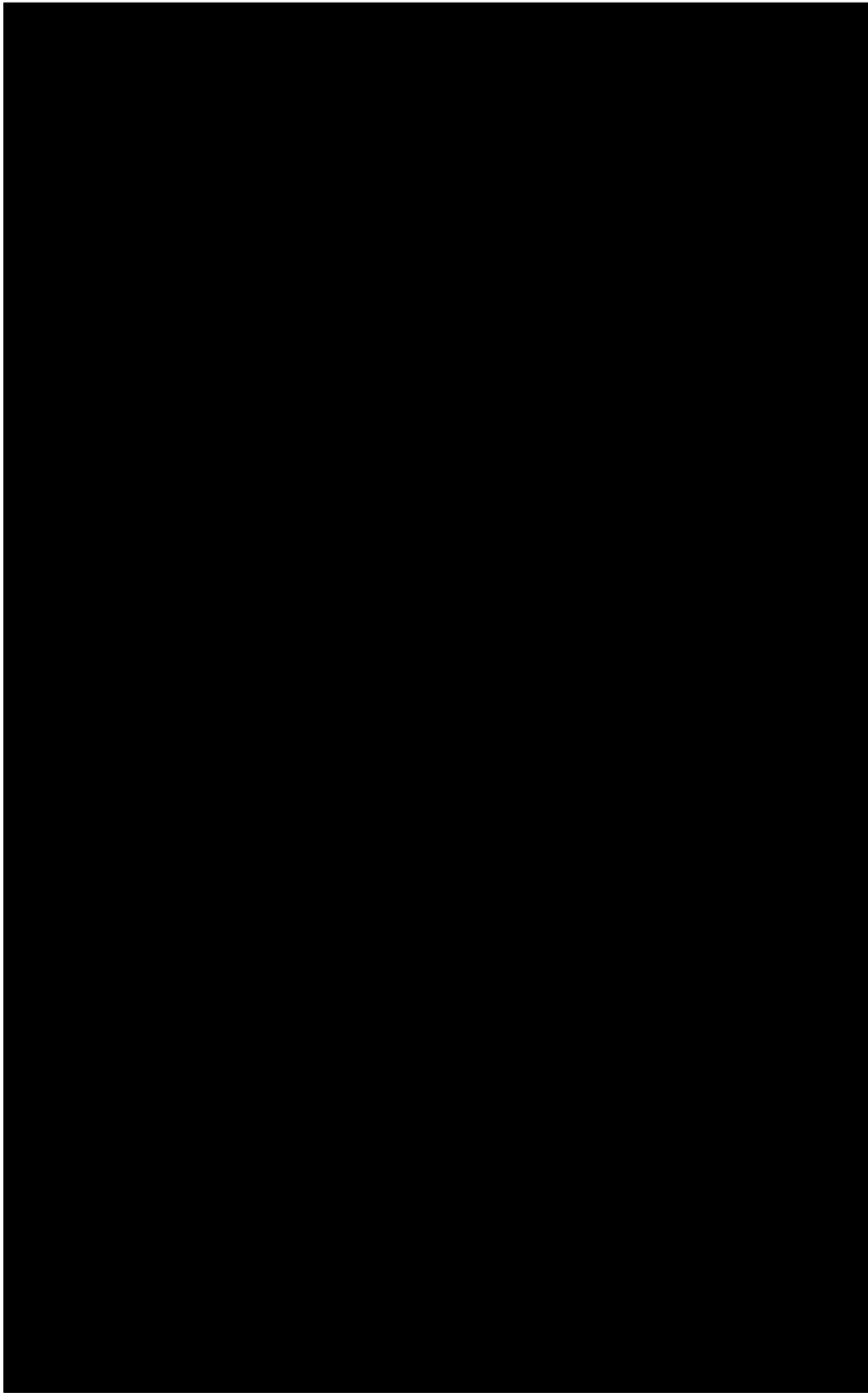








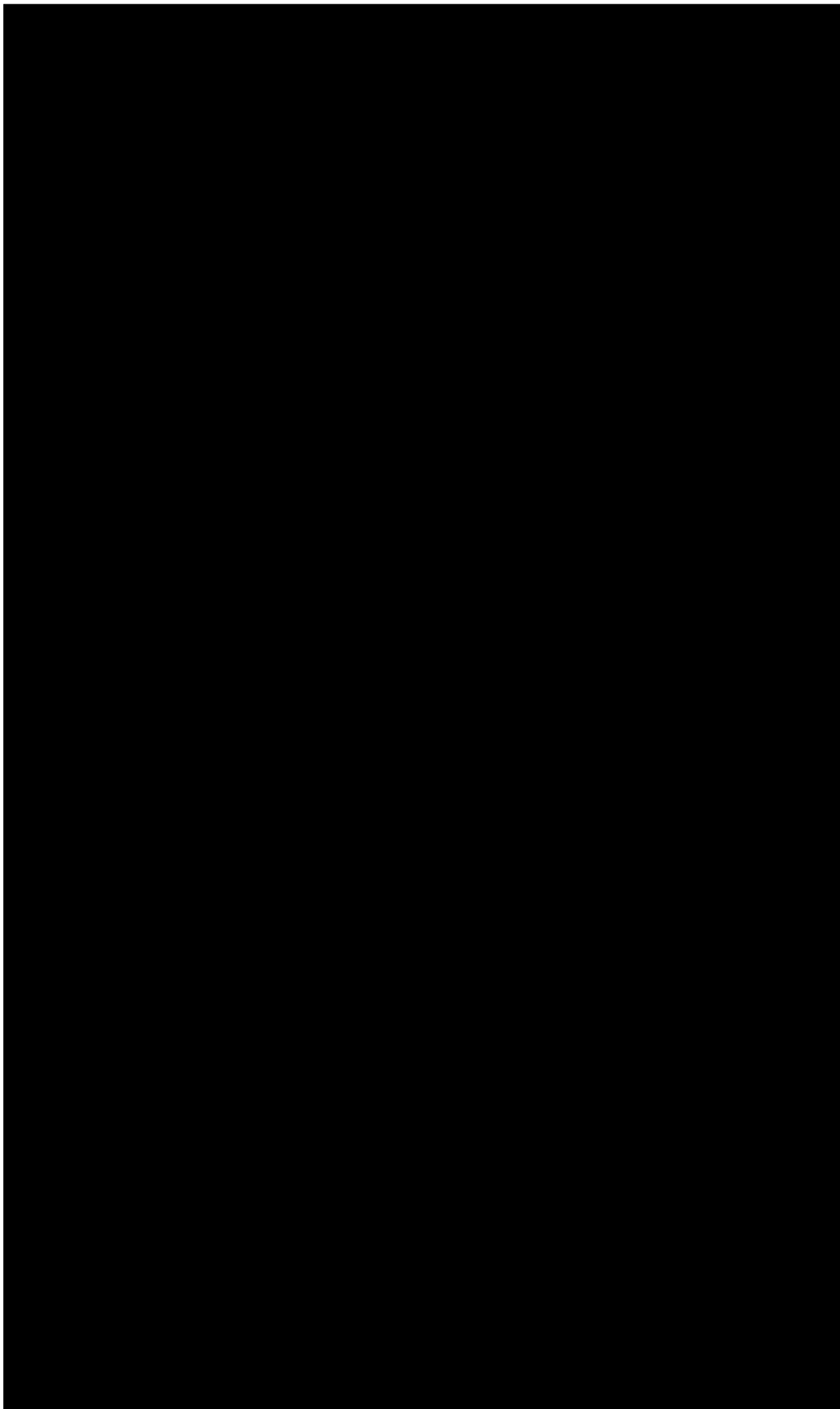


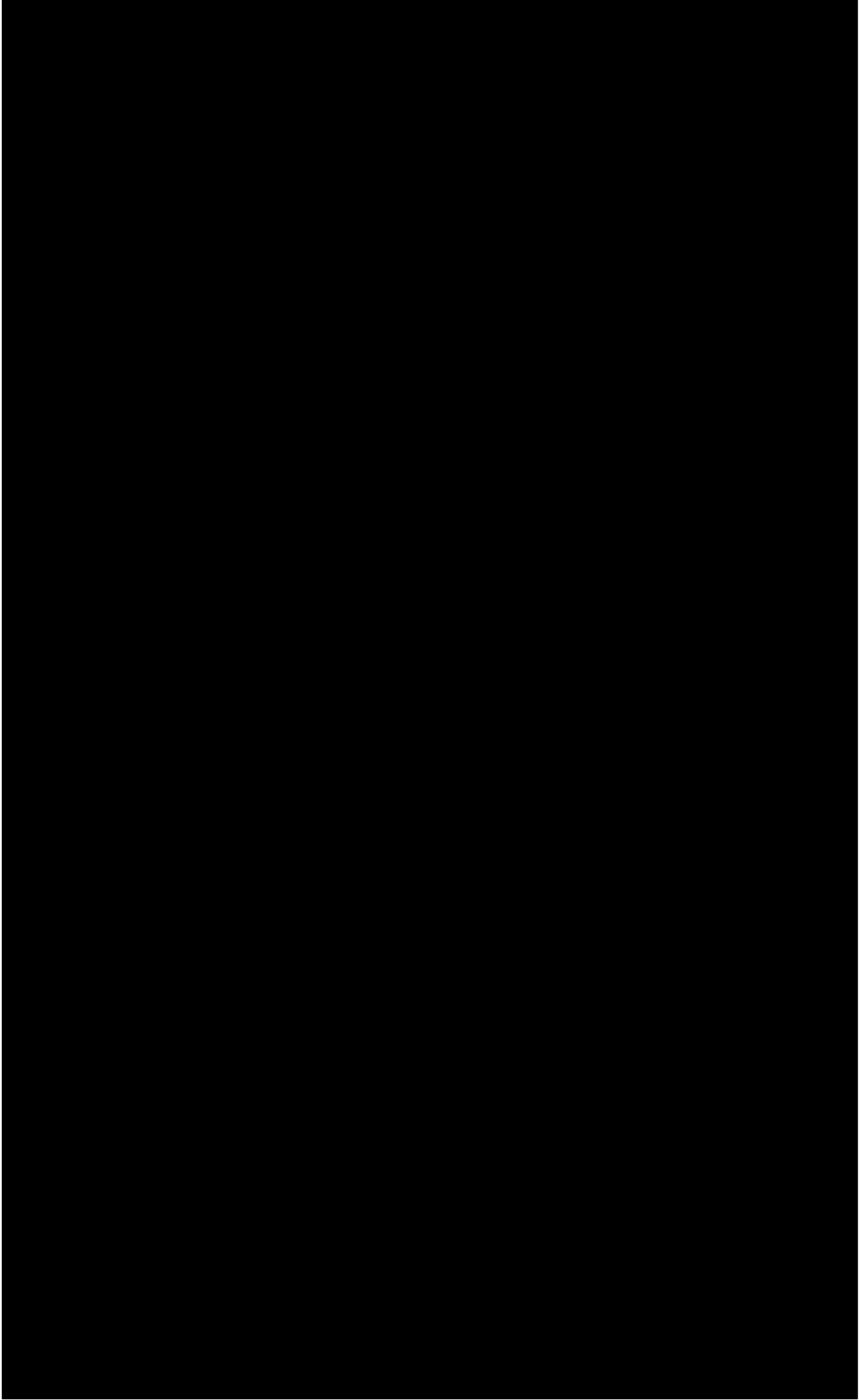


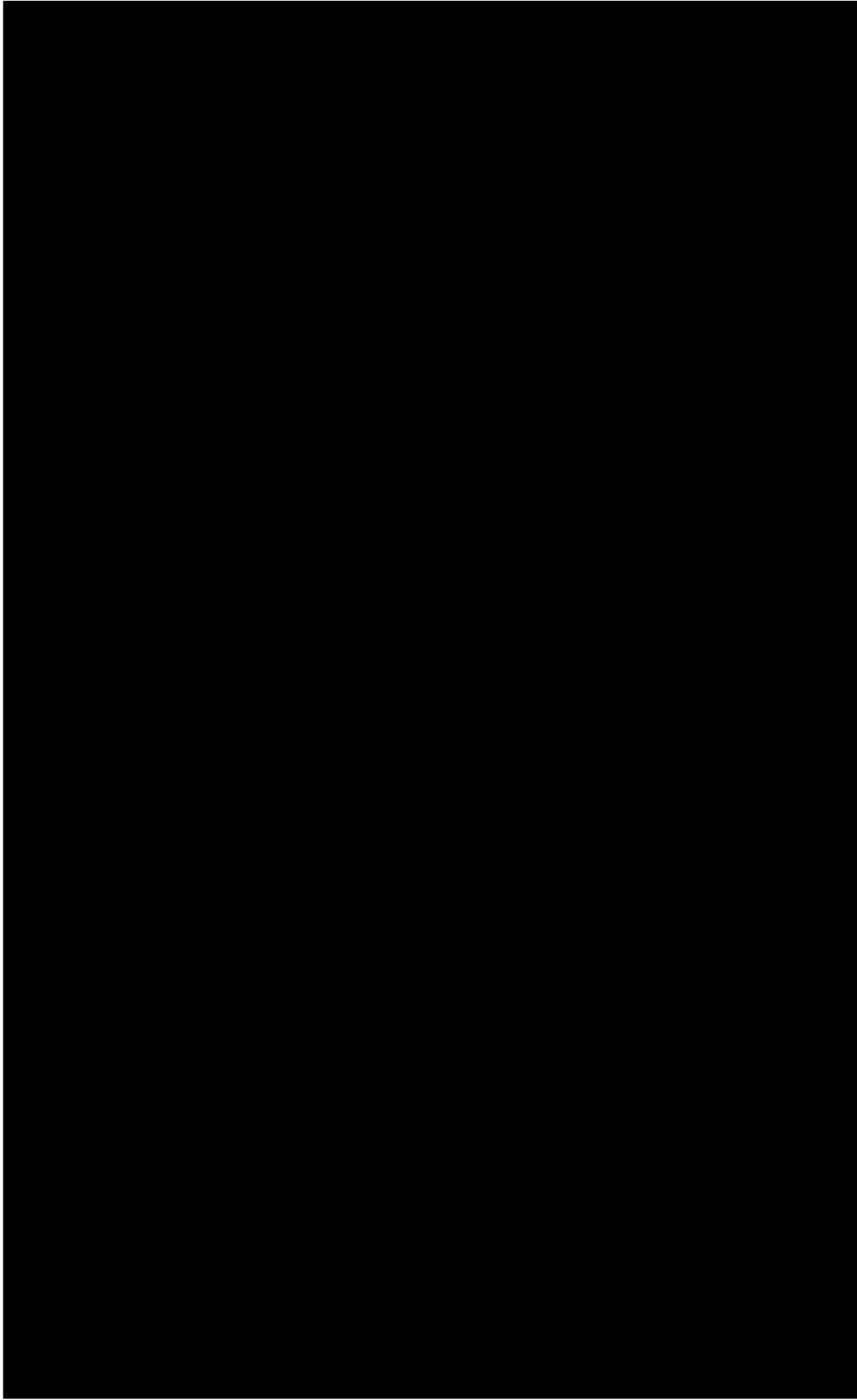
Attachment 23
Bridging Documents

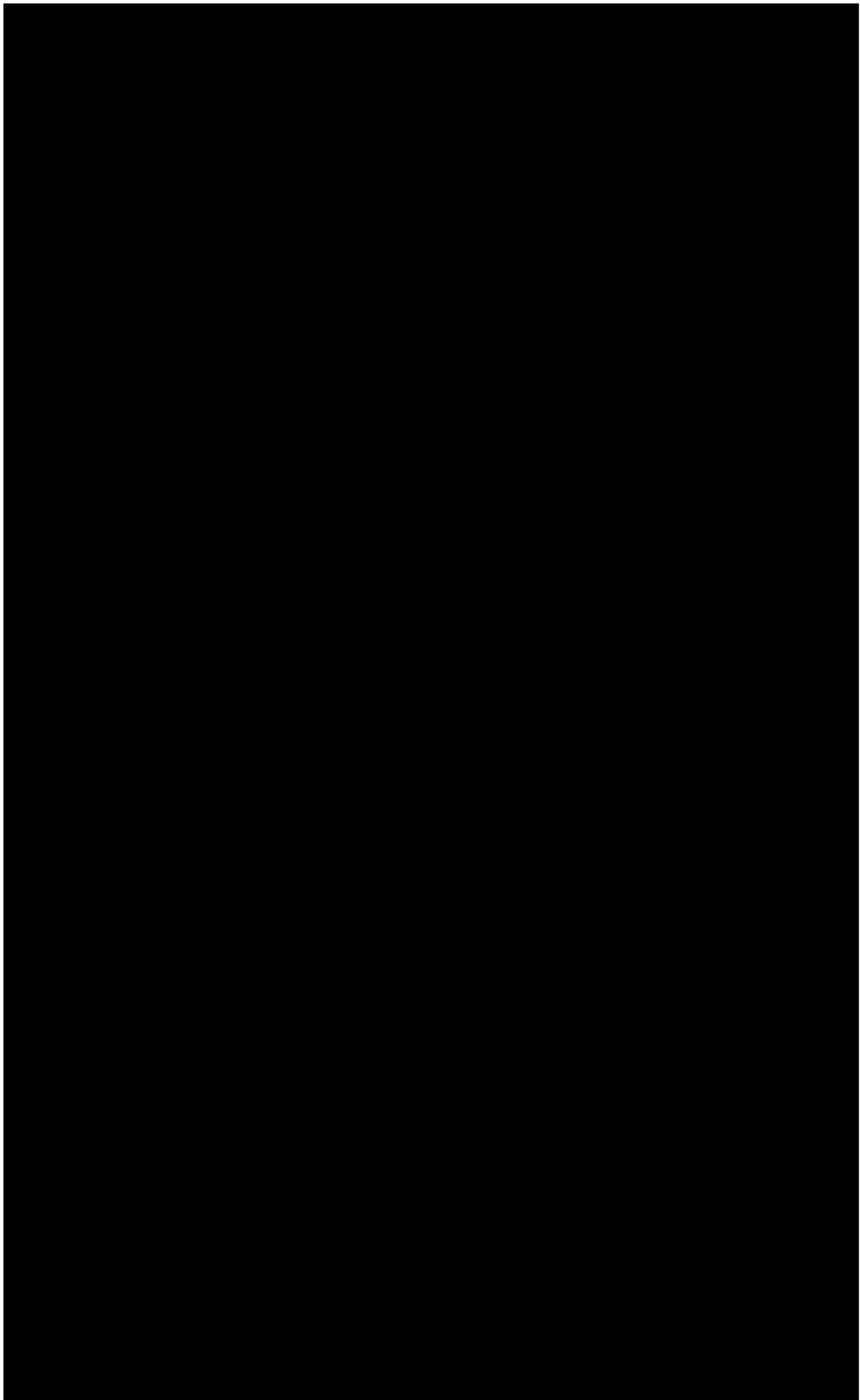
Noble Energy Inc & Atwood Oceanics – Management System Interface – Tier 2

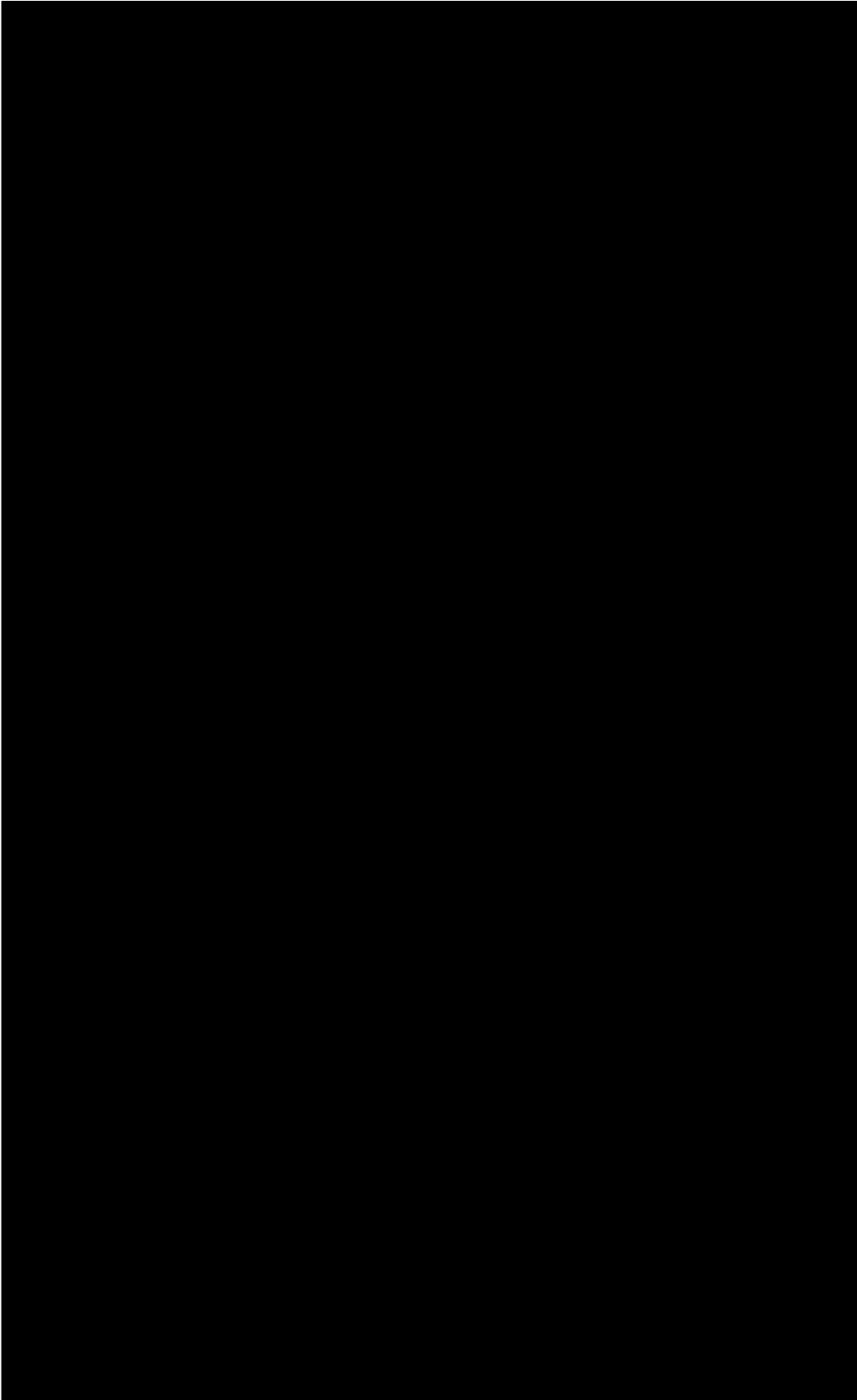
Noble Energy Mediterranean Ltd & Atwood Advantage – Operational Interface – Tier 4

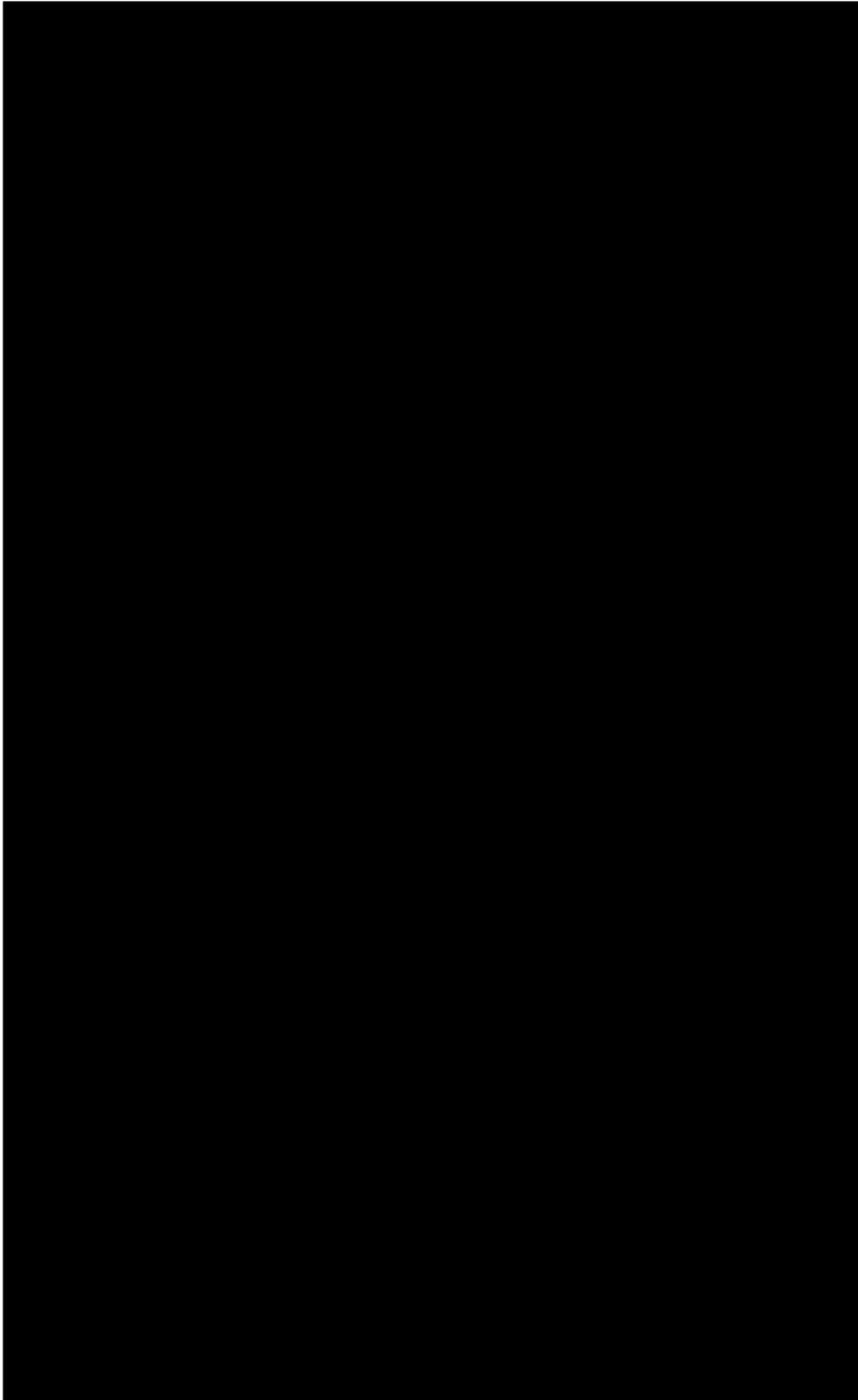


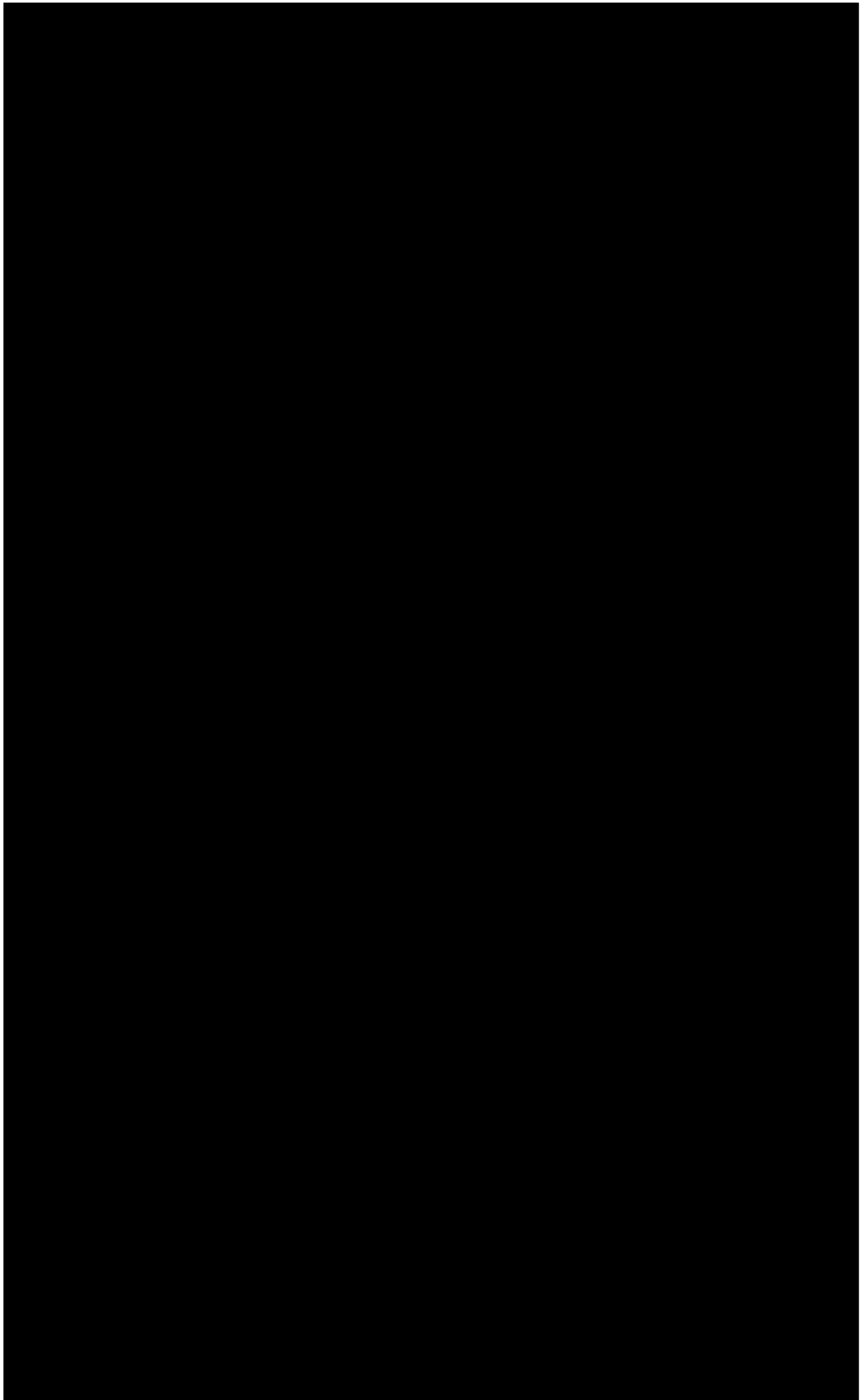


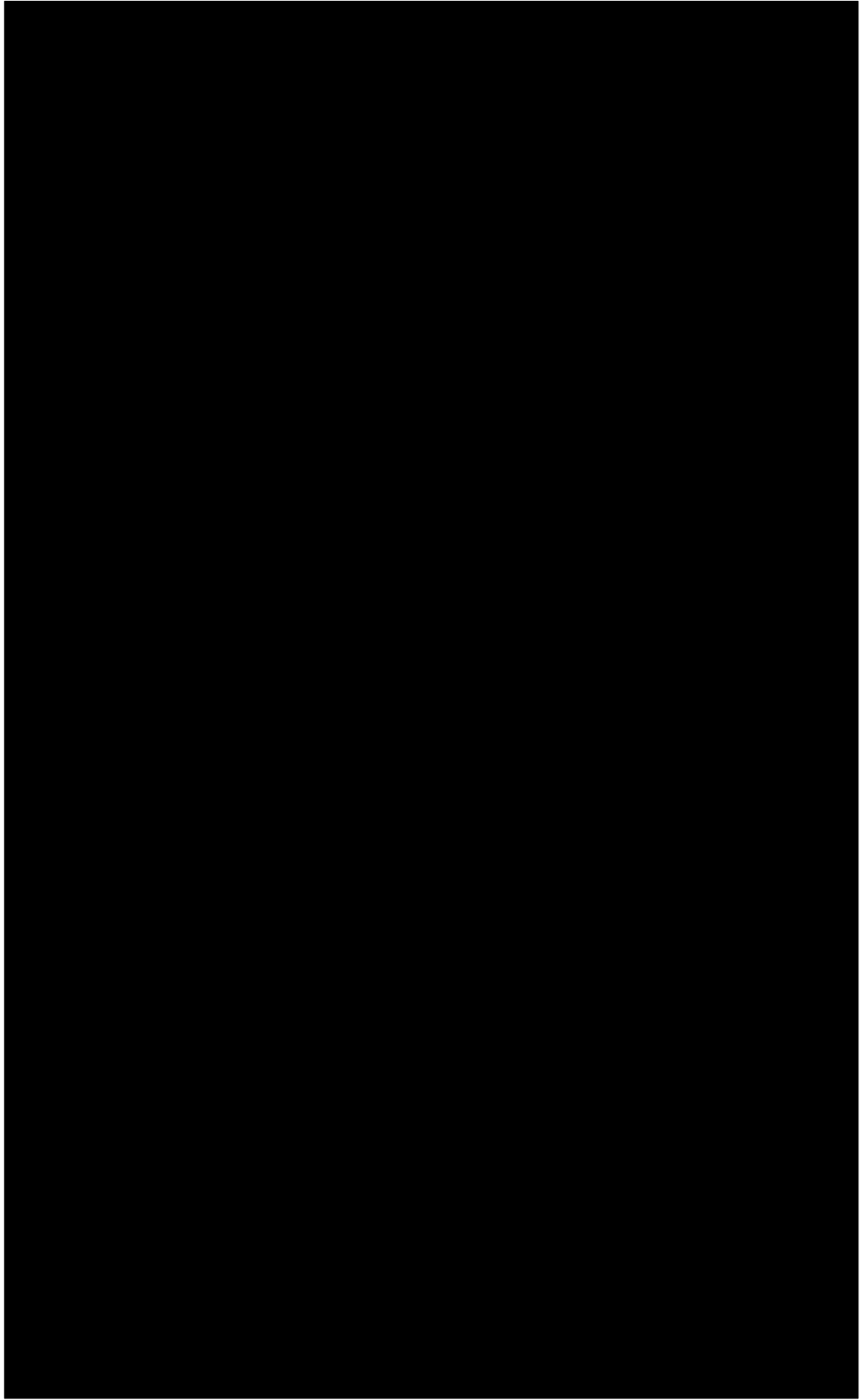


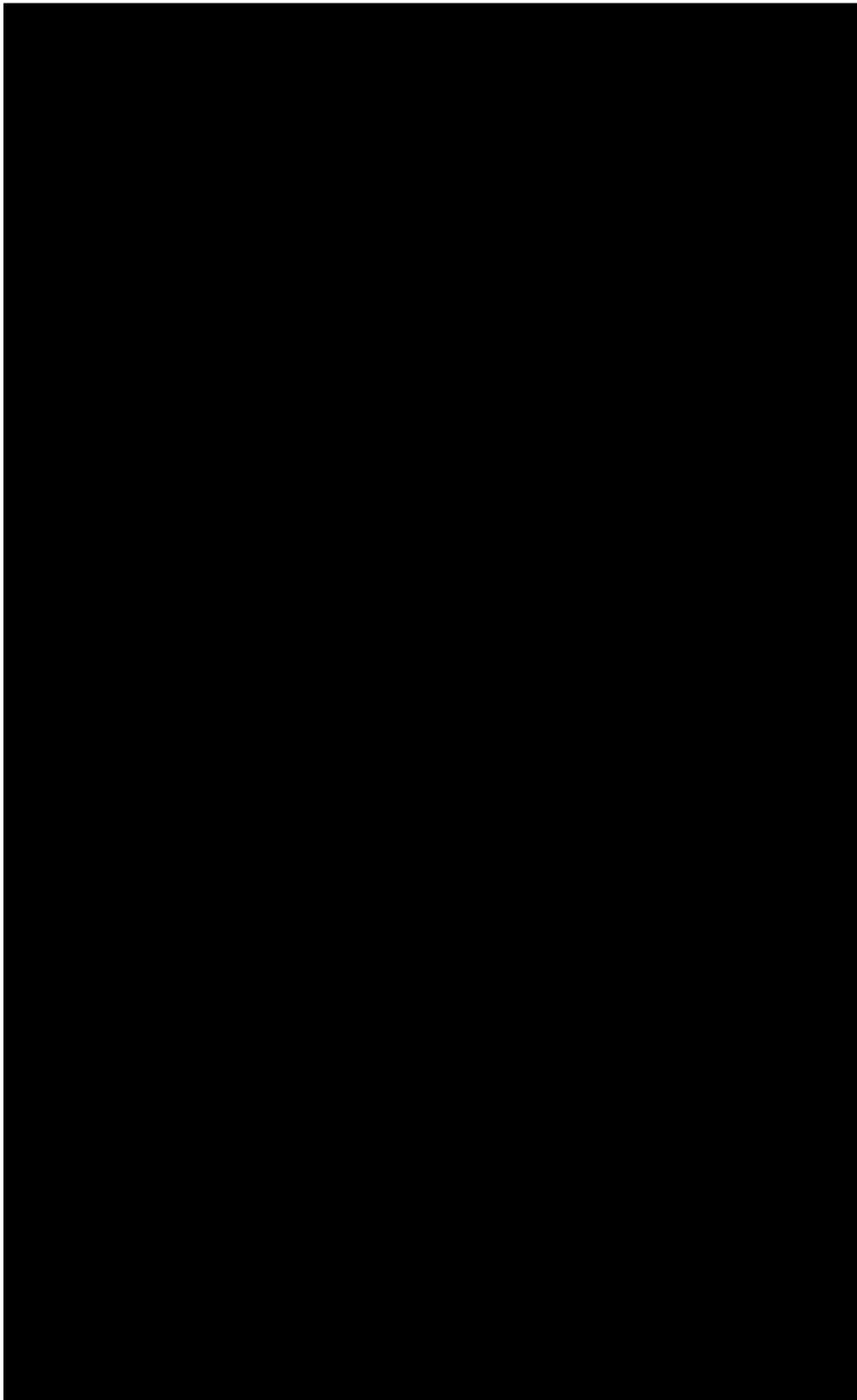


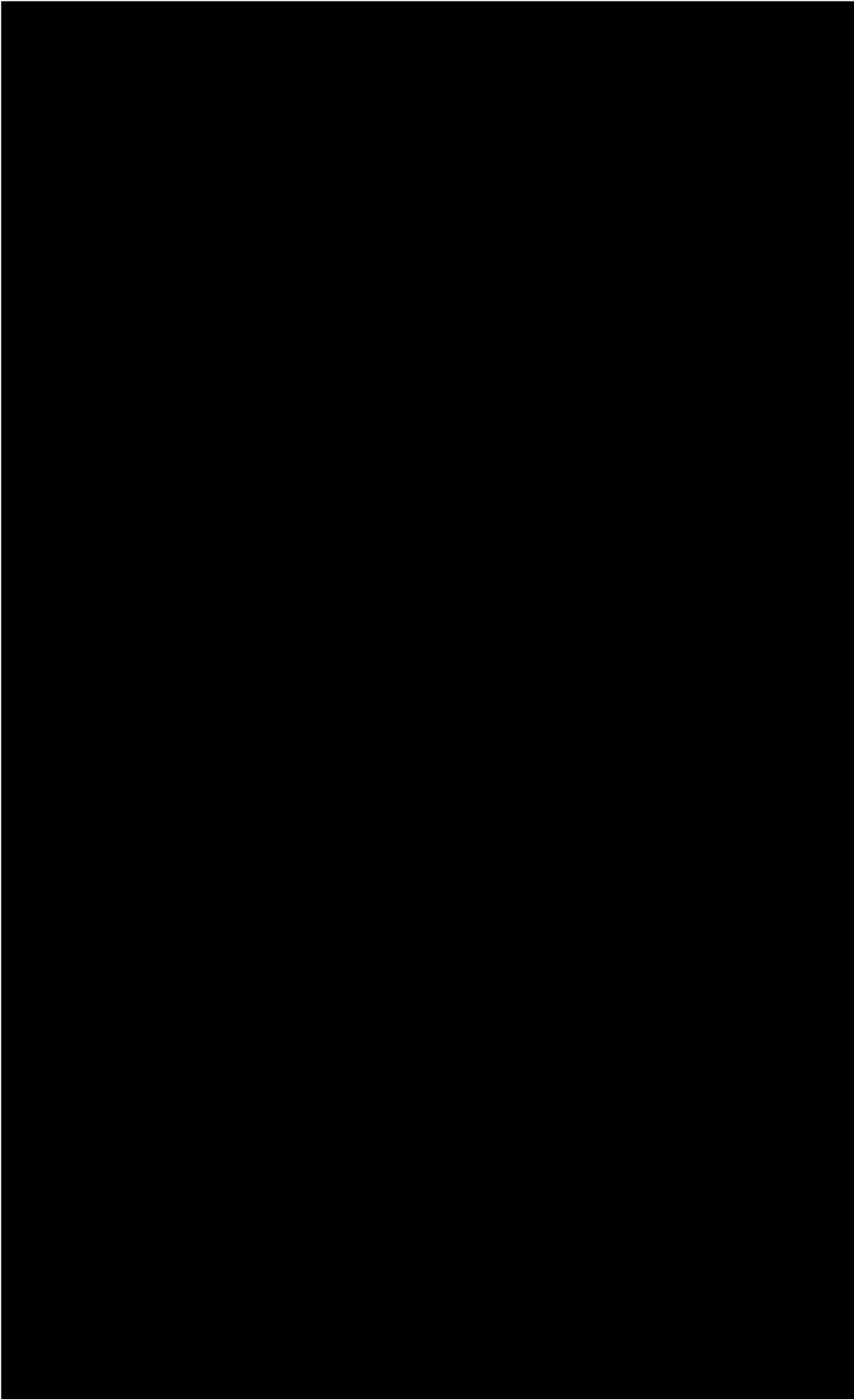


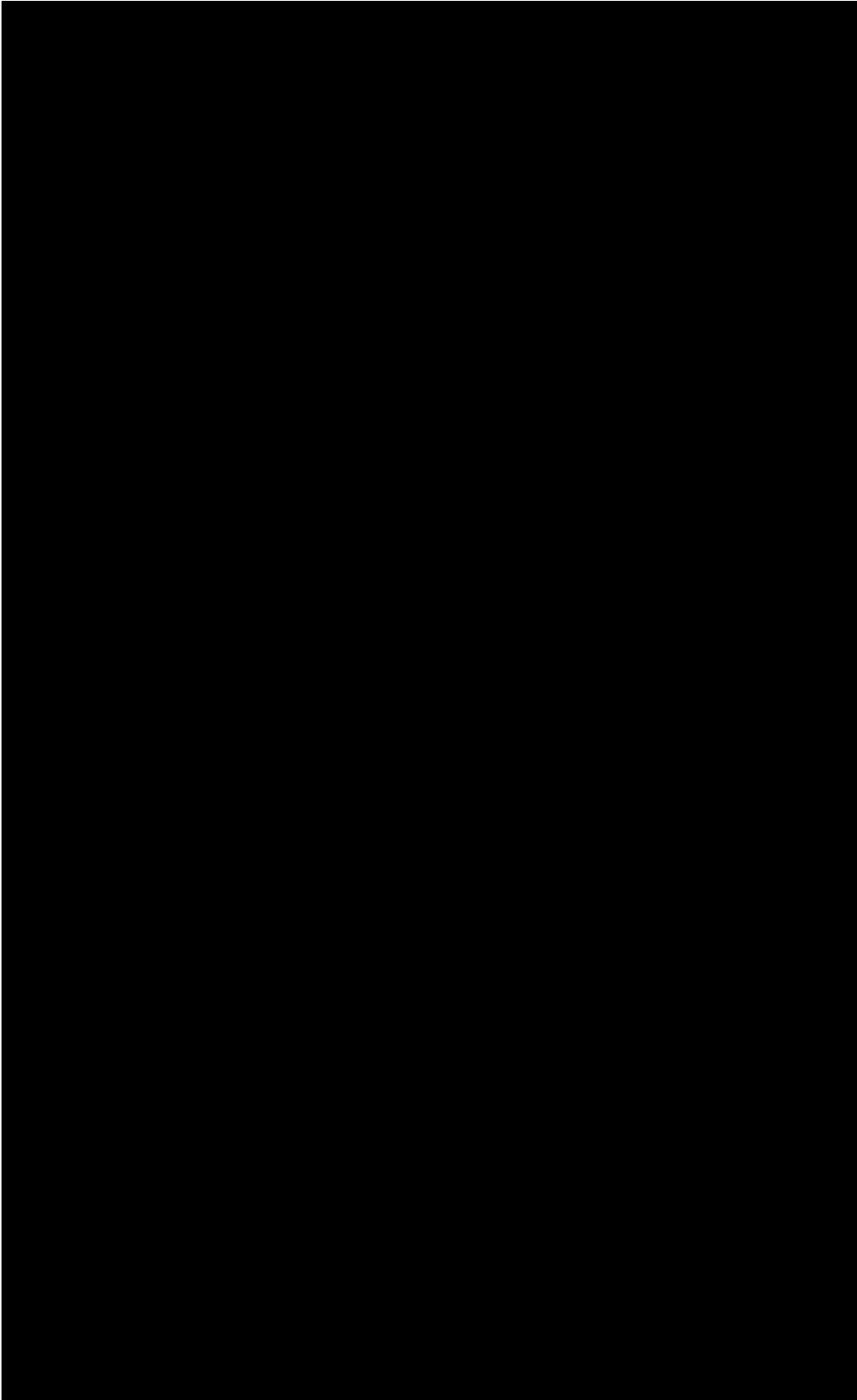


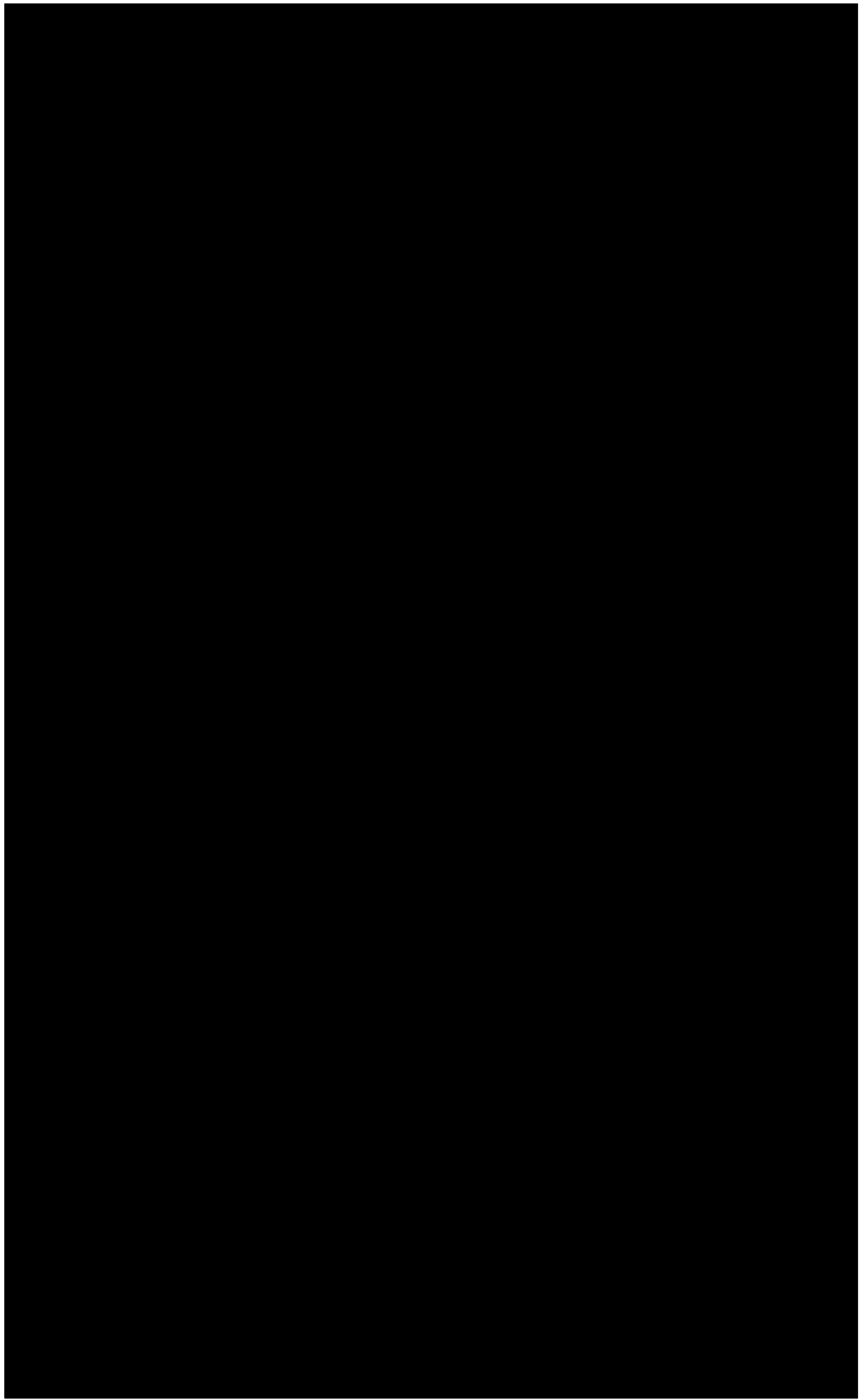


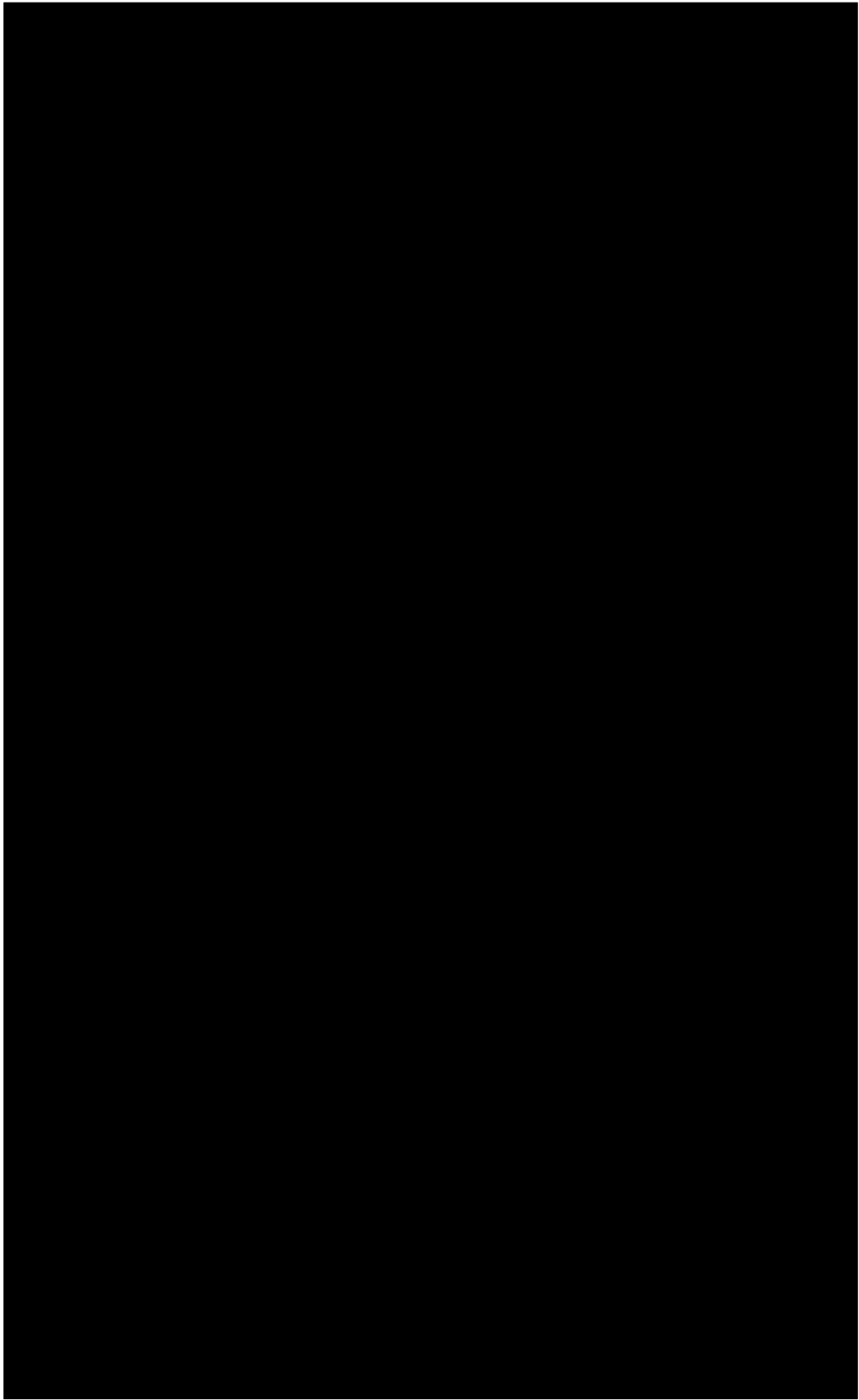


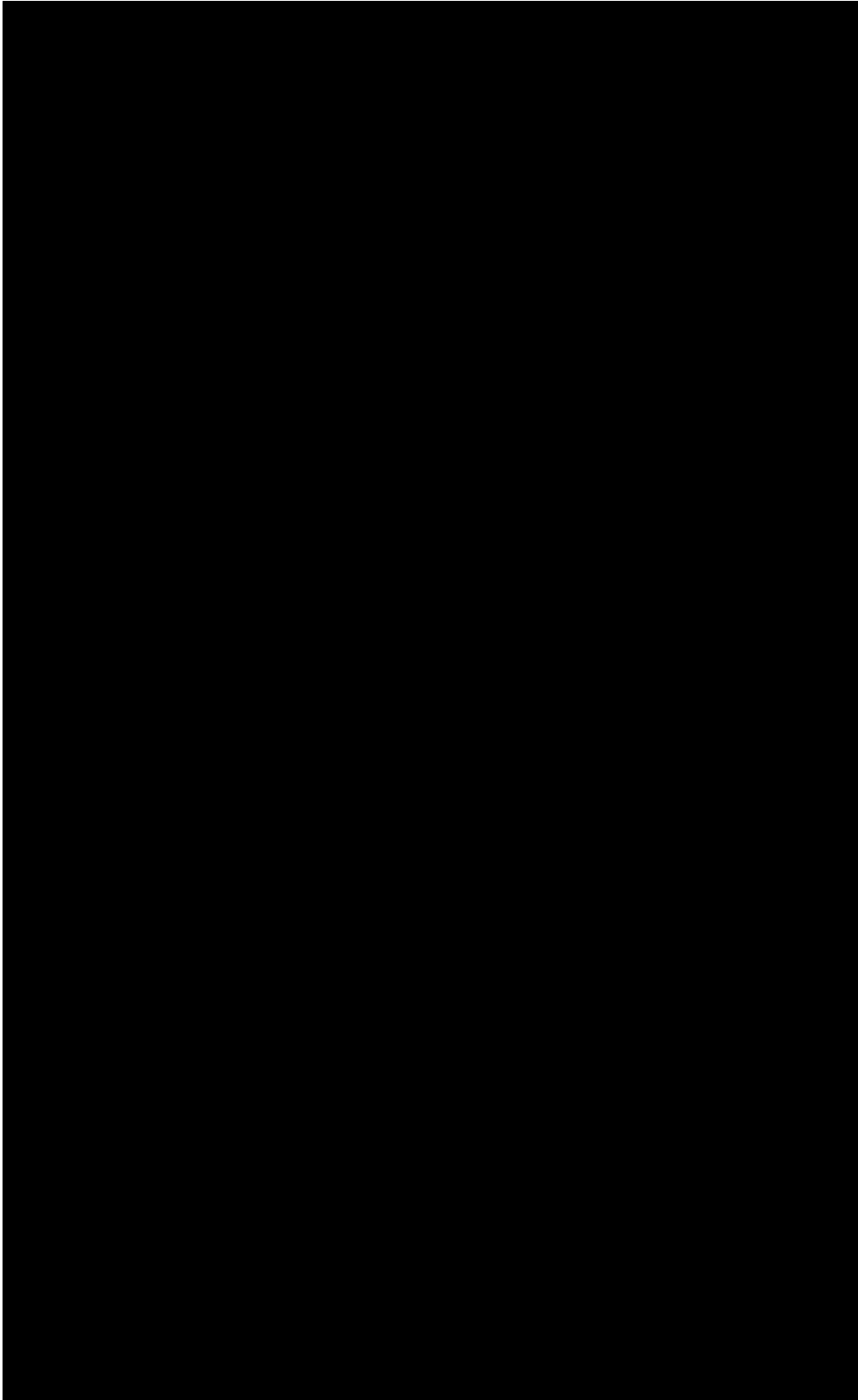


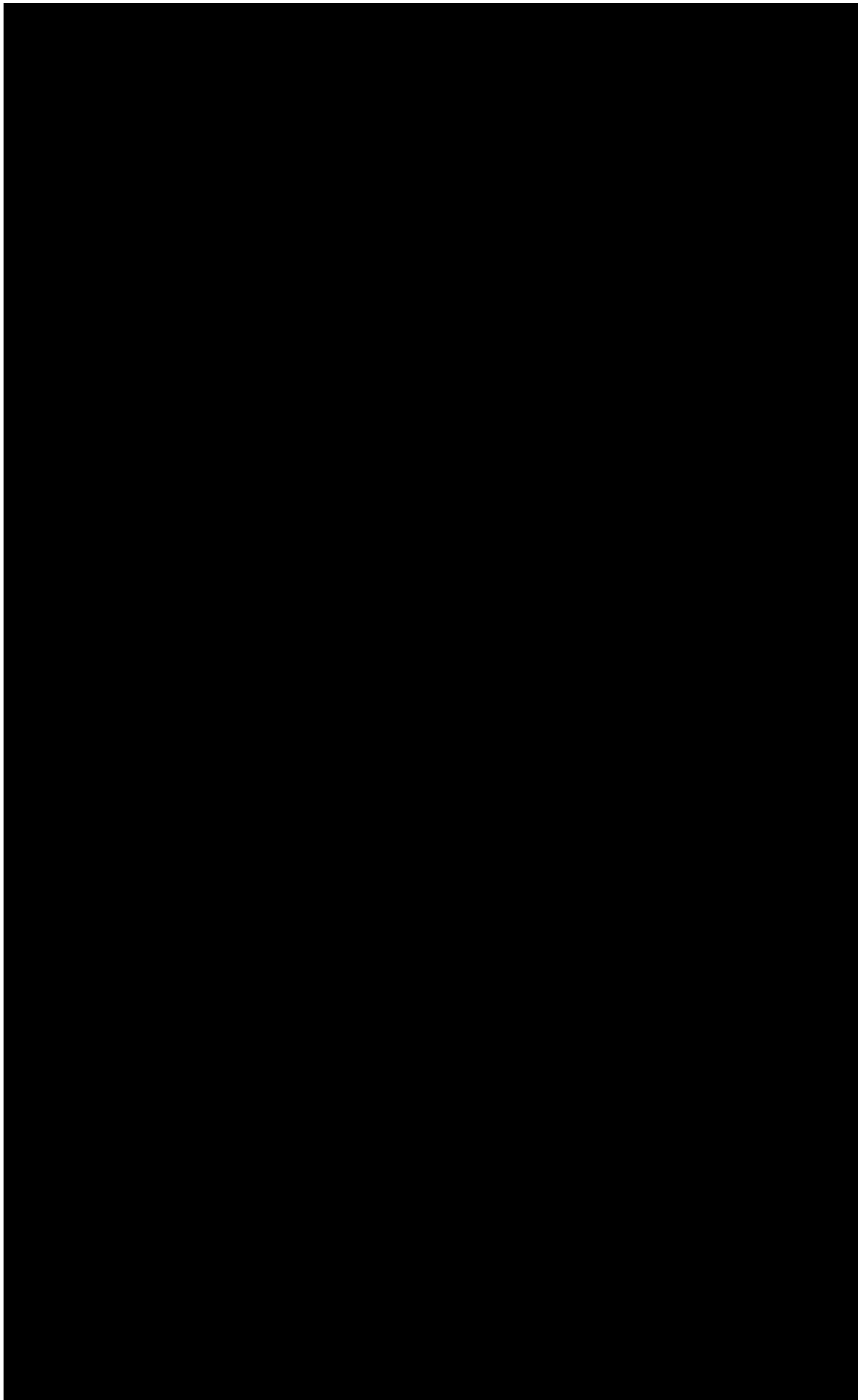


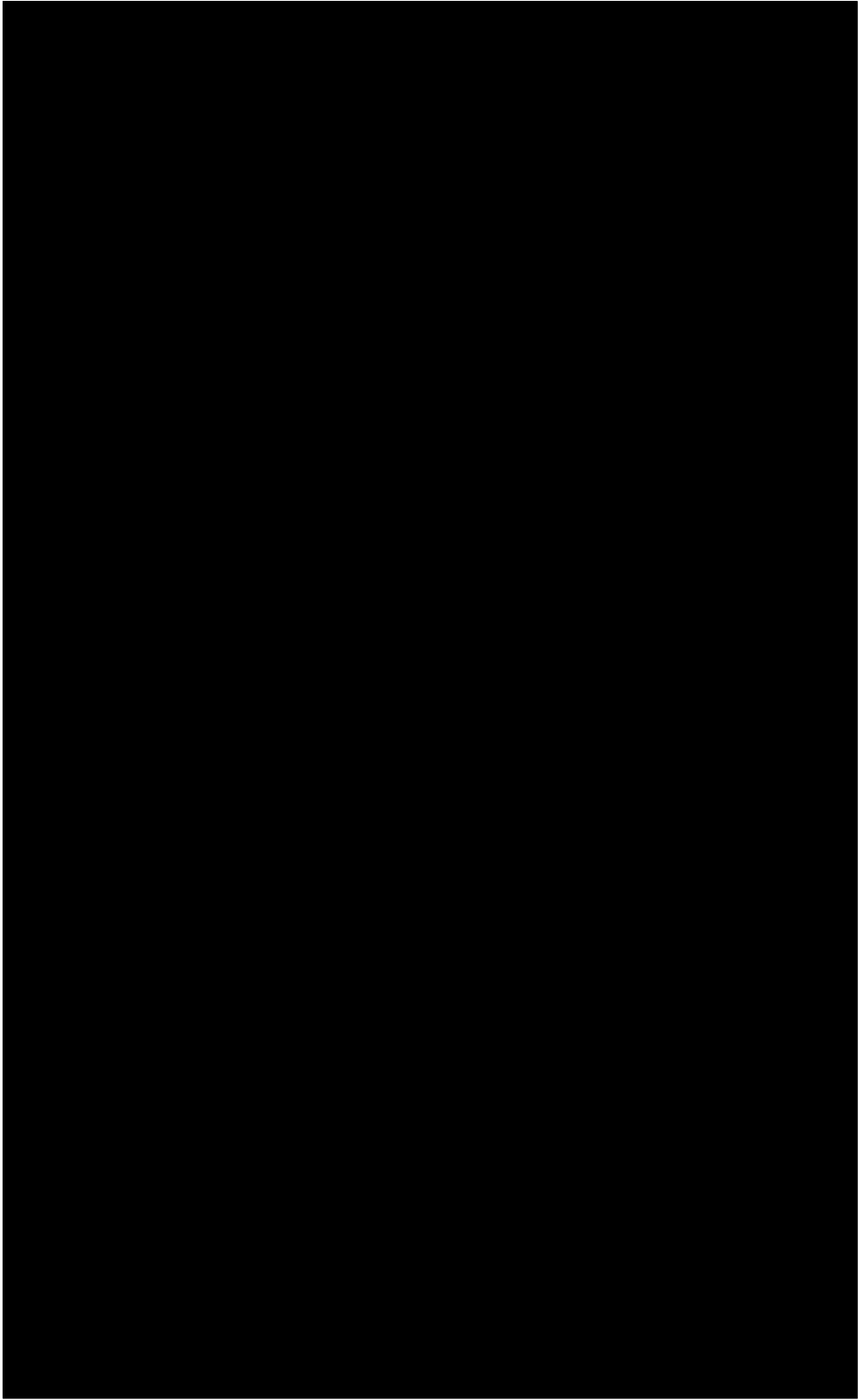


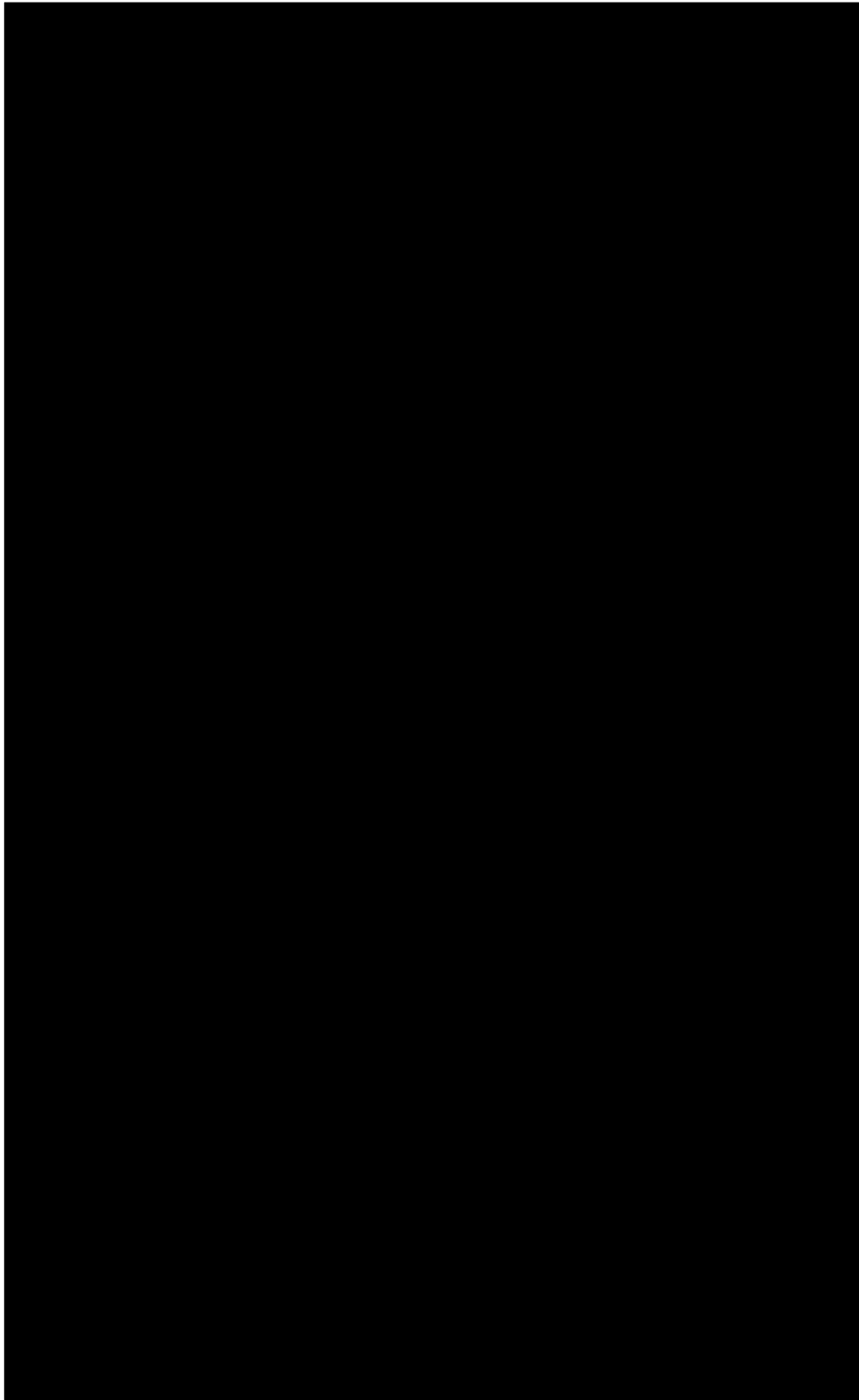


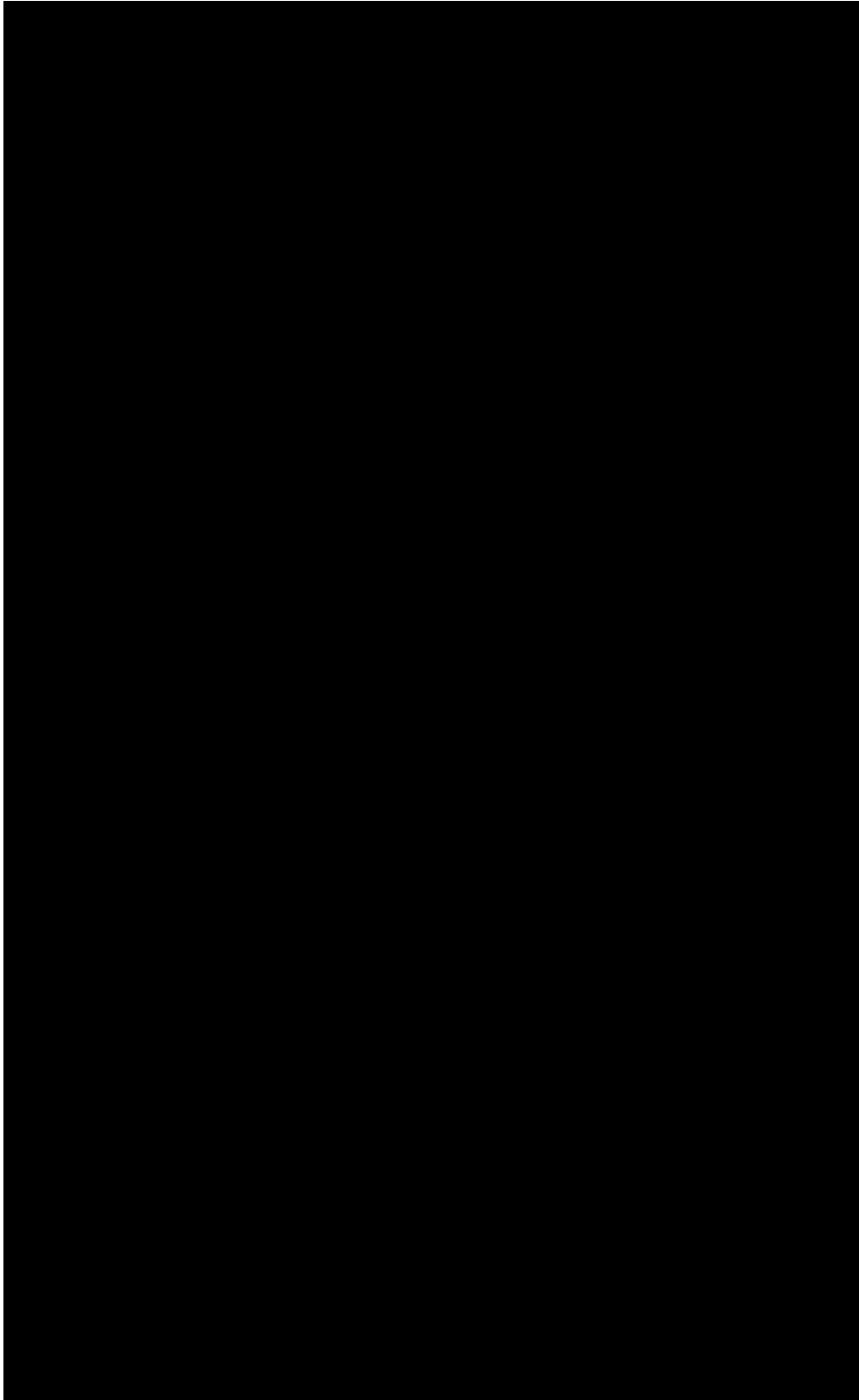




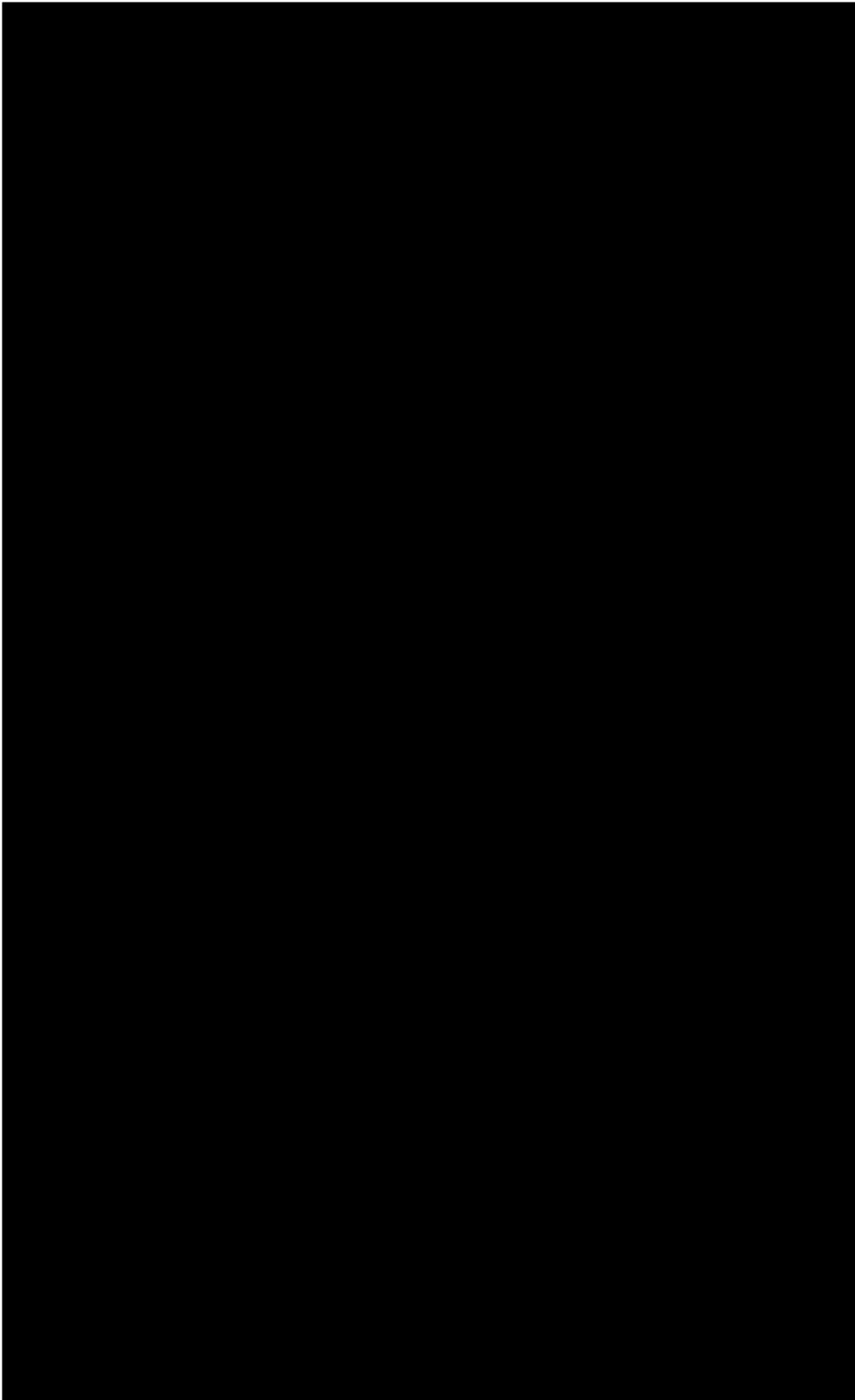


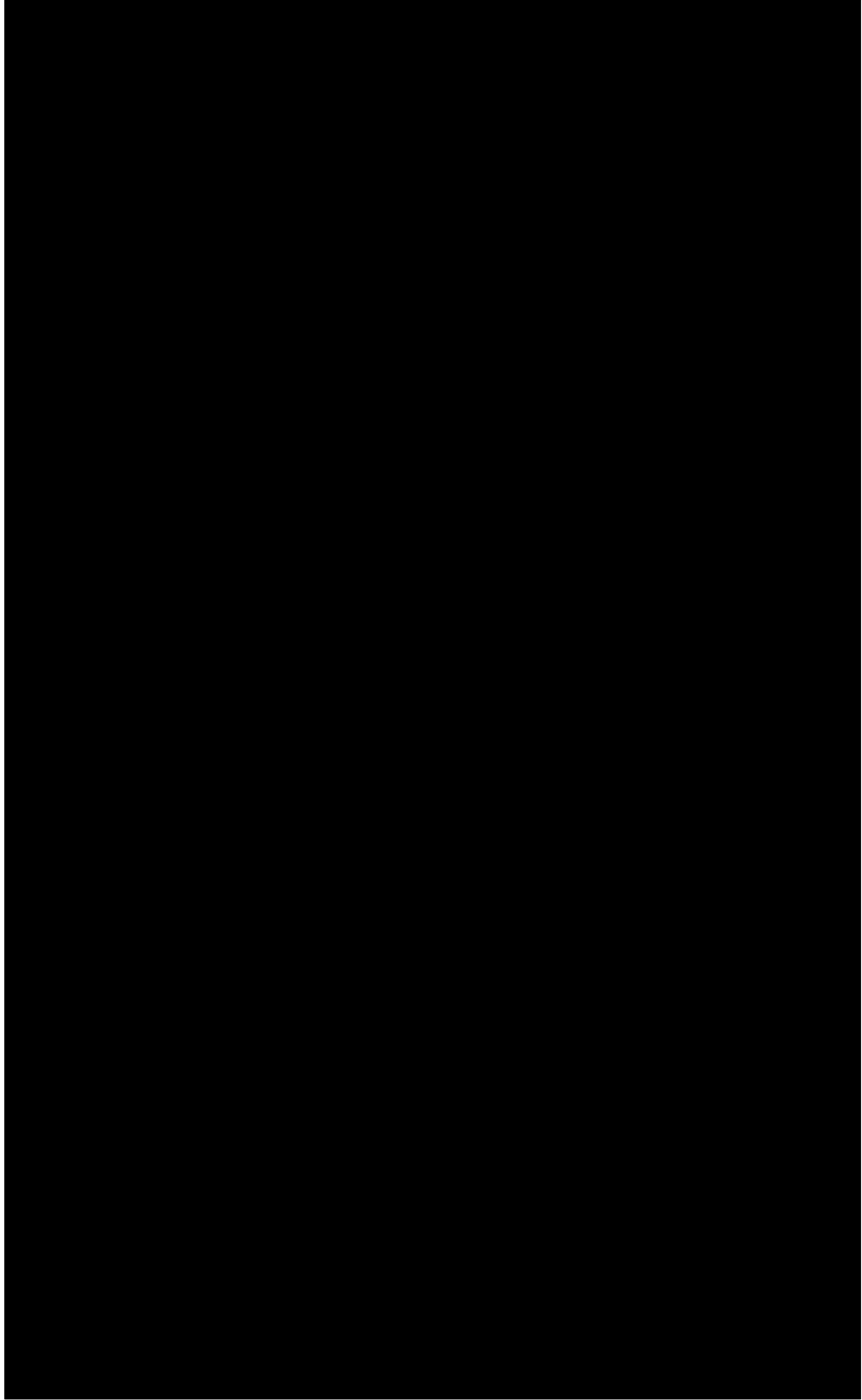


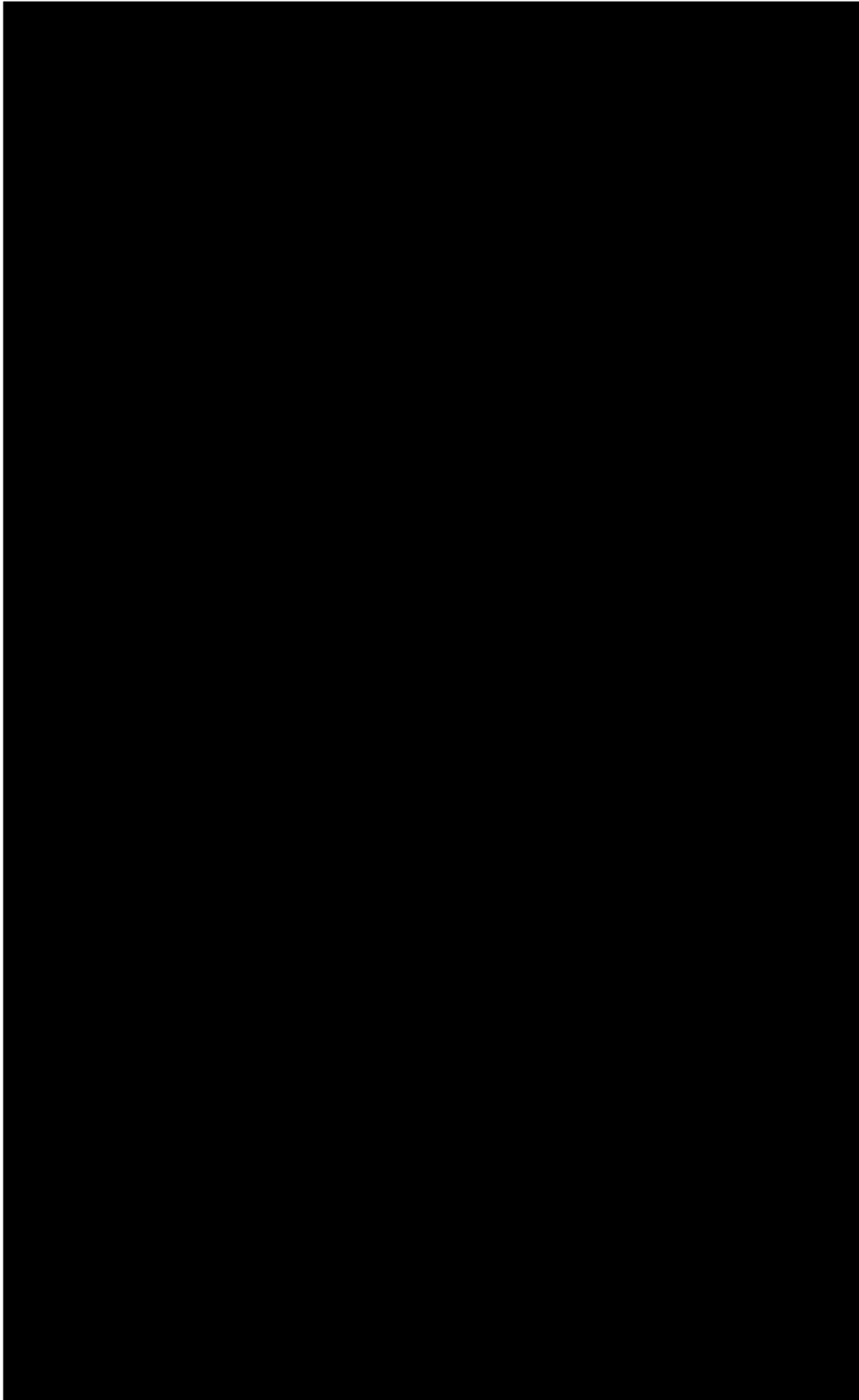


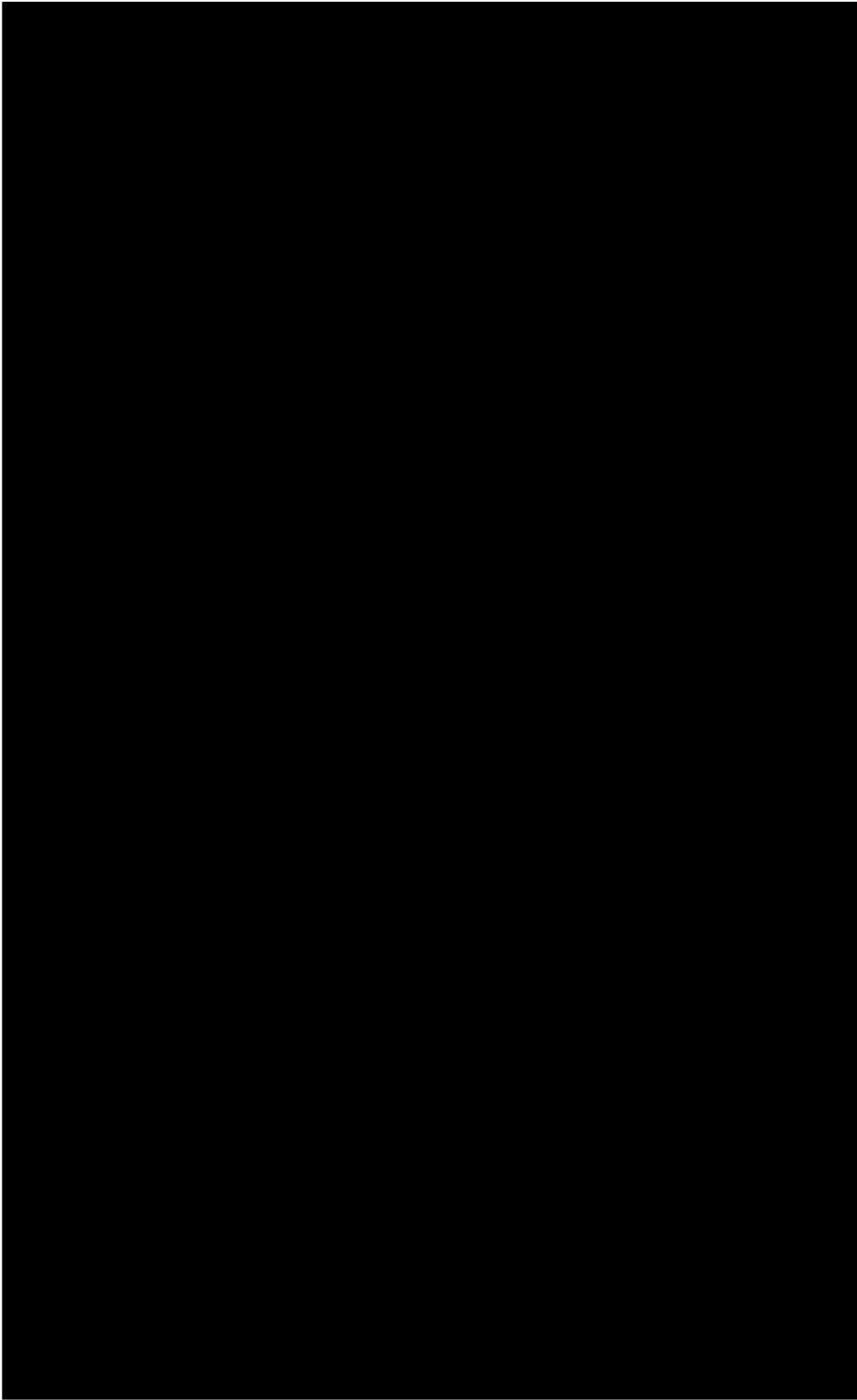


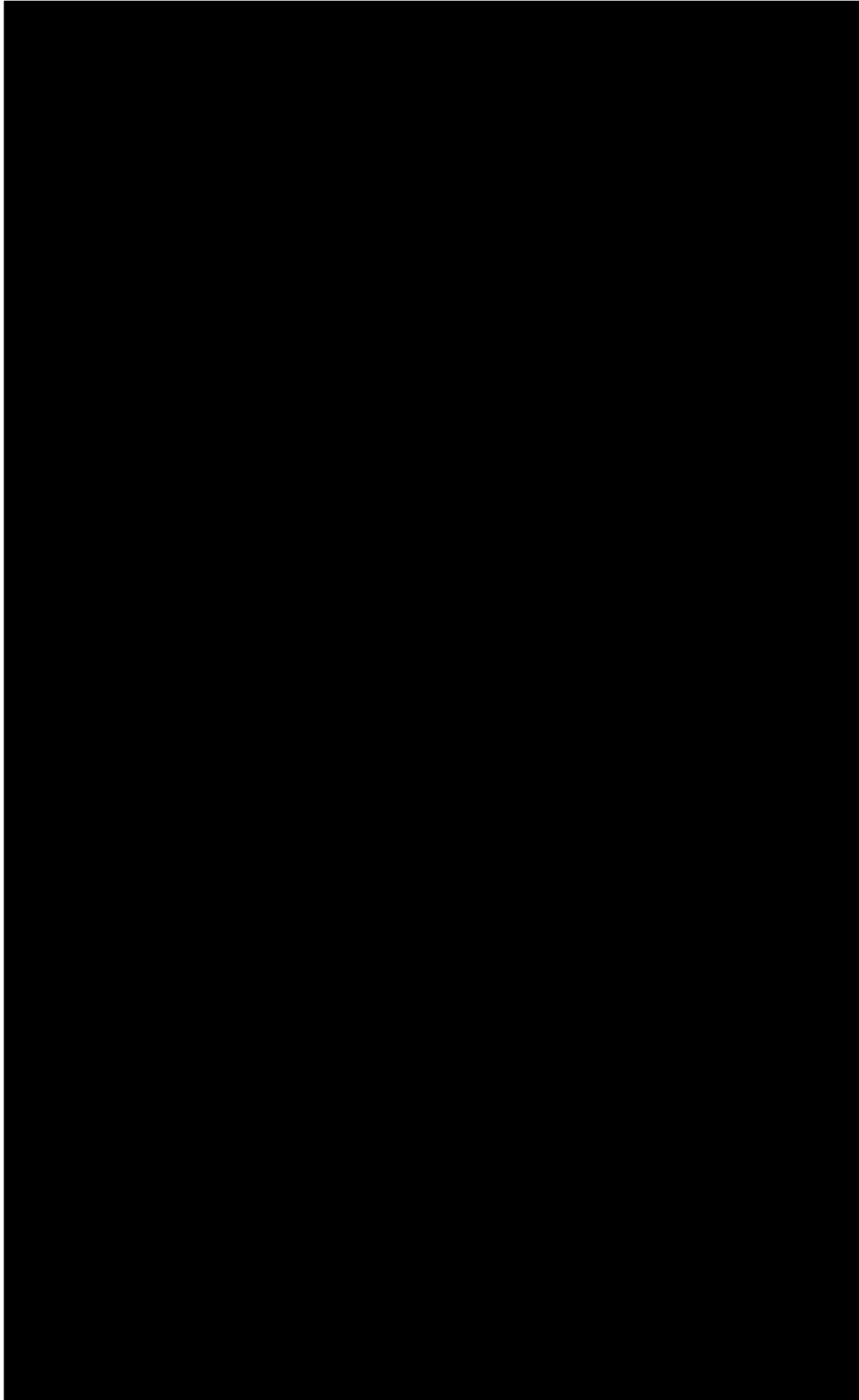


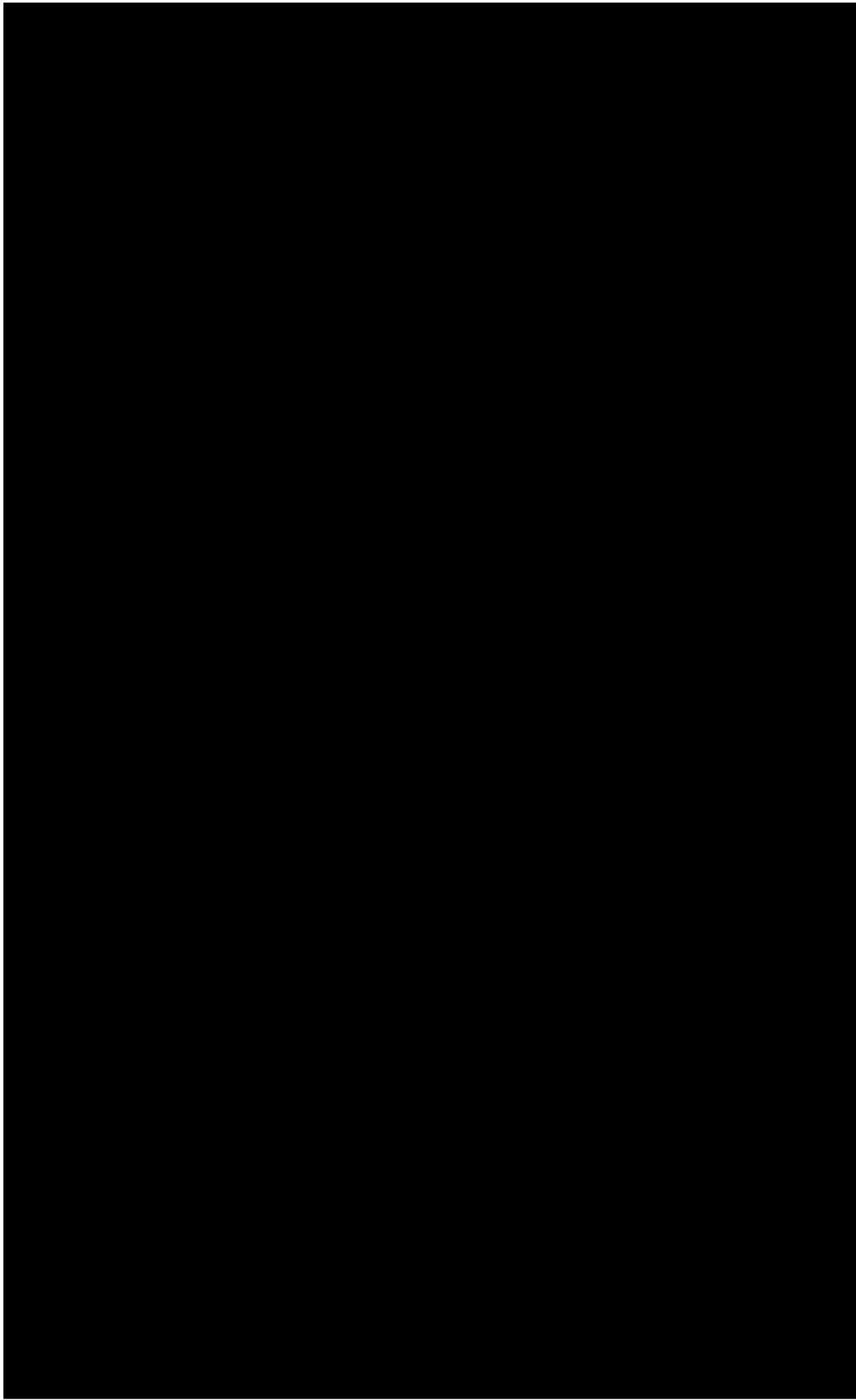


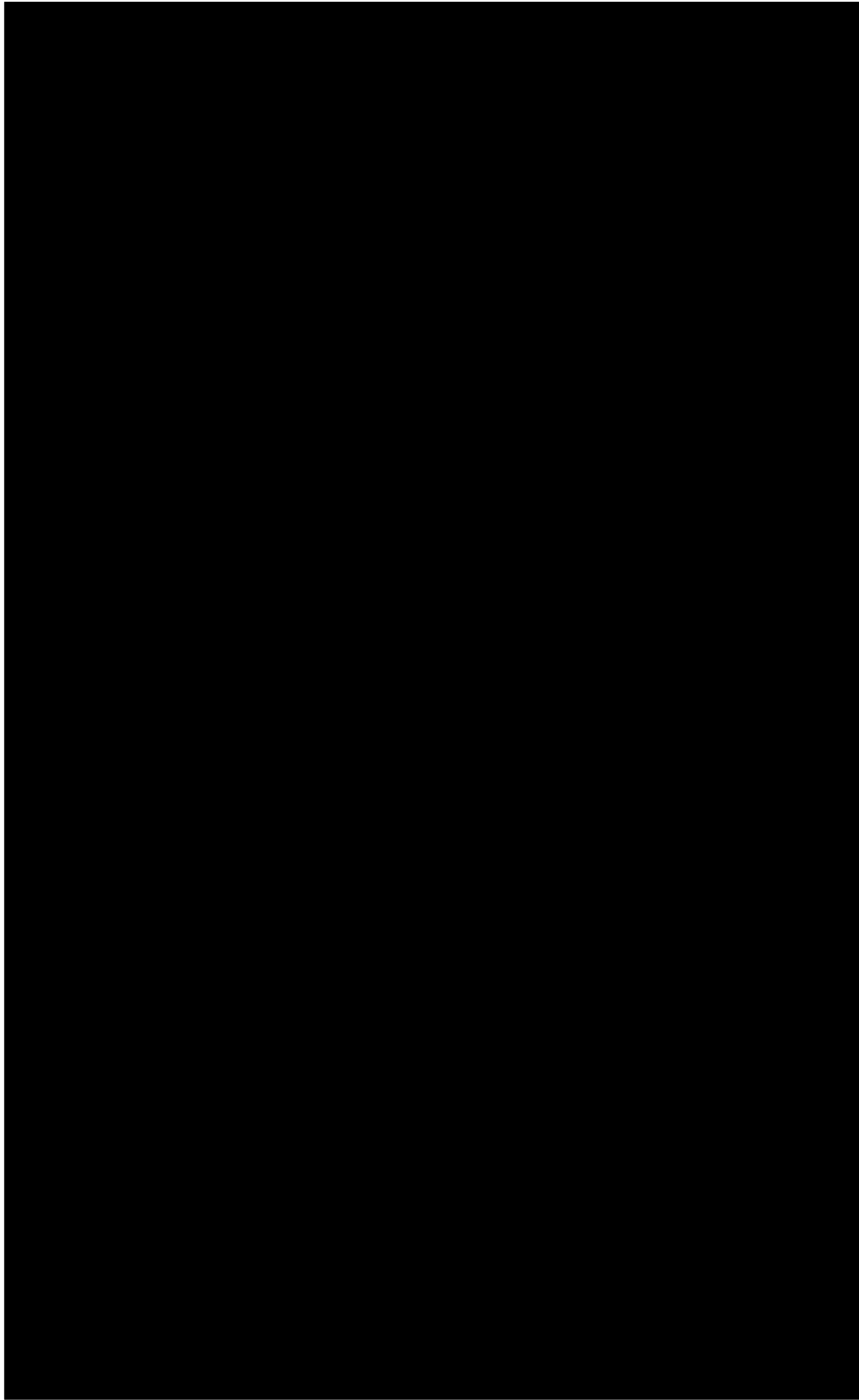


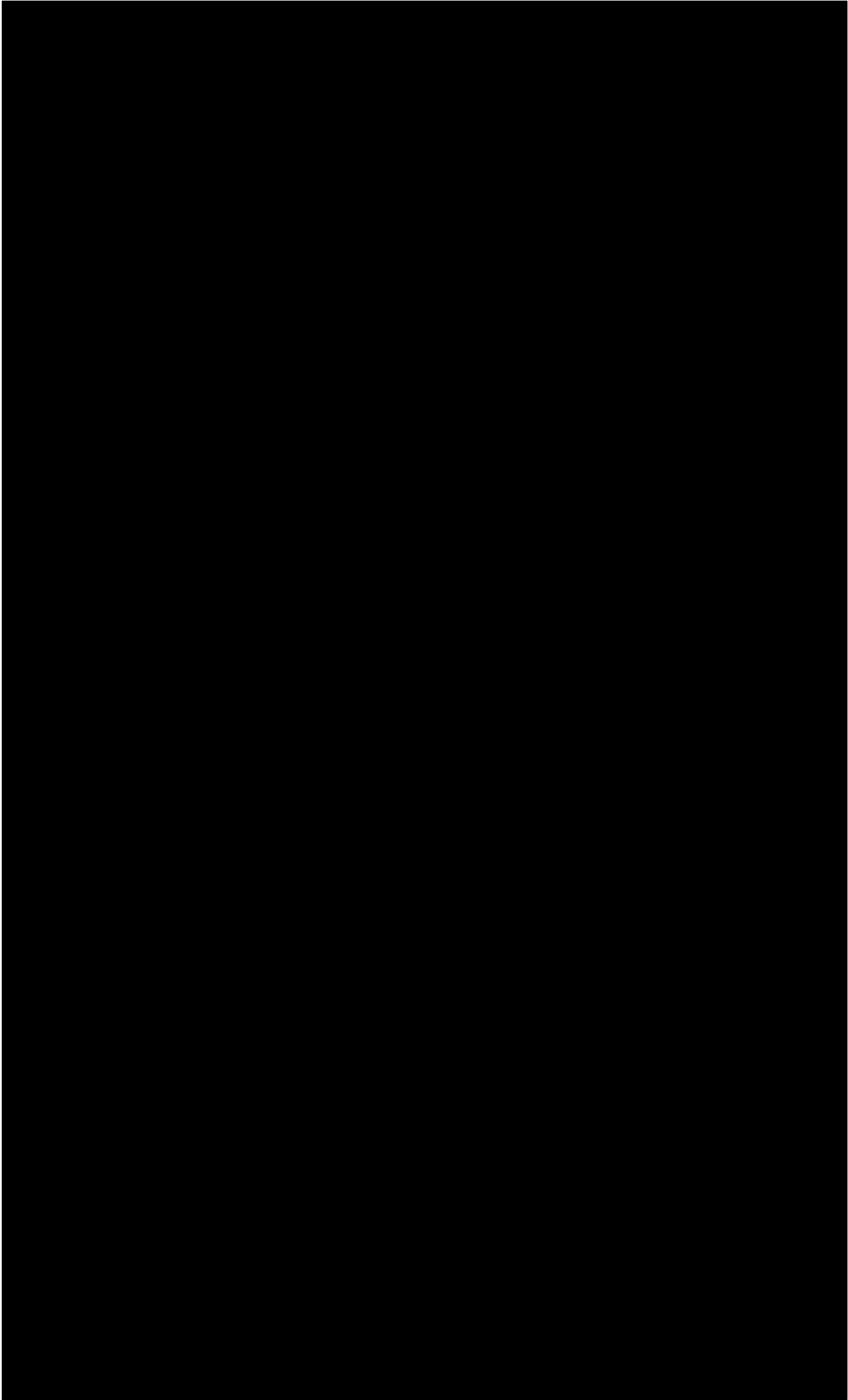


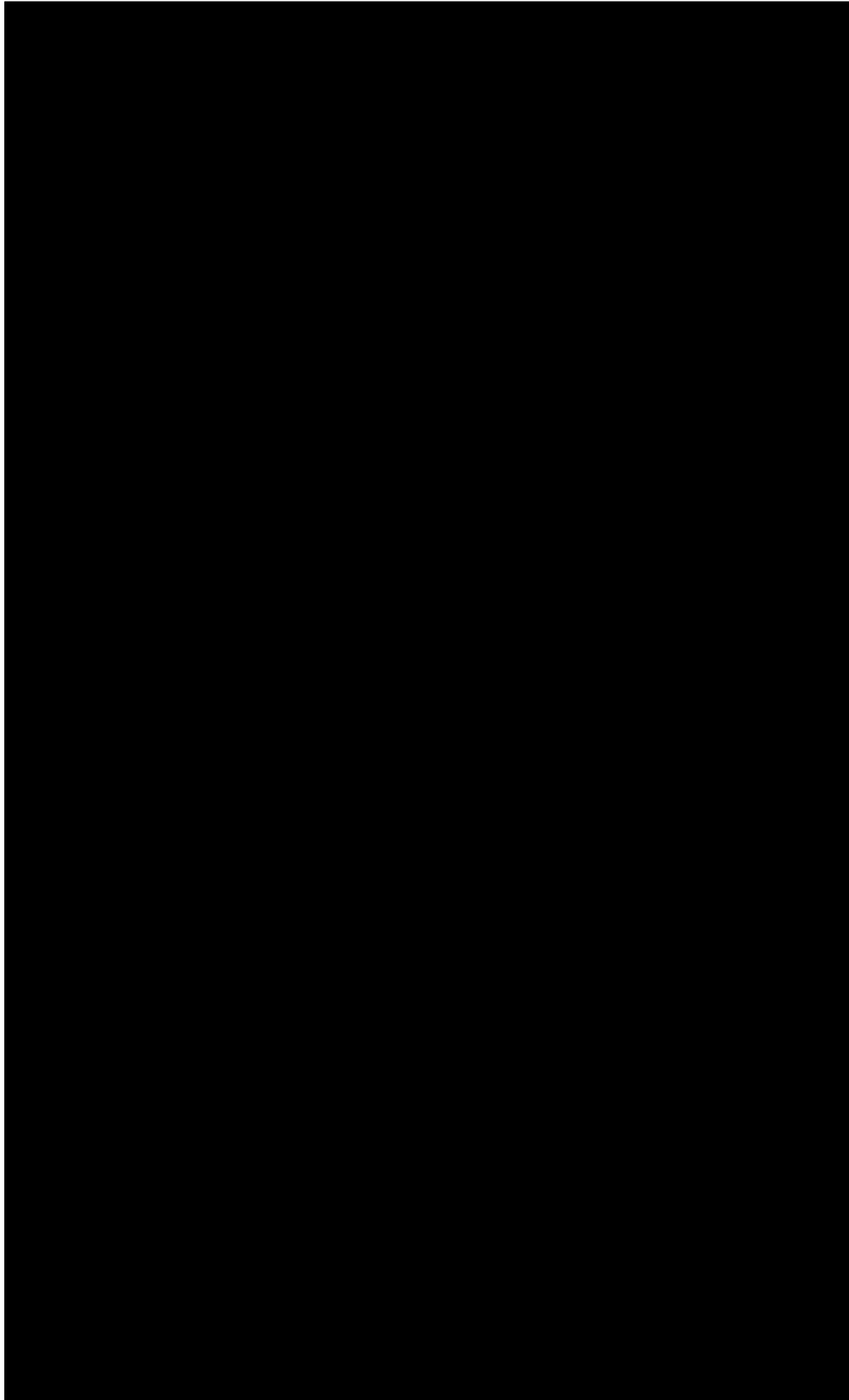


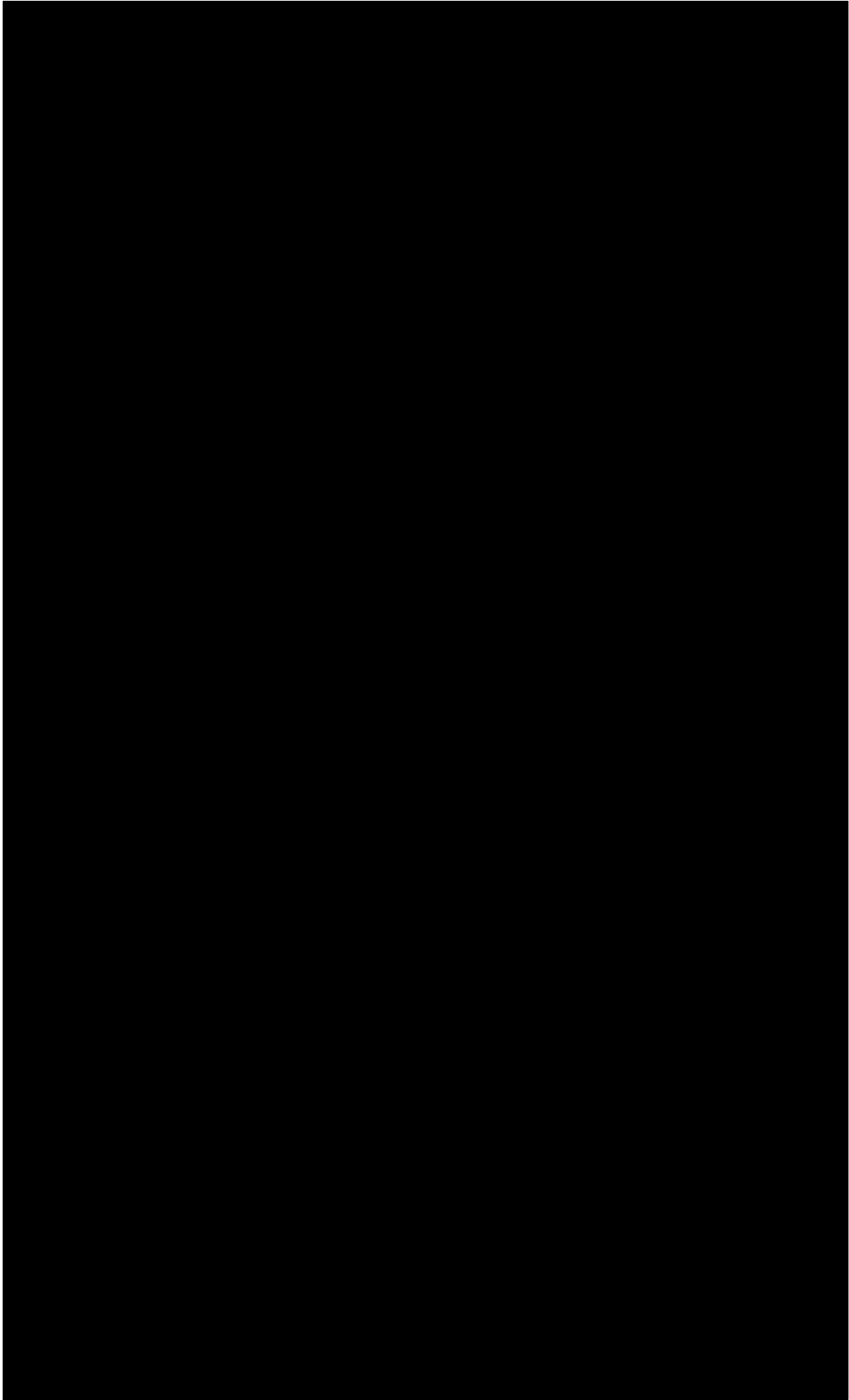


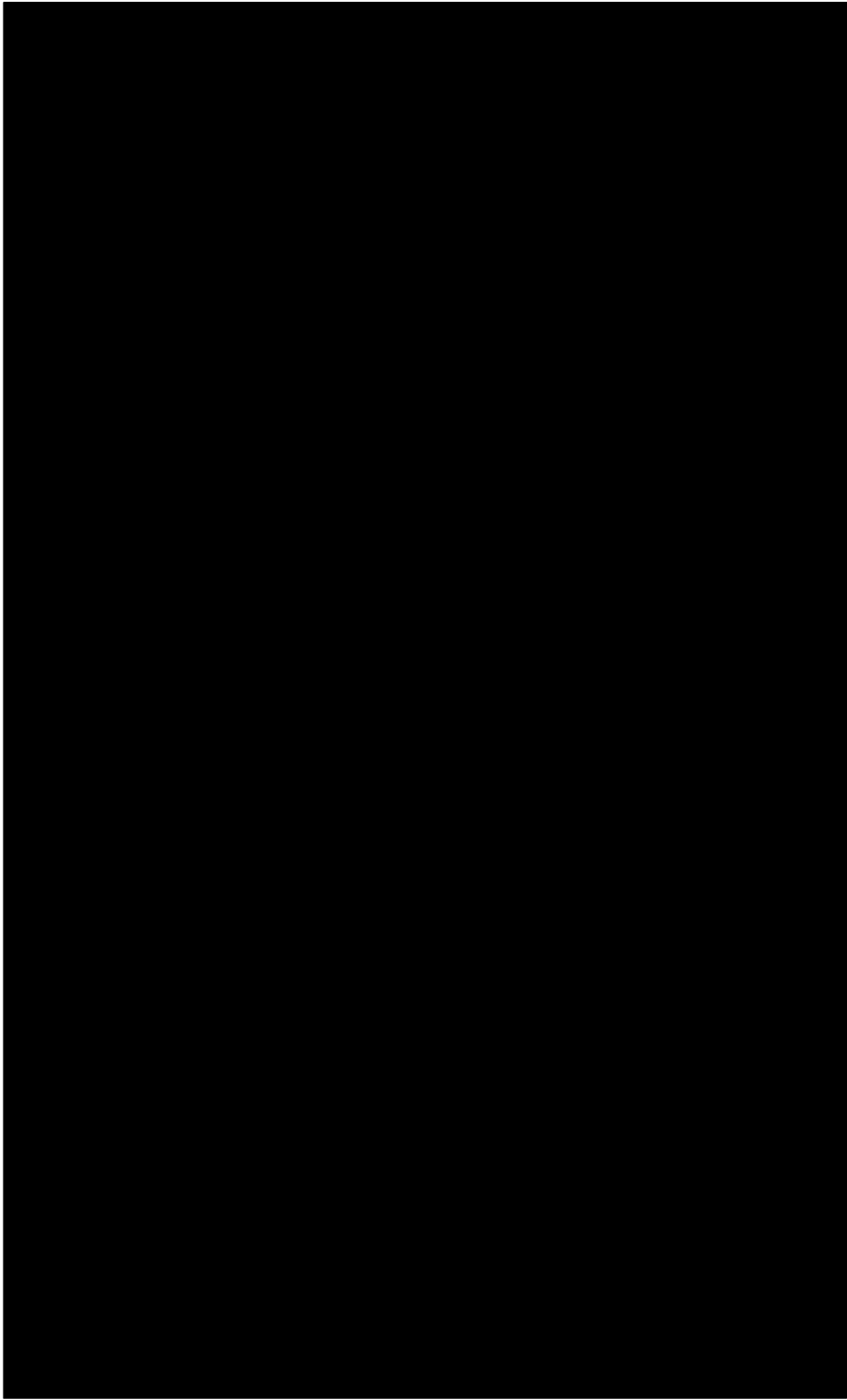


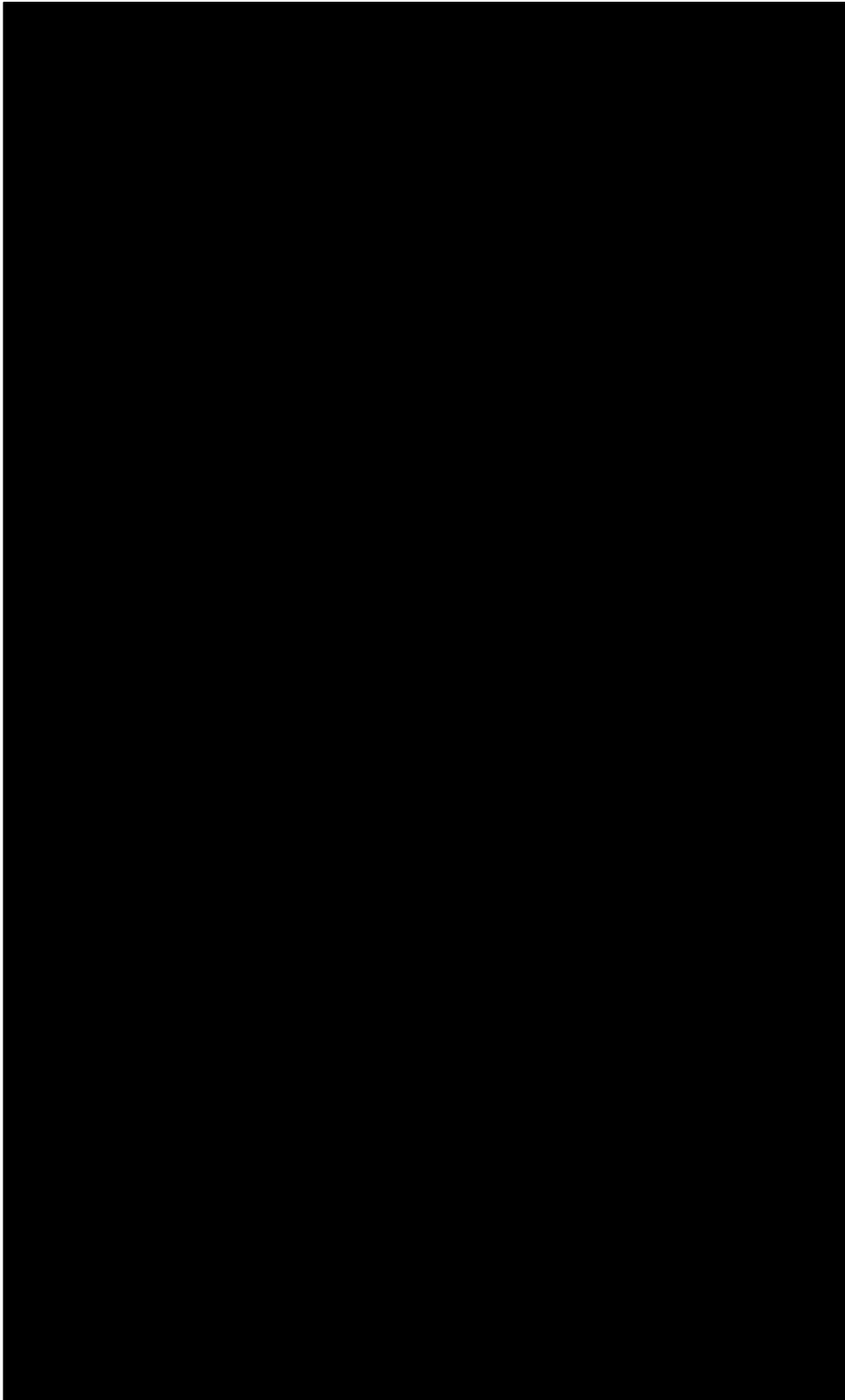


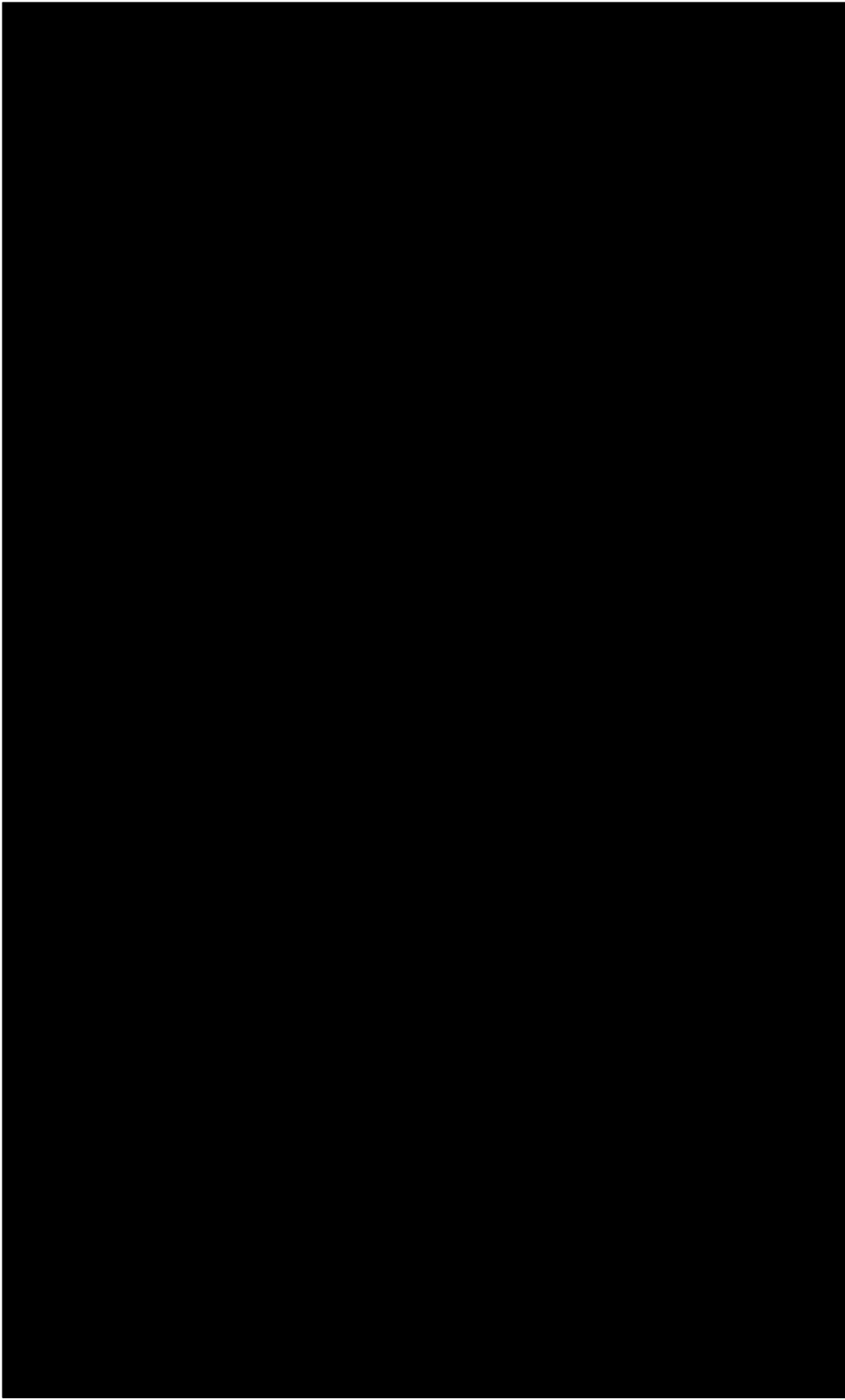


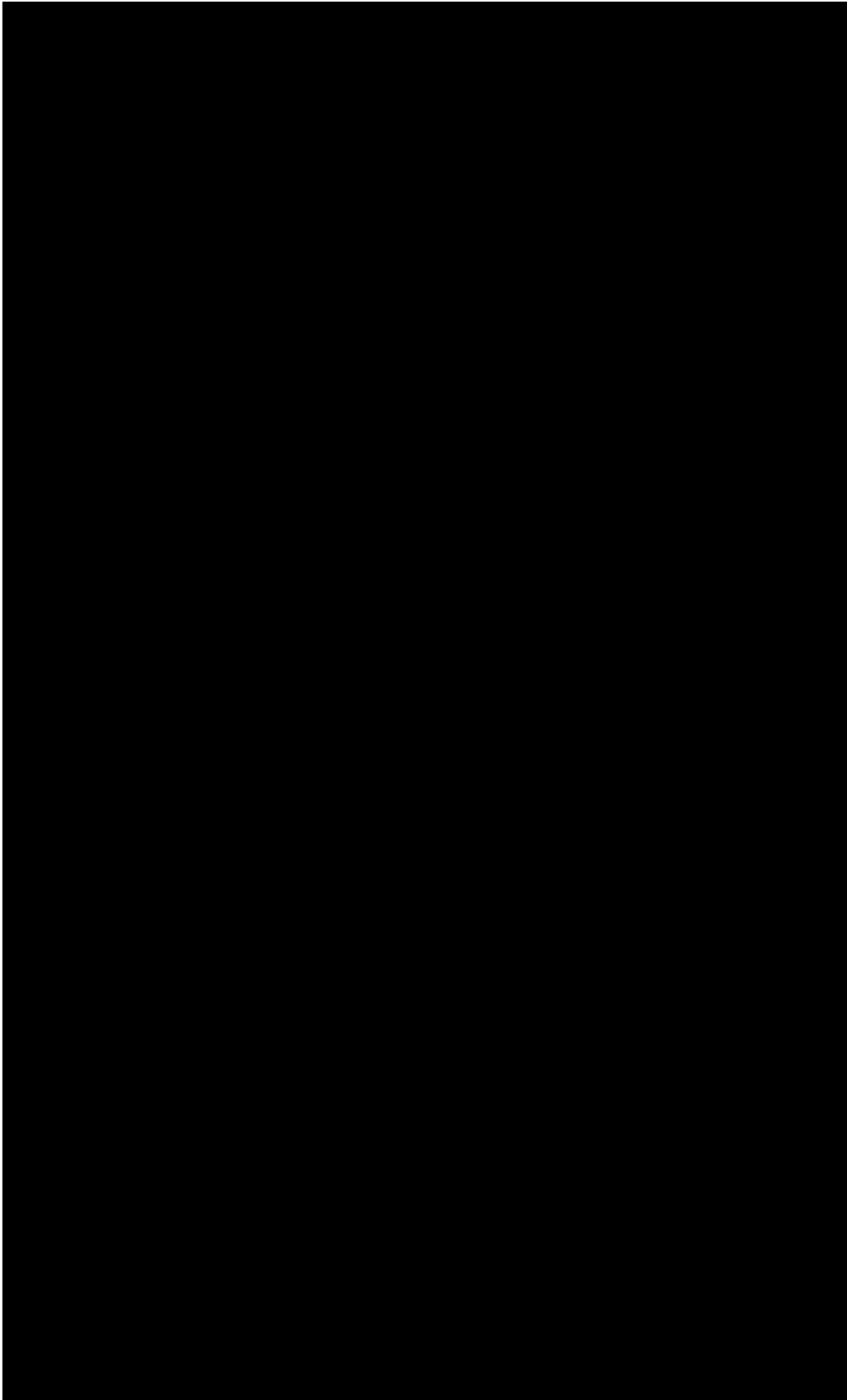


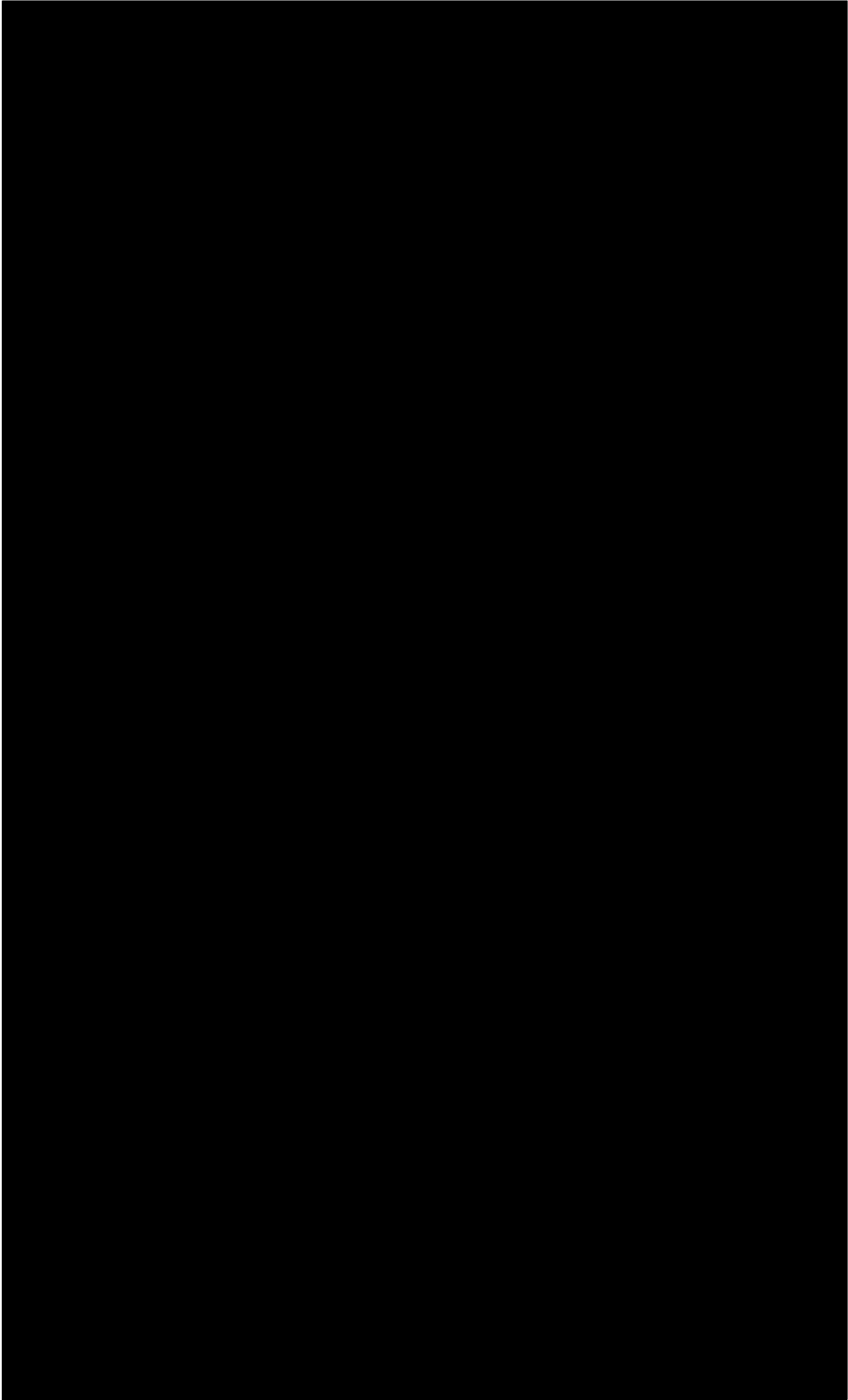


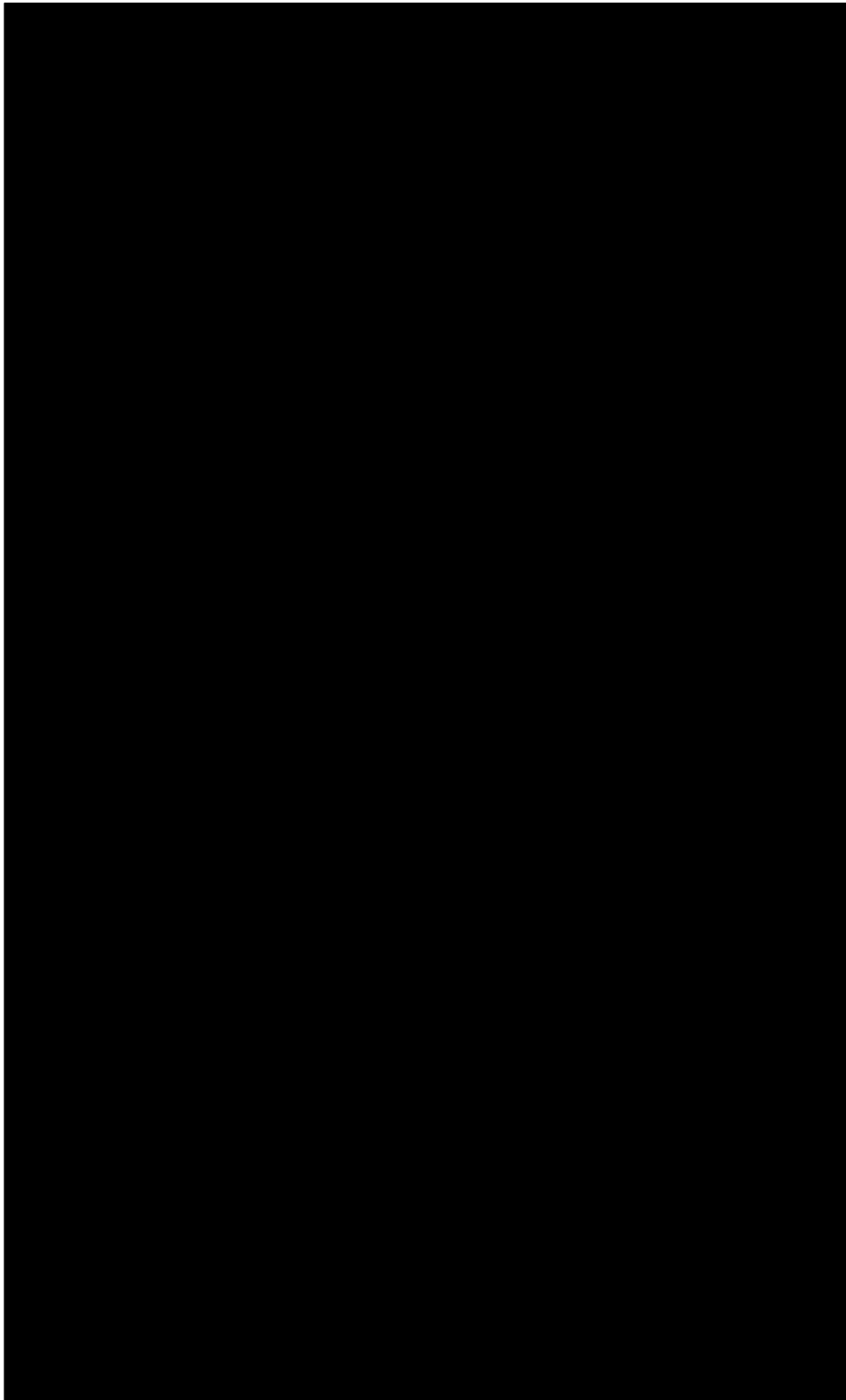




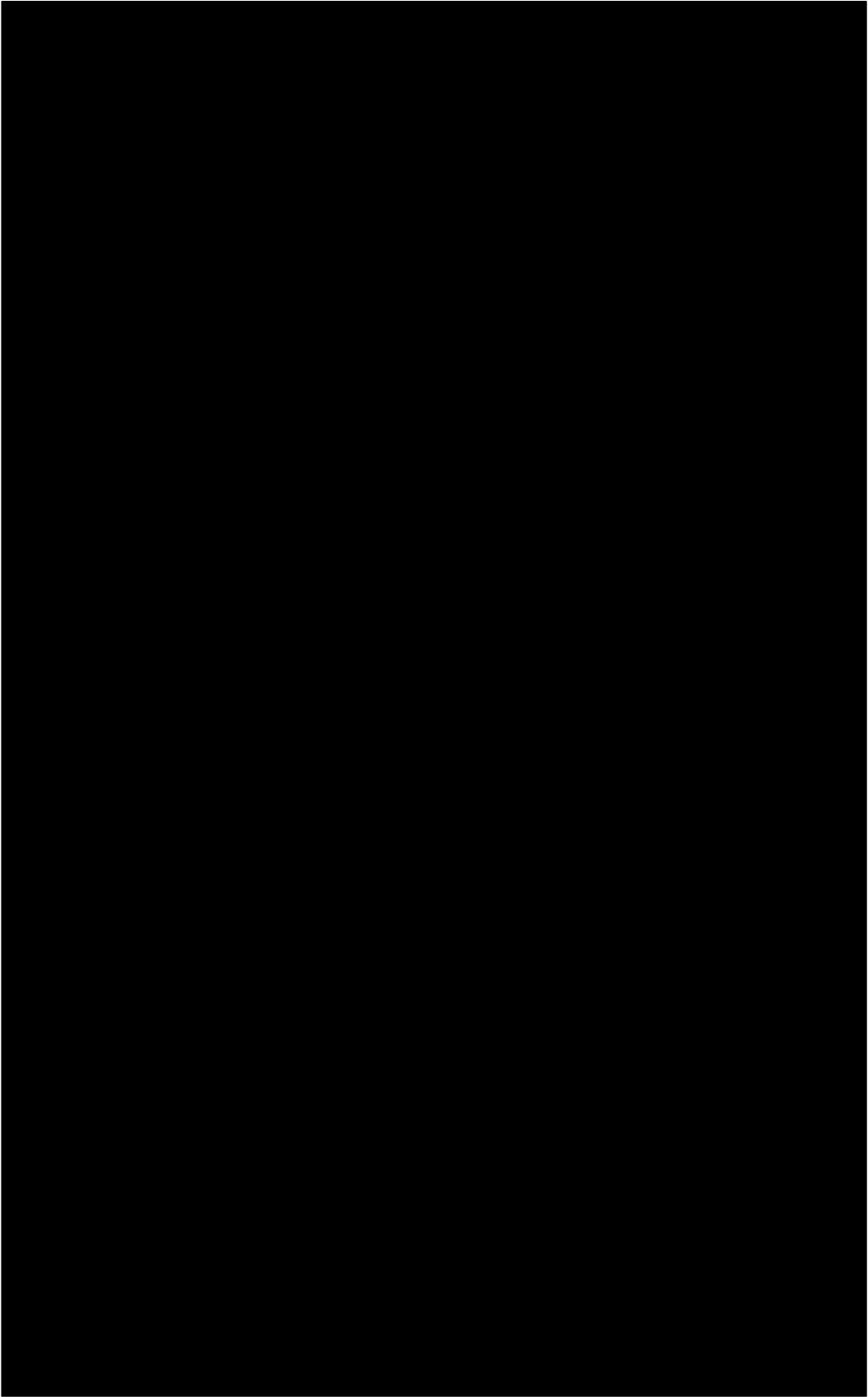


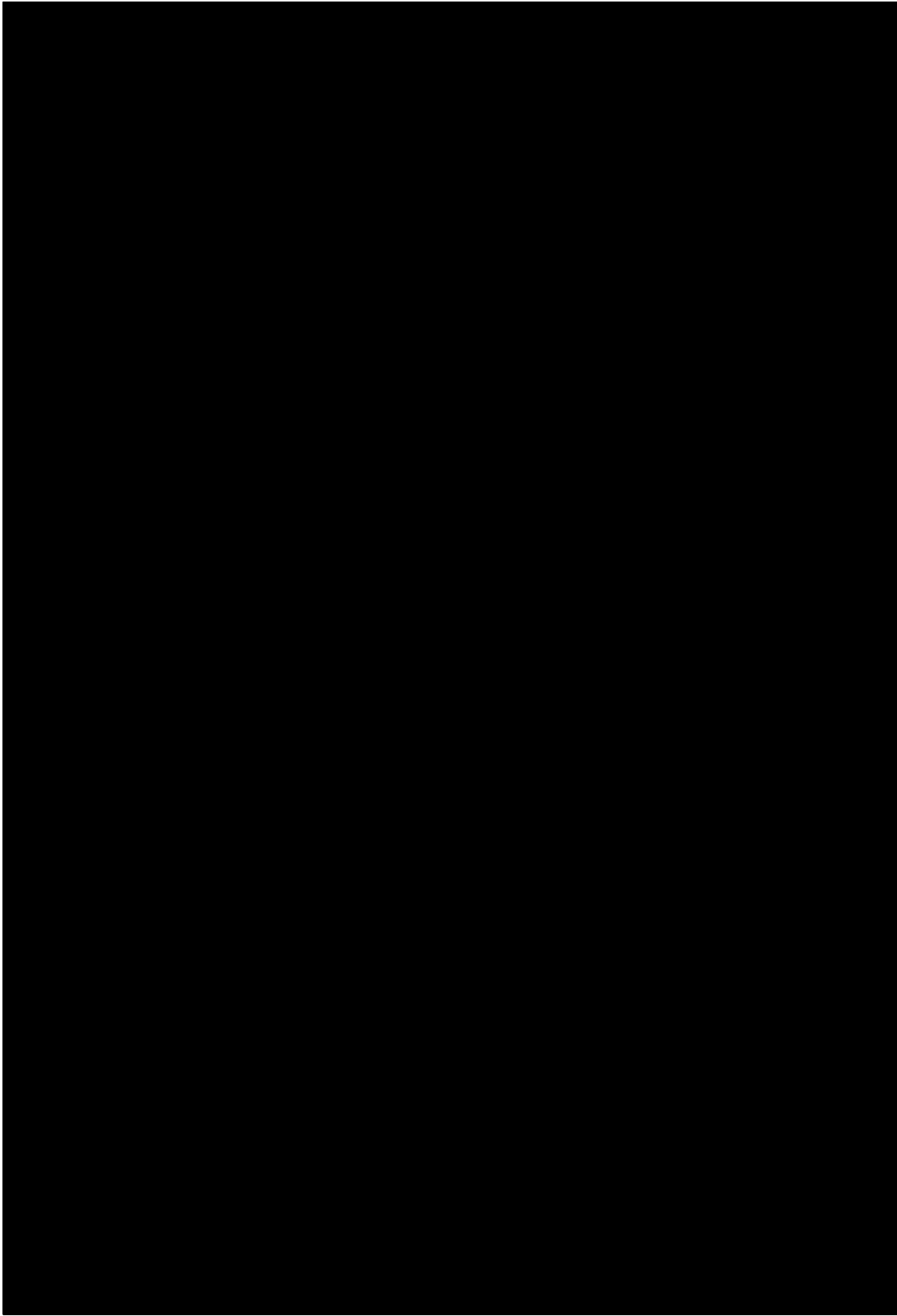


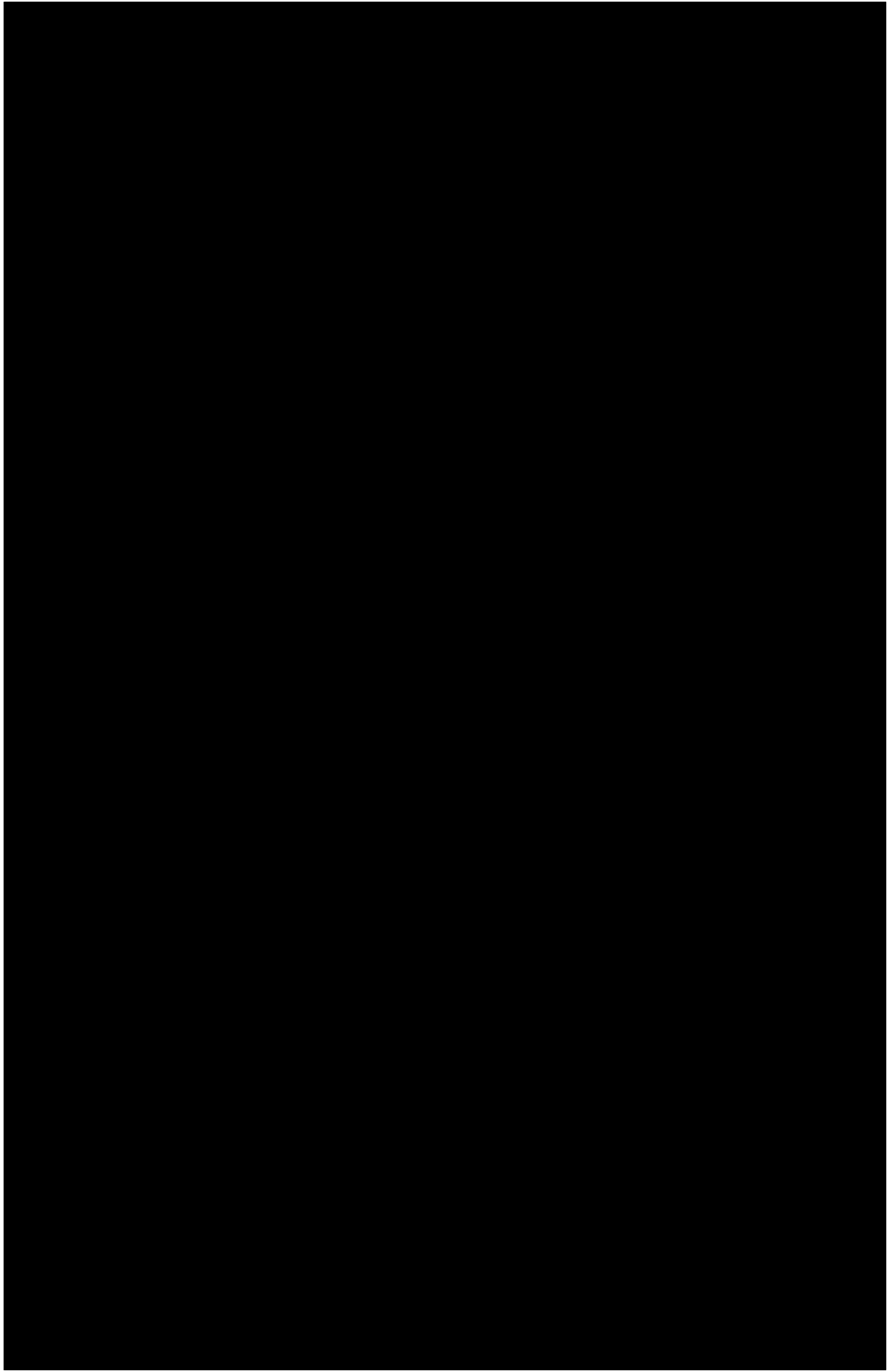




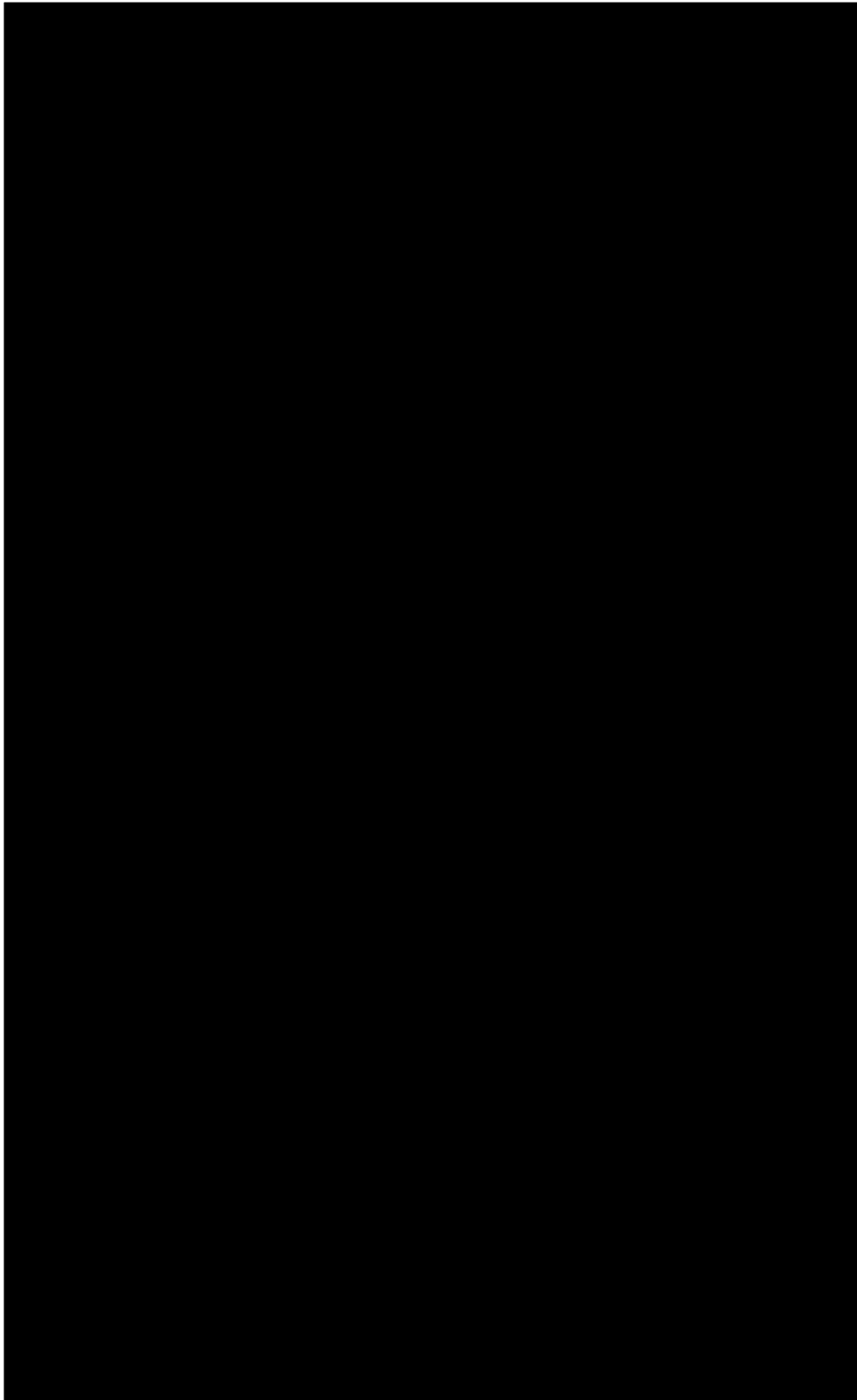
Attachment 24
Shallow Water Flow Contingency

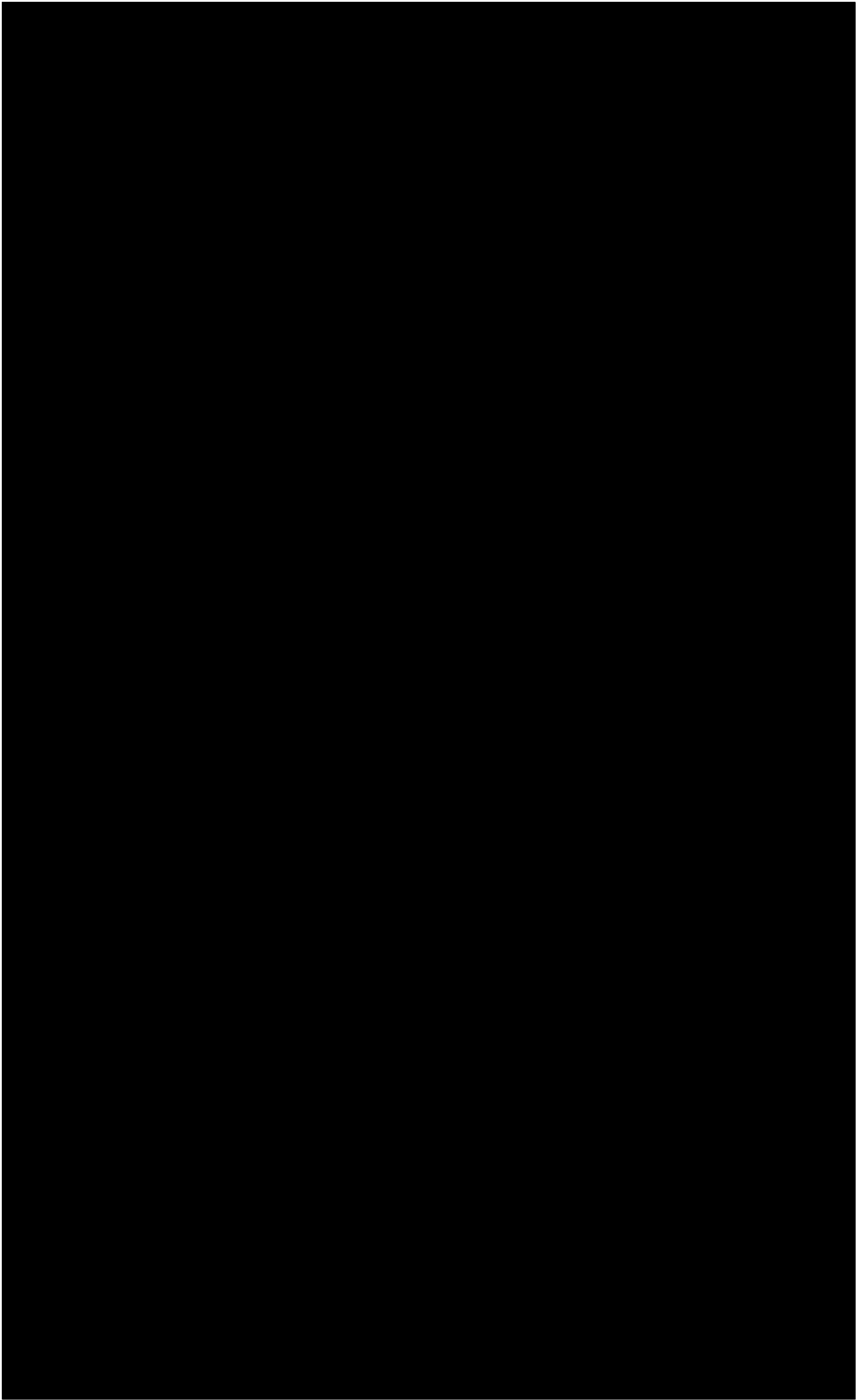


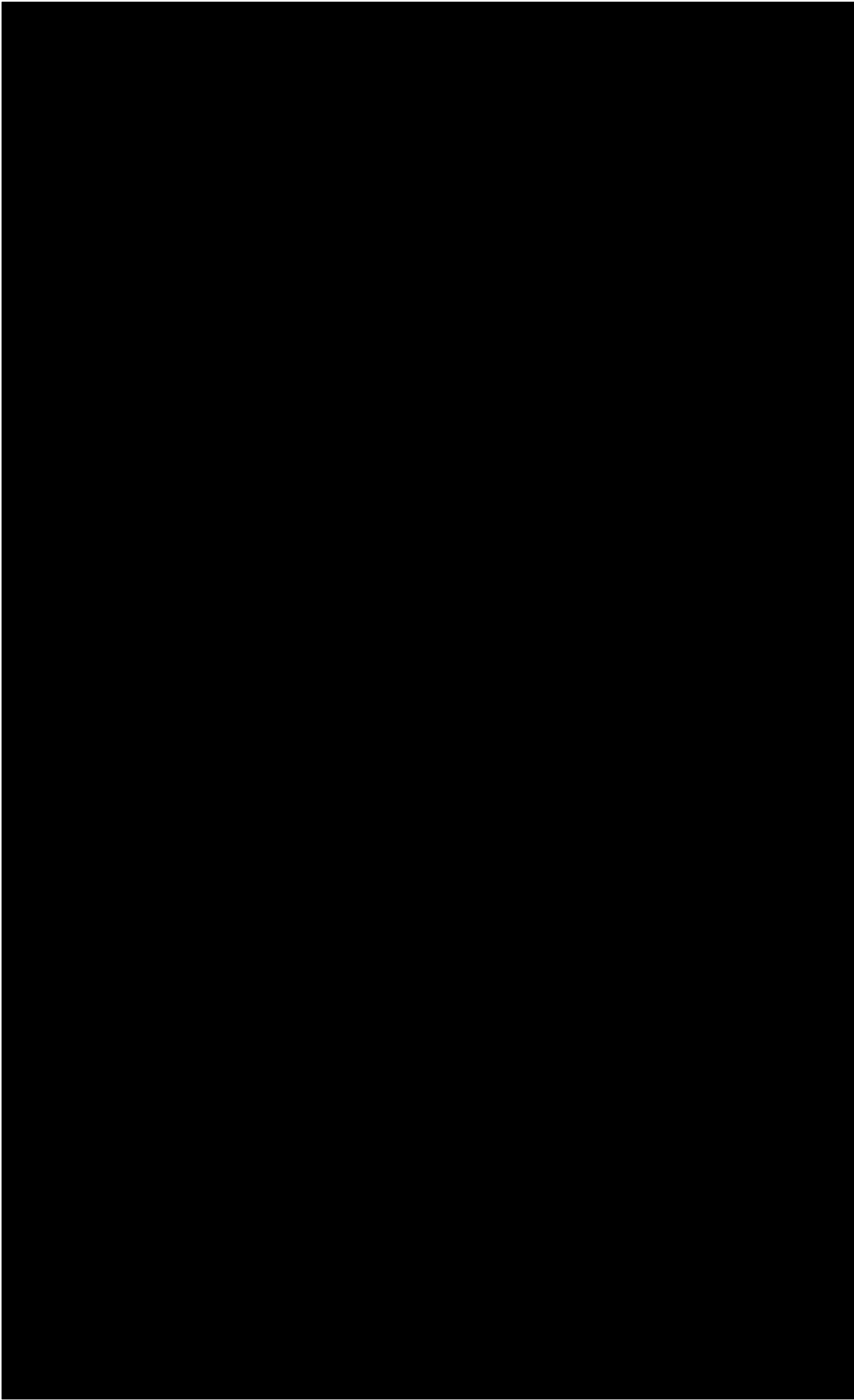


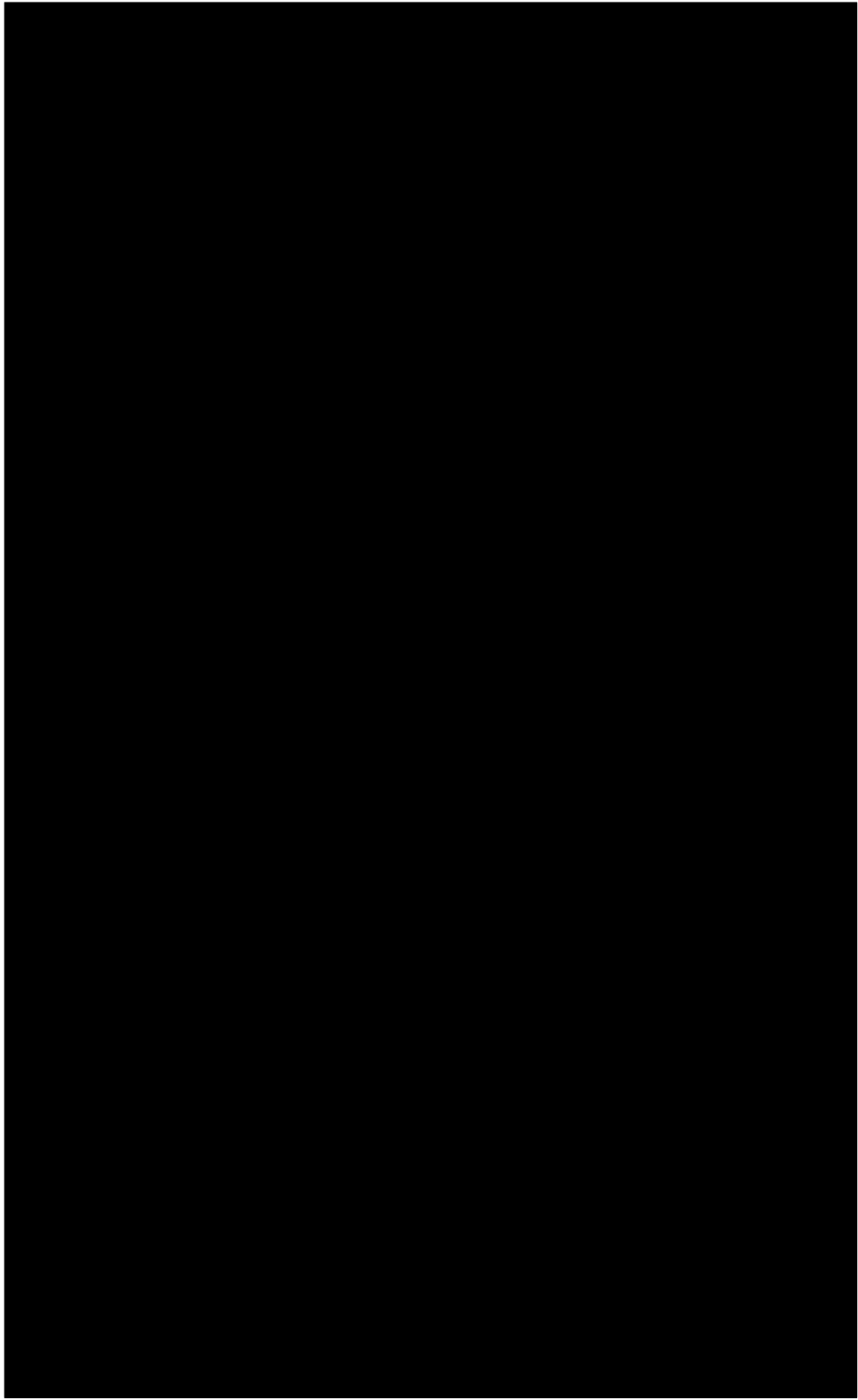


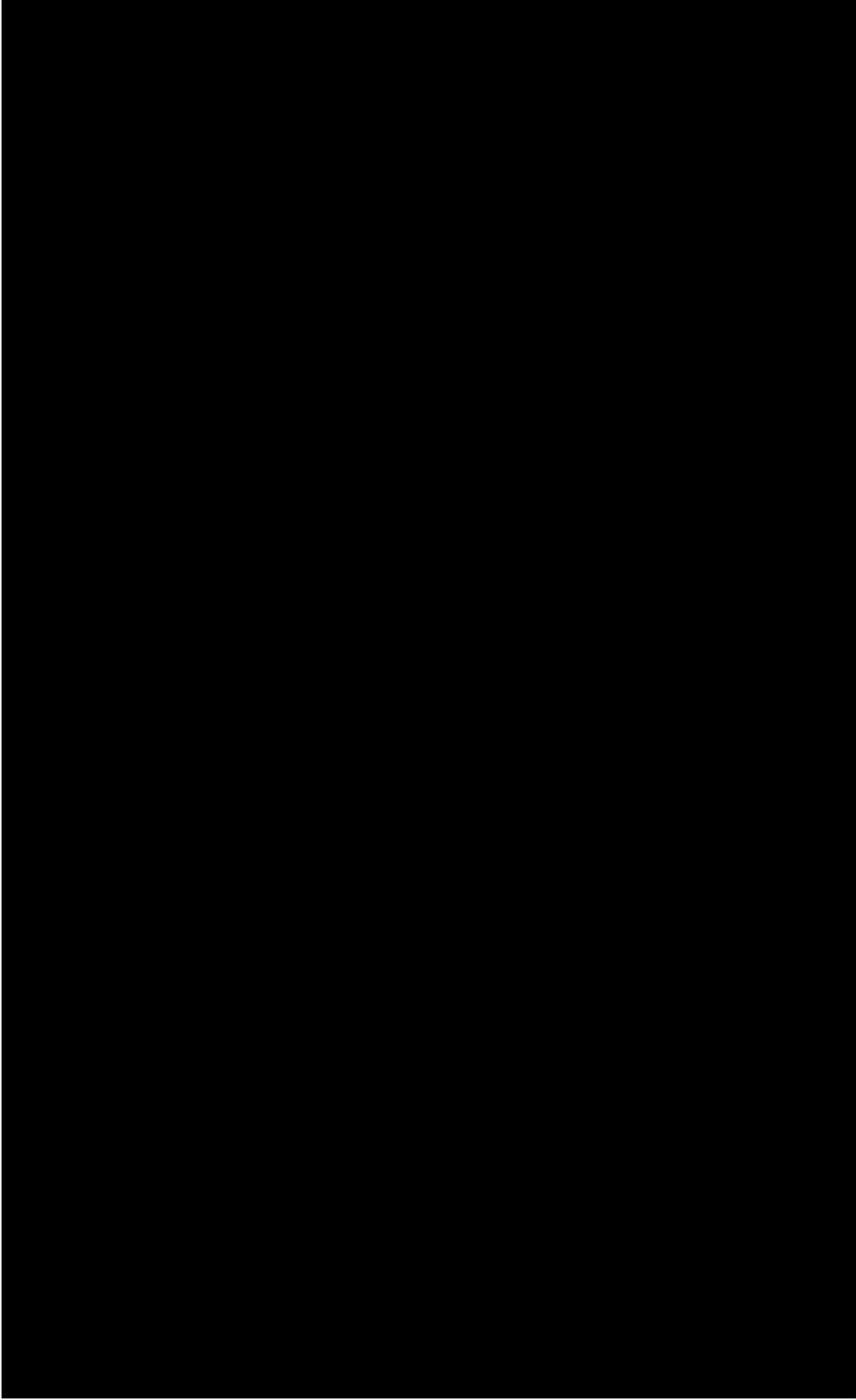
Attachment 25
Atwood Oceanics Well Control Handbook

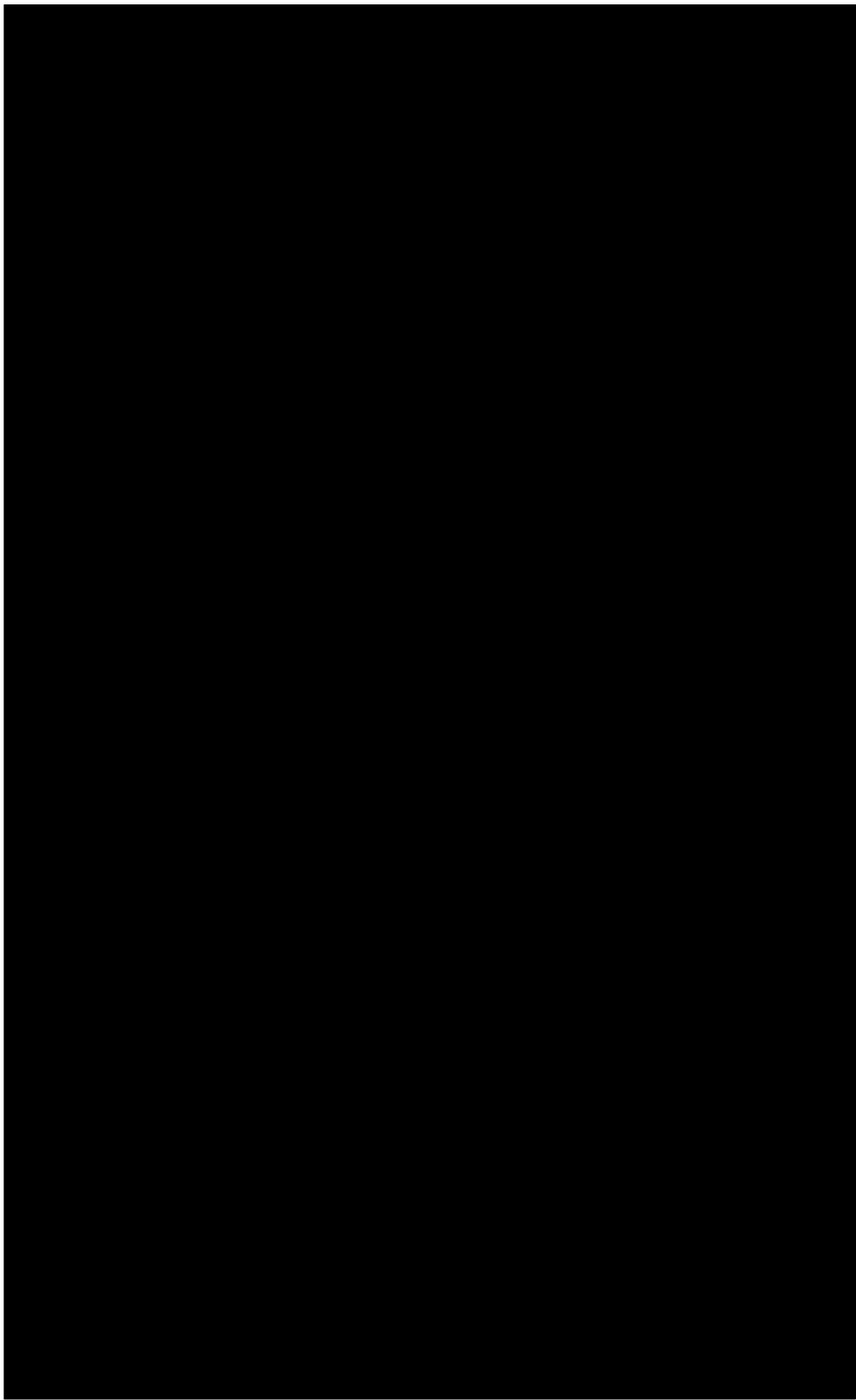


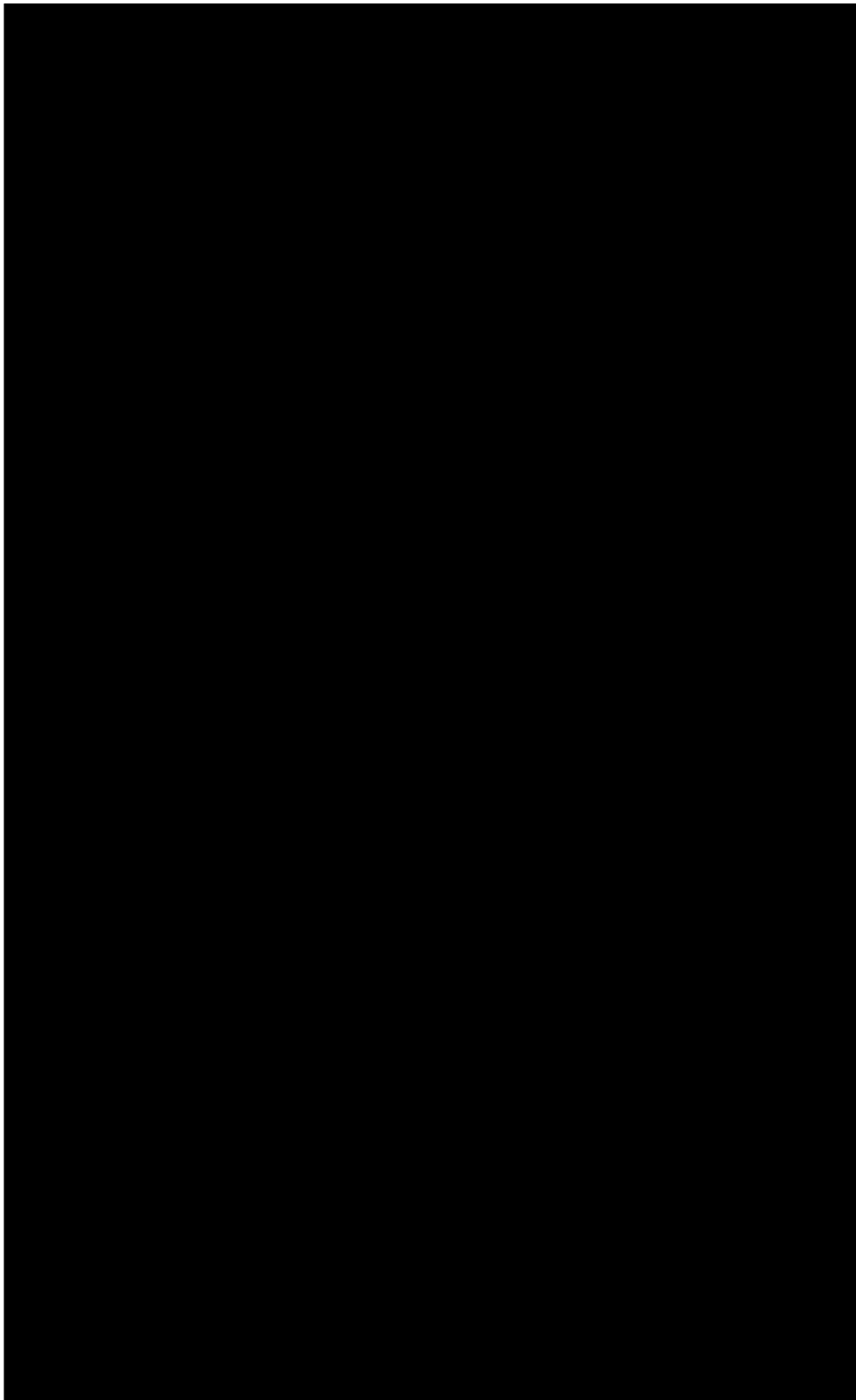


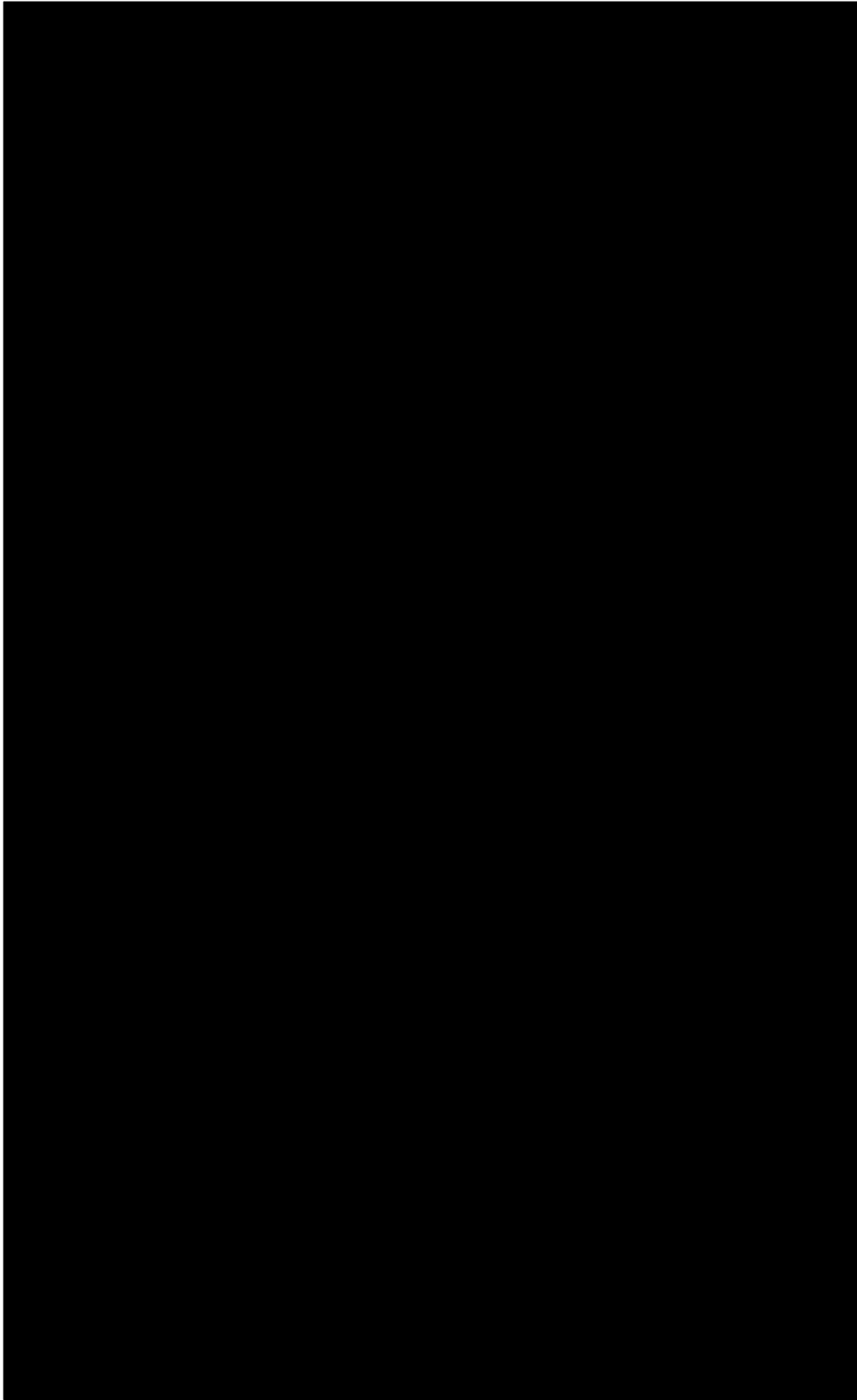


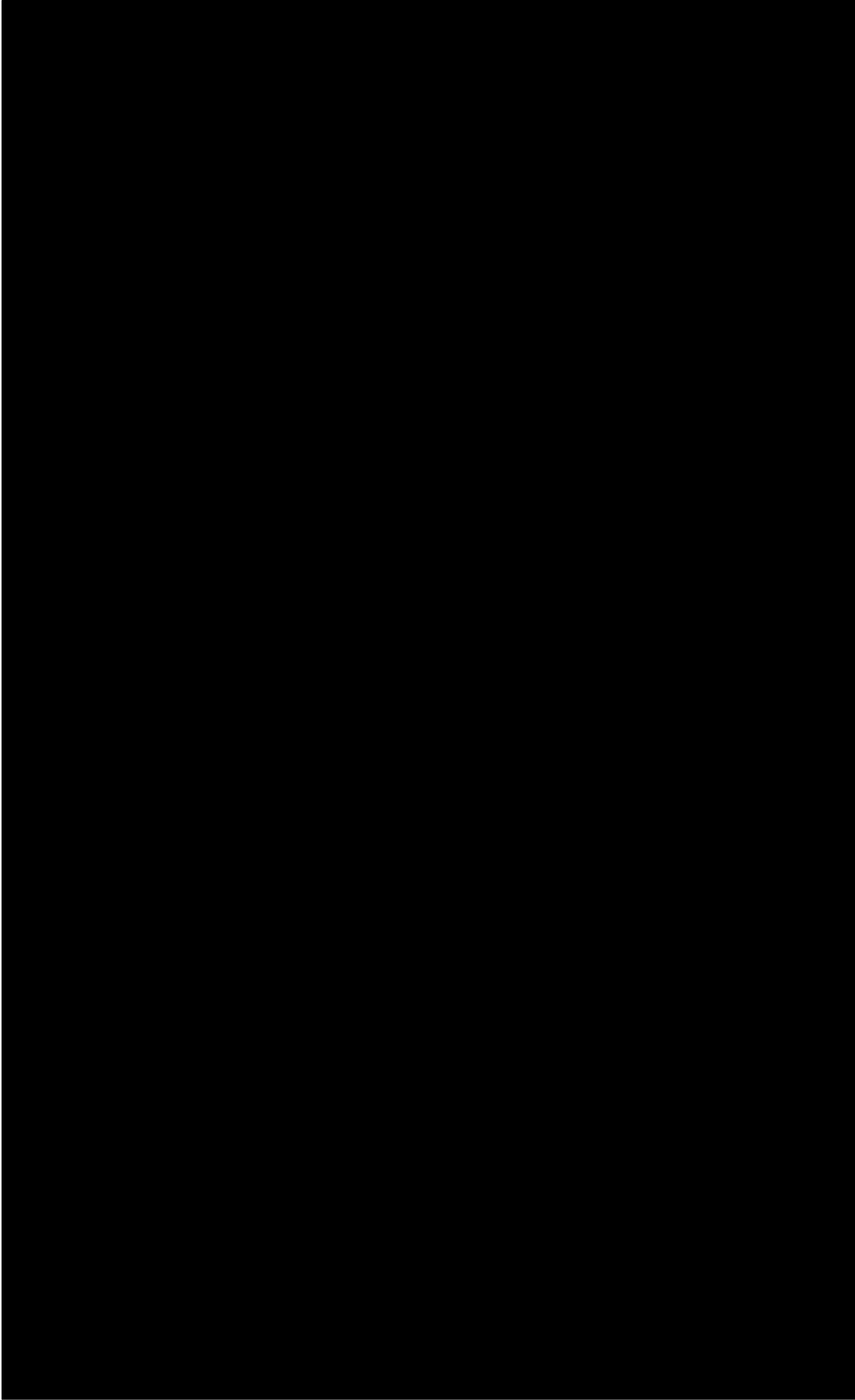


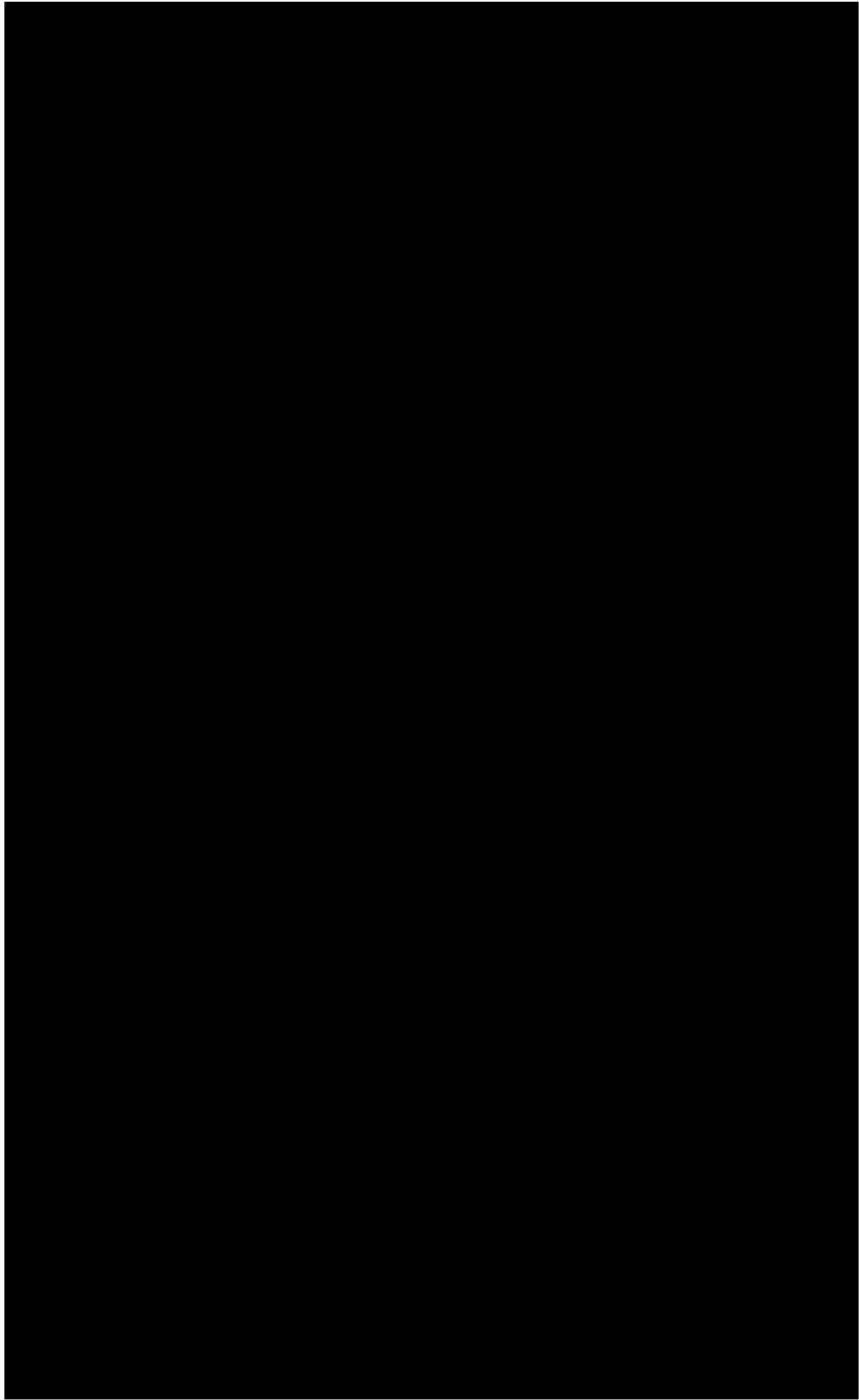


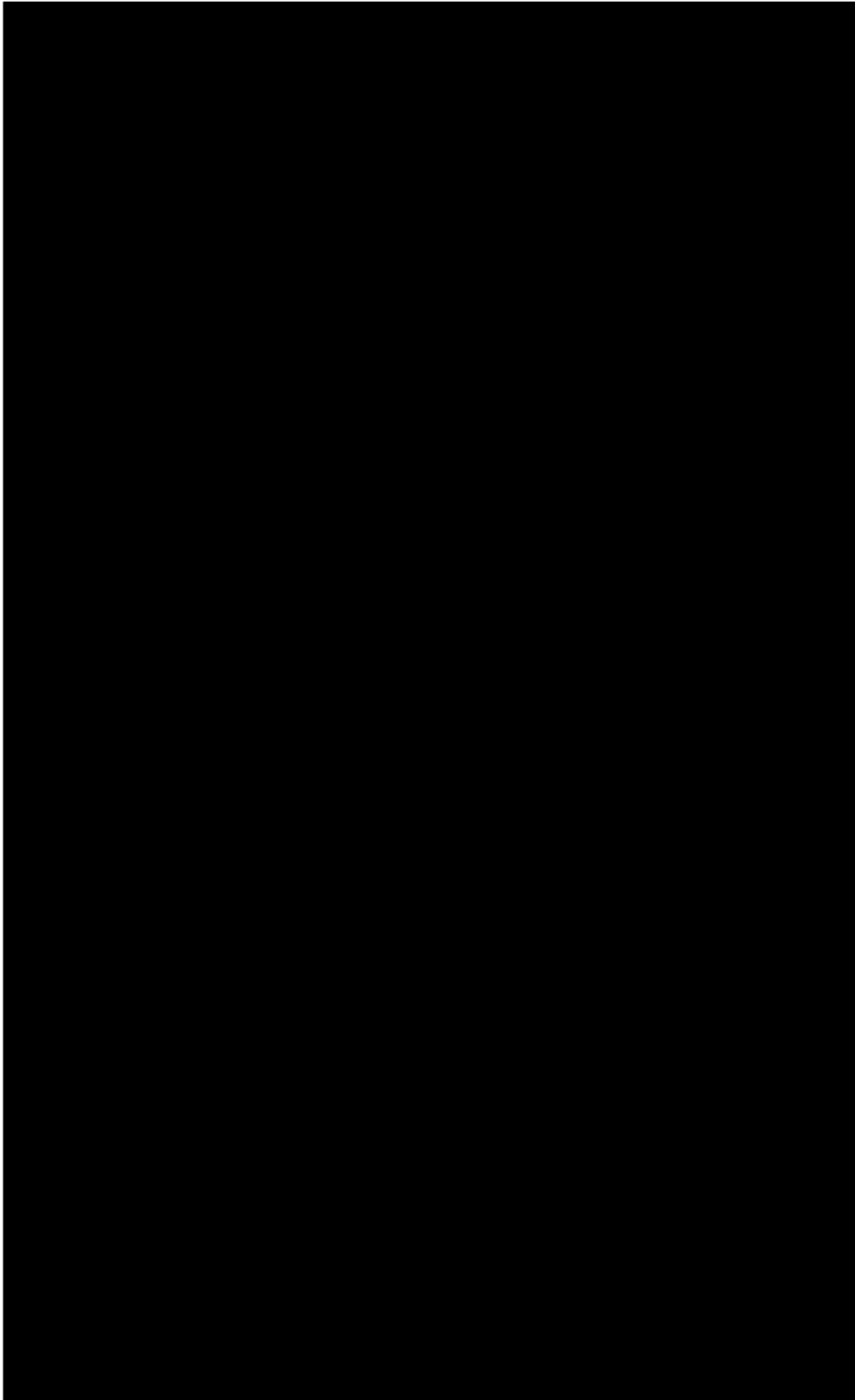


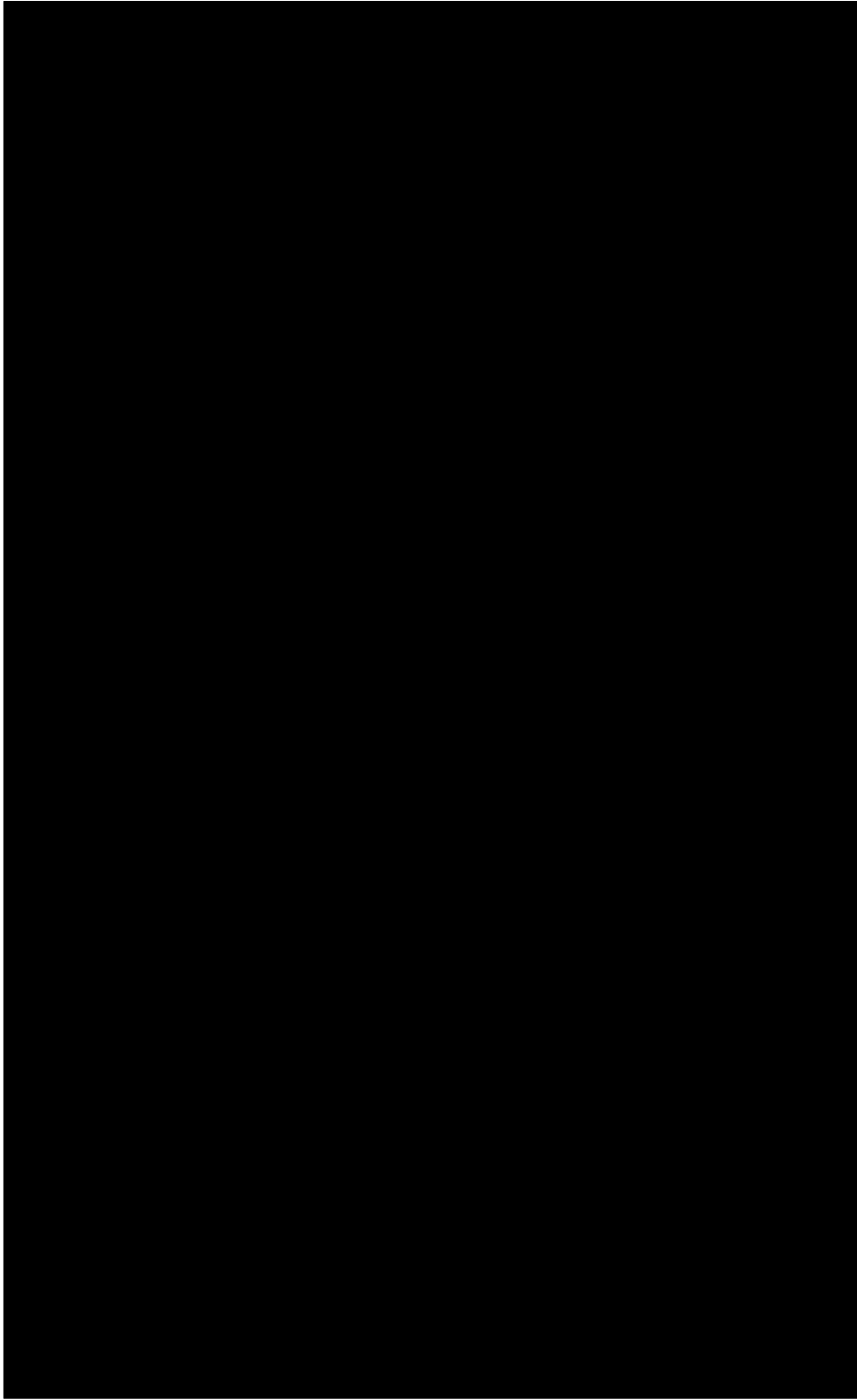


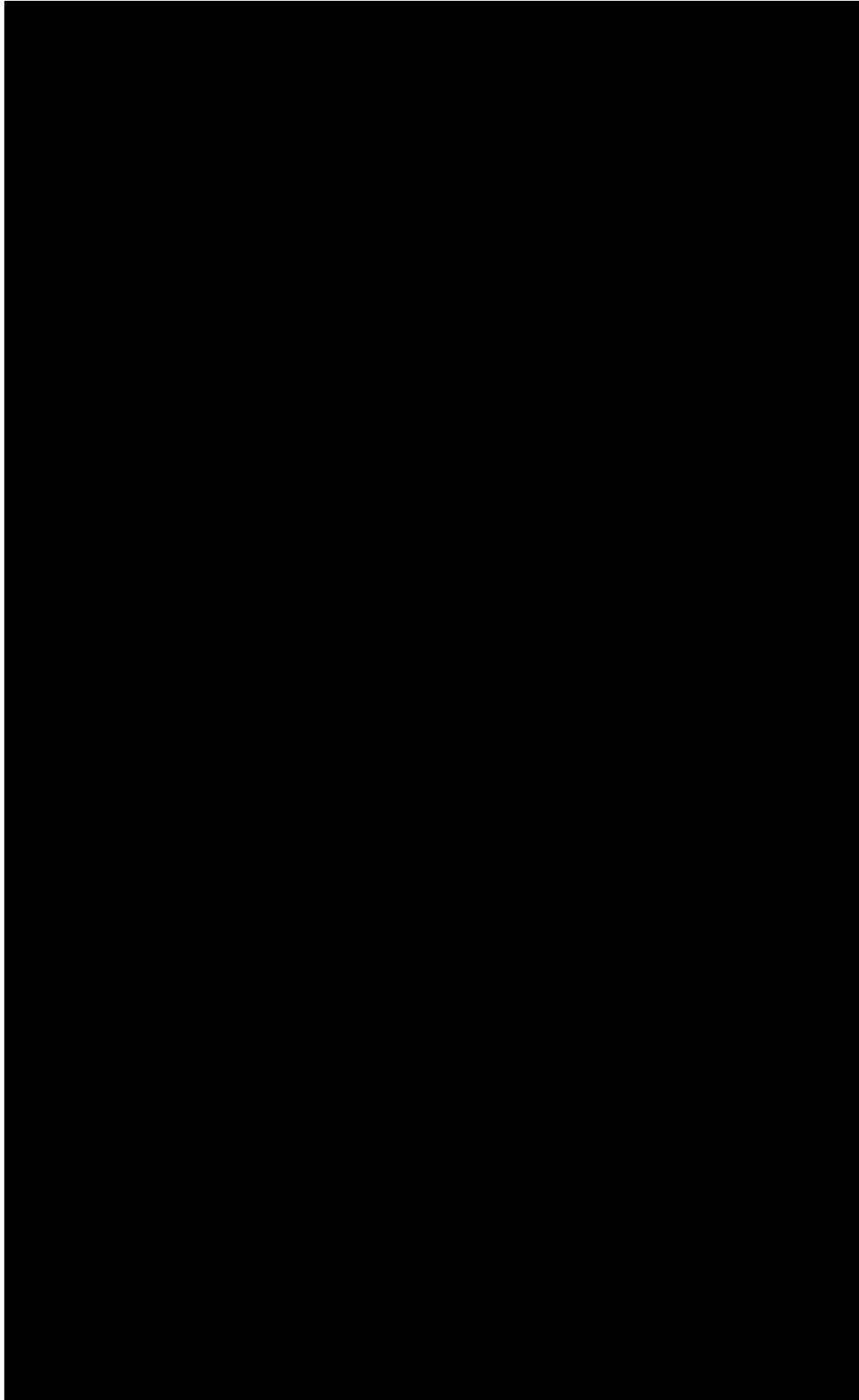


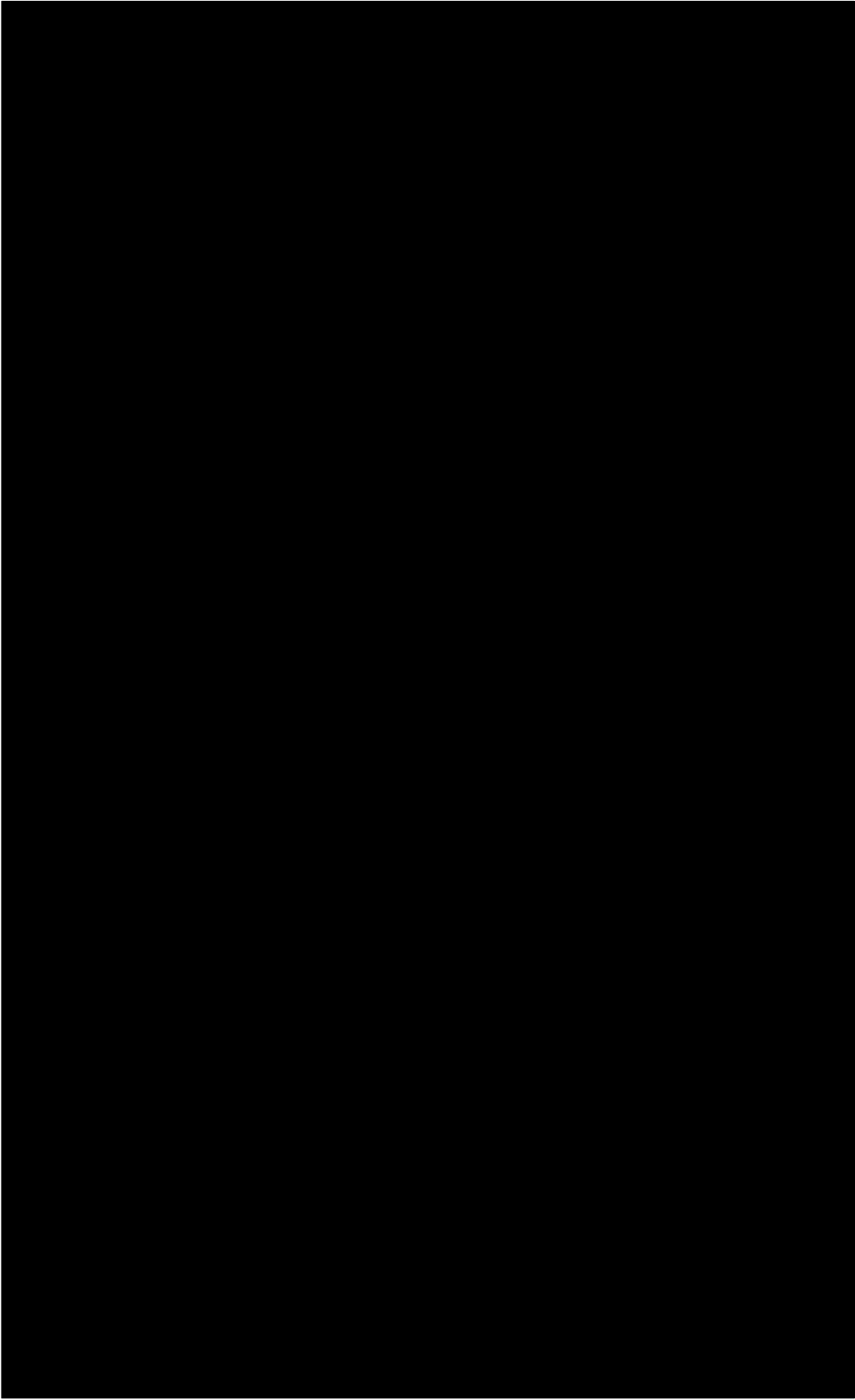


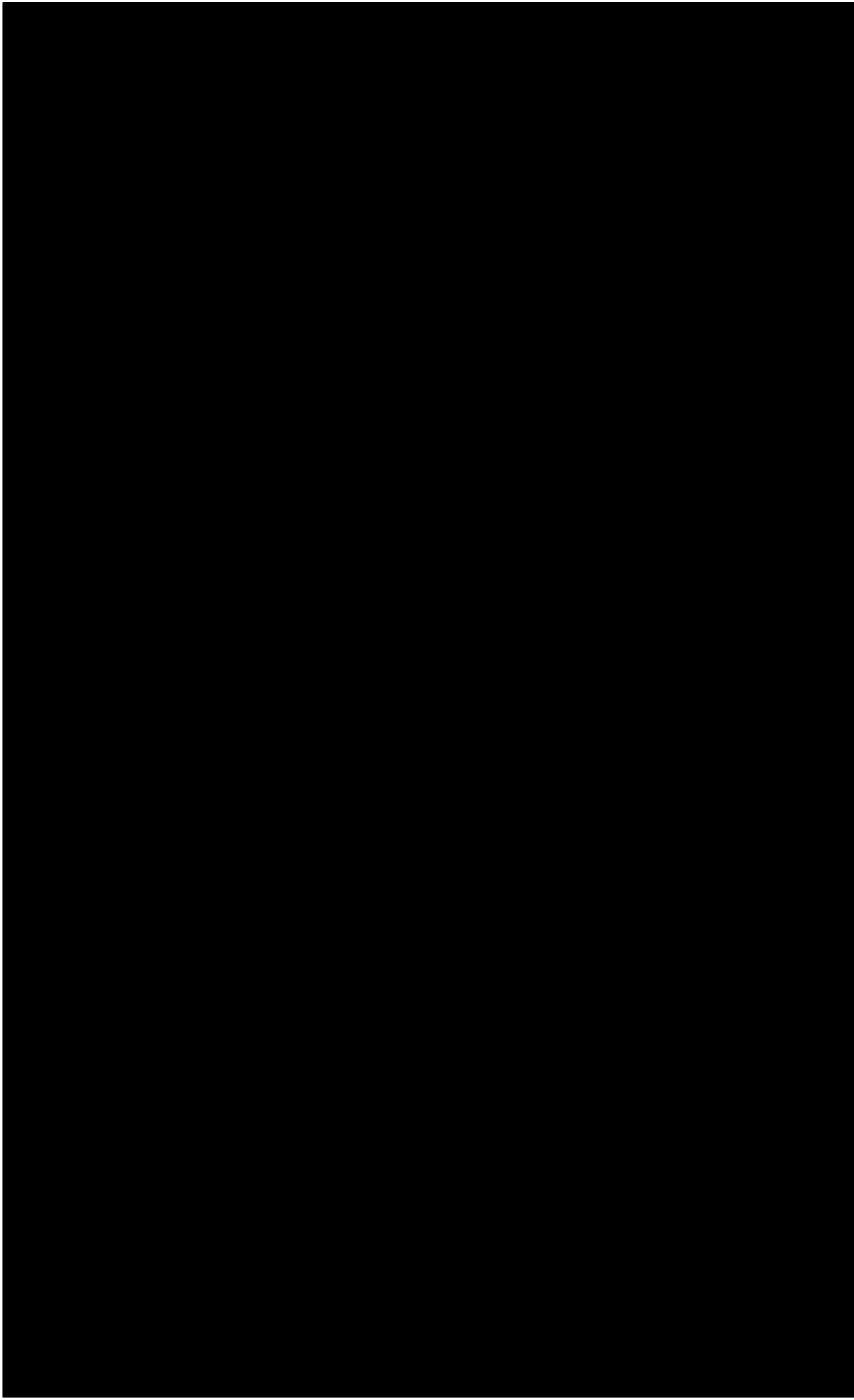


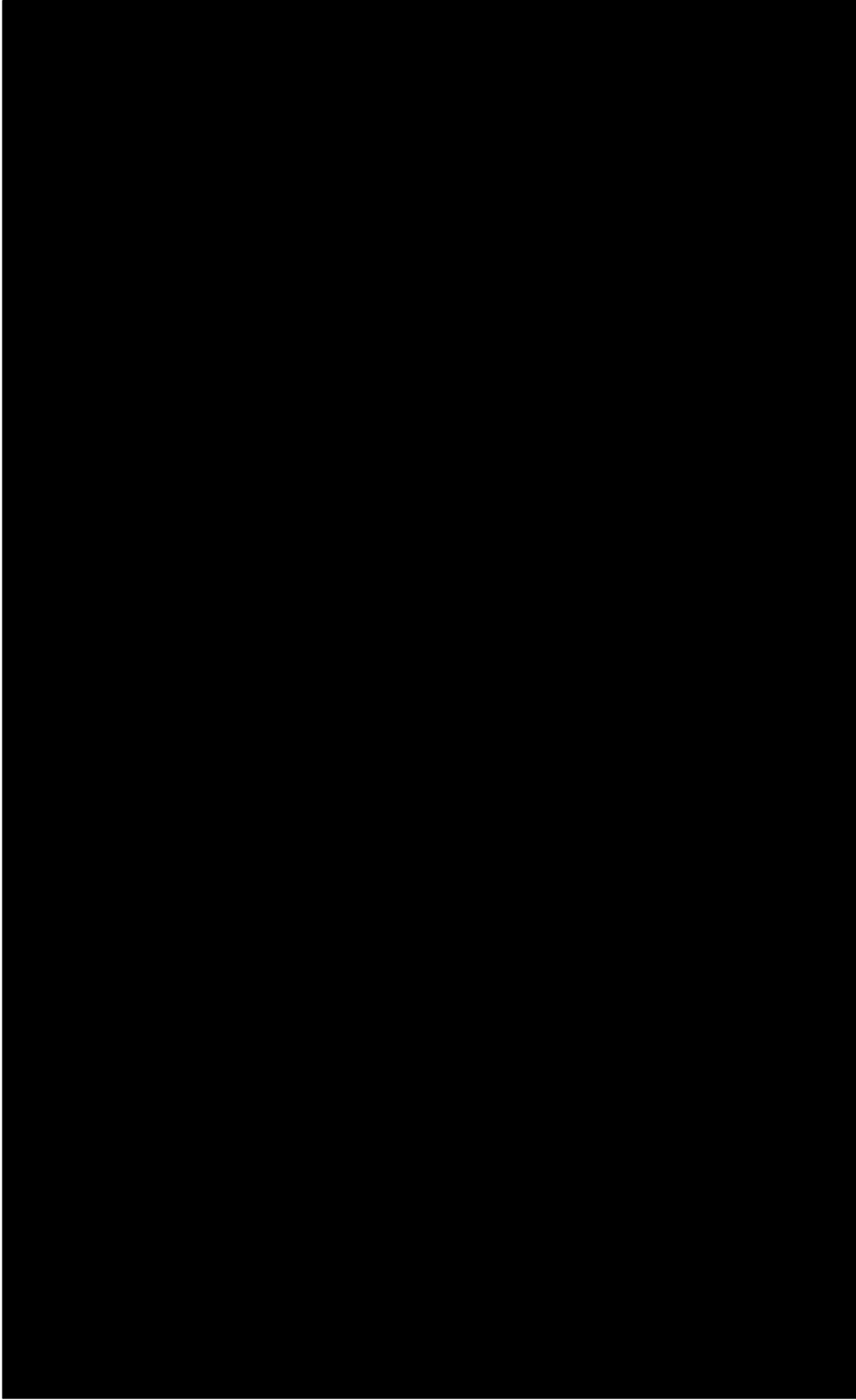


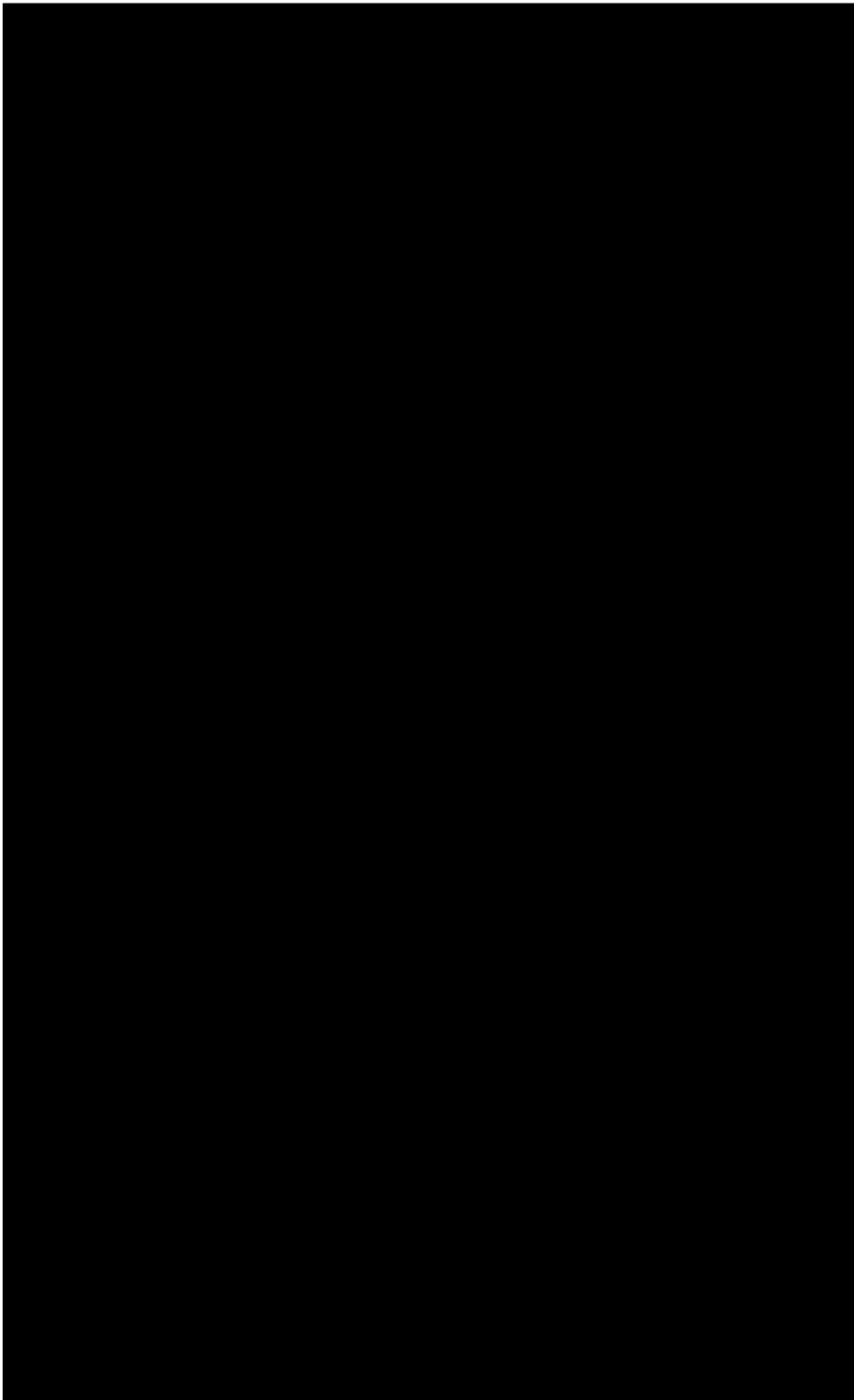


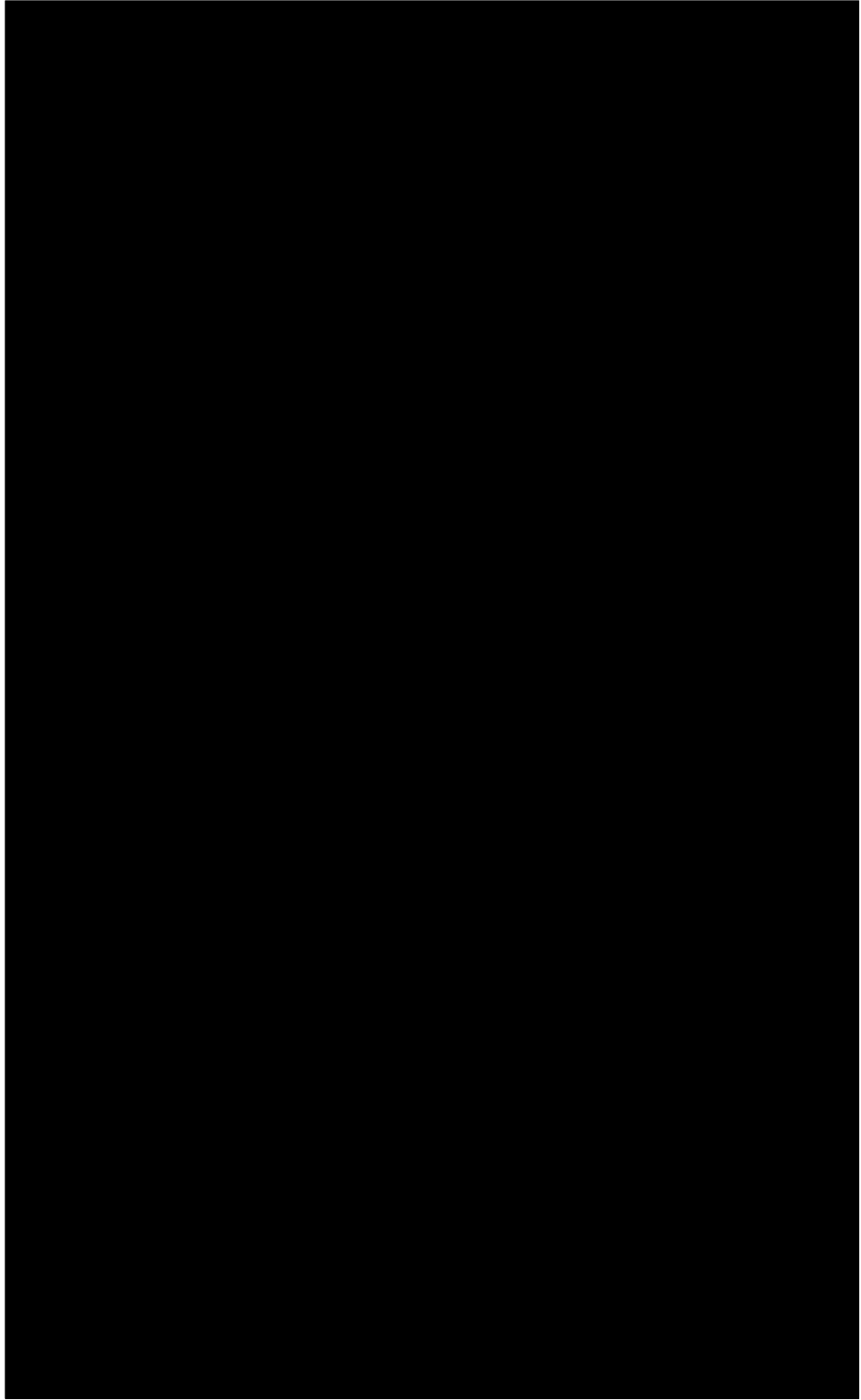


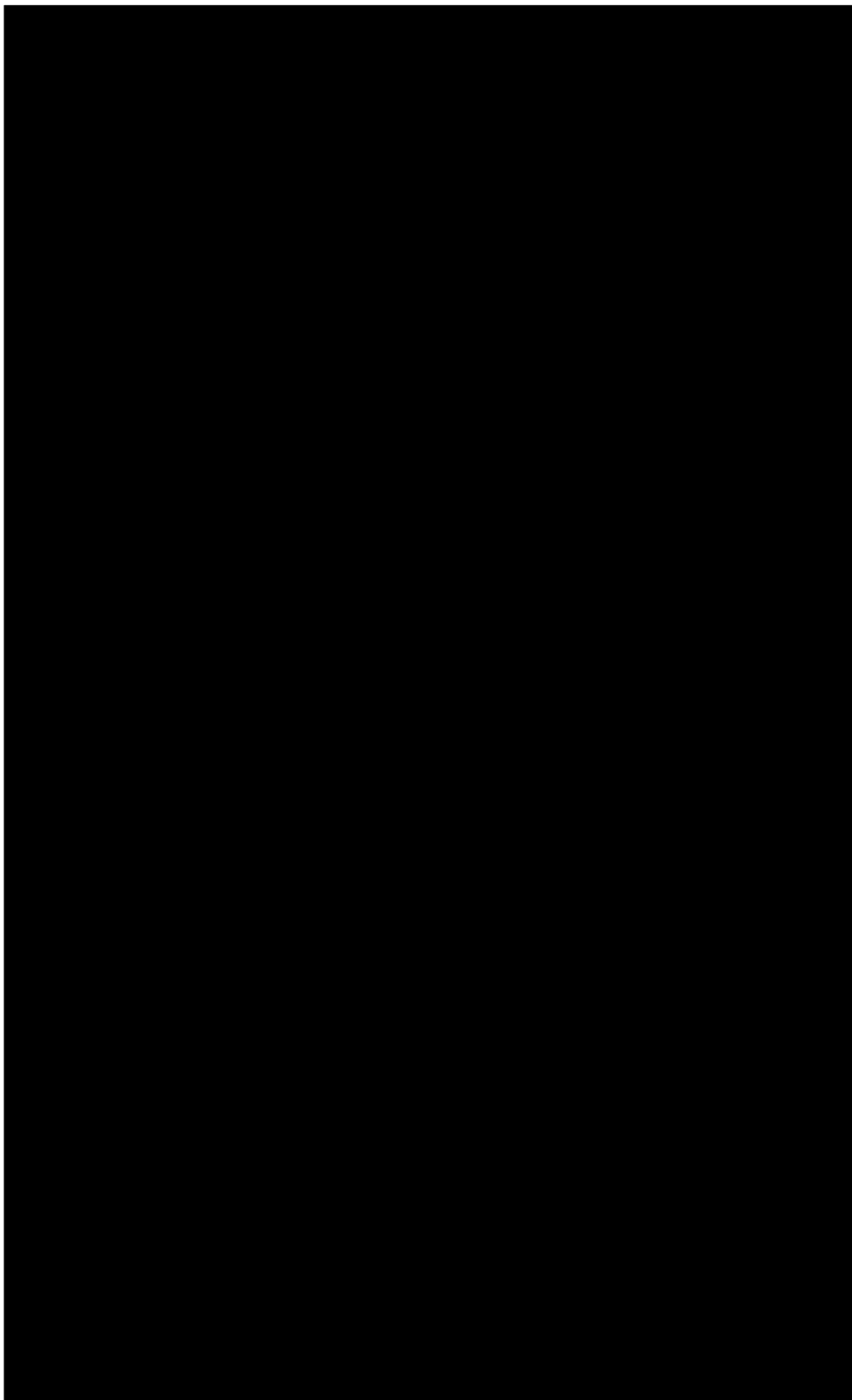


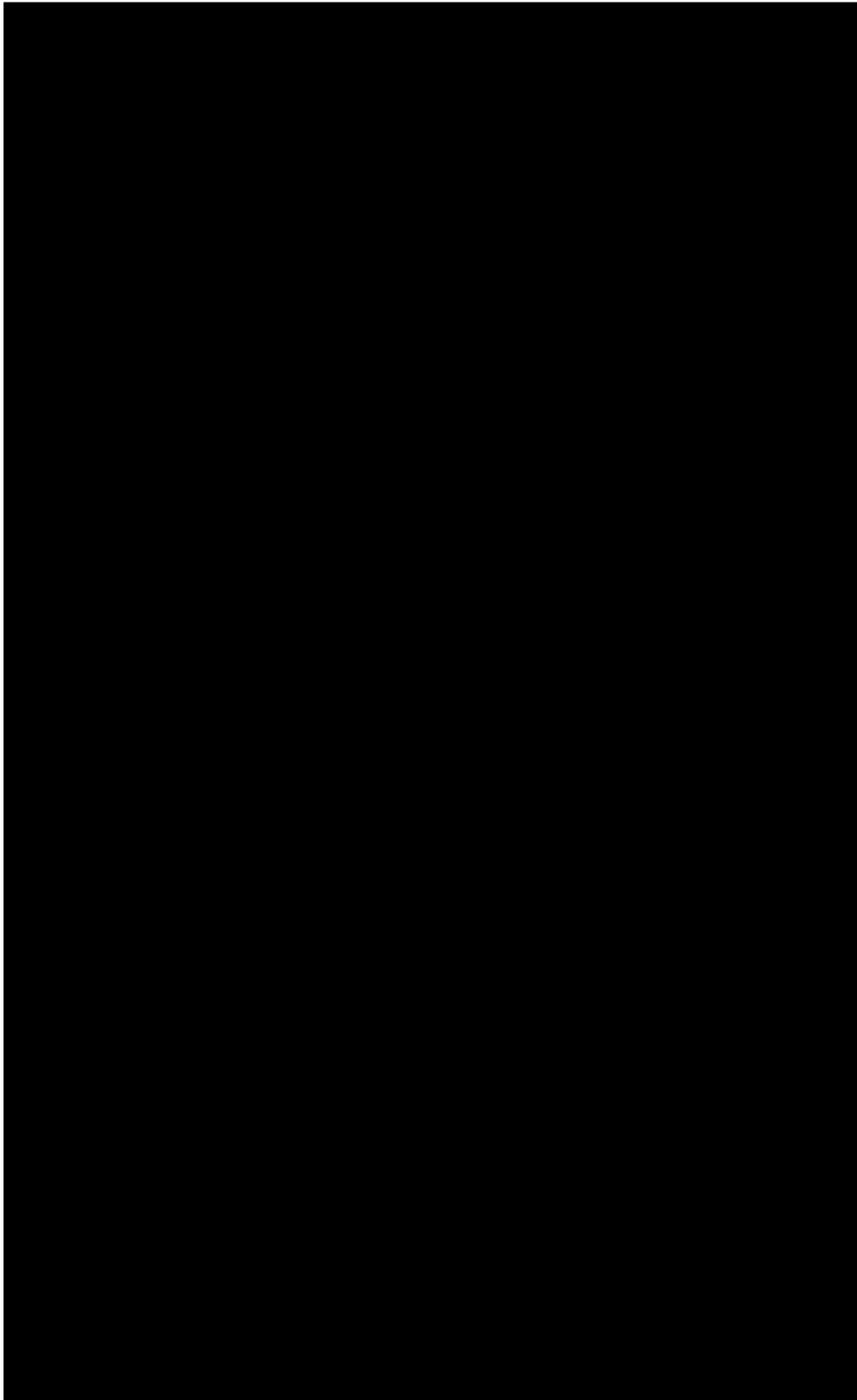


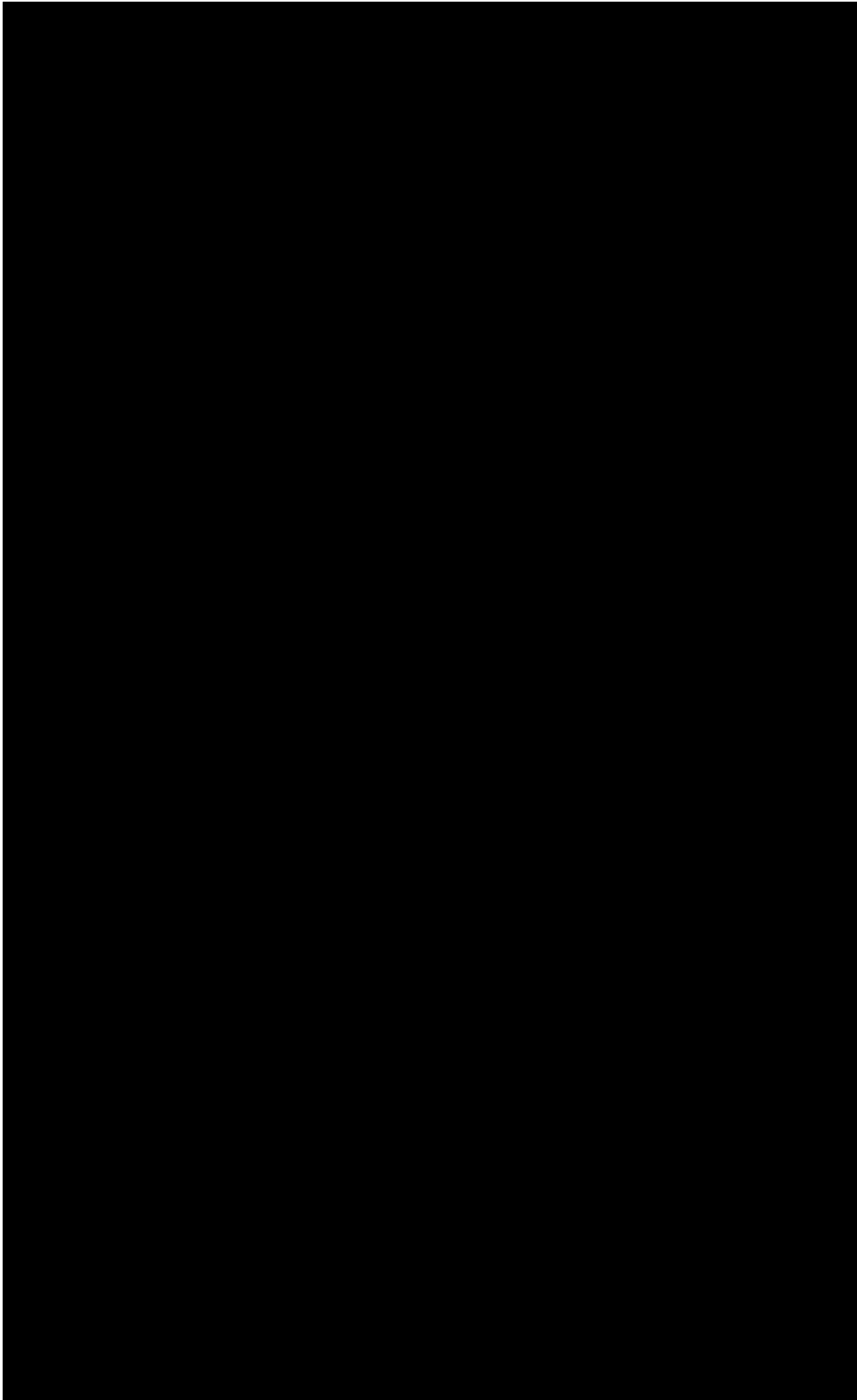


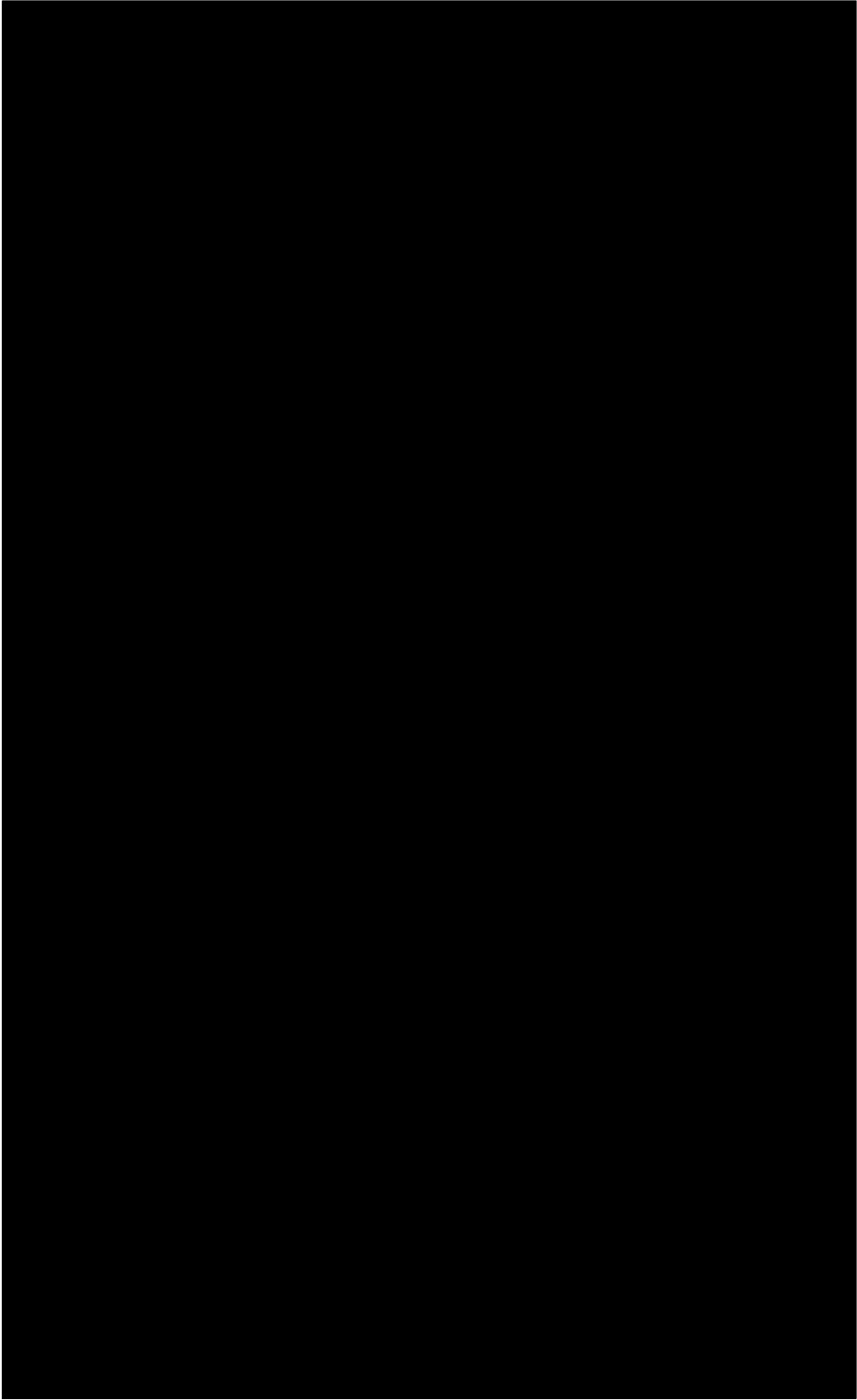


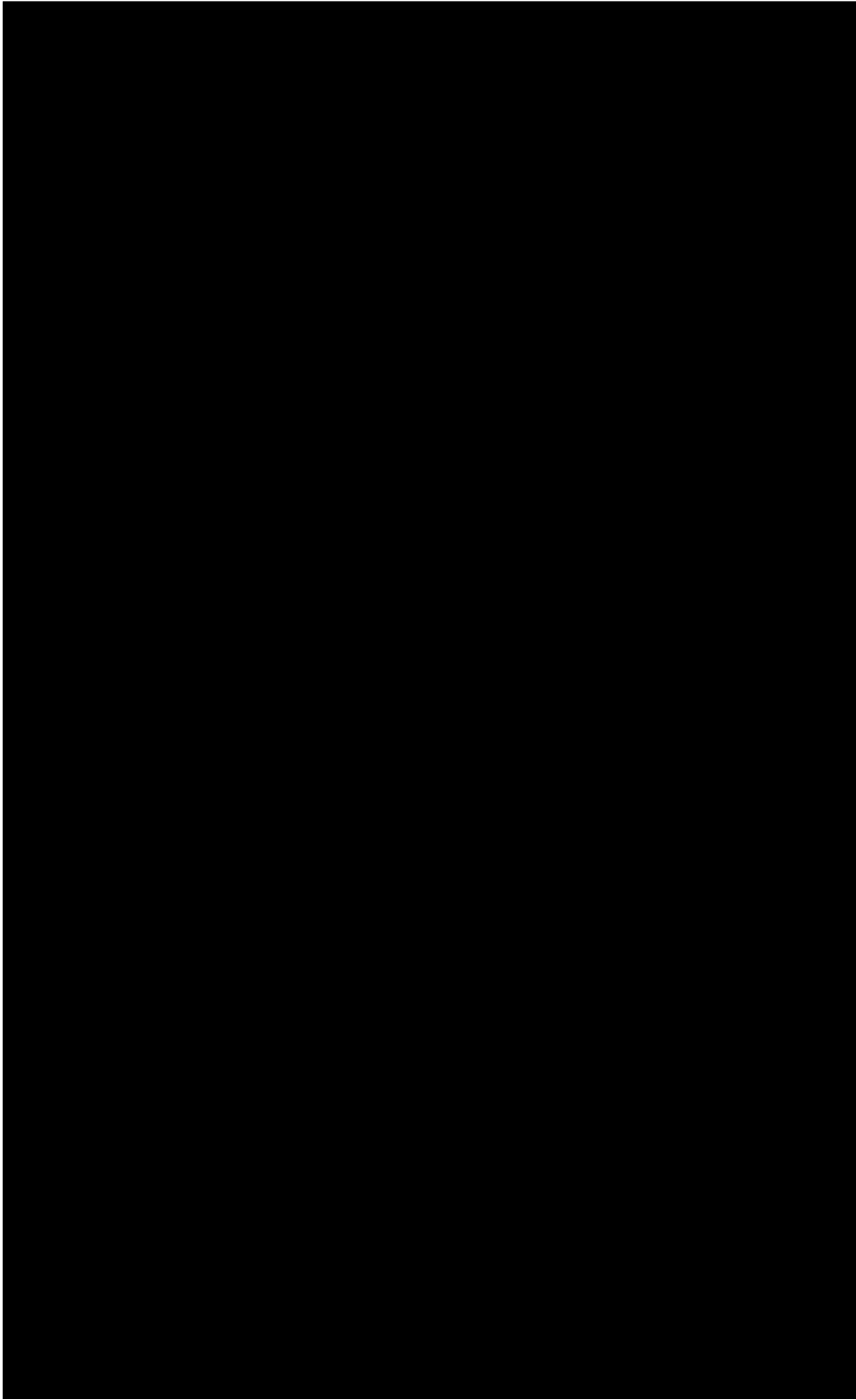


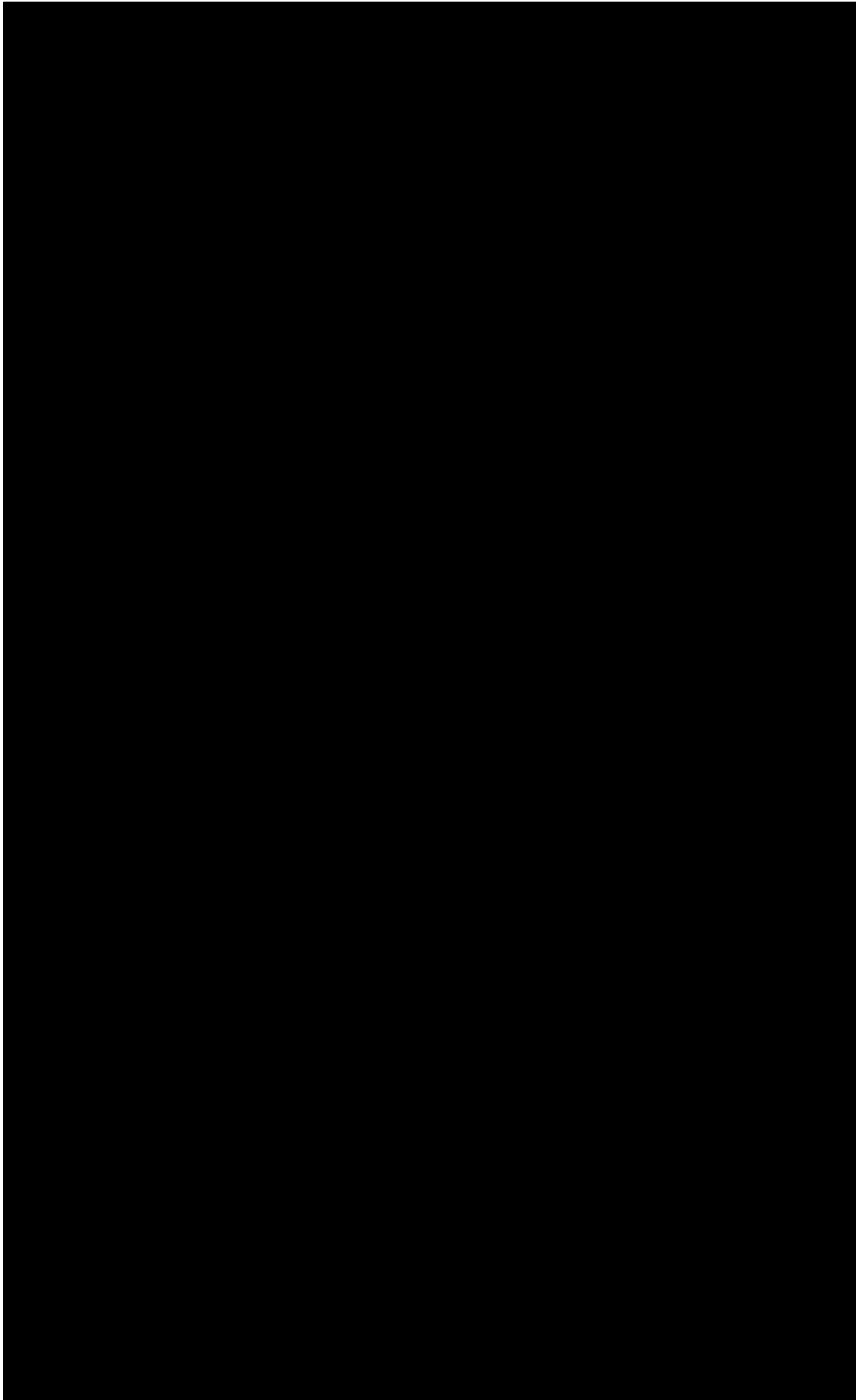


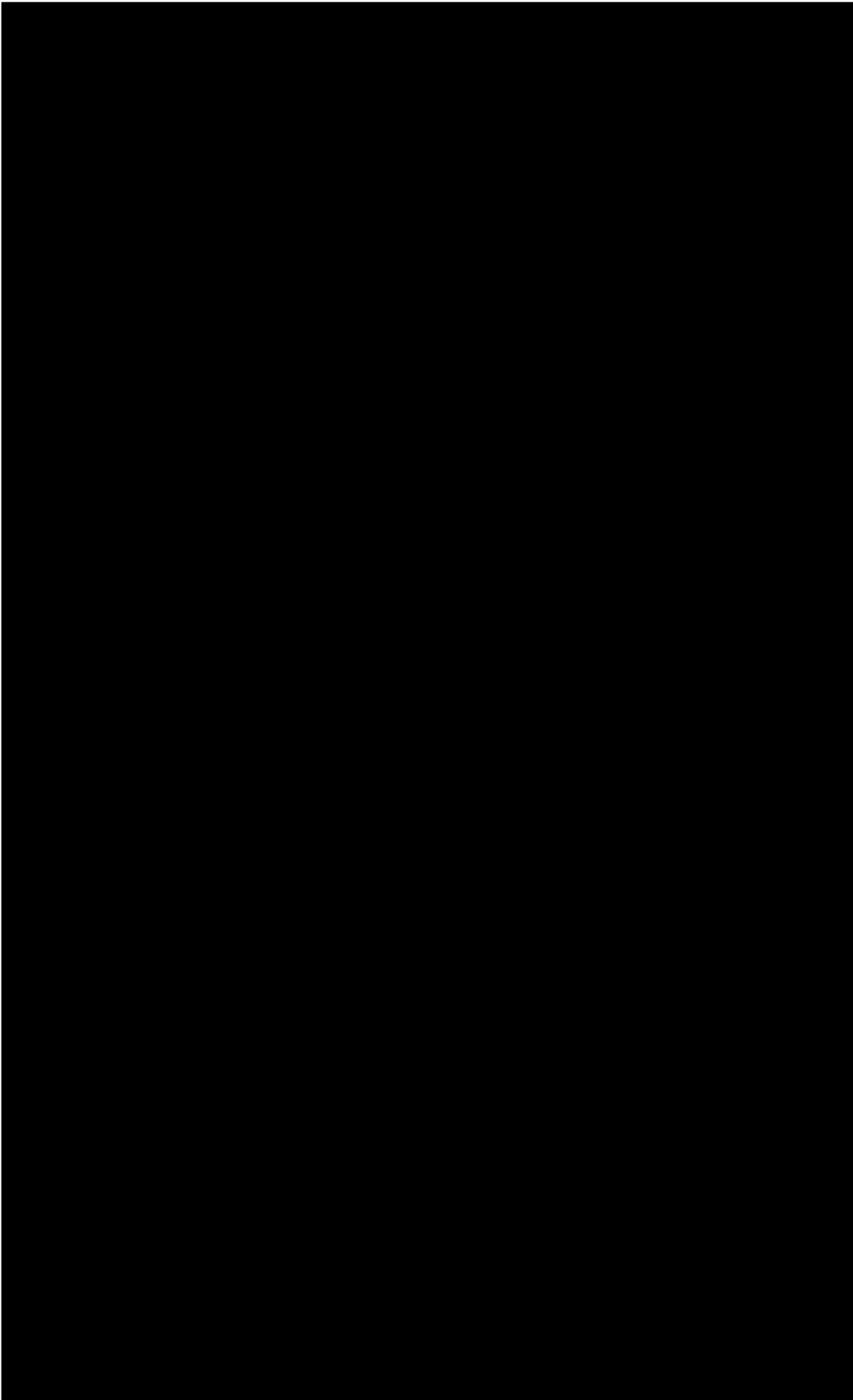


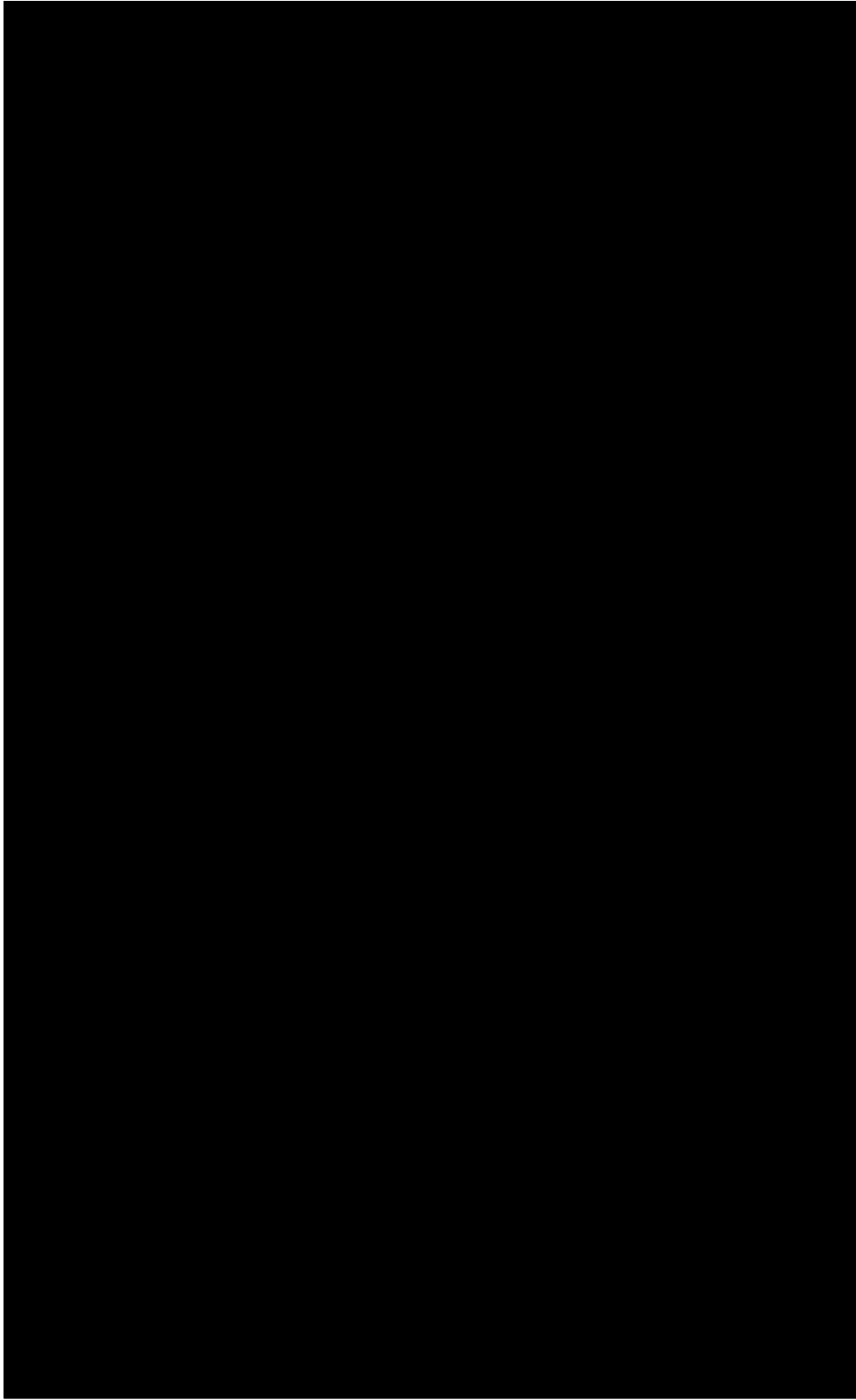


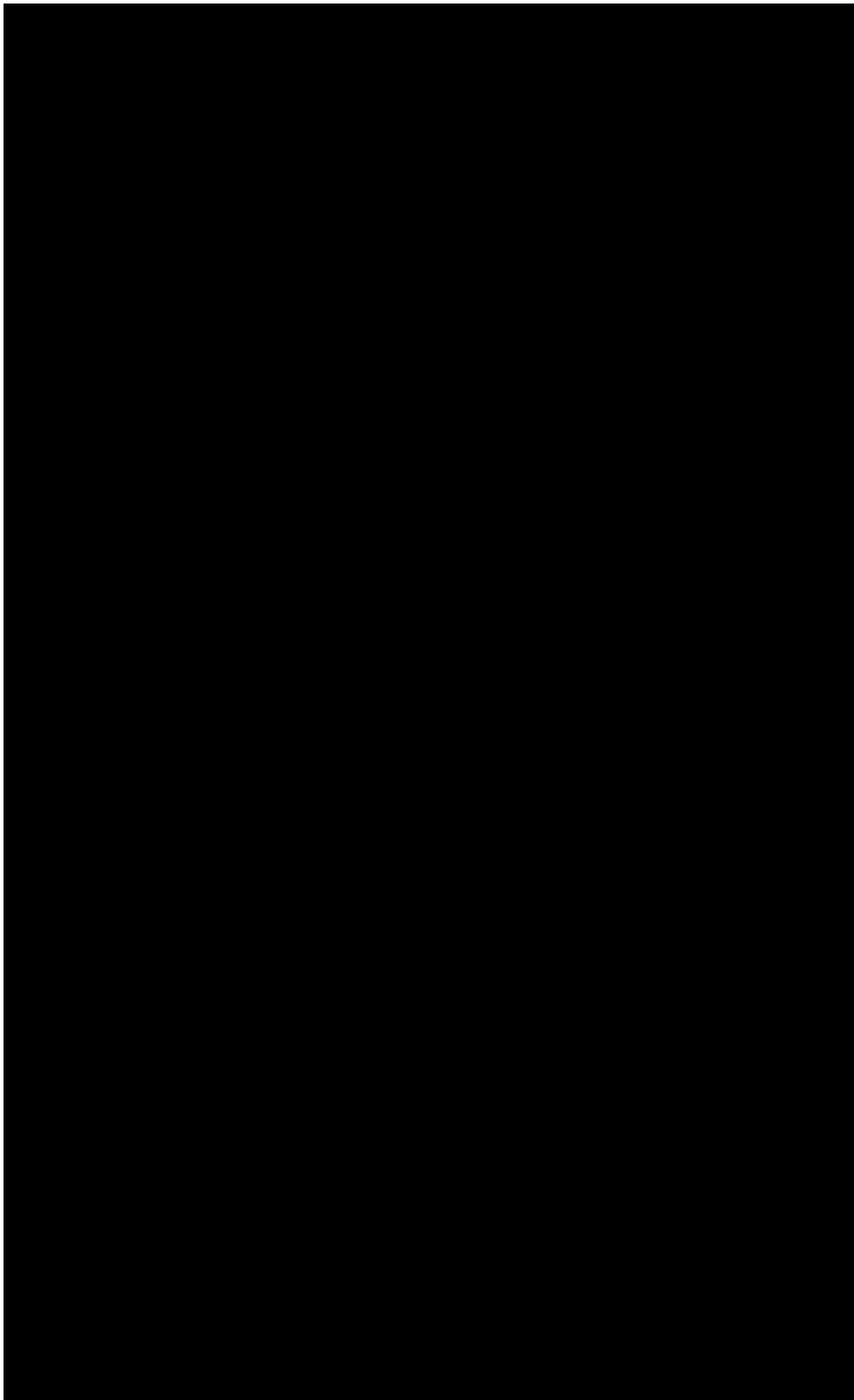


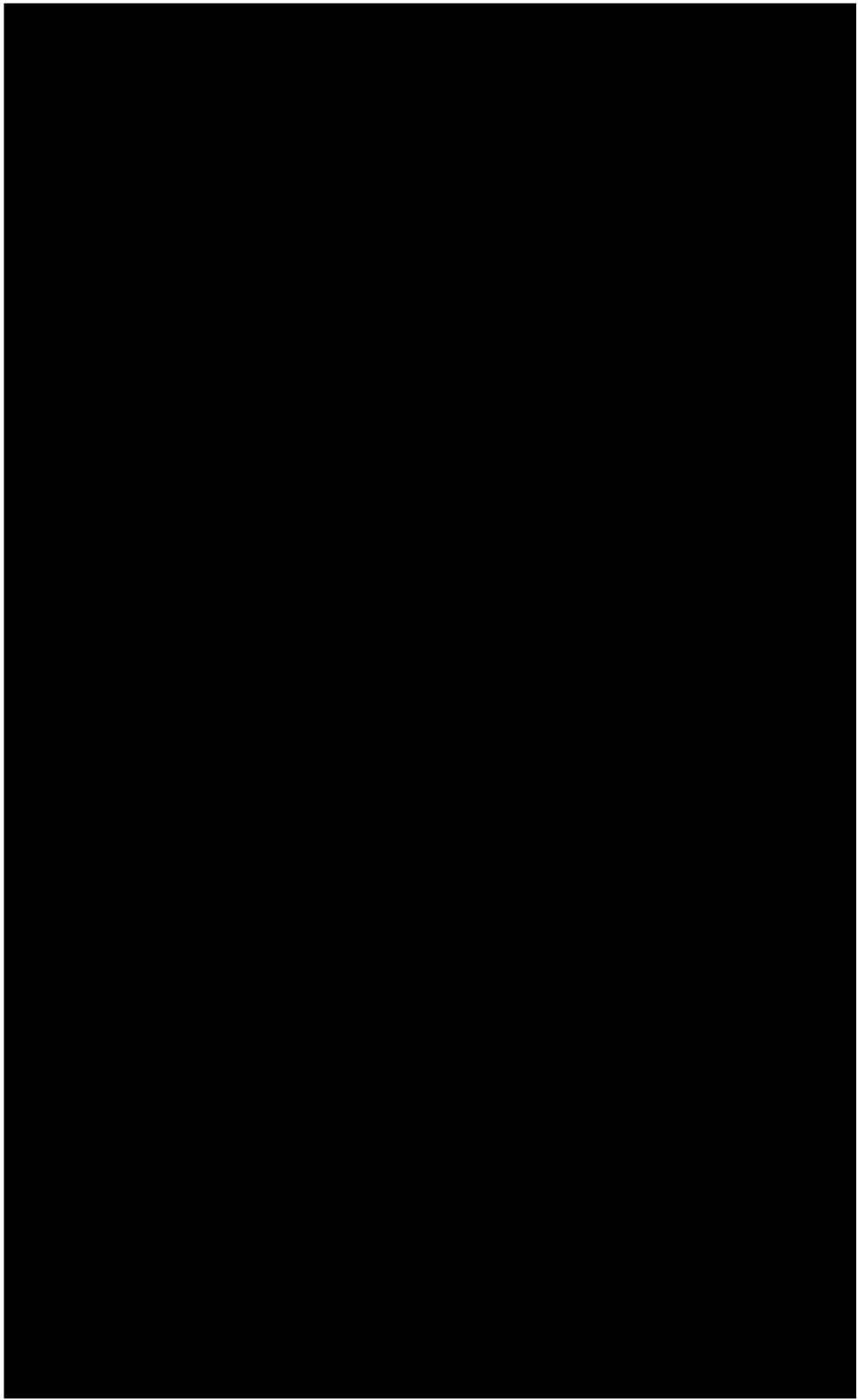


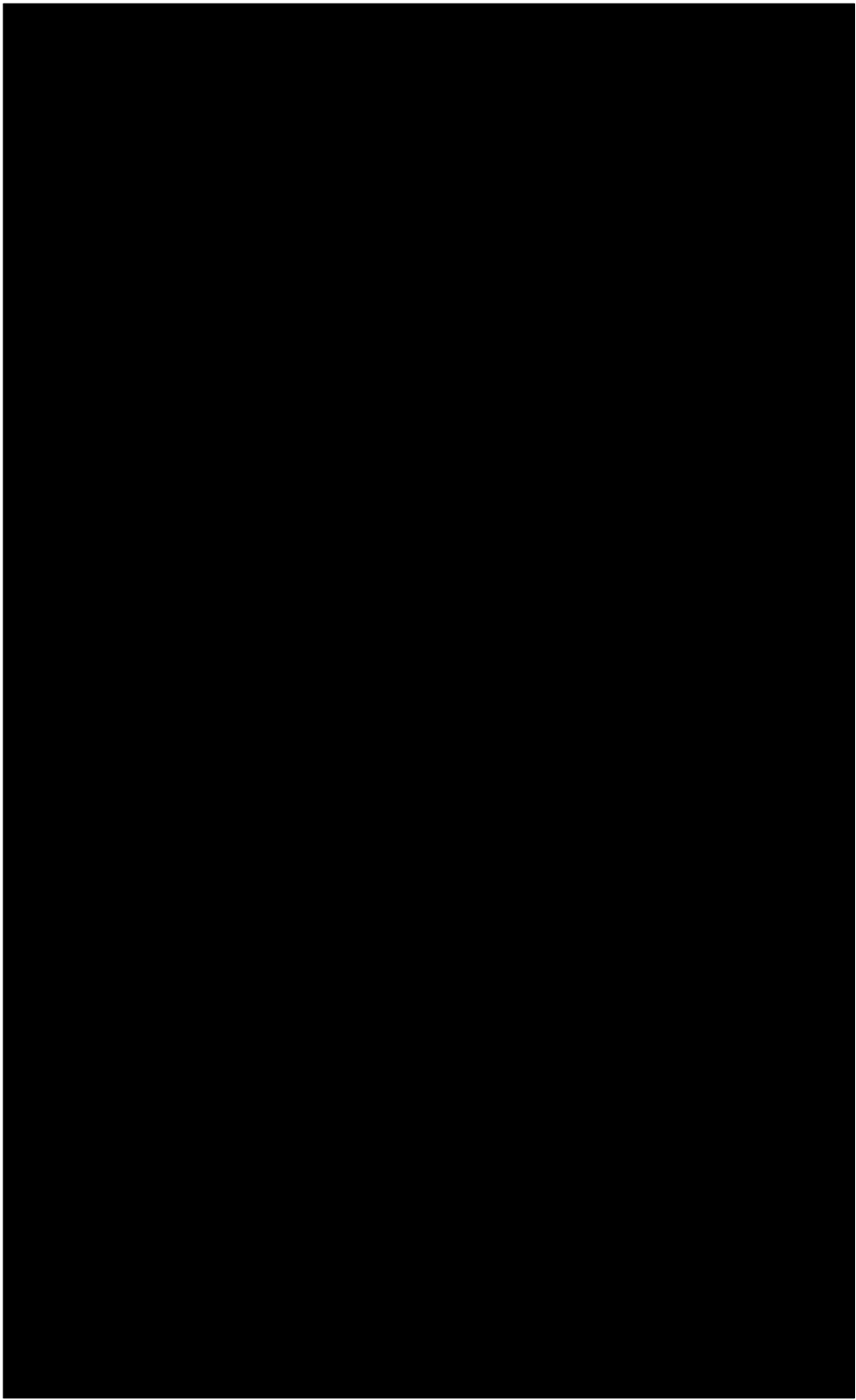


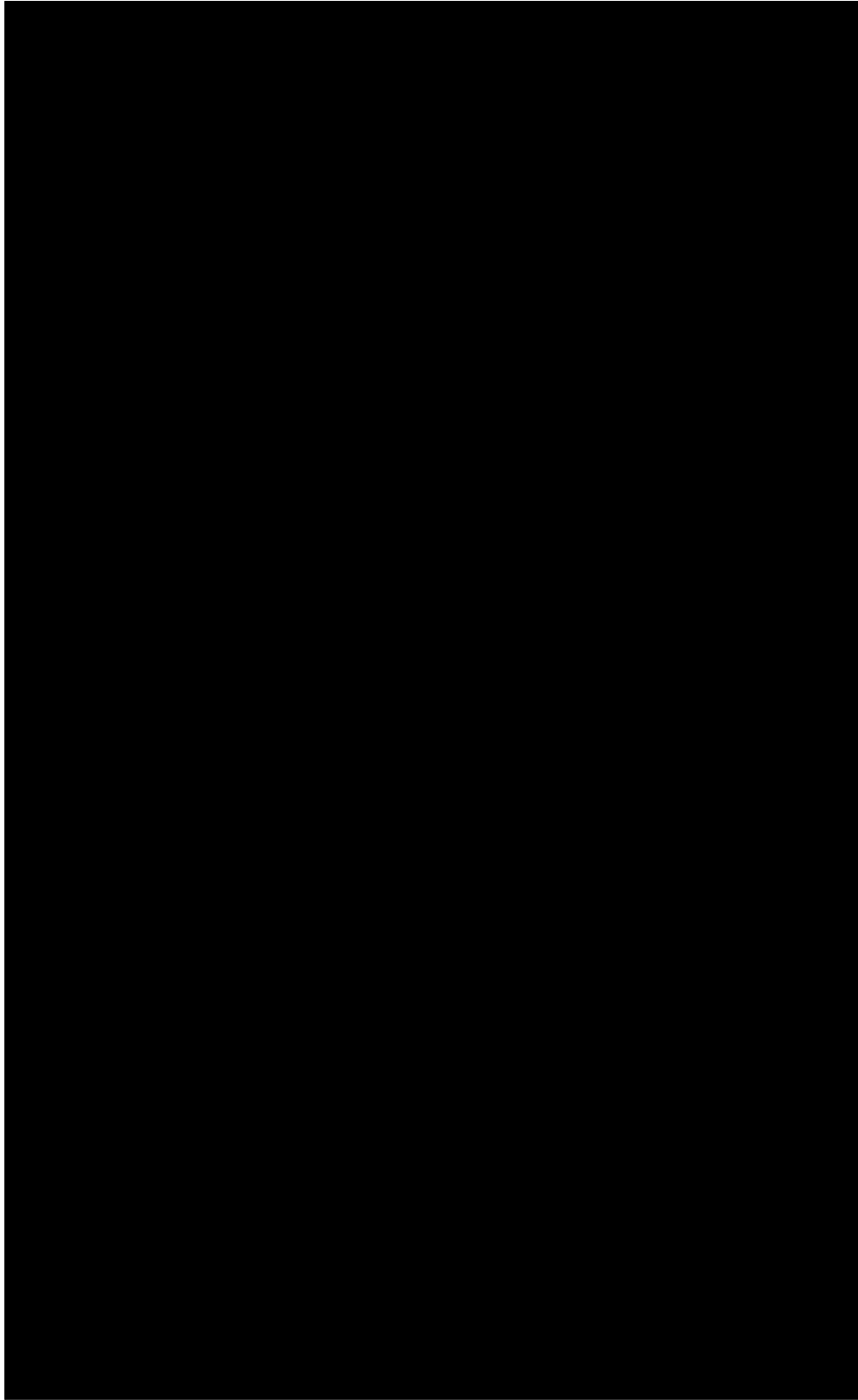


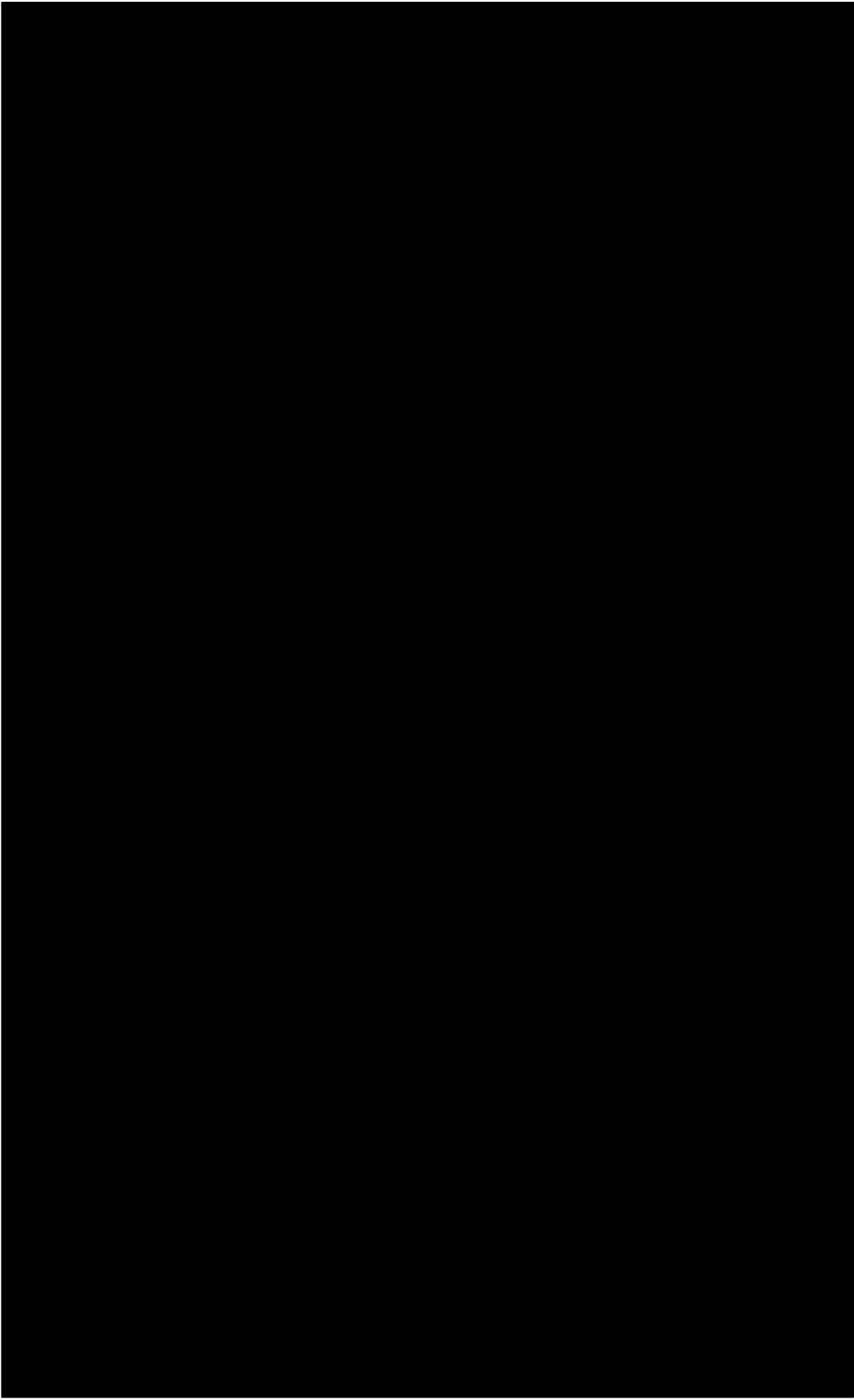


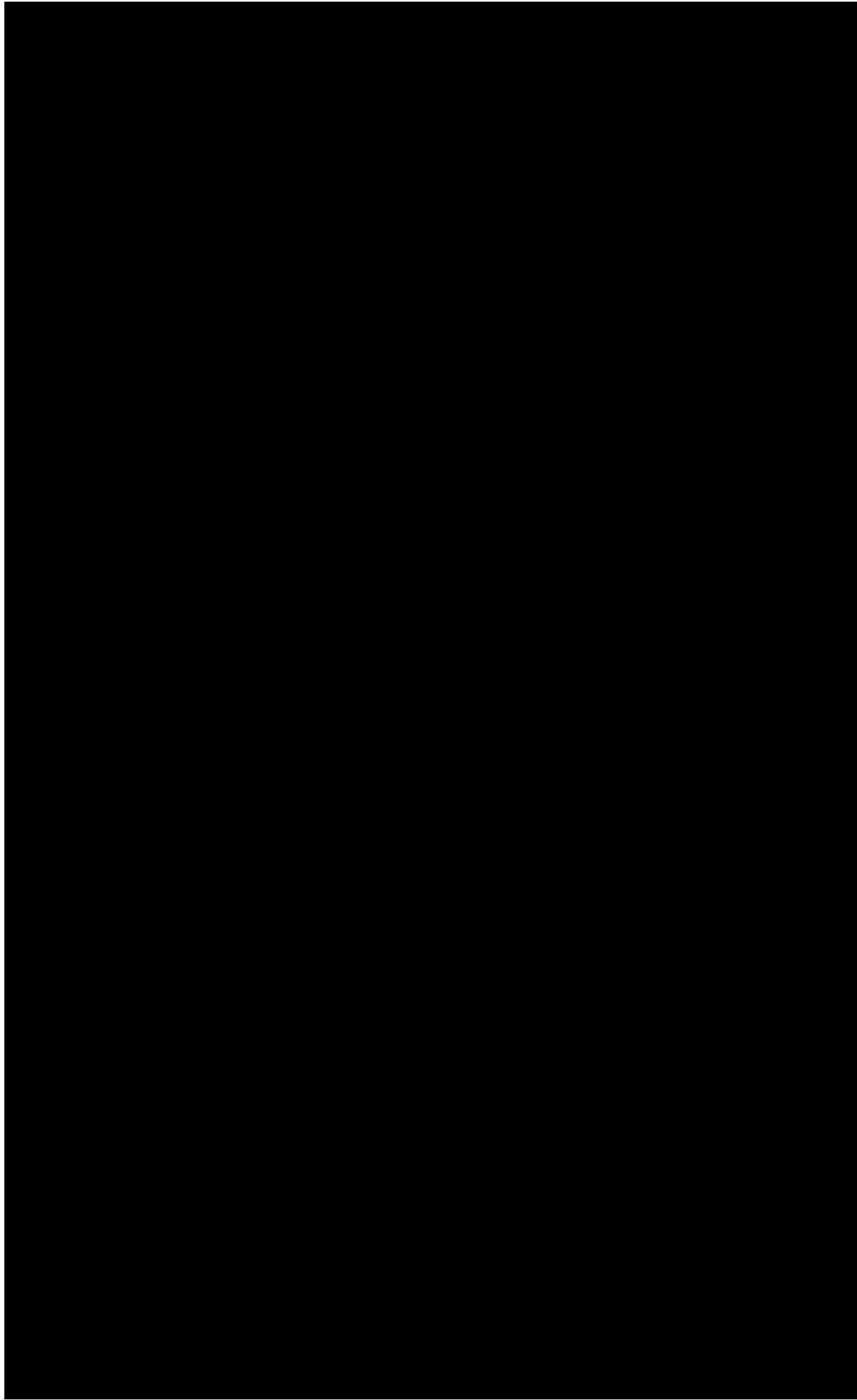


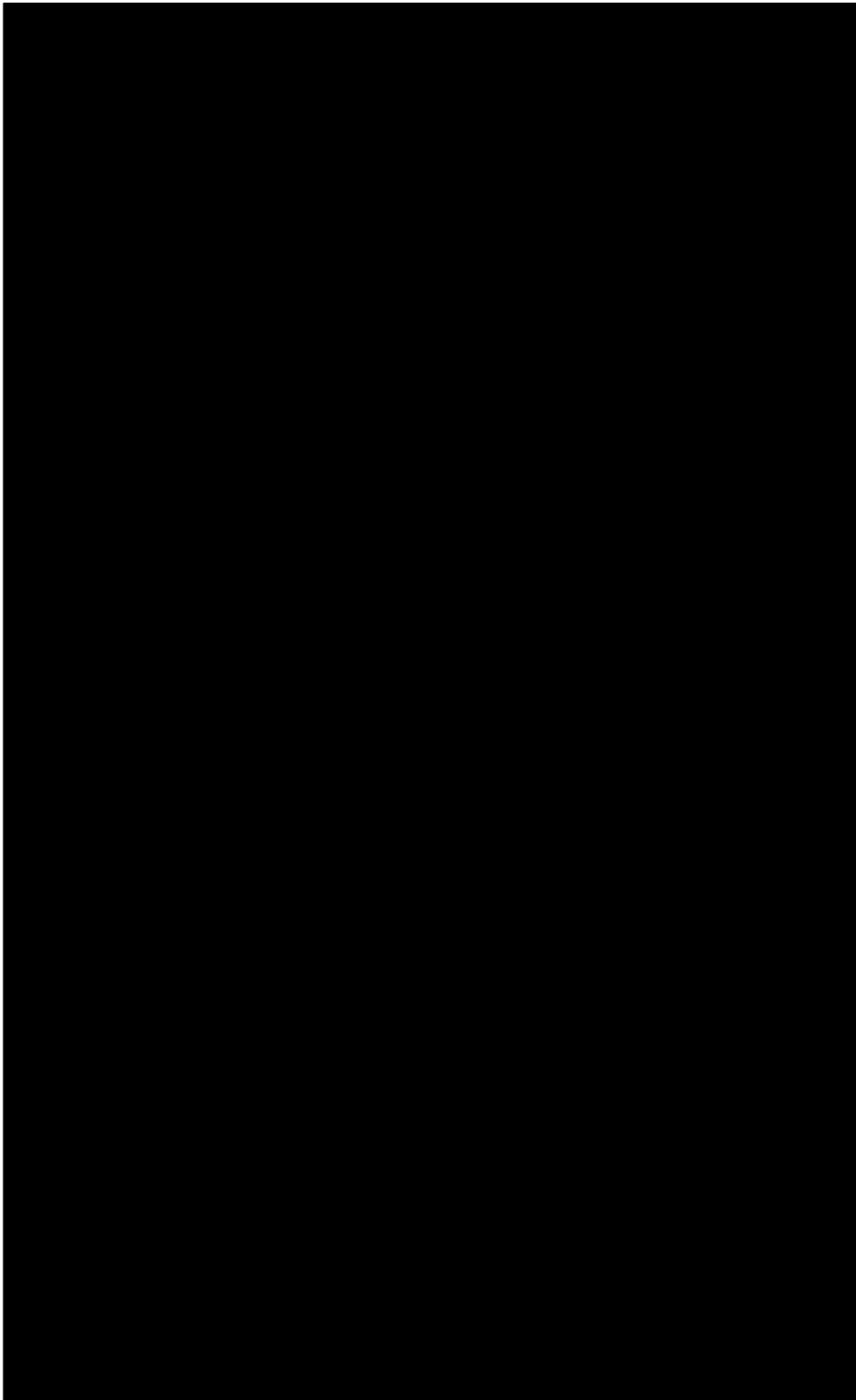


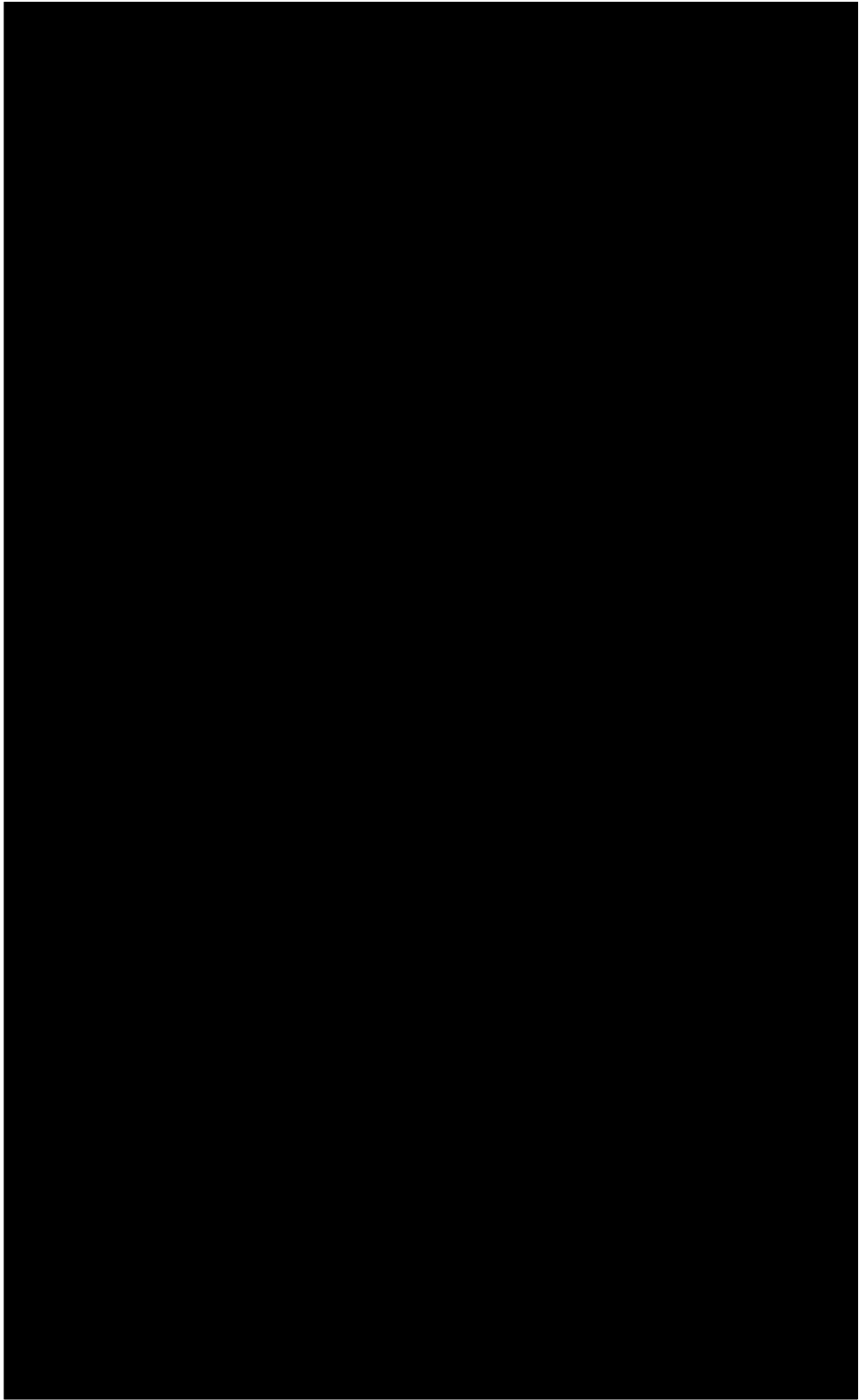


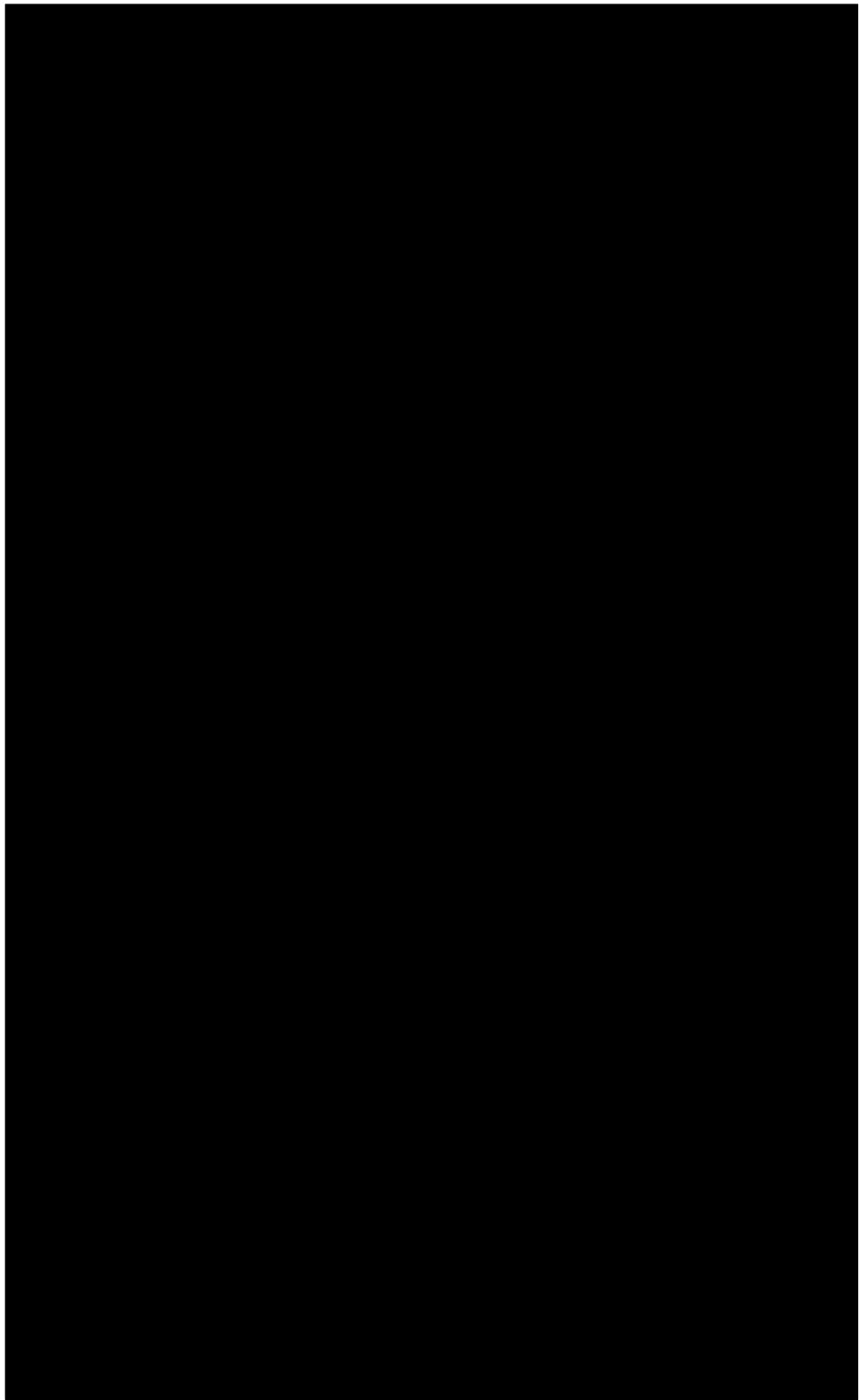


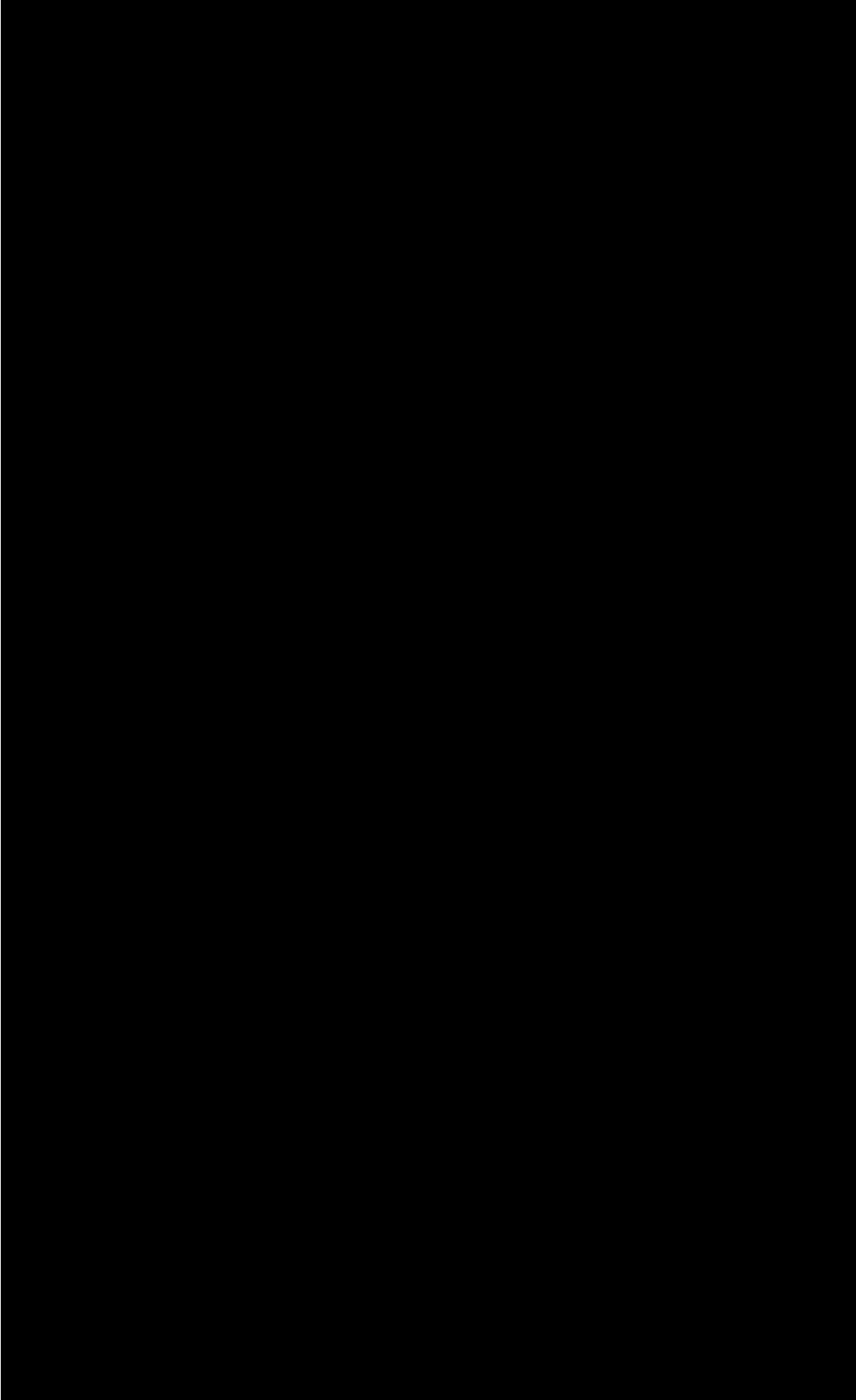


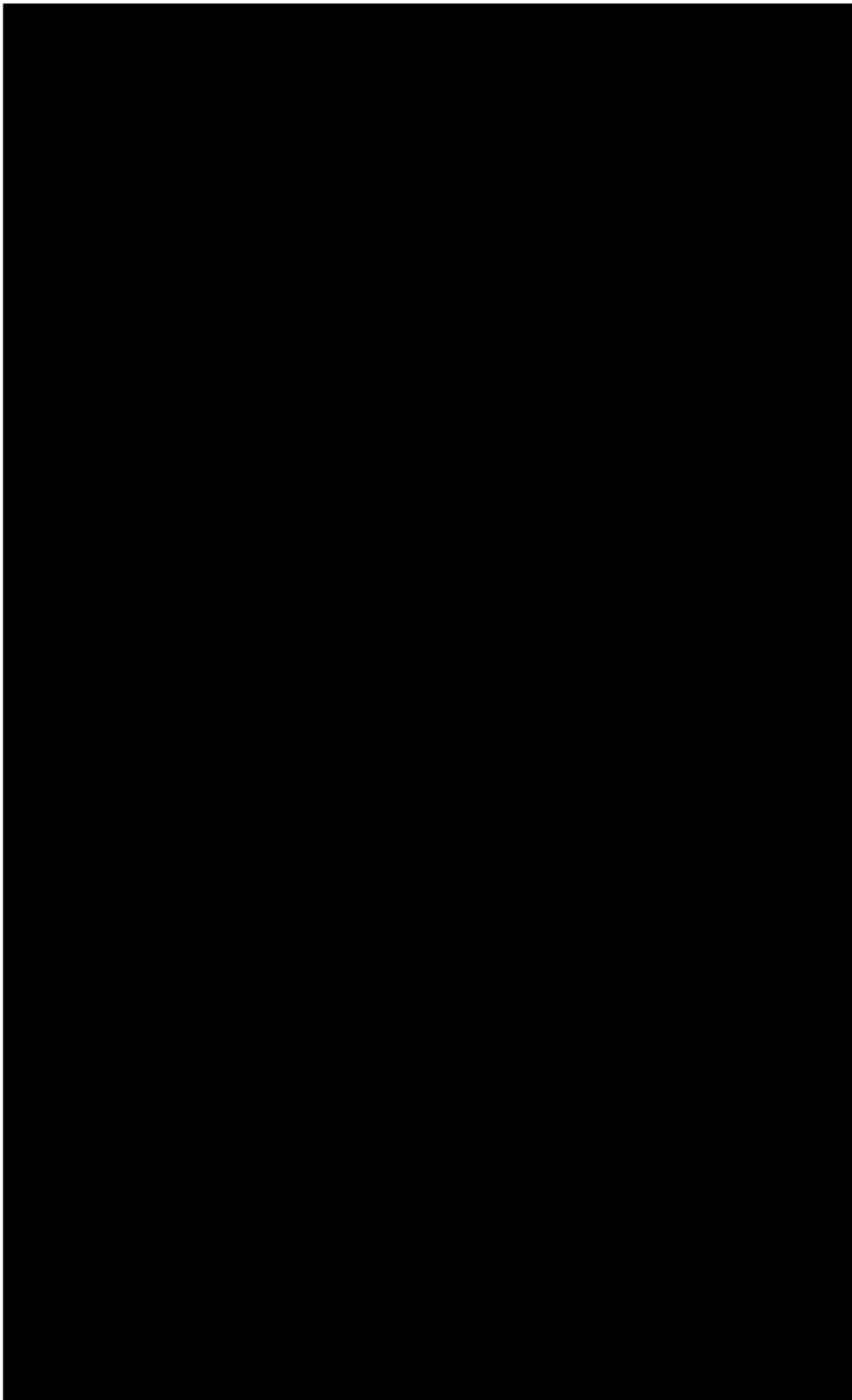


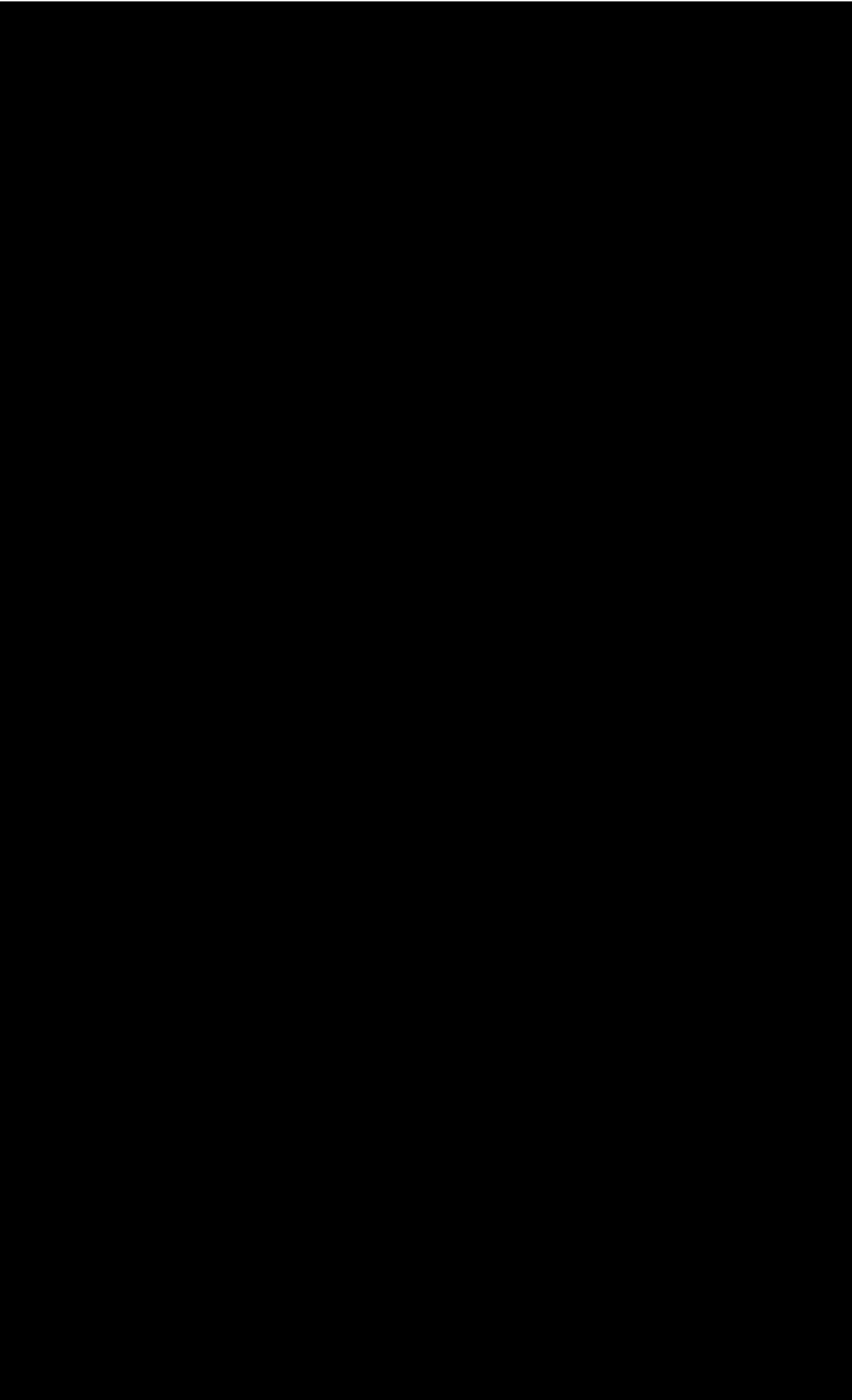


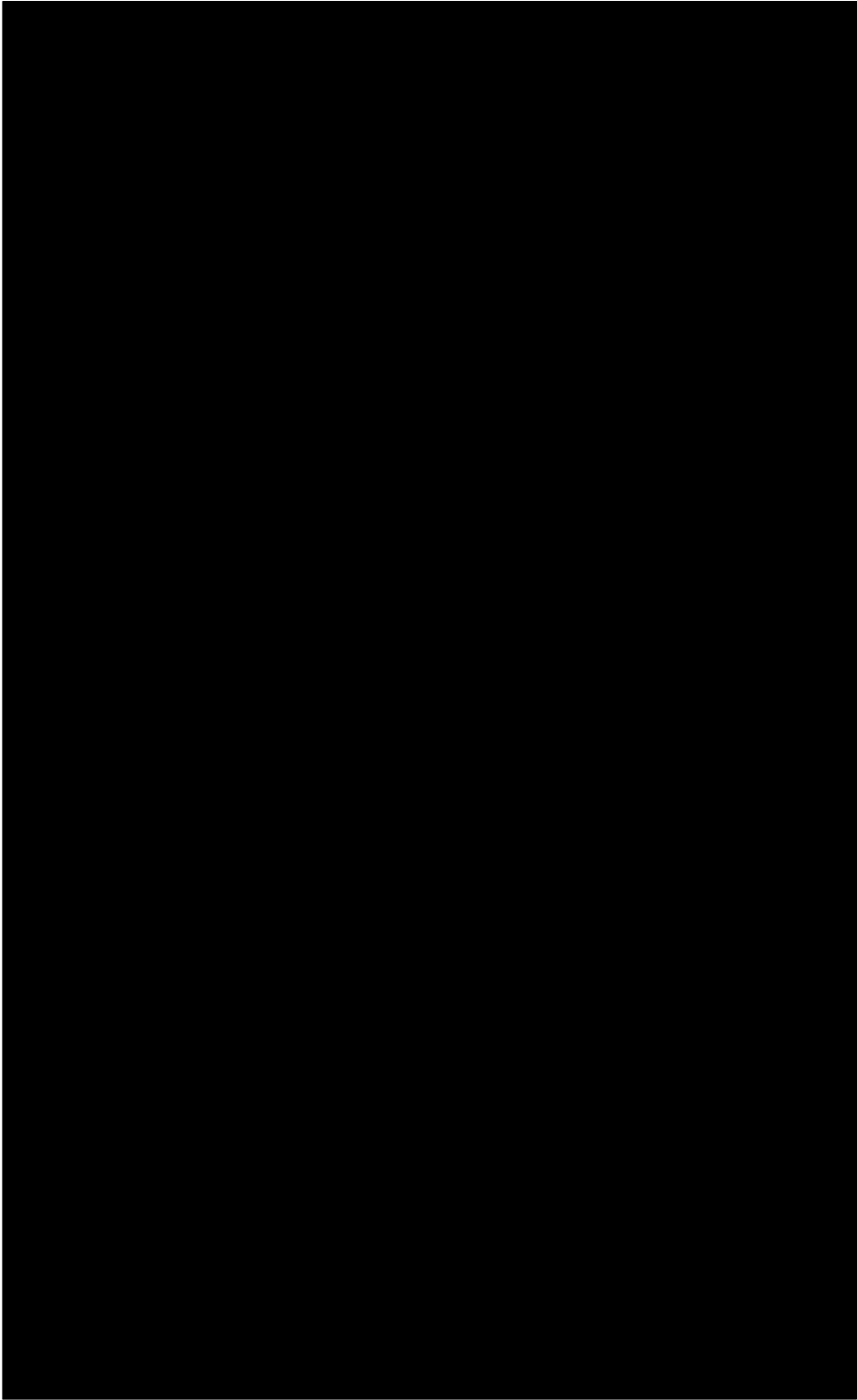


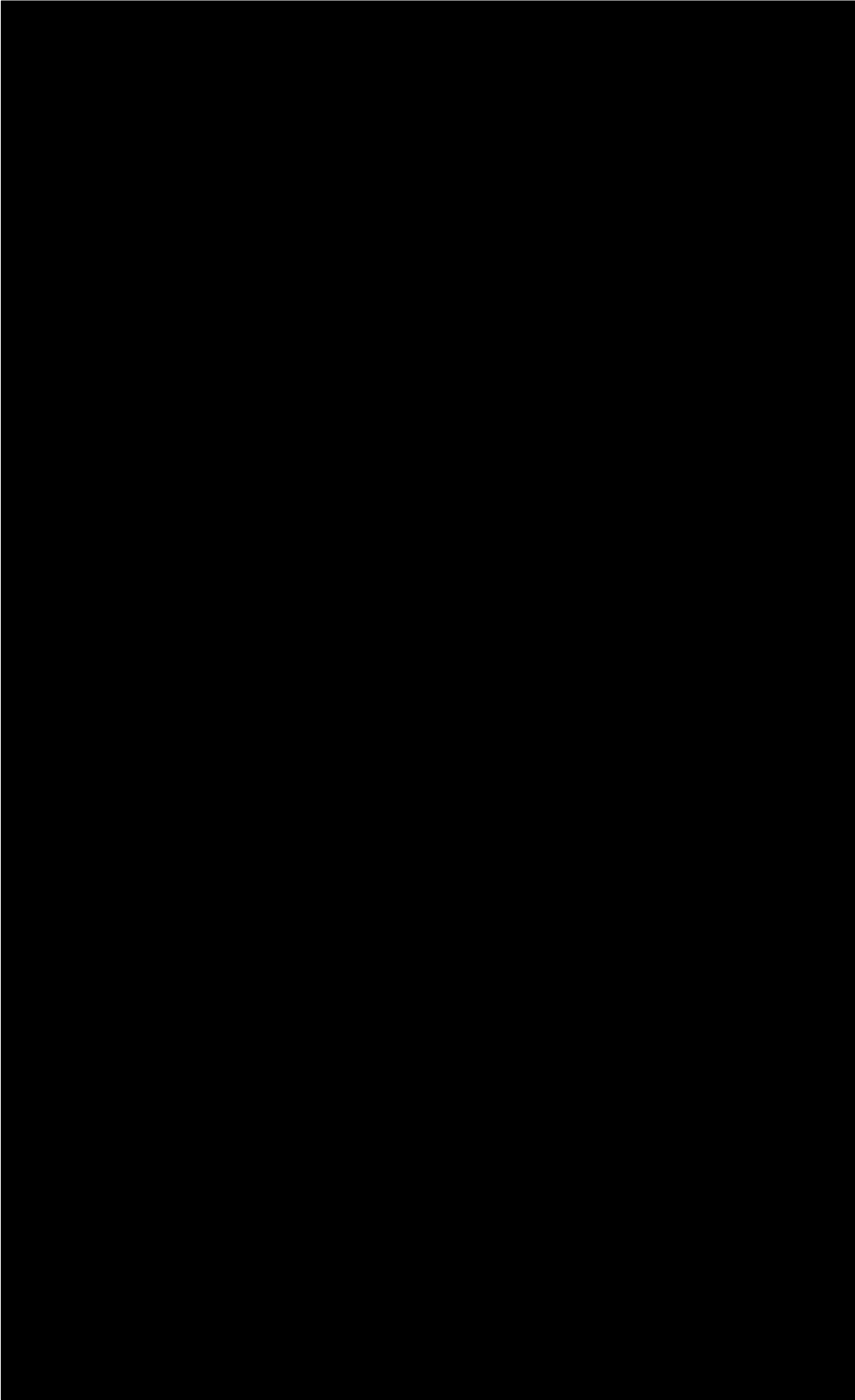


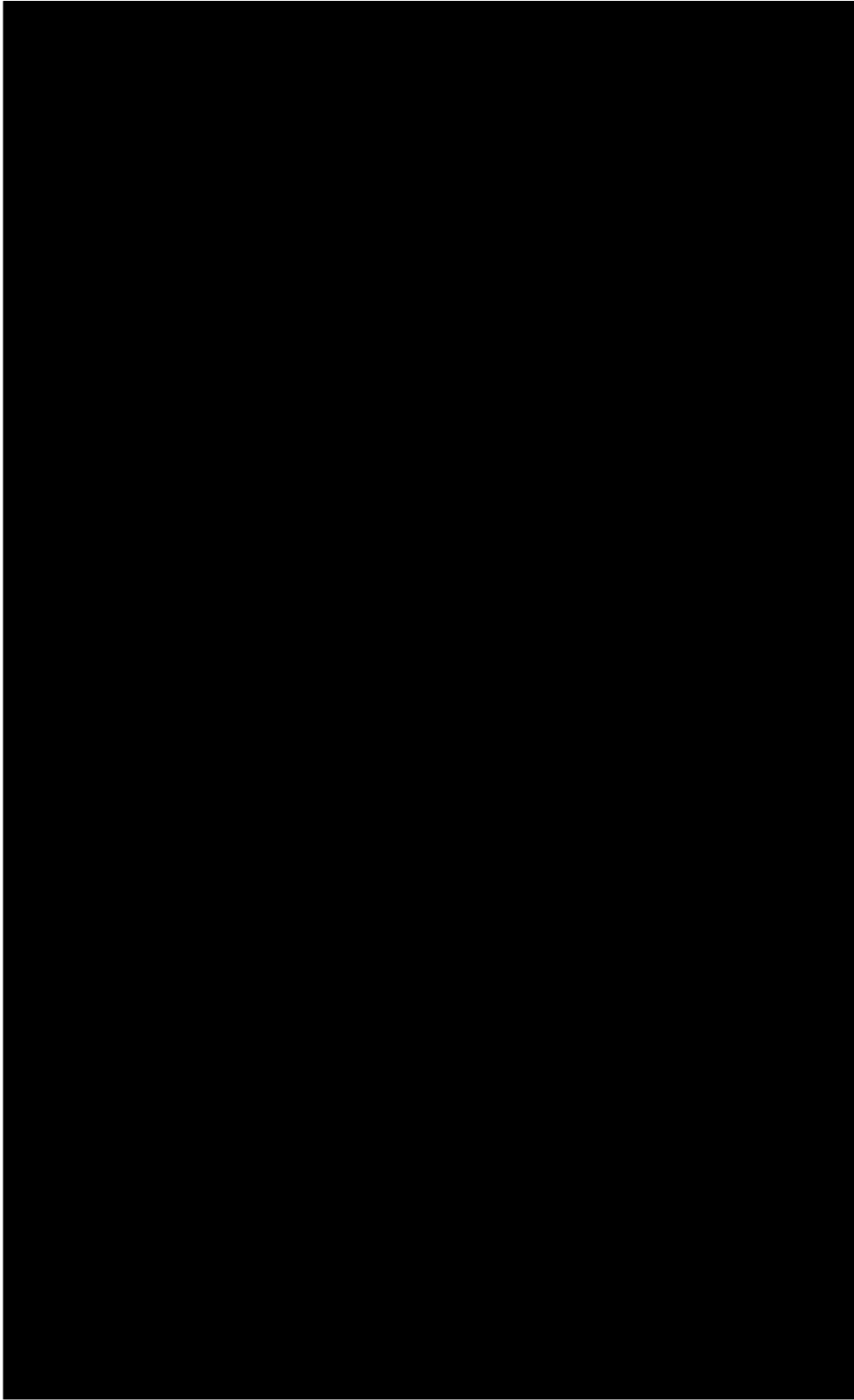


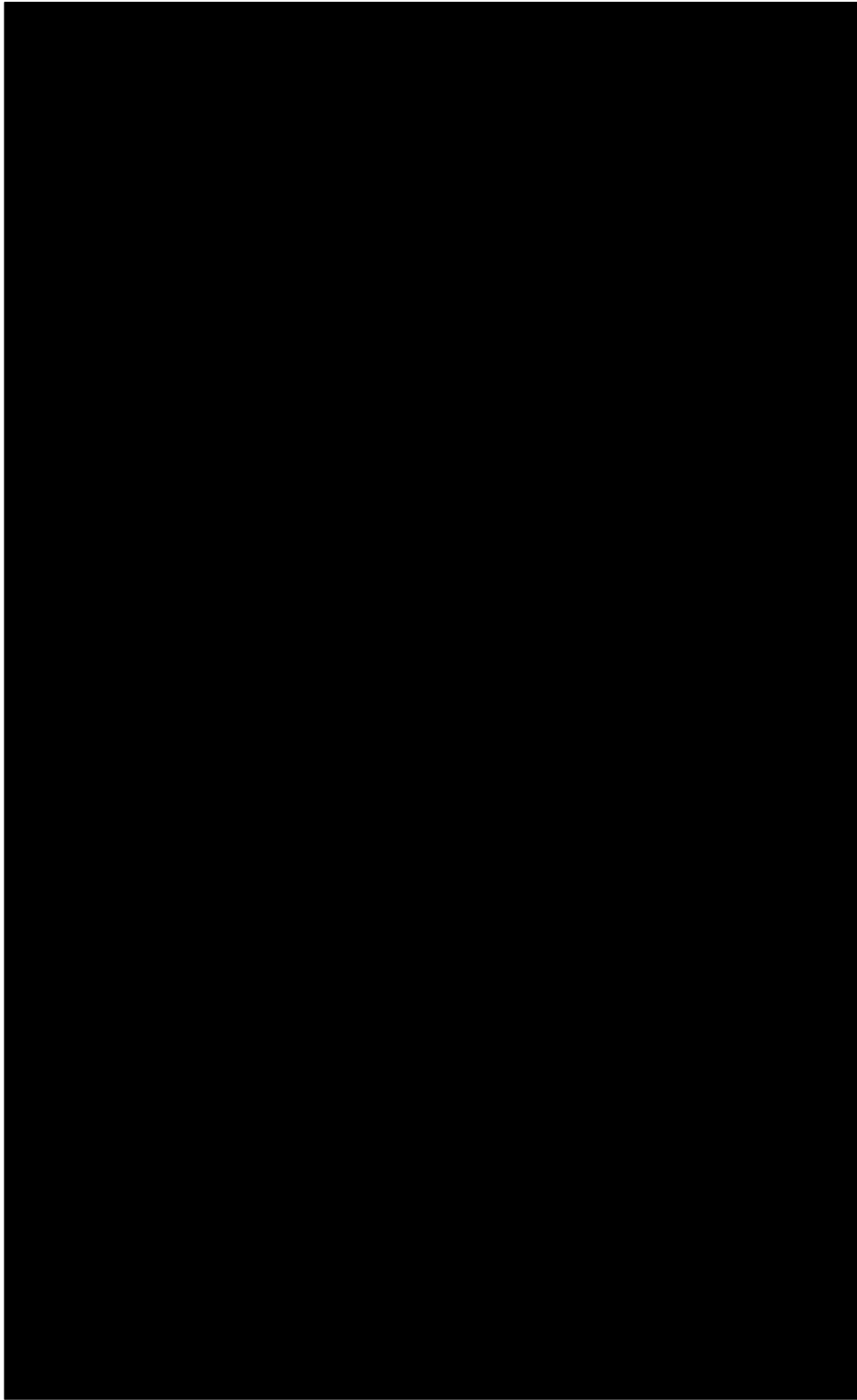


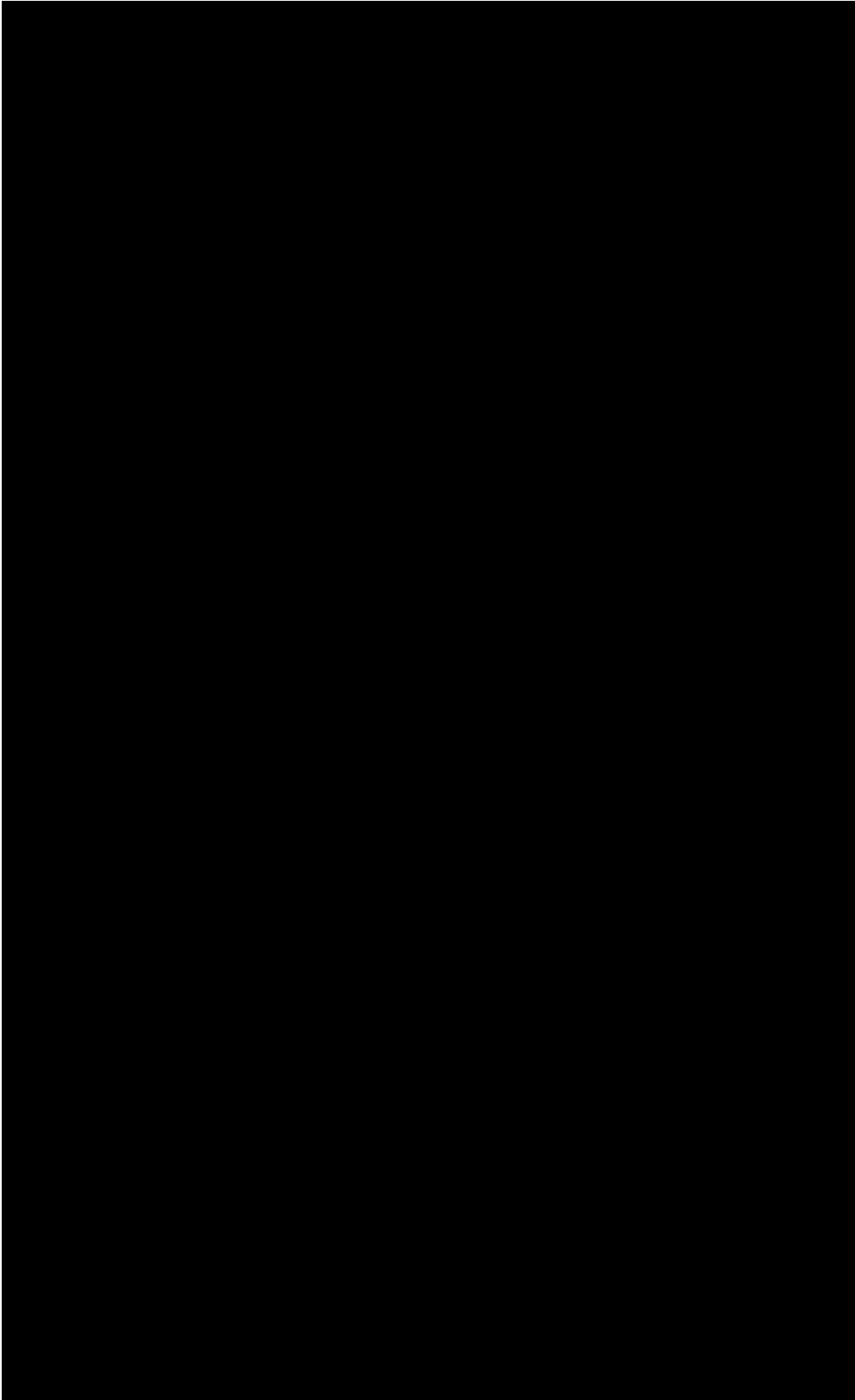


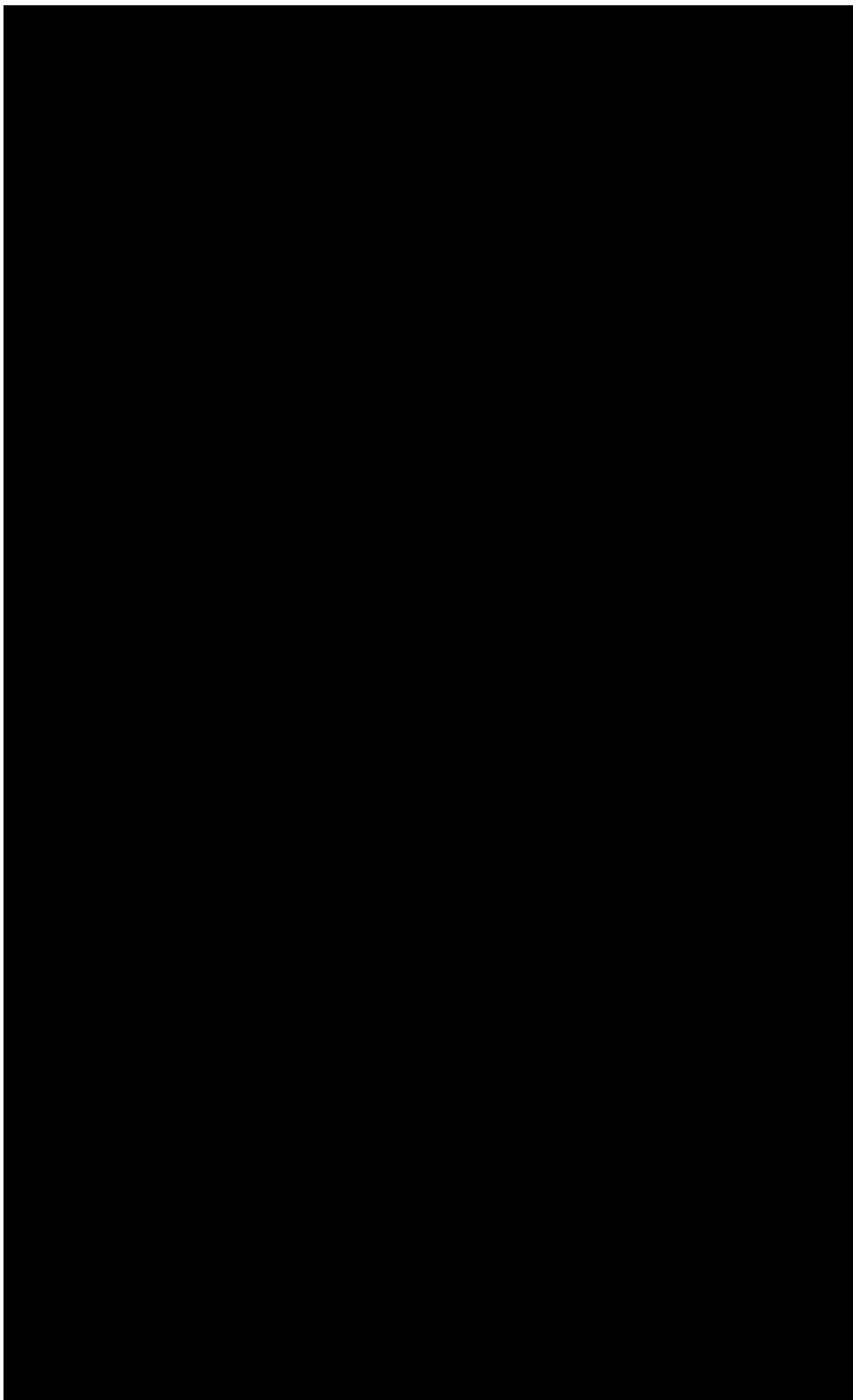


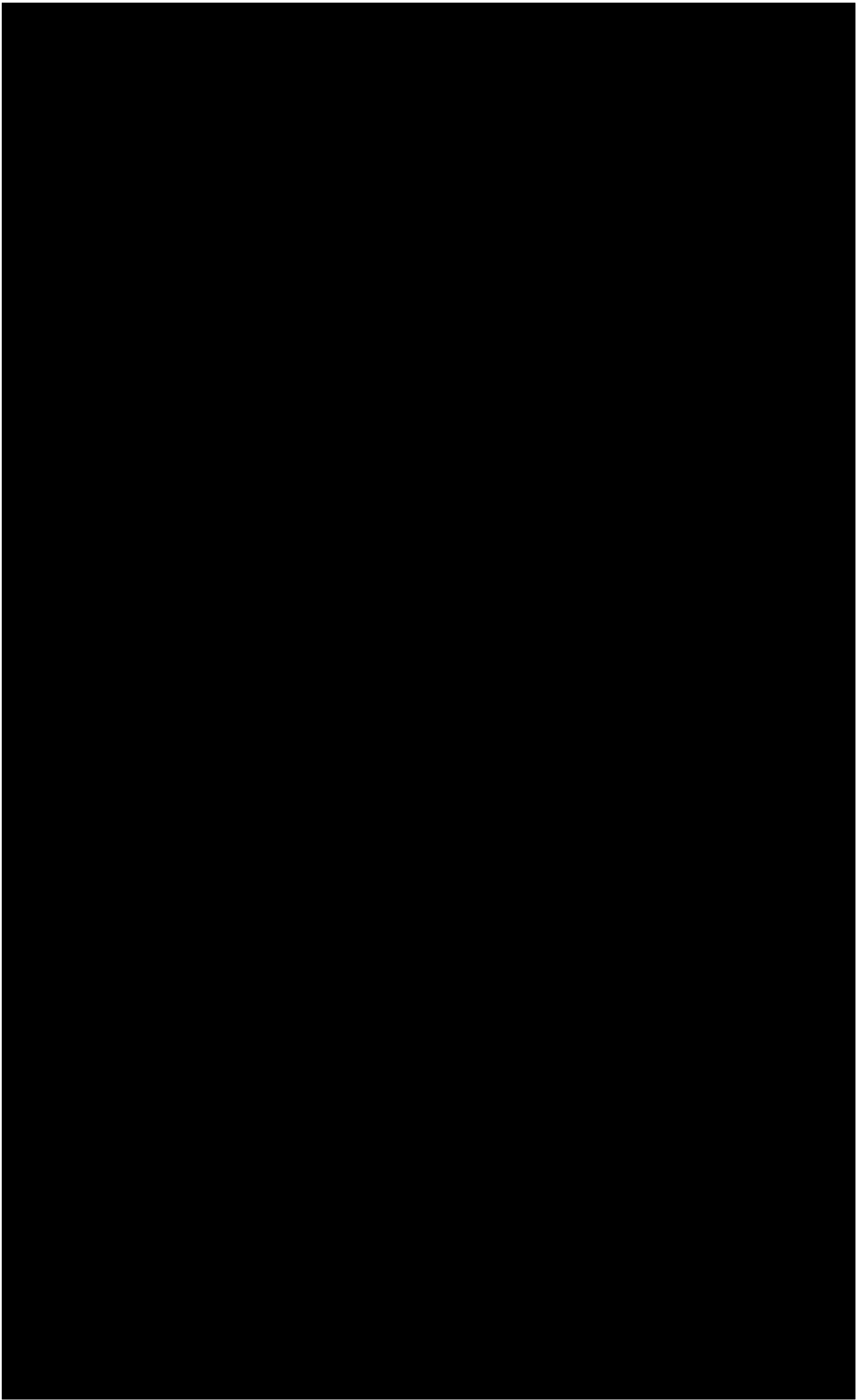


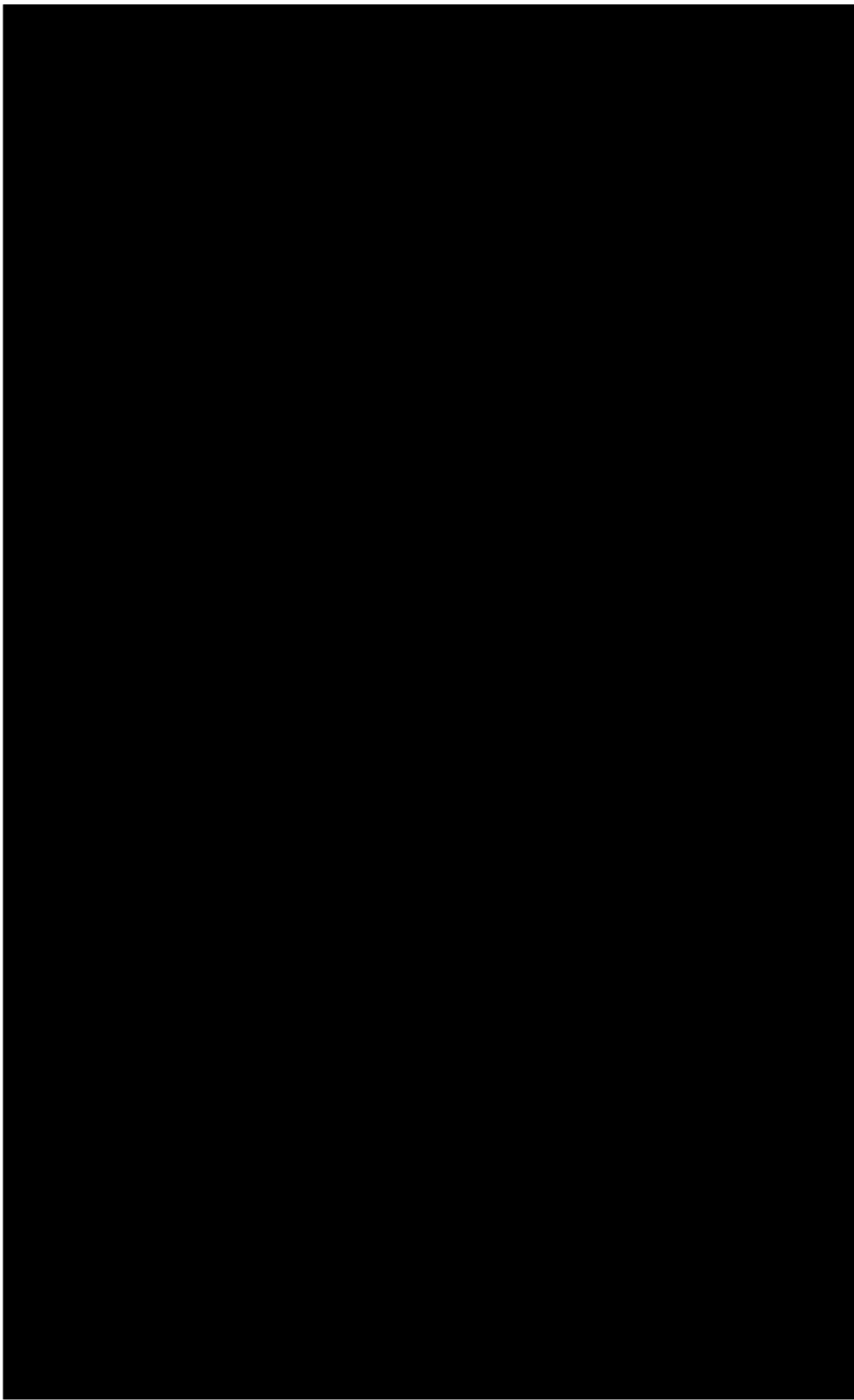


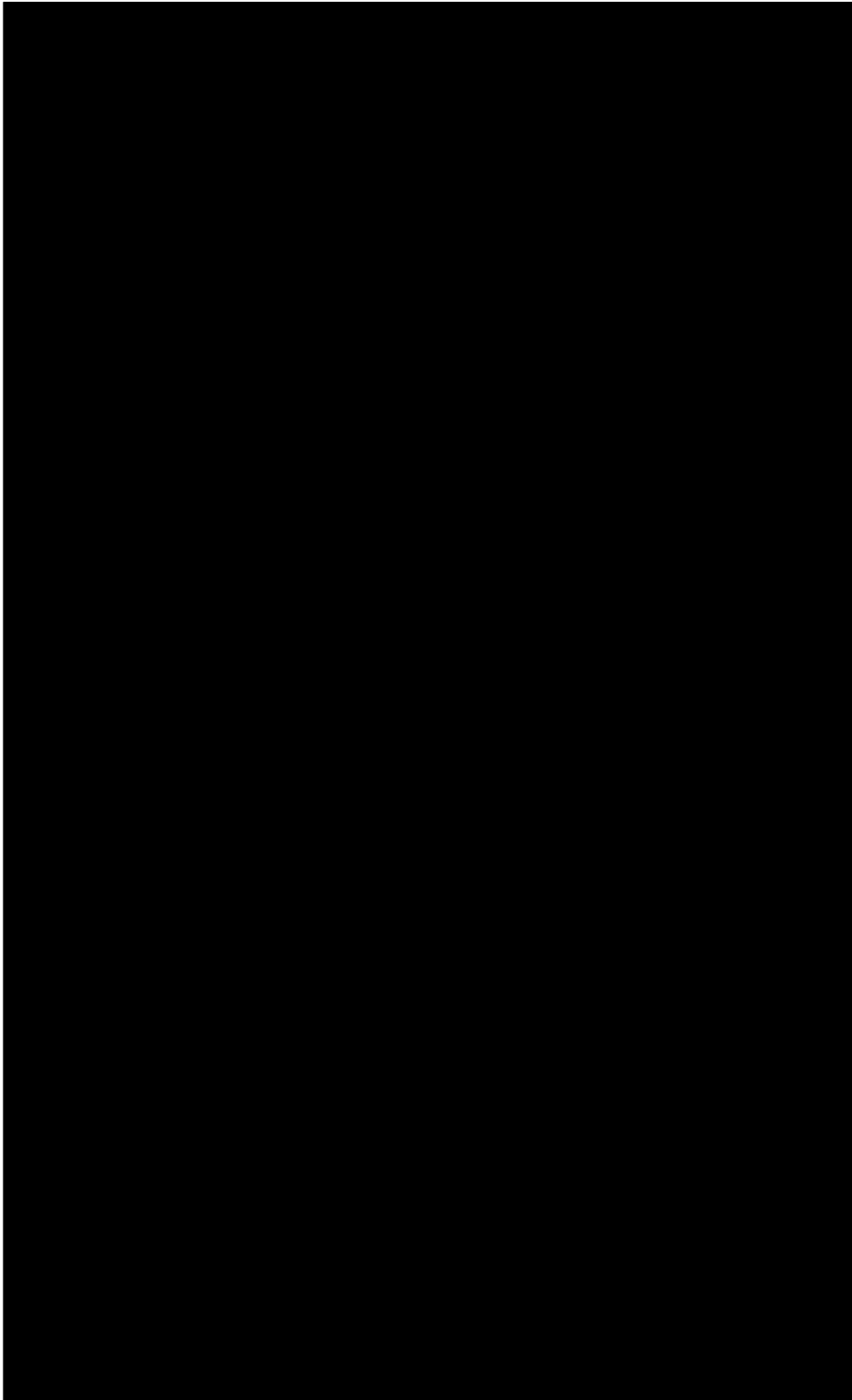


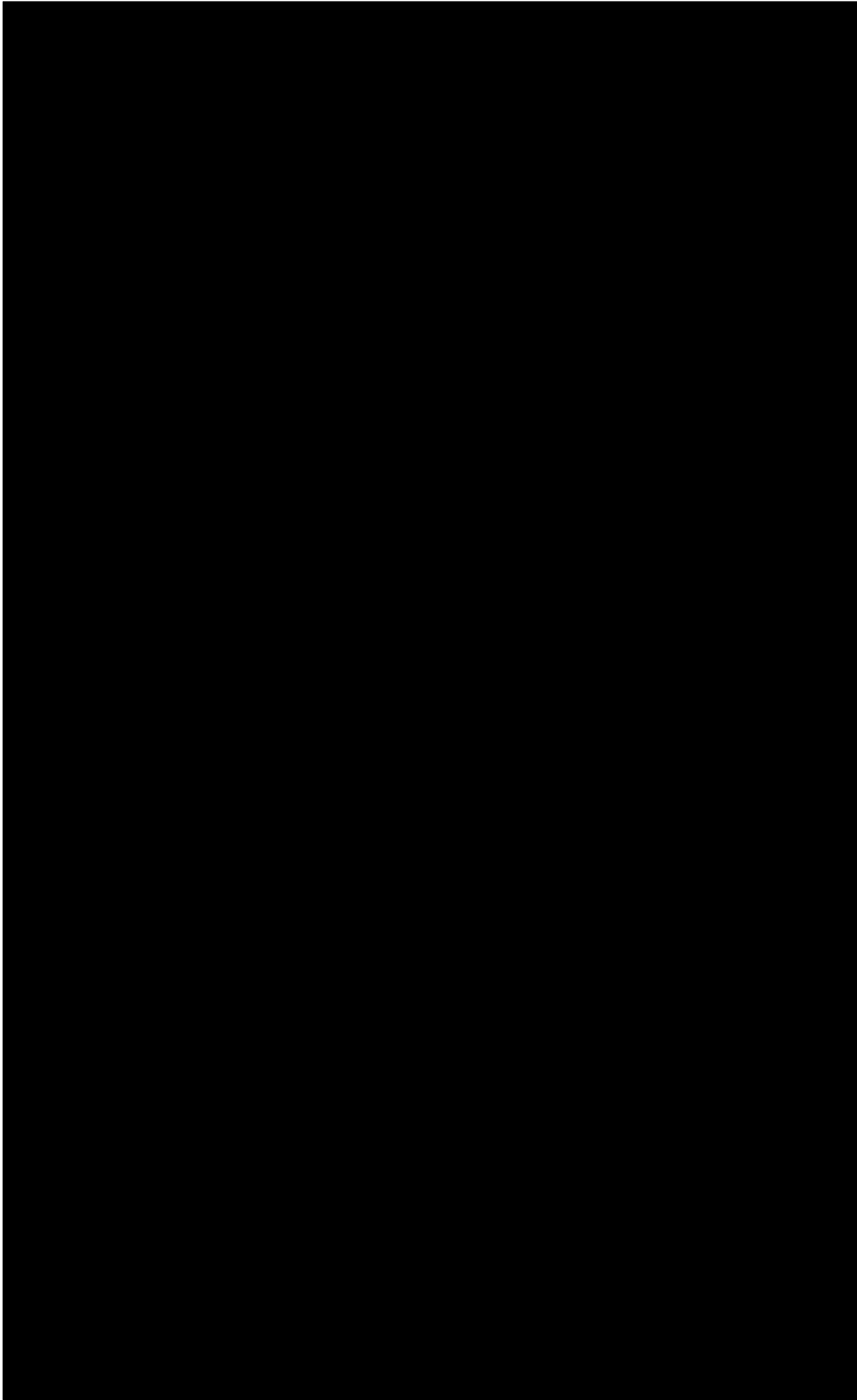


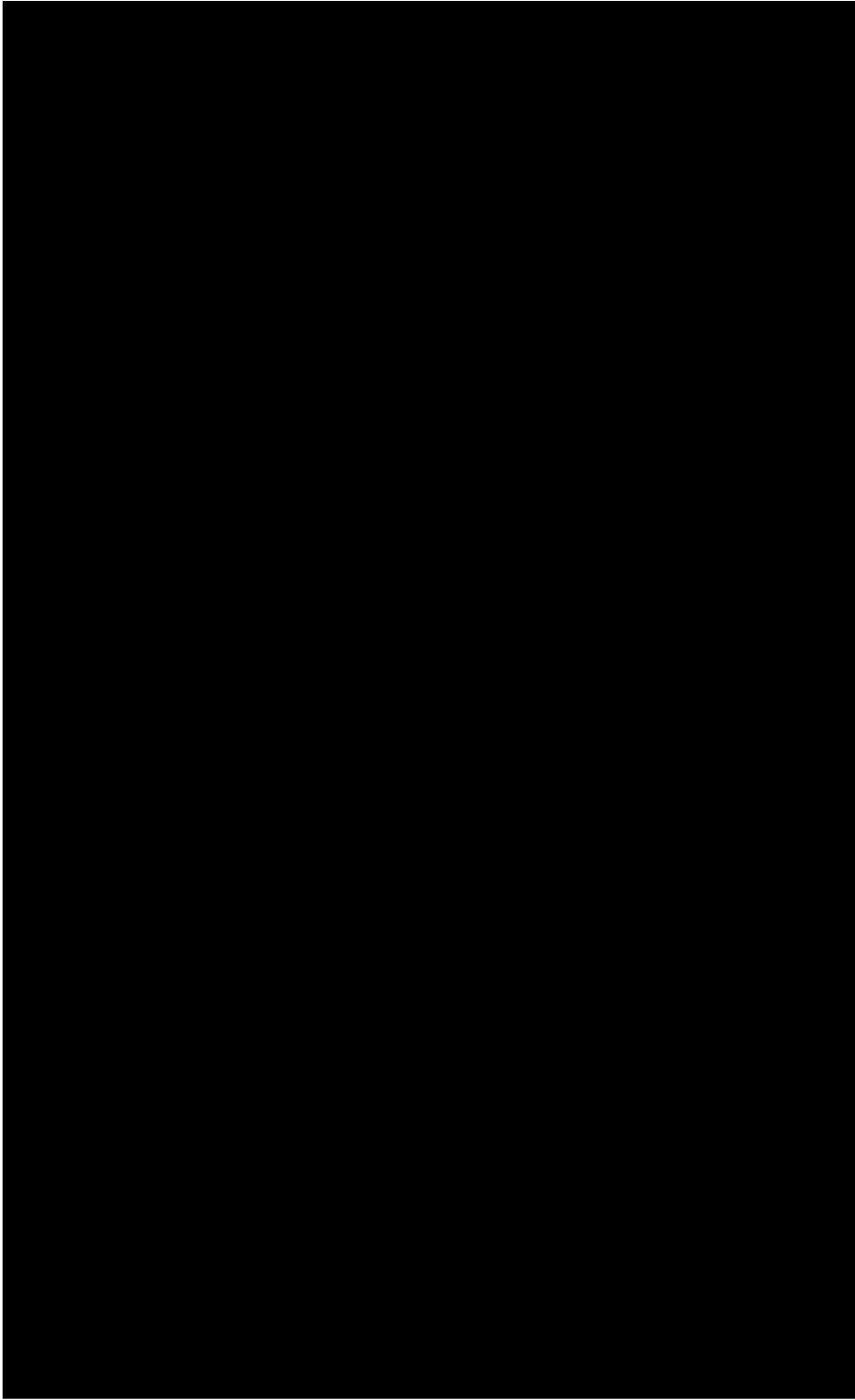


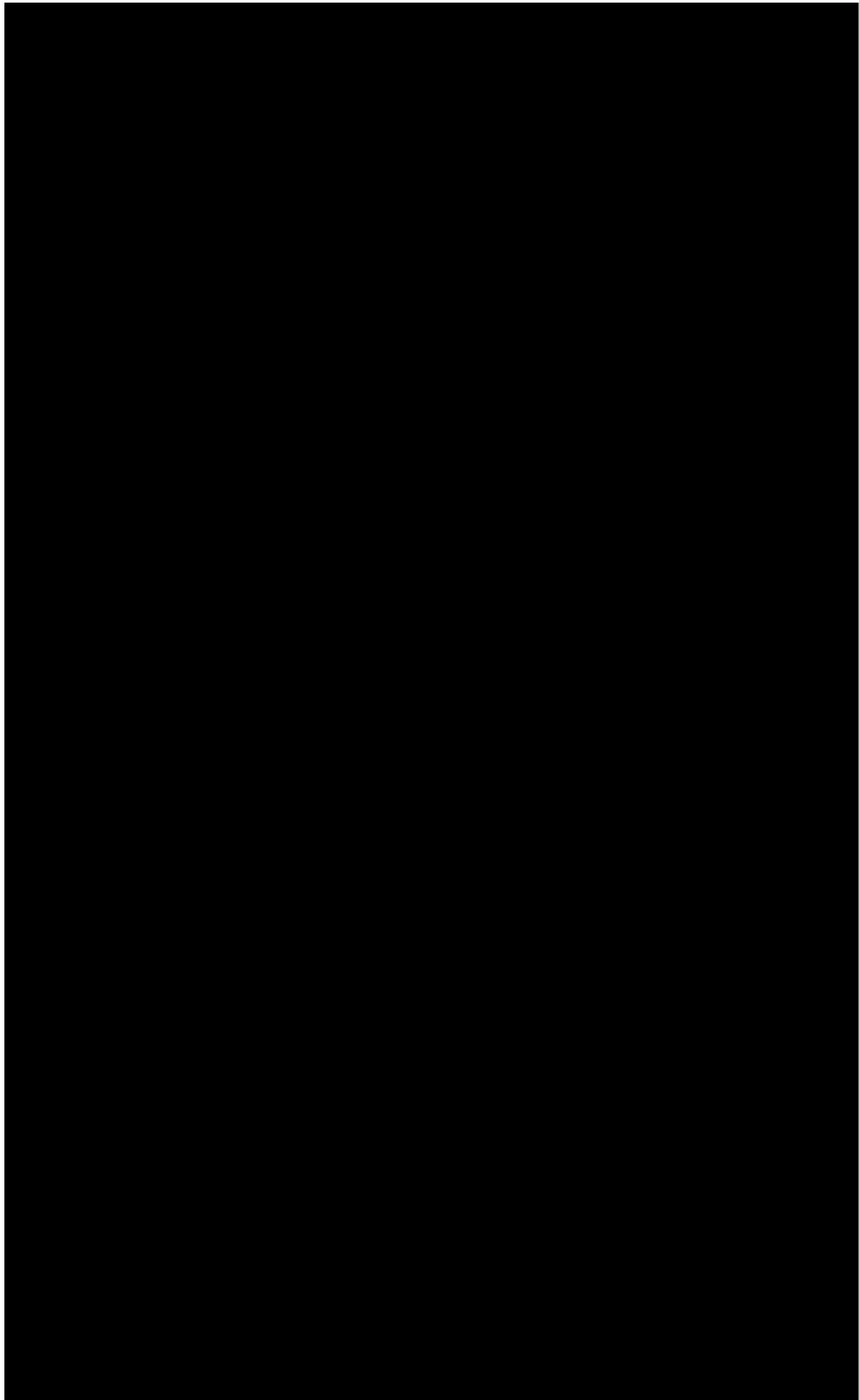


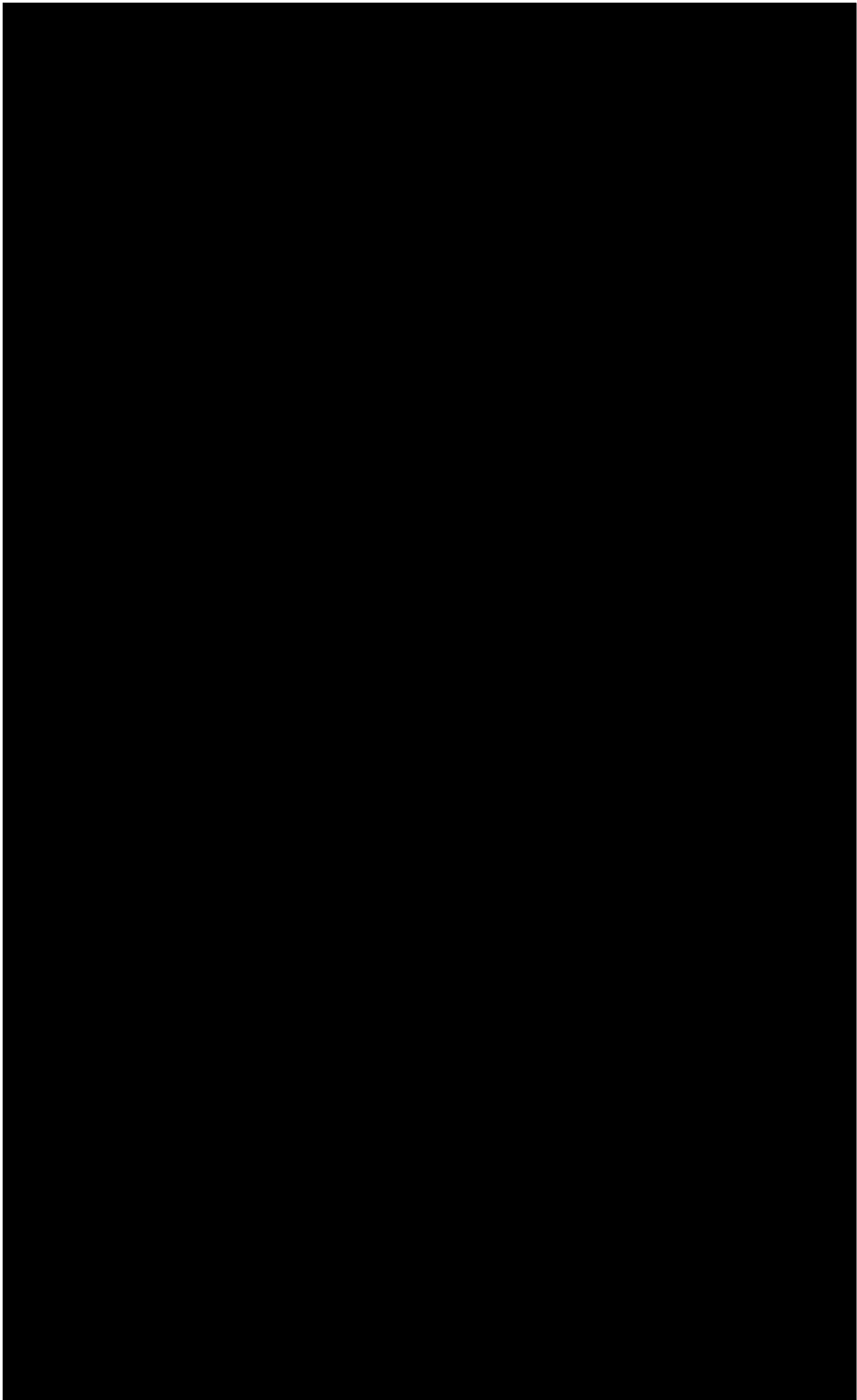


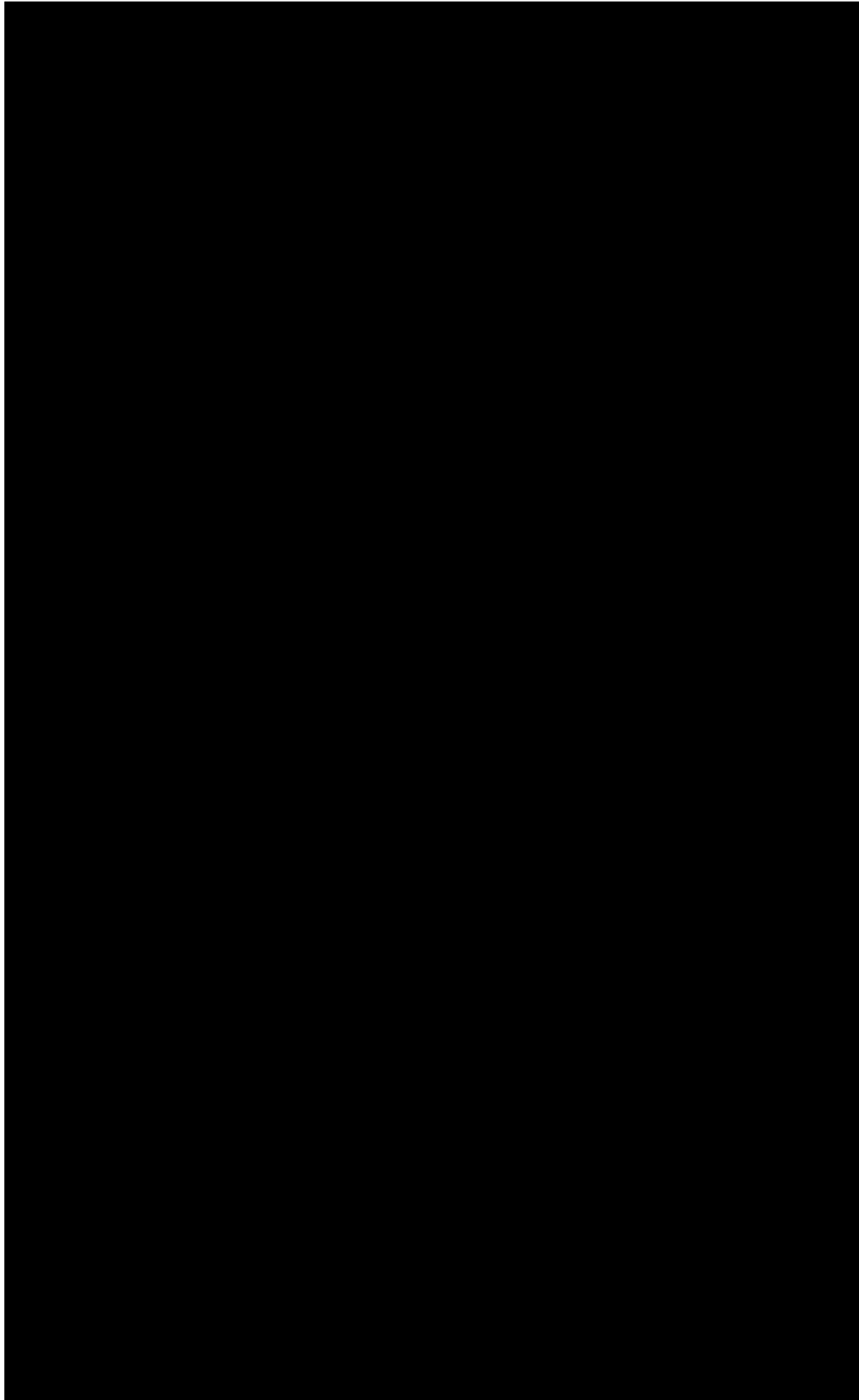


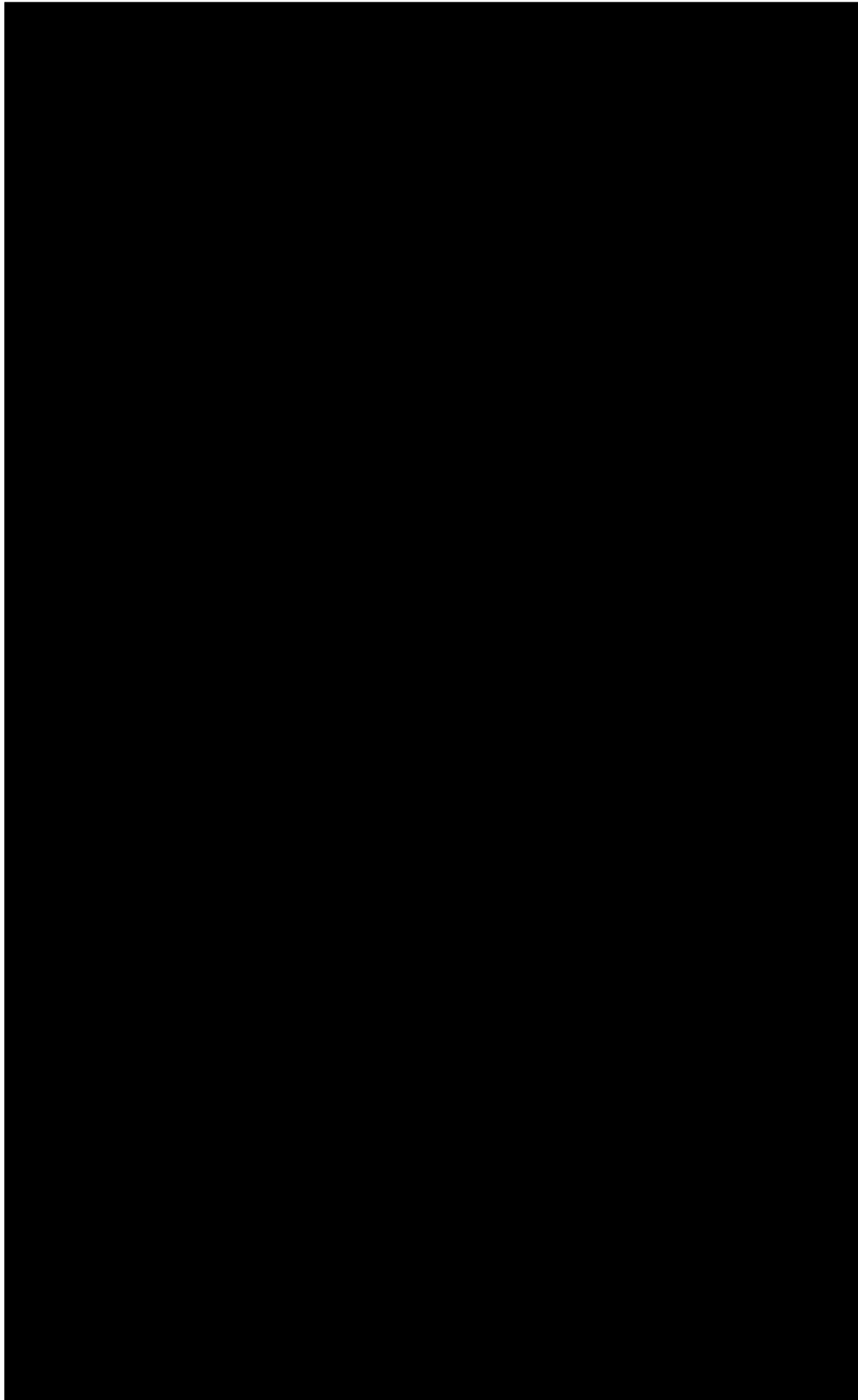


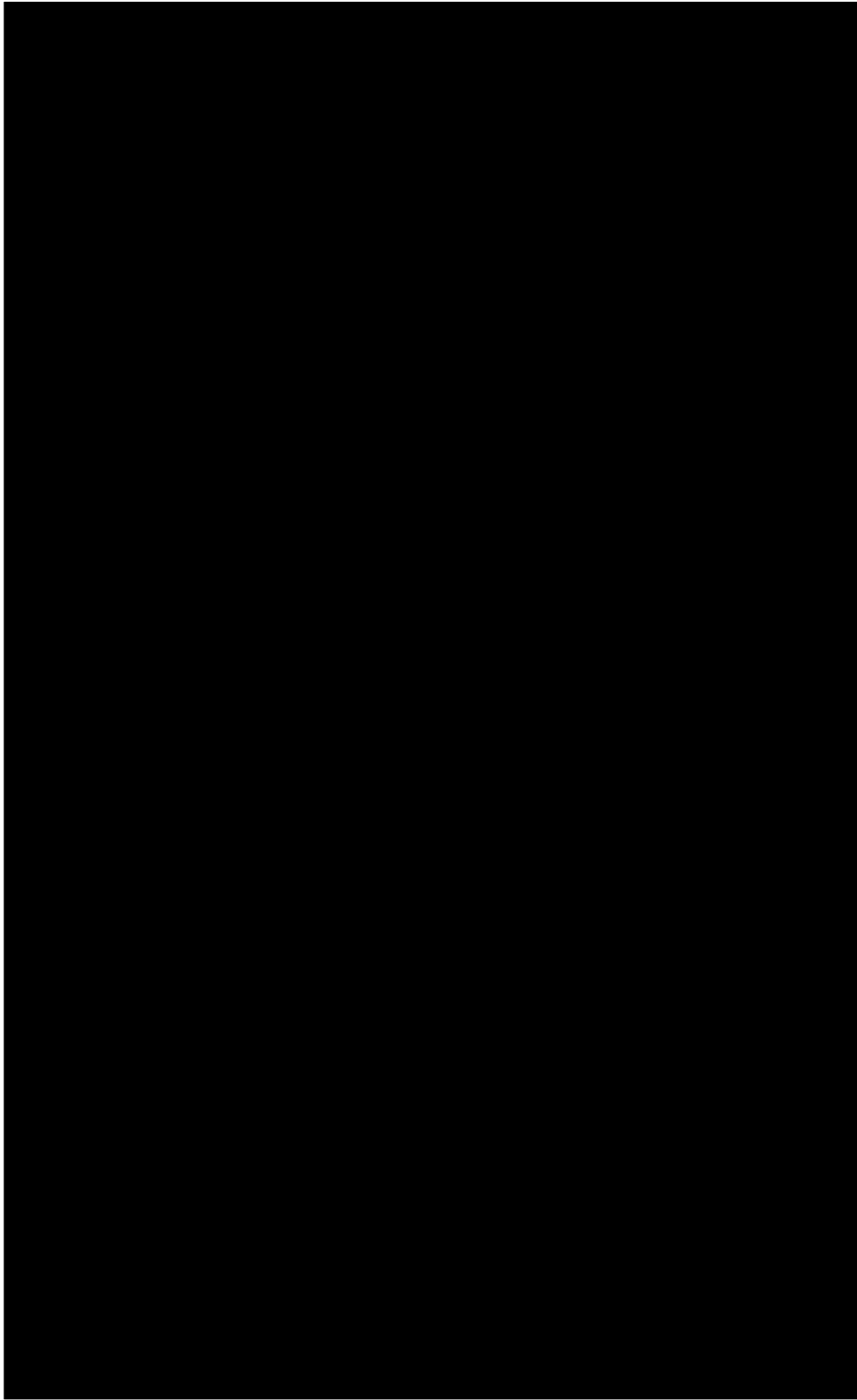


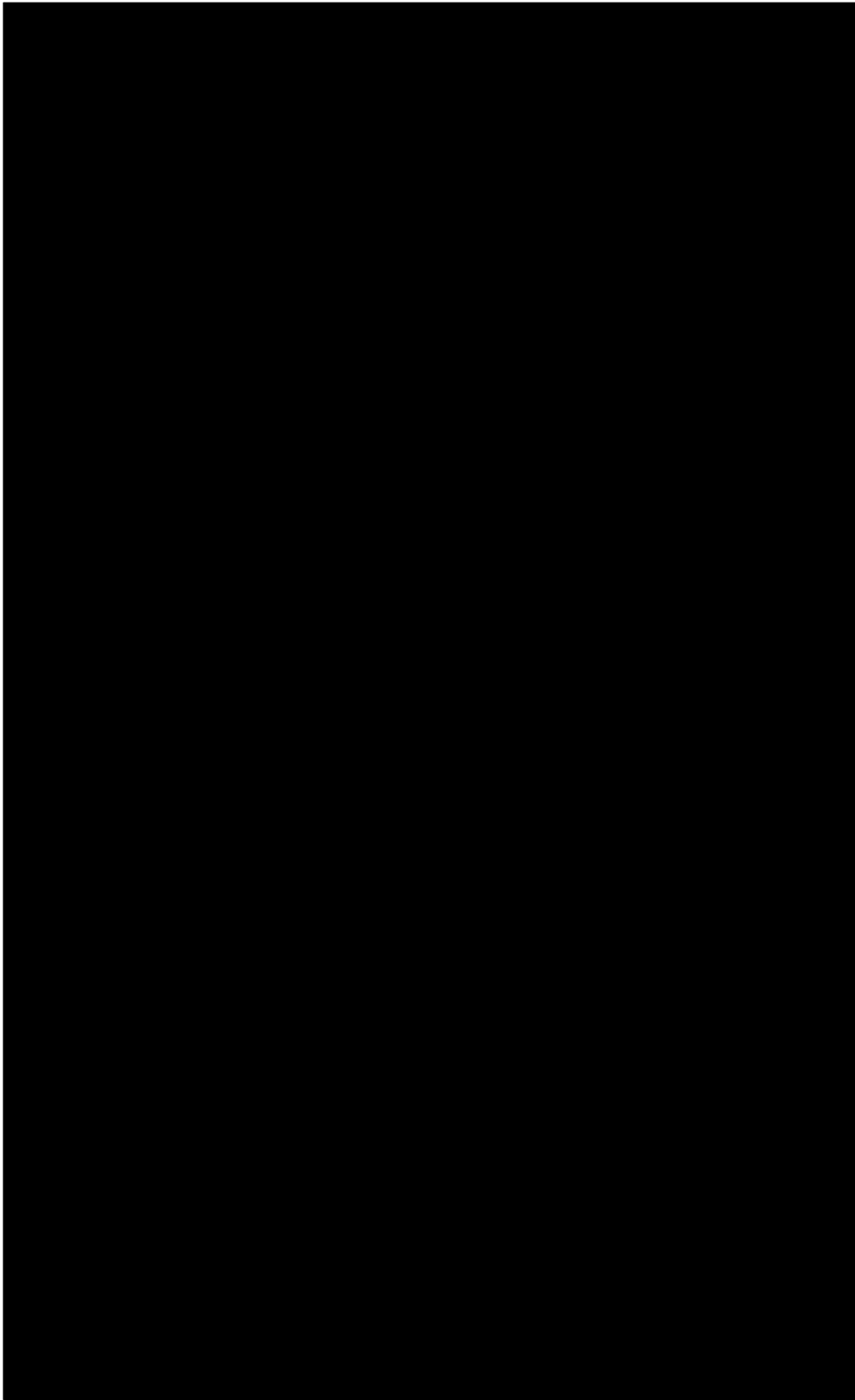


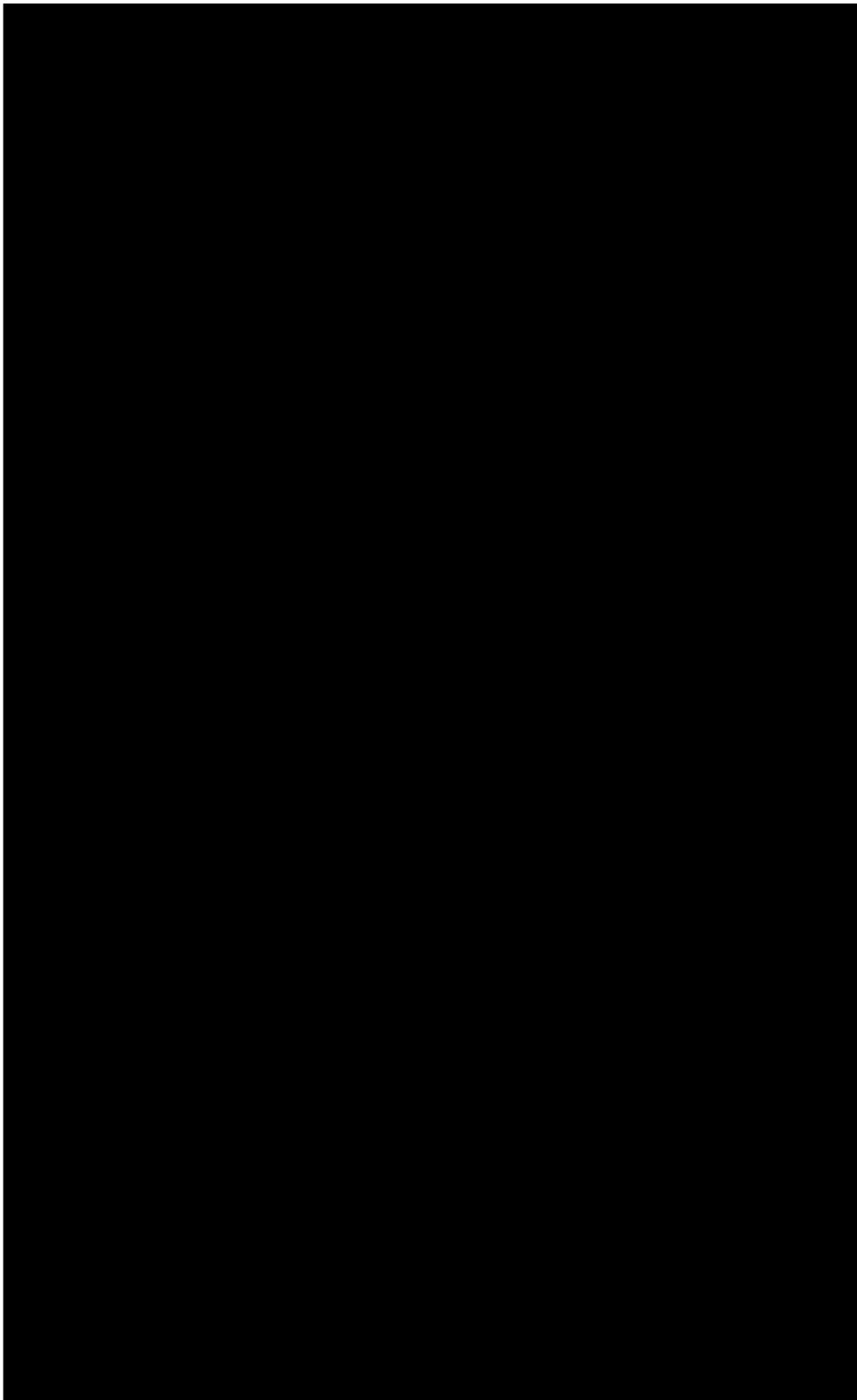


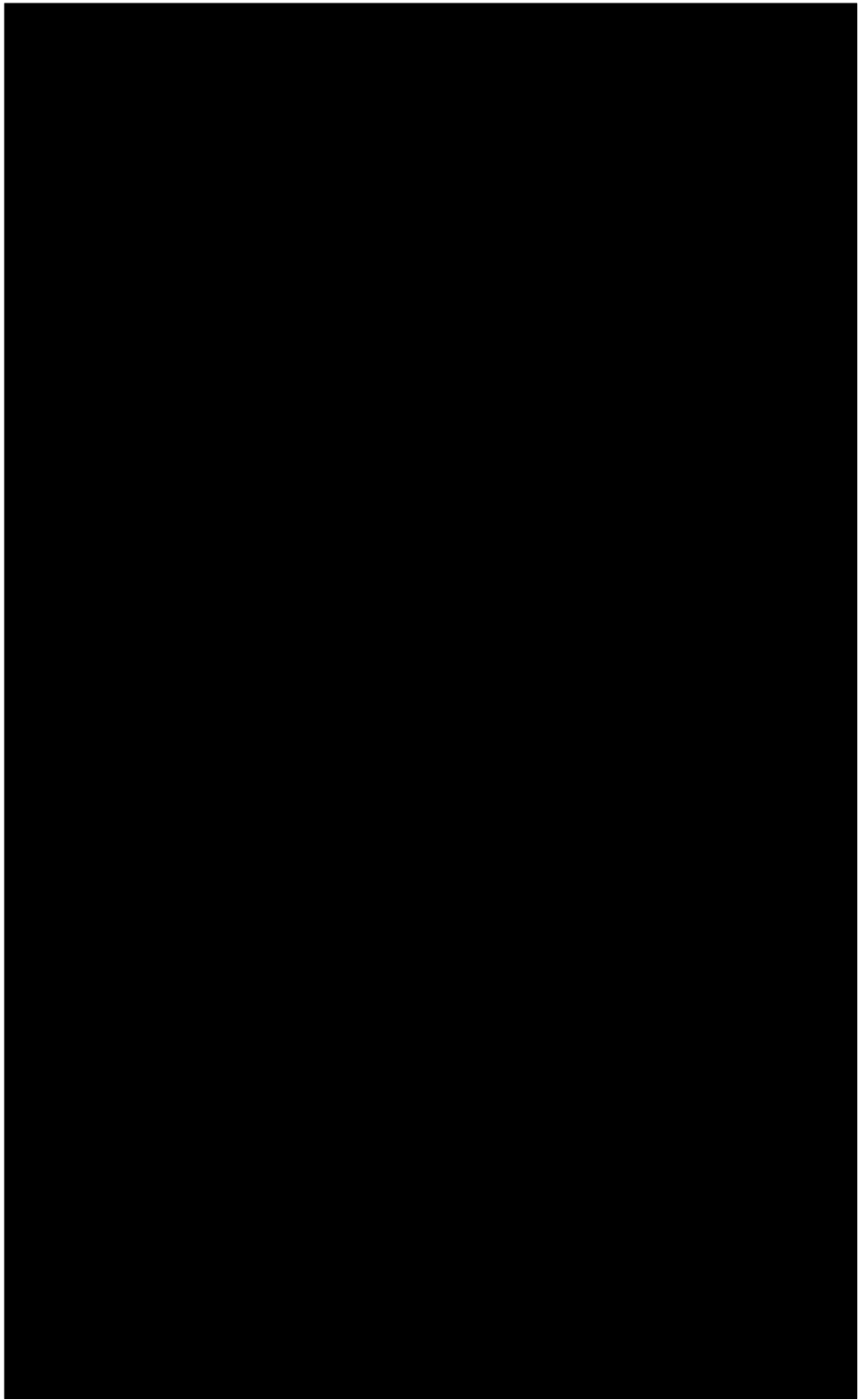


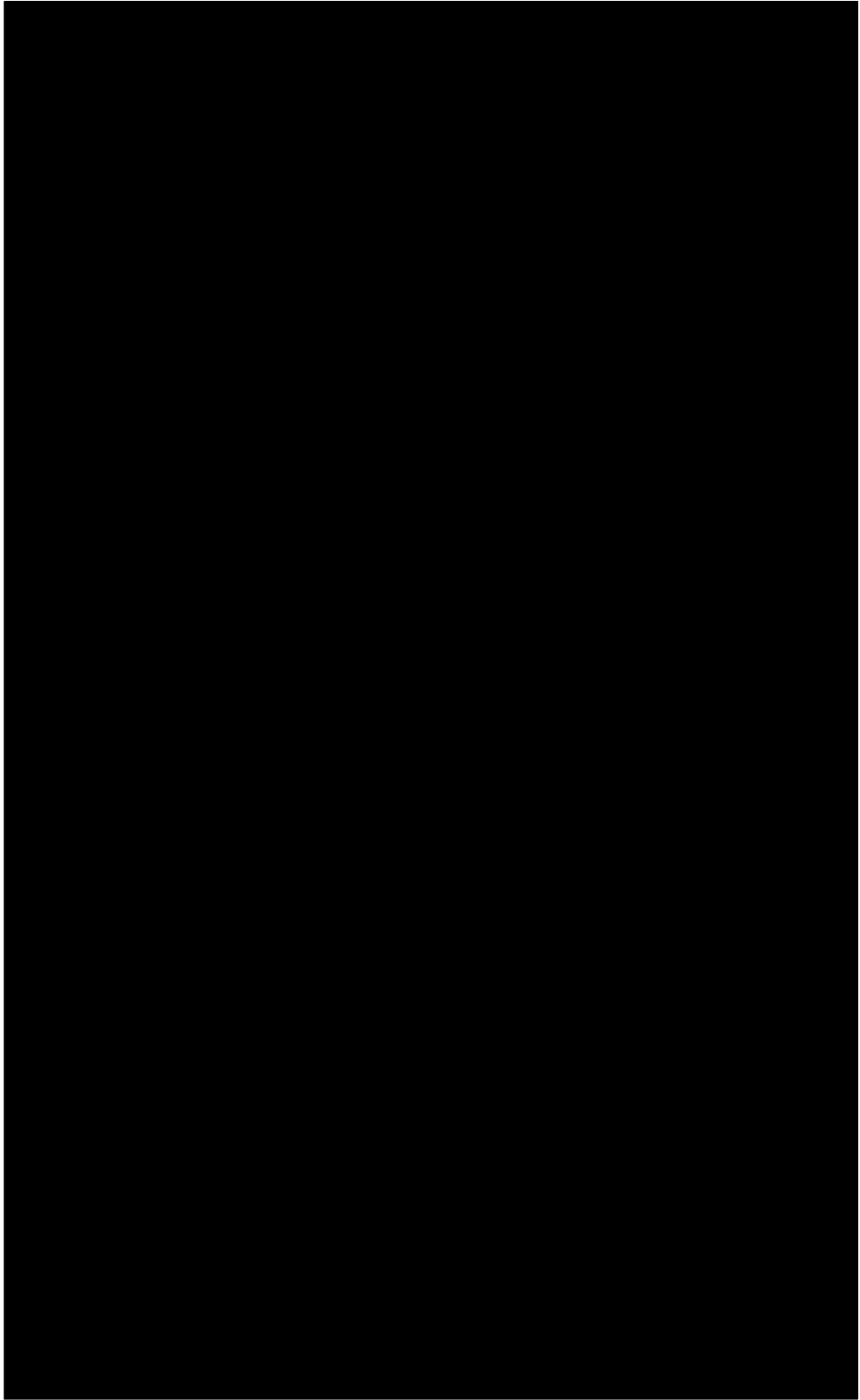


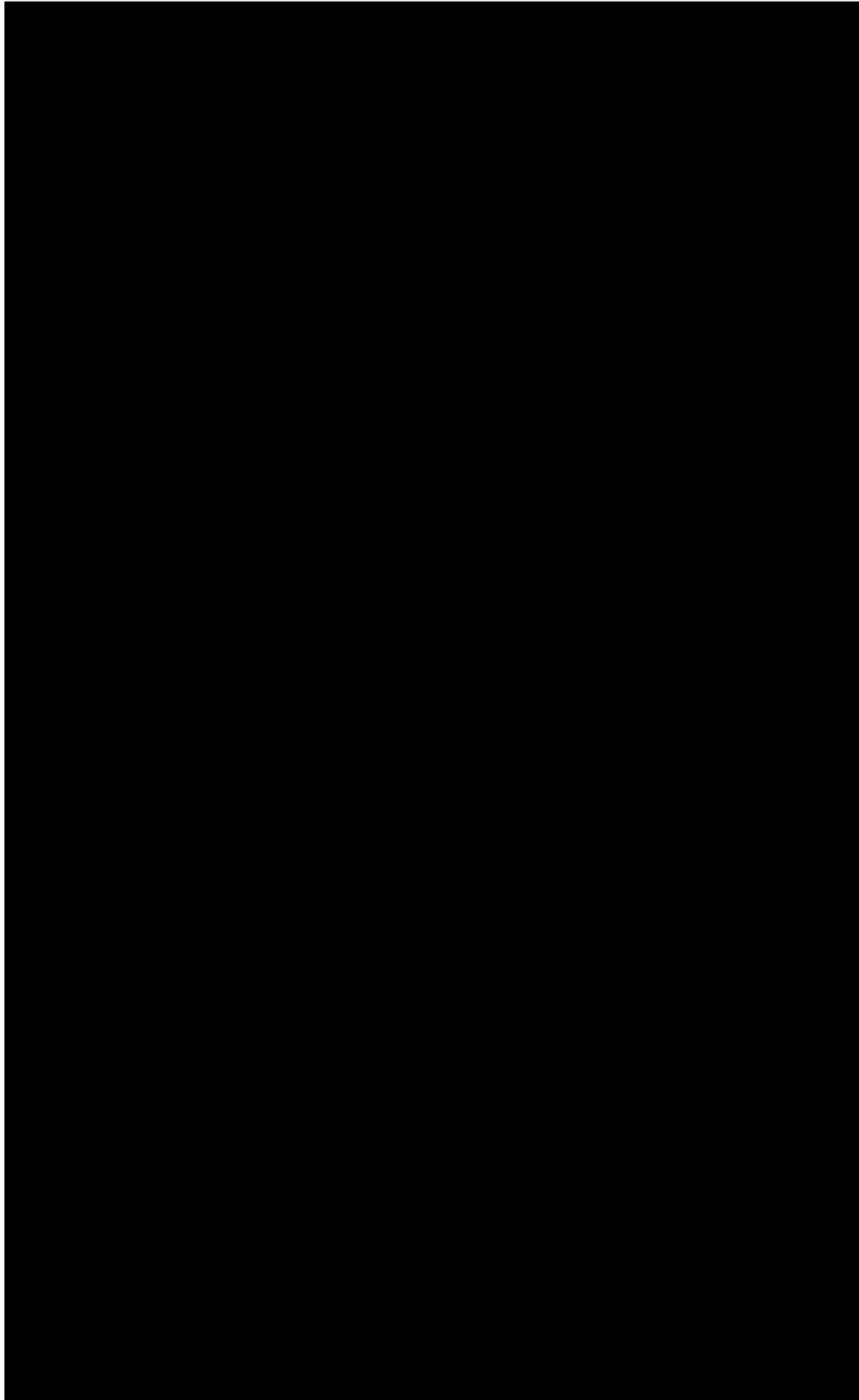


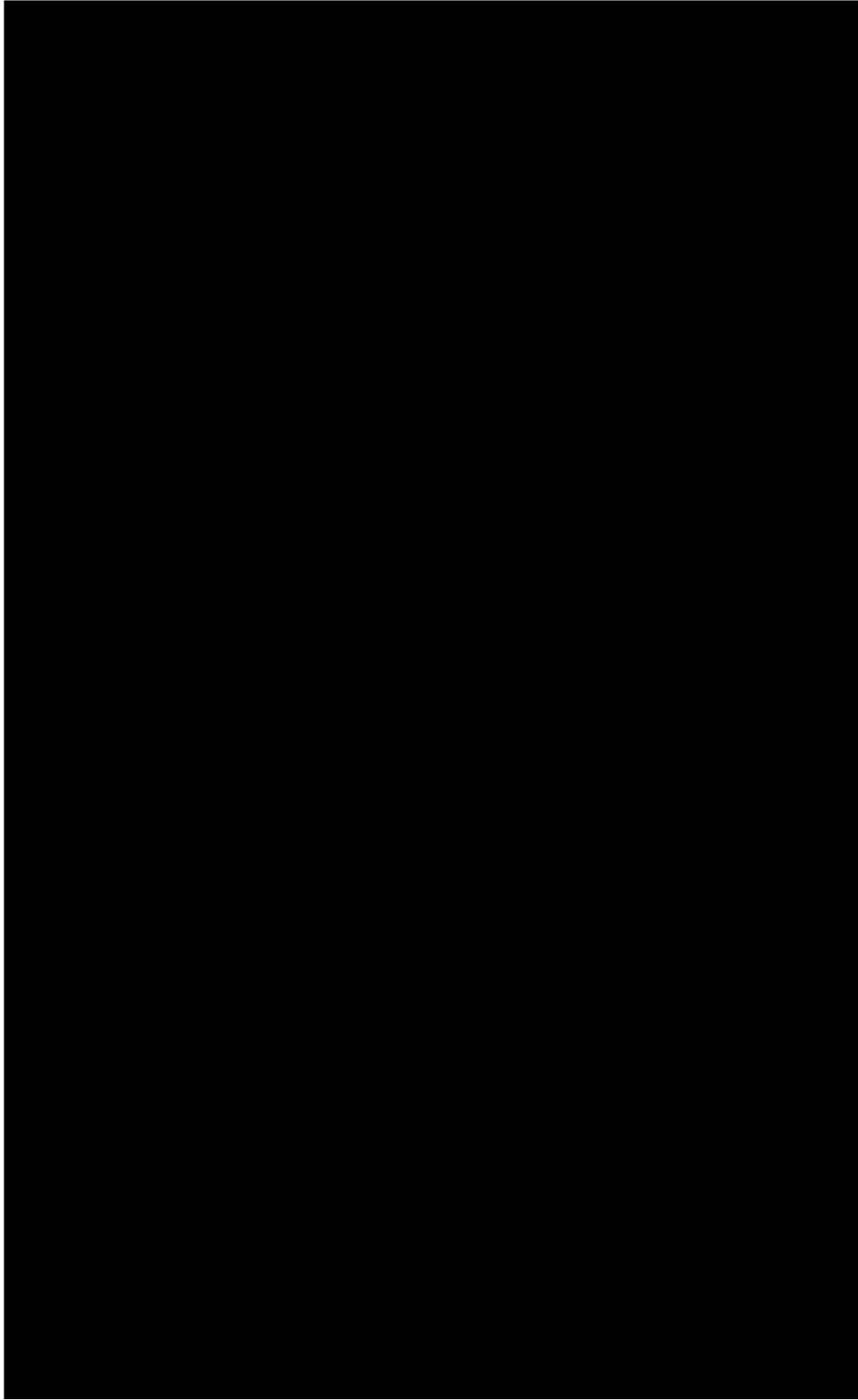


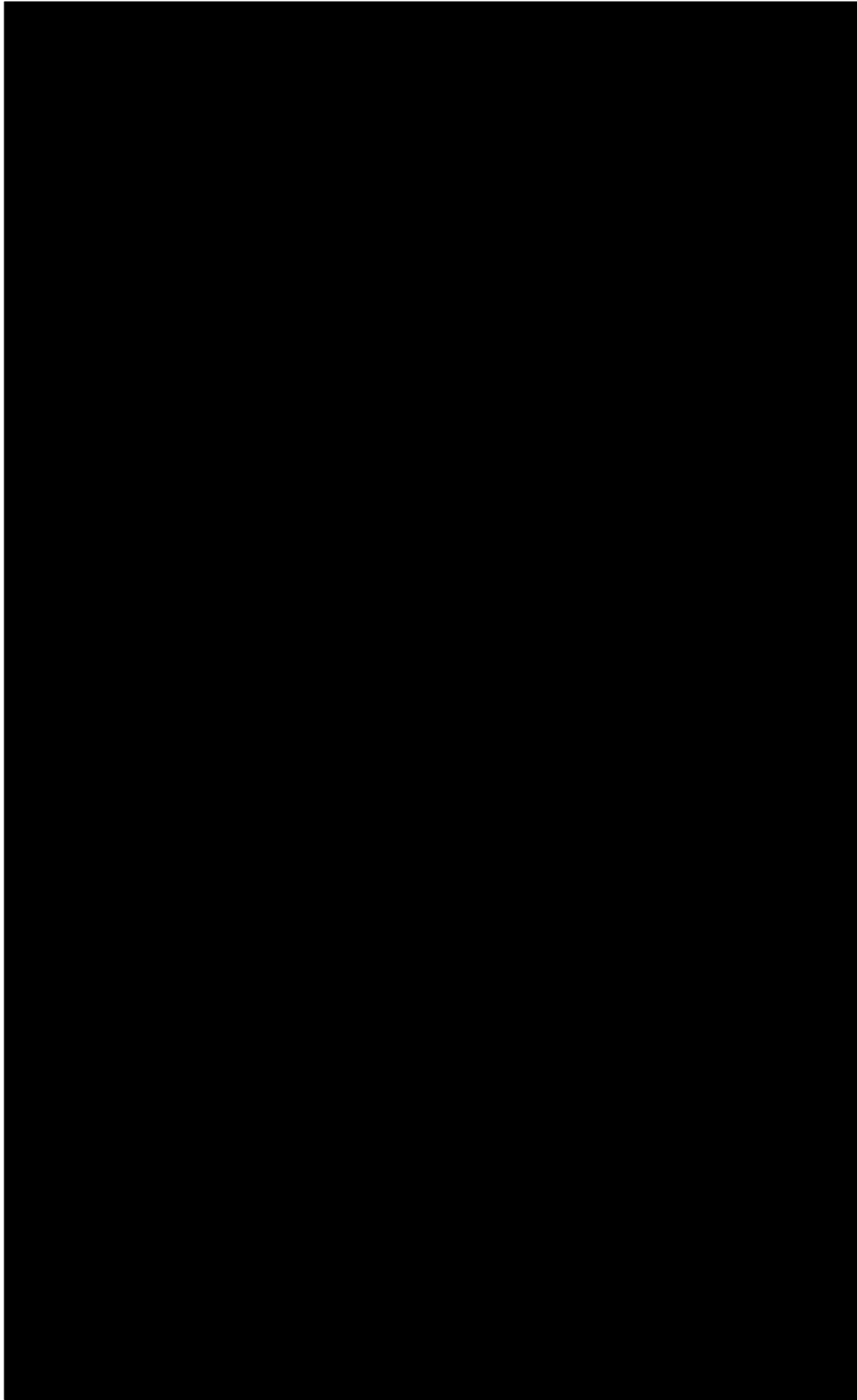


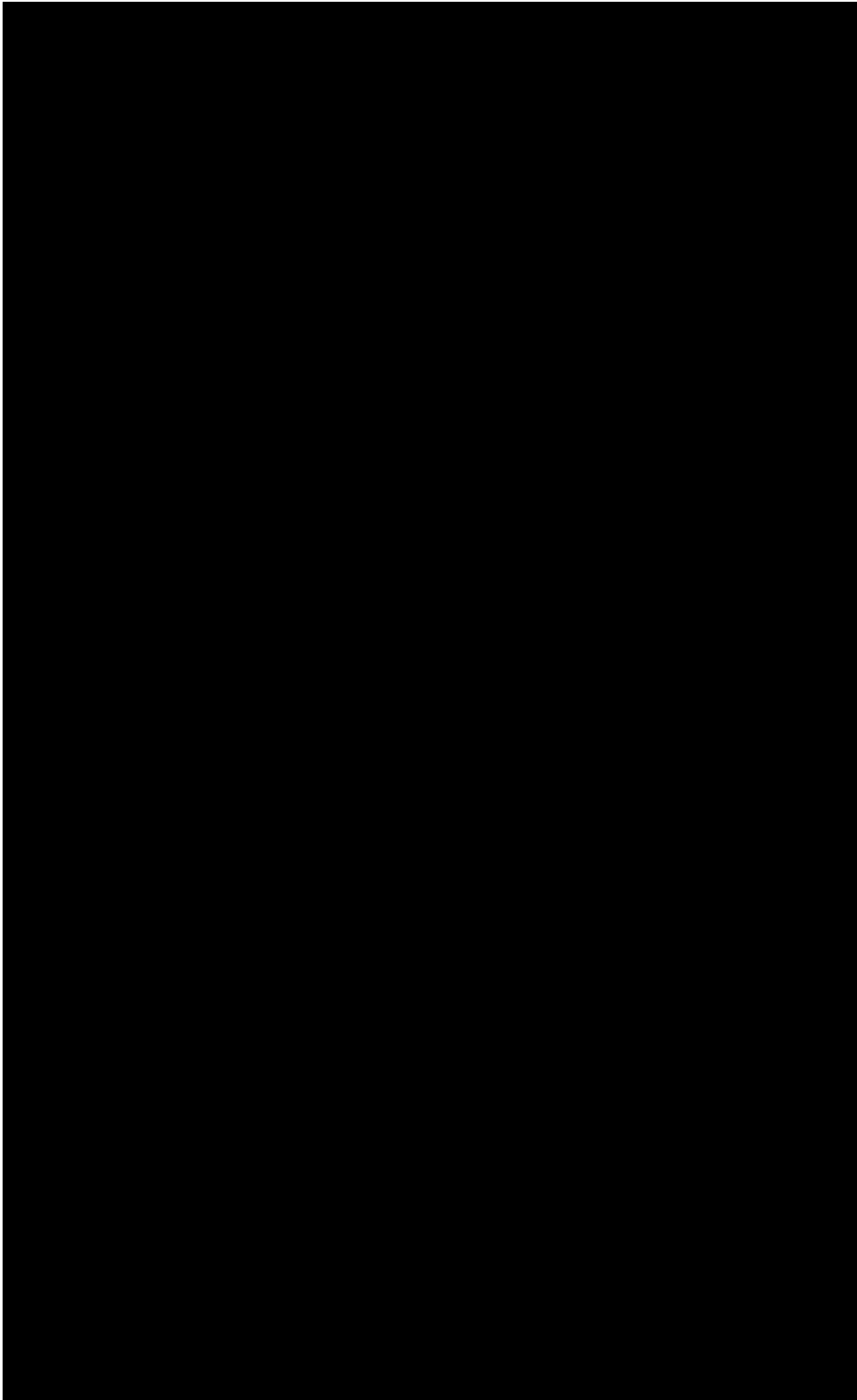


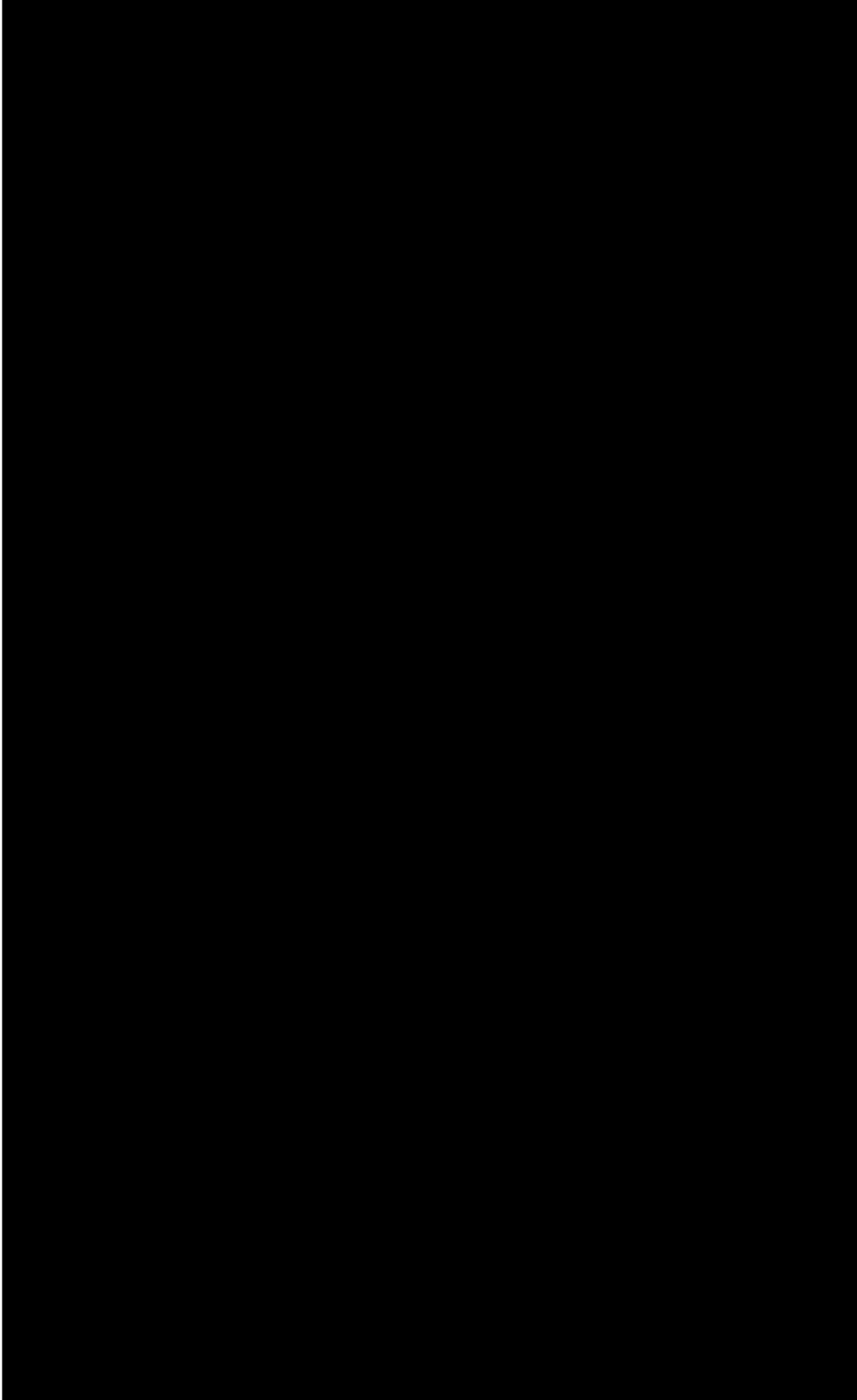


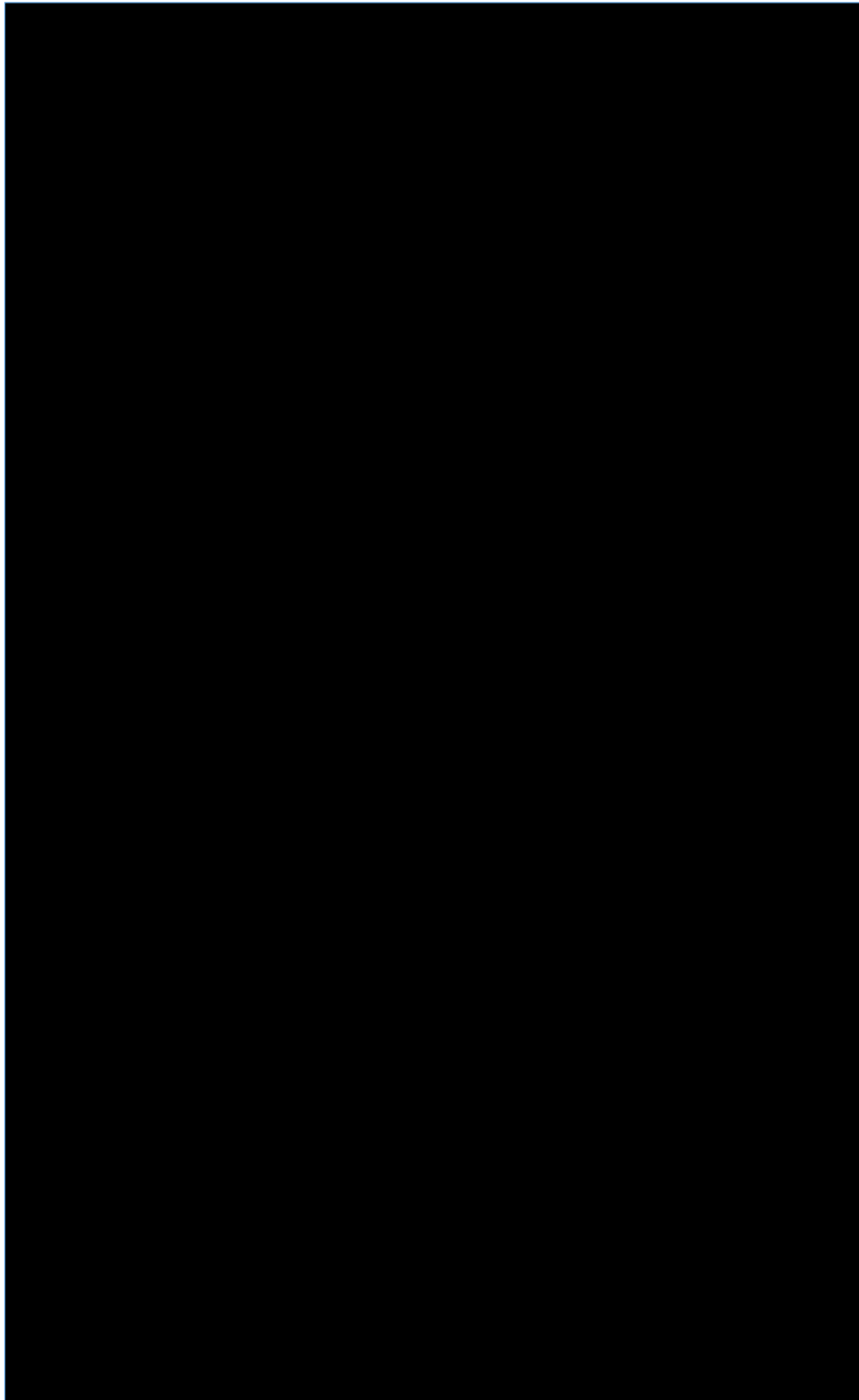


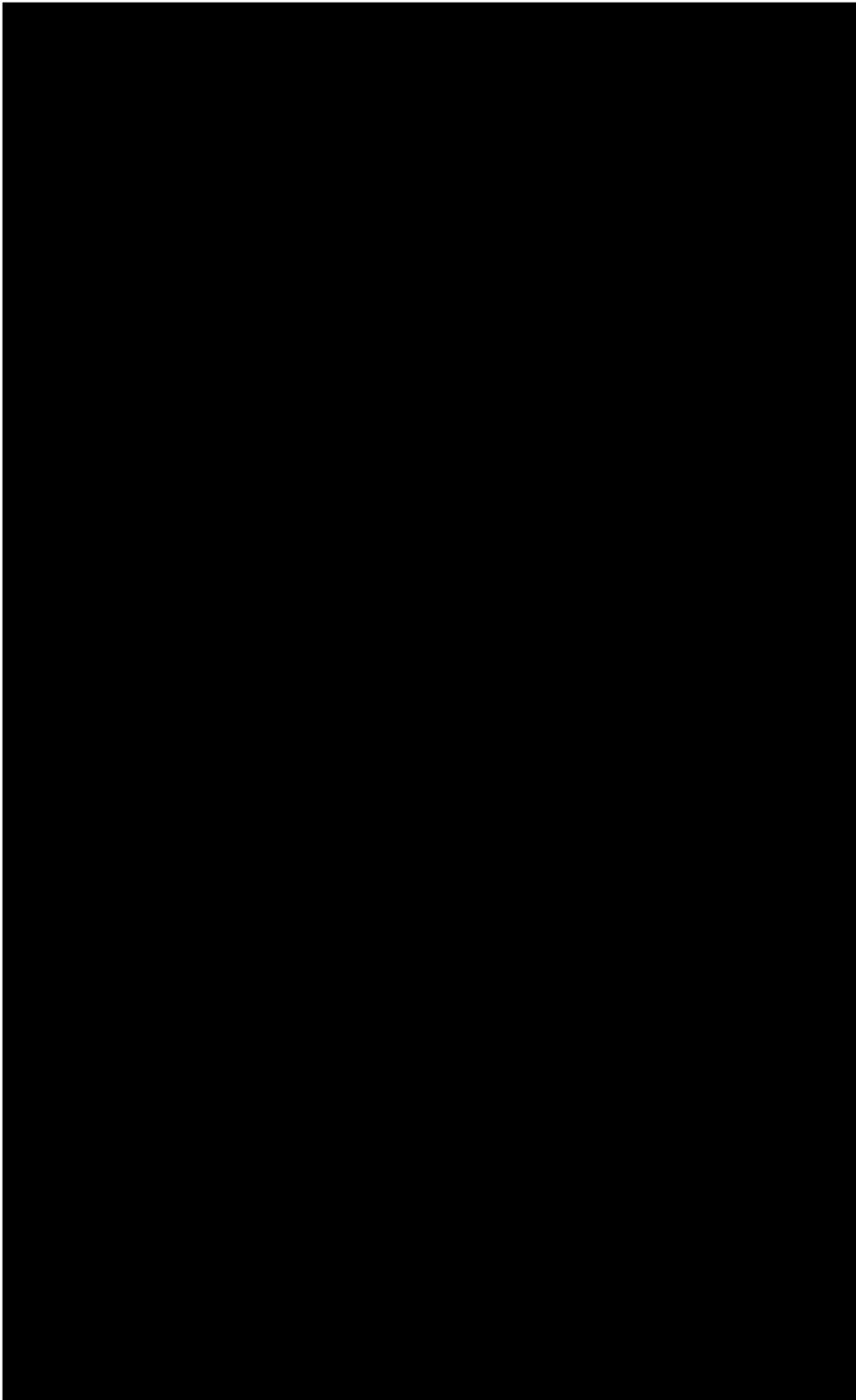












Attachment 26
Expert Opinion on Increased WBM Discharge



Marine Ventures International

147 Bar Yehuda Ave.
Nesher 3688306
Israel

Phone: +972 50 4943754

MEMORANDUM

Date: [REDACTED]
To: [REDACTED]
From: [REDACTED]
Subject: [REDACTED]

INTRODUCTION

[REDACTED]

[REDACTED]

[REDACTED]

REVIEW OF TAMAR SW-1 DATA

[REDACTED]

[REDACTED]

POTENTIAL DIFFERENCES BETWEEN TAMAR-SW AND LEVIATHAN DRILLING PROGRAMS

[REDACTED]

Water Depth

[REDACTED]

WBM Formulation

[REDACTED]

Volume of WBM and Barite Discharged

[REDACTED]

Table 1. WBM volumes from comparable well approvals and actual discharge volumes.

Drilling site	WBM Volume - according to the Discharge Permits		Barite - according to the Discharge Permit applications	
	Total (m³)	Riserless (m³)	Total (tonne)	Riserless (tonne)
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Discharge of Barite and Trace Metals

[REDACTED]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

Distance Offshore

[Redacted text block]

Cumulative Impacts

[Redacted]

Biological or Physical Characteristics of the Sites

[Redacted]

[Redacted]

Depth of Discharge of Excess WBM

[Redacted]

[Redacted]

[Redacted]

[REDACTED]

Location of Discharge of Excess WBM

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

CONCLUSION

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

REFERENCES

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Attachment 1

Total Material Discharge - WBM + Brine		LEV 5/LEV 7	Toxicological	Ecotoxicity	Degradability	Bio-accumulation	Clarification	PLONOR
PRODUCT	FUNCTION	Total Weight Metric Tons						
[Redacted Content]								

Total Material Discharge - WBM + Brine		LEV 5/LEV 7	Toxicological	Ecotoxicity	Degradability	Bio-accumulation	Clarification	PLONOR
PRODUCT	FUNCTION	Total Weight Metric Tons						
[Redacted Content]								

ATTACHMENT 2

Barite - Drilling LEV 5 & LEV 7												
Sampling Date	Barite sample no.	Sample no.	Ag	As	Cd	Cr	Ni	Hg	Cu	Fe	Pb	Zn
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg

	WBM	Barite	Ag	As	Cd	Cr	Ni	Hg	Cu	Fe	Pb	Zn
	m ³	MT	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg