TRANSPERFECT

May 31, 2018

Certification

TransPerfect

QUALITY MANAGER'S DECLARATION:

I, Denise Marie Cochrane, hereby declare:

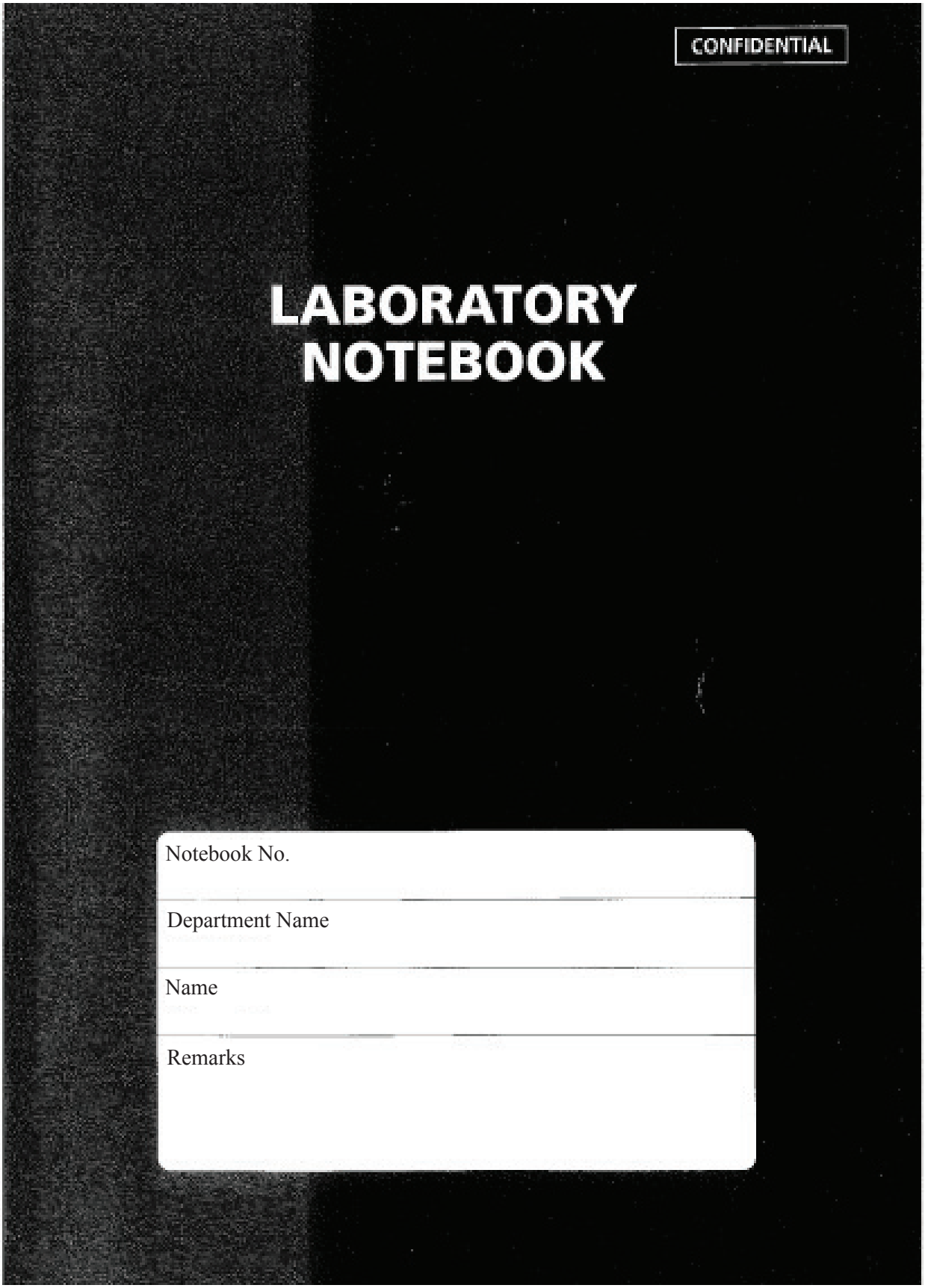
That I possess advanced knowledge of the Japanese and English languages. The attached Japanese into English translation has been translated by TransPerfect and reviewed by me and, to the best of my knowledge and belief, it is a true and accurate translation.

In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the patent which is under review in this proceeding.

Denise Marie Cochrane

NICHIA EXHIBIT 2350
Vizio, Inc. v. Nichia Corp.
Case IPR2017-01623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NOTEBOOK
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Department Name
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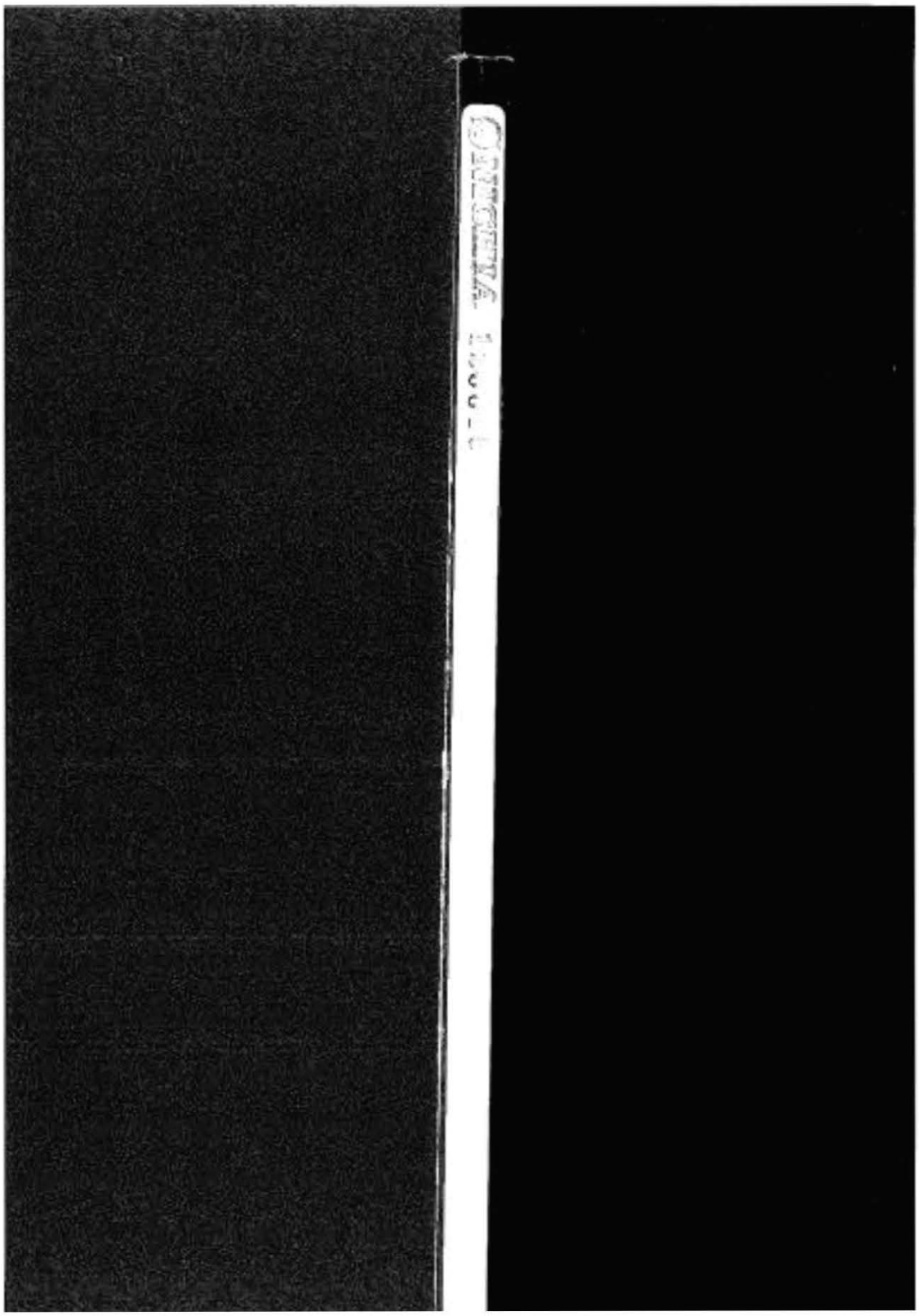
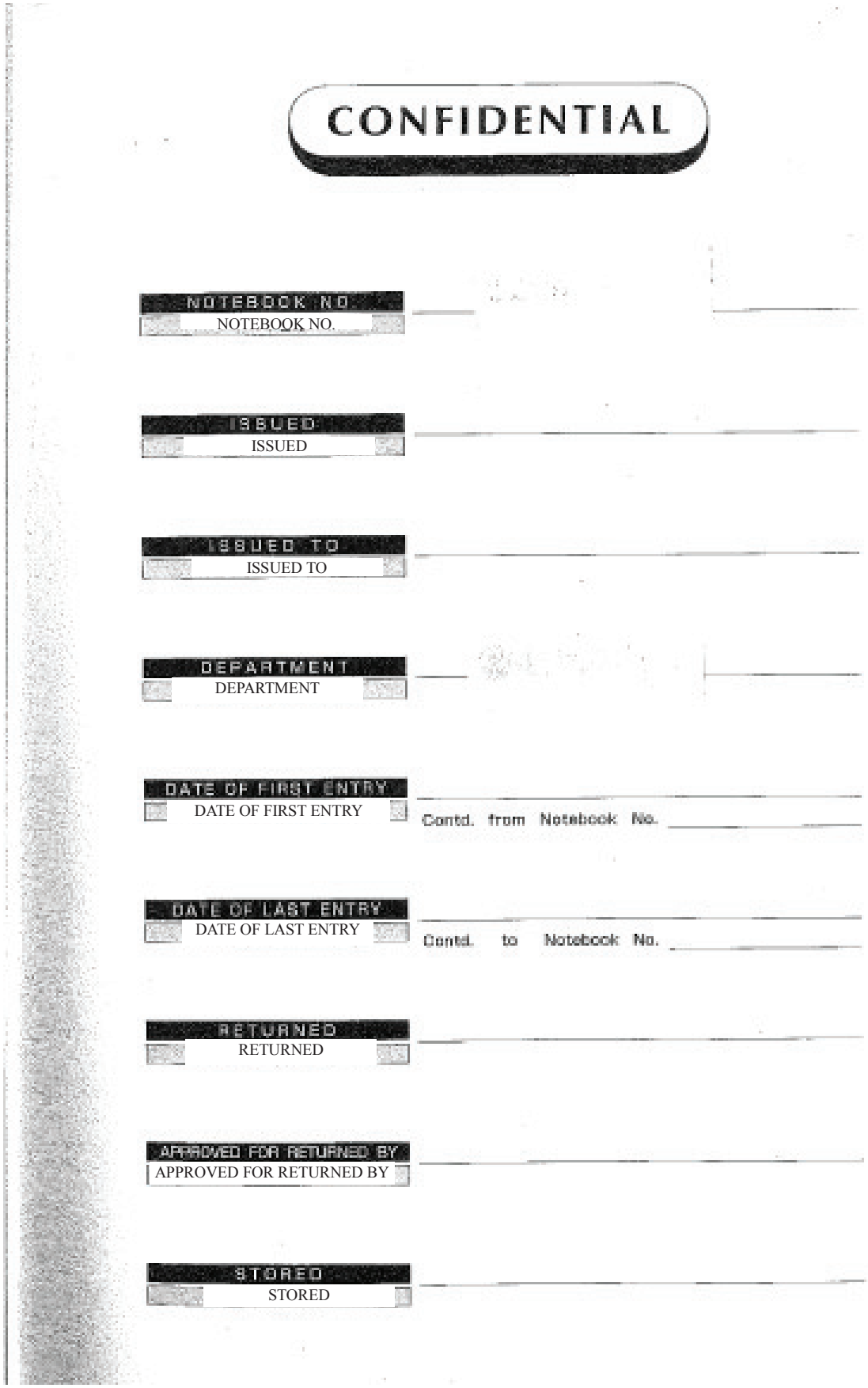


LABORATORY NOTEBOOK

2007-5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Guideline for LABORATORY NOTEBOOK Entry and Management

-- Introduction --

This LABORATORY NOTEBOOK is for recording research and development activities of researchers and inventors by themselves. This LABORATORY NOTEBOOK is a valuable asset of the company, and at the same time, it can be used as a proof material necessary for proof of the date of the invention. Therefore, at the time of recording, it is necessary to be recorded to a degree where a person skilled in the art can easily understand the idea of the technical concept as an invention (Conception), the background leading to the idea and continuous research activities (Diligence), and its practicality (Reduction to Practice), that is, means and methods for realizing the conceived technique and concept.

- Notes-

1. Issuance (Management Department)

When issuing LABORATORY NOTEBOOK to researchers and inventors, fill out the necessary items (issue date, LABORATORY NOTEBOOK number, issuer name, names of researchers and inventors, and the like) in the management ledger.

2. Record (Recorder)

a. Use a pen or ballpoint pen (black or blue ink) for recording. Pencils are not allowed.

b. Researchers and inventors fill out necessary items such as name, LABORATORY NOTEBOOK lending date, and date of first entry.

c. In the table of contents, fill out the necessary items such as record date, subject of the research and experiment, and recording page.

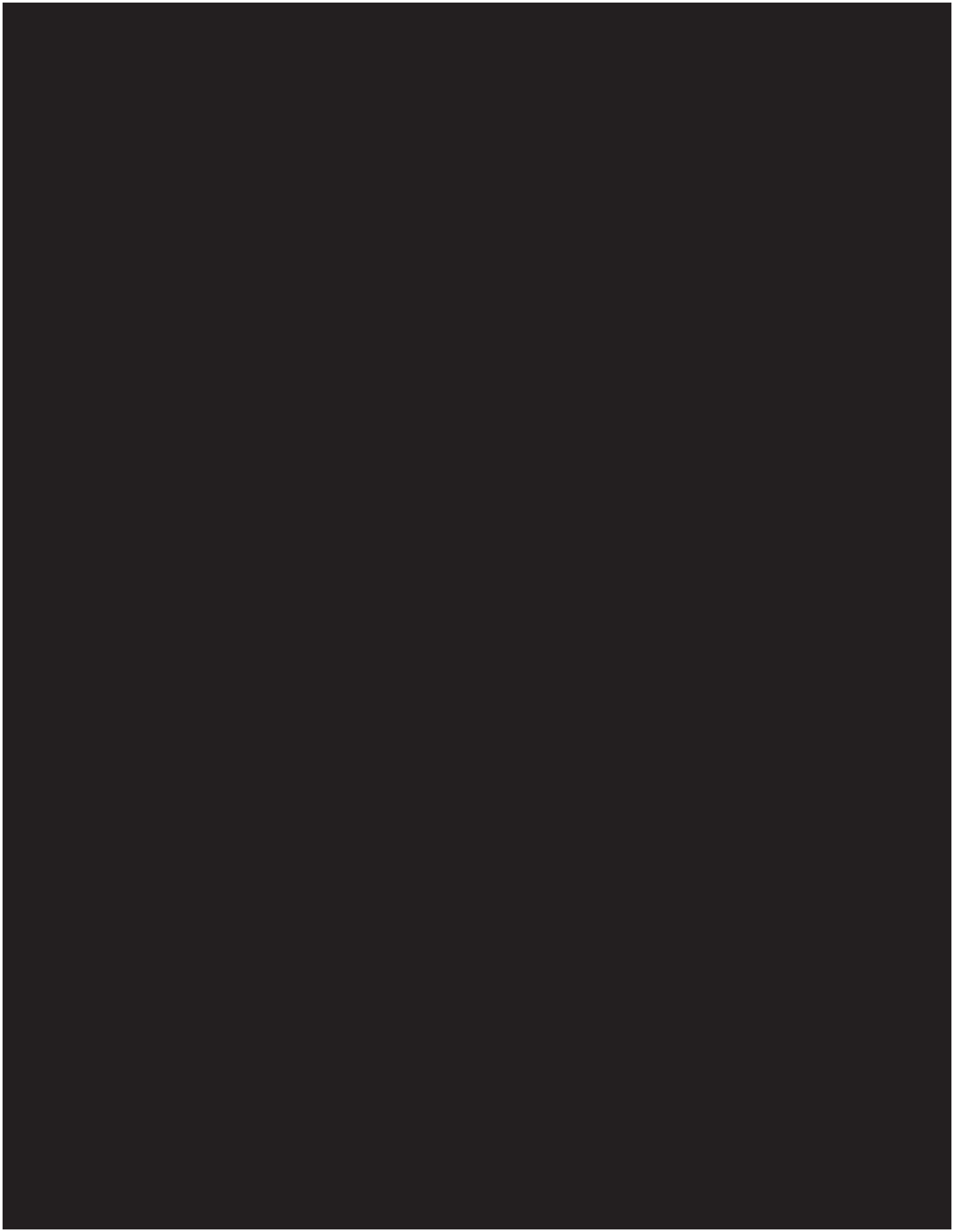
d. Even if engaging in a plurality of projects or subjects at the same time, use in the order of the pages, and fill in the necessary items such as projects and subjects at the top of each page.

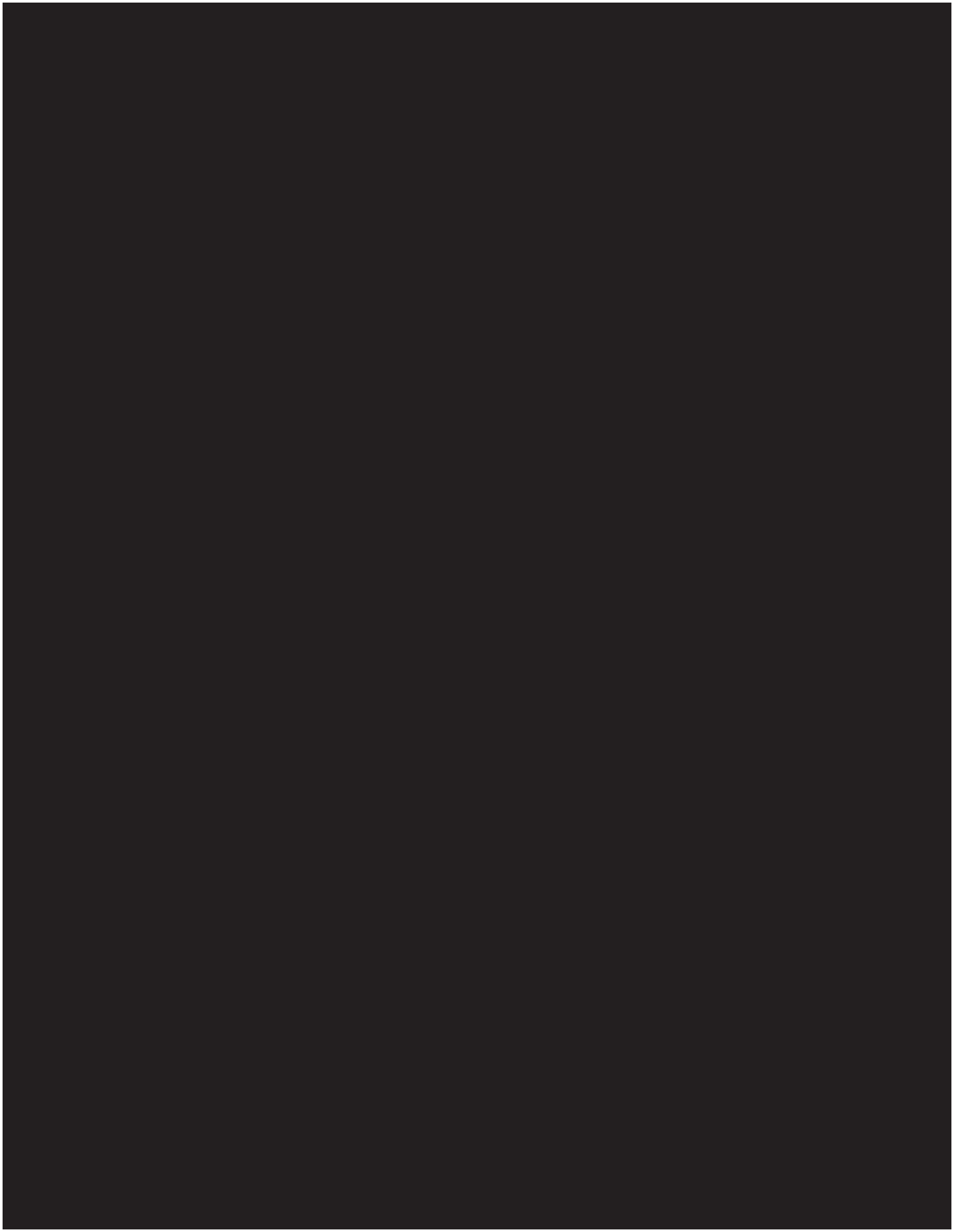
e. When the entry continues on the next page or another page, fill in the connection on each of the page.

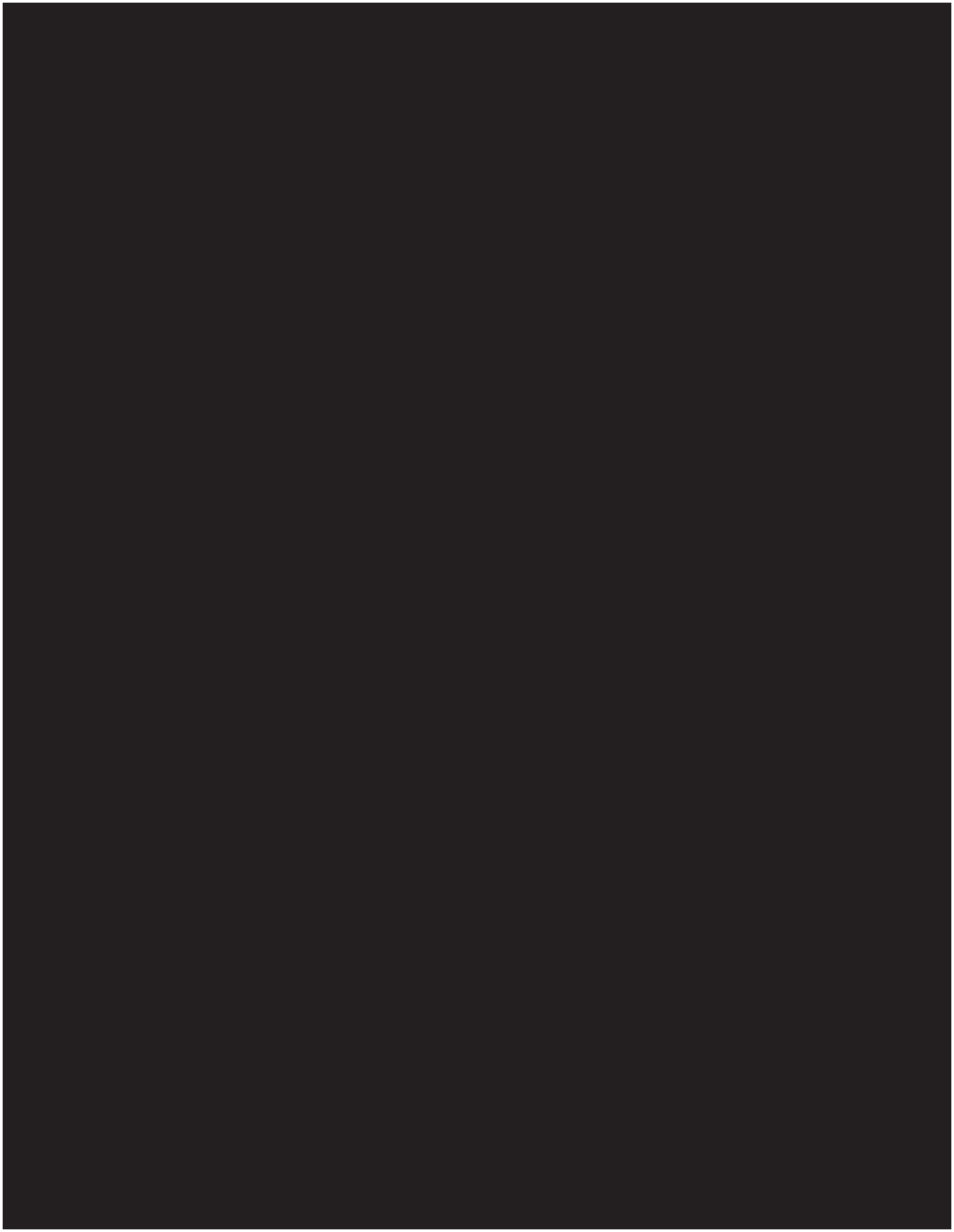
f. Fill in so that the empty space will not be produced between the entries, and when the empty space is produced, cross out that part with a hatched line.

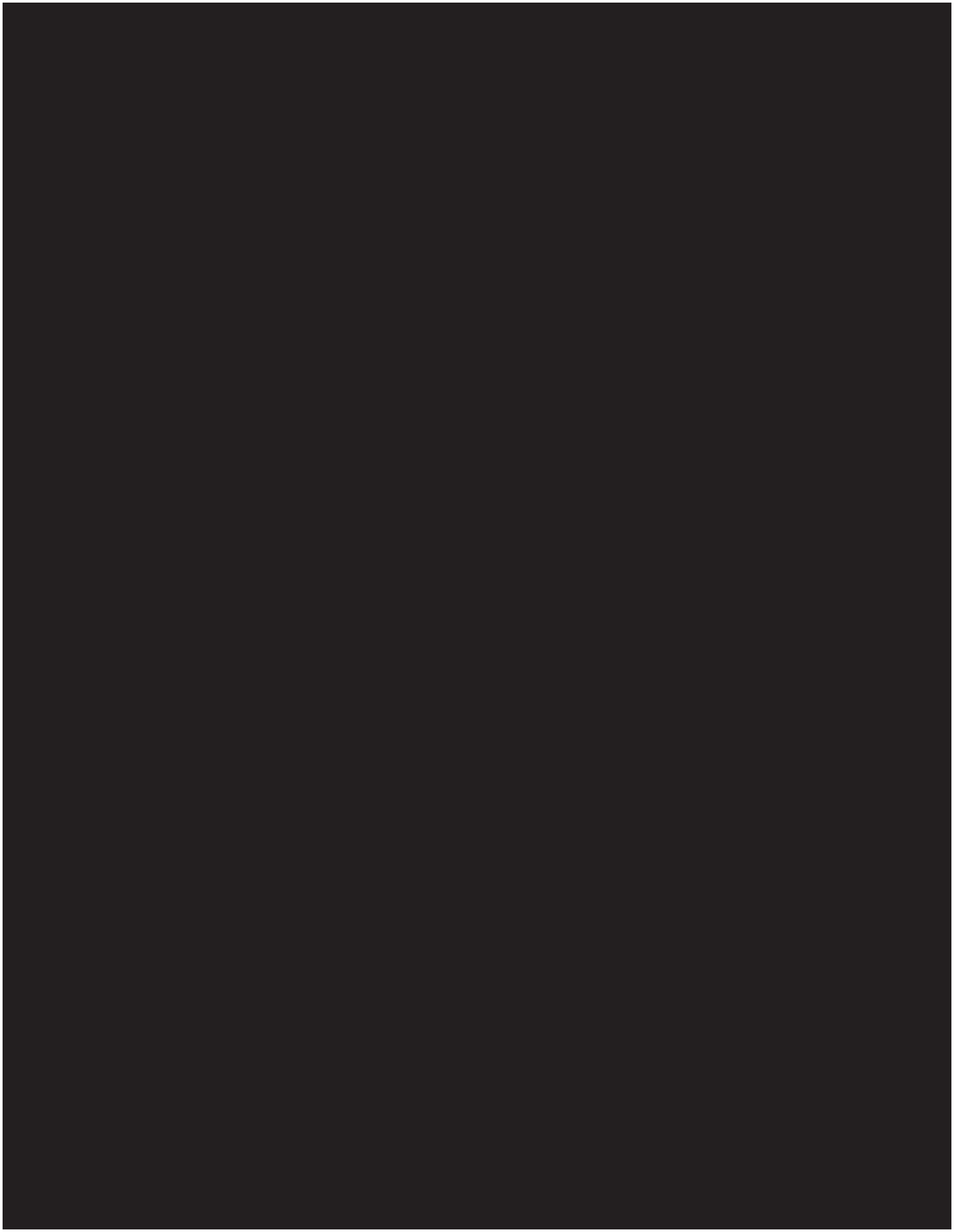
g. When correcting or deleting, erase it with a double line without using an eraser, correction liquid, correction tape, or the like, and add an initial or signature and correction date in small letters to the corresponding part.

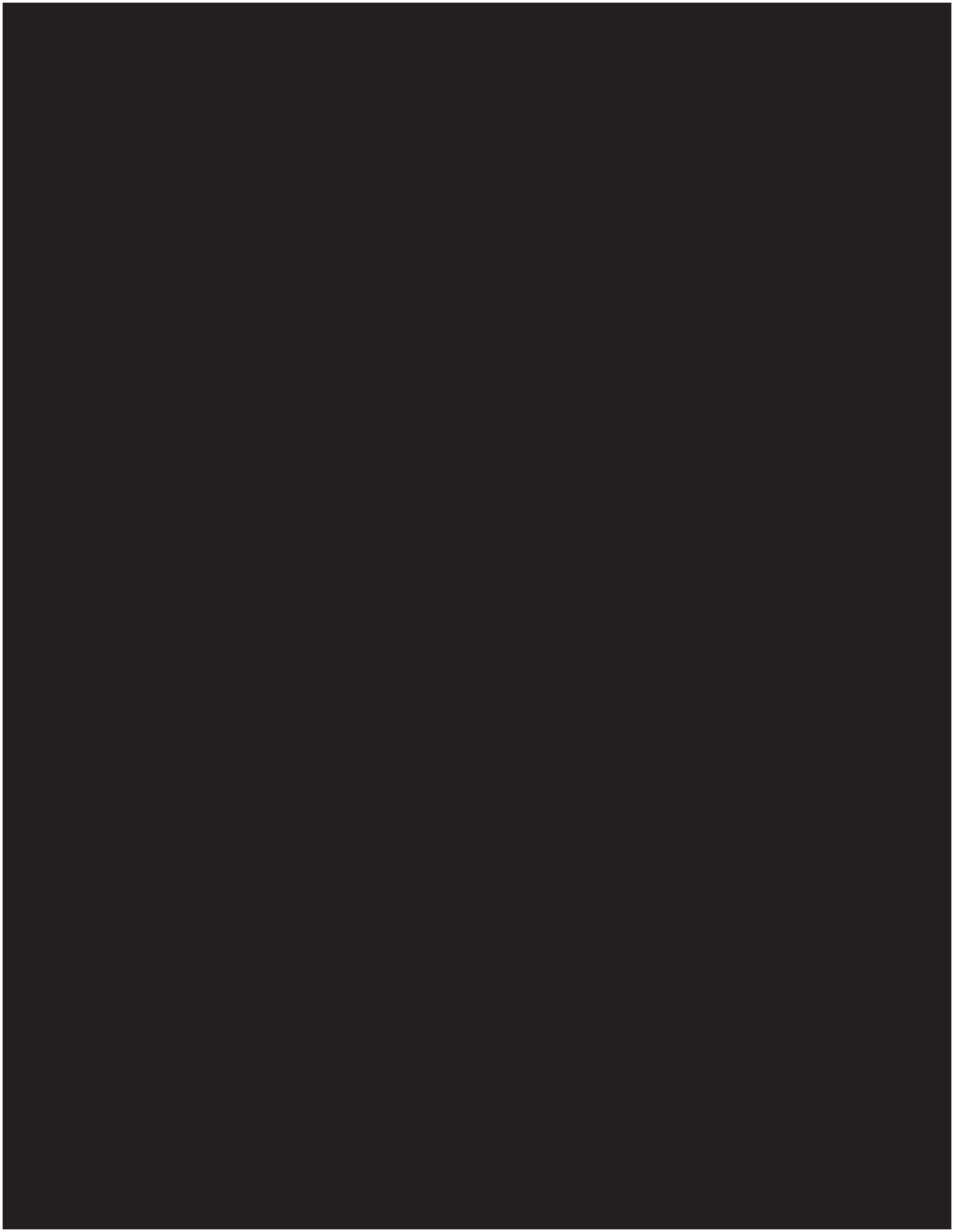
h. When additions, corrections or deletions have occurred at a later date in the contents filled previously, add an initial or signature and the date of addition, correction, and deletion to the corresponding part, and have the witness fill in the signature and the signature date.

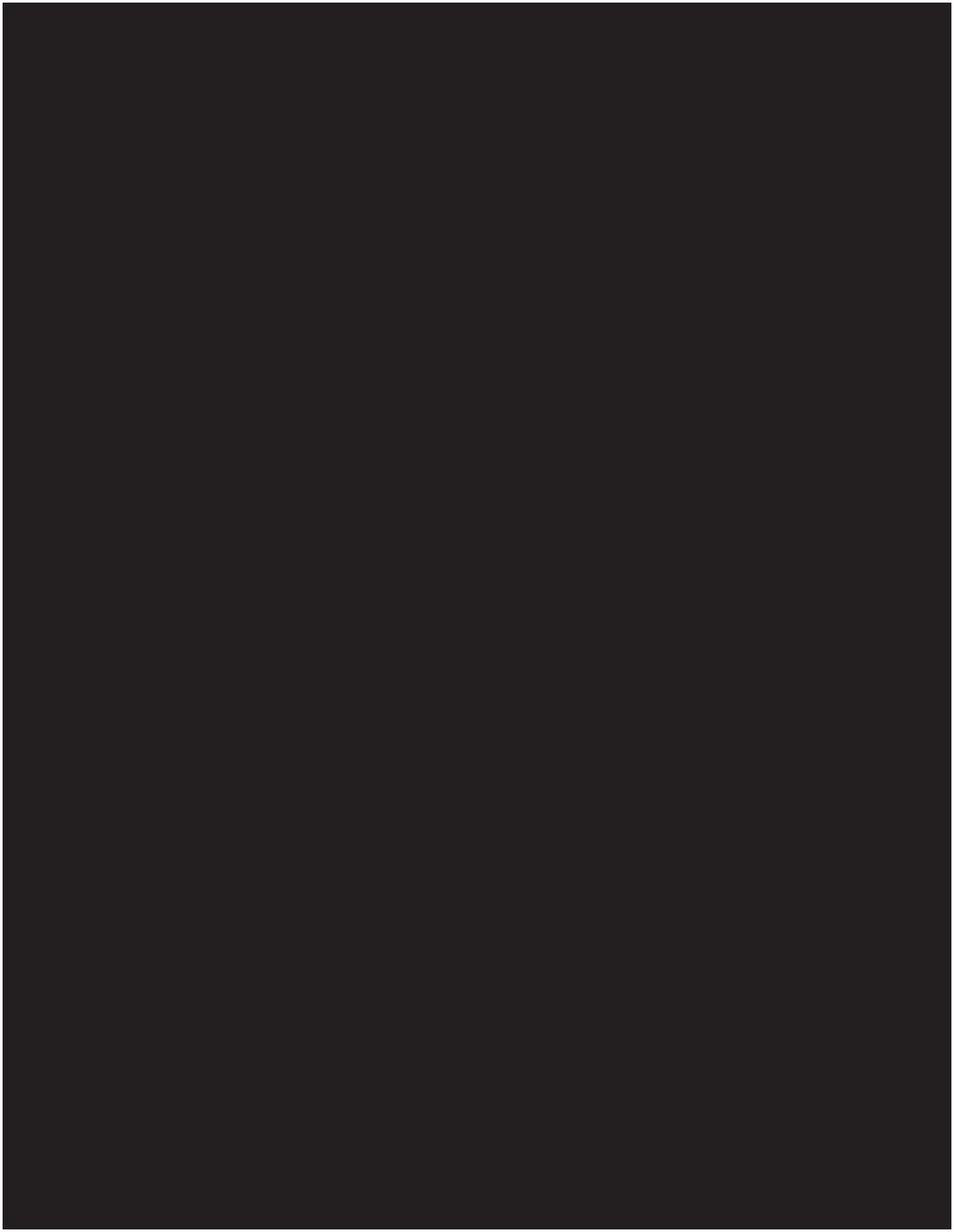


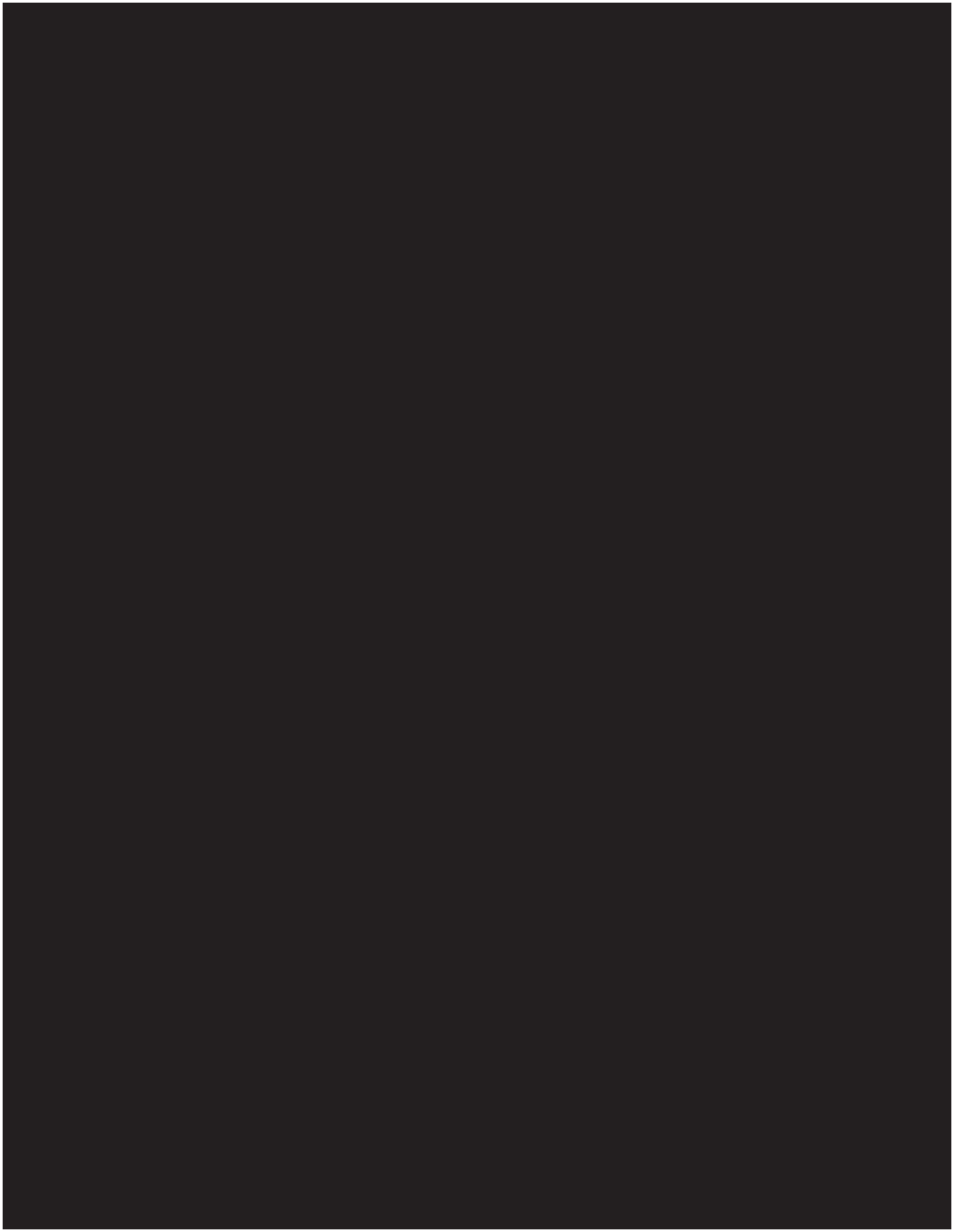


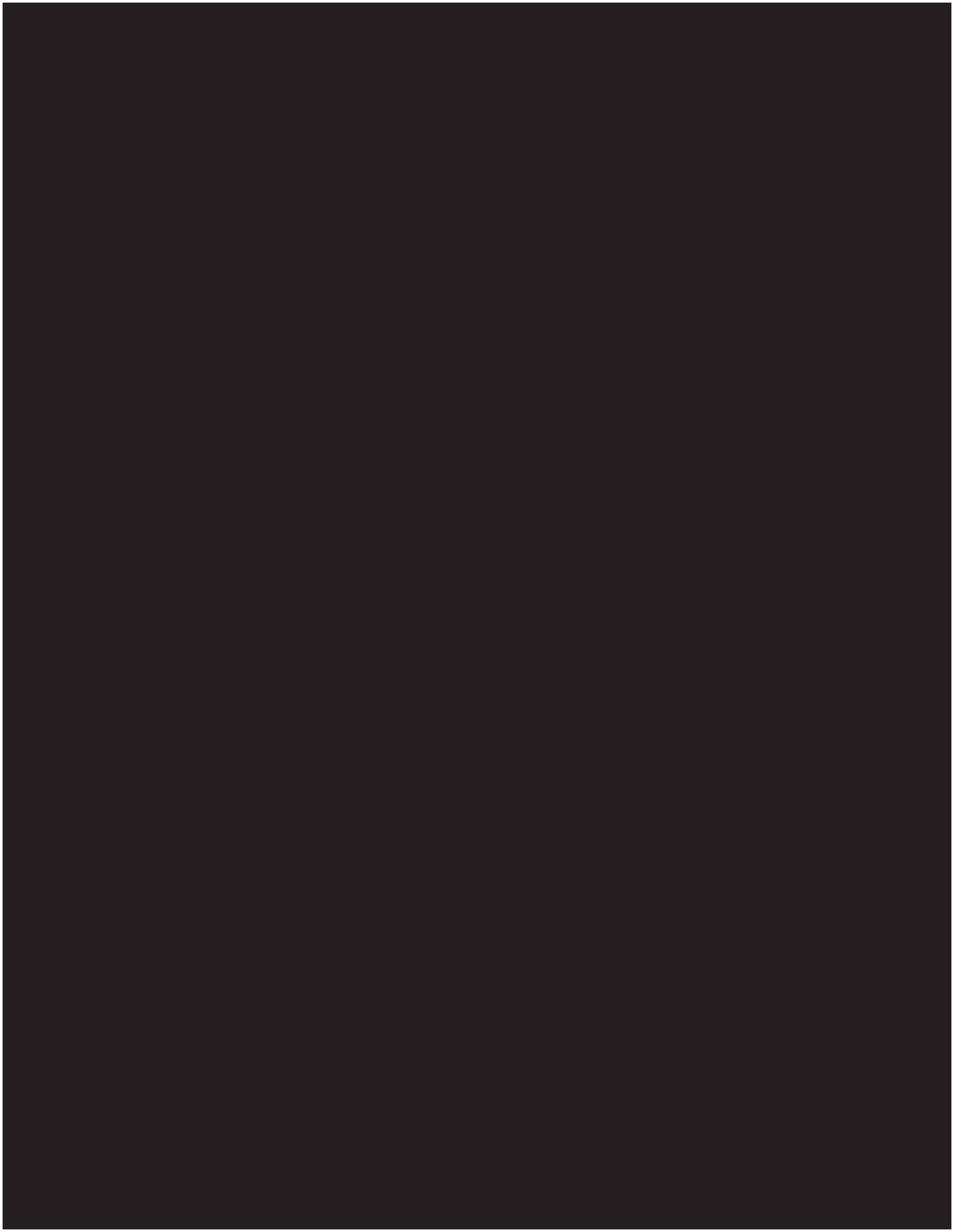


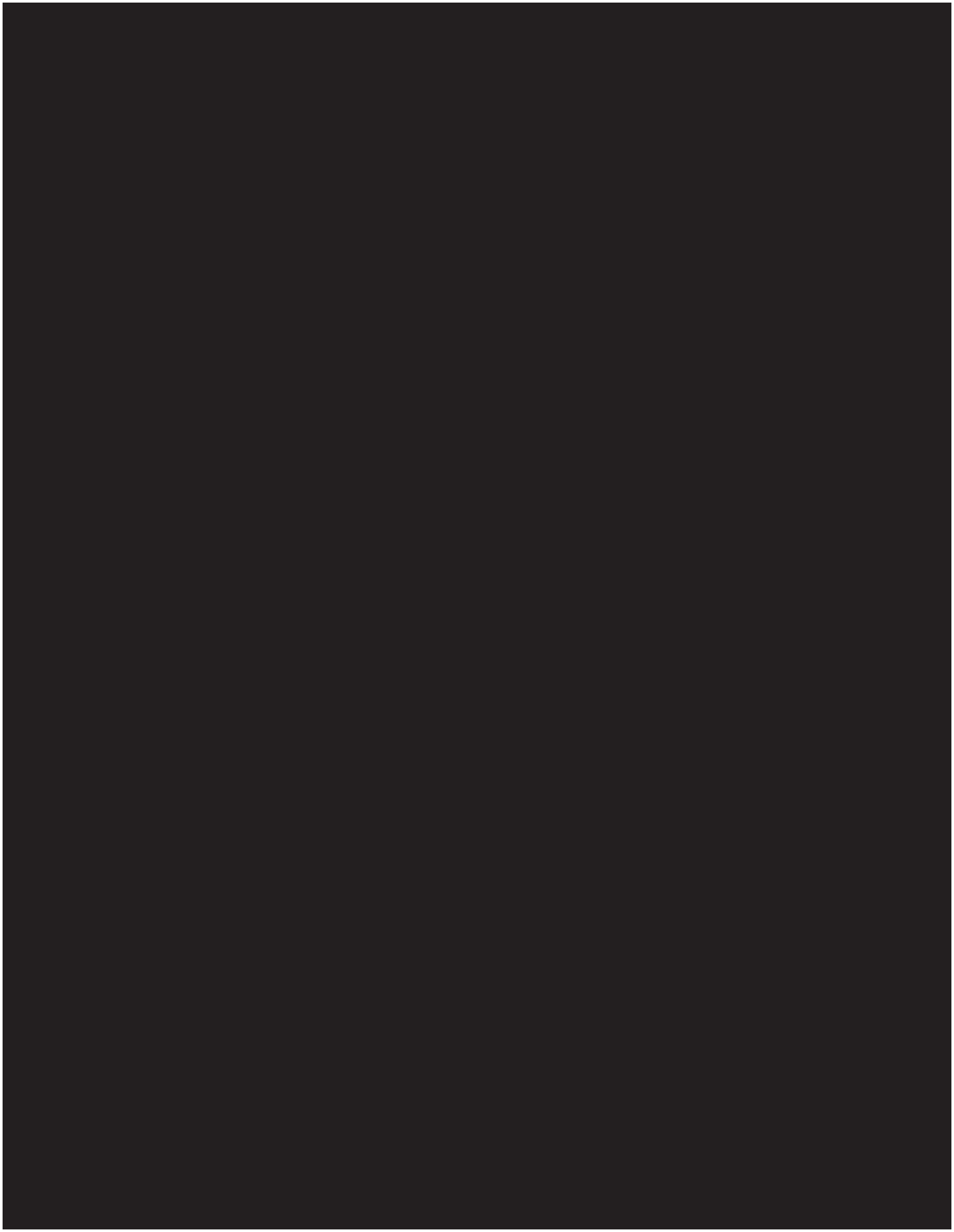


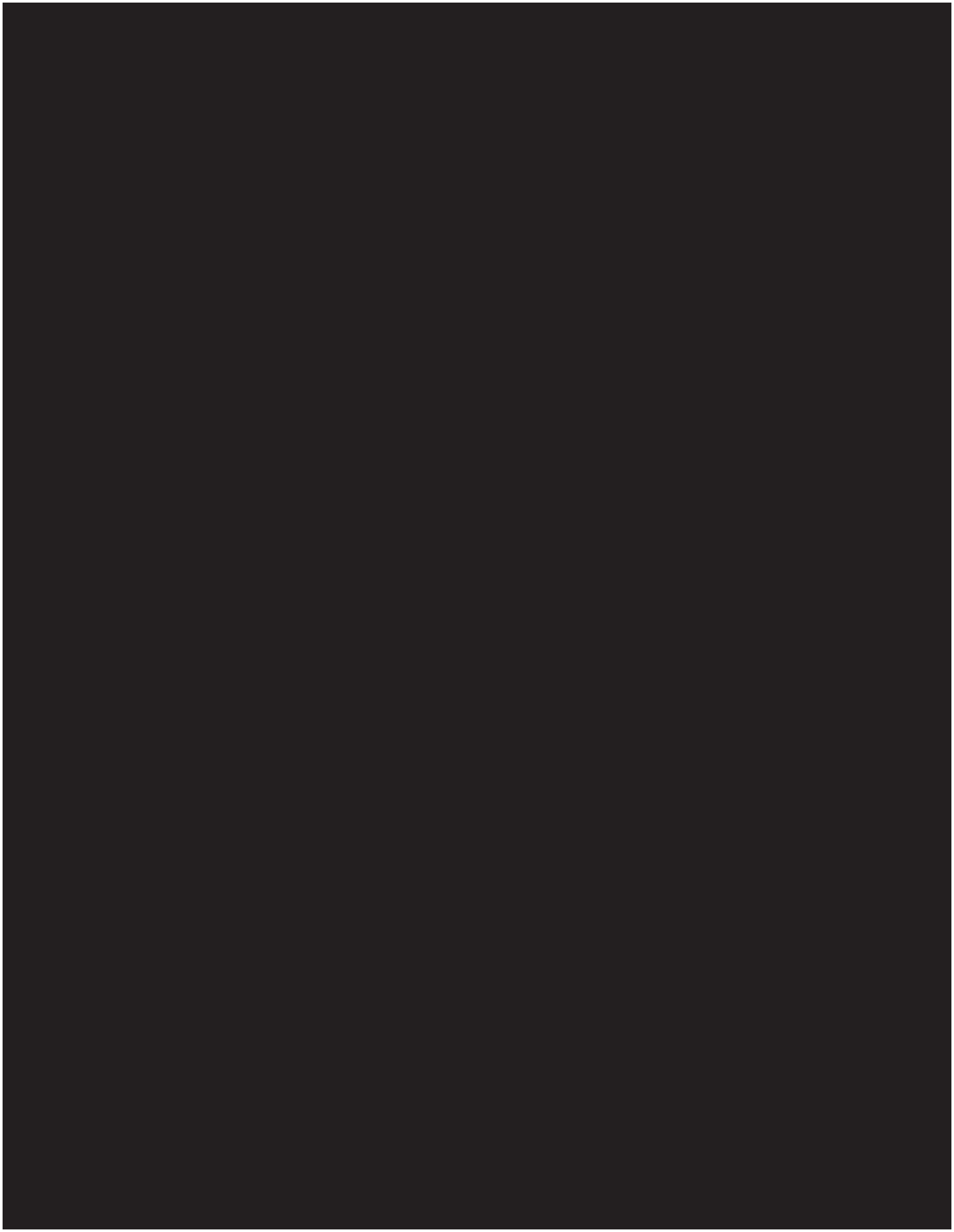


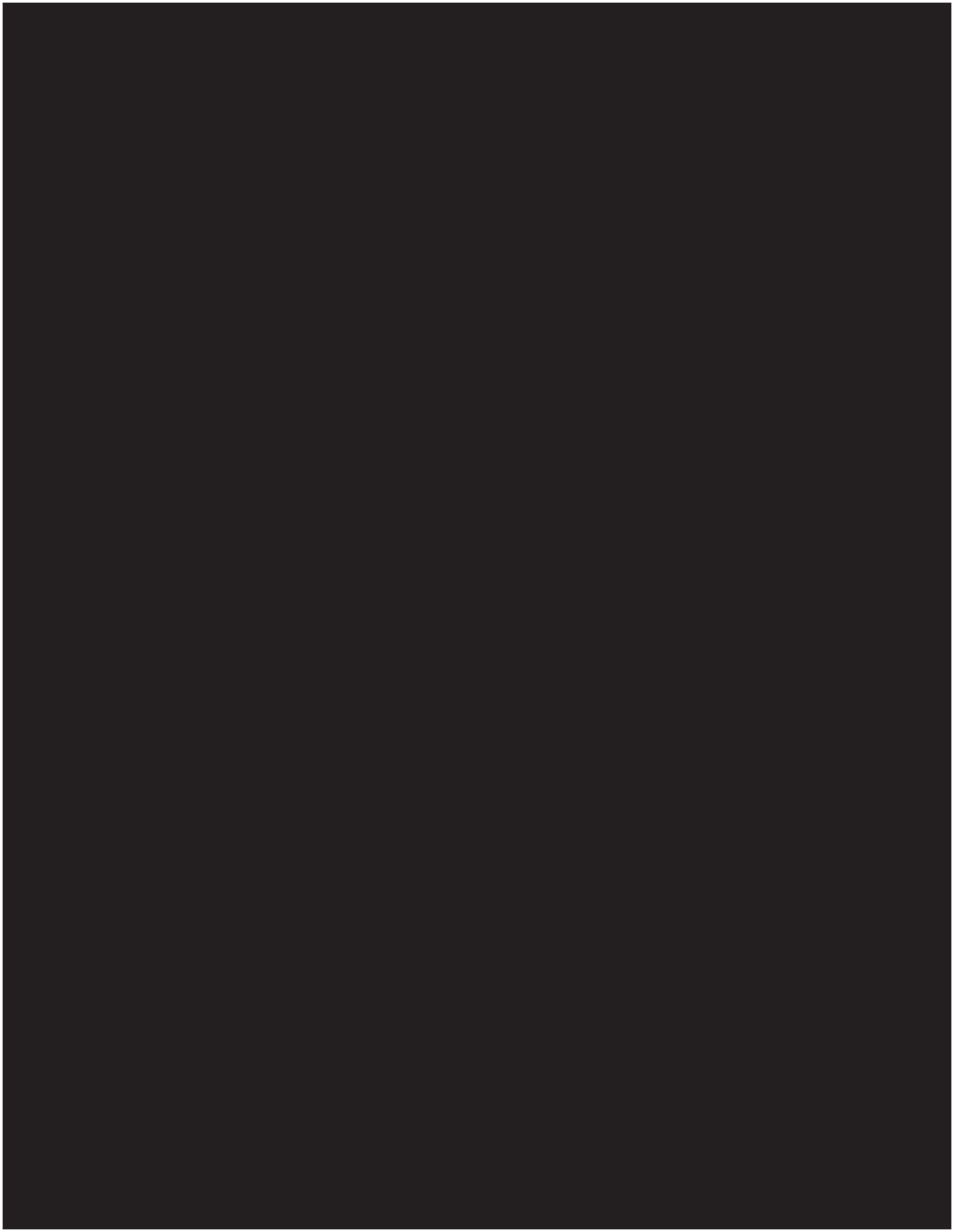


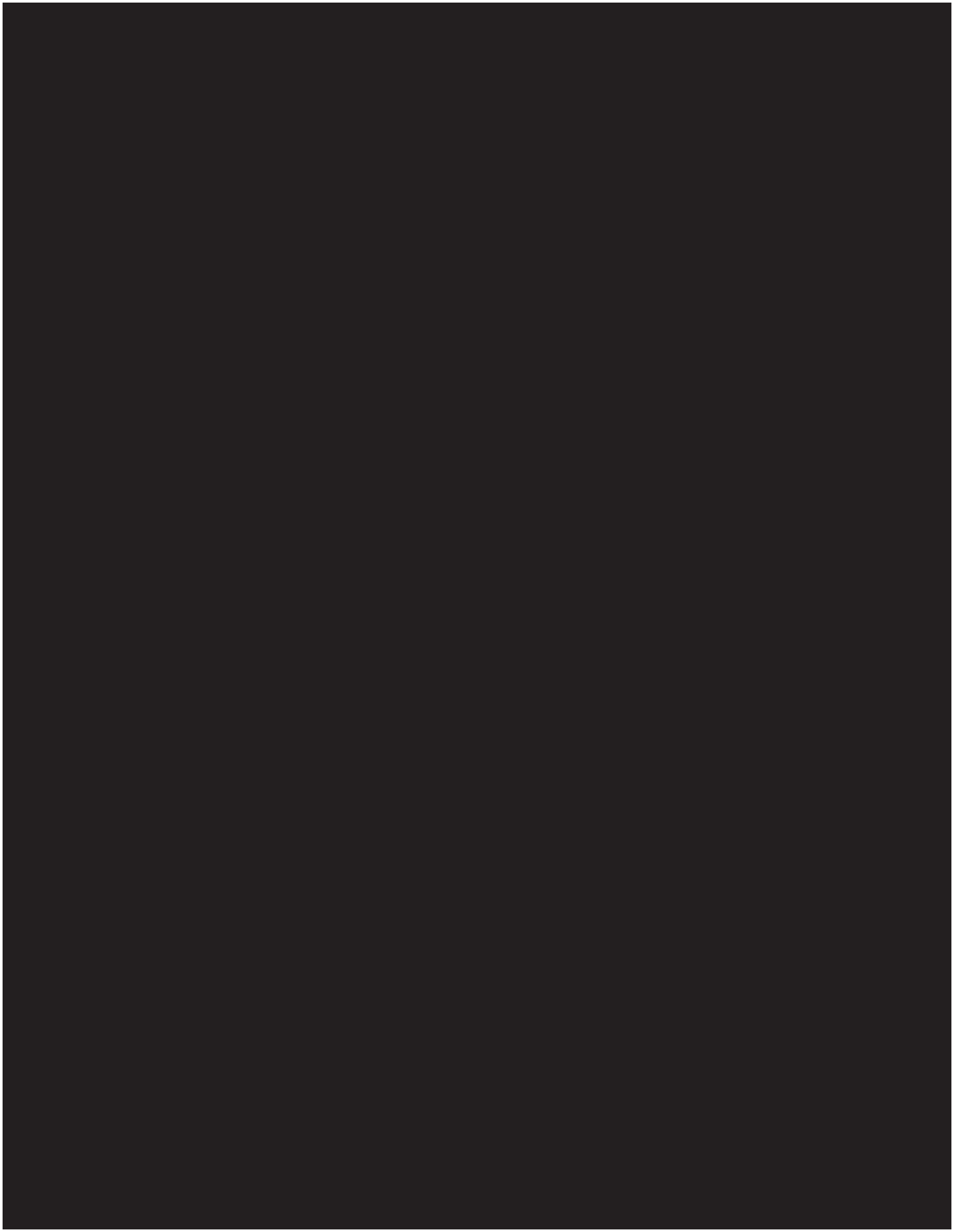


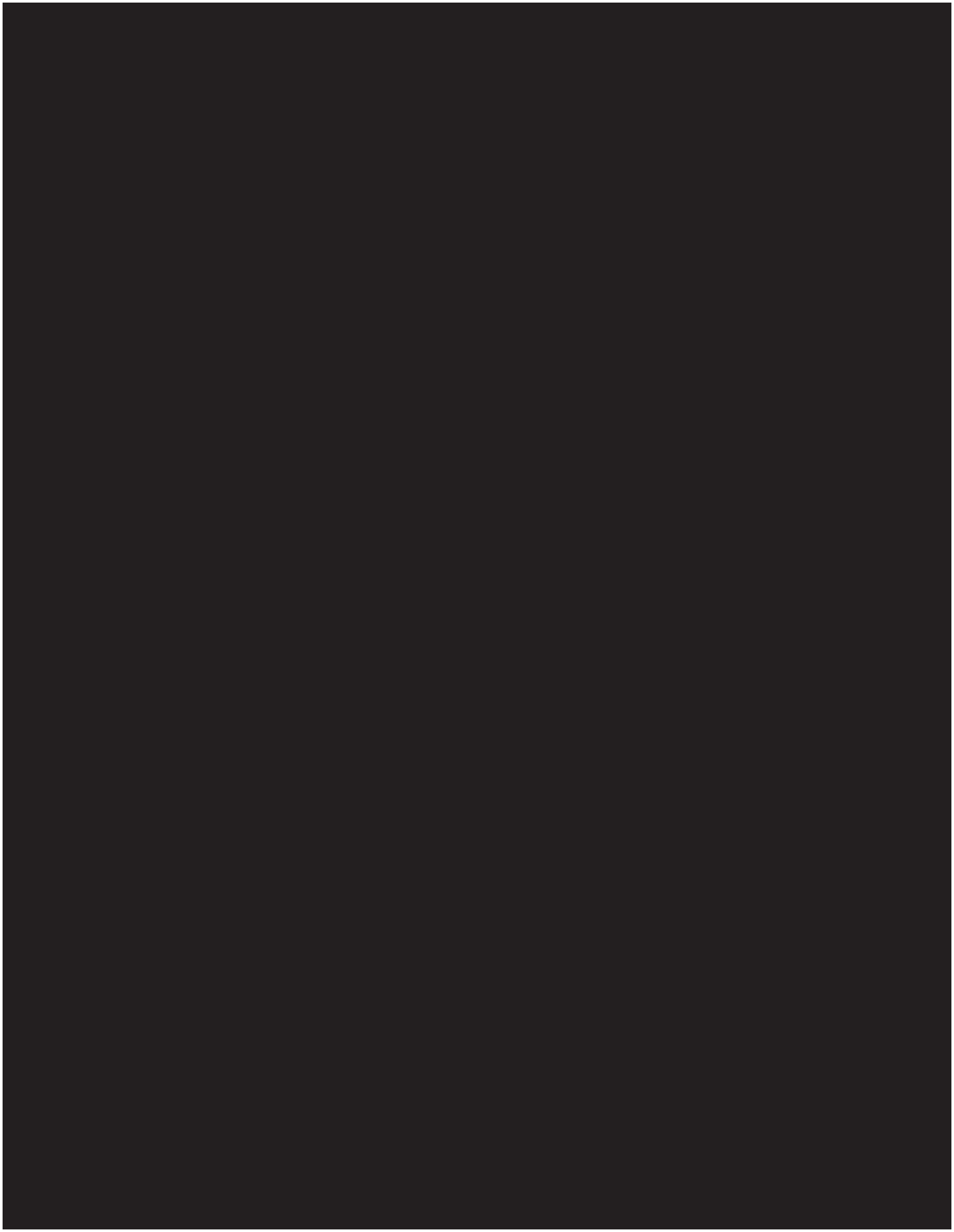


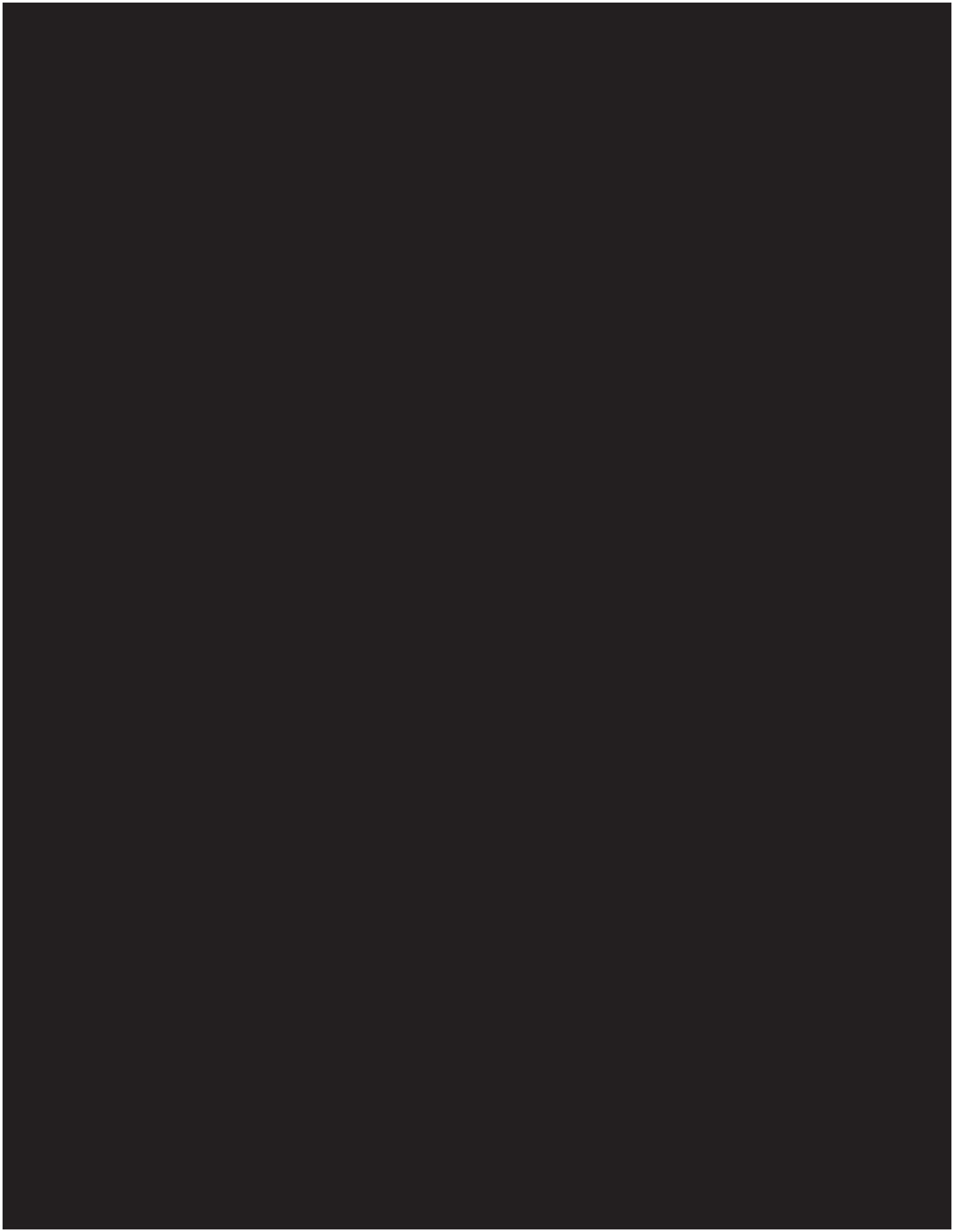


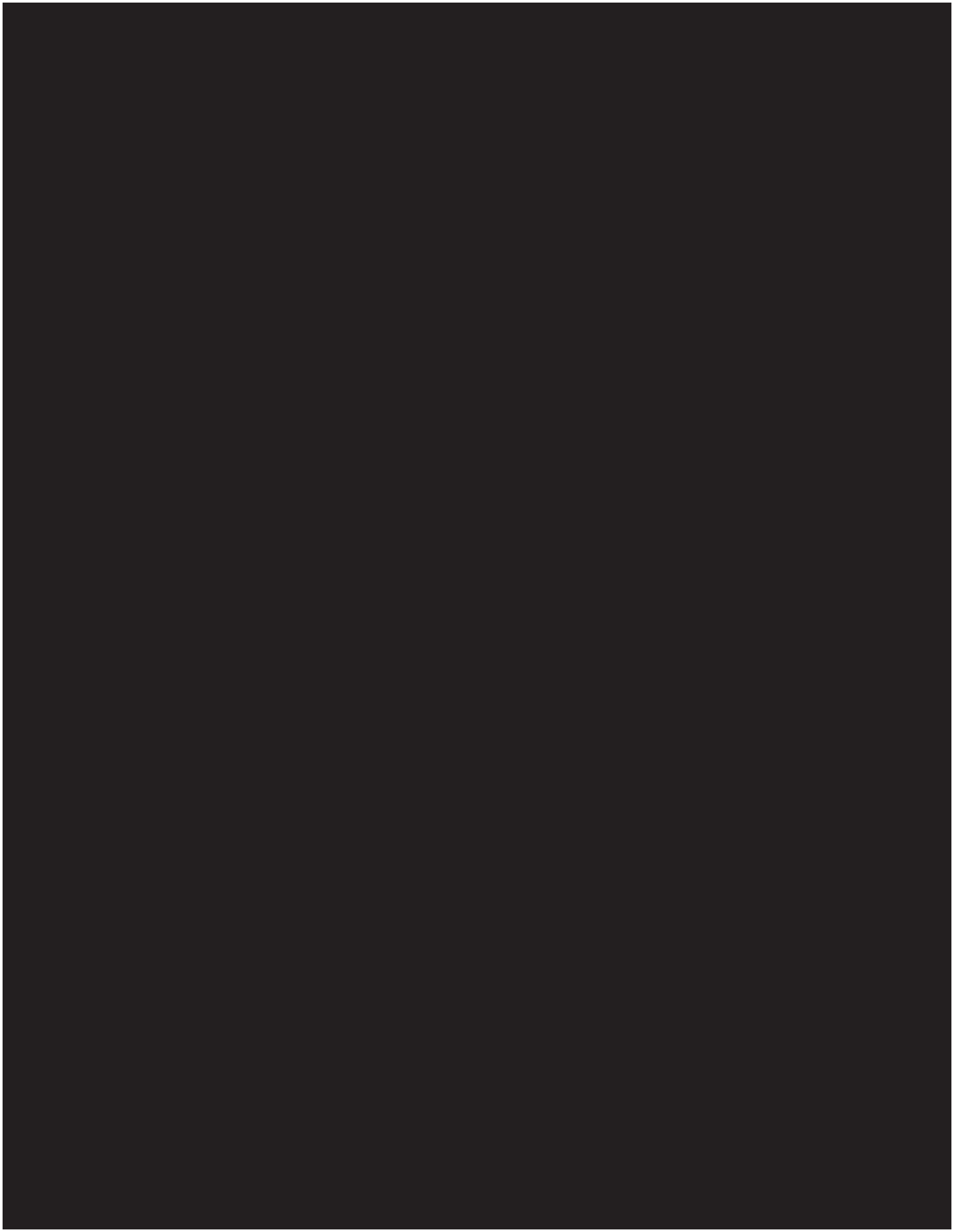


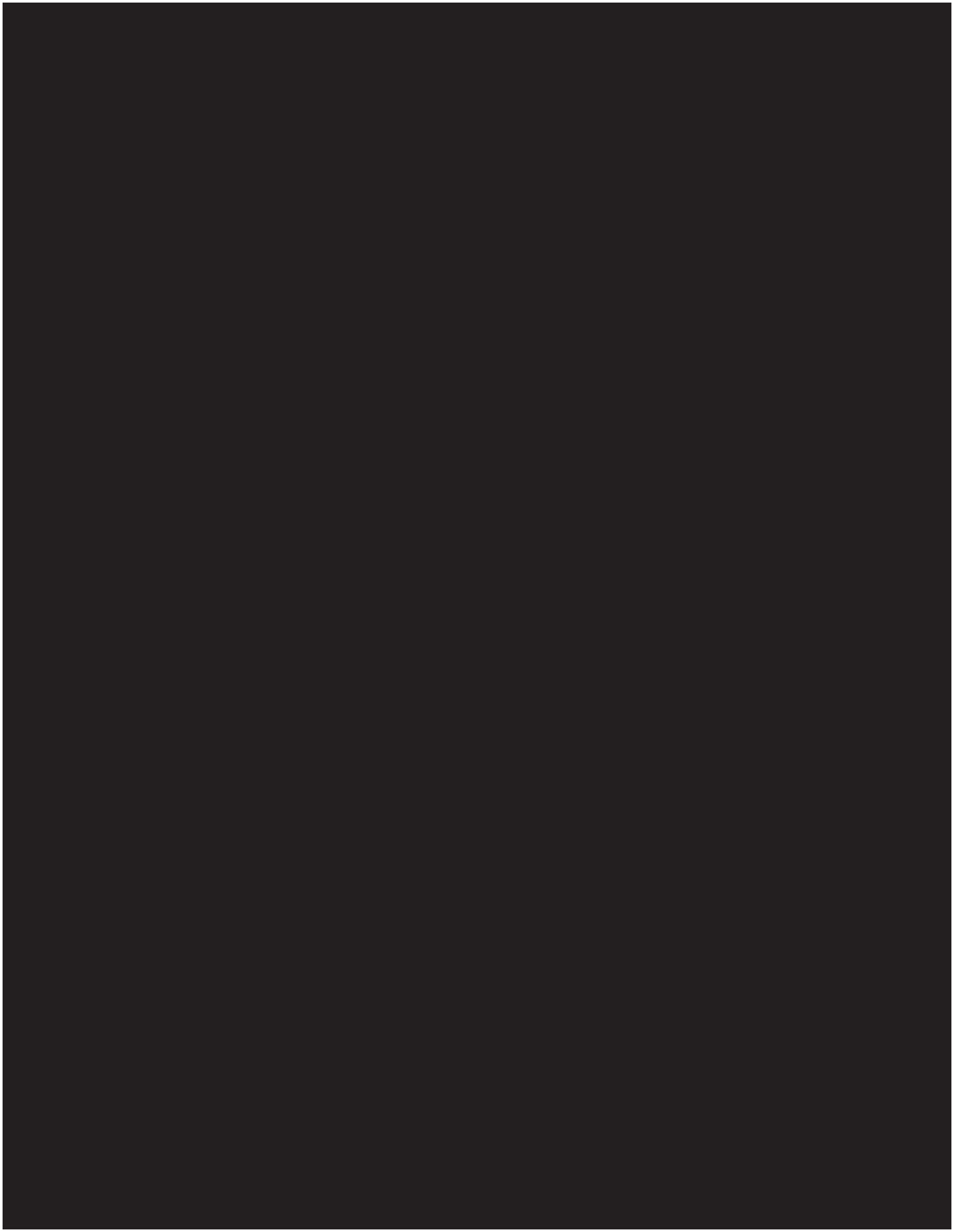


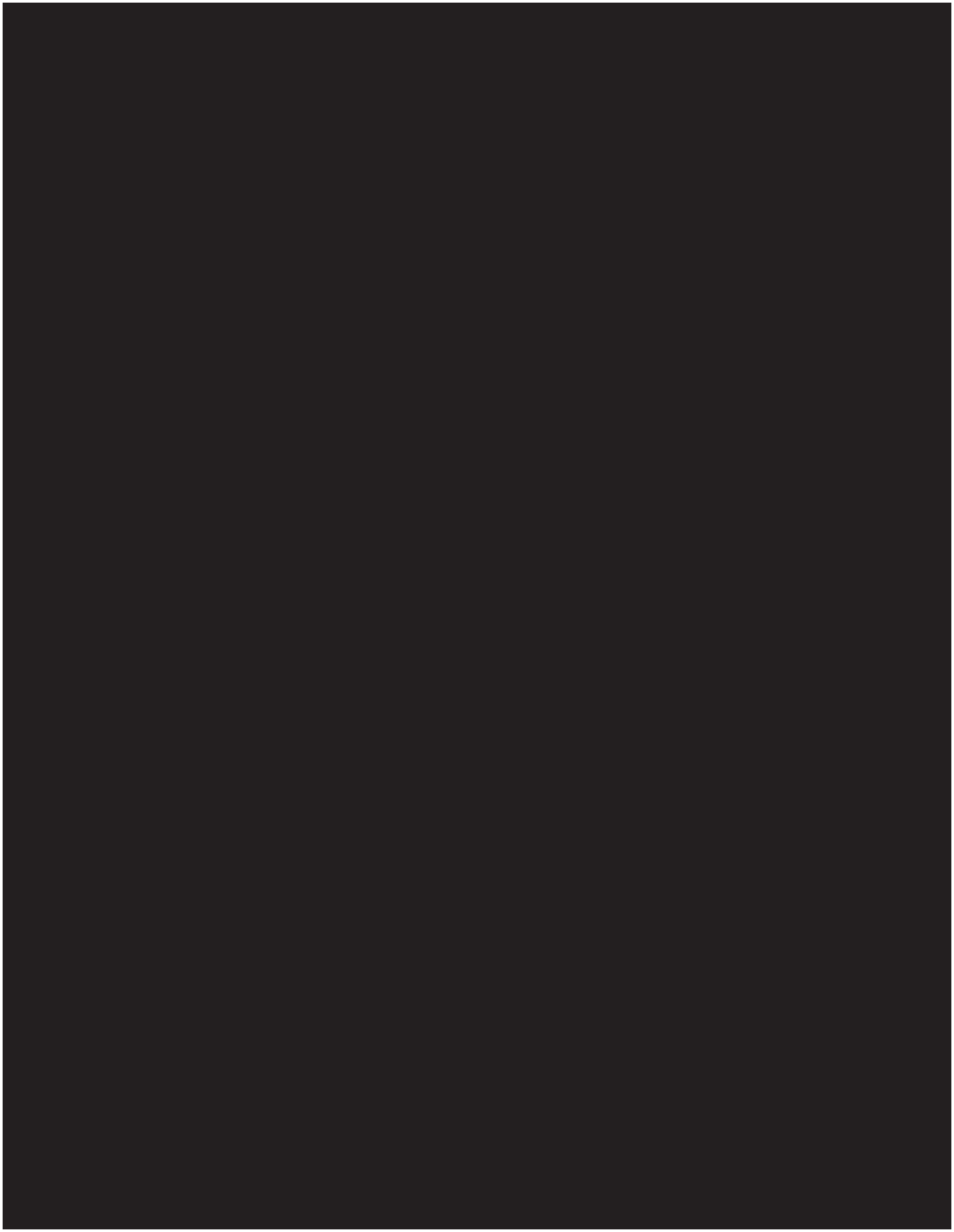


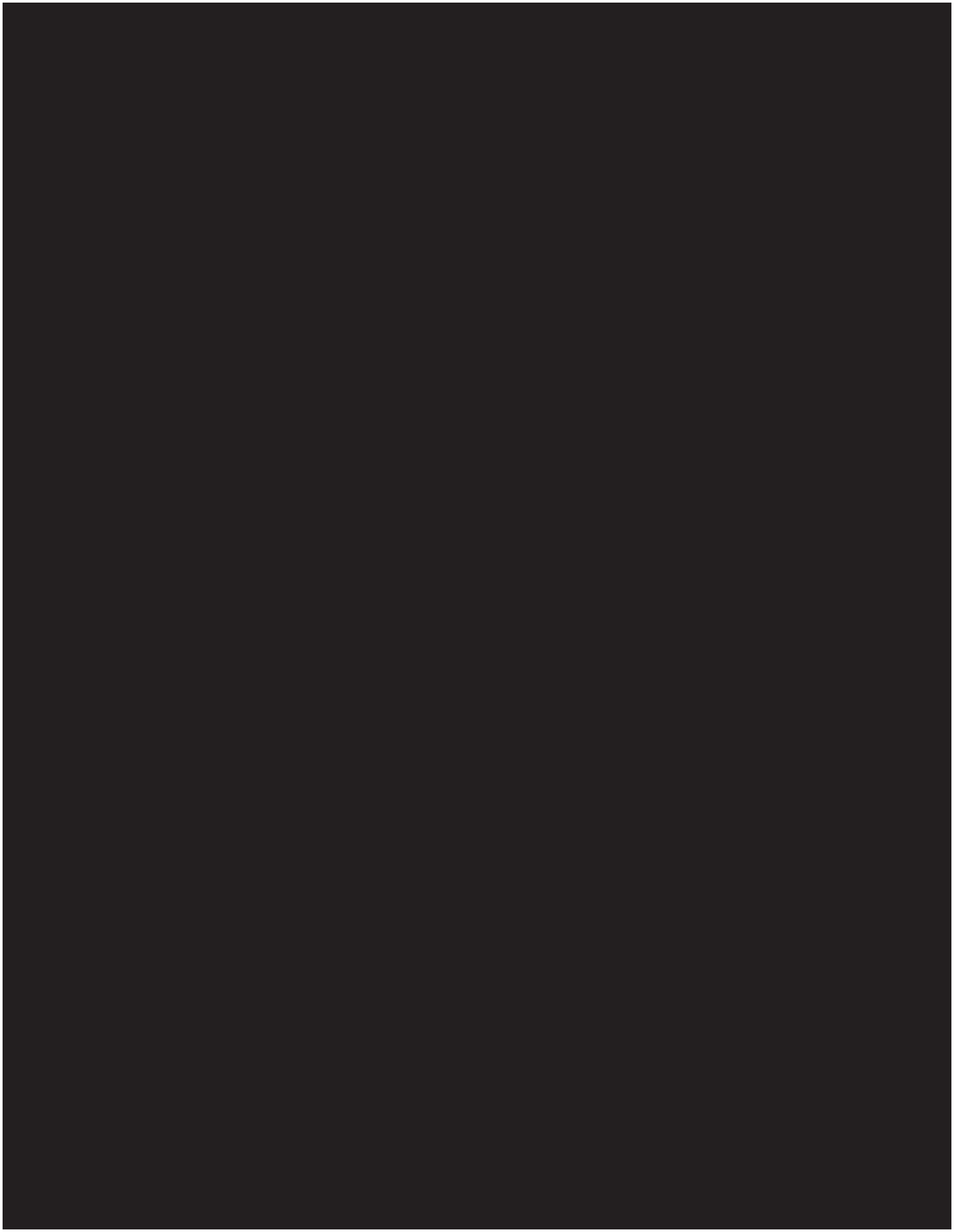


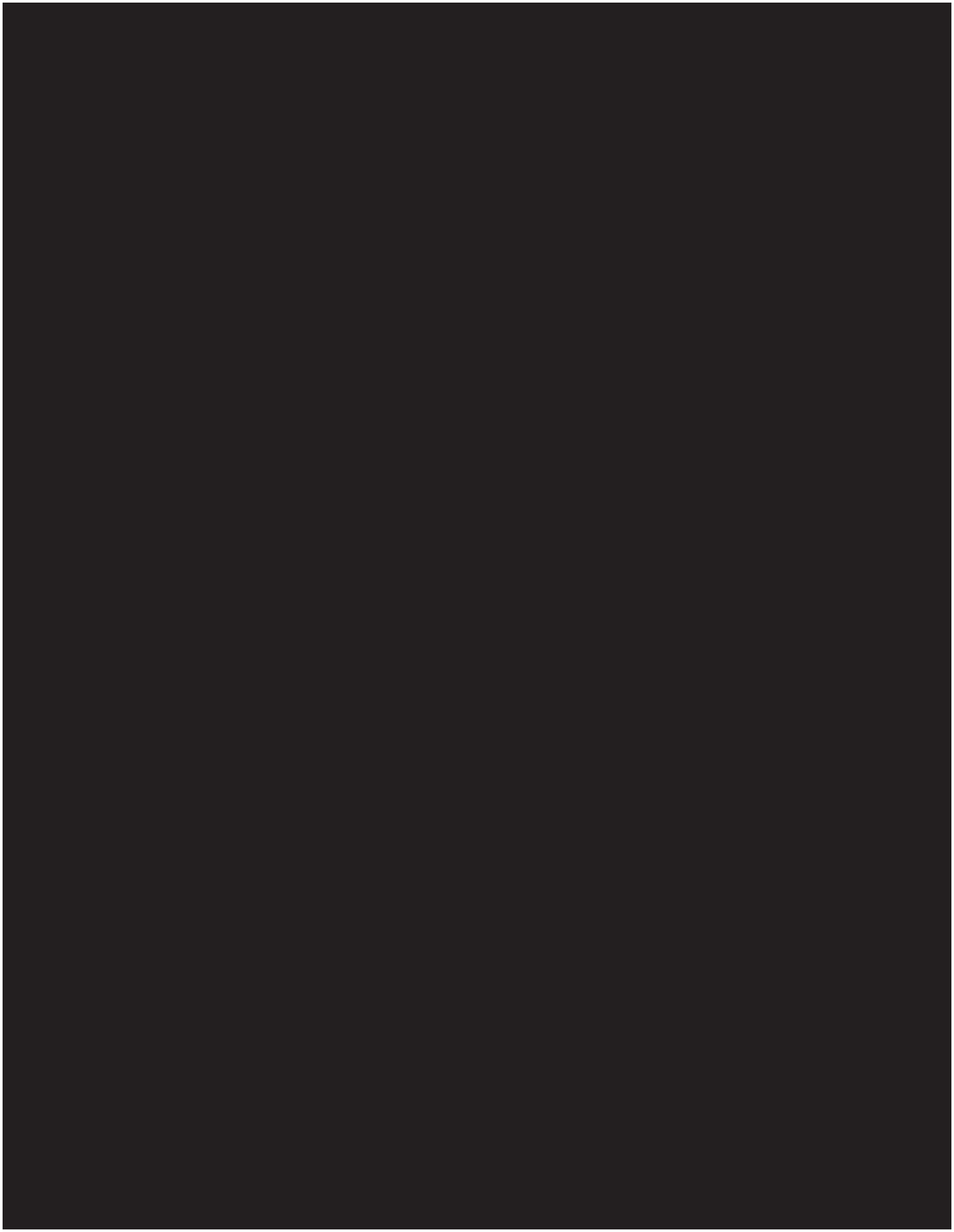


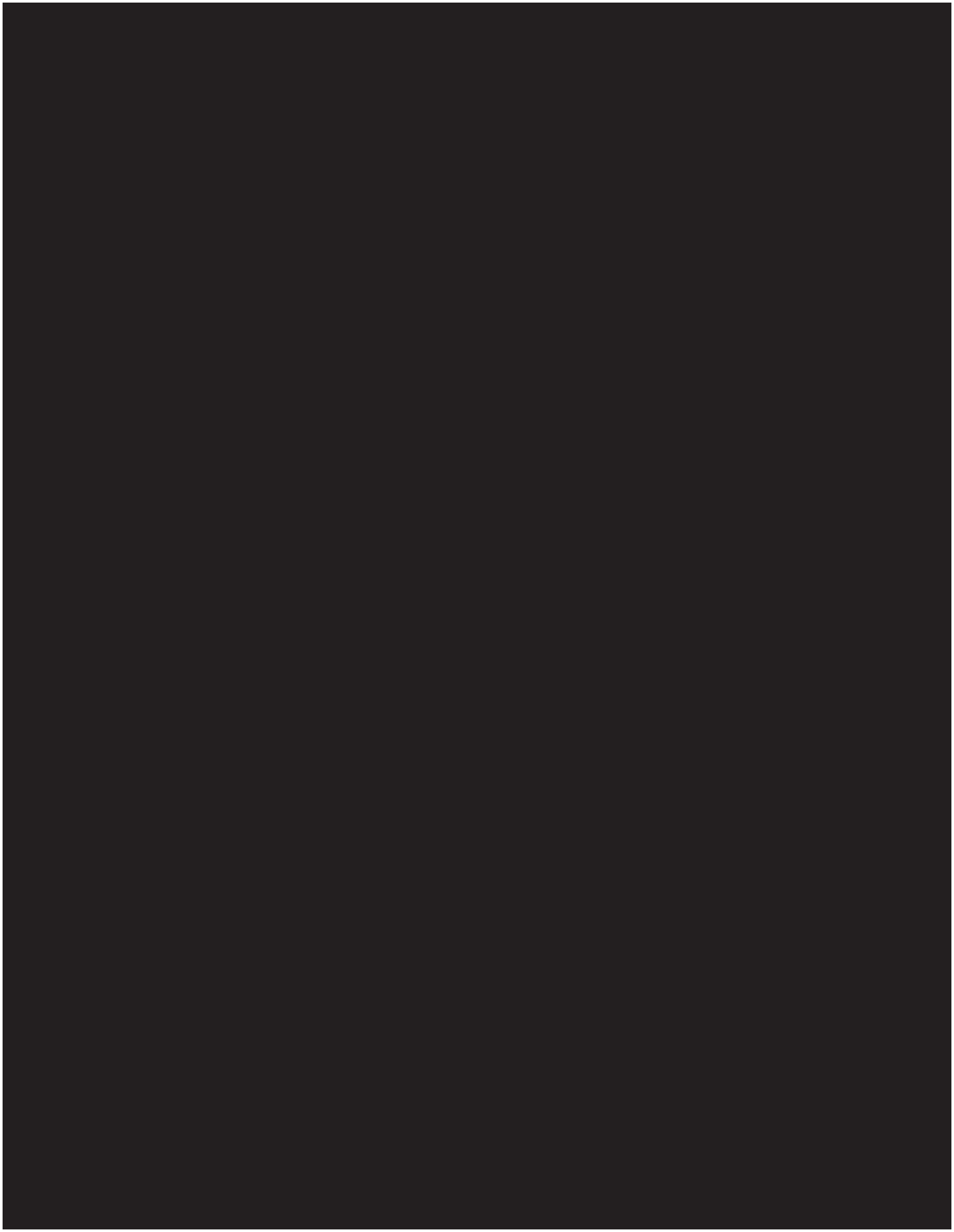


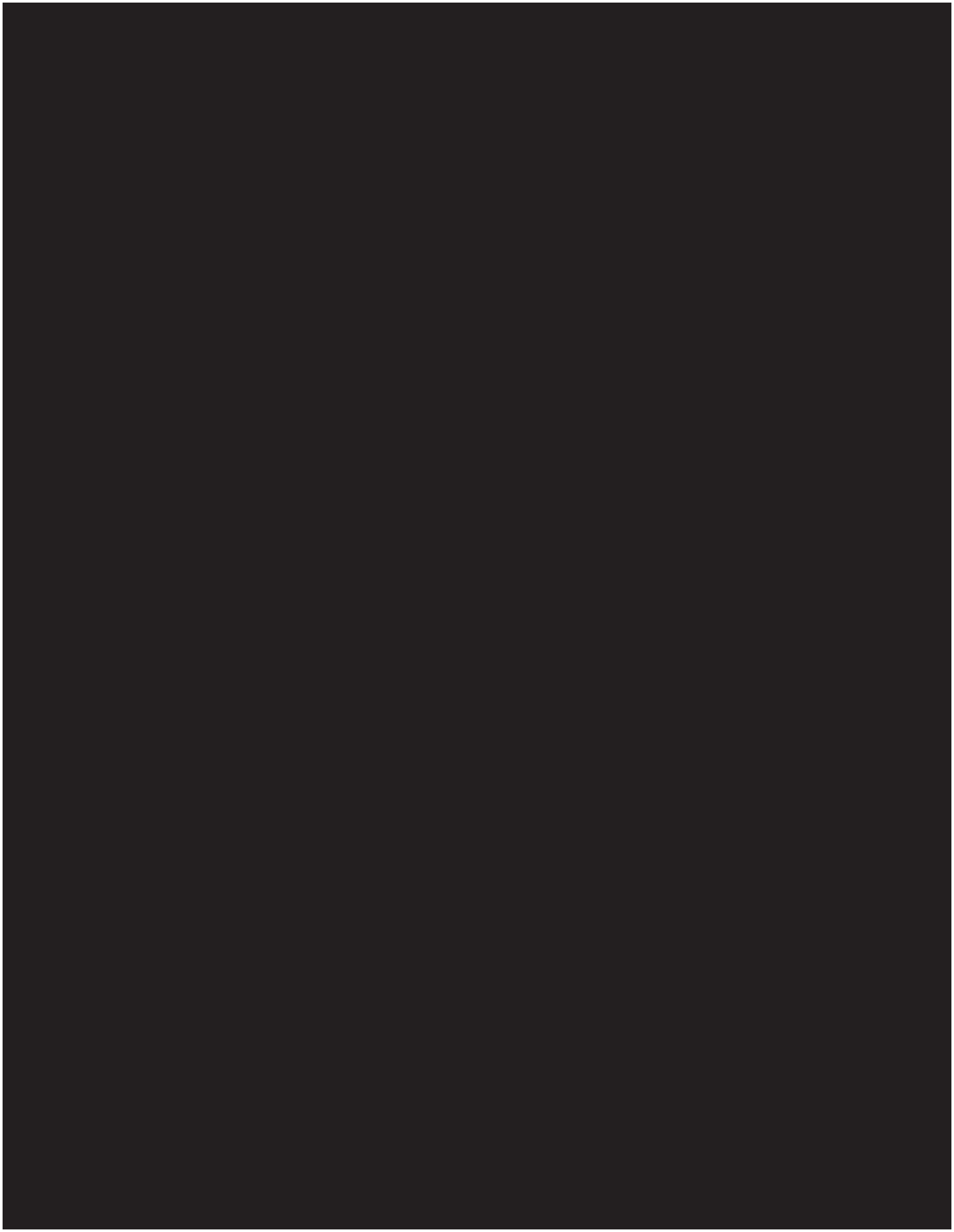


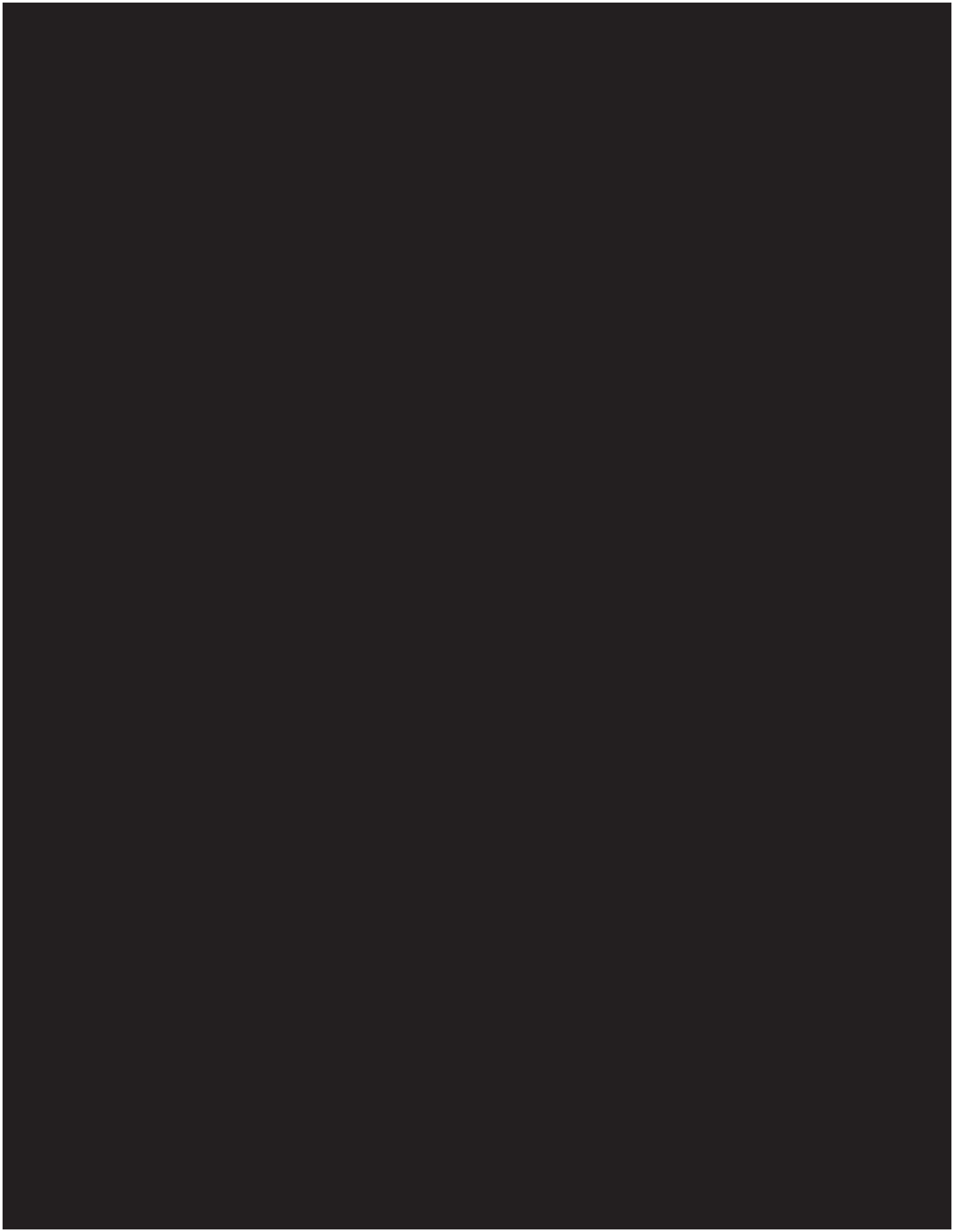


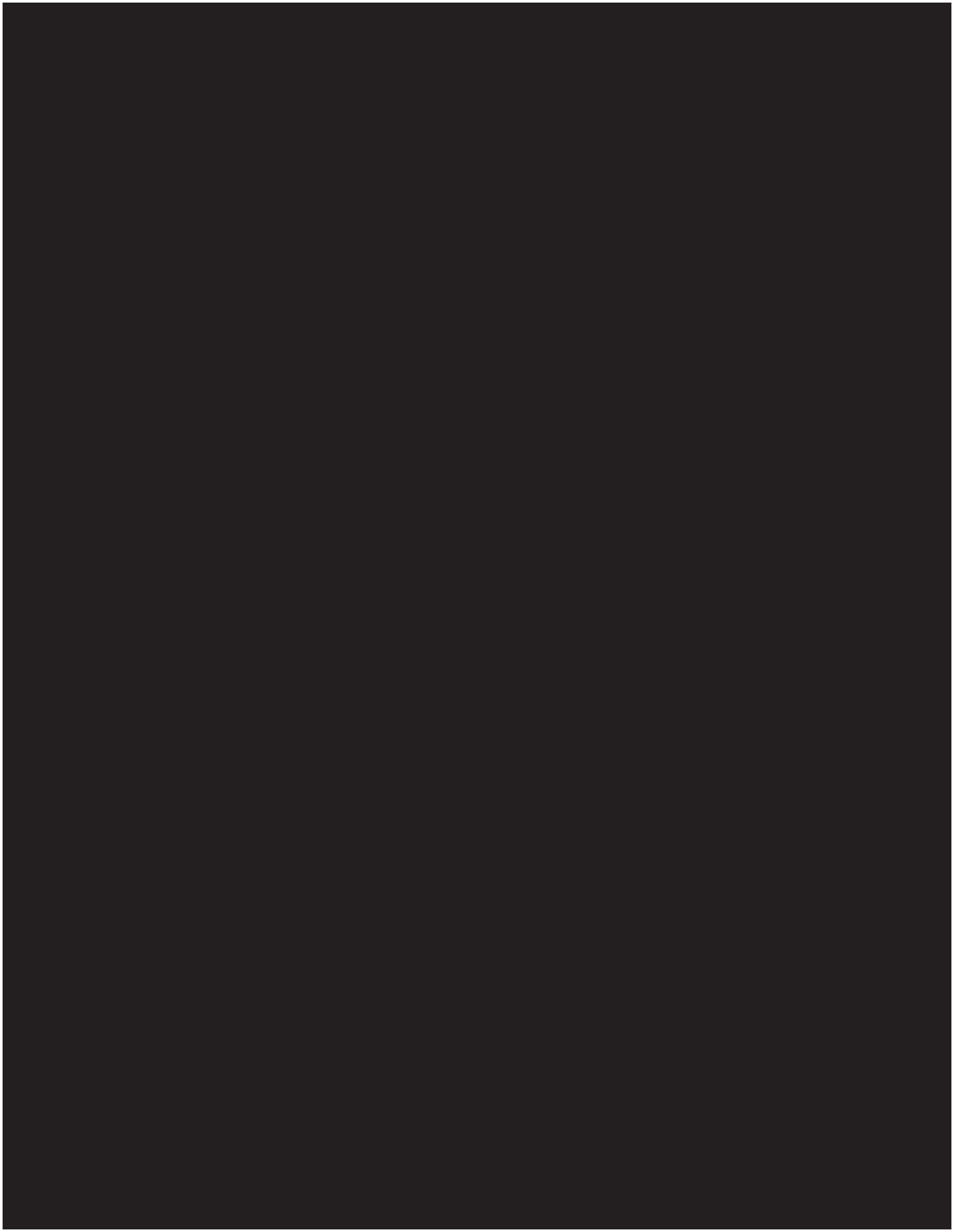


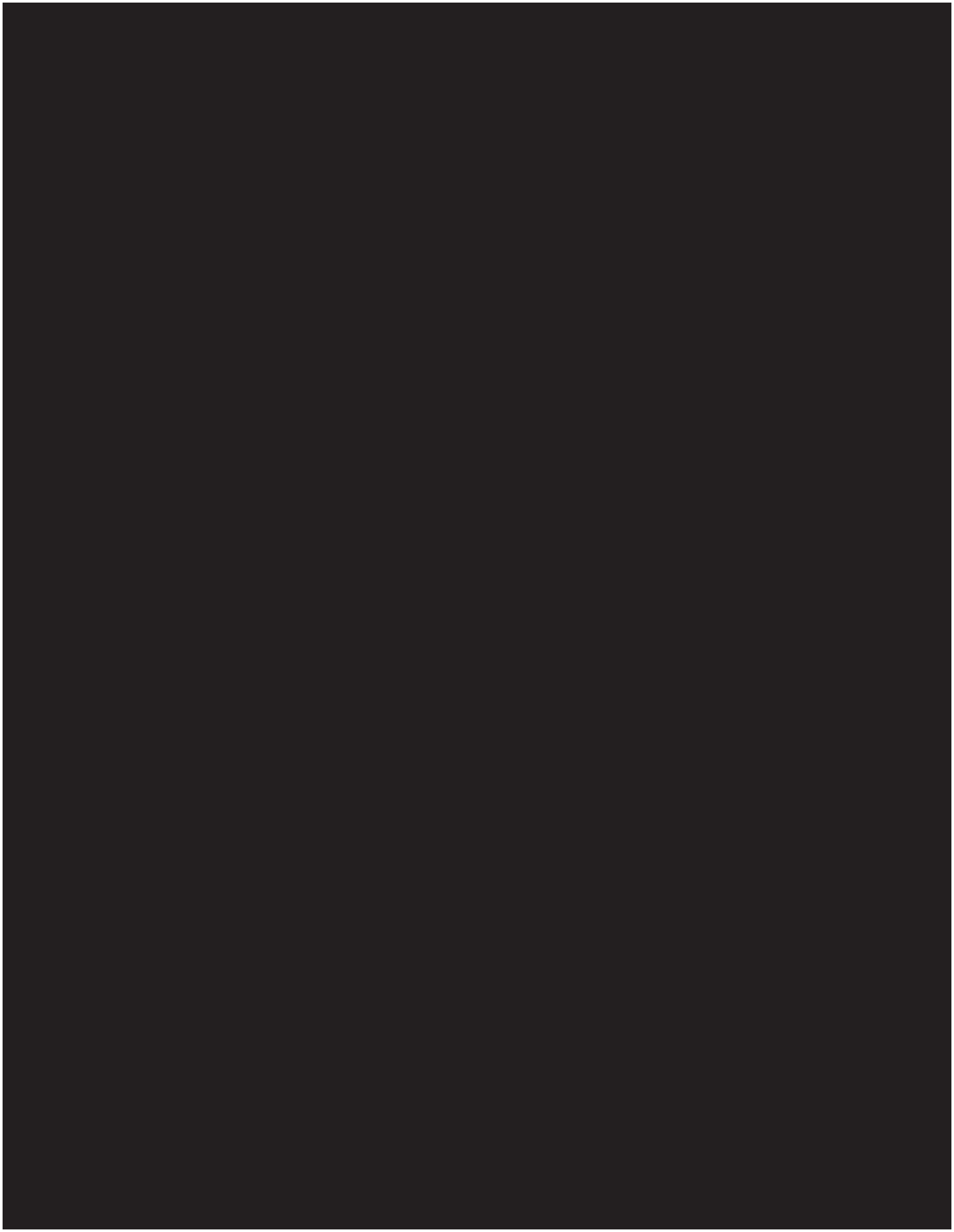


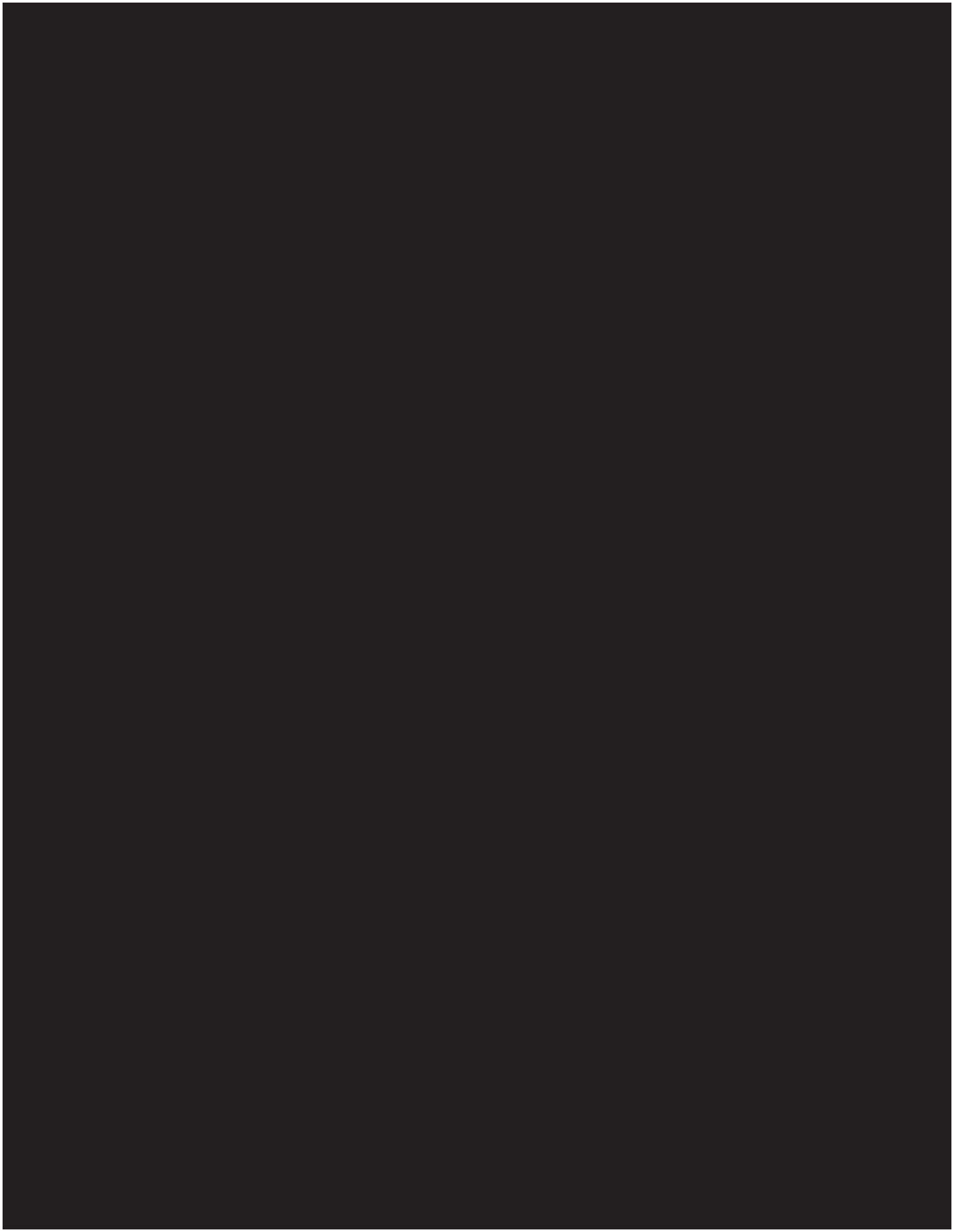


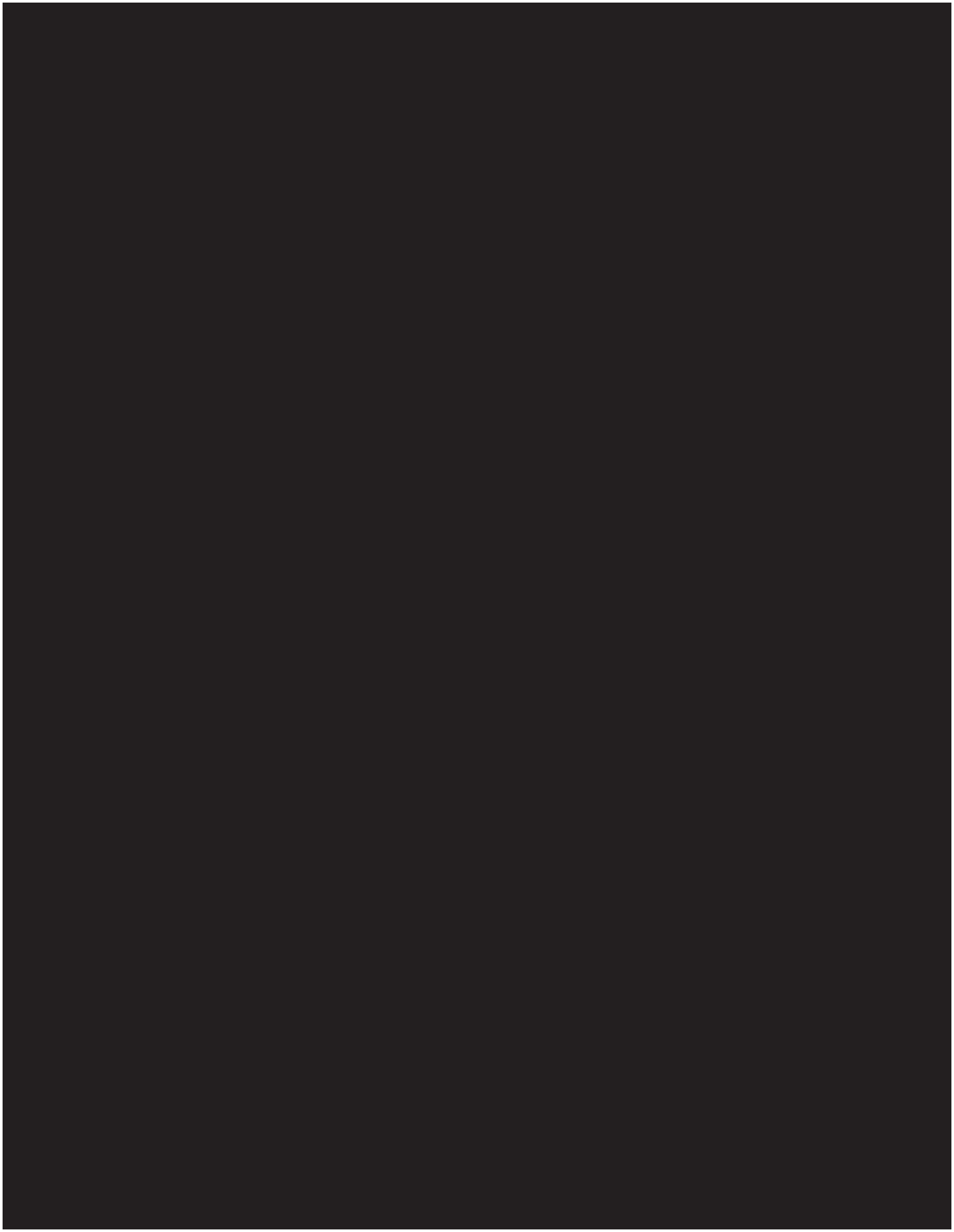


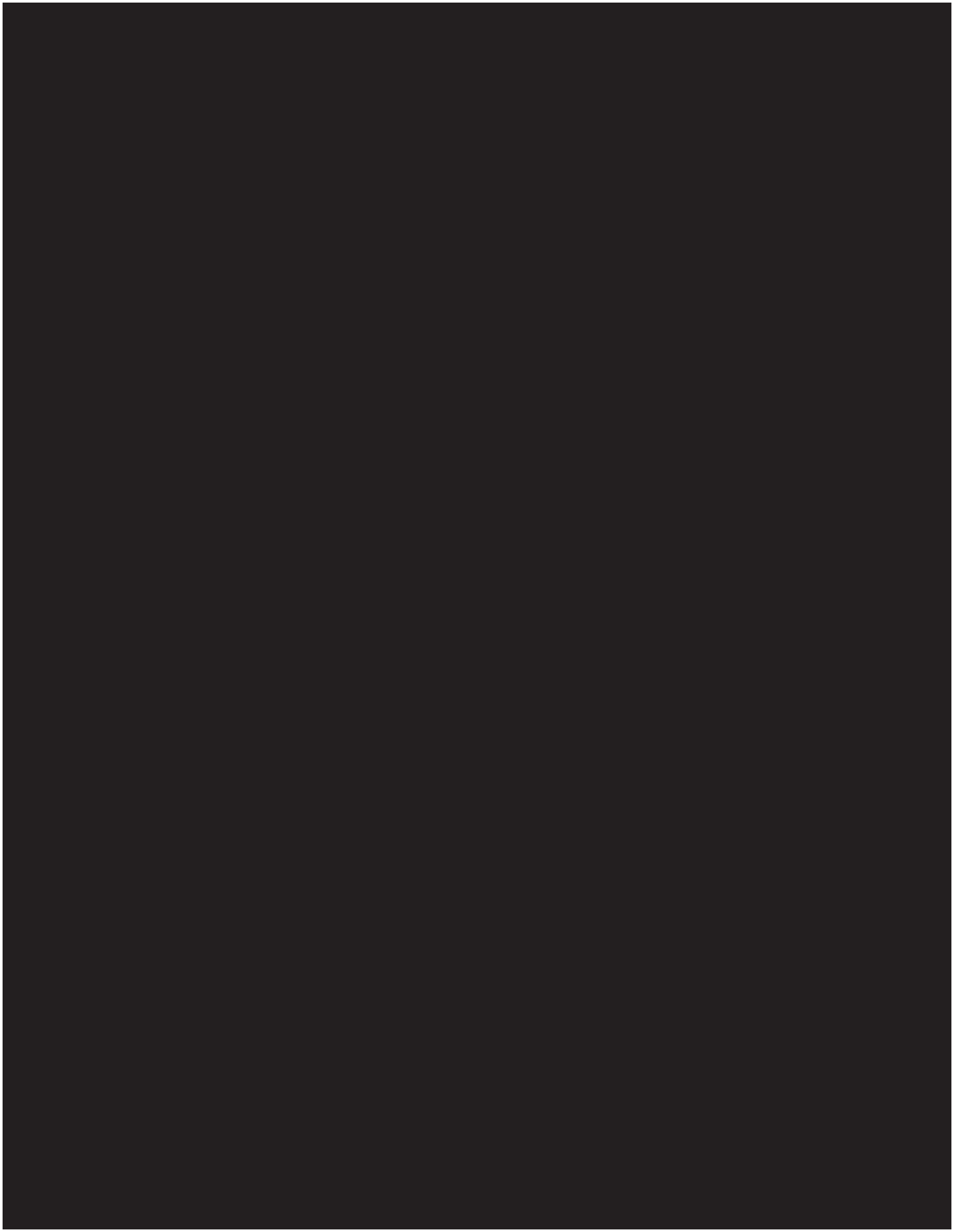


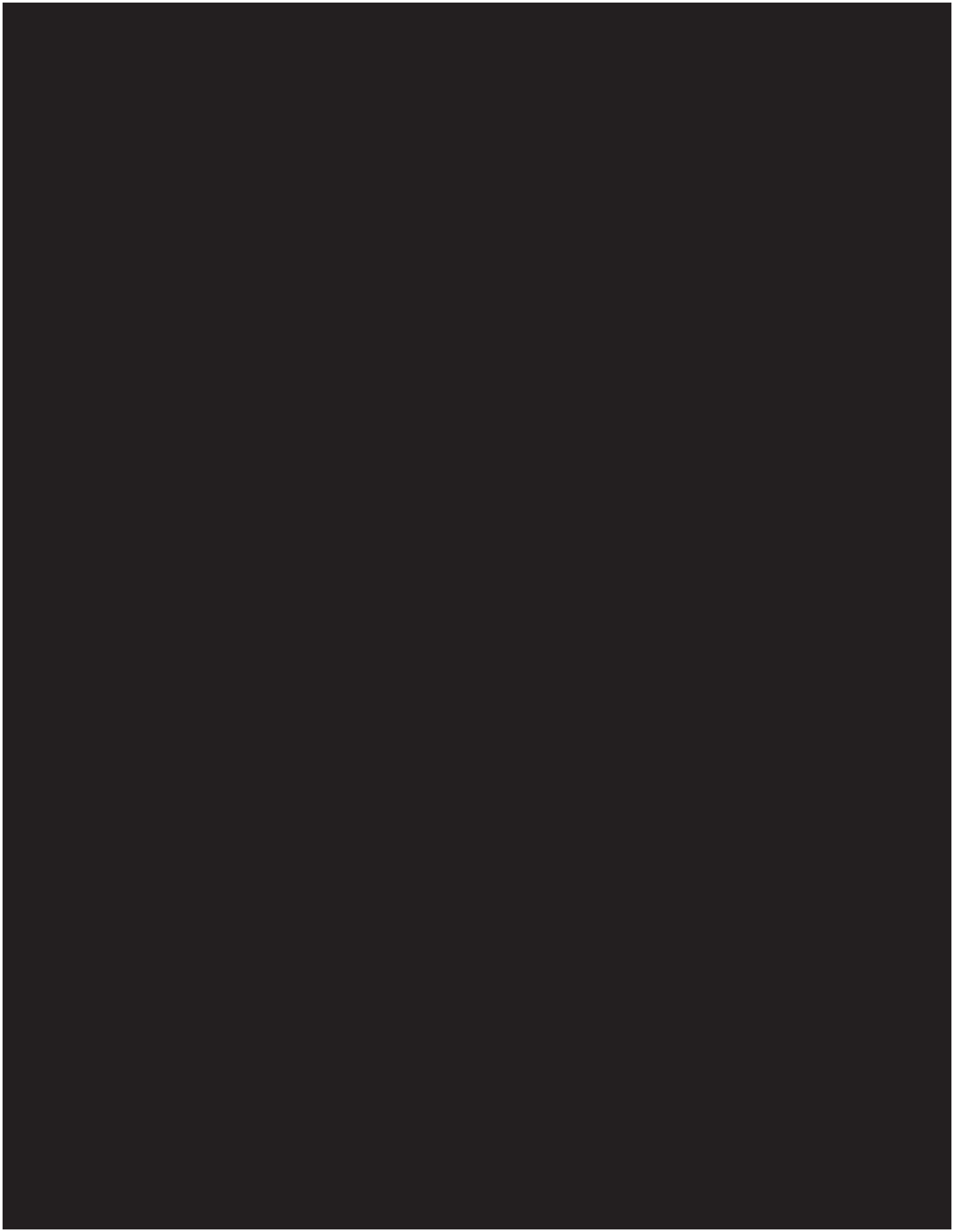


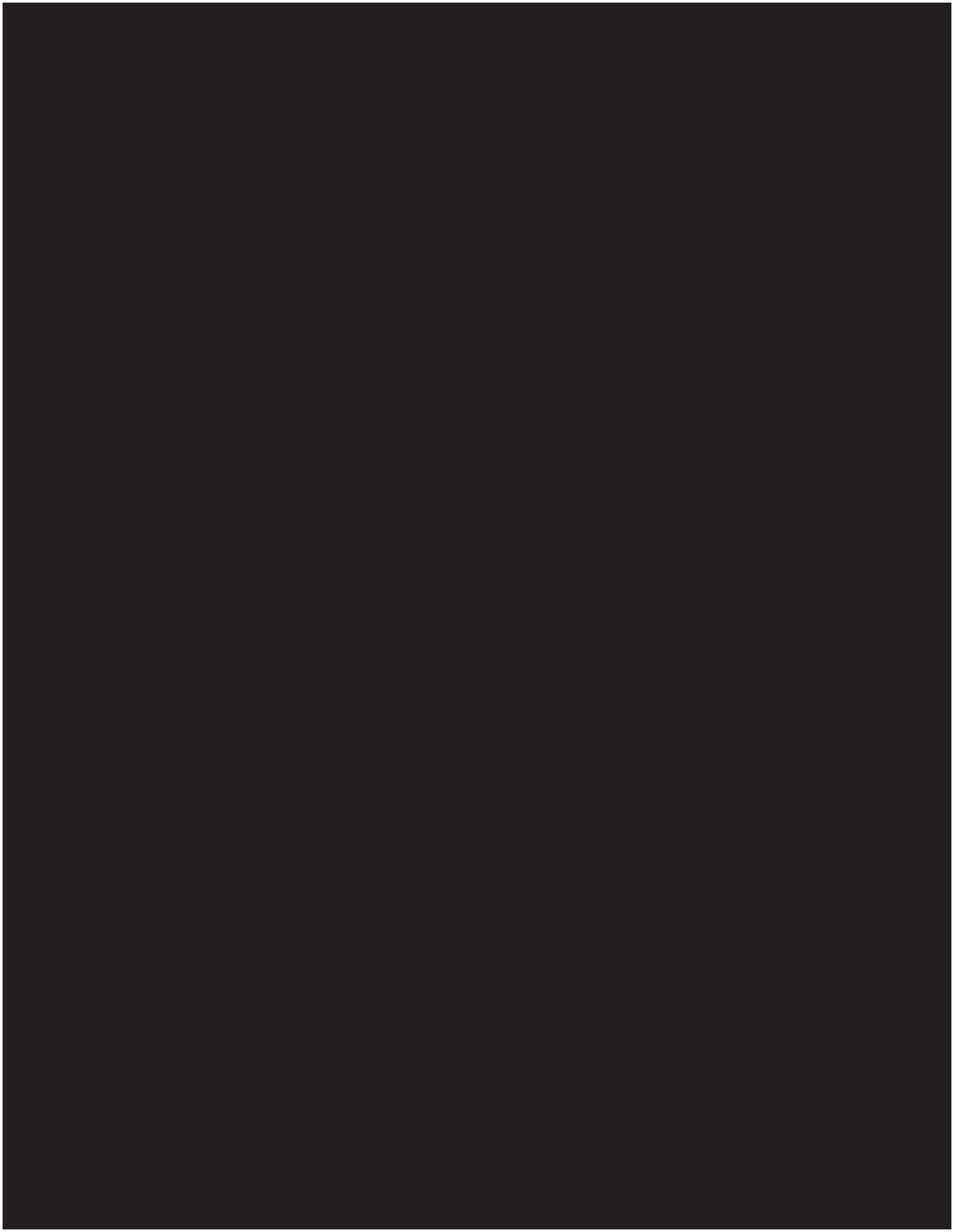


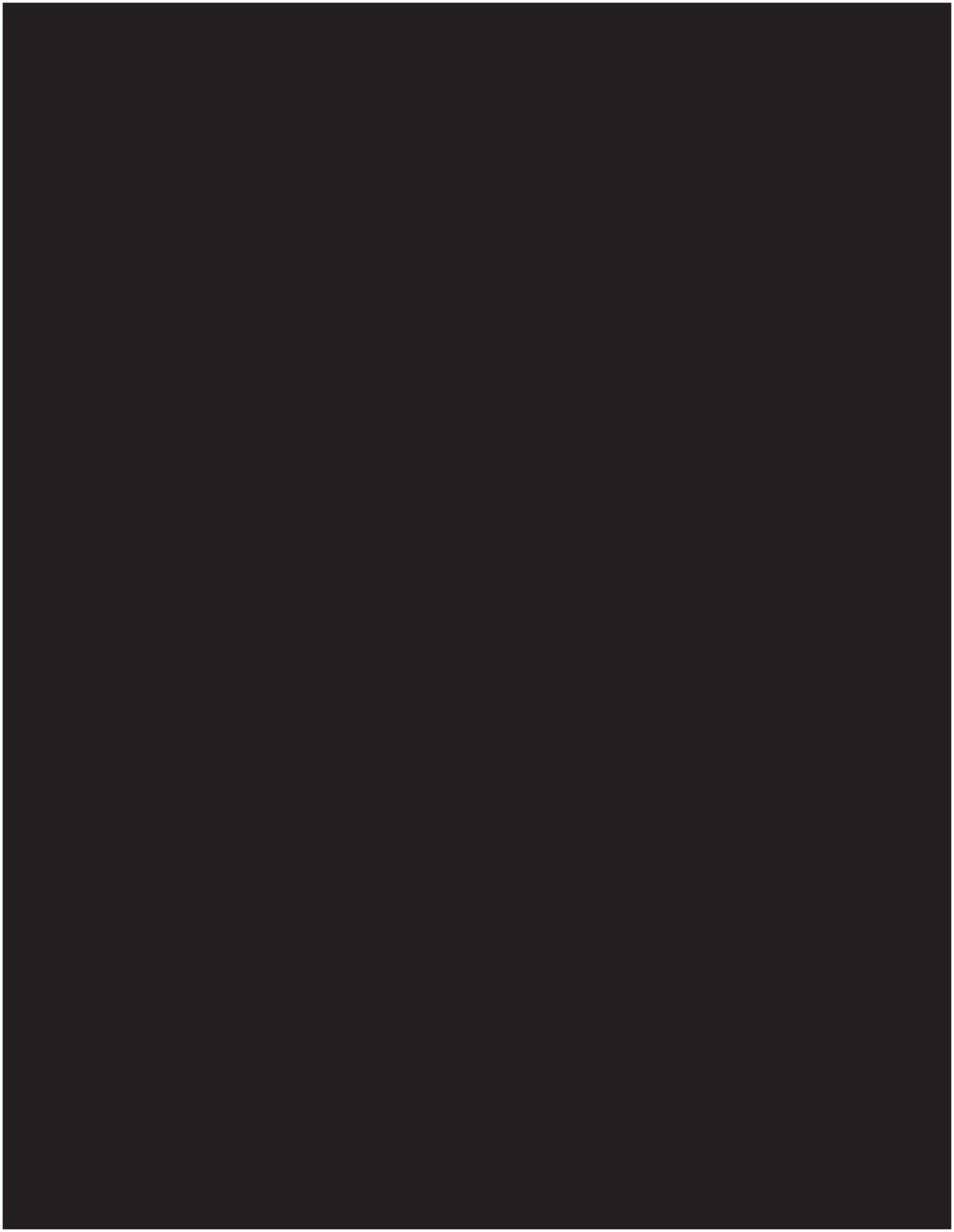


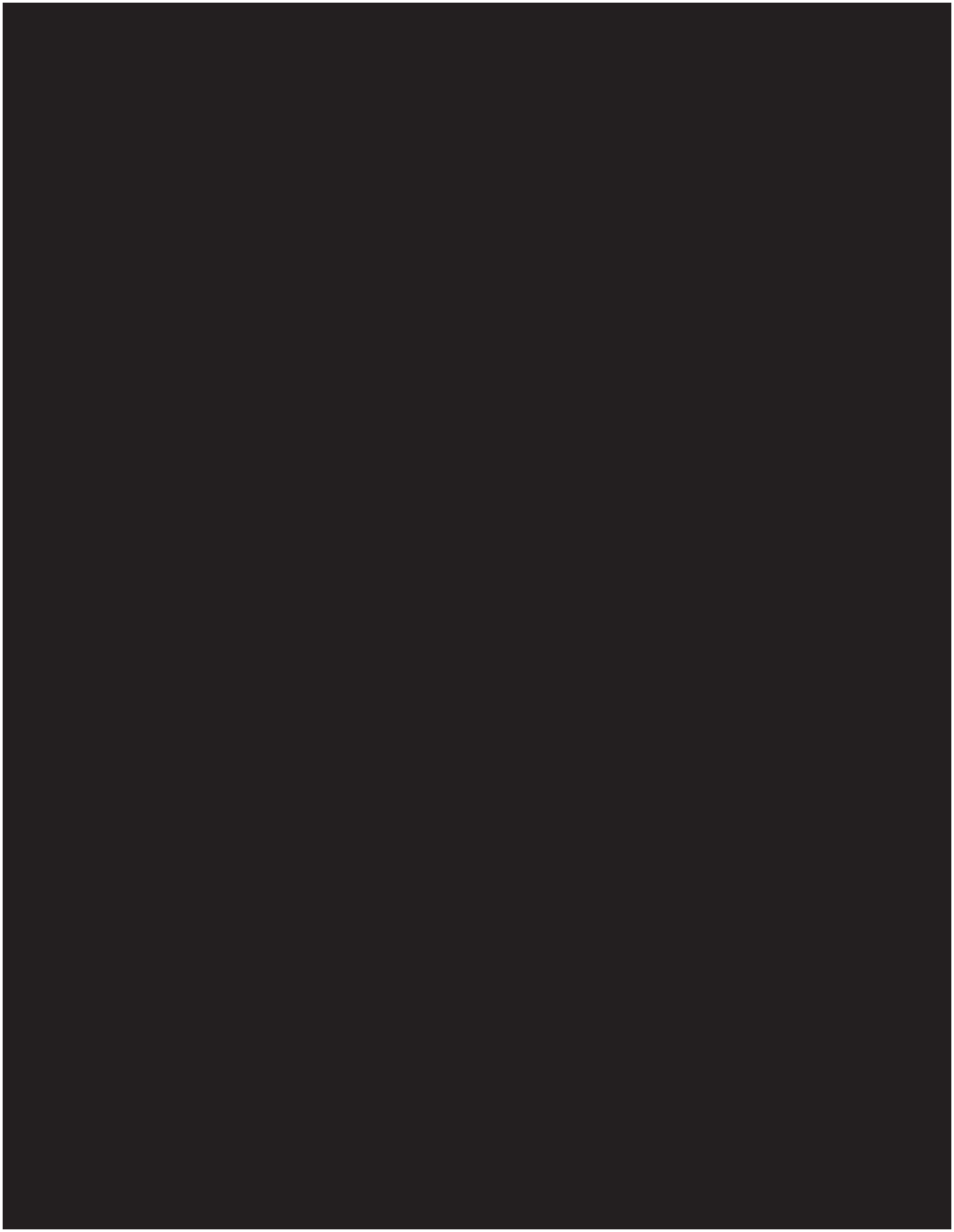


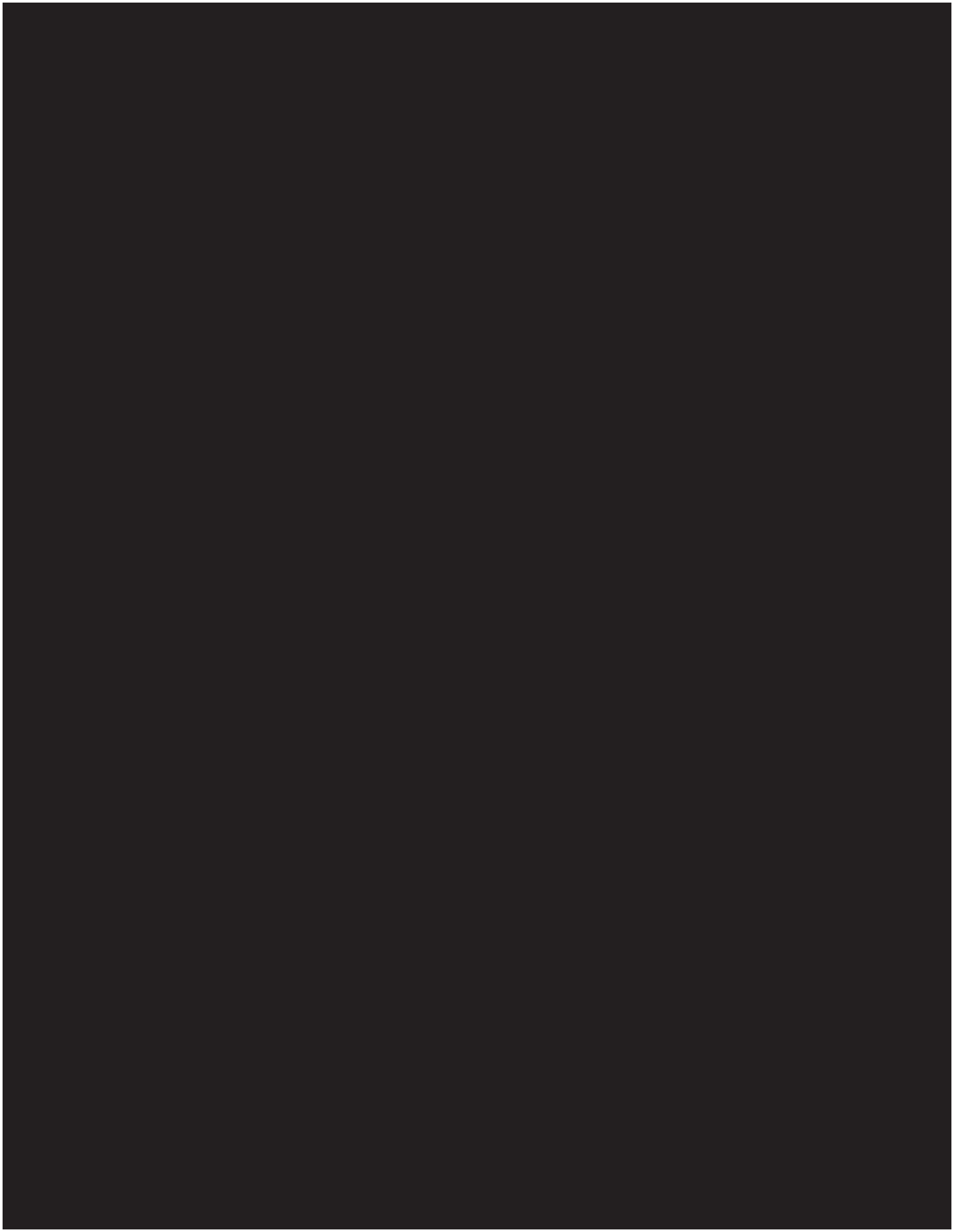


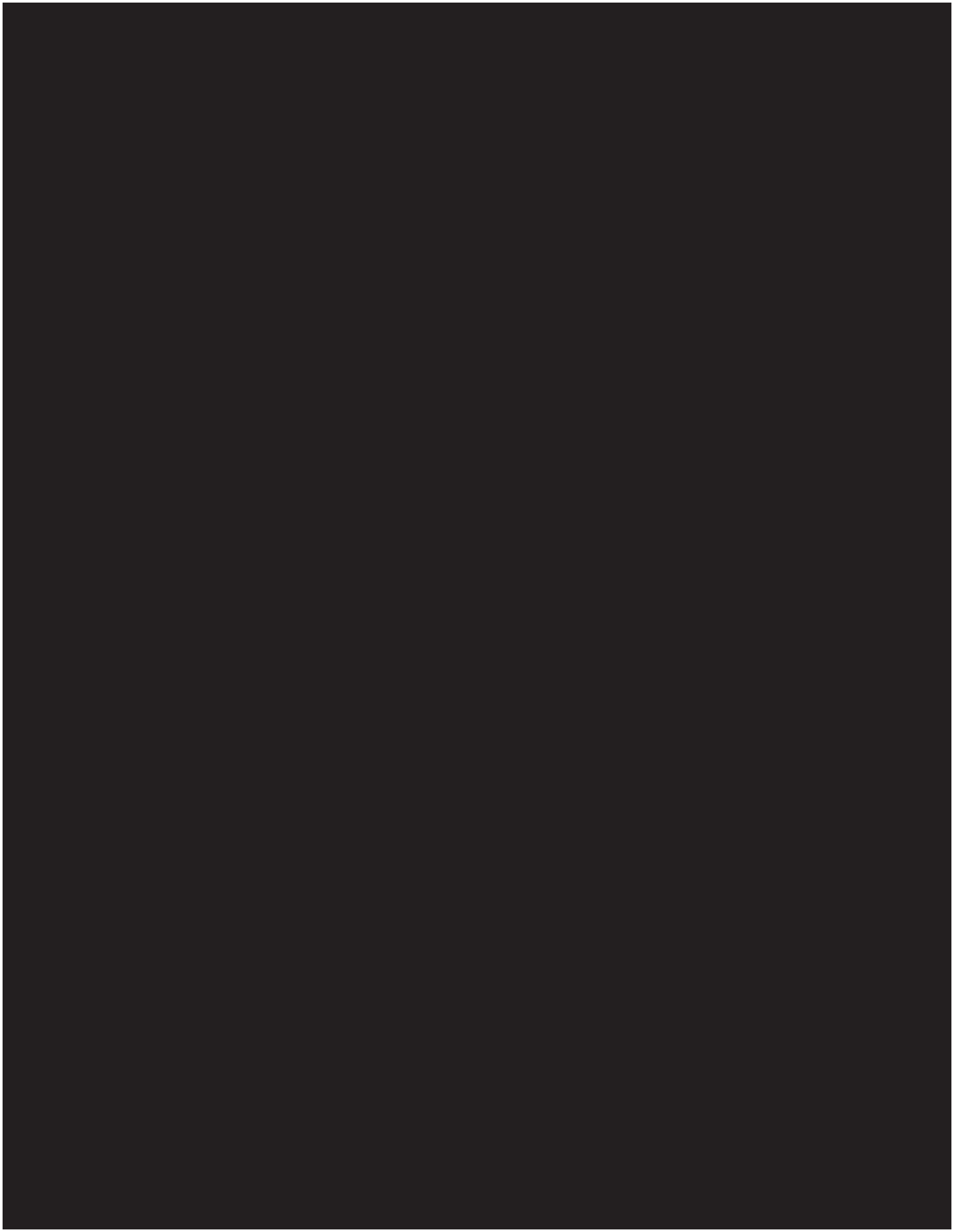


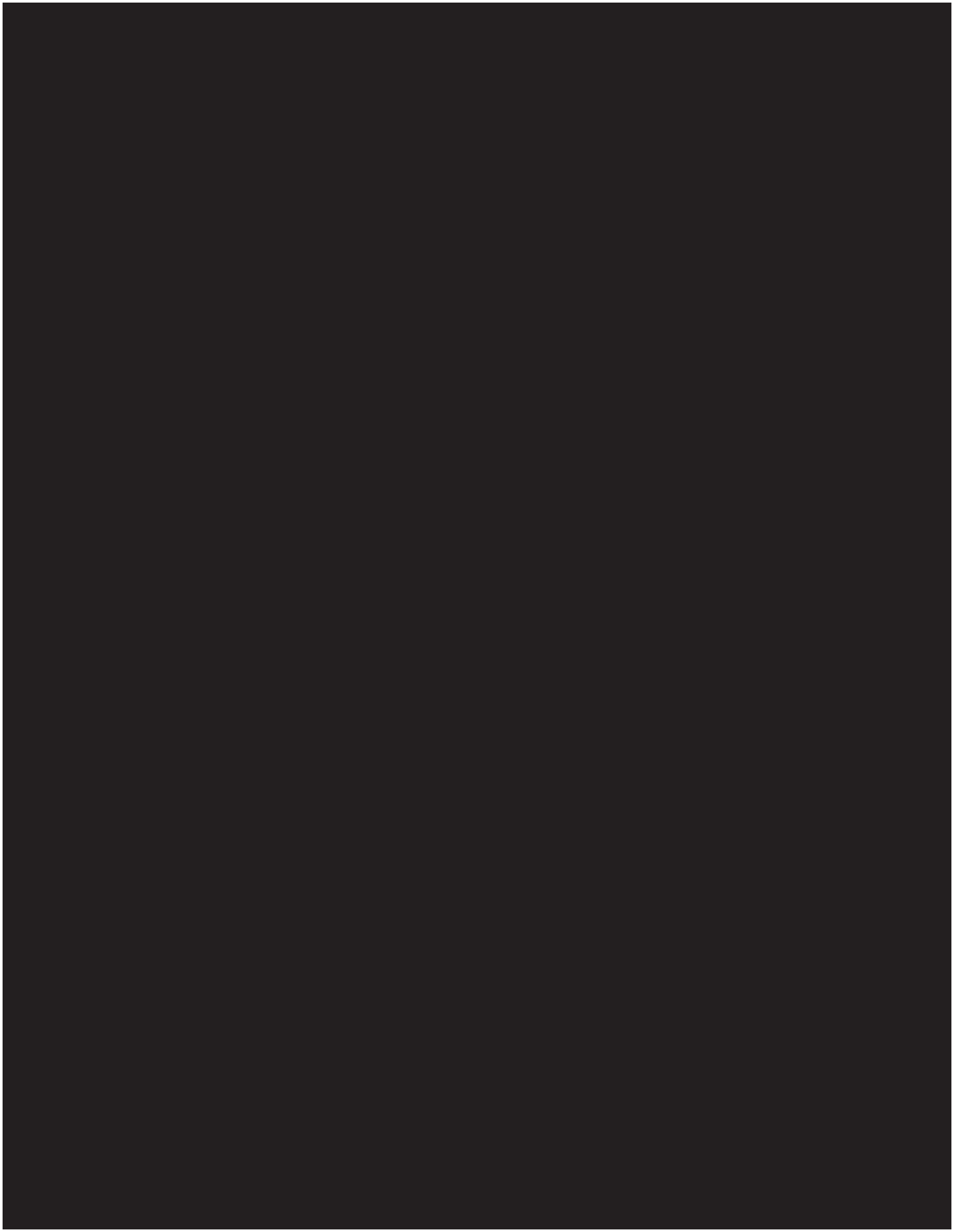


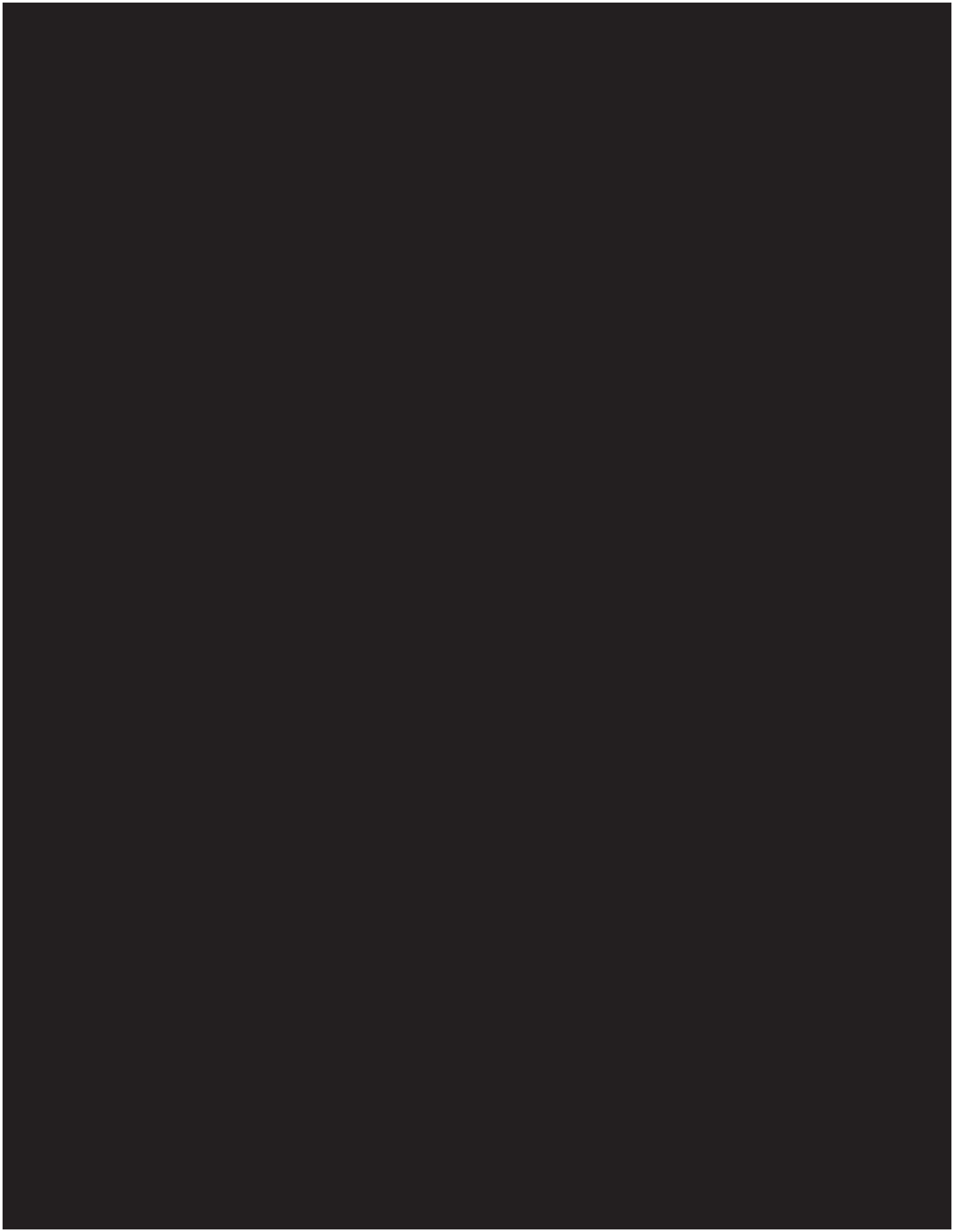


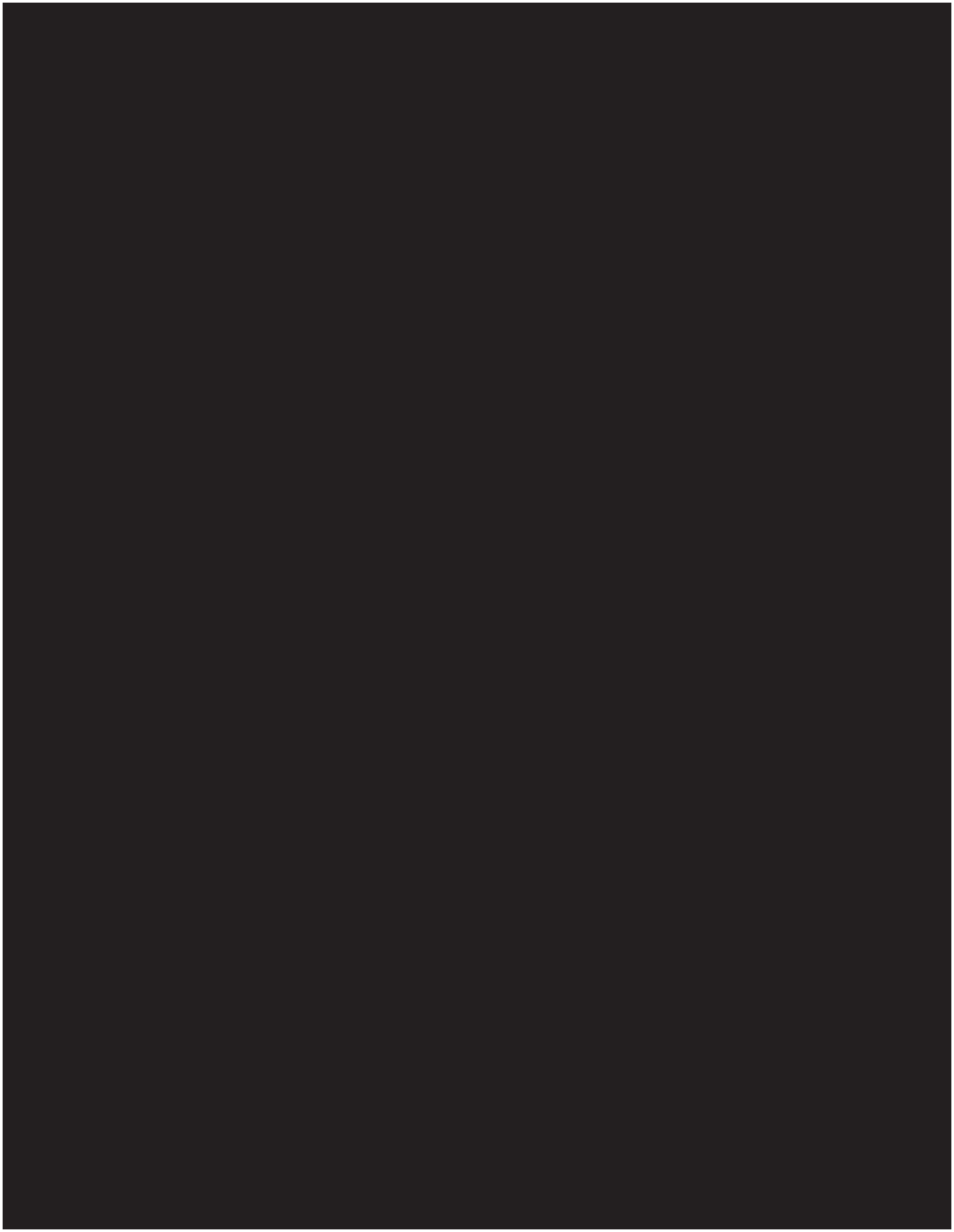












Notebook No: **12001637** Date MM/DD/YYYY

Project	Subject

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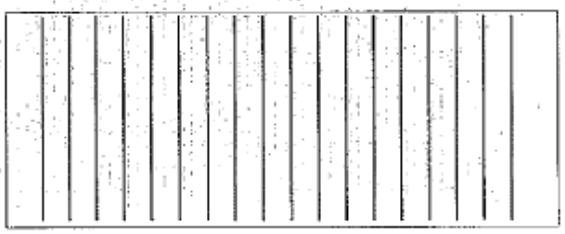
[handwritten:] *01/29/2008*
Weekly report meeting
Made a monthly report

01/30/2008
Thorough cleaning
Correcting the monthly report
Prepared the material for explaining MAP method to STP

[seal:] Engineering 01/30/2008 Ichikawa

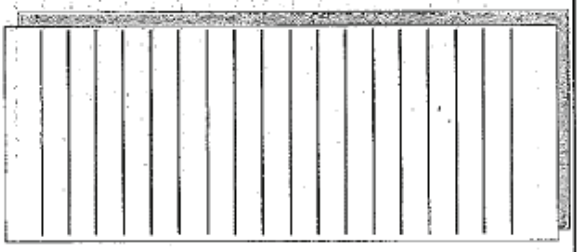
MAP (Molded Array Packaging) method

Lead frame
47 × 100mm (example)
Containing slits which become gaps when it becomes LED.



MAP (Molded Array Packaging) method

Assembly tape pasting
Without pasting, the resin will leak out from the slits.

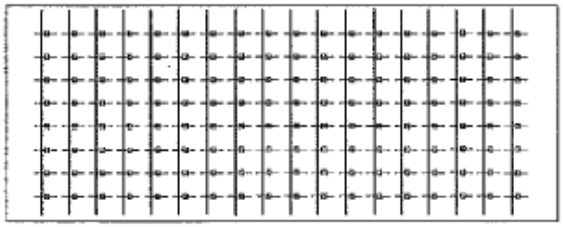


[seal:] Engineering 02/04/2008 Miki

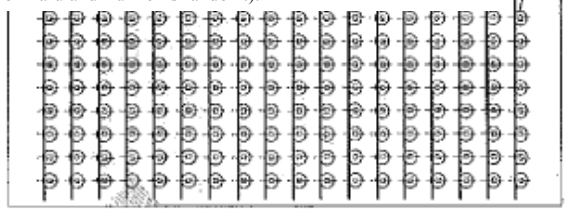
[seal:] Engineering 01/30/2008 Ichikawa

MAP (Molded Array Packaging) method

DB, WB



MAP (Molded Array Packaging) method
Transfer or Compression molding
The figure below, in the case of transfer (however the handling of Karu and Runner is random.).



[seal:] Engineering 01/30/2008 Ichikawa

To Page No:

Date	Date
Invented by [signature:] *Hiroshi Ichikawa* [hw:] *01/30/2008*	Understood and Witnessed by Signed [signature:] *Junji Takechi [hw:] 02/15/2008*
Recorded by [seal:] Engineering ~~02/04/2008~~ Miki MM/DD/YYYY	Signed MM/DD/YYYY

Notebook No: **12001637** Date MM/DD/YYYY

Project Subject

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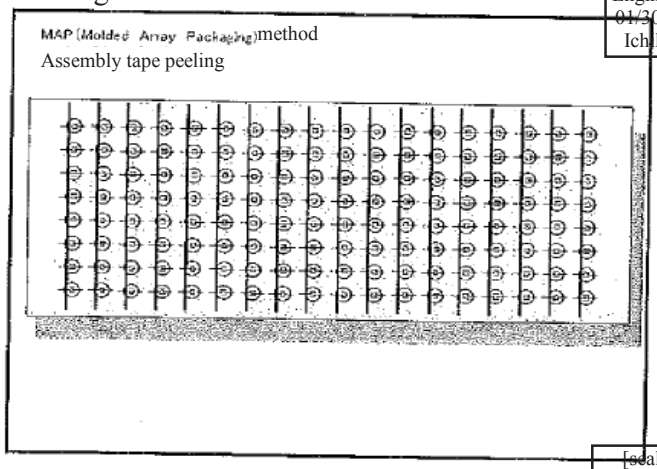
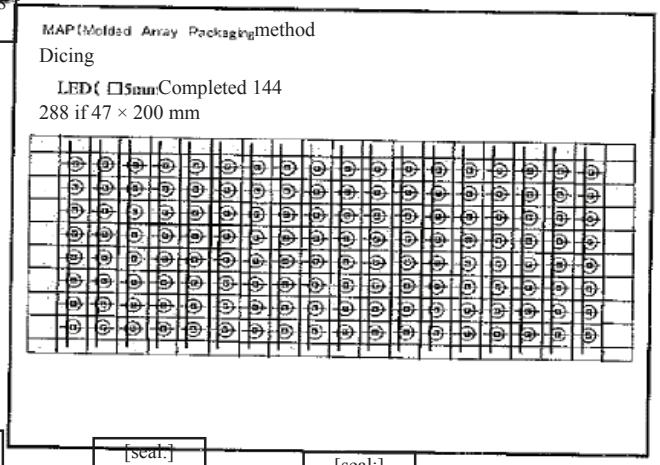


[seal:] Engineering 01/30/2008 Ichikawa



[seal:] Engineering 01/30/2008 Ichikawa

[seal:] Engineering 01/30/2008 Ichikawa

[seal:] Engineering 02/04/2008 Miki

[handwritten:] *01/31/2008*

Dealing with UL (SCR1012)

Prototyping (Reproduction confirmation of effect of lens and cavi depth on light extraction of 083)

Frame type lens formation

Improving light extraction efficiency of 083

Confirming the effect of the shallow cavi and lens by color comparison.

Prototype condition

Prototype LED: NS6W083B

Cavi depth:

① Design value of current product 0.625 mm

② Targeting roughly 0.4 mm by hand polishing

③ Targeting roughly 0.2 mm by hand polishing

Inner blend ratio

NP-206-12	OE-6340A	OE-6340B
40	50	50
50	50	50
60	50	50
70	50	50
80	50	50

Inner blend amount (g)

NP-206-12	OE-6340A	OE-6340B
8	10	10
10	10	10
12	10	10
14	10	10
16	10	10

NP-206-12 lot: 206-12-008

OE-6340 lot: 0005016751

Rentaro: Stir for two minutes

Vacuum de-foaming

Needle: 22 G

Dispenser One in the TS2 building clean room

Press Data: 400

dispense time YAG (hr)	40	50	60	70	80
Cavi depth 0.625mm	0.970	0.970	0.970	0.990	1.230
Cavi depth 0.4mm	0.65~0.68	0.640	0.650	0.790	0.800
Cavi depth 0.2mm	0.370	0.370	0.400	0.450	0.480(0.500)

Curing condition: Wait at room temperature for 6 hr + (50 → 70) ºC × 1 hr + 70ºC × 3 hr + (70 → 100) ºC × 2 hr + 100ºC × 3 hr + (100 → 150) ºC × 1 hr + 150 ºC × 3 hr (setting) The Yamato oven in the TS2 building

[seal:] Engineering 01/31/2008 Ichikawa

To Page No:

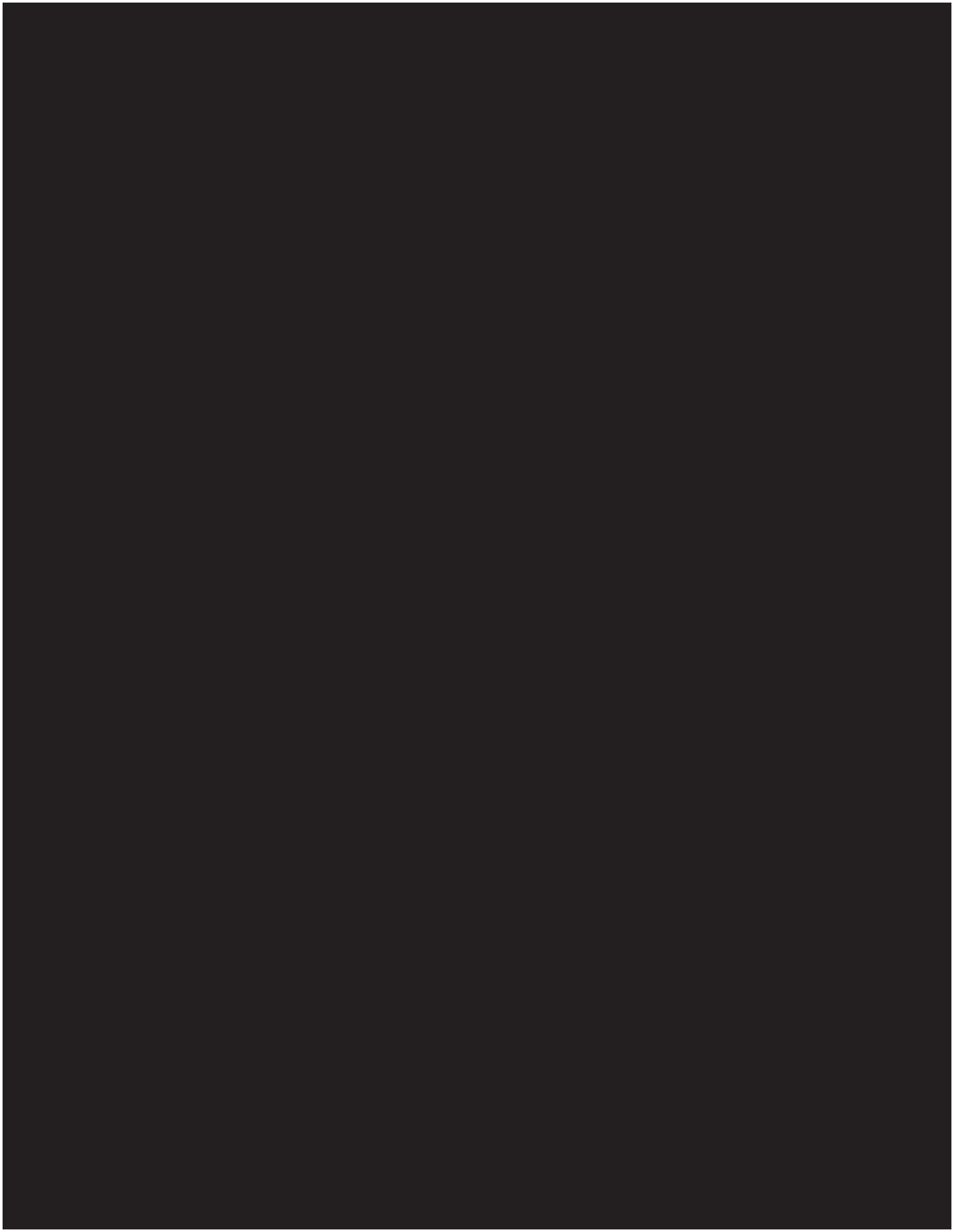
Date Understood and Witnessed by Date

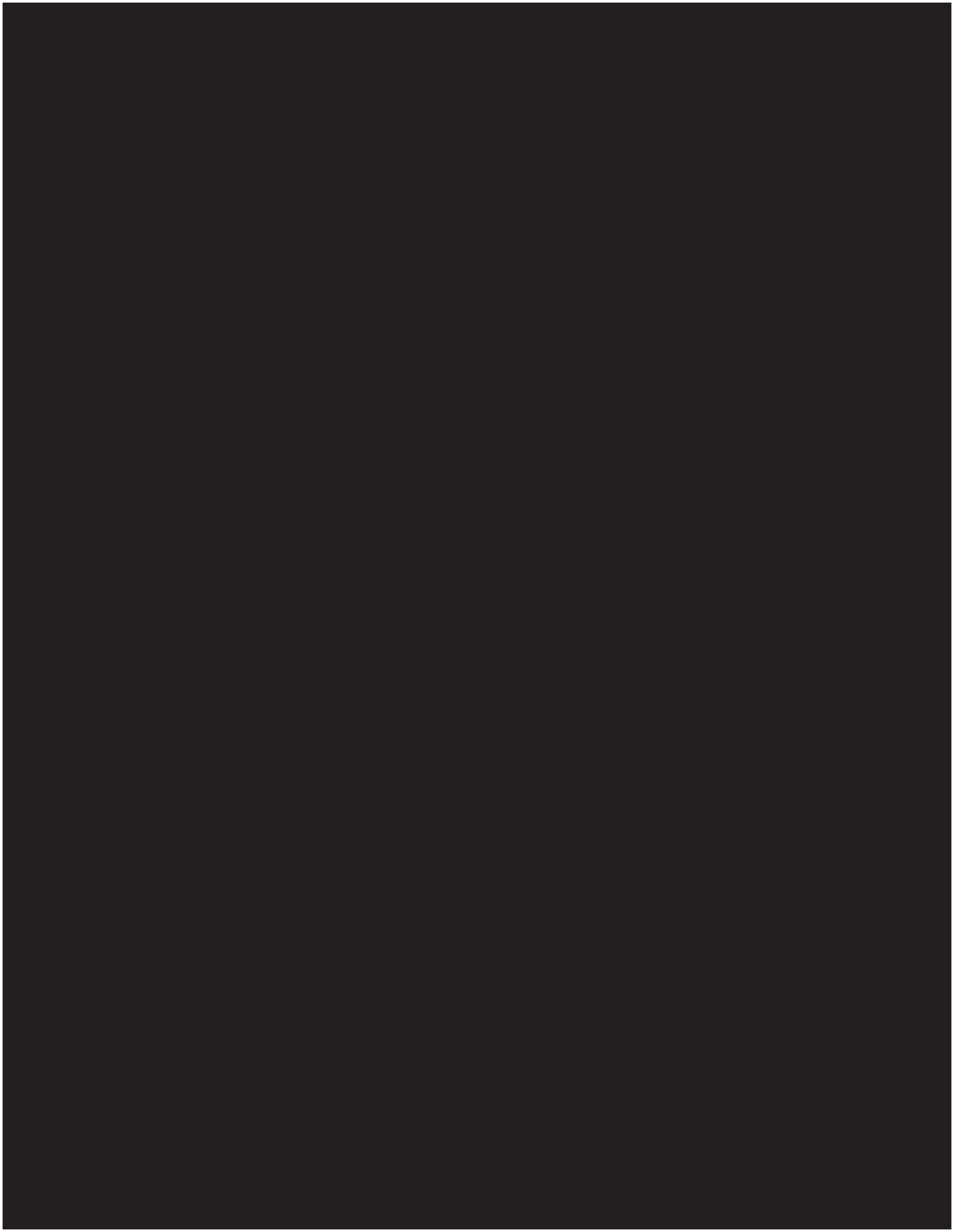
Invented by [signature:] *Hiroshi Ichikawa* [hw:] *01/31/2008*

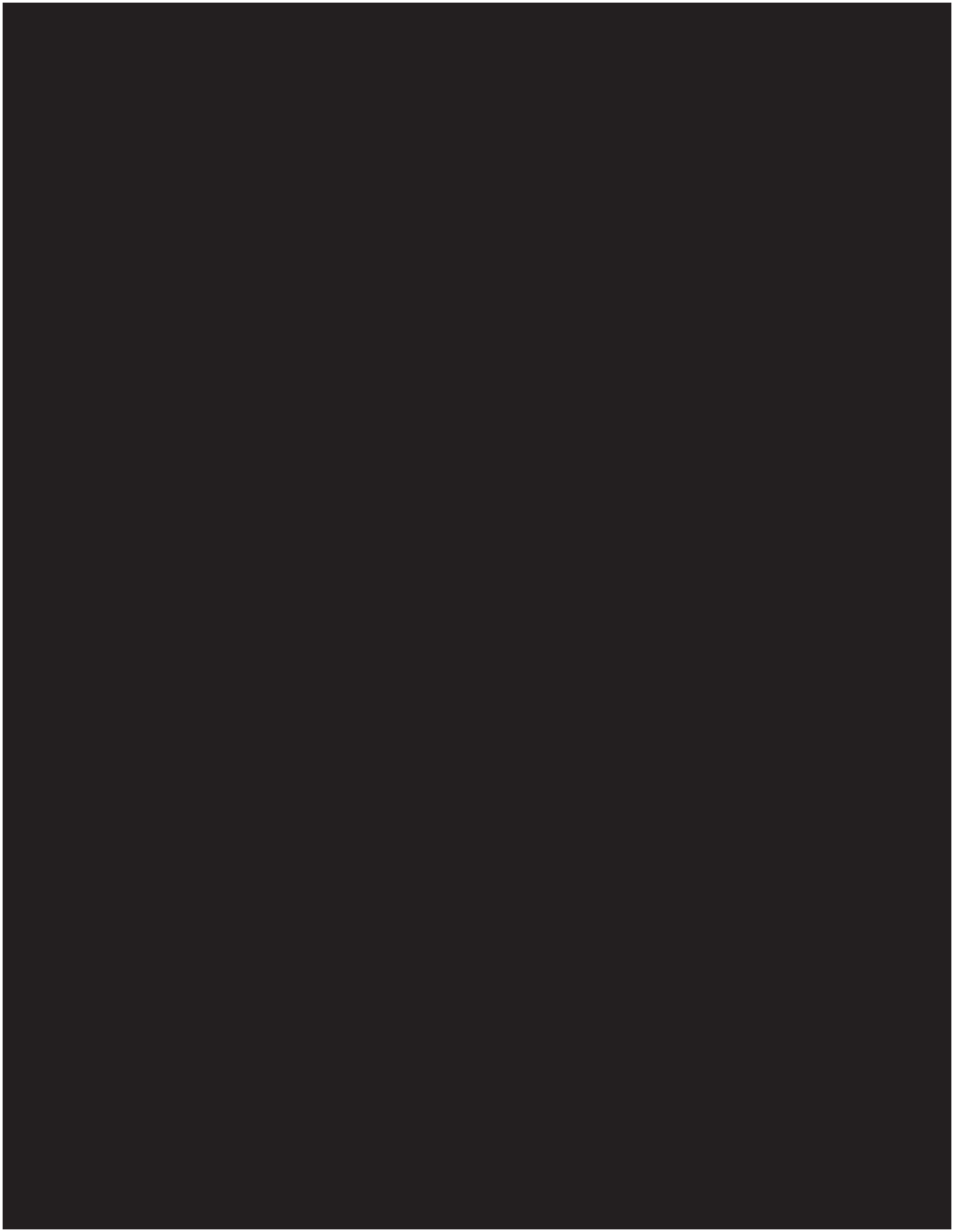
Signed [signature:] *Junji Takechi* [hw:] *02/15/2008*

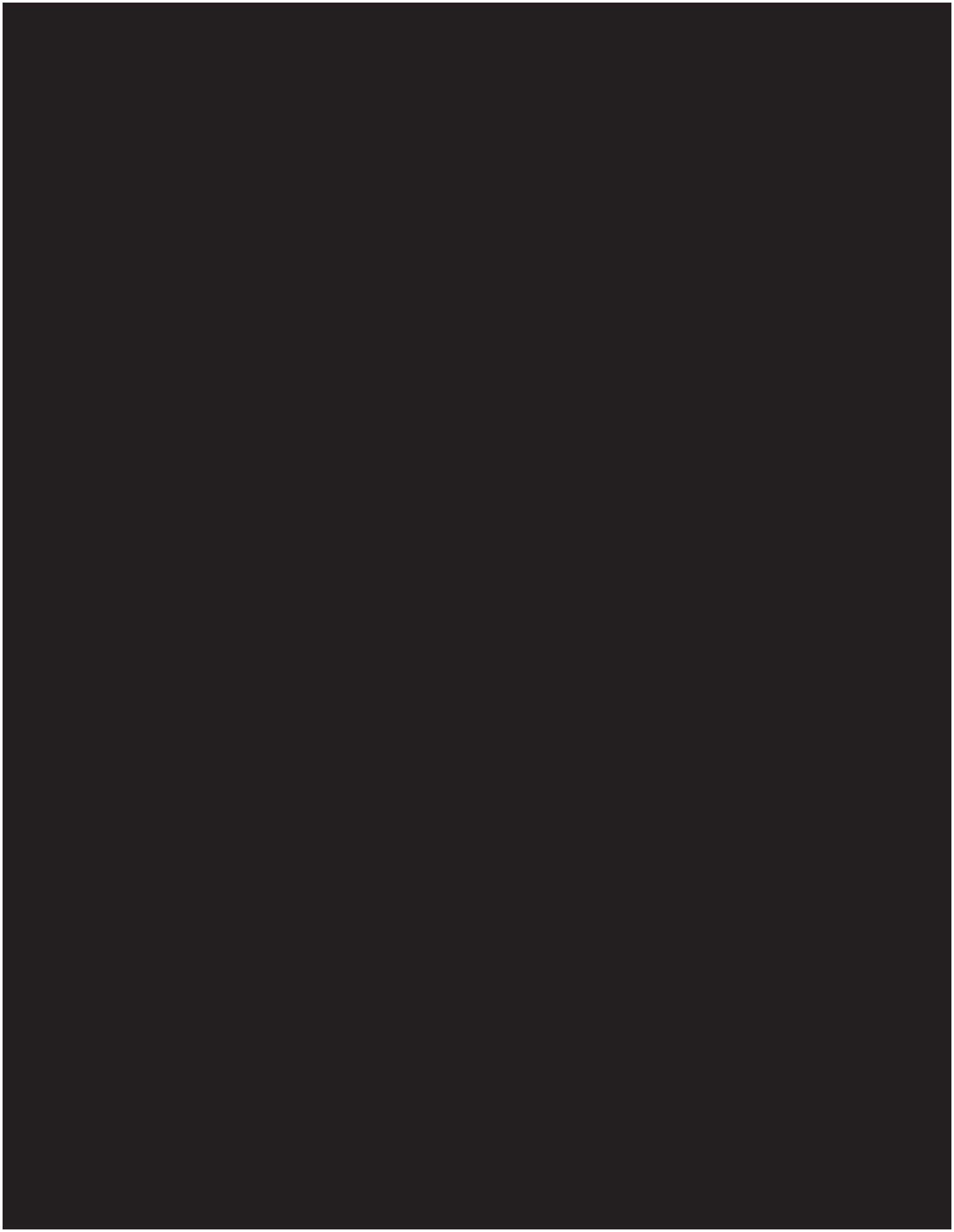
Recorded by [seal:] Engineering 02/04/2008 Miki MM/DD/YYYY

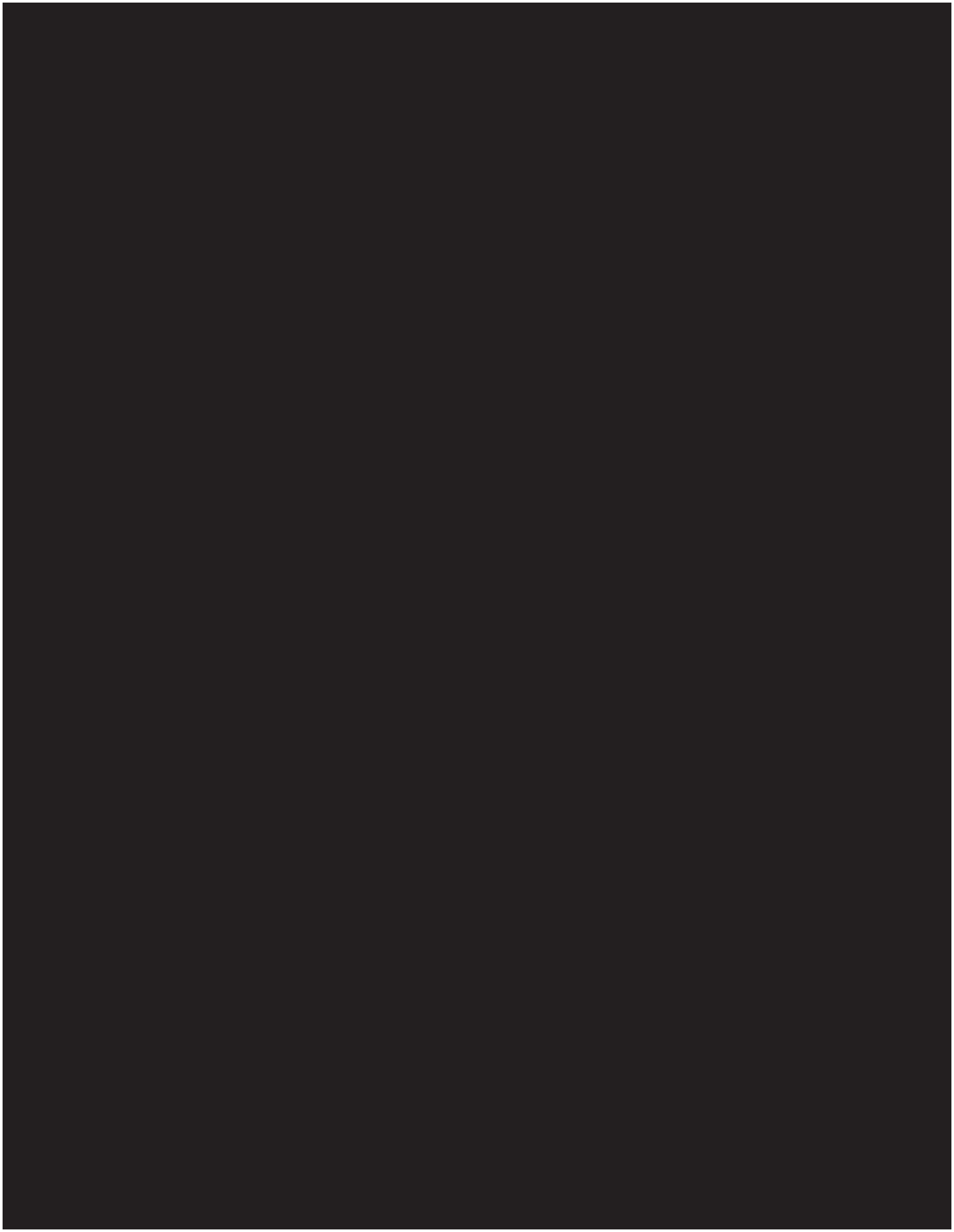
Signed MM/DD/YYYY

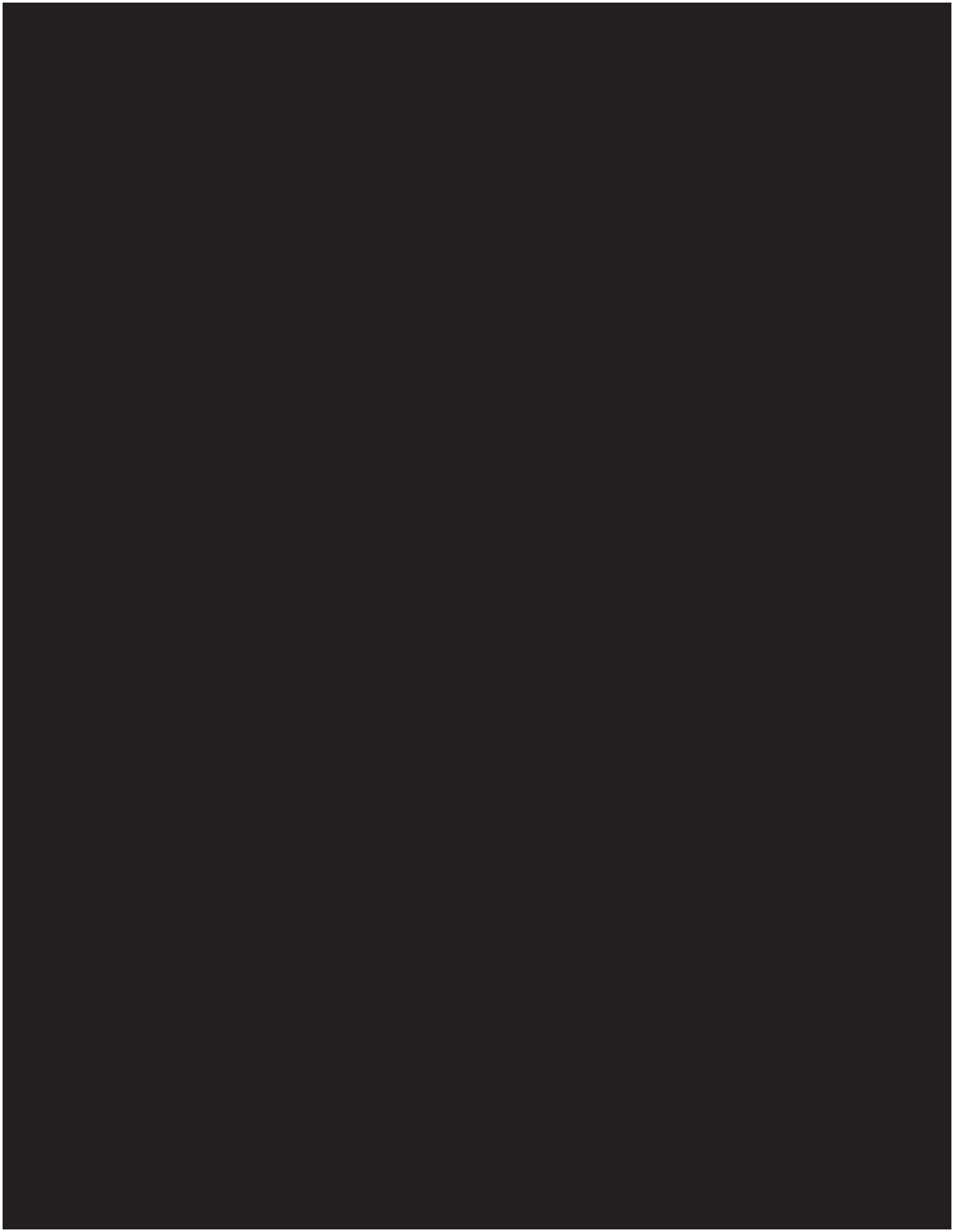


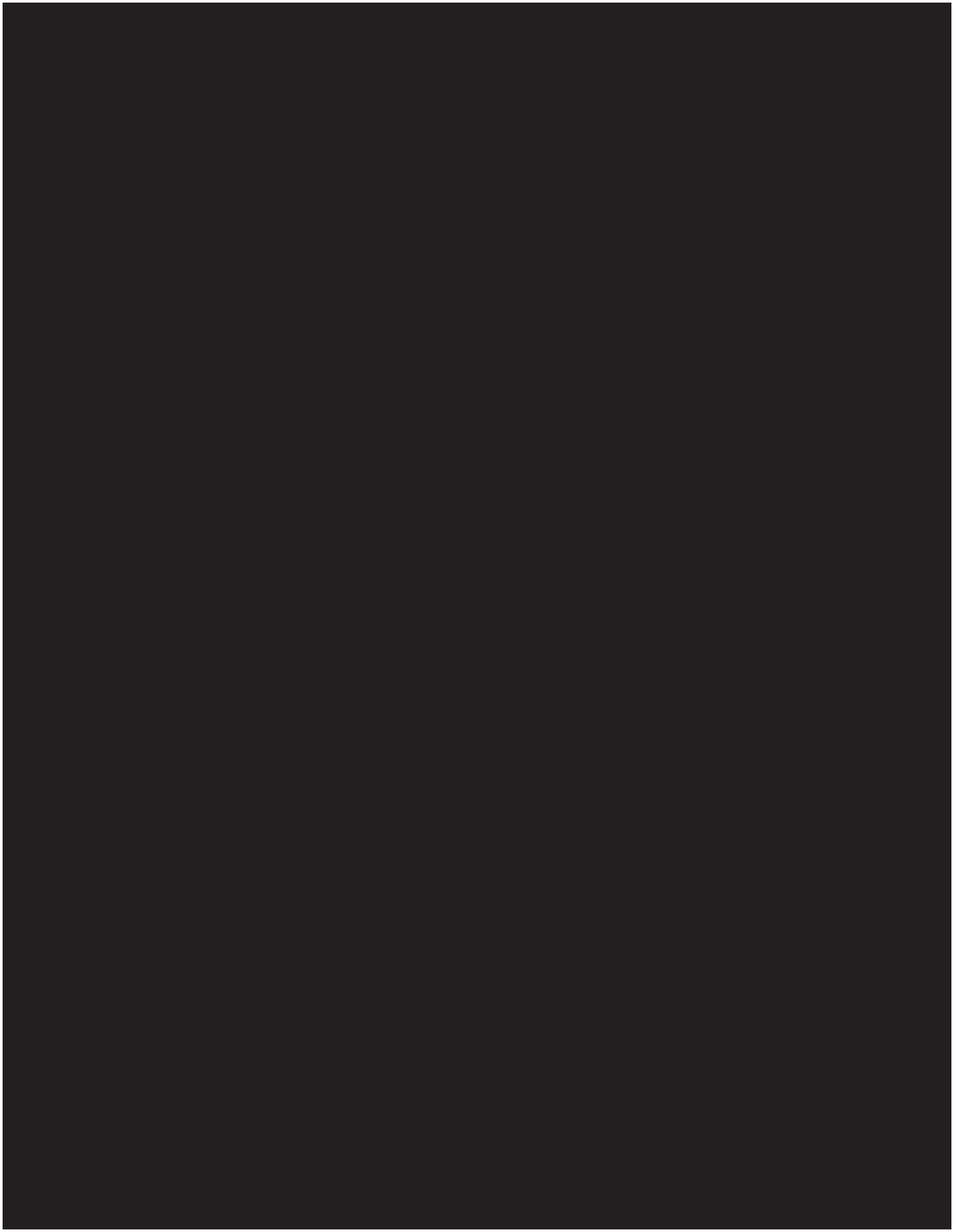


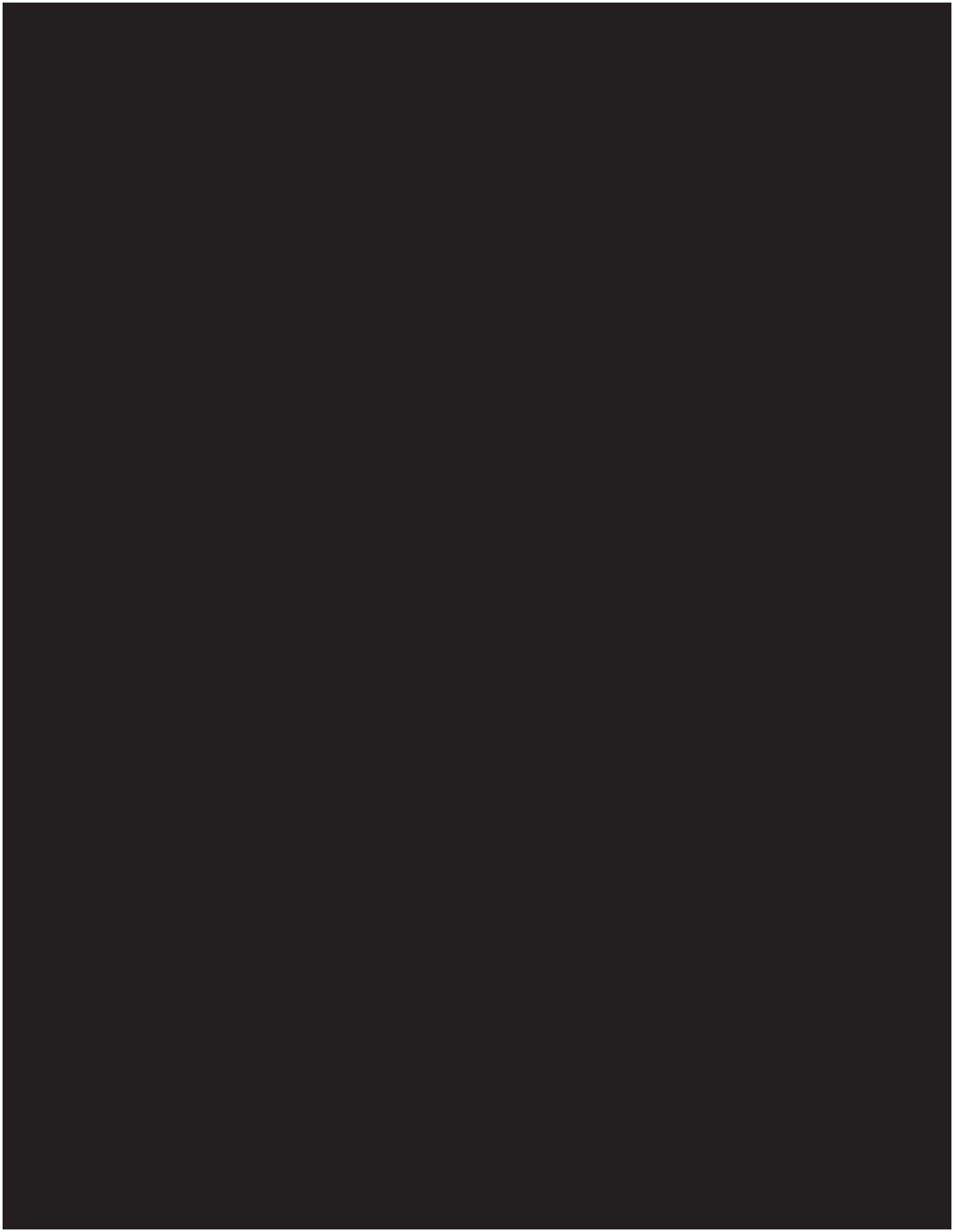












Notebook No : **12001637** Date MM/ DD/ YYYY

Project	Subject

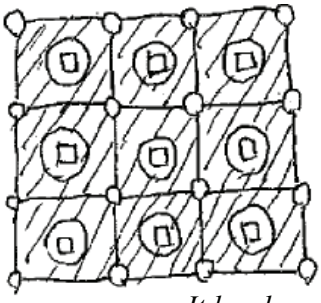
From Page No :

[handwritten:] *02/ 12/ 2008*

- *Weekly report meeting*
- *Summarizing the direct mold patent*

02/ 13/ 2008

- *Summarizing the direct mold patent*
- *Meeting for the direct mold PKG shape (with STP)=*



With cavi
Without cavi (small)

5 × 5
Or
3 × 2

It has been decided that we will try making prototypes of a substrate with 183 with its L/F and EMC gathered together in an array like this.
Have the schedule of design be issued by 2/16 from STP.

- *UL test specimen size adjustment and sending to UL*

SCR-1012

02/ 14/ 2008

① Mold a lead frame to create an assembled substrate.
LED manufactured by assembling and then dicing at least one side and the manufacturing method thereof
② Lead frame LED with castellation structure
Prepare a material for investigating prior art of the patent of the application idea described above
Next page

[stamp:] Tamaki

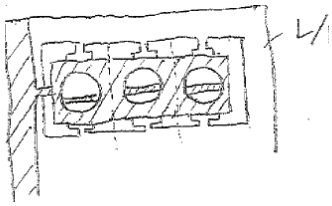
To Page No :

Date	Understood and Witnessed by Date
Invented by [signature] *Hiroshi Ichikawa* *02/ 14/ 2008*	Signed [signature] *Hideyuki Nagai* *02/ 15/ 2008*
Recorded by [stamp:] Technology 02/ 16/ 2008 Miki MM/ DD/ YYYY	Signed MM/ DD/ YYYY

Notebook No : **12001637**

Project

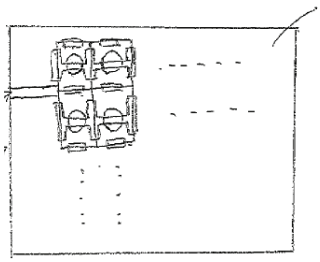
[handwritten:]
dicing at least one side



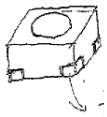
Molding resin

[stamp:]
Technology
02/ 14/ 2008
Ichikawa

Assembled substrate



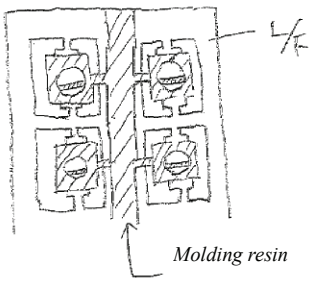
Singulation



→ Lenses can also be attached to this type by compression molding.

Edge (No caster → Solder fillet cannot be made)
Since it is the cut copper, it is easily oxidized, whereby solder wetting is bad and the joining is not reliable

[stamp:]
Technology
02/ 16/ 2008
Miki



Molding resin

① Mold a lead frame to make a (assembled) substrate. LED made by assembling and dicing at least one side and the manufacturing method thereof

[stamp:]
Technology
02/ [Illegible]/ 2008
Ichikawa

[stamp:]
Tamaki

To Page No :

Date

Invented by [signature] *Hiroshi Ichikawa* *02/ 14/ 2008*

Recorded by [stamp:] Technology 02/ 16/ 2008 Miki MM/ DD/ YYYY

Understood and Witnessed by Date

Signed [signature] *Hideyuki Nagai* *02/ 15/ 2008*

Signed MM/ DD/ YYYY

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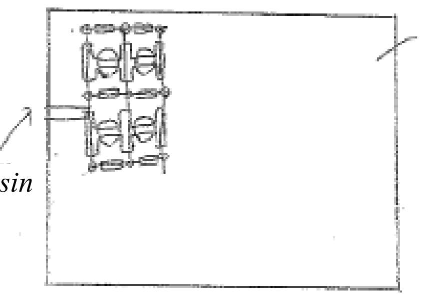
Notebook N[handwritten:]

Project

From P

[stamp:] Technology 02/ 14/ 2008 Ichikawa

② *LED of a lead frame with a castellation structure*

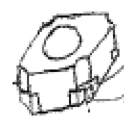


Molding resin

There is a hole which will become a caster at L/F

L/F

Singulation ⇒

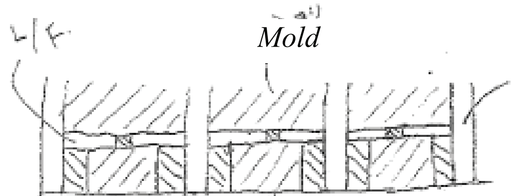


A cut copper here.

Silver plating here.

Edge (there is a caster → Solder fillet can be made)

However, lenses ~~can also~~ cannot be attached to ^the substrate of this type by compression molding.



L/F

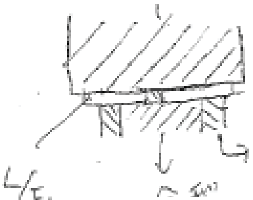
Mold

Pin (clog the hole of L/F)

Mold

Mold

Molding resin



L/F

Mold

Molding resin

← *Such as 183* *Conventionally* → It is necessary to put out the edge because the part to be cut by the mold becomes small. → needless space is needed

[stamp:] Technology 02/ 14/ 2008 Ichikawa

[stamp:] Technology 02/ 16/ 2008 Miki

[stamp:] Tamaki

Date · Witnessed by · Date

Invented by [signature] *Hiroshi Ichikawa* *02/ 14/ 2008*

[stamp:] Technology 02/ 16/ 2008 Miki

Recorded by ____ MM/ DD/ YYYY

Signed ____ MM/ DD/ YYYY

Signed [signature] *Hideyuki Nagai* *02/ 15/ 2008*

Notebook No : **12001637** Date MM/ DD/ YYYY

Project	Subject

From Page No :

[handwritten:]

・ *Visitor*

Rohm and Haas

There was introduction in the past via Nichia America.
Once again, there was a presentation of sealing resin.
Famous for acrylics. There are also polymers and monomers.
Sales of 8.3 billion US dollars in 2006.
Of the unusual thing, salt alone has sales of 100 billion yen.
There are introductions of silicone resins with high refractive indexes of 1.60 and 1.57.
From Nichia
① Method of degeneration of silicon
② At what stage will silicon raw materials be obtained?
③ Features
④ Comparison data with Dow JCR. Water vapor transmission, low molecular weight siloxane content, [Illegible] and the like were requested.

[stamp:] Ichikawa

There is no track record of the material.
Asked NDA (draft) and Japanese translation thereof.
Make a ref. for light (heat) resistance test of Hitachi Chemical's molding material
NS 104-2. (Lot S1482E - 0314)
100°C × 3 hr + 150°C × 4 hr
OE-6340 (Lot 0005016751)
Under cure conditions of 083

[stamp:] Tamaki

To Page No :

Date	Understood and Witnessed by Date
Invented by [signature] *Hiroshi Ichikawa* *02/ 14/ 2008*	Signed [signature] *Hideyuki Nagai* *02/ 15/ 2008*
Recorded by [stamp:] Technology 02/ 16/ 2008 Miki MM/ DD/ YYYY	Signed MM/ DD/ YYYY

Notebook No : **12001637** Date MM/ DD/ YYYY

Project	Subject

From Page No :

[handwritten:] *02/ 15/ 2008*

- *Made a ref. for heat resistance and light resistance test of Hitachi Chemical's molding material 9ZR*
  FSX 0510
- *Dealing with the apparatus for Instron high temperature tensile test (especially for the company K)*
- *Going to IP to ask for the prior art investigation of the patent idea of the previous day.*

[stamp:] [Illegible]

To Page No :

Date	Understood and Witnessed by Date
Invented by [signature] *Hiroshi Ichikawa* *02/ 15/ 2008*	Signed [signature] *Hideyuki Nagai* *02/ 15/ 2008*
Recorded by [stamp:] Technology 02/ 16/ 2008 Miki MM/ DD/ YYYY	Signed MM/ DD/ YYYY

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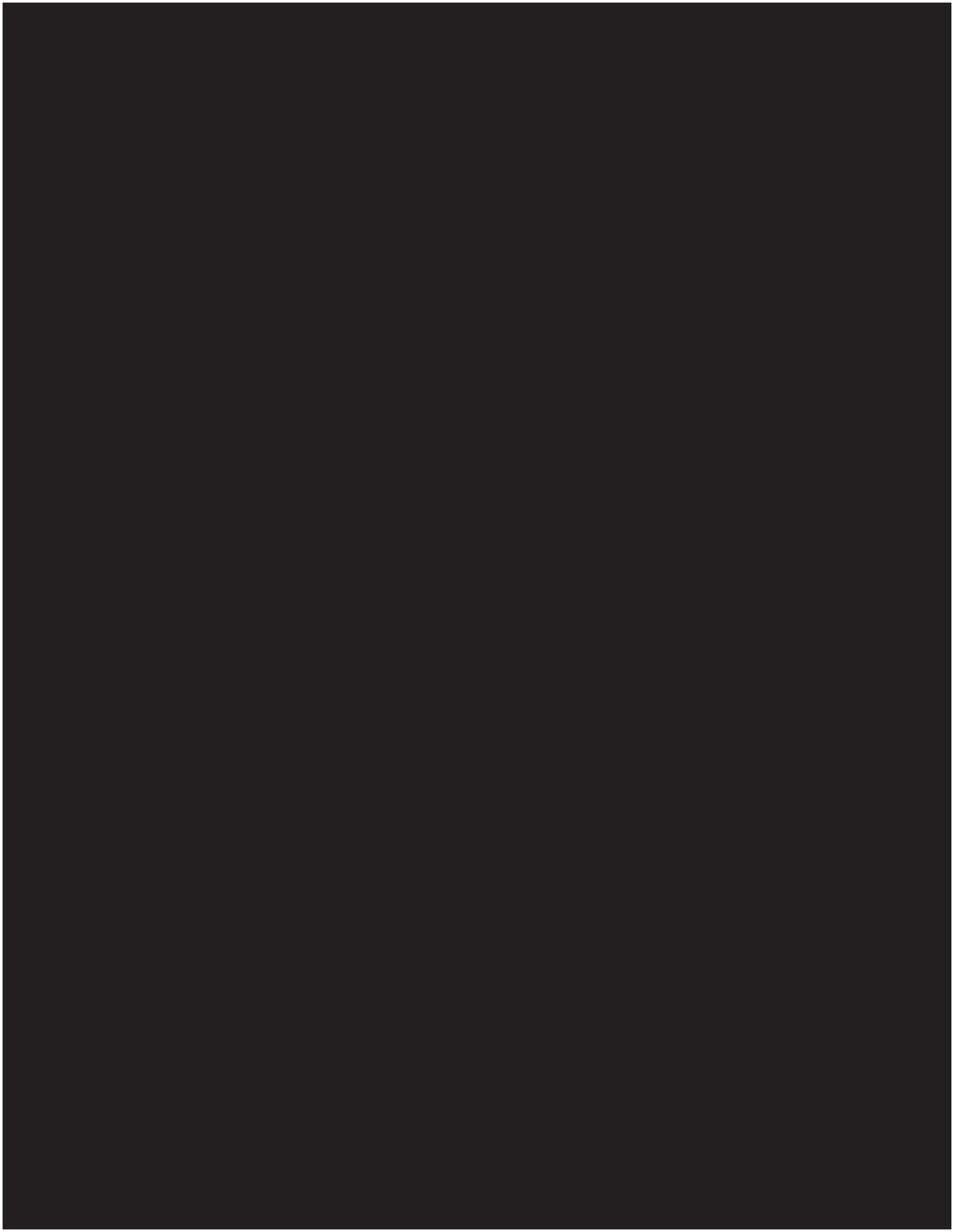
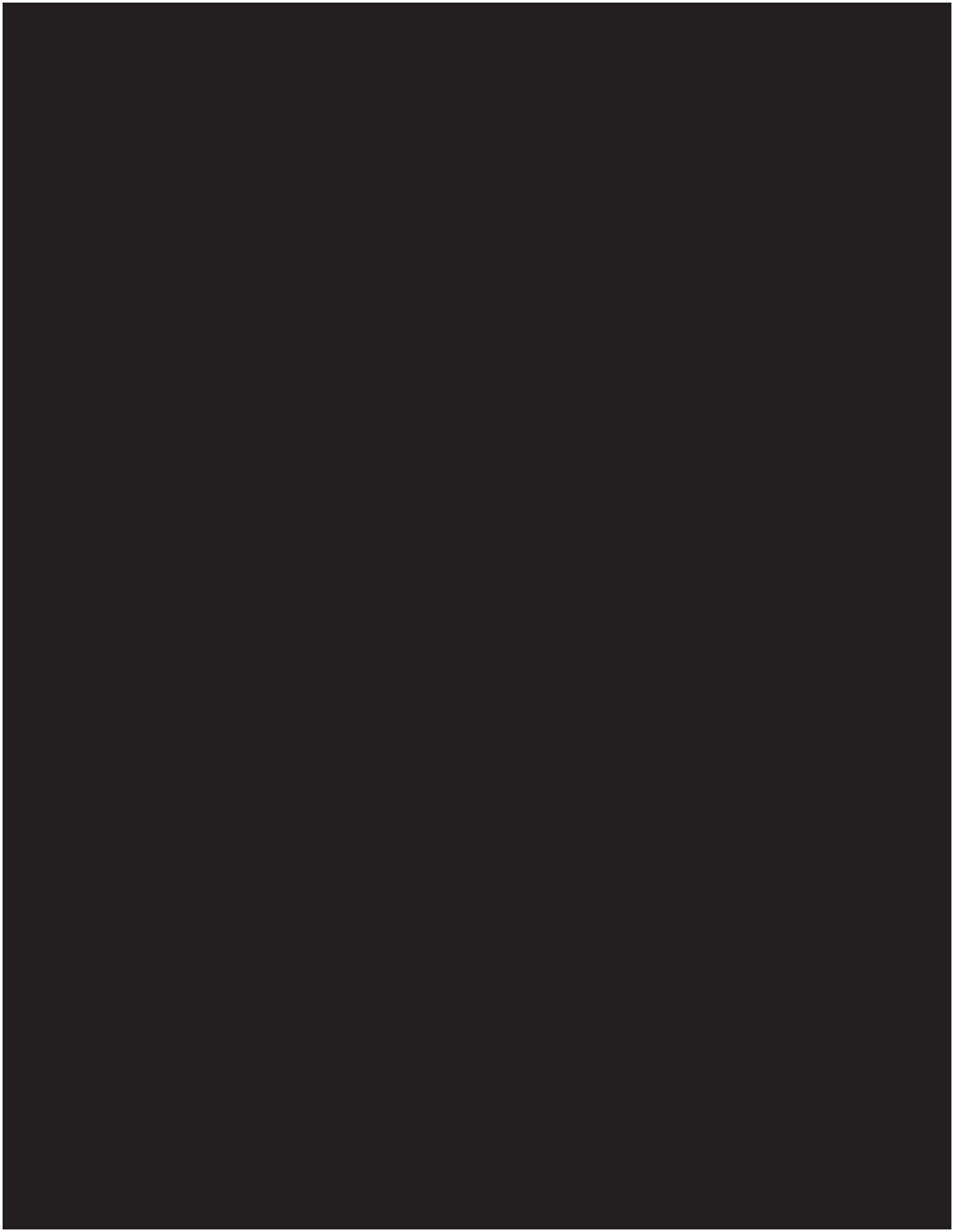
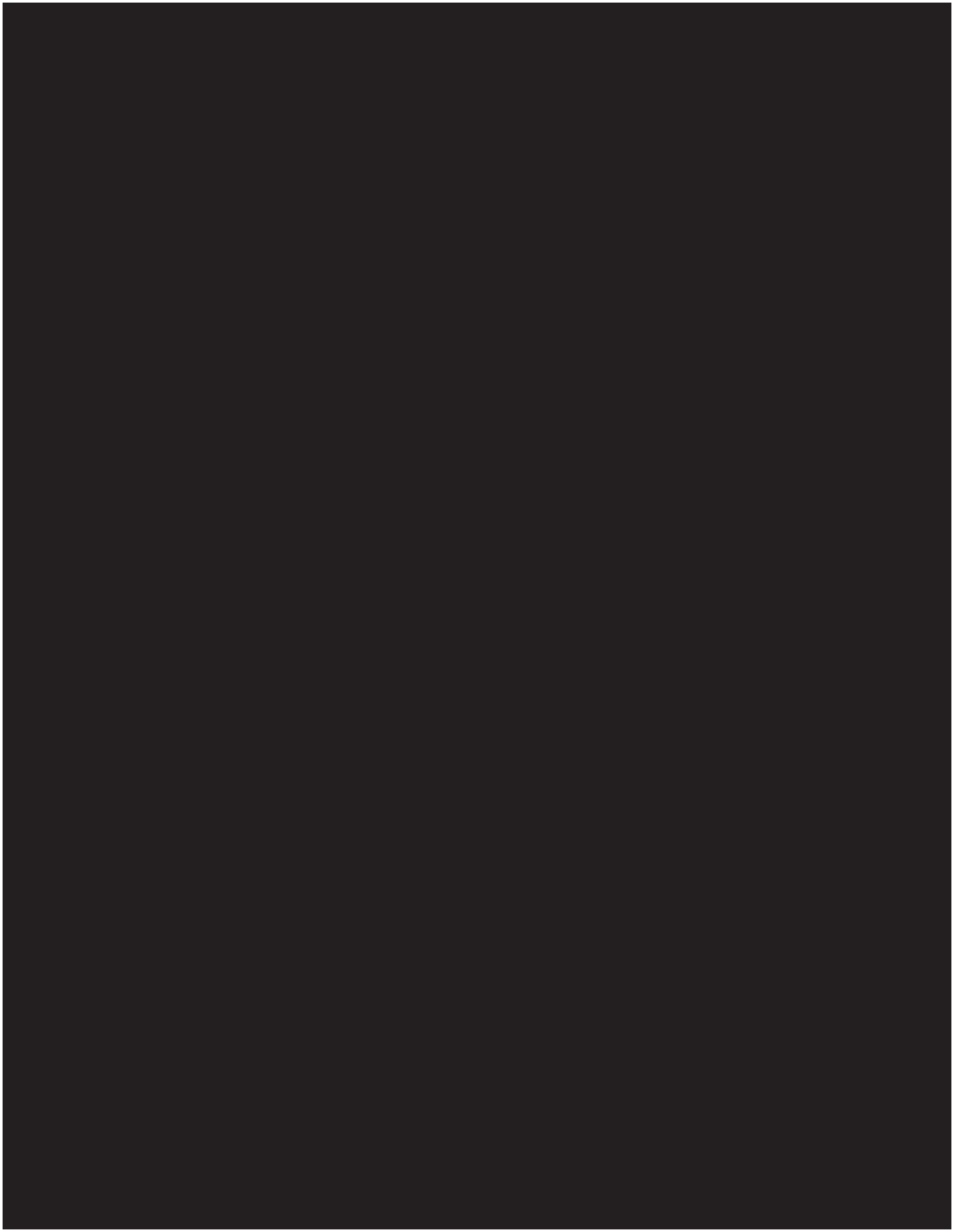
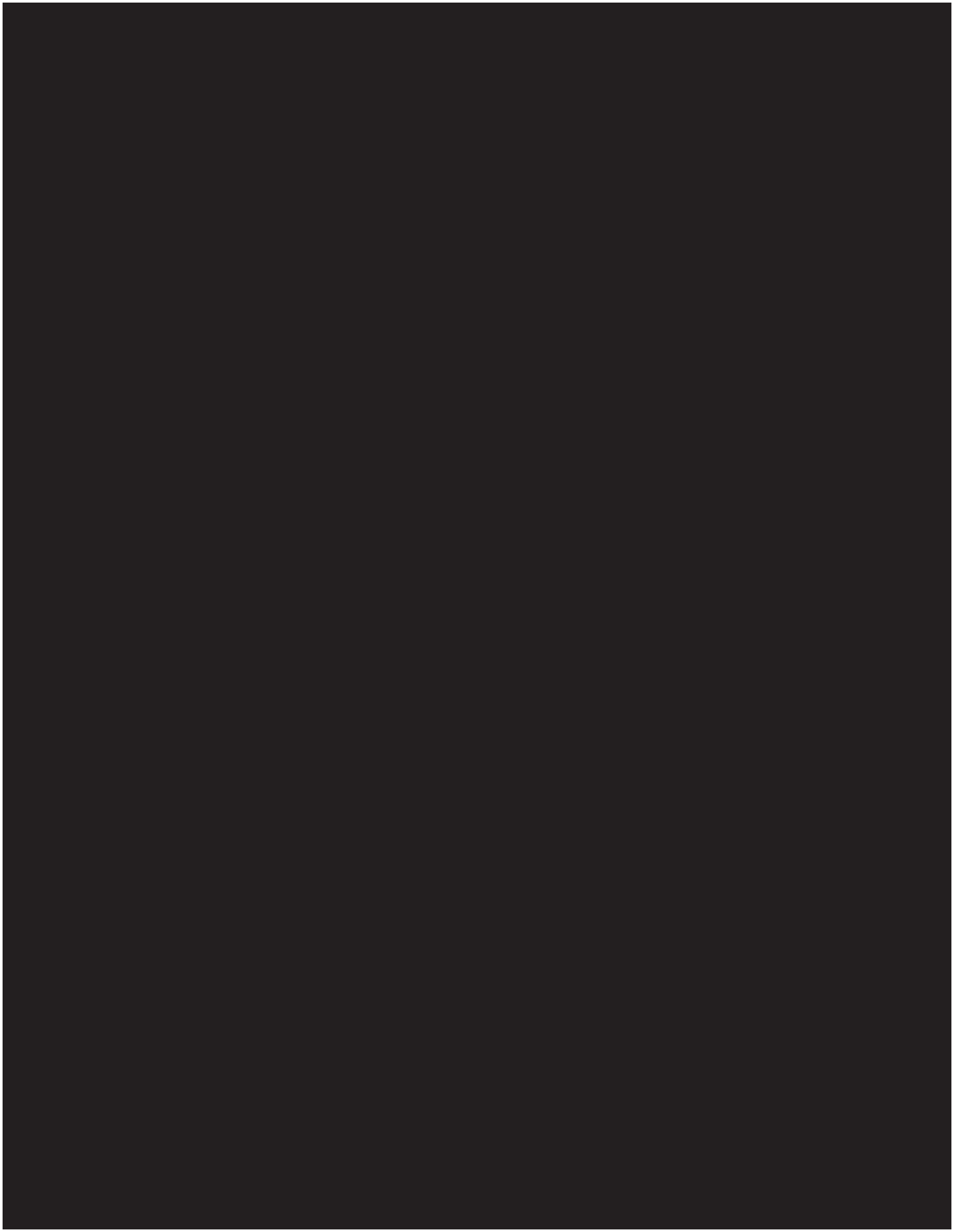
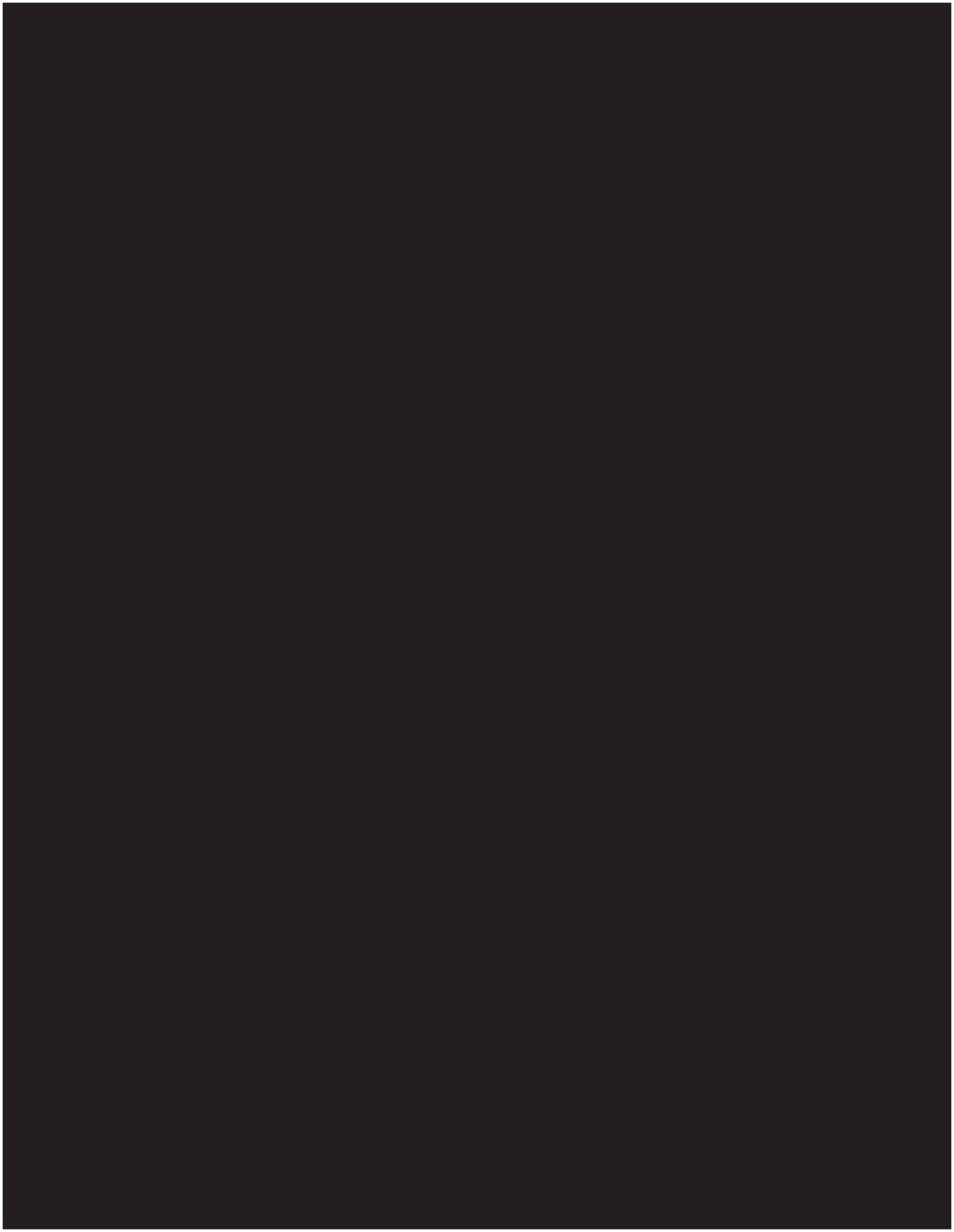
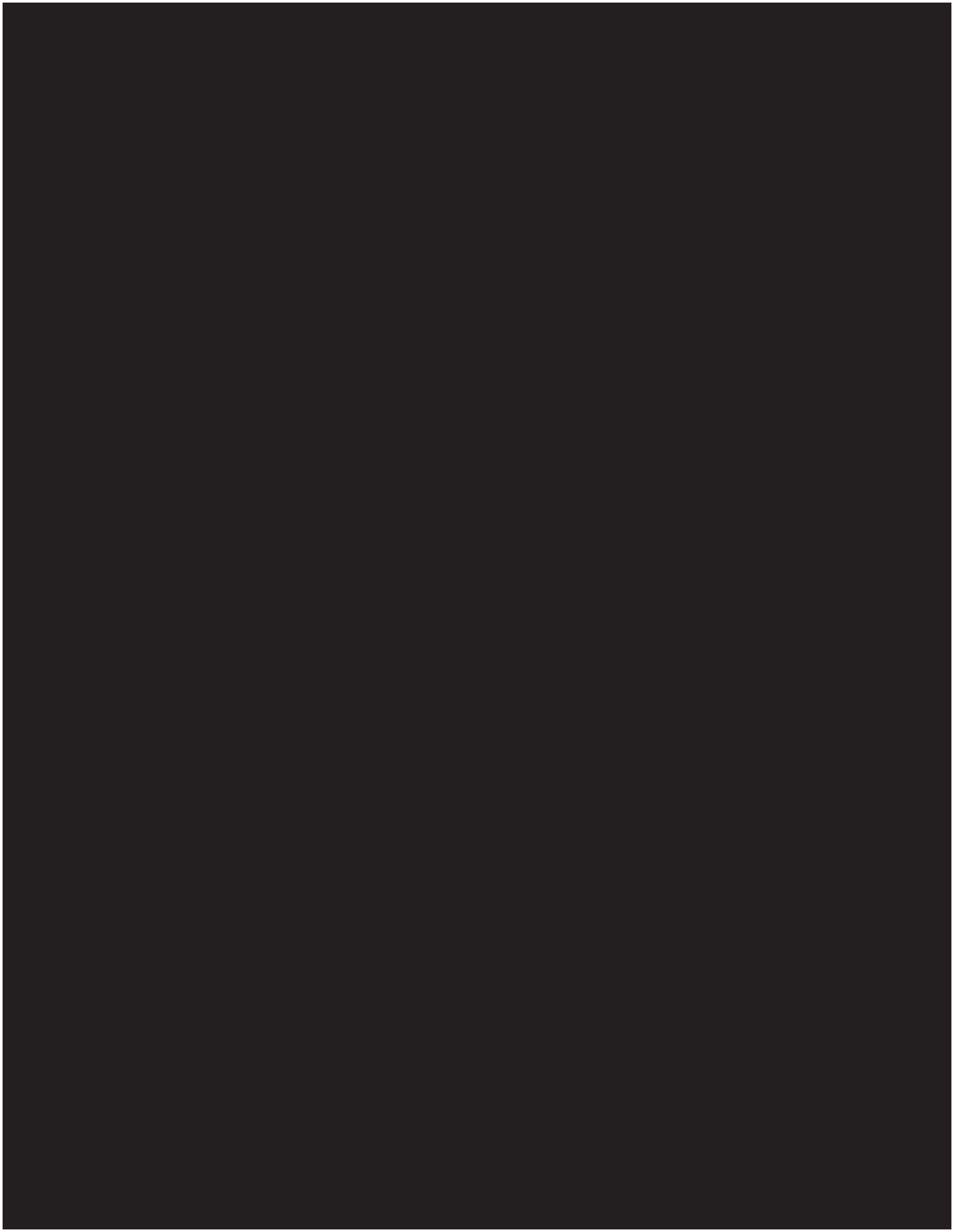


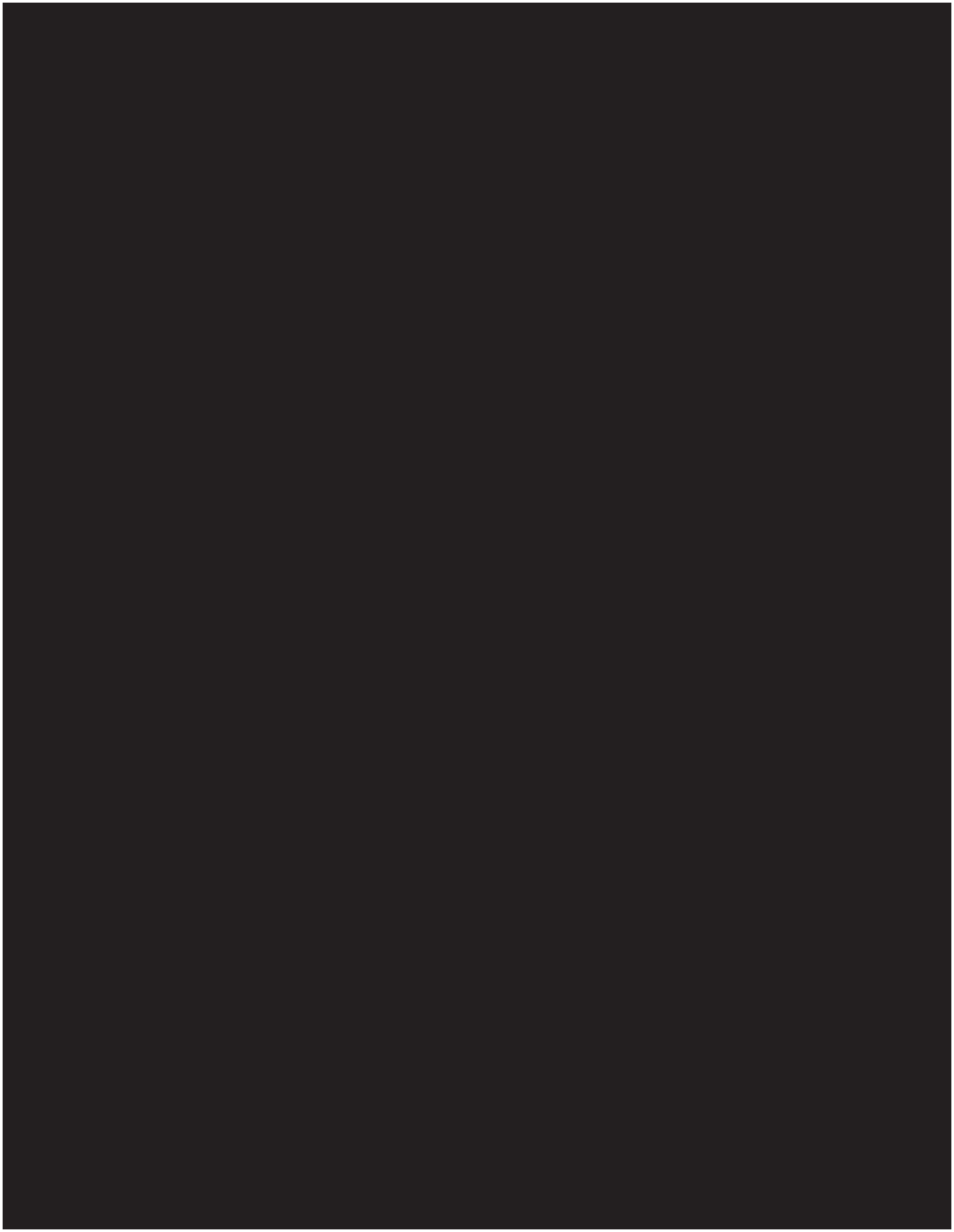


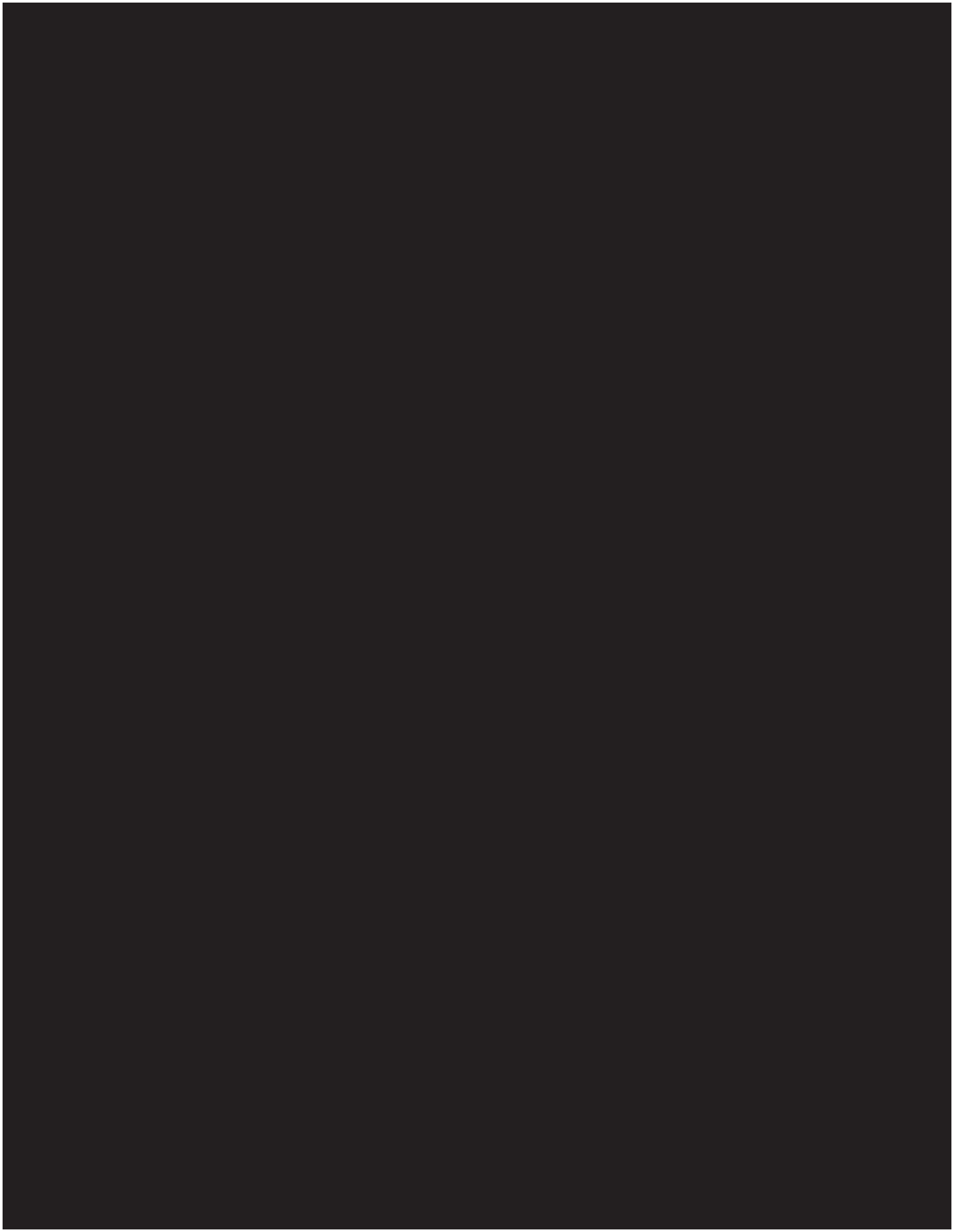


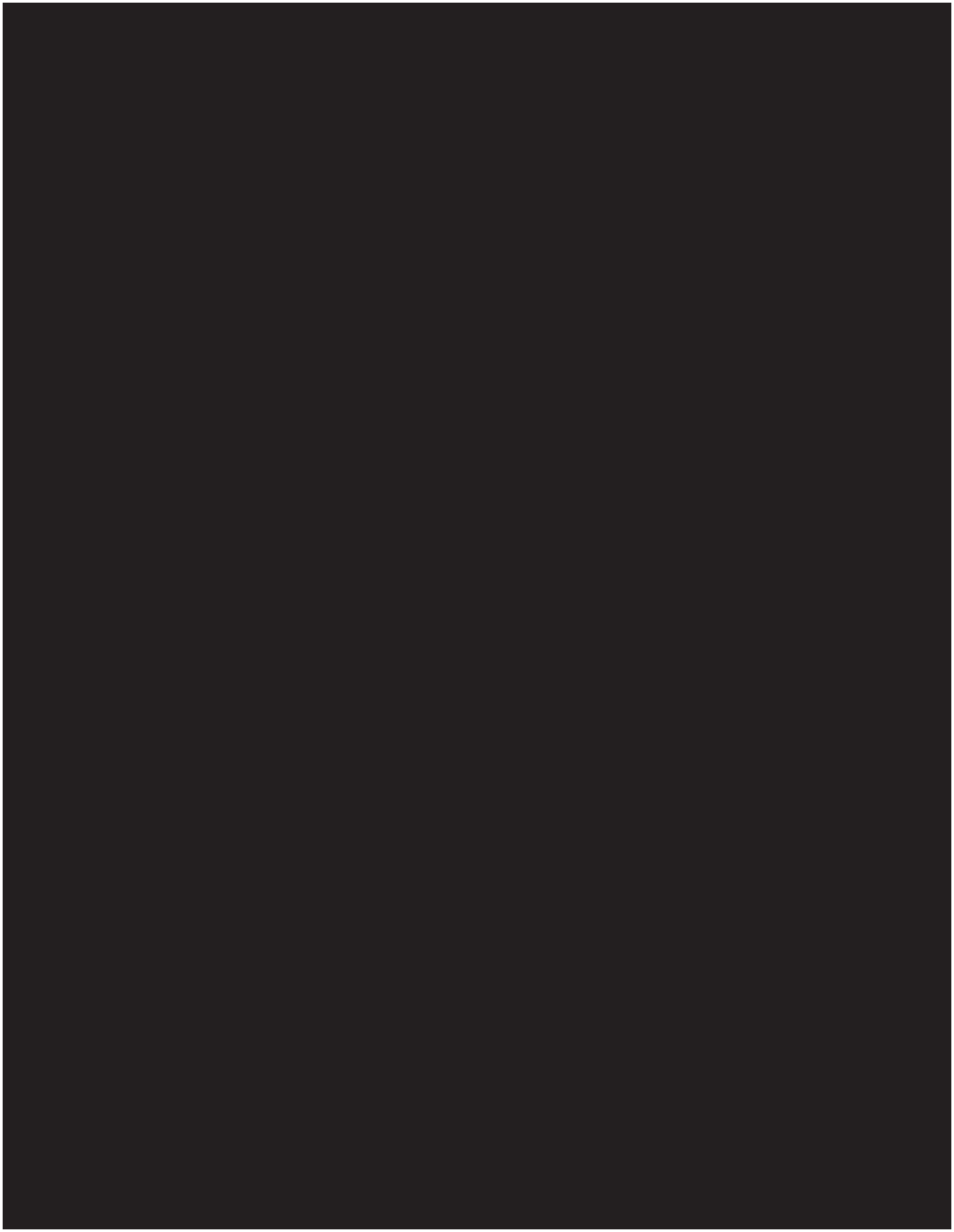


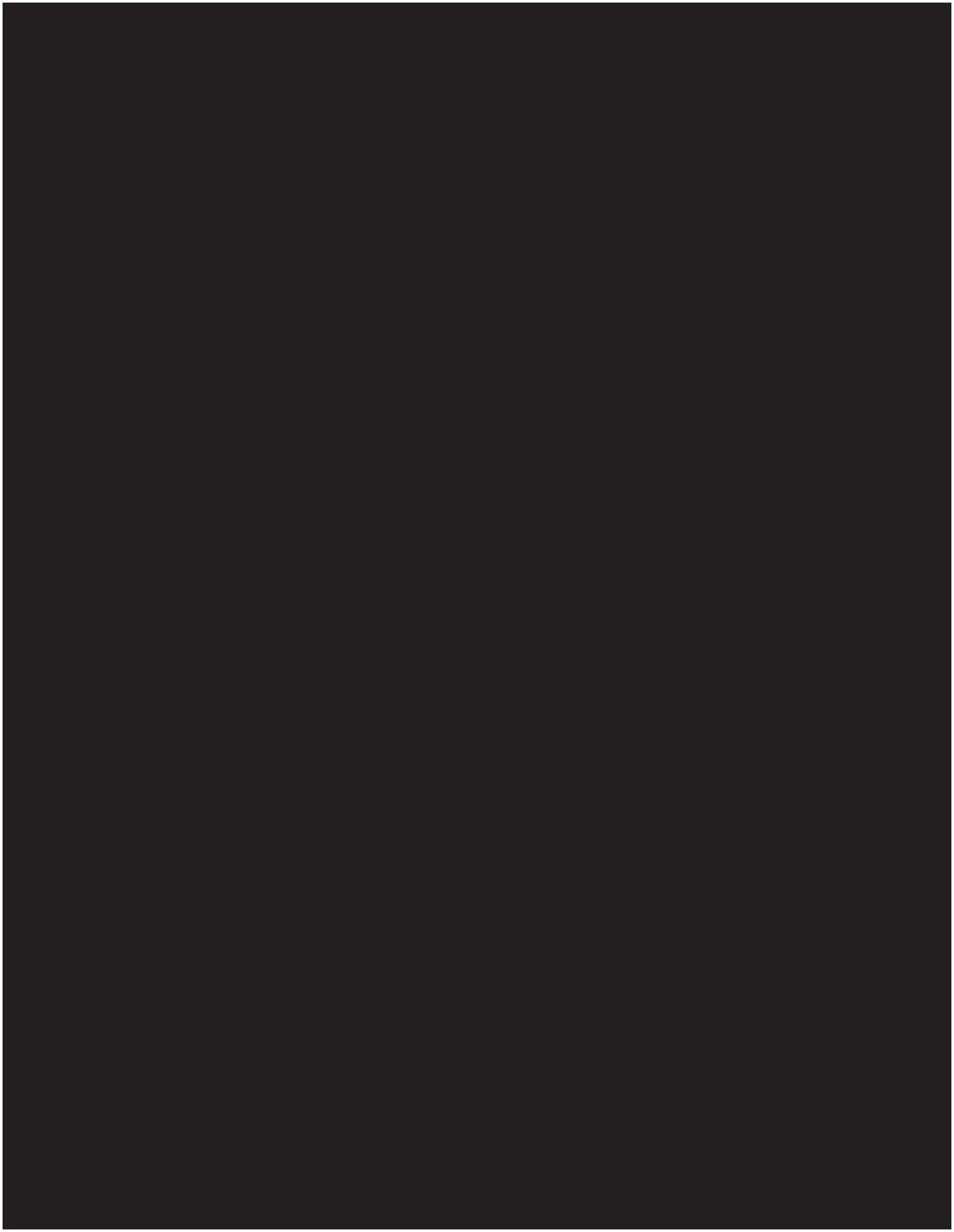


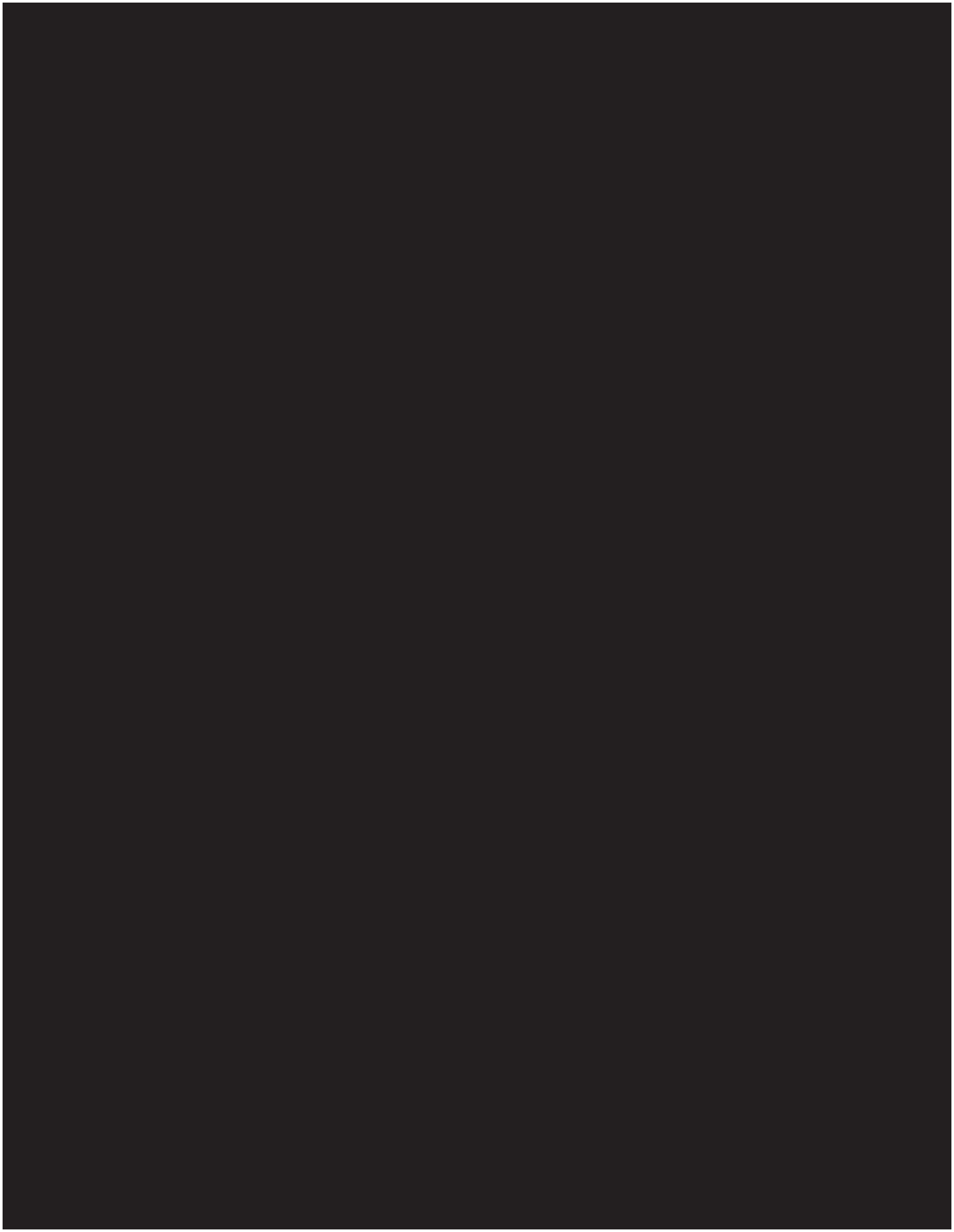


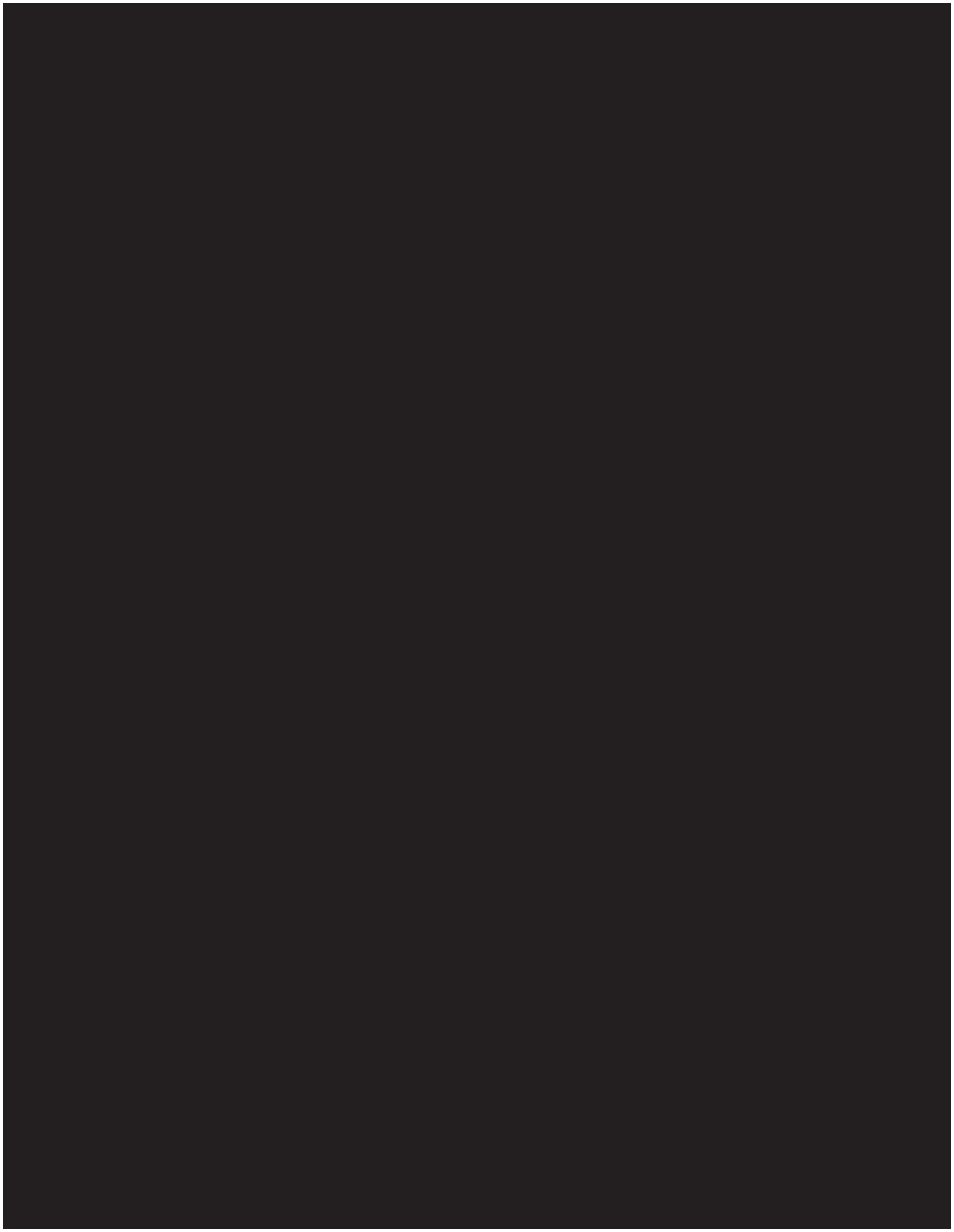


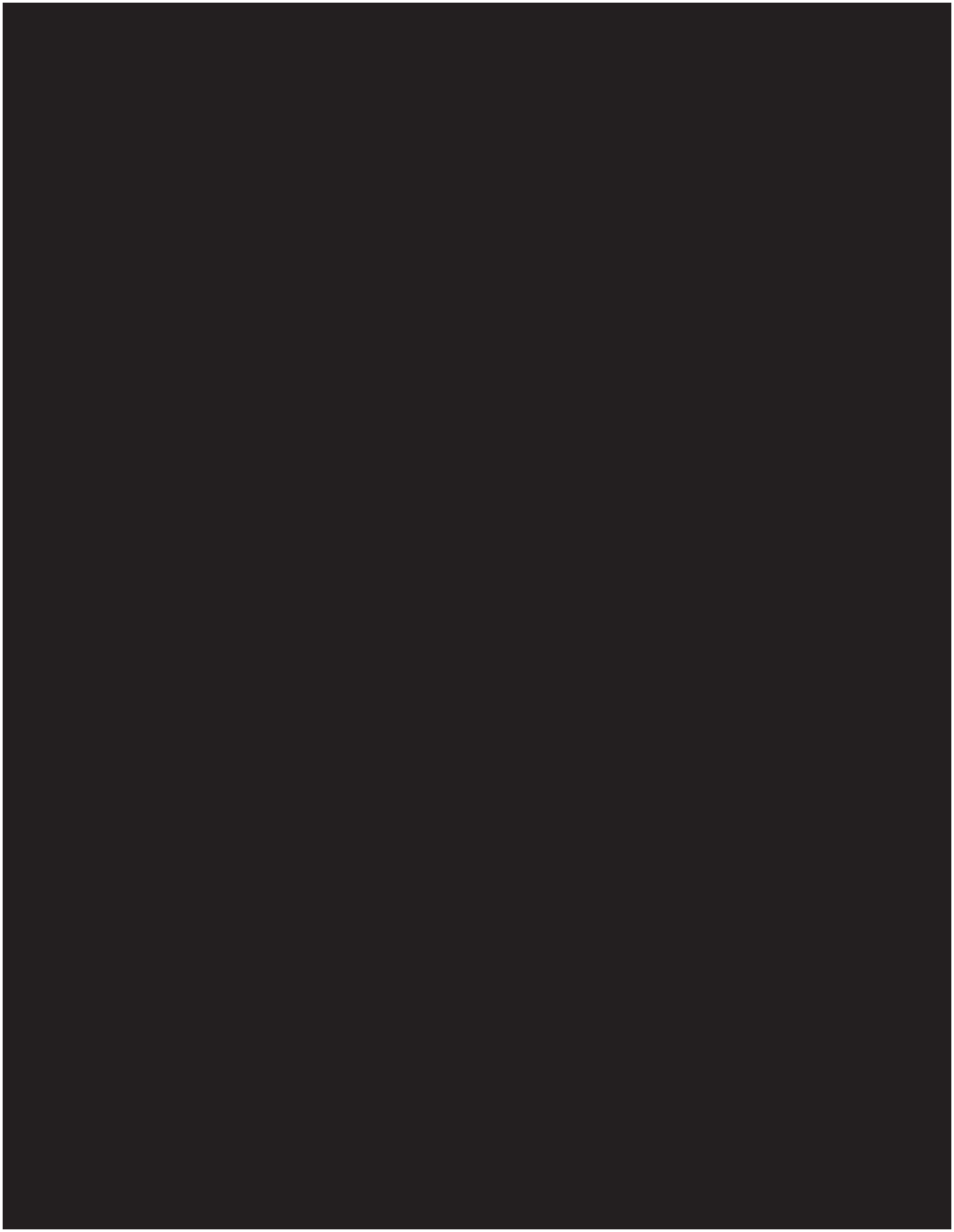


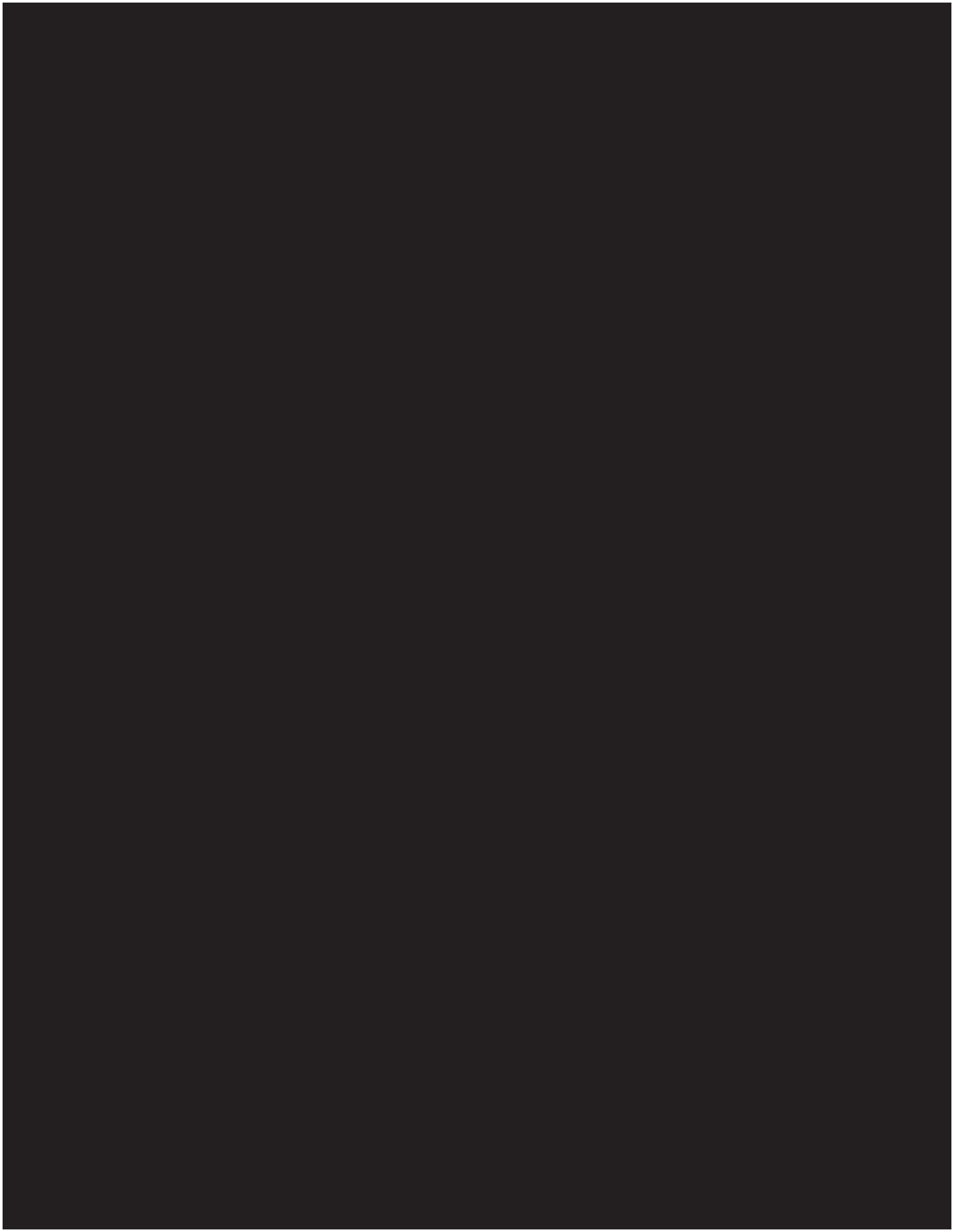


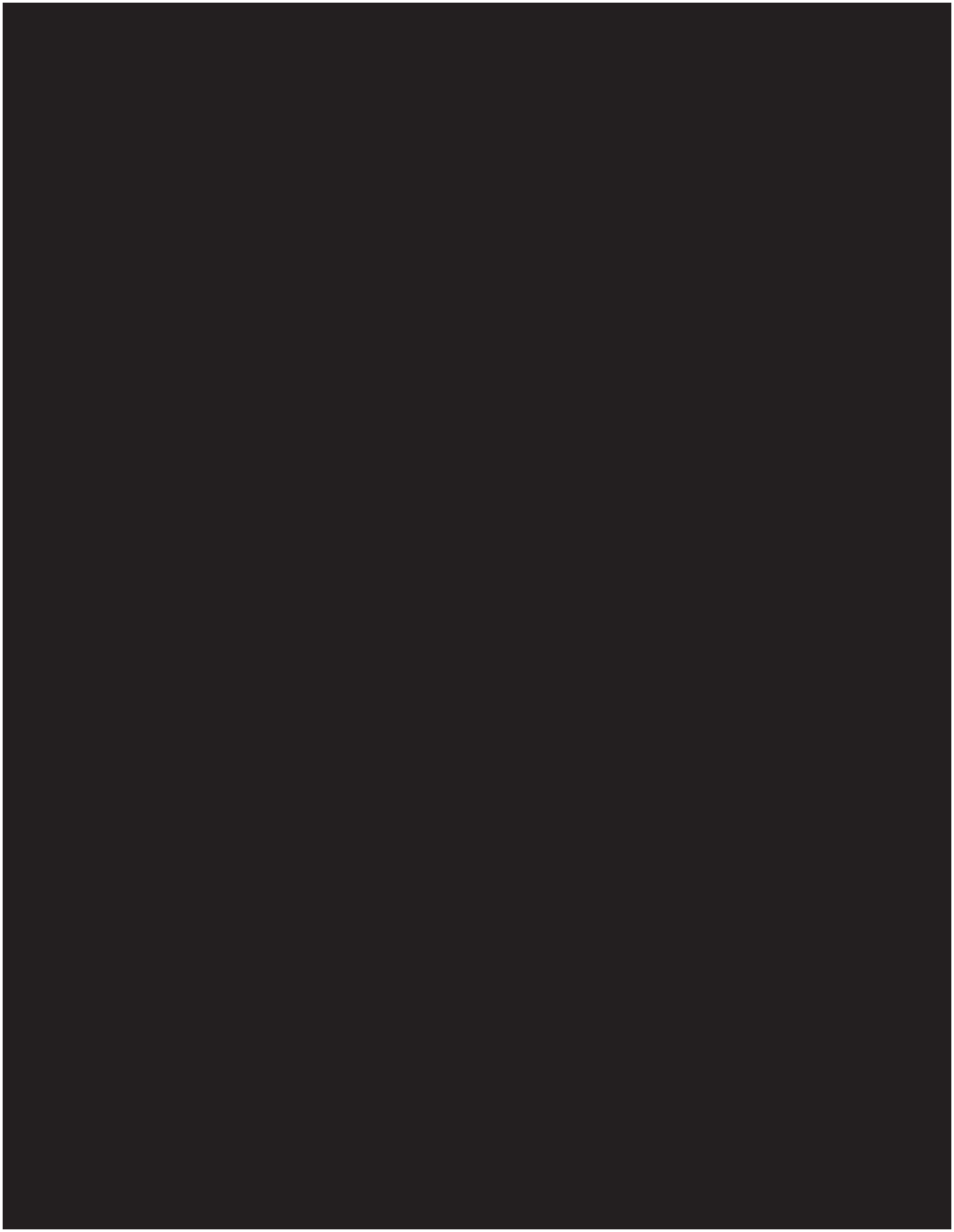


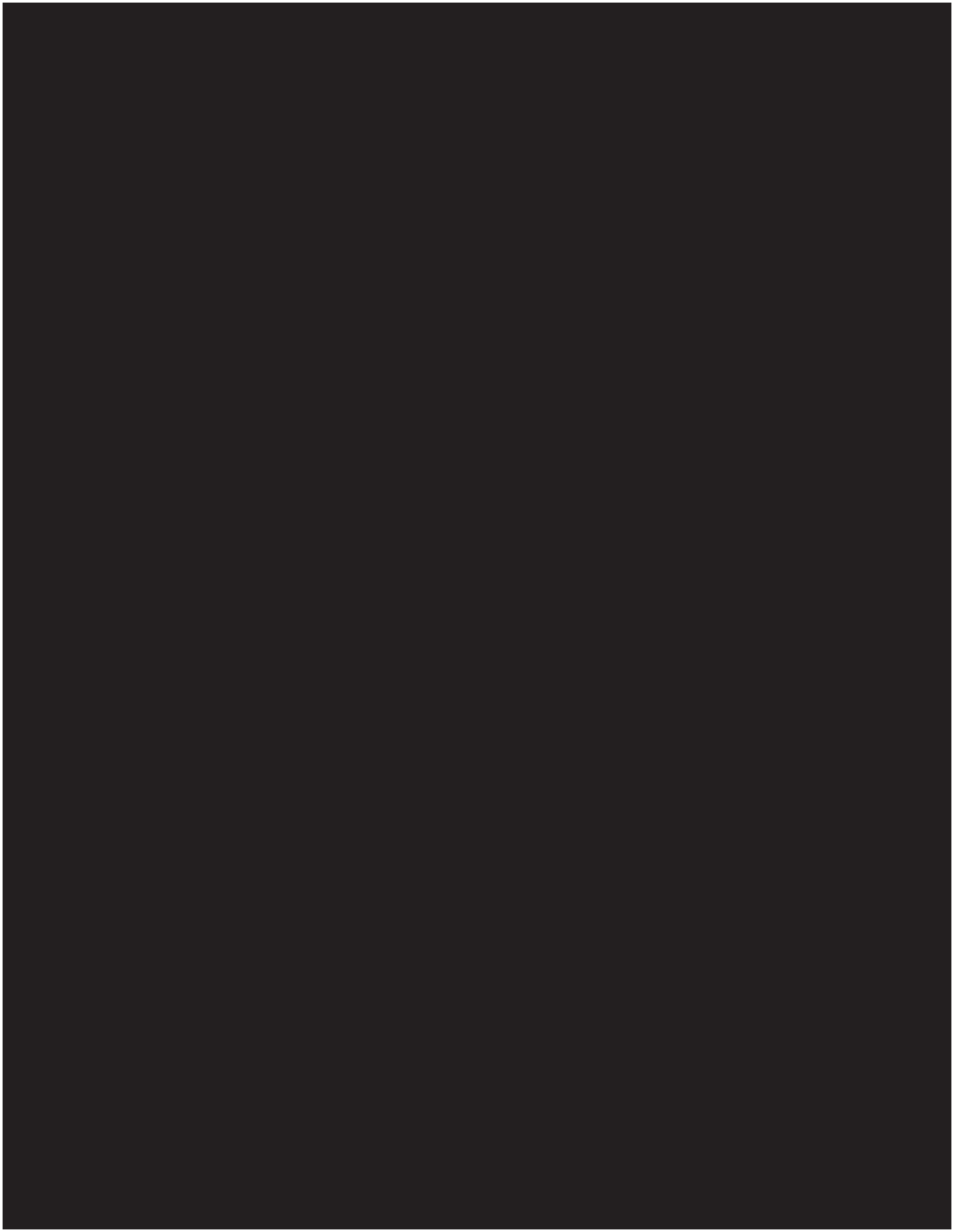


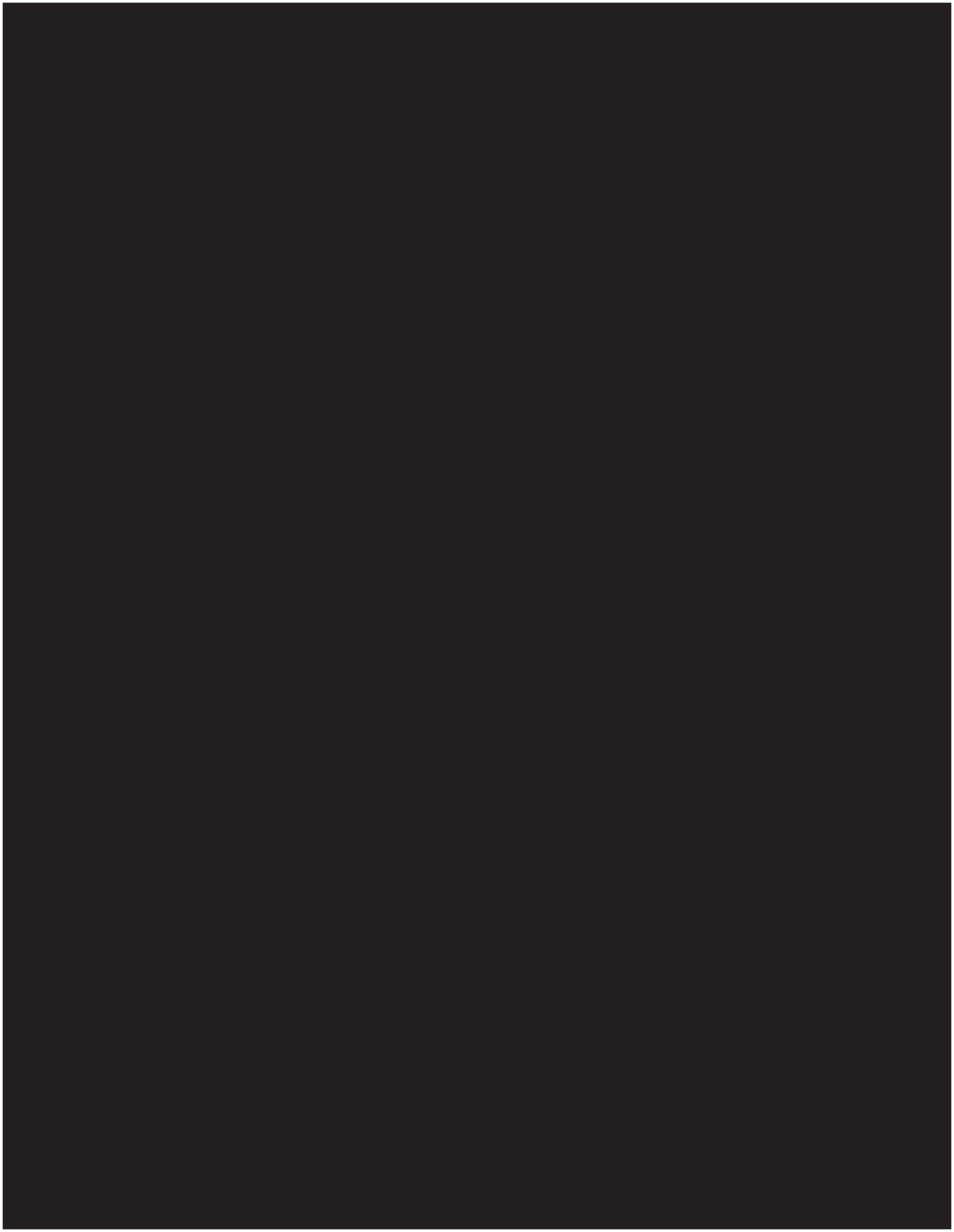


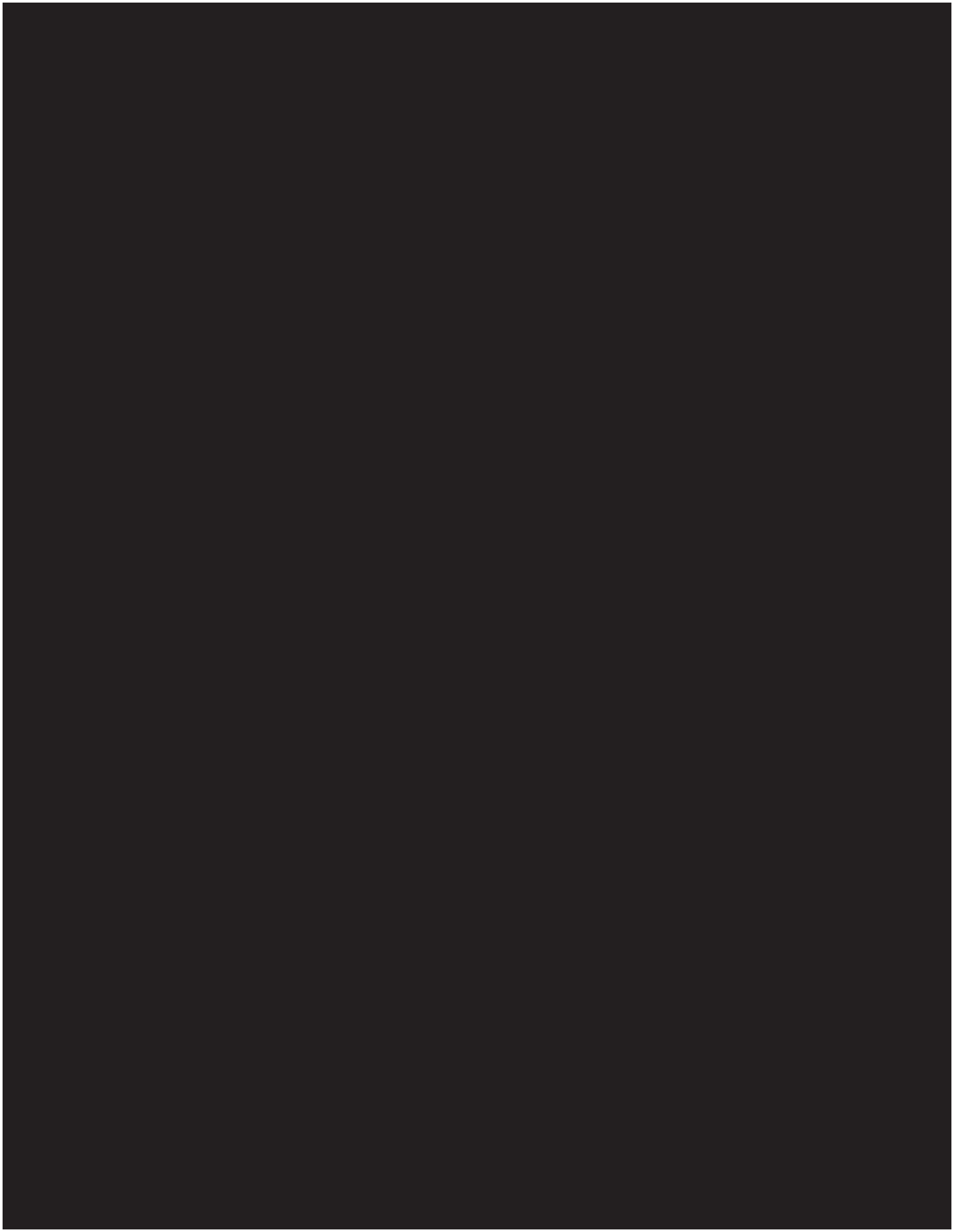












Notebook No: **12001637** Date MM/DD/YYYY

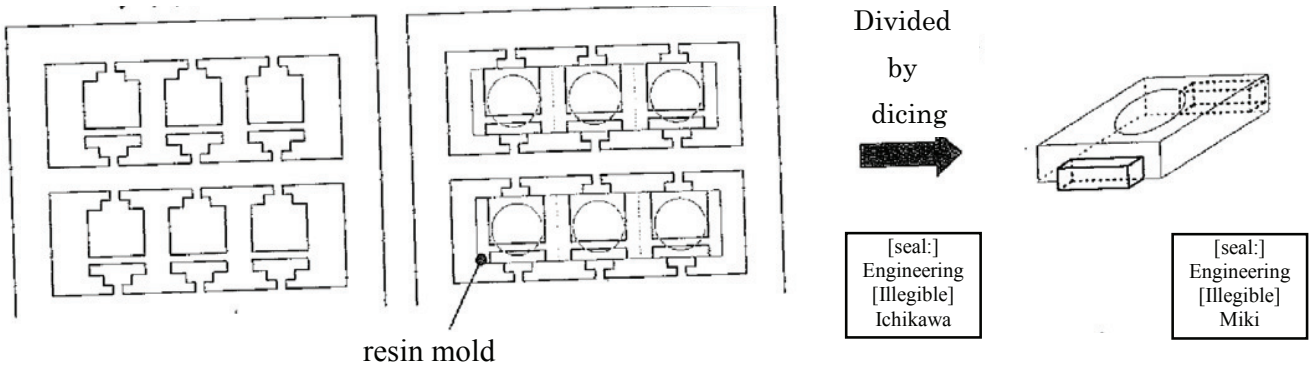
Project	Subject

From Page No: [Handwritten:] *Summary of EMC collective substrate patents*

[seal:] Engineering 2/09/2008 Ichikawa

Characteristics:

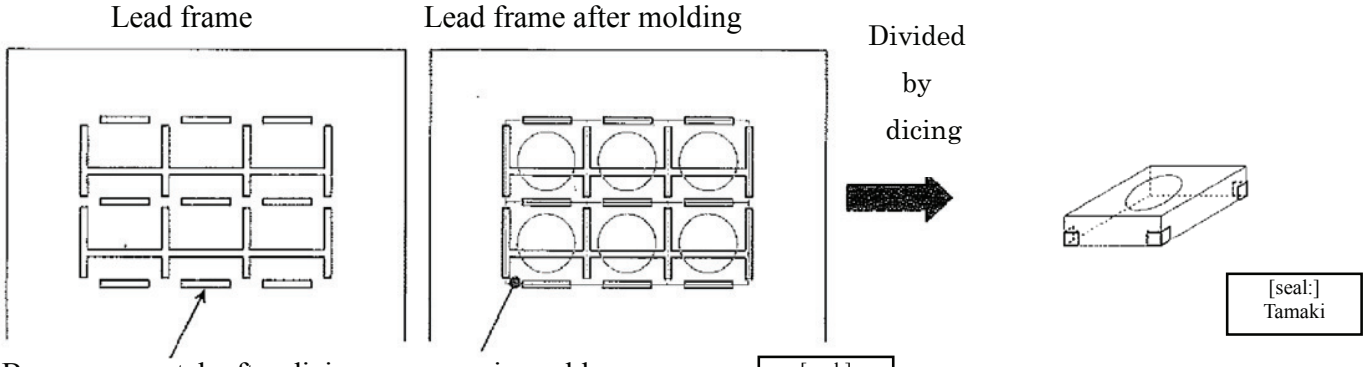
(1) LED and its manufacture method characterized by production through dicing at least one side of housing to increase number of units, wherein dye-bonding, wire bonding, and resin sealing are performed to the collective housing body with resin mold in lead frames.



[seal:] Engineering [Illegible] Ichikawa

[seal:] Engineering [Illegible] Miki

(2) LED and its manufacturing method characterized by production through dicing into individual units in order to further increase the number of finished units in (1), wherein die bonding, wire bonding, and resin sealing are performed on substrate with two-dimensional housing collection. Lead frames contain notches to increase adhesion with resin mold.



[seal:] Tamaki

[seal:] Engineering [Illegible] Ichikawa

To Page No:

Date	Understood and Witnessed by Date
Invented by [signature:]*Hiroshi Ichikawa* [hw:] *03/09/2008*	Signed MM/DD/YYYY
Stamp: 3/10/2008 [seal:] Engineering 3/10/2008 Miki	Signed MM/DD/YYYY
Recorded by MM/DD/YYYY	

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Notebook No: **12001637** Date MM/DD/YYYY

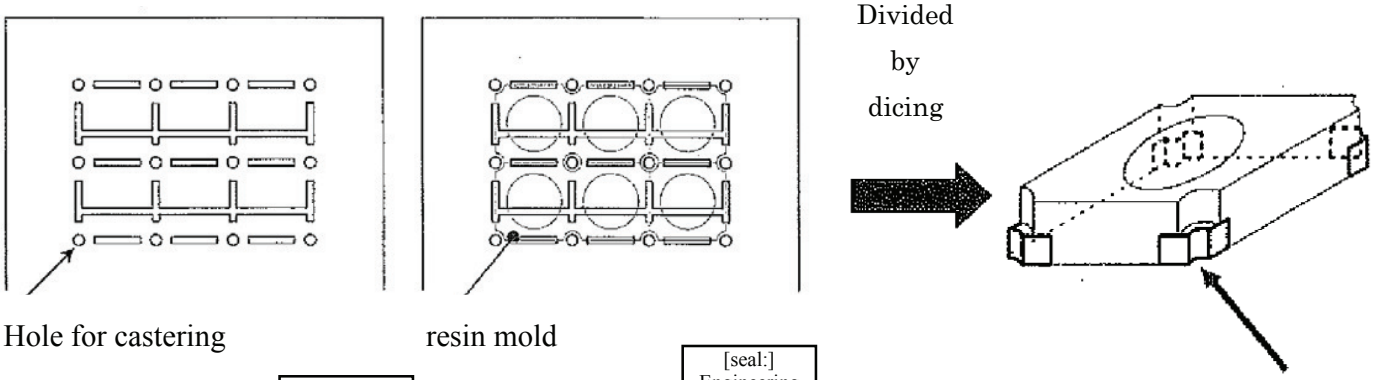
Project	Subject

From Page No:

[seal:] Engineering 3/9/2008 Ichikawa

(3) Side part of lead from (2) are not entirely metal plated and are susceptible to oxidation due to cut section composed with Cu material becoming exposed. To improve, when lead frame with hole treated with metal-plating that becomes castellated after dicing is used, the castellation part is a metal-plated surface, which is not readily oxidized, improving the reliability of solder.

Lead frame Lead frame after molding



Hole for castering resin mold castellation

[seal:] Engineering 3/10/2008 Miki

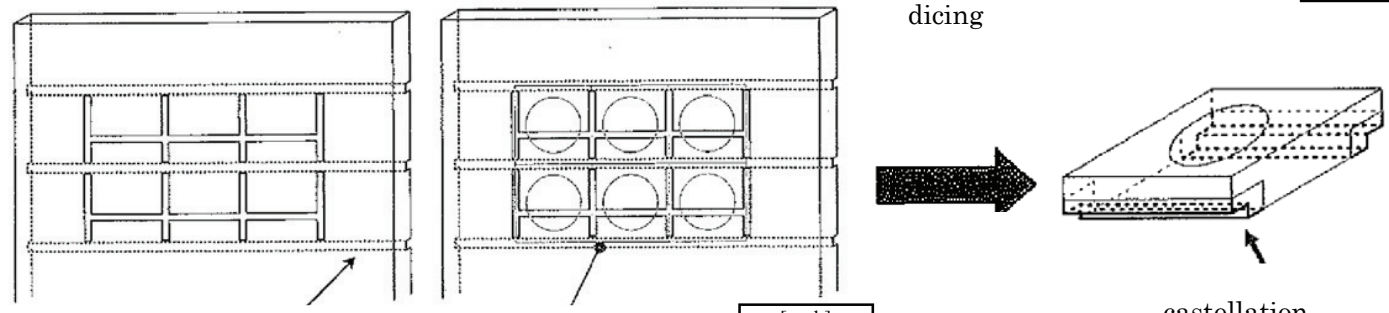
[seal:] Engineering [Illegible] Ichikawa

[seal:] Engineering 3/10/2008 Ichikawa

[seal:] Engineering [Illegible]

(4) After dicing into units, the same effect as (3) may be obtained when lead frame having groove on its back side, treated with metal plating that becomes castellated, is used.

Lead frame Lead frame after molding



[seal:] Tamaki

Groove on back side resin mold castellation

[seal:] Engineering [Illegible] Ichikawa

To Page No:

Date	Understood and Witnessed by Date
Invented by [signature:]*Hiroshi Ichikawa* [hw:] *03/09/2008*	Signed_____ MM/DD/YYYY
Recorded by_____ [seal:] Engineering 3/10/2008 Miki MM/DD/YYYY	Signed_____ MM/DD/YYYY

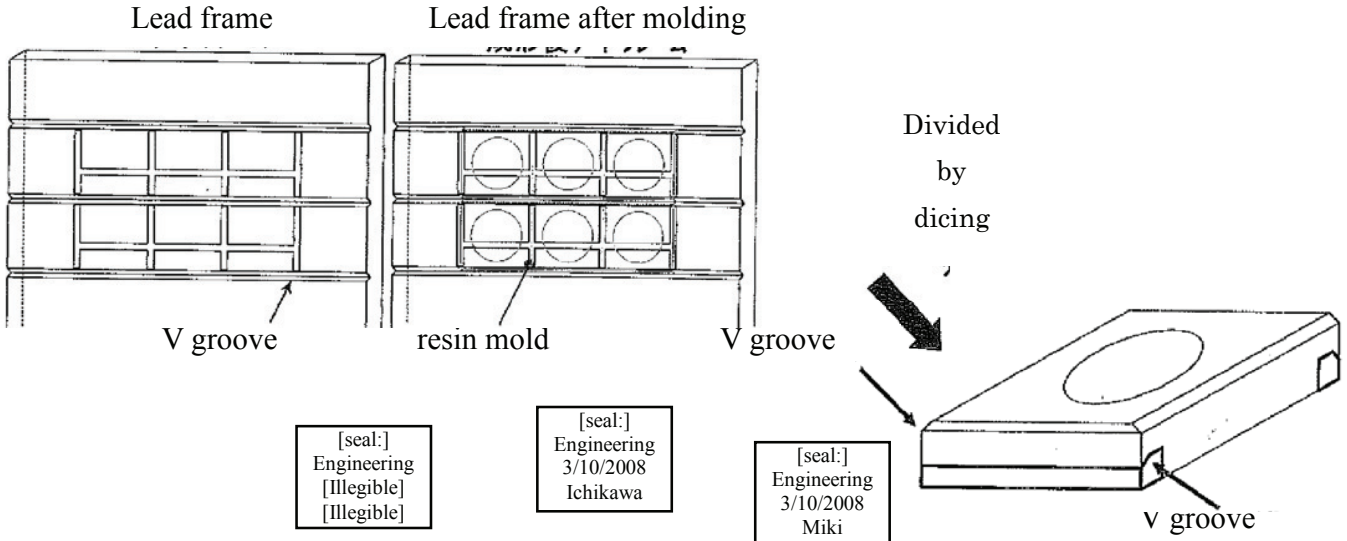
Notebook No: **12001637** Date MM/DD/YYYY

Project	Subject

[seal:] Engineering [Illegible] Ichikawa

From Page No:

(5). (1), (2), (3), & (4) may have grooves inserted in lead frame and resin mold to thin thickness for dicing (for example, a V groove).



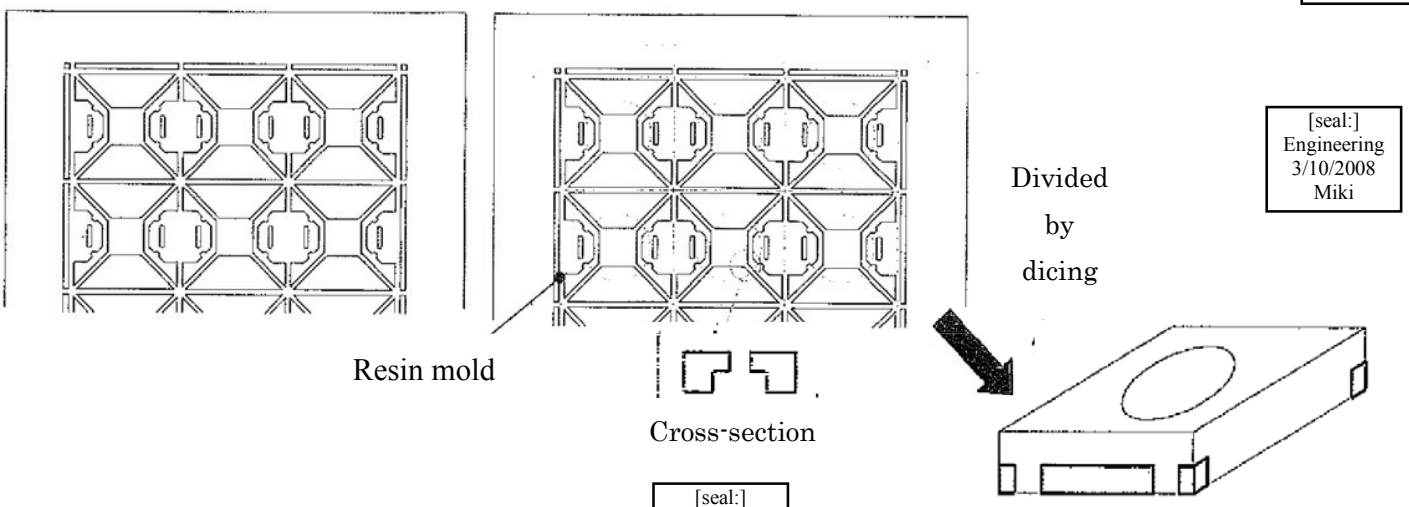
[seal:] Engineering [Illegible] [Illegible]

[seal:] Engineering 3/10/2008 Ichikawa

[seal:] Engineering 3/10/2008 Miki

(6). Structure retains frame along the dicing line in order to control blade from shaking during dicing. Furthermore, to increase adhesion with resin mold, the frame is formed with steps, hole, and notch. Frame along dicing line serves as a cutting board during dicing, and is eliminated after dicing into units. After units are diced, diced LED requires two or more glass.

[seal:] Tamaki

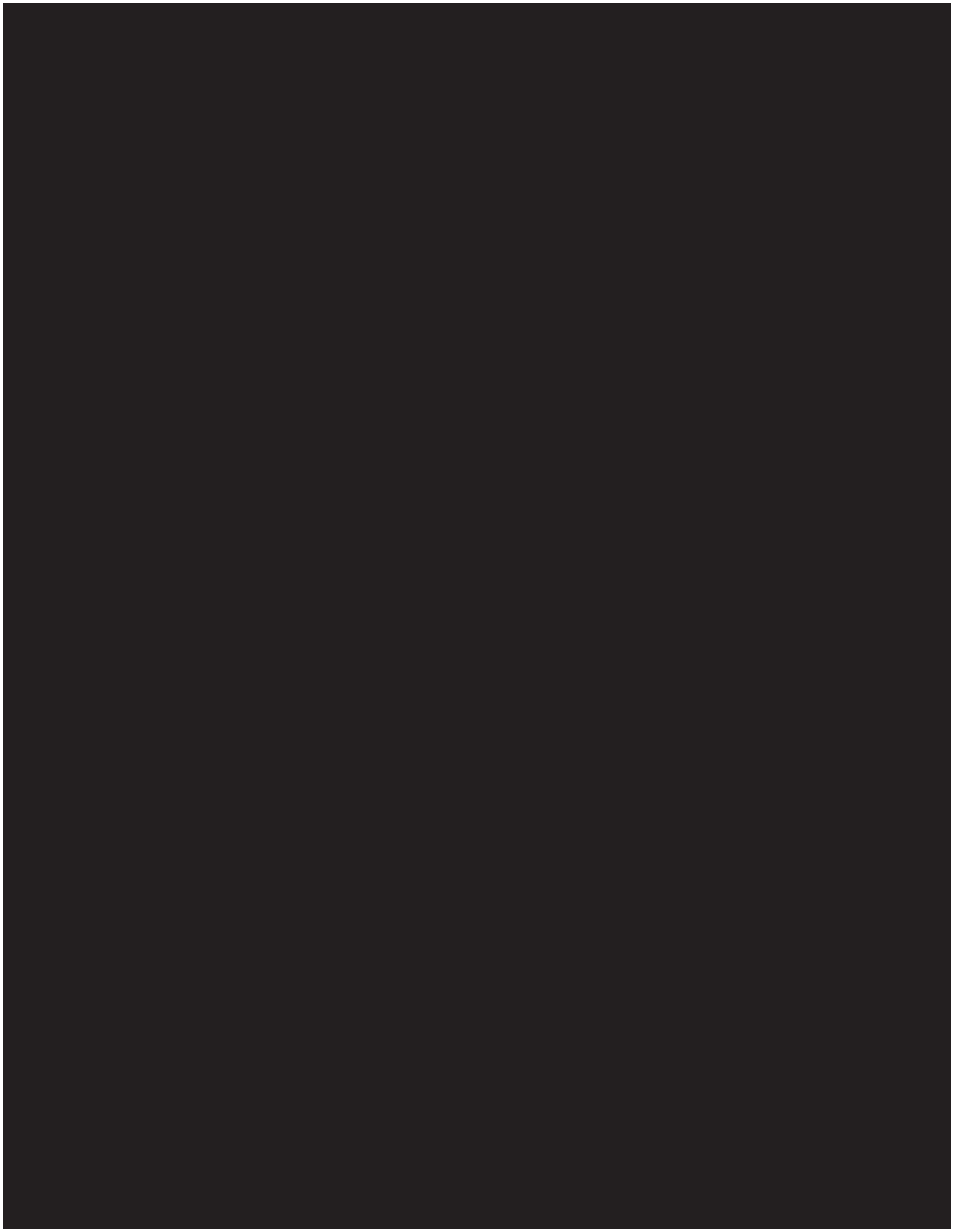


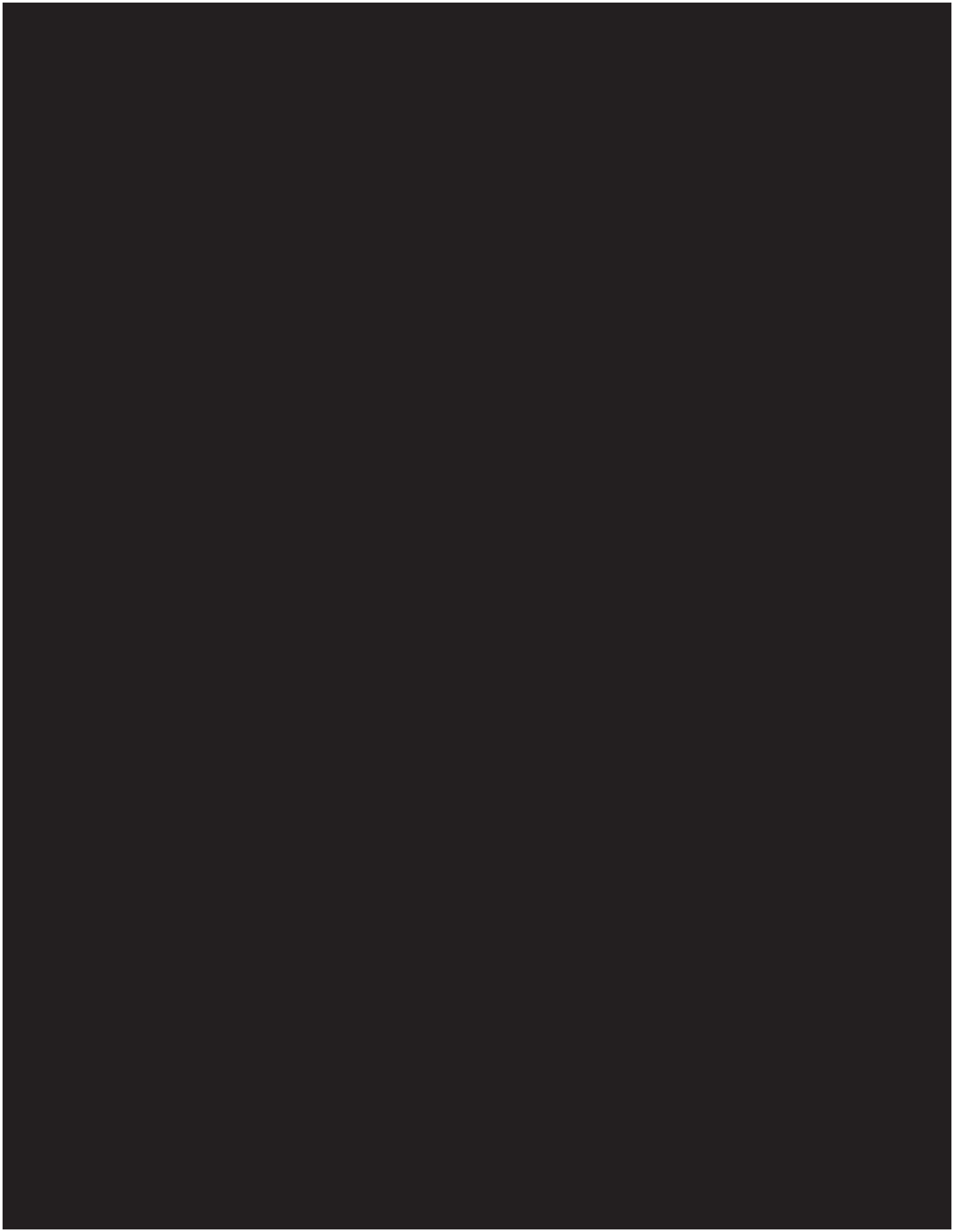
[seal:] Engineering 3/10/2008 Miki

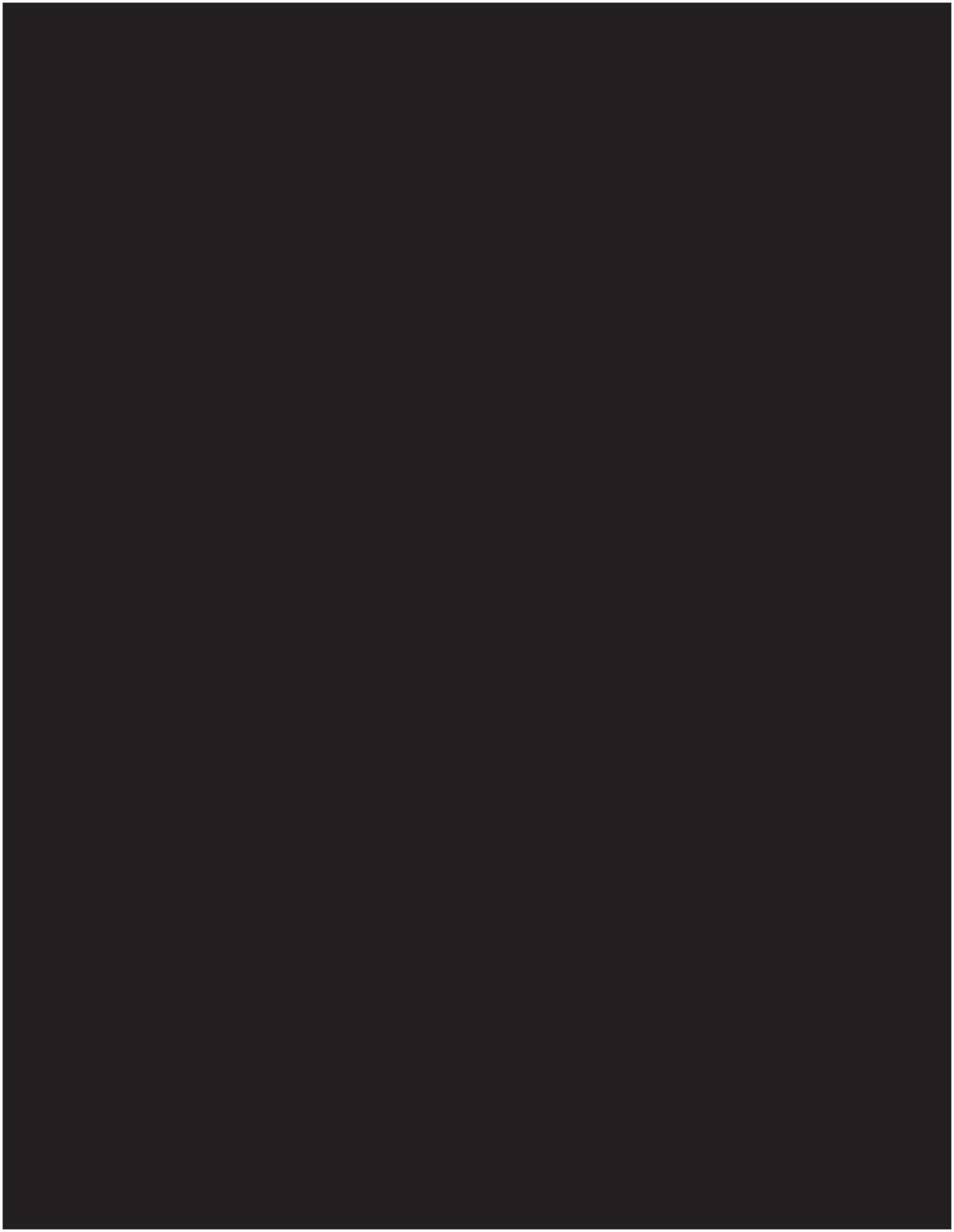
[seal:] Engineering 3/10/2008 Ichikawa

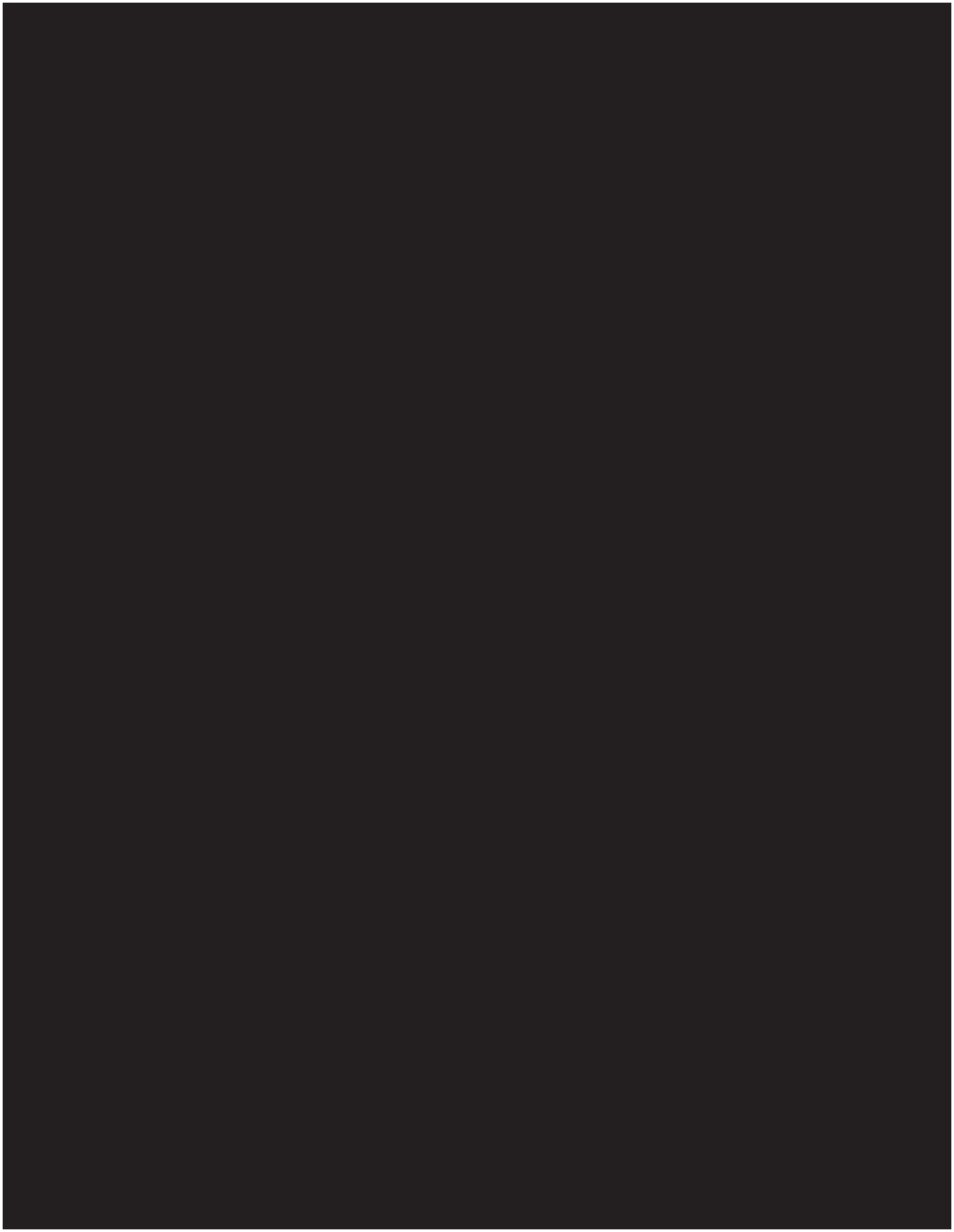
To Page No:

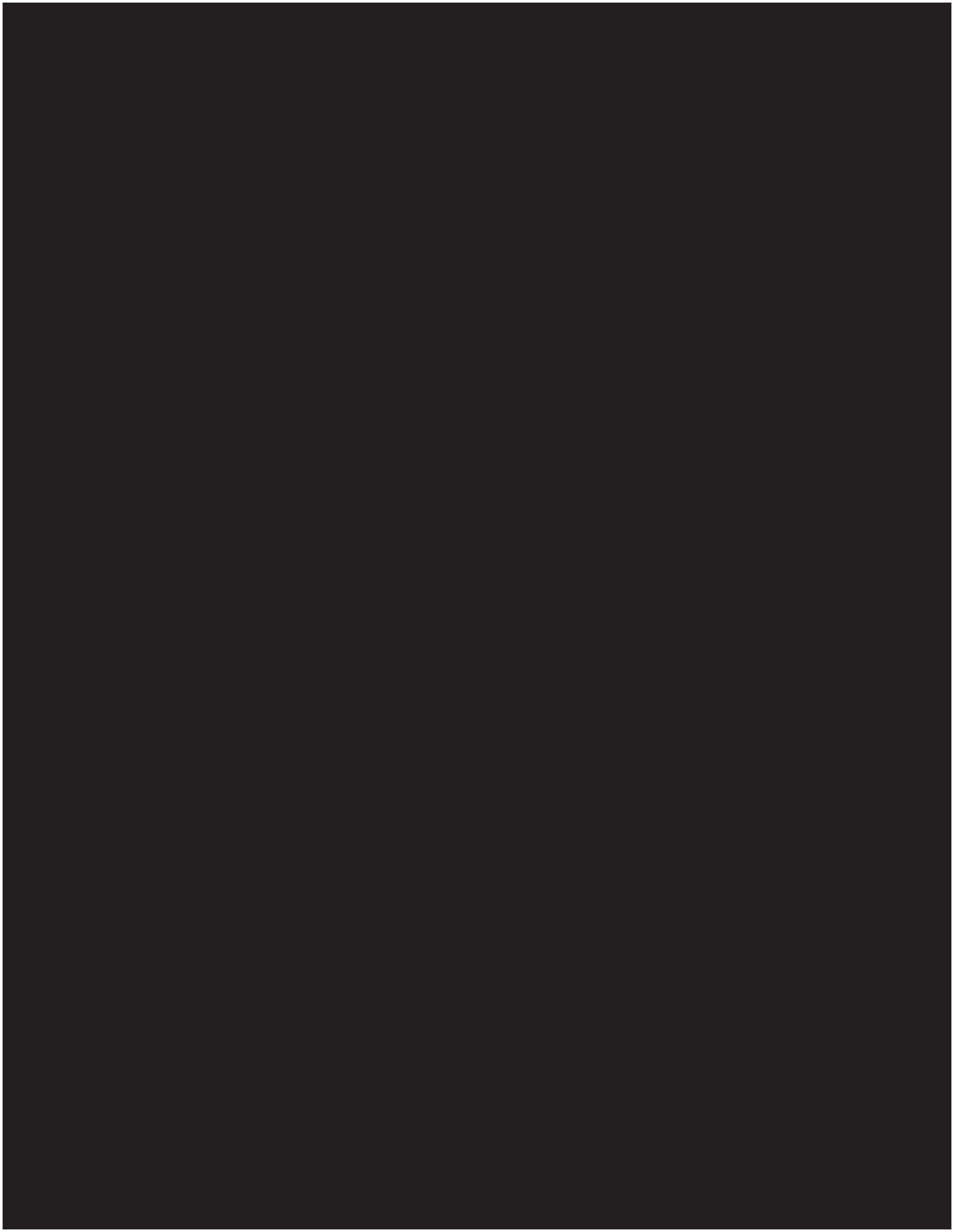
Date	Understood and Witnessed by	Date
Invented by [signature:] *Hiroshi Ichikawa* [hw:] *03/09/2008*	Signed	MM/DD/YYYY
Recorded by [seal:] Engineering 3/10/2008 Miki MM/DD/YYYY	Signed	MM/DD/YYYY

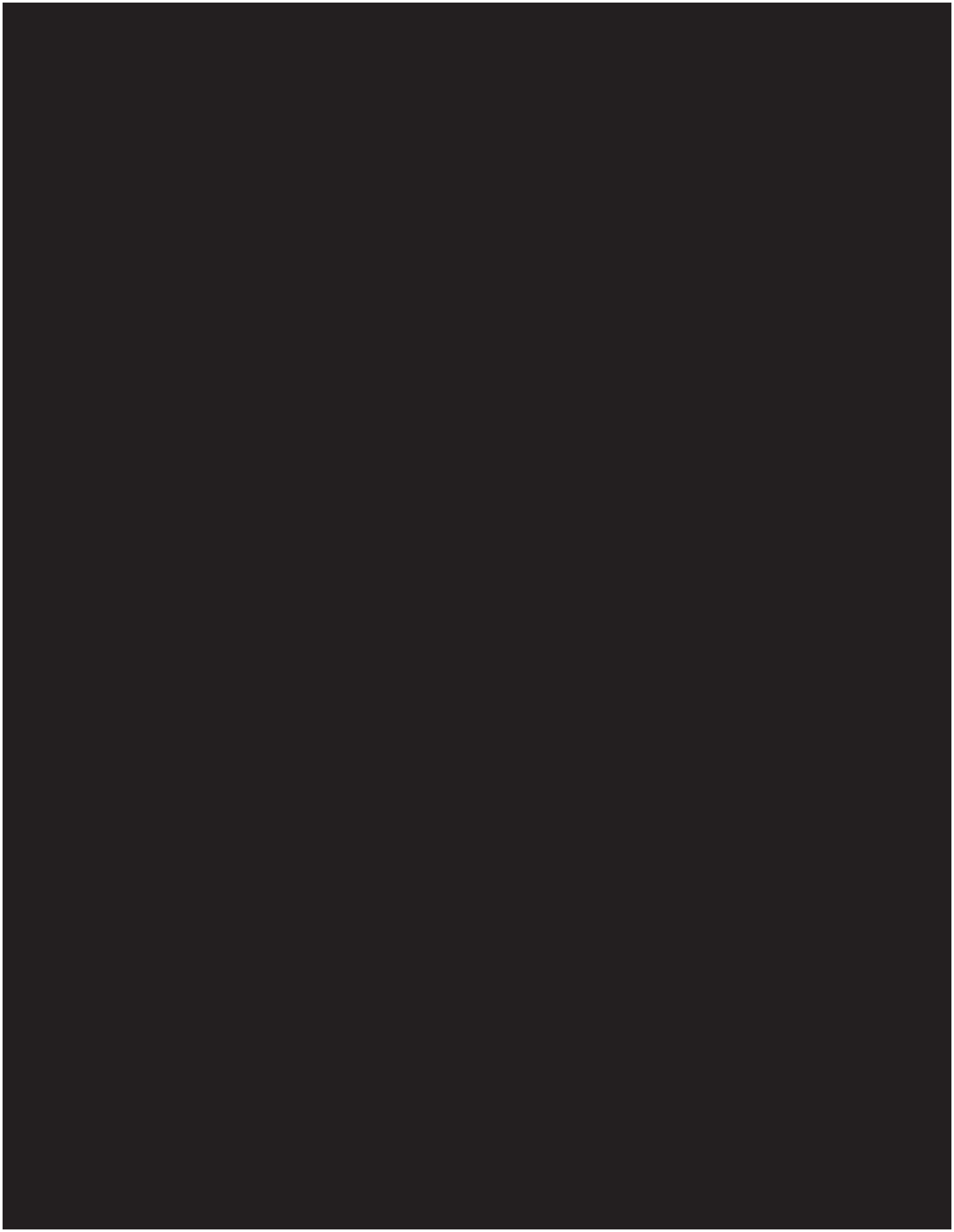


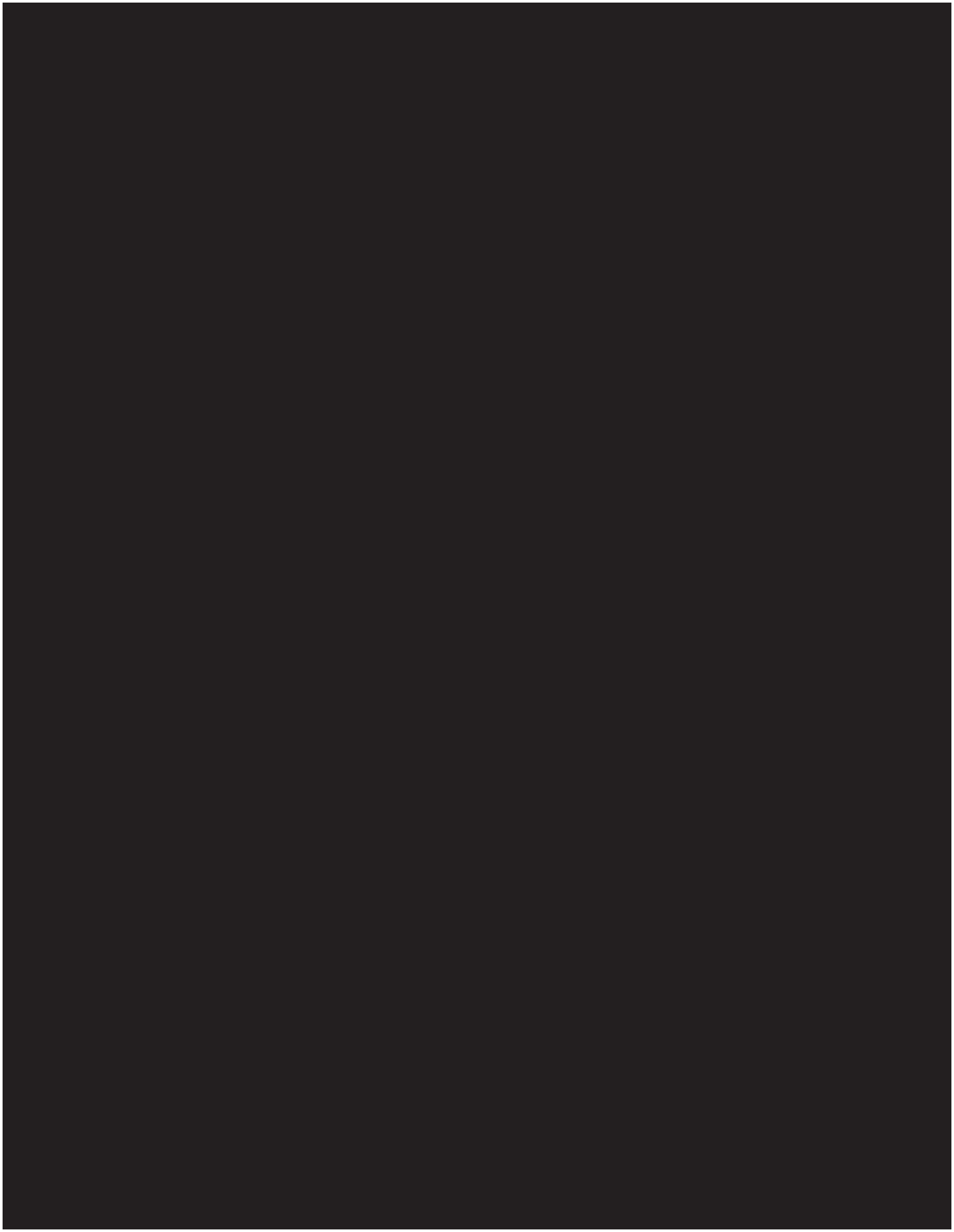


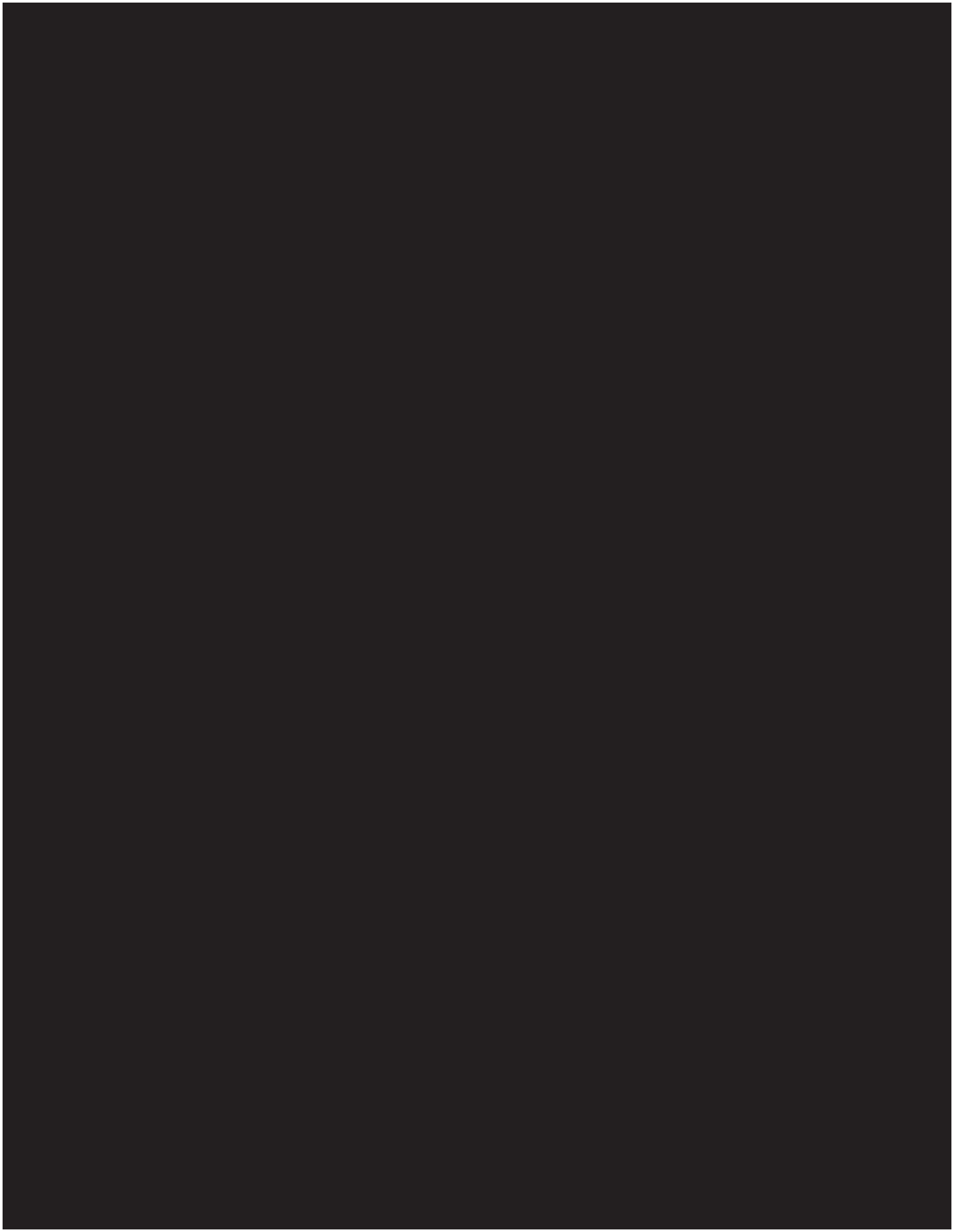












Notebook No : **12001637** Date MM/DD/YYYY

Project	Subject

From Page No :

[Handwritten:] *Meeting for EMC collective substrate figures*

Meeting for patents (Hayashi KK, Tamura IP, Sasaoka)

Aim to file a patent for LED having a caster structure with hole and a groove on backside.

In such case, it is necessary to clarify the difference between ceramic type.

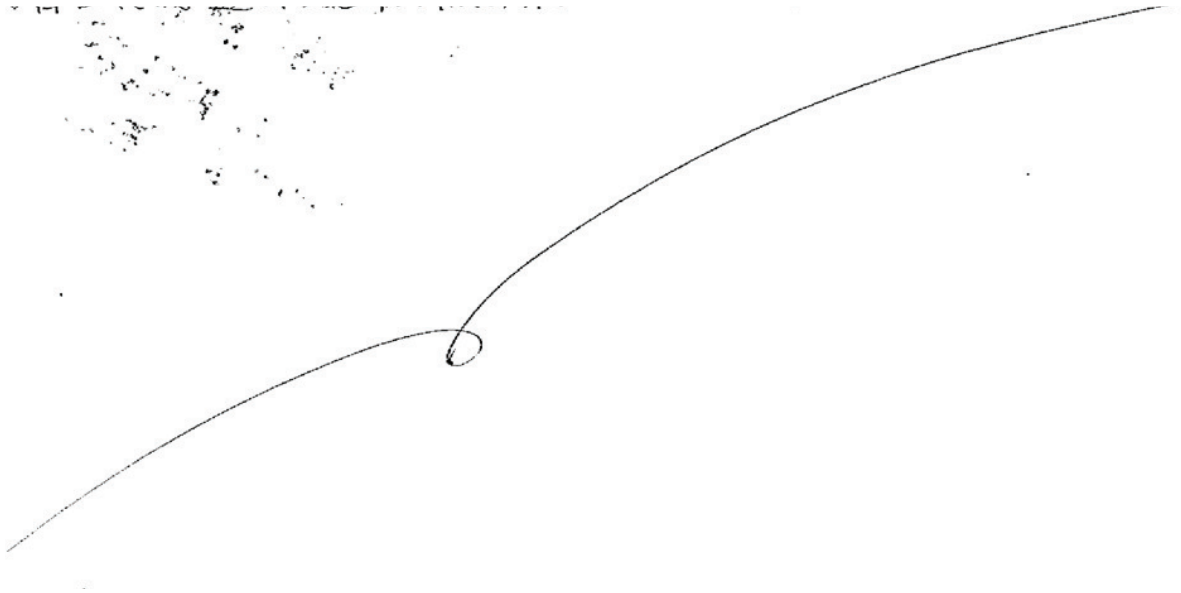
Since the ceramic has cracking problem during soldering, we will aim to file an application by using a metallic L.F resembling a similar linear expansion coefficient as the substrate in use (glass epoxy, alumni).

[seal:] Ichikawa

As for the need for a caster, we can justify that since the metal material becomes exposed while diced in order to increase productivity, the caster with Ag remaining is used to increase adhesiveness.

- *Begin test for Hitachi Chemical's anti-transparency resin and heat-resistant, phosphor-resistant resin.*

[seal:] Tamaki



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Notebook No : **12001637** Date MM/DD/YYYY

Project	Subject [seal:] Engineering 3/10/2008 Ichikawa

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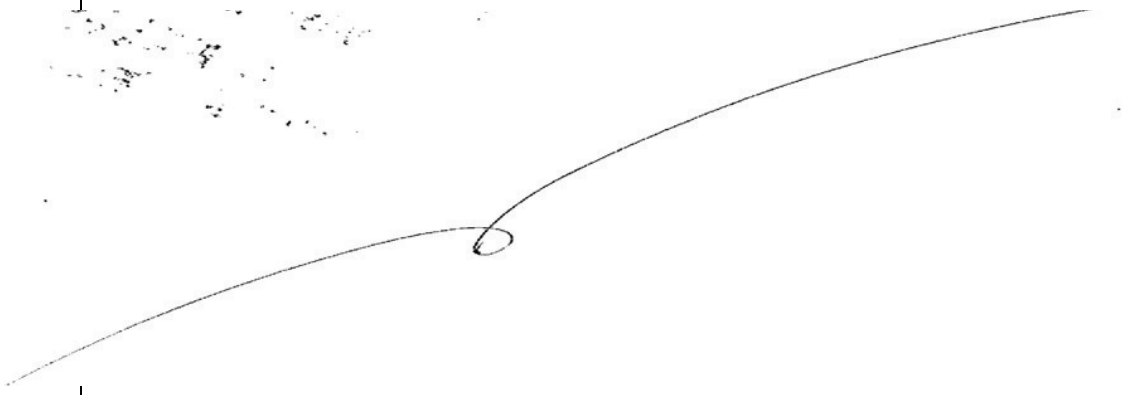

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Project | Subject [seal:] Ichikawa

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PKG

(1). Usually, ceramic PKG includes a dented part for fillet molding called castellation on its outer side to improve the strength of solder joint of semiconductor.
(2). However, (1)'s method is insufficient because the linear expansion coefficient is great for PKG and mounted substrate (resin, metal, etc.)
*Especially, the conditions above is usual when ceramic PKG size is greater than 3.5mm.
(3). To solve the problems presented in (2), we provided resin-type PKG having lead frame made with metal (ex. copper, alloy, 42 alloy, steel, aluminum) that has small linear expansion coefficient when used with mounted substrate and further having castellation for improved strength on solder joint.
(4). PKG resin material is resin with hardening property and resin with heat resistance property. Furthermore, it is desirable that they are resin with heat curing properties with expansion rate similar to metal.
(5). Sealing material include epoxy and silicone, and silicone with superior heat resistance is more favorable.

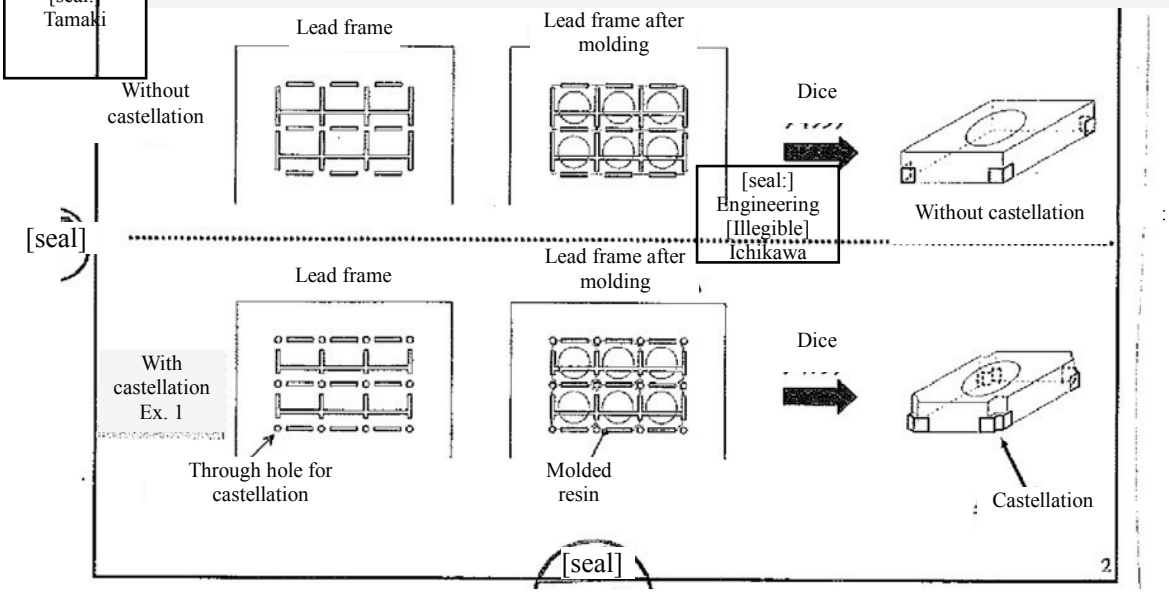
Summary

(1). PKG described above is diced into individual units instead of forming by cuts to improve the number of produced units within lead frames (improved production and cost reduction).
(2.) After dicing metallic lead frame, the diced surface becomes exposed and susceptible to oxidation.
Therefore, solder wettability becomes low, and solder adhesion reliability becomes low after using substrate.
(3) To solve the problem of (2) by placing a through-hole, spot facing or groove by pressing, half-etching, dicing or the like on the back side of the lead frame, and then plating, even when it is diced, it is possible to provide a castellation without exposing the base material of the lead frame.
(4). Also, is possible to include castellation to PKG with resin mold/lead frame on dicing line.

[seal:] Miki

LED lead side parts are not completely metal plated and Cu material cross section becomes exposed, becoming susceptible to oxidation. Therefore, reliability for adhesion is low due to low solder wettability. This may be improved by using lead frame having metal-plated through hole which becomes castellated after dicing into units because castellated part has metal facing and is resistant to oxidation, increasing adhesion reliability.

[seal:] Tamaki



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Project	Subject

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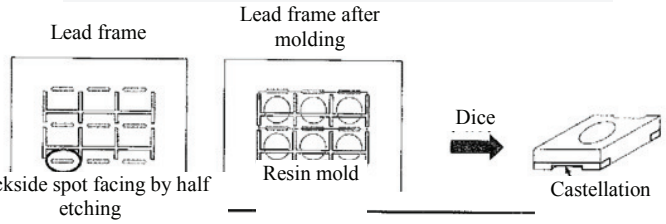
Ex. 2. For the PKG in the previous page, rather than a through hole, you can provide a spot facing made by half-etching with plating on the back face.



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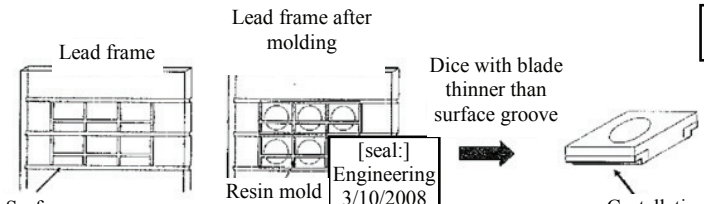
Ex. 3. PKG from prior page may have metal-plated groove on backside instead of face spotting.

[seal:] Tamaki



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Notebook No : **12001637** Date MM/DD/YYYY

Project	Subject

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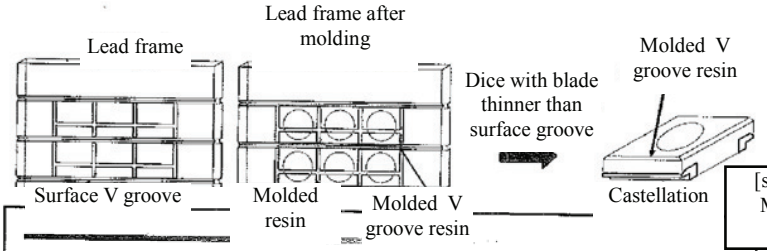
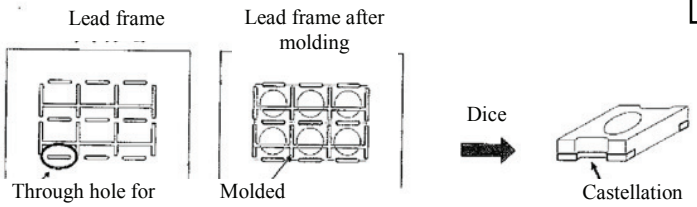
Ex. 3 PKG from prior page may include V groove on resin mold and surface of lead frame to improve dicing and to improve resin mold adhesion



[seal:] Miki

Ex. 4 PKG from page 2 may include through hole with metal plating on PKG sides instead of PKG 4 corners.

[seal:] Tamaki



[seal:] Engineering [Illegible] Ichikawa

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Date	Understood and Witnessed by Date
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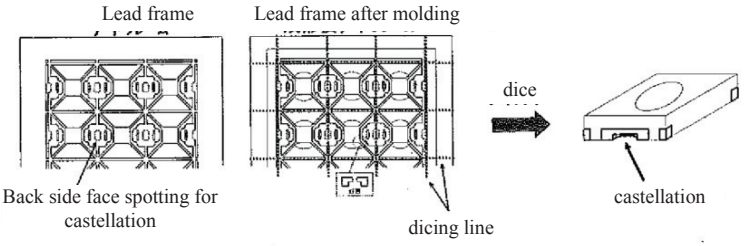
Notebook No: **12001637** Date MM/DD/YYYY

Project	Subject

From Page Nc

[seal:] Engineering [illegible] Ichikawa

Ex.5 Castellation may be mounted on PKG having dicing line on lead frame



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Date	Understood and Witnessed by Date
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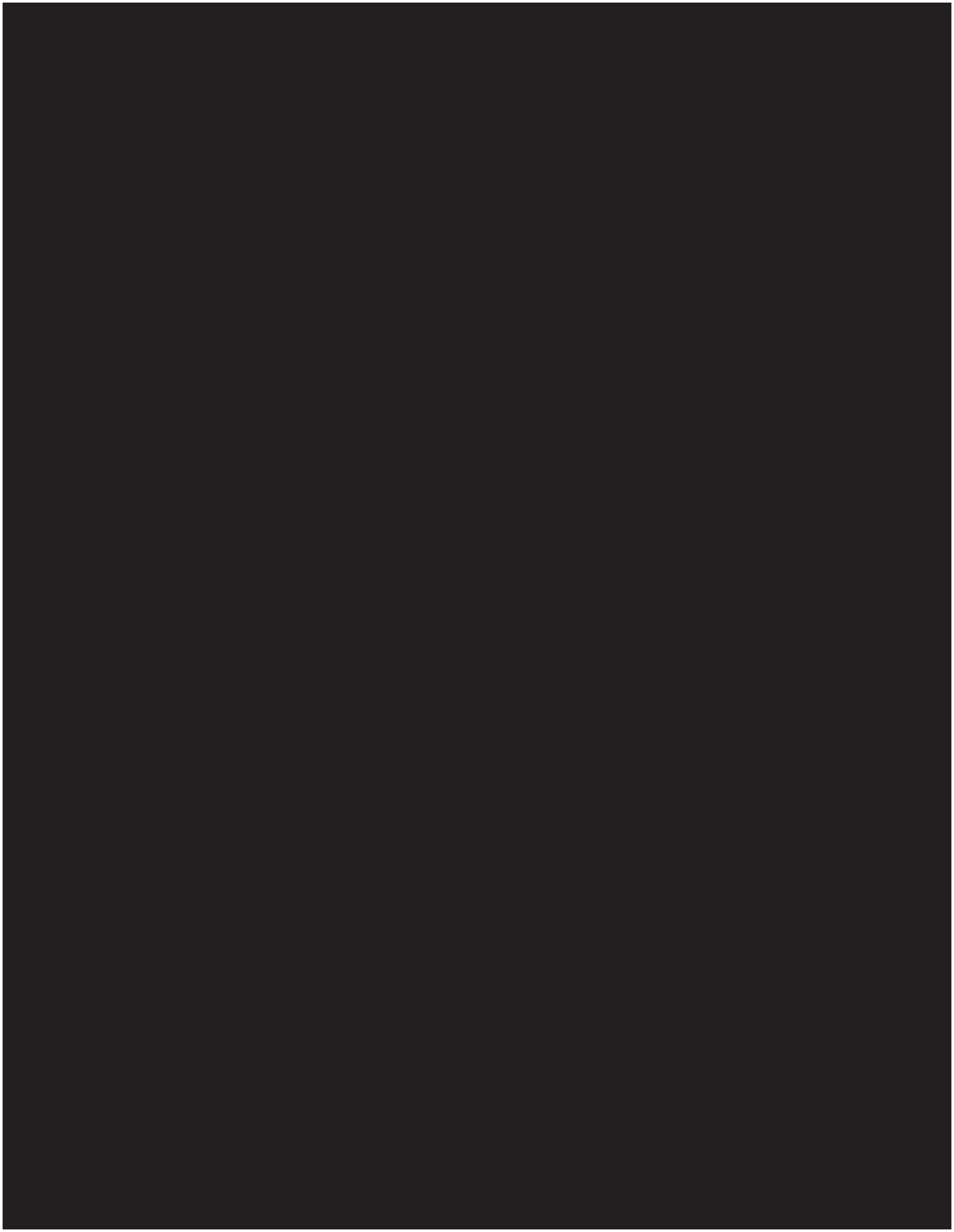
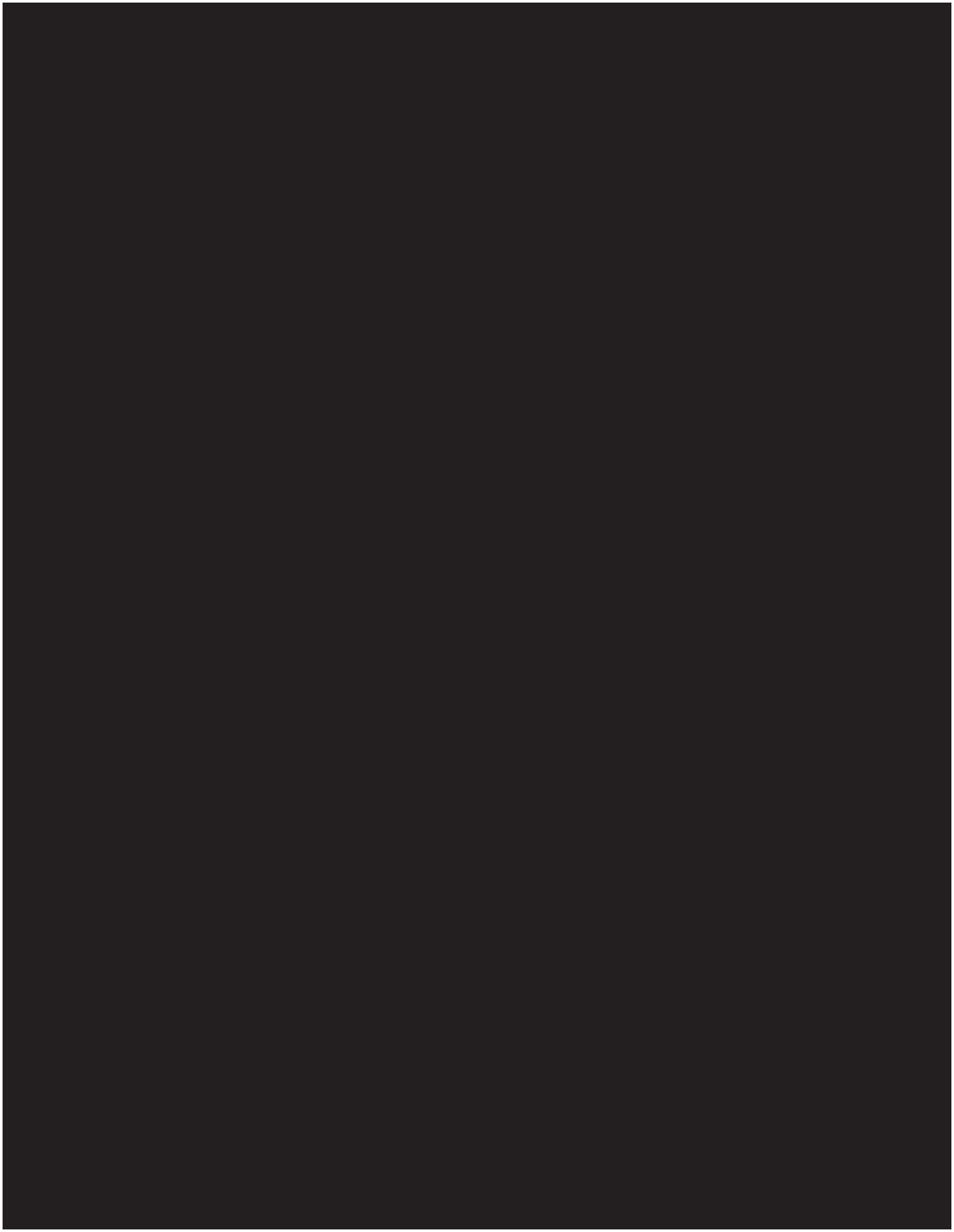
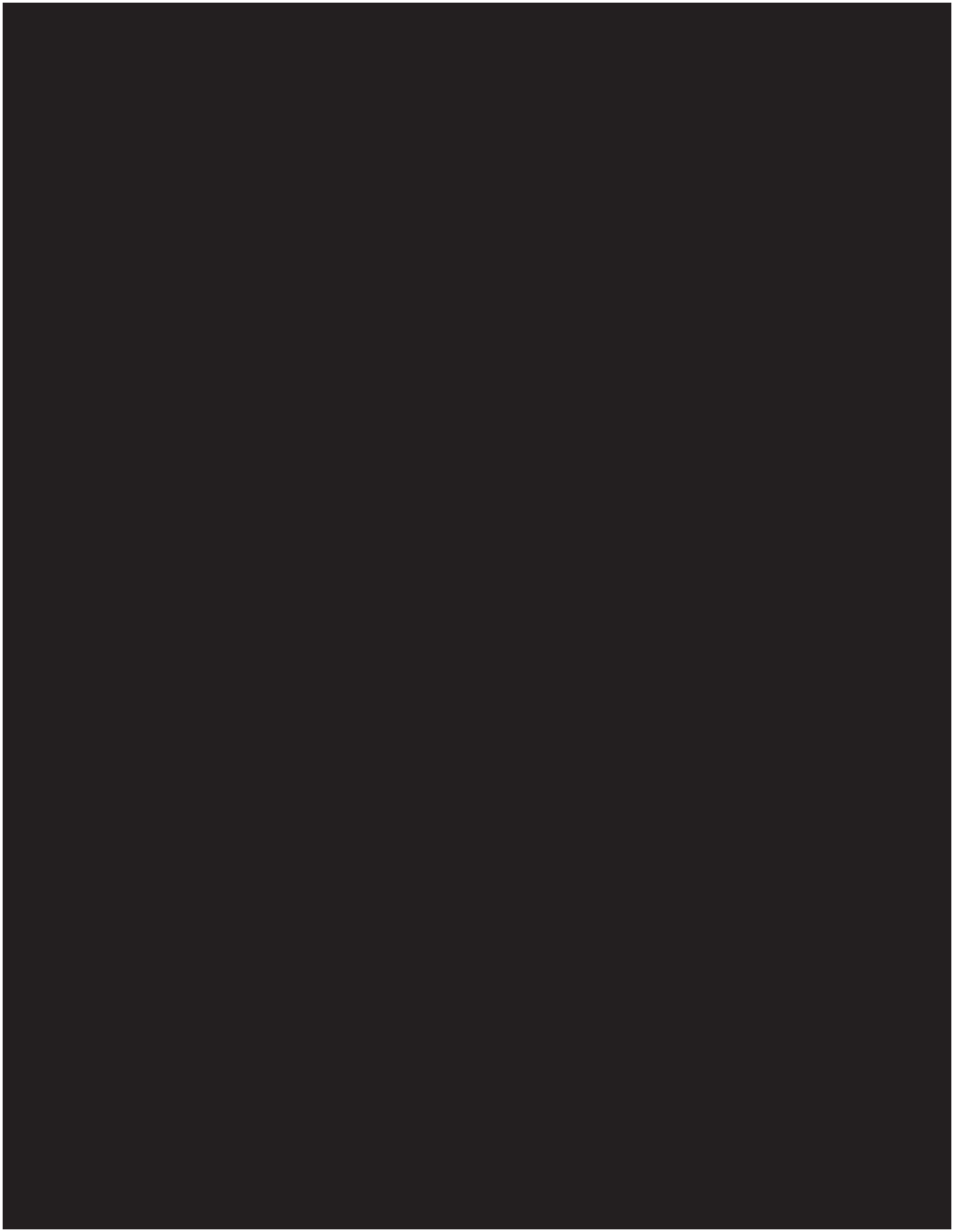
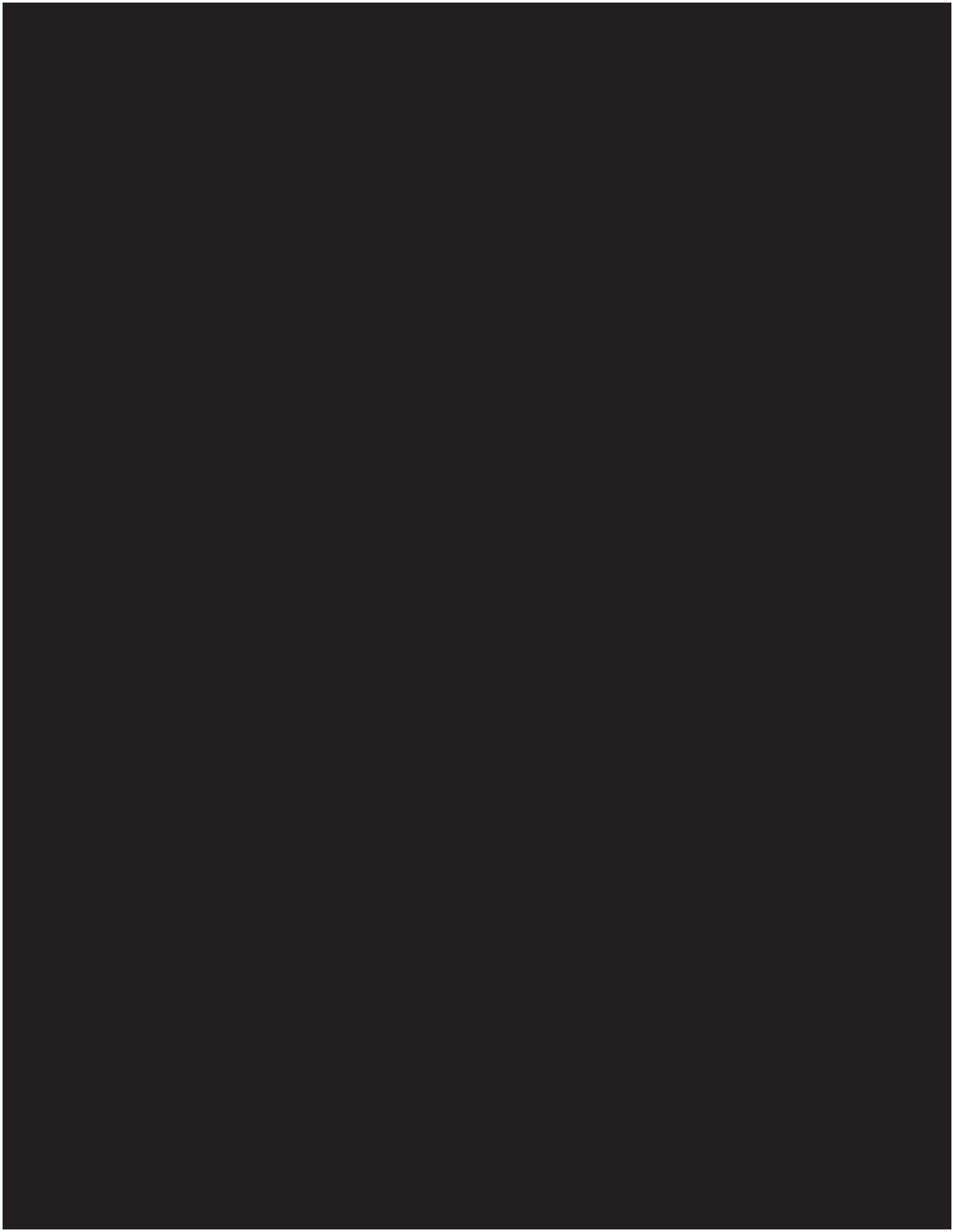
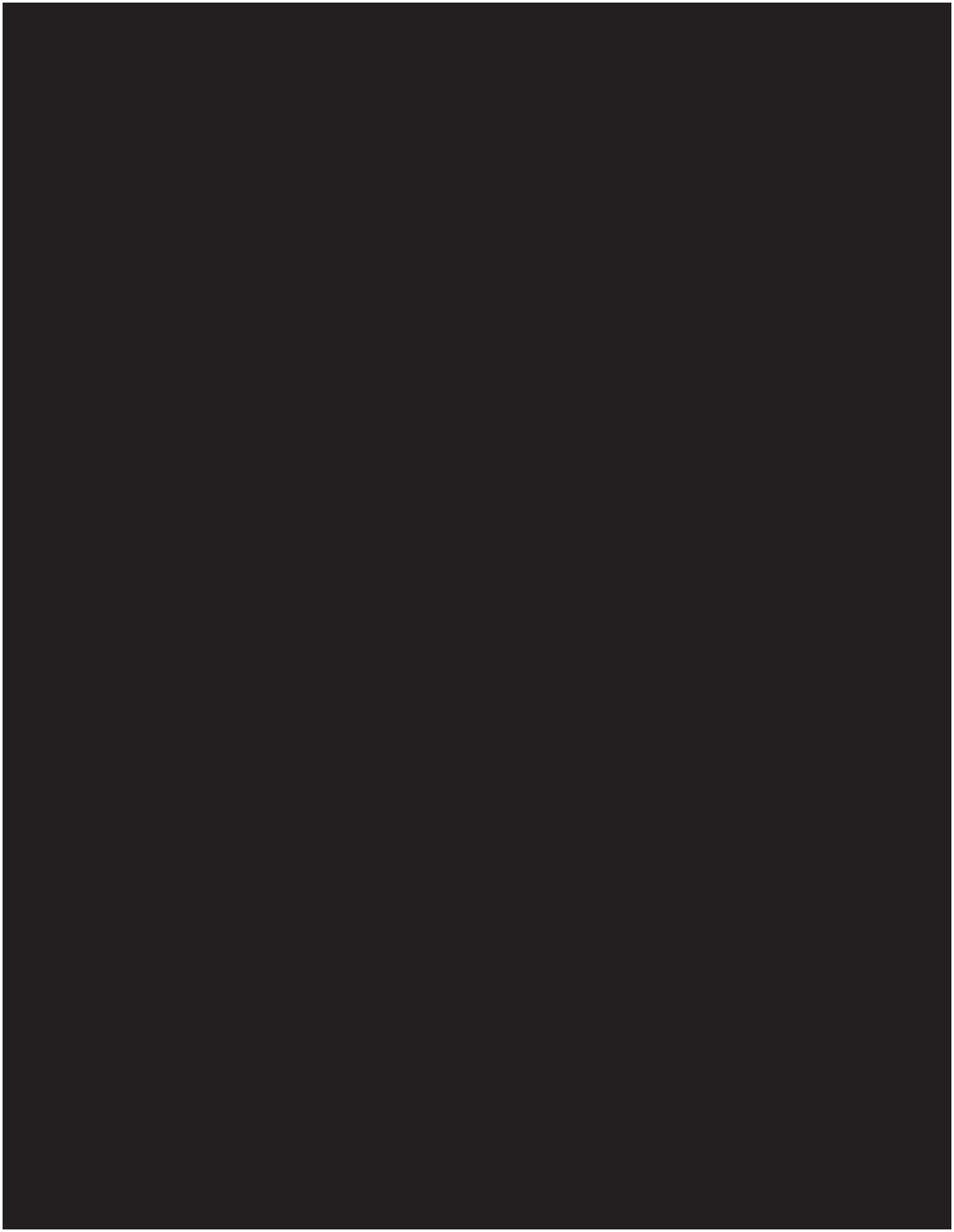
Recorded by [seal:] Miki MM/DD/YYYY	Signed MM/DD/YYYY

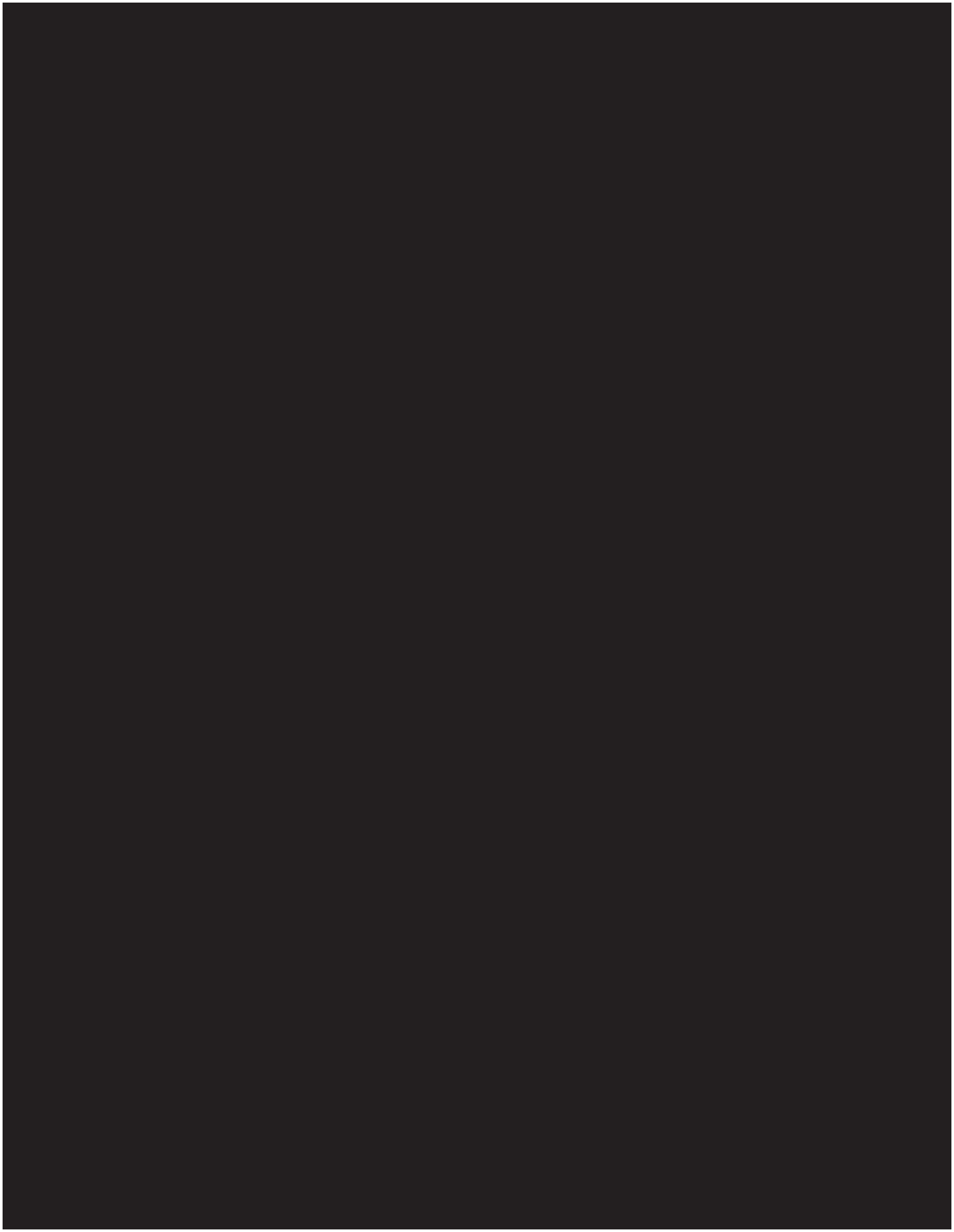


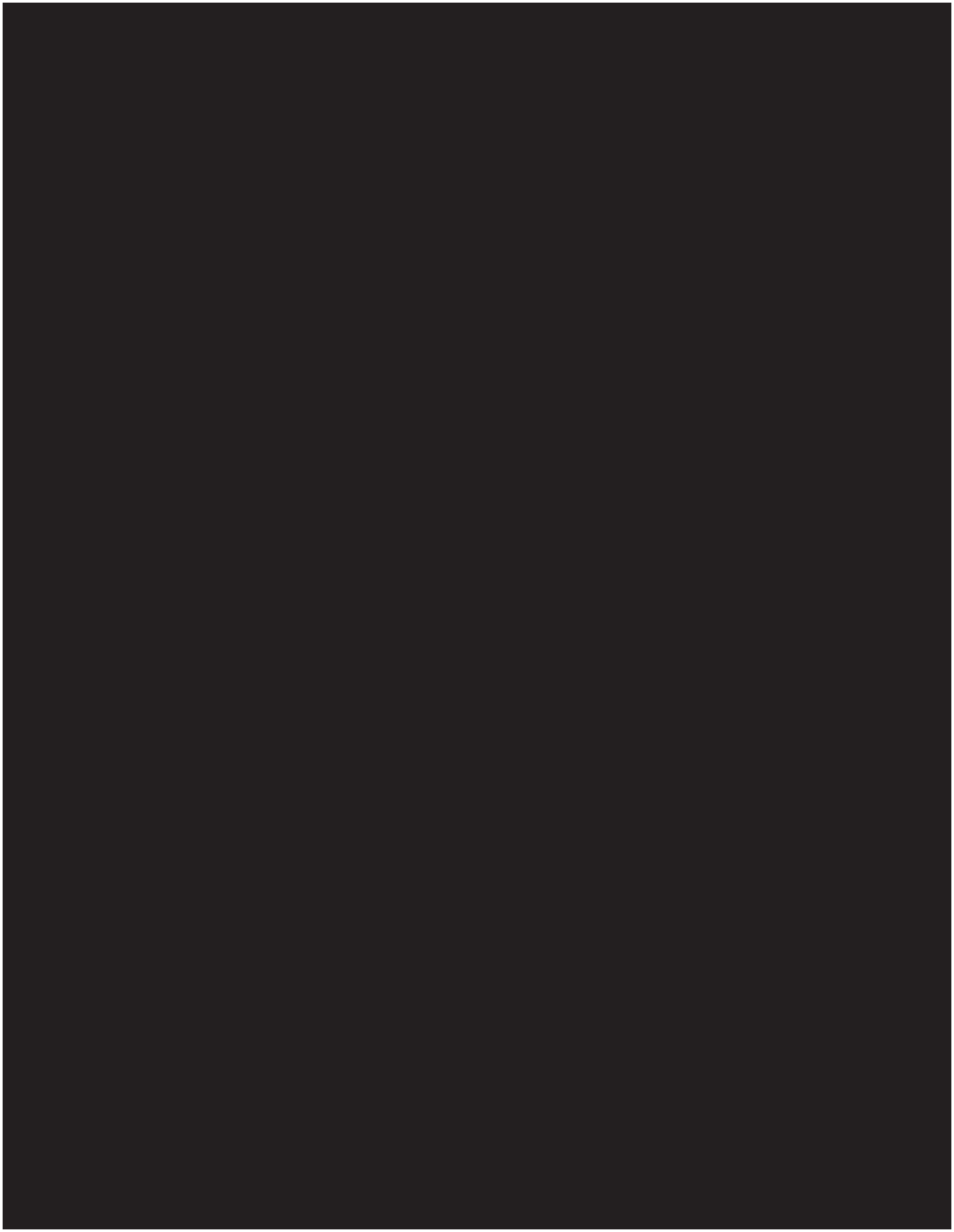


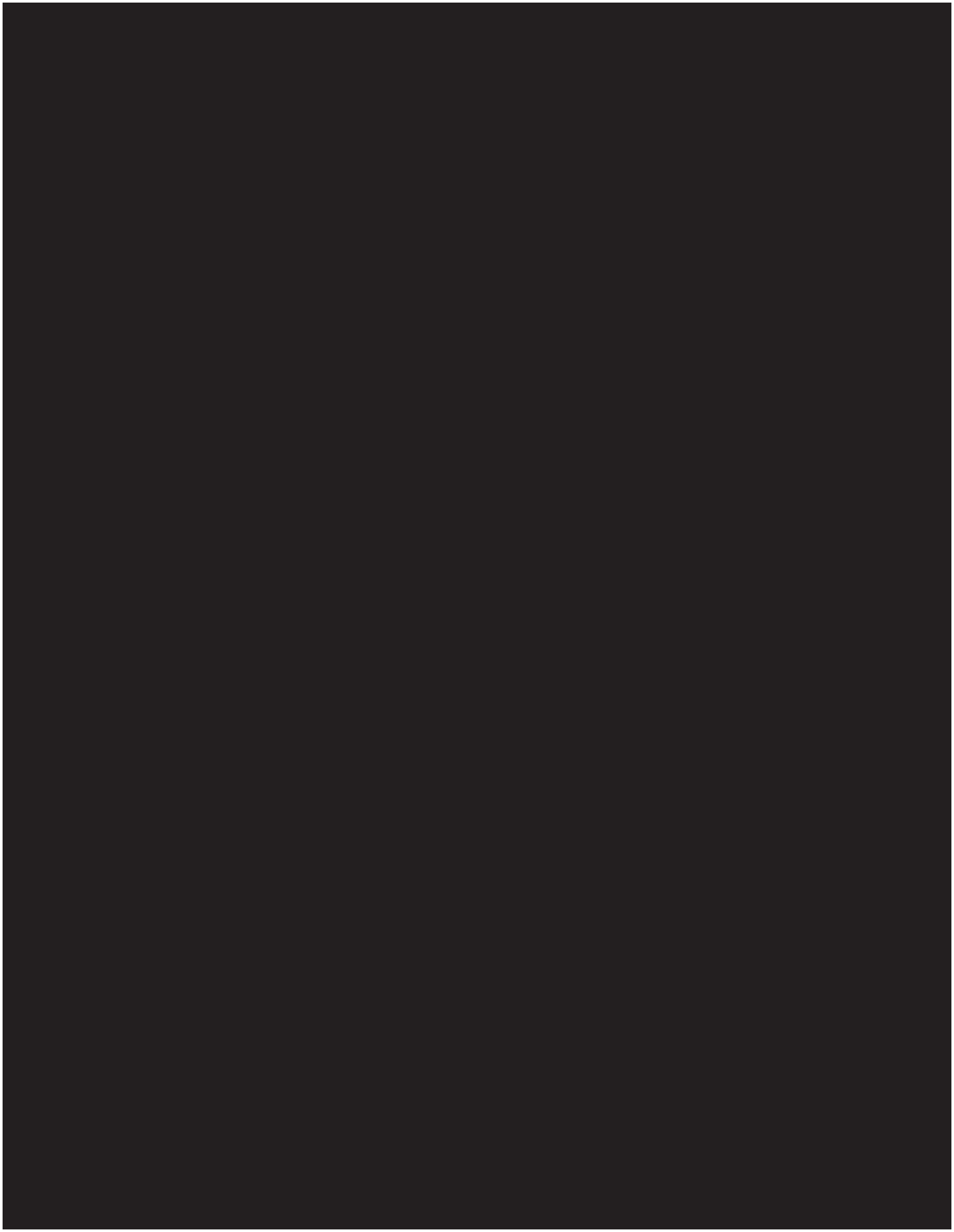


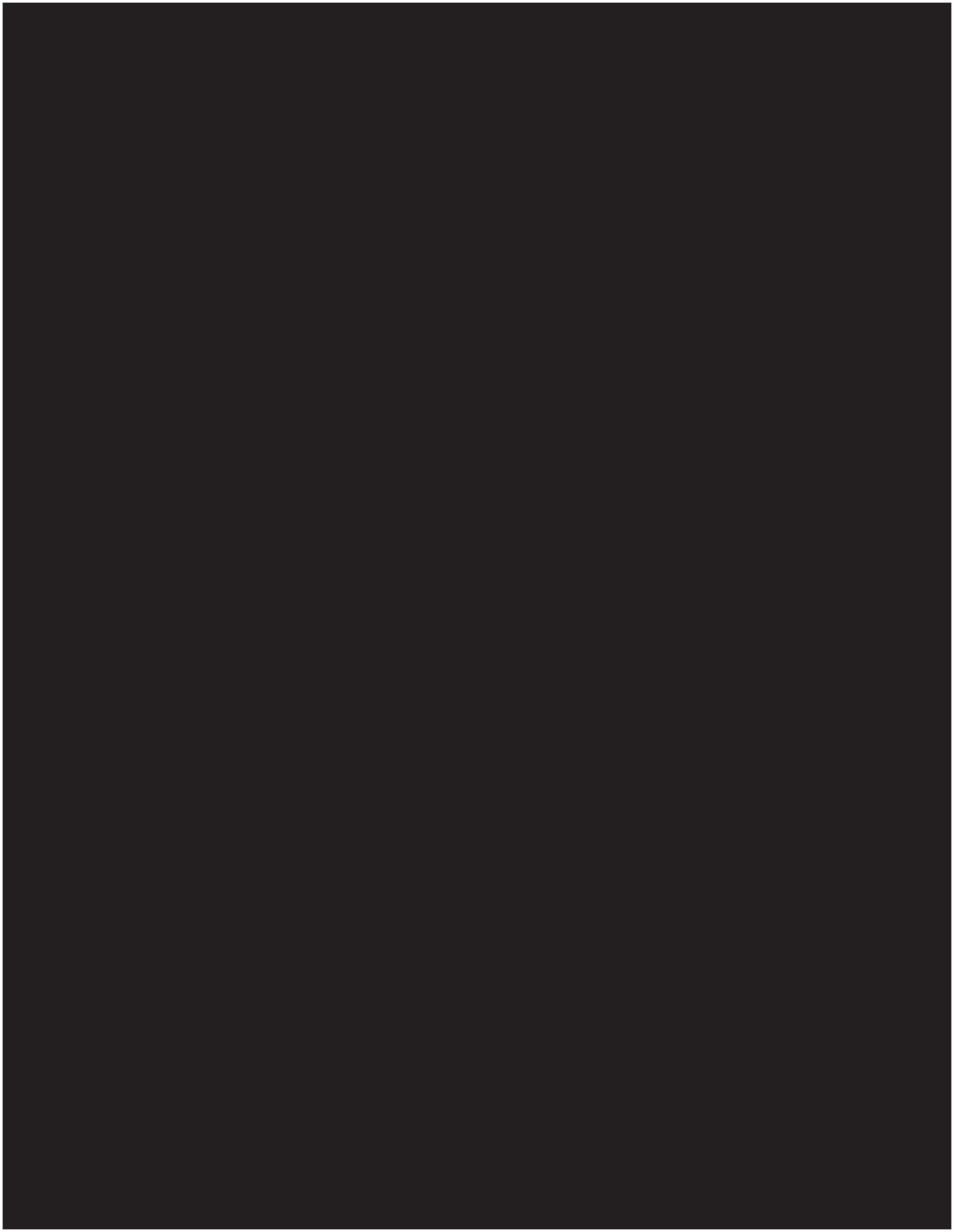


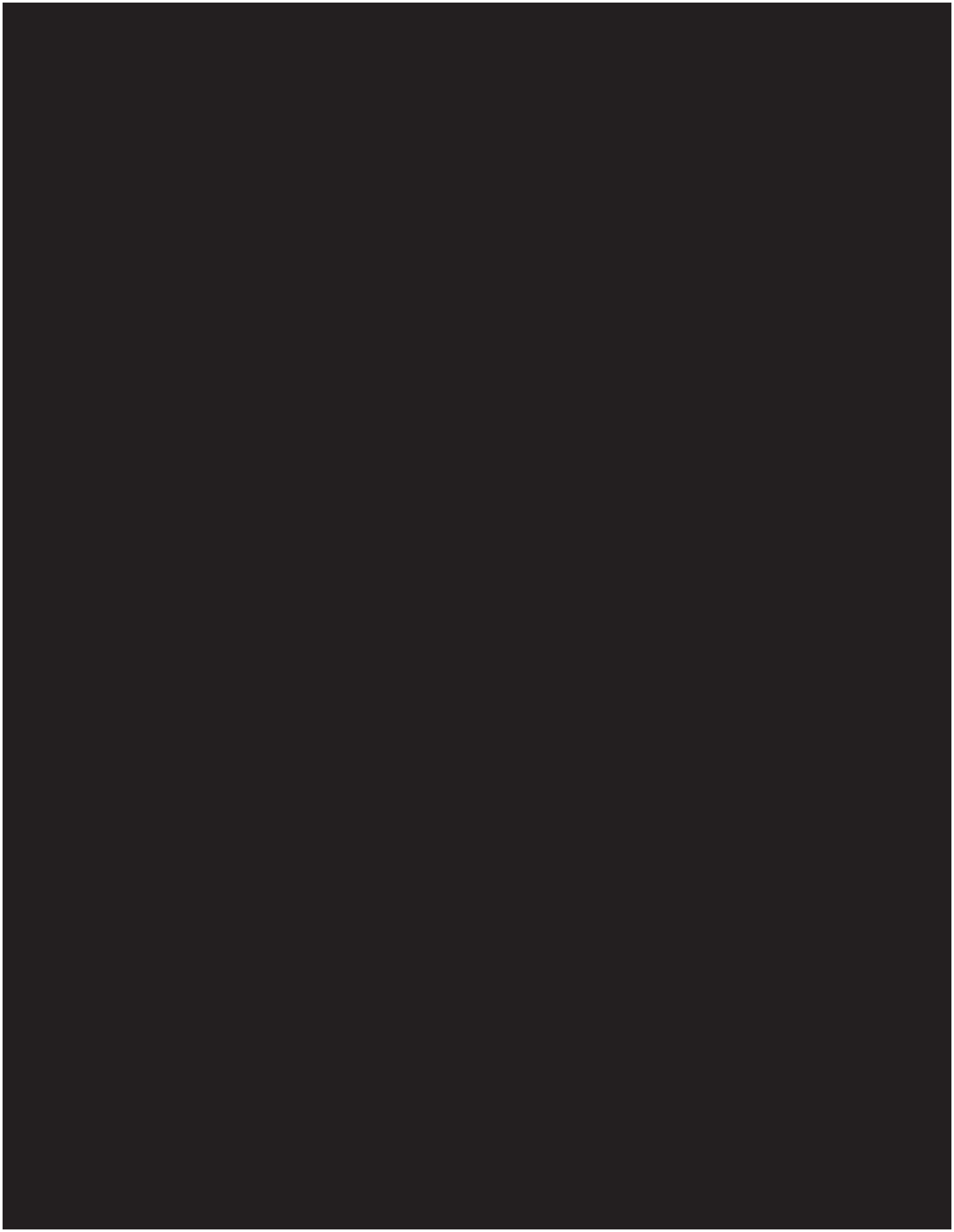


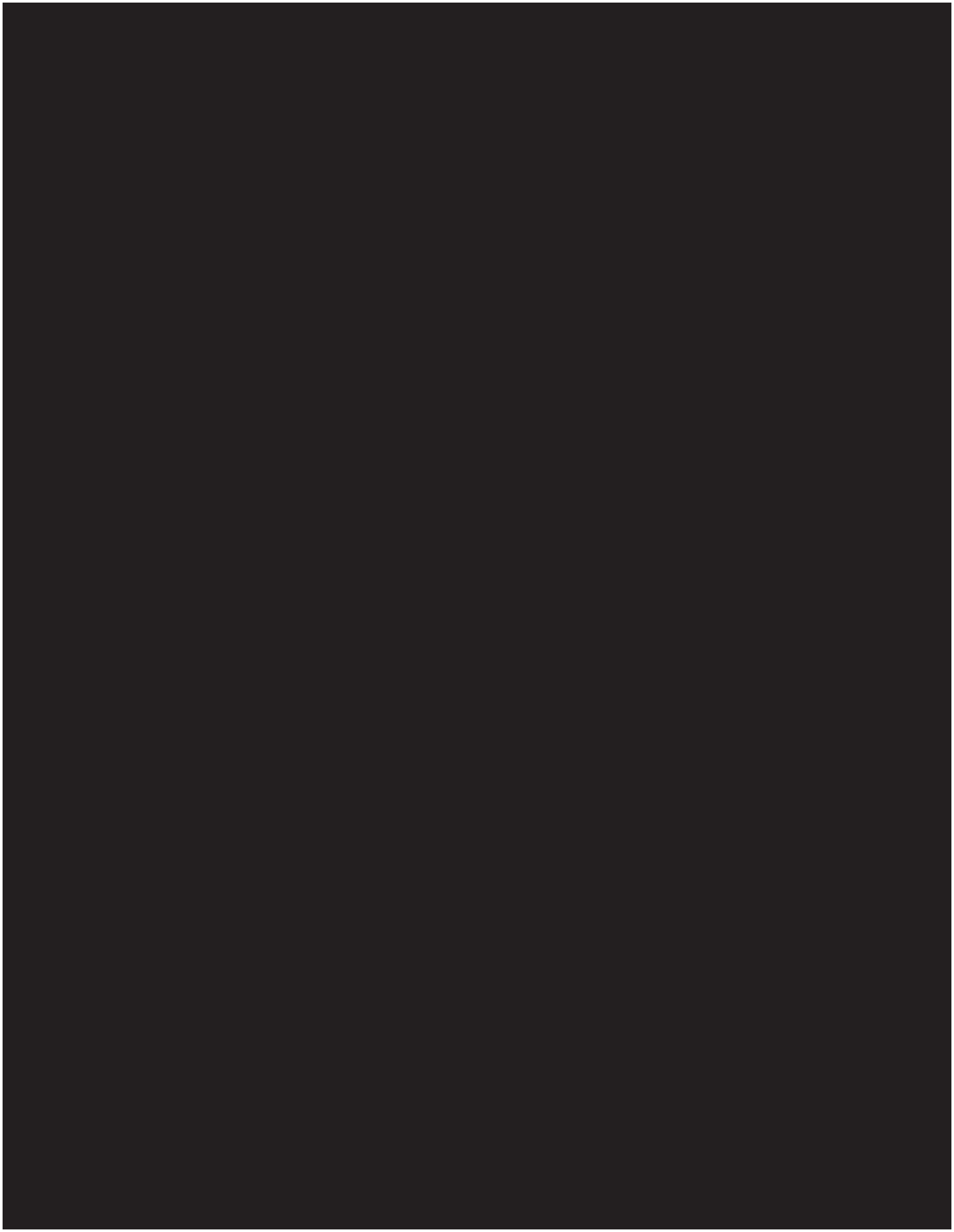


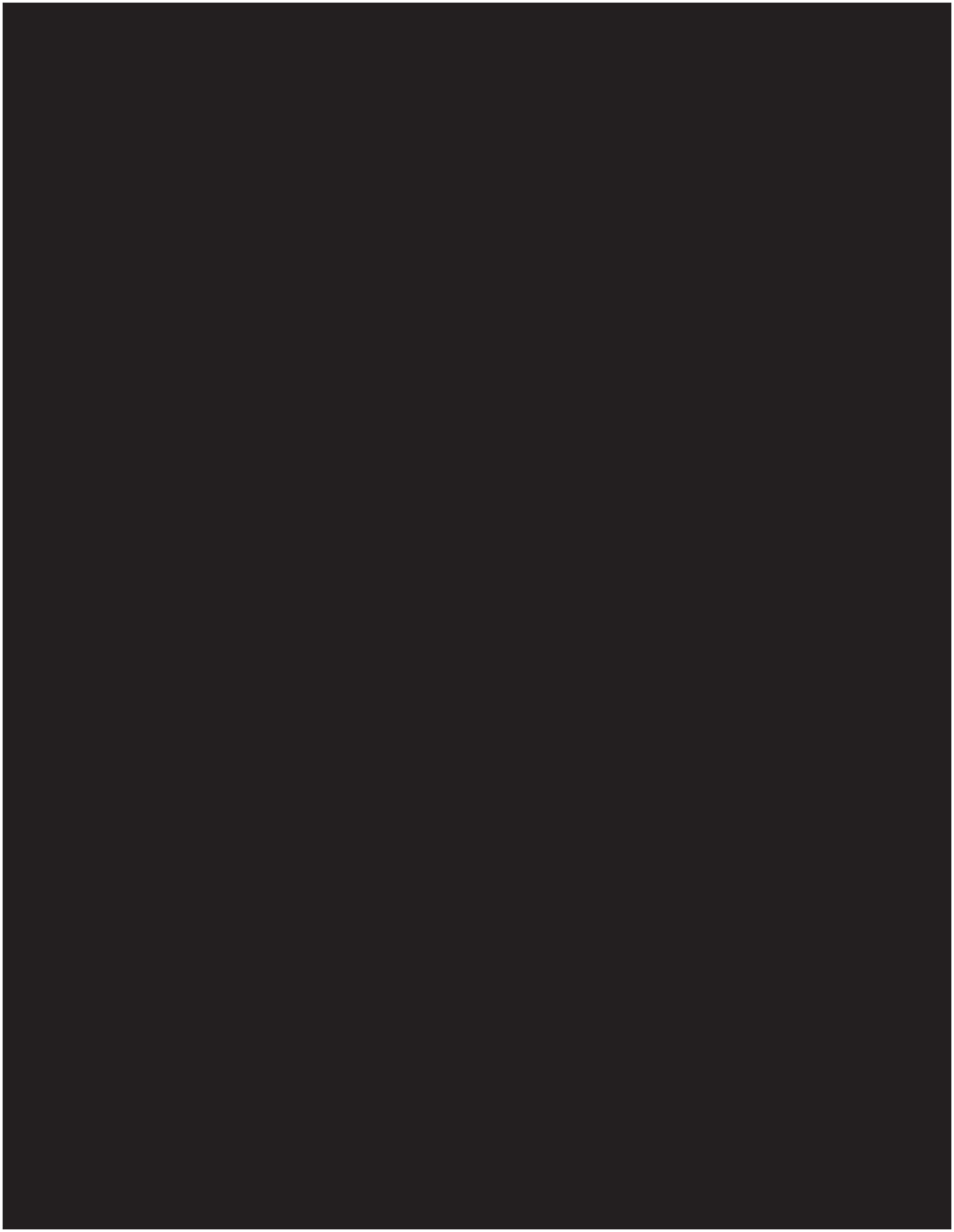


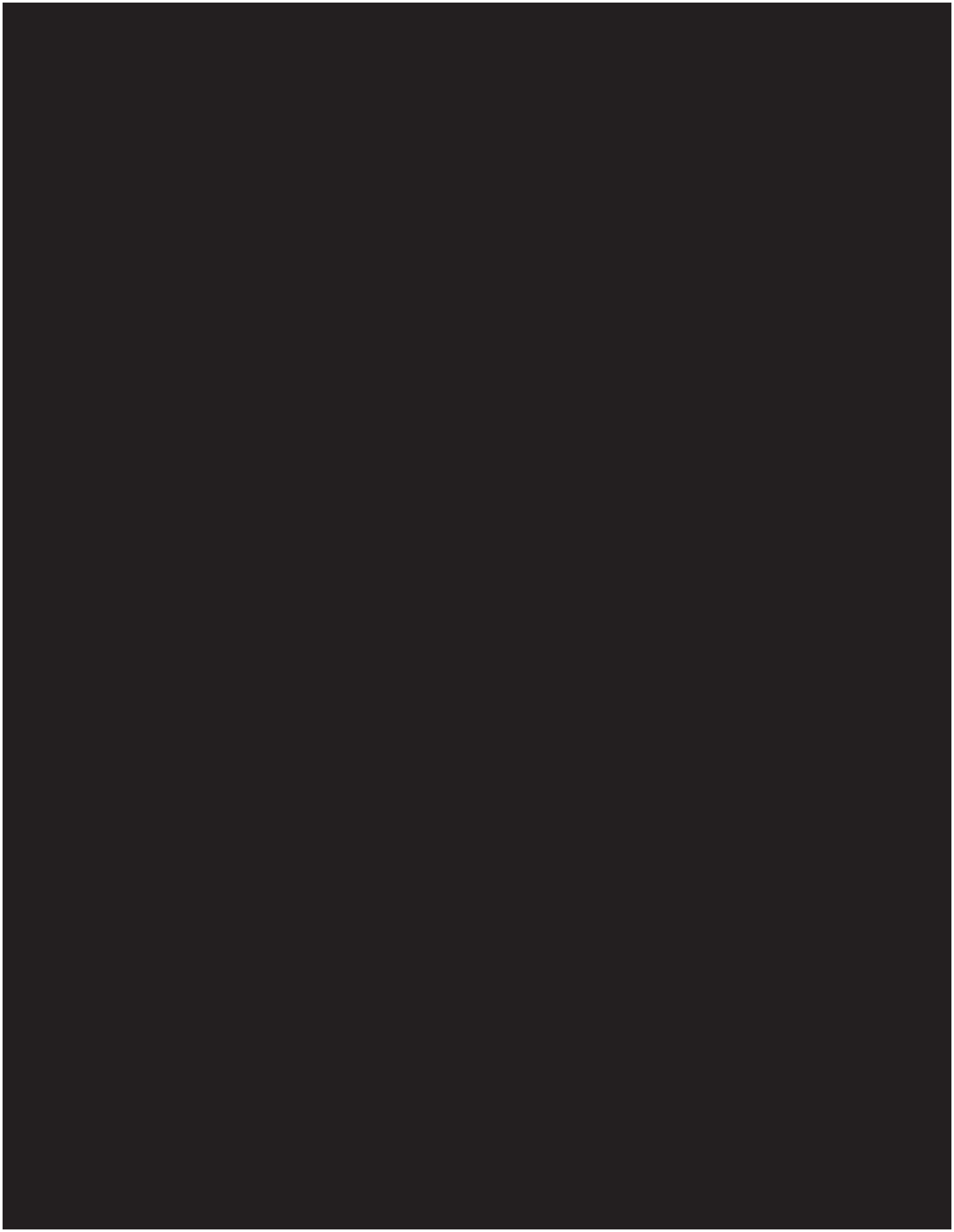


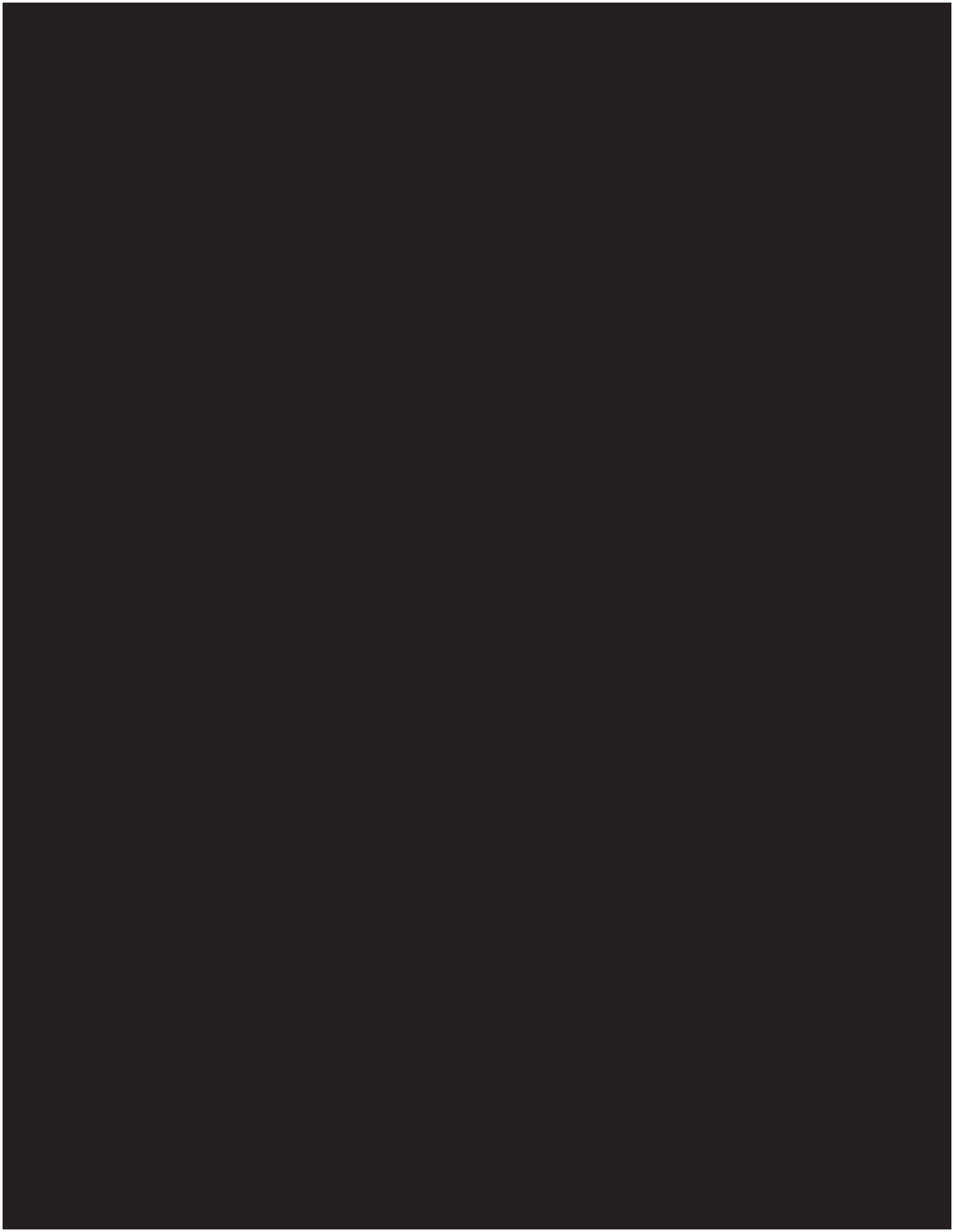


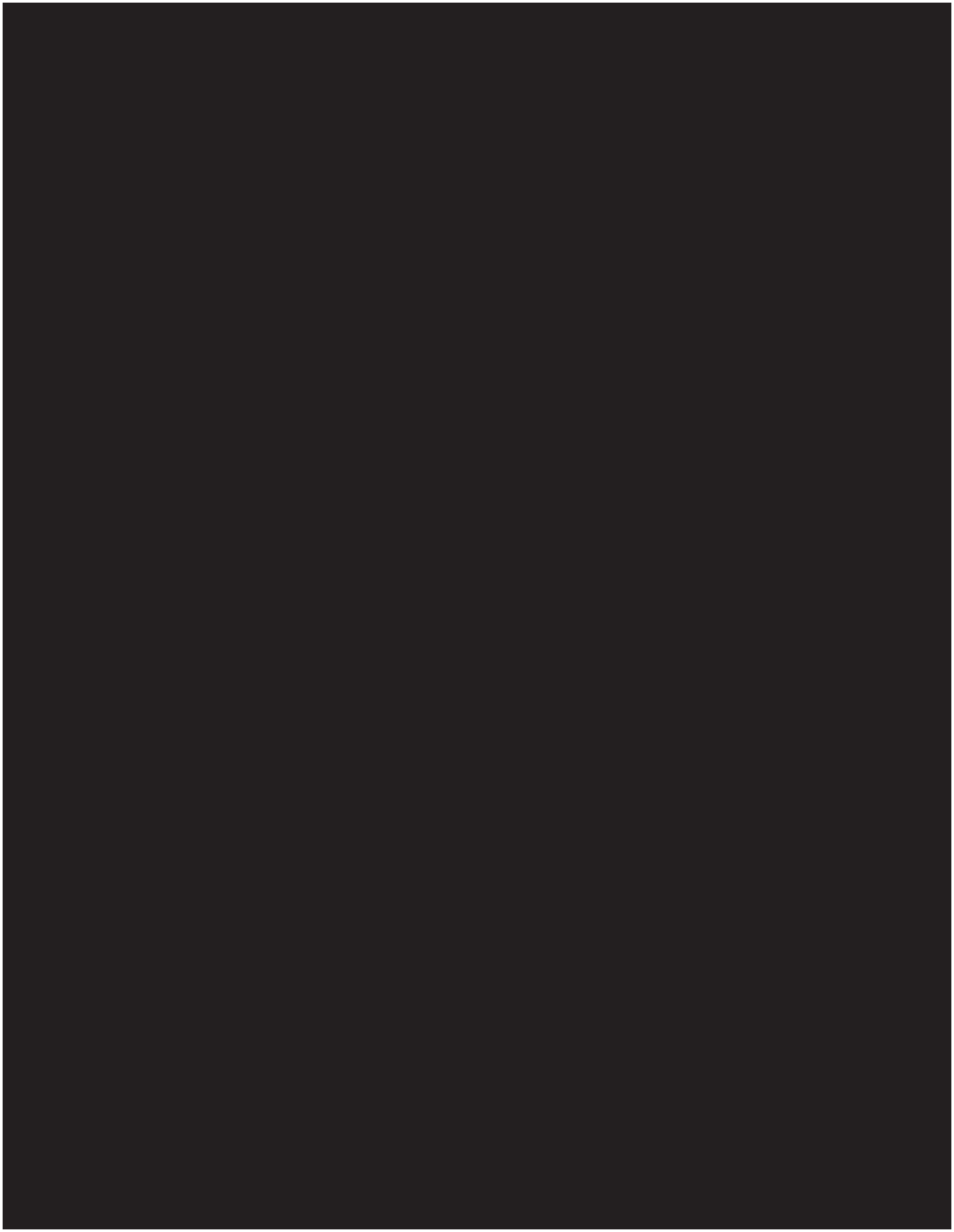


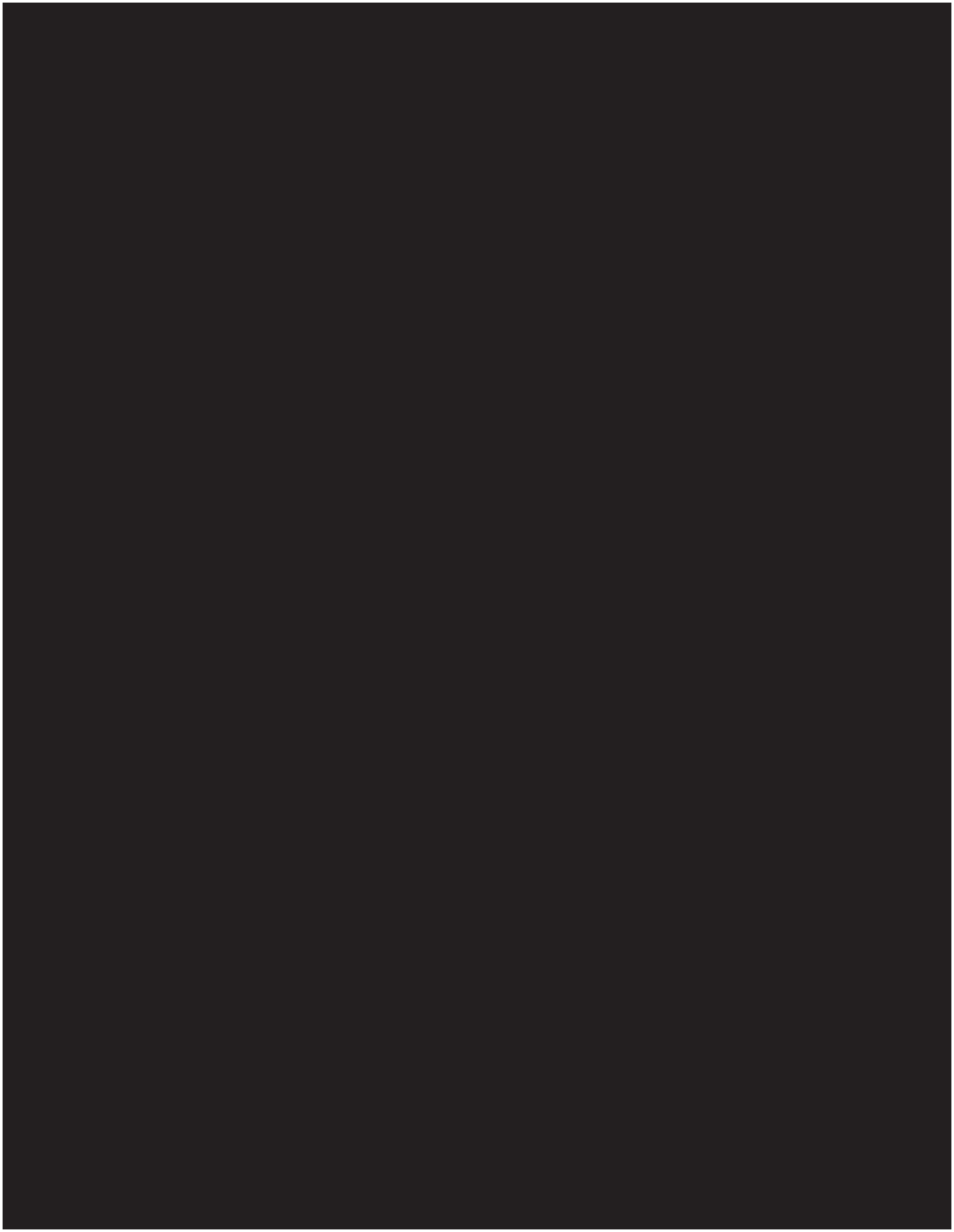


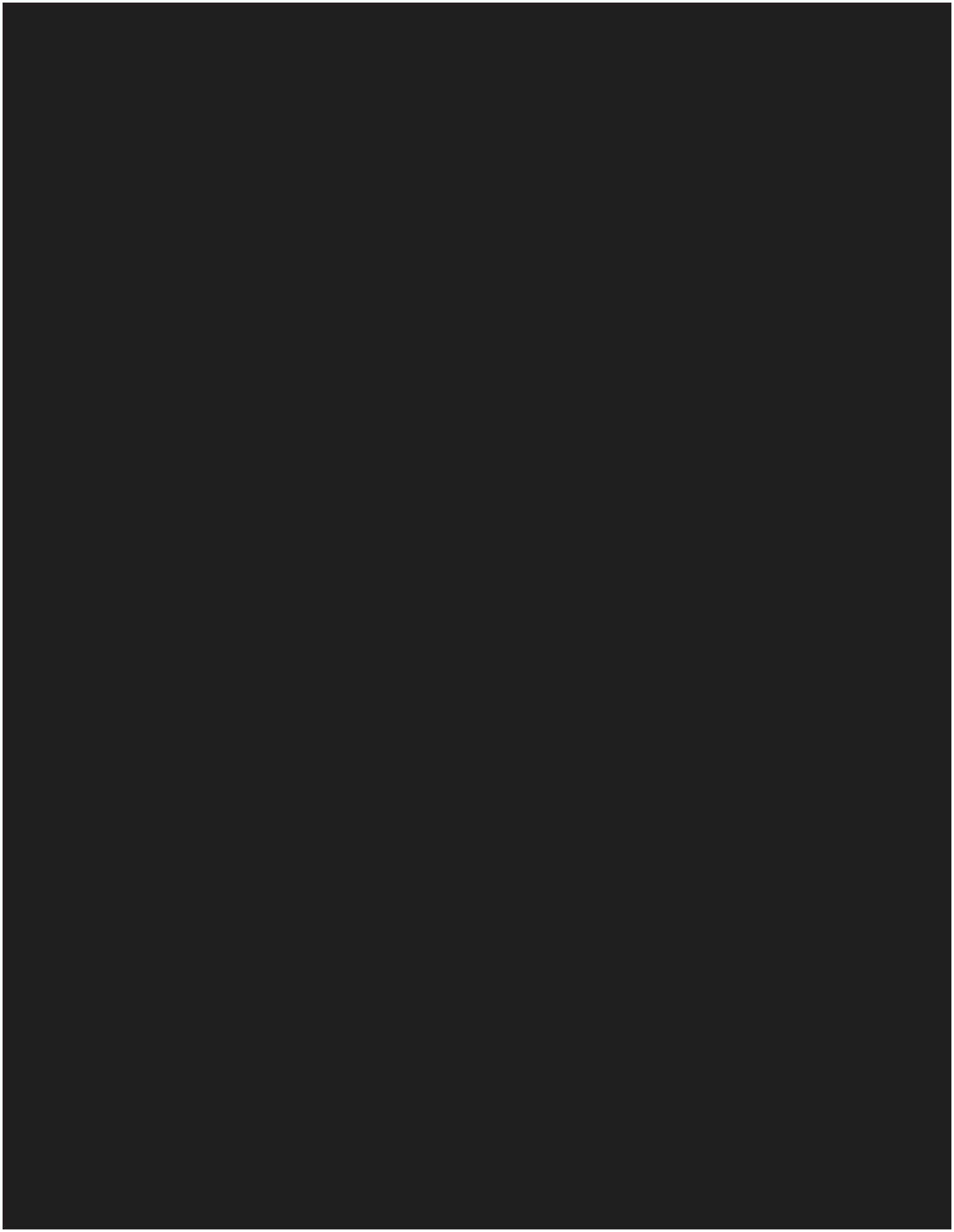


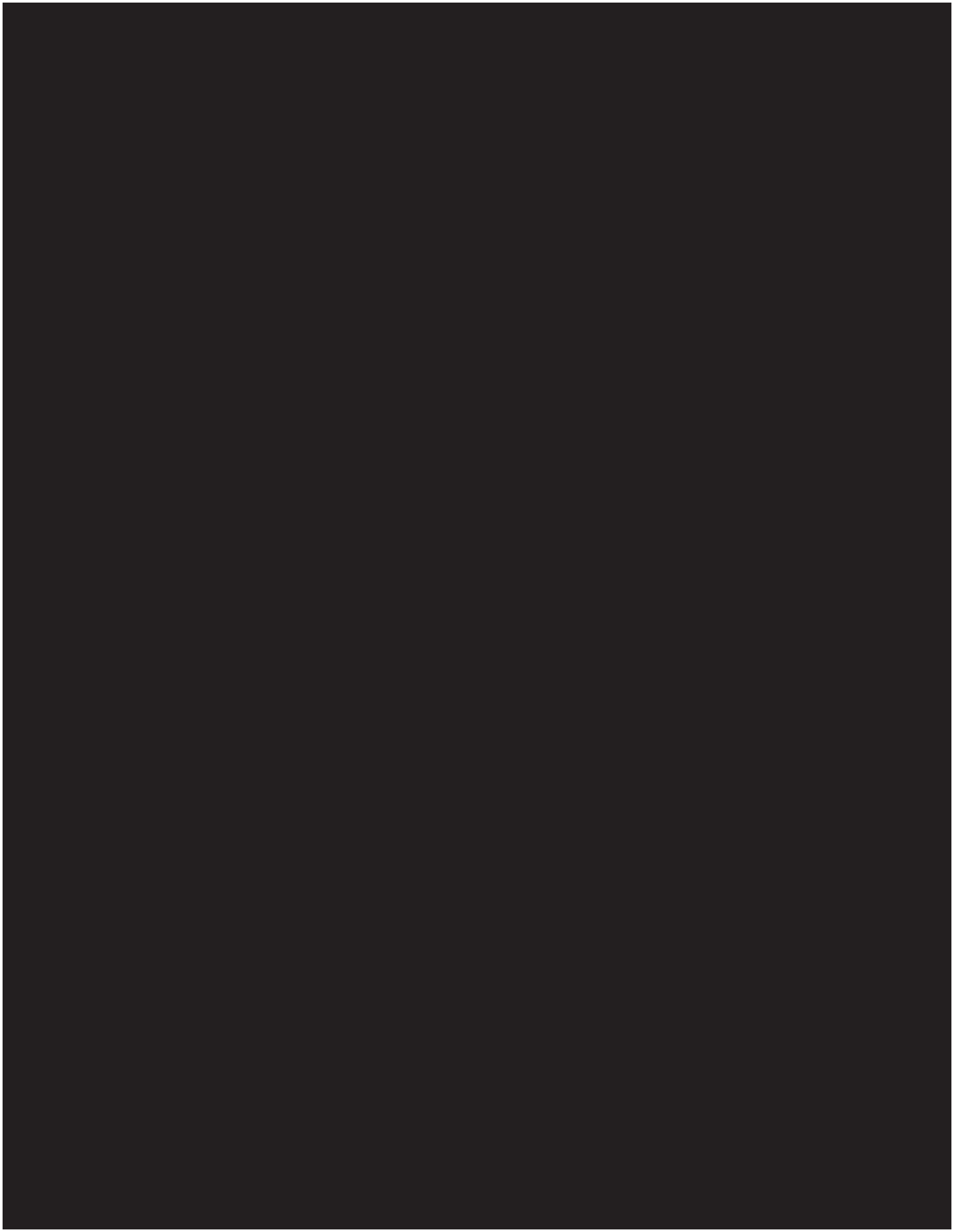


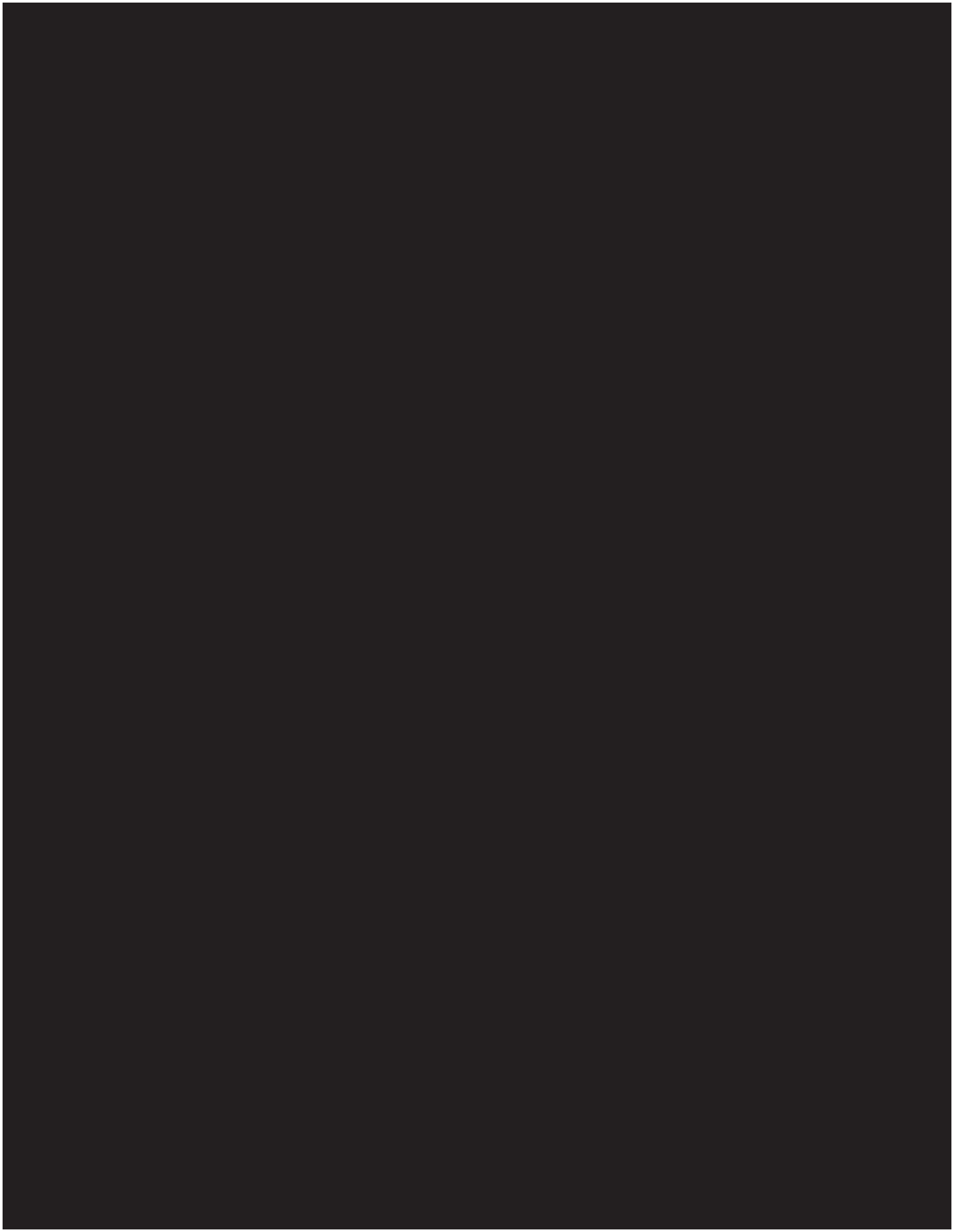


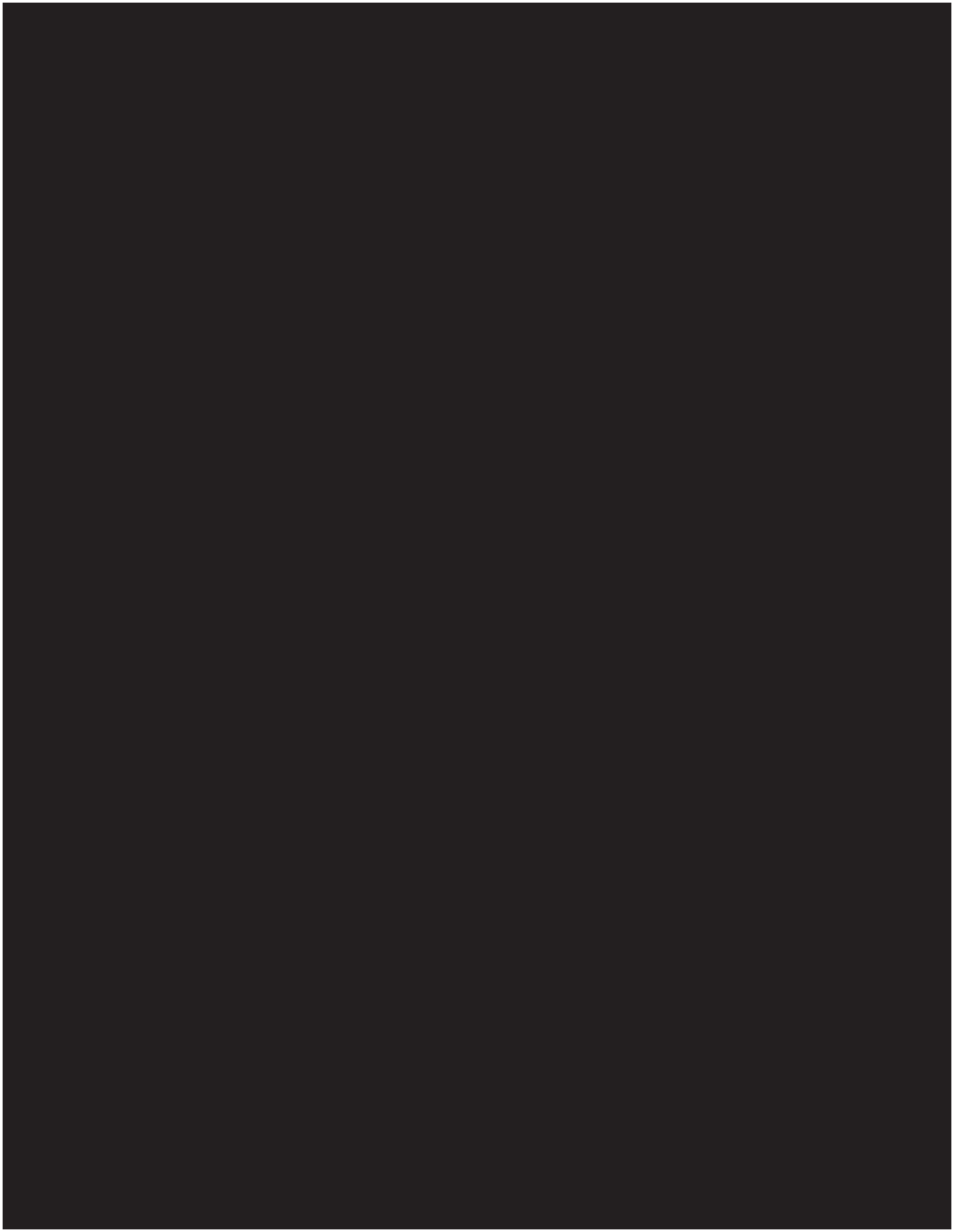


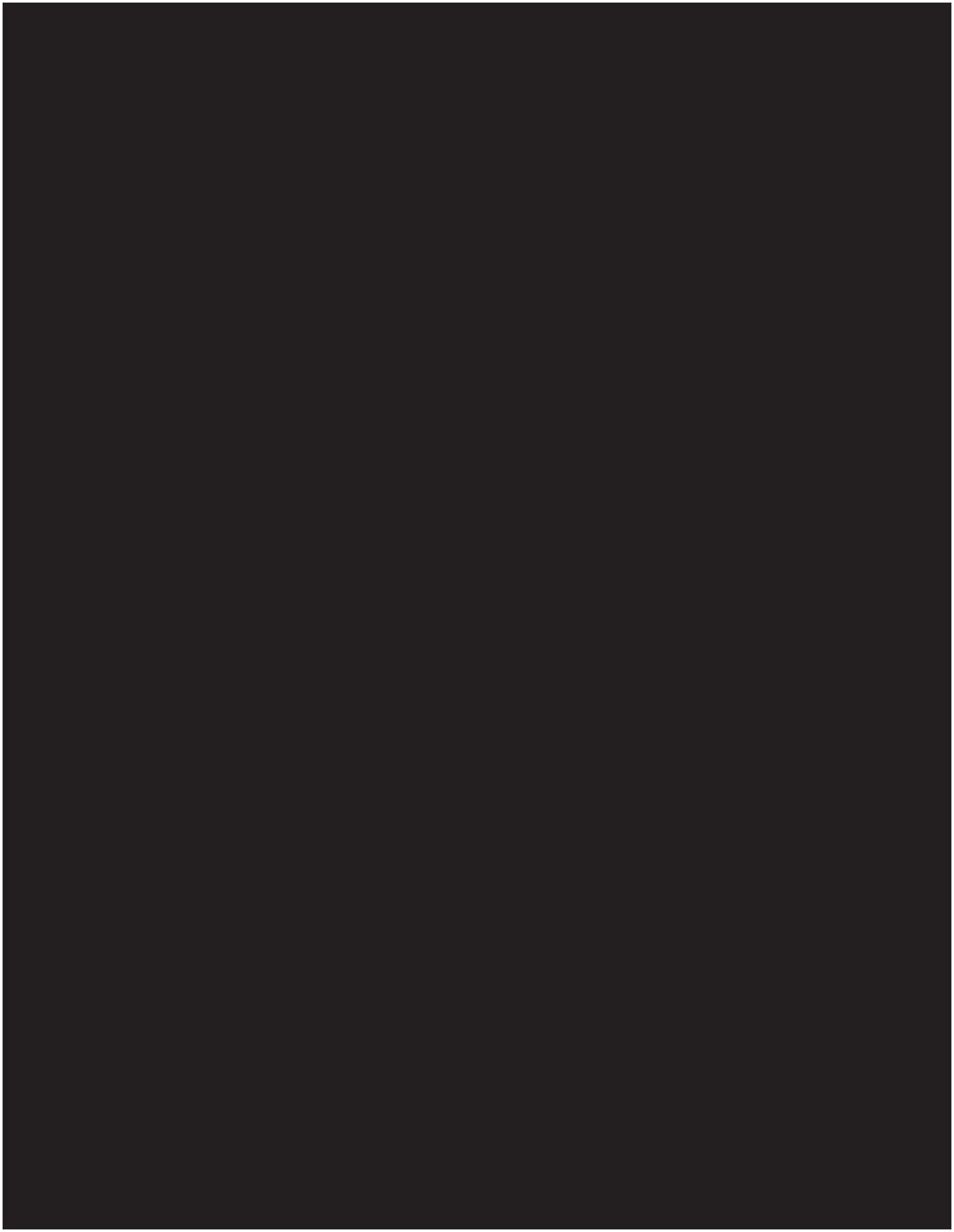


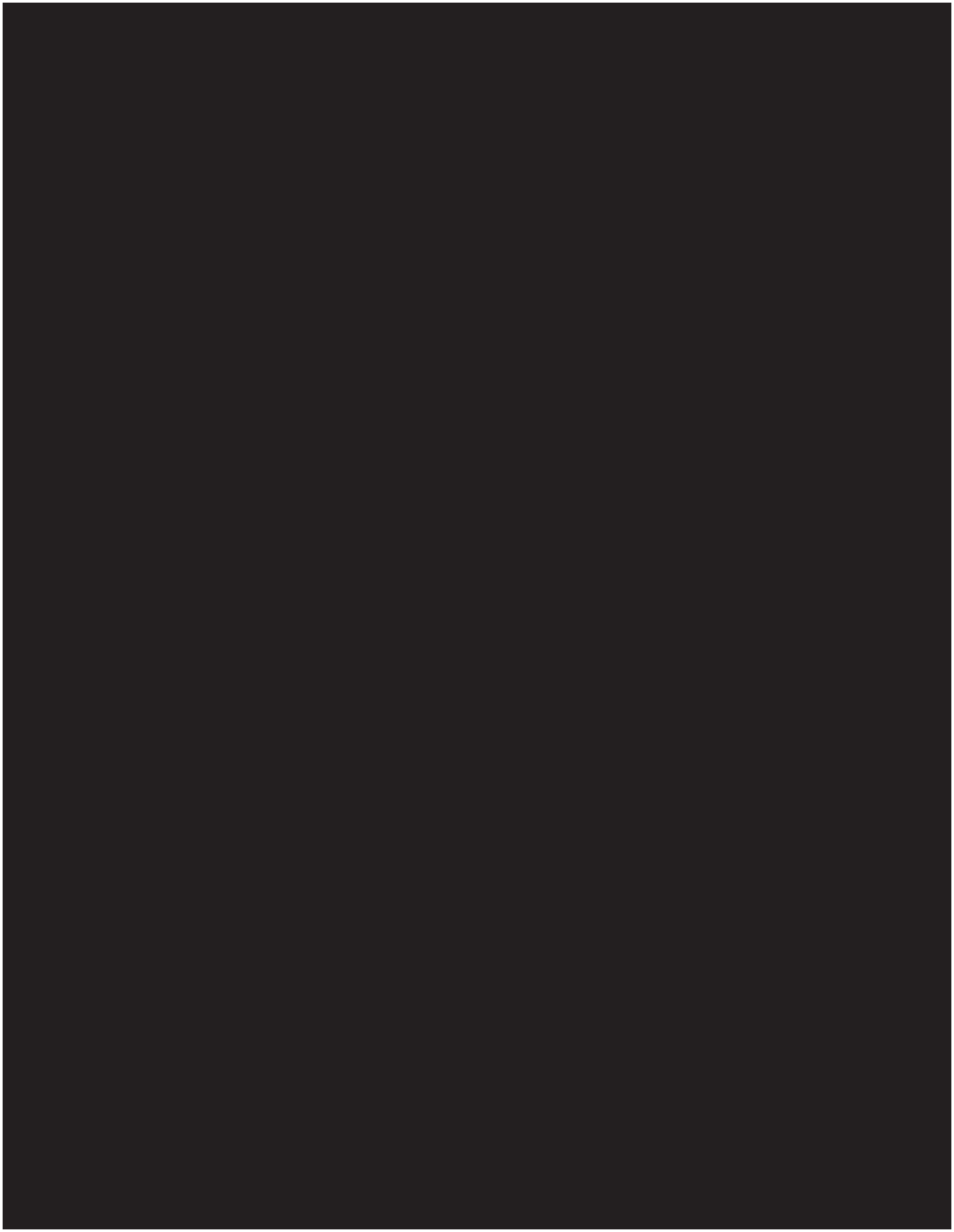


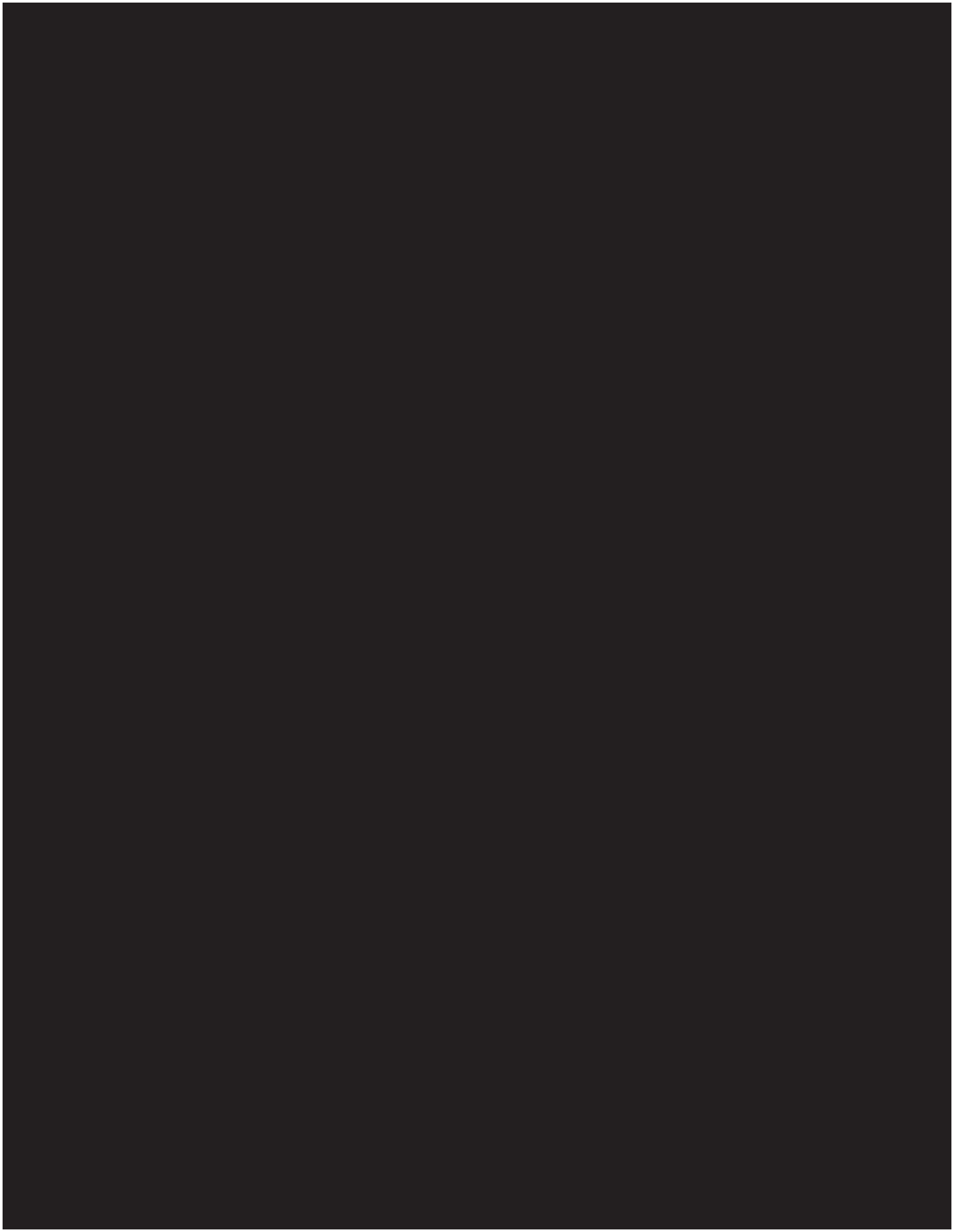


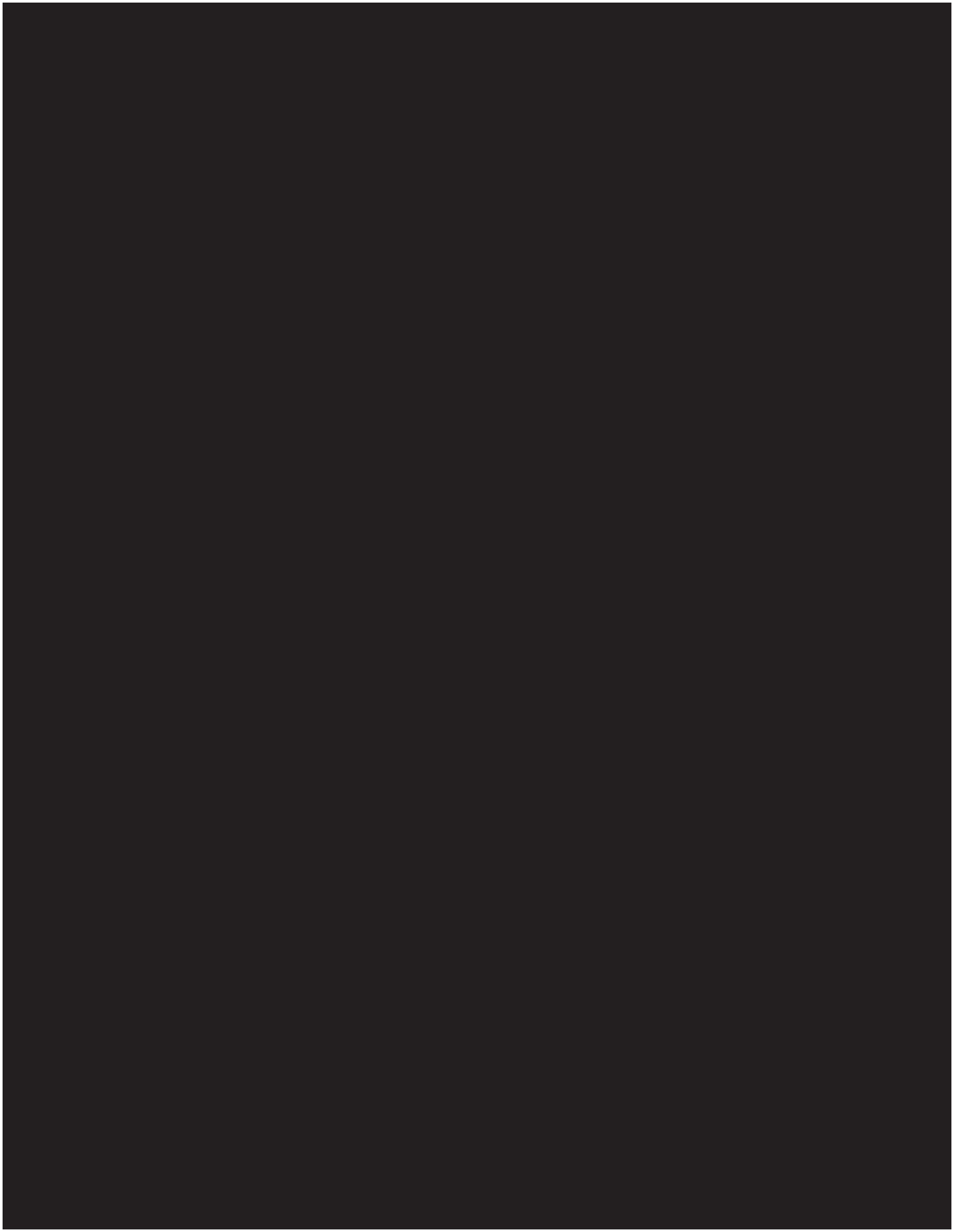


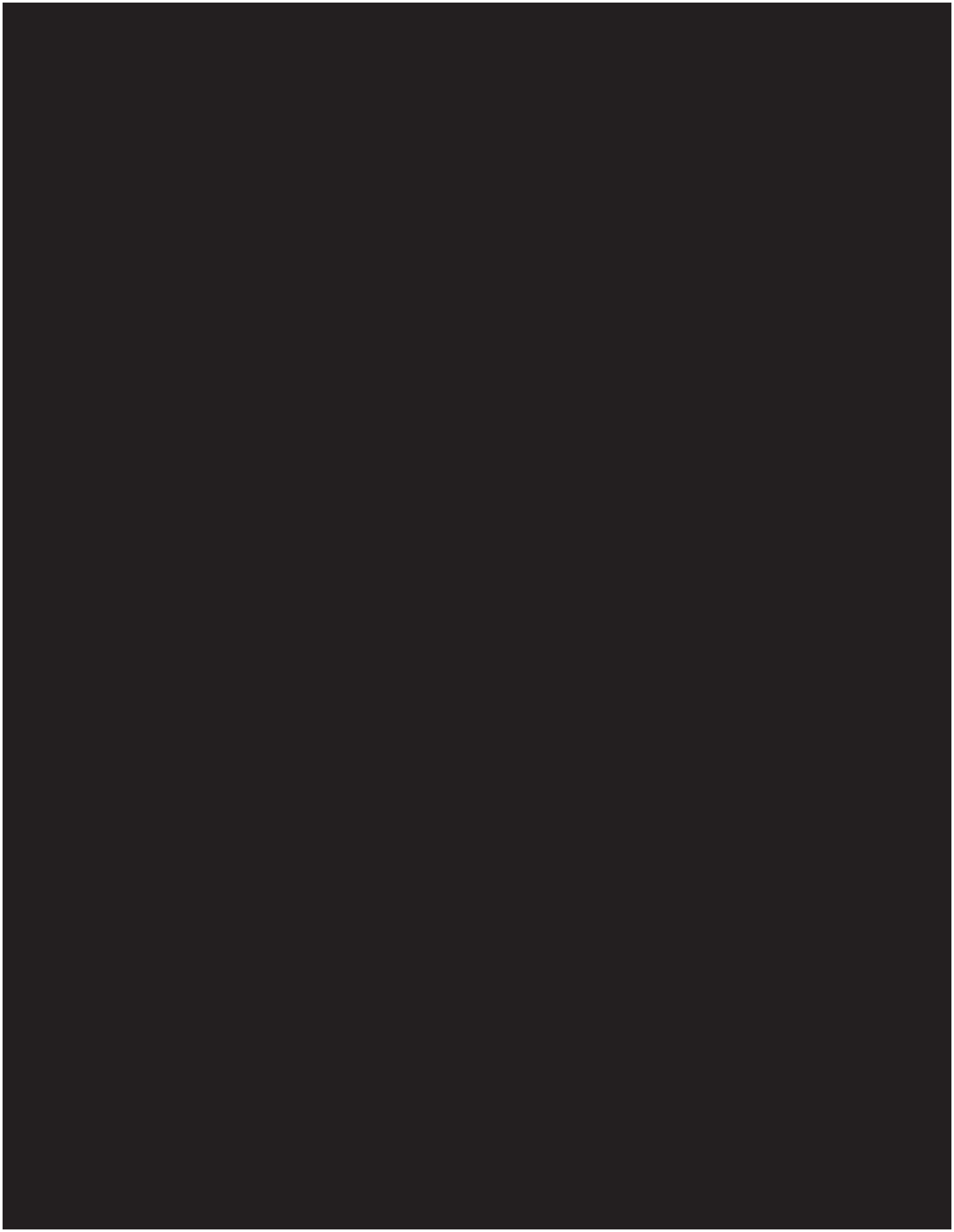


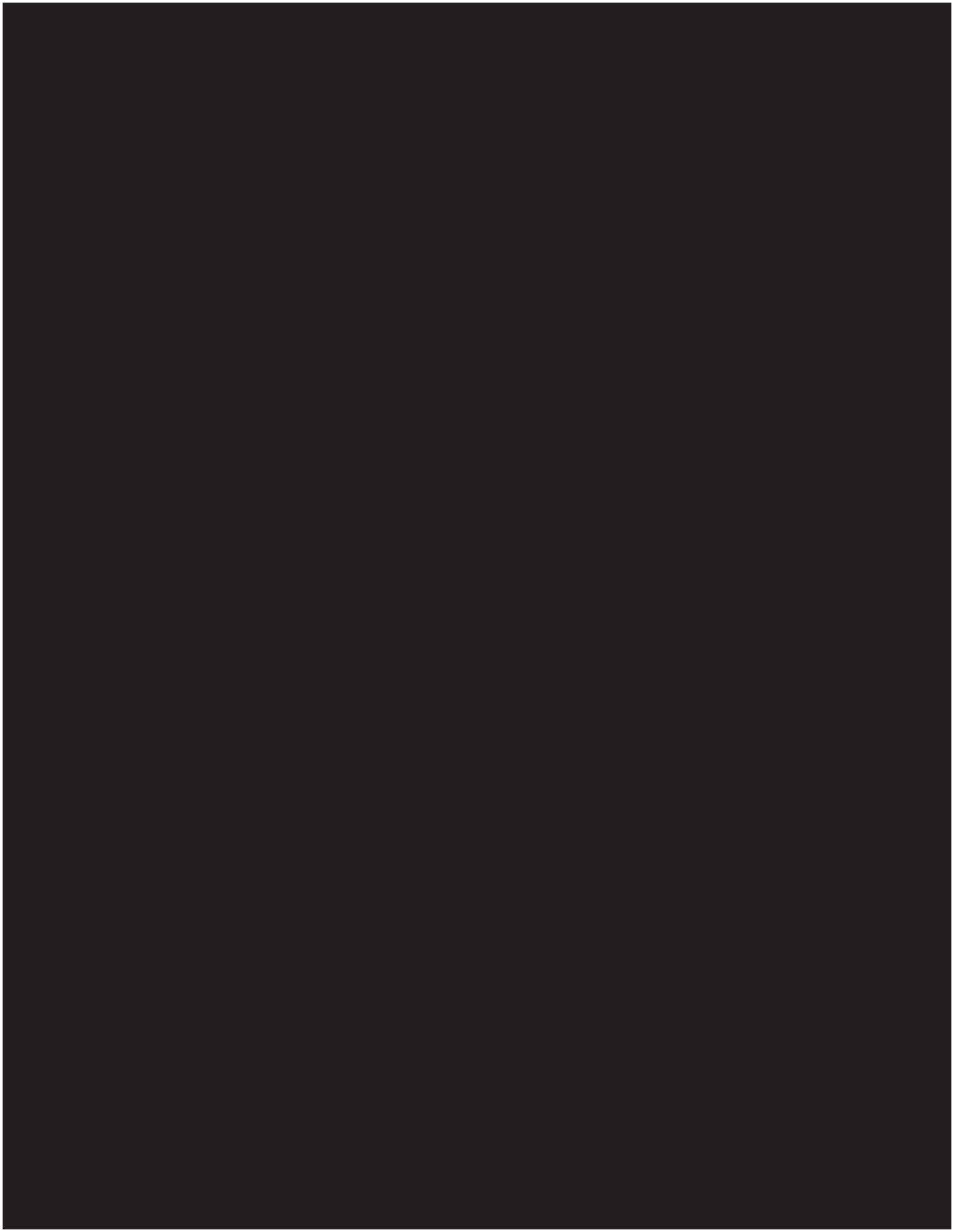


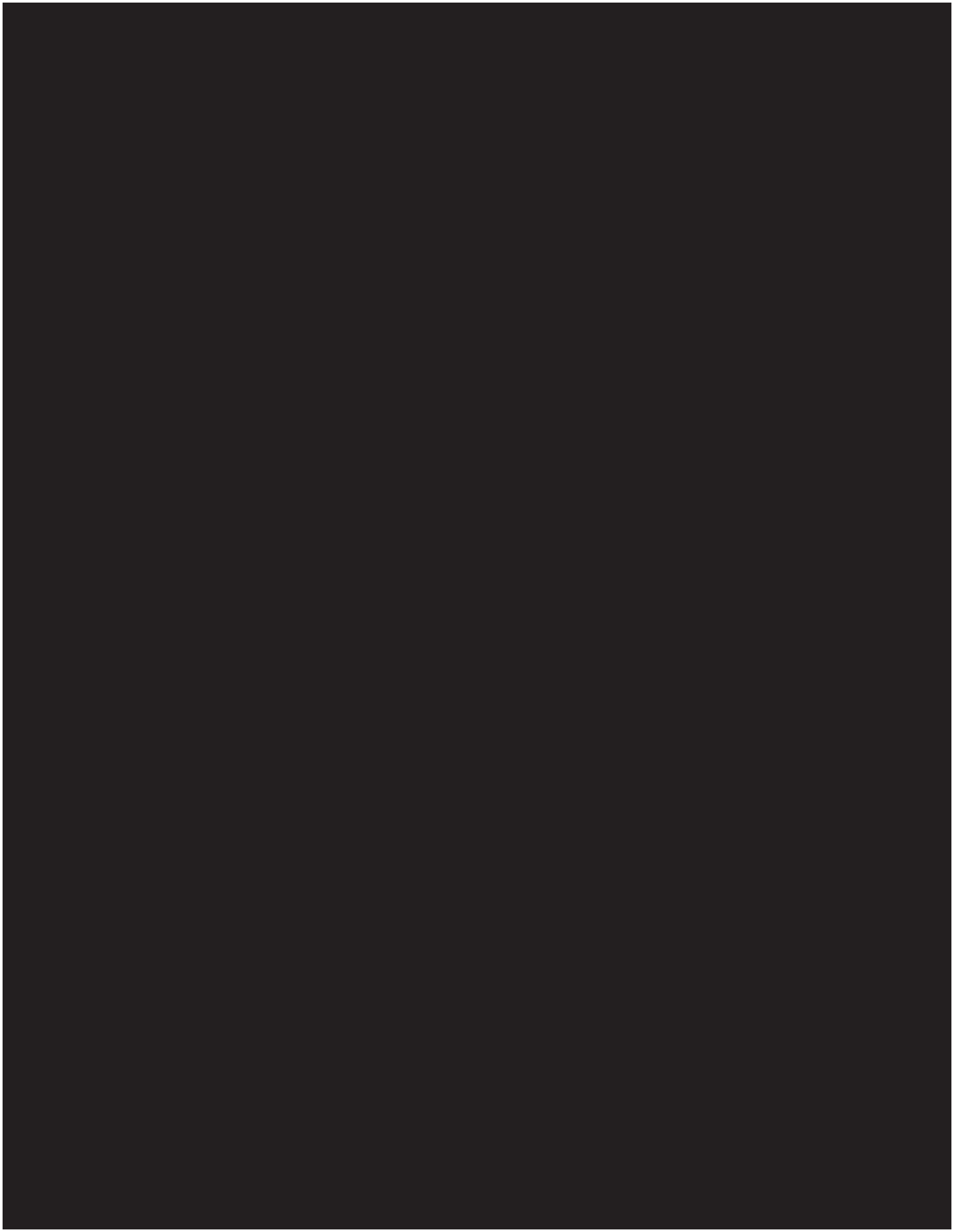


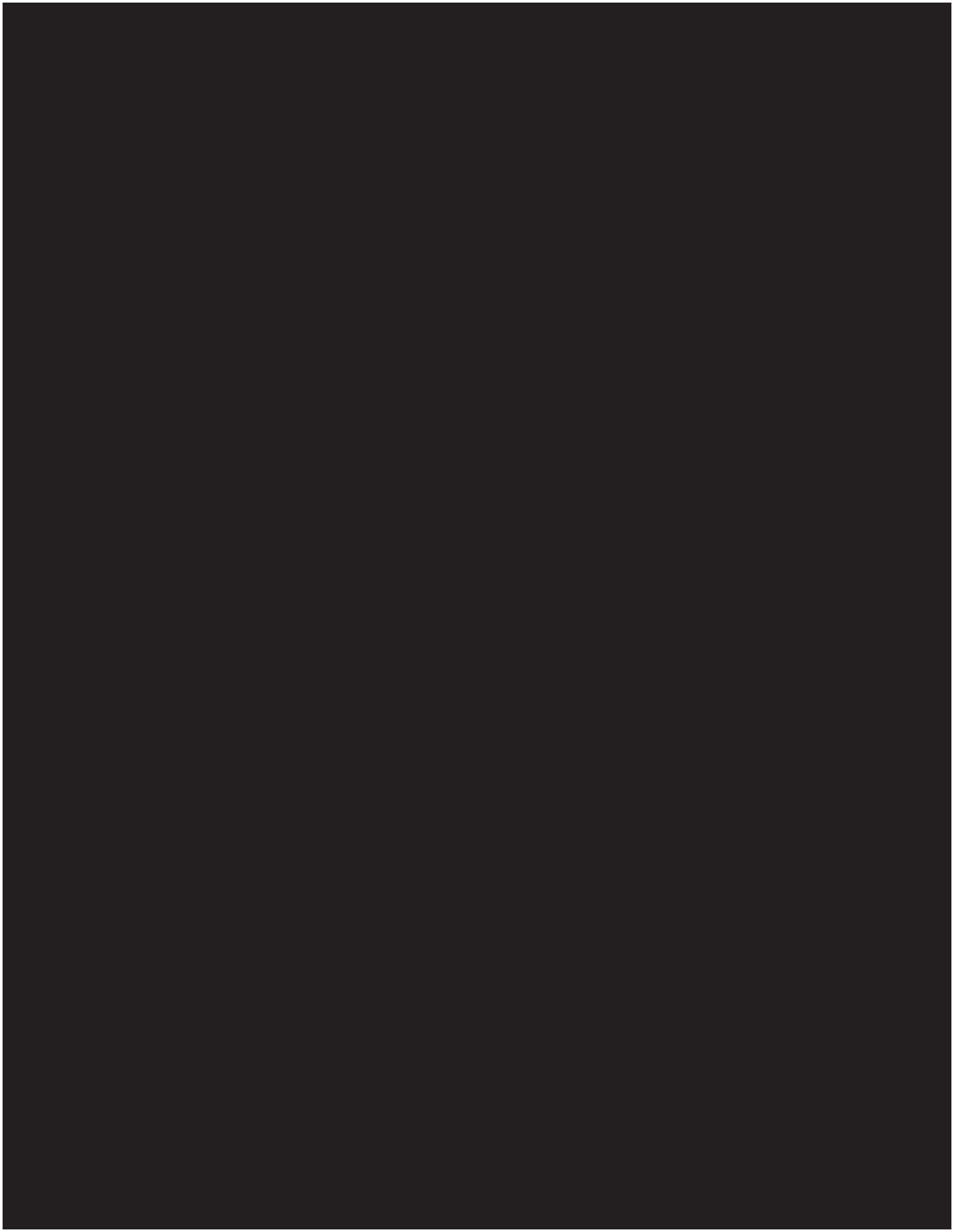


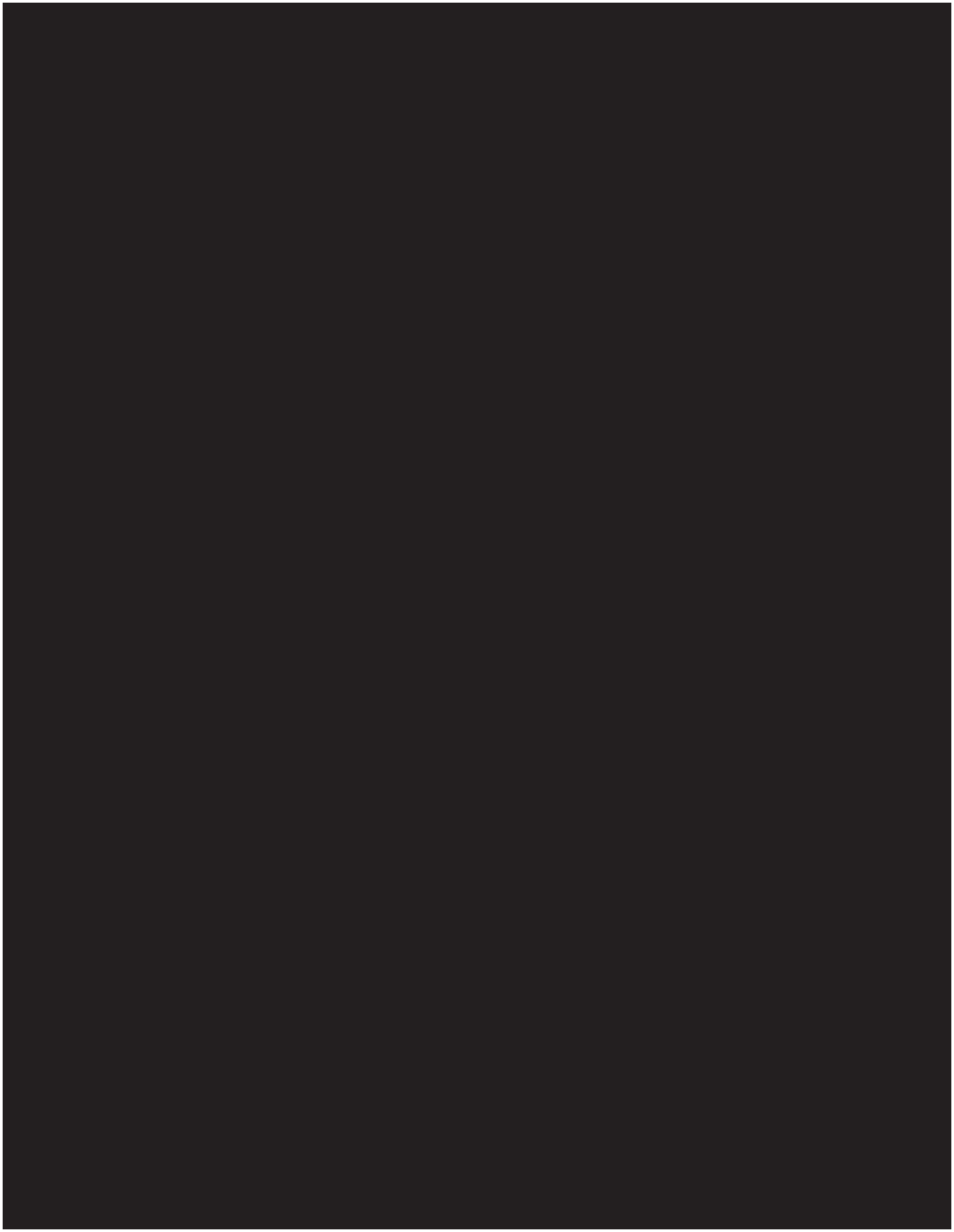


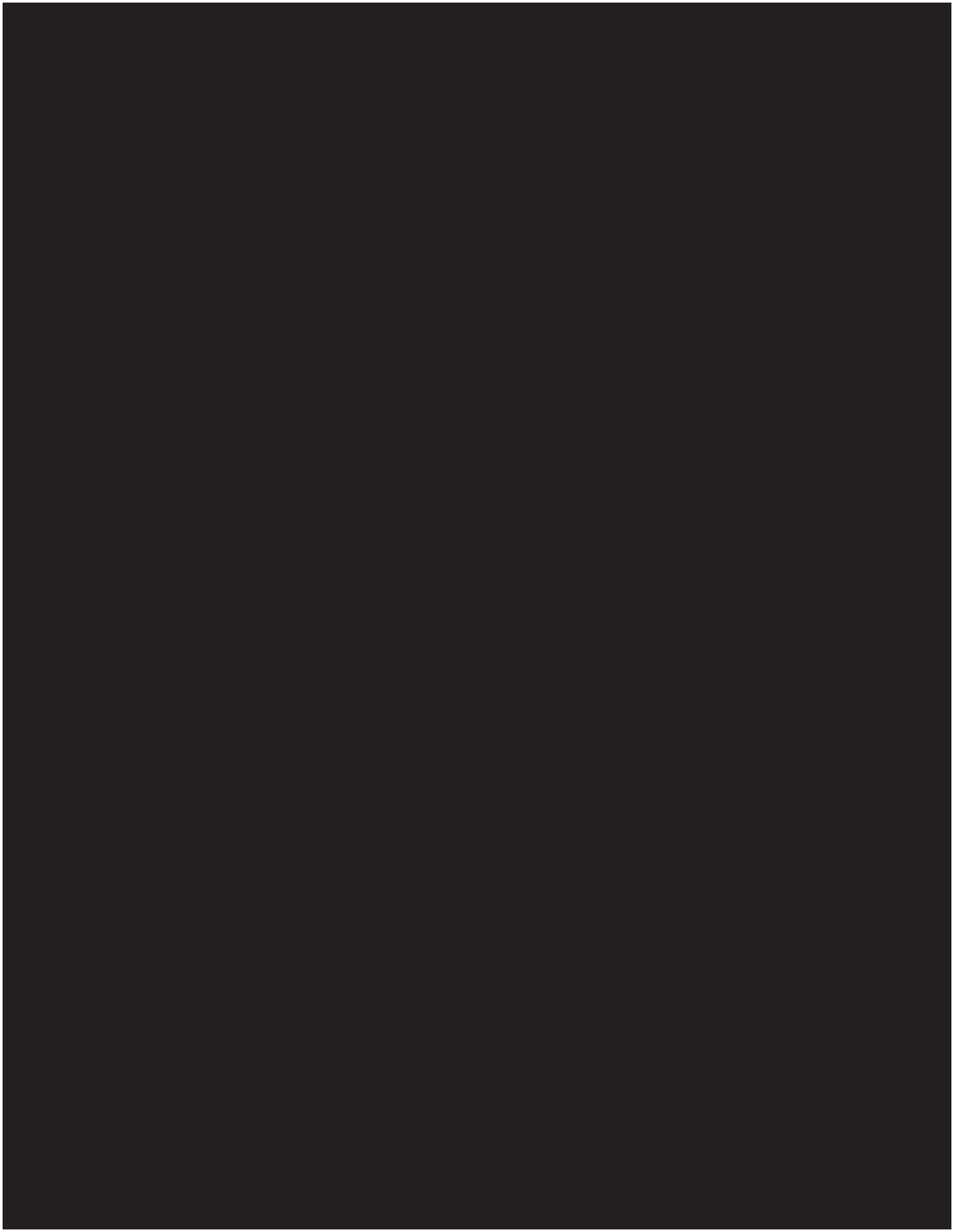


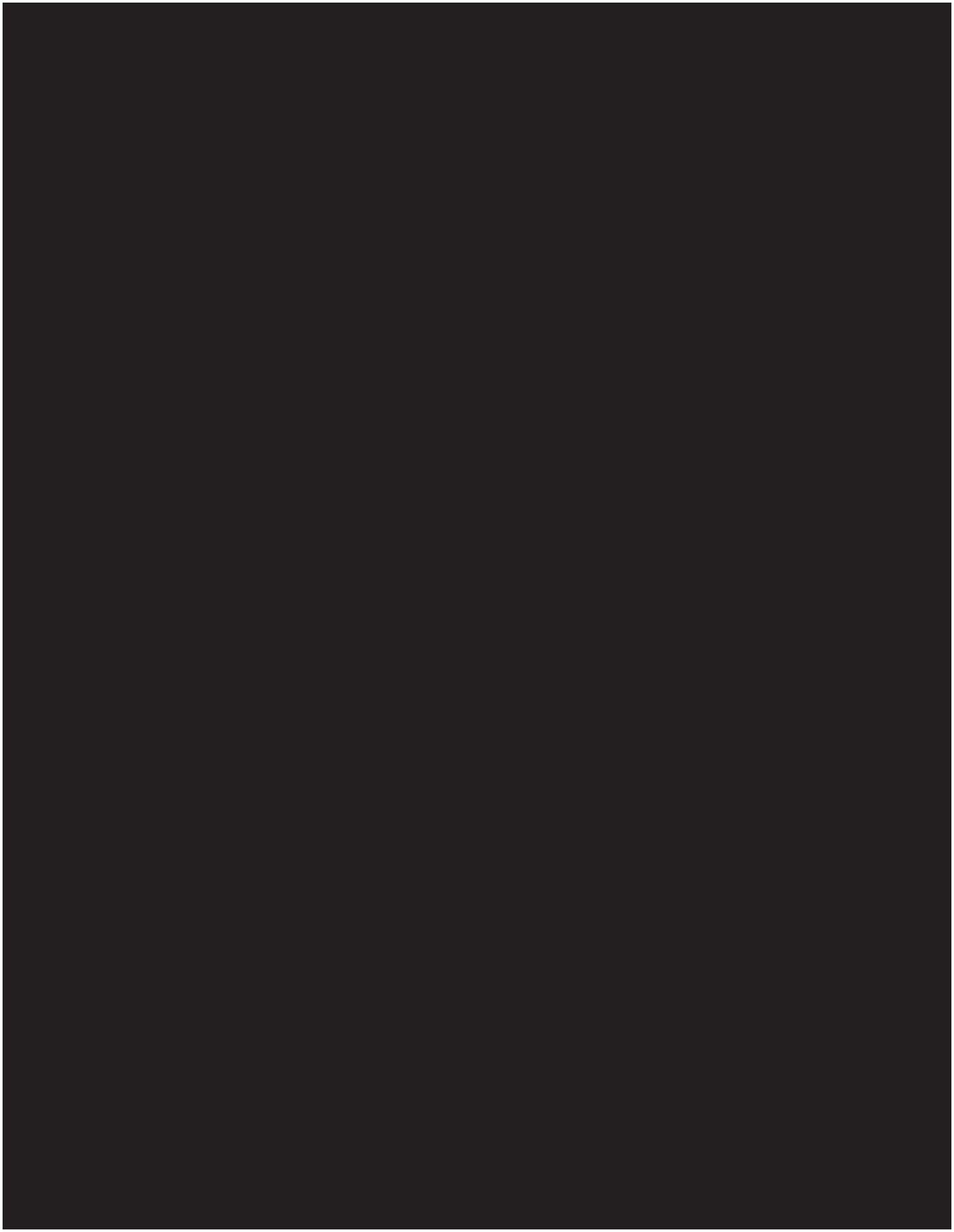


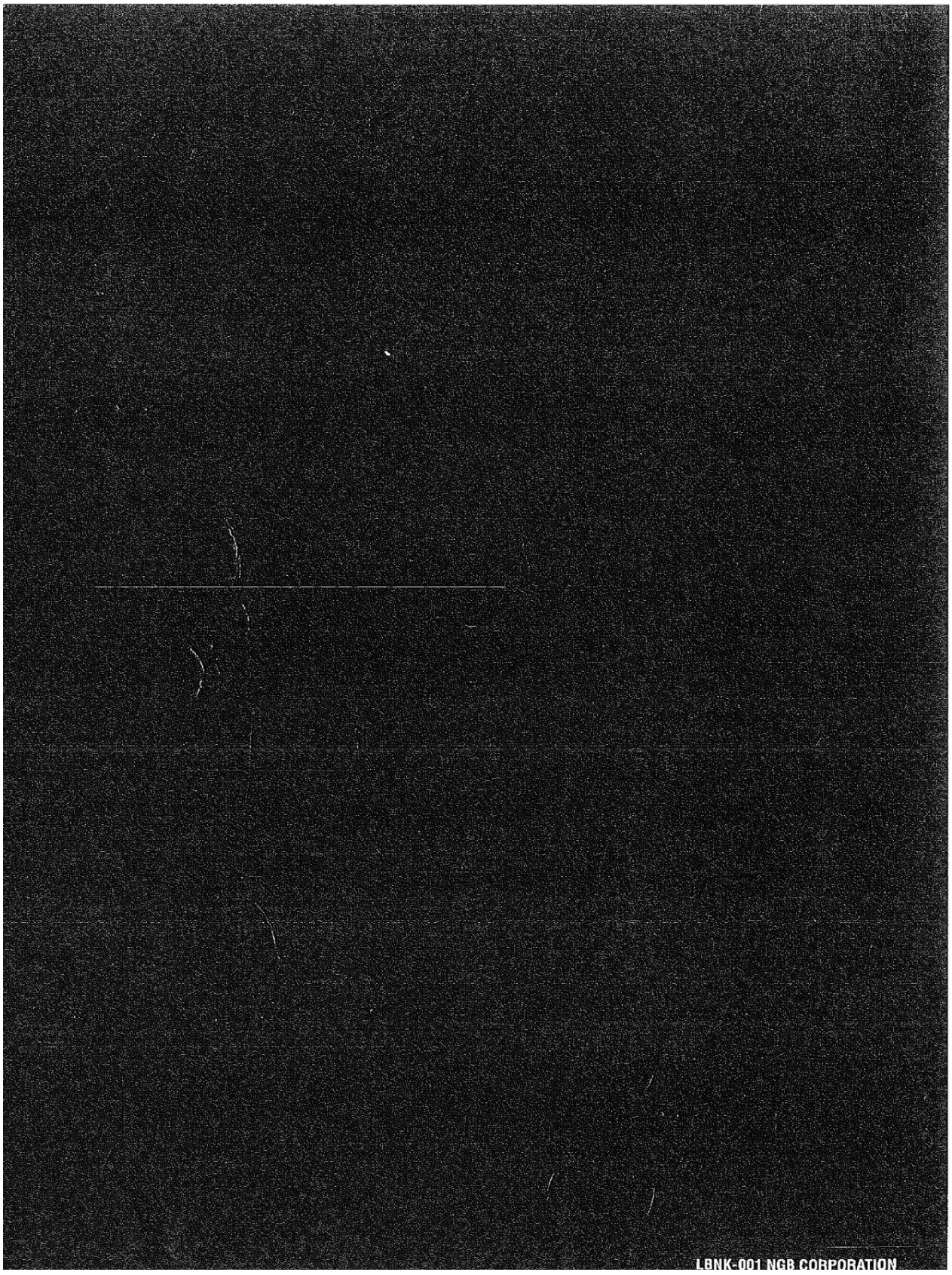








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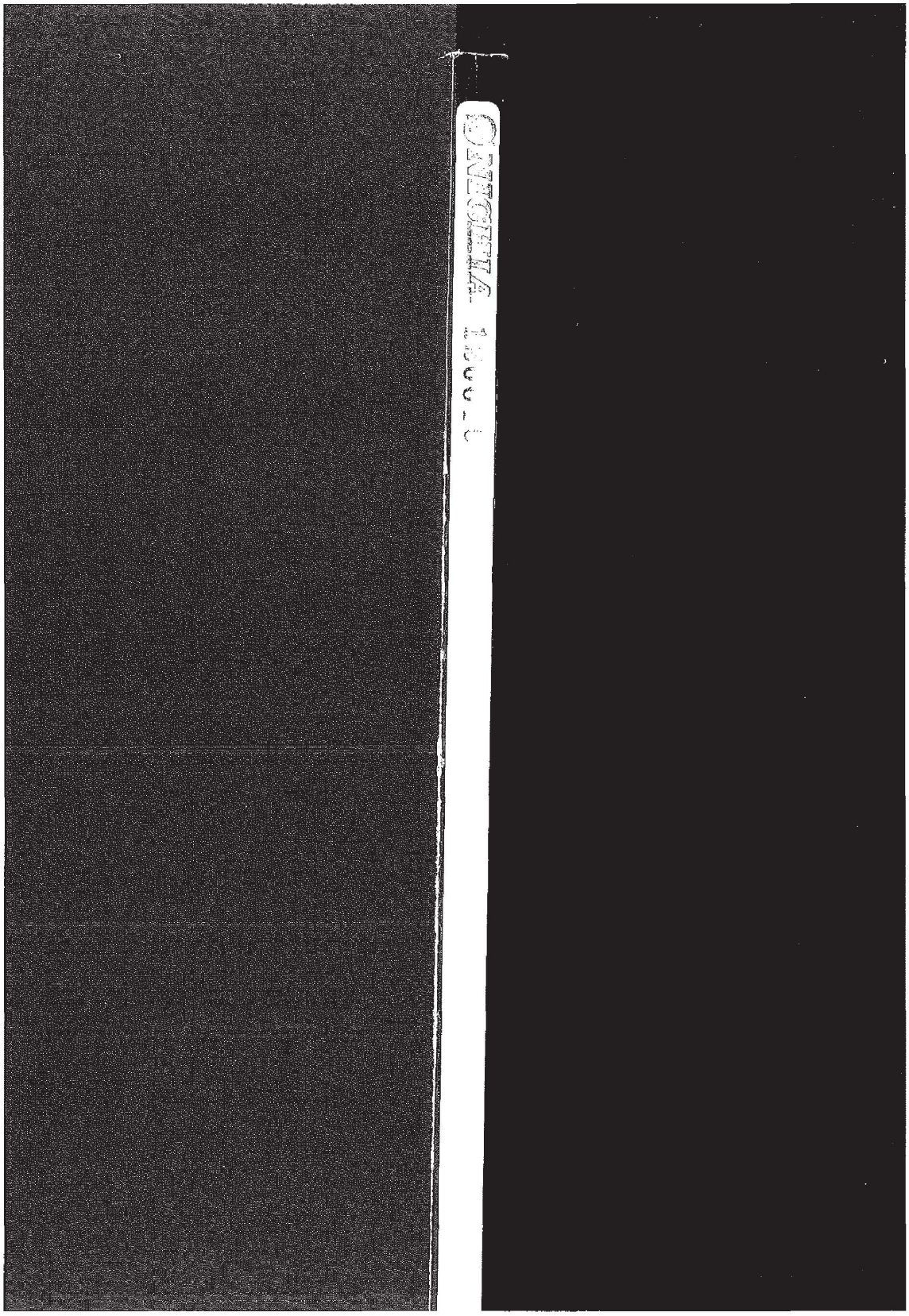
氏　　名	
備　　考	



LABORATORY NOTEBOOK

2007.5

CONFIDENTIAL

NOTEBOOK NO.
ノート番号

ISSUED
貸出日

ISSUED TO
氏名

DEPARTMENT
所属部署名

DATE OF FIRST ENTRY
記録開始日

Contd. from Notebook No. _____

DATE OF LAST ENTRY
記録終了日

Contd. to Notebook No. _____

RETURNED
返却日

APPROVED FOR RETURNED BY
返却確認者

STORED
保管日

LABORATORY NOTEBOOKの記入・管理の手引き

— はじめに —

このLABORATORY NOTEBOOKは研究者・発明者の研究・開発活動を自らの手で記録するためのものです。このLABORATORY NOTEBOOKは会社の貴重な財産であると同時に発明日の立証に必要な証拠資料にもなります。したがって、記録に際しては発明としての技術的概念の着想（Conception）および着想に至る背景や継続的な研究活動（Diligence）又、その具現性（Reduction to Practice）すなわち、着想した技術・概念を具体化する手段や方法などを当業者が容易に理解できる程度に記録する必要があります。

— 注　意 —

1．発　行（管理部署）

研究者·発明者にLABORATORY NOTEBOOKを発行する際は、管理台帳に必要事項（発行日、LABORATORY NOTEBOOK番号、発行者氏名、研究者・発明者氏名など）を記入する。

2．記　録（記入者）

a．記録にはペンまたはボールペン（黒または青インク）を使用する。鉛筆は不可。

b．研究者・発明者は氏名、LABORATORY NOTEBOOK貸出日、記録開始日などの必要事項を記入する。

c．目次には記録日、研究および実験の主題、記録頁などの必要事項を記入する。

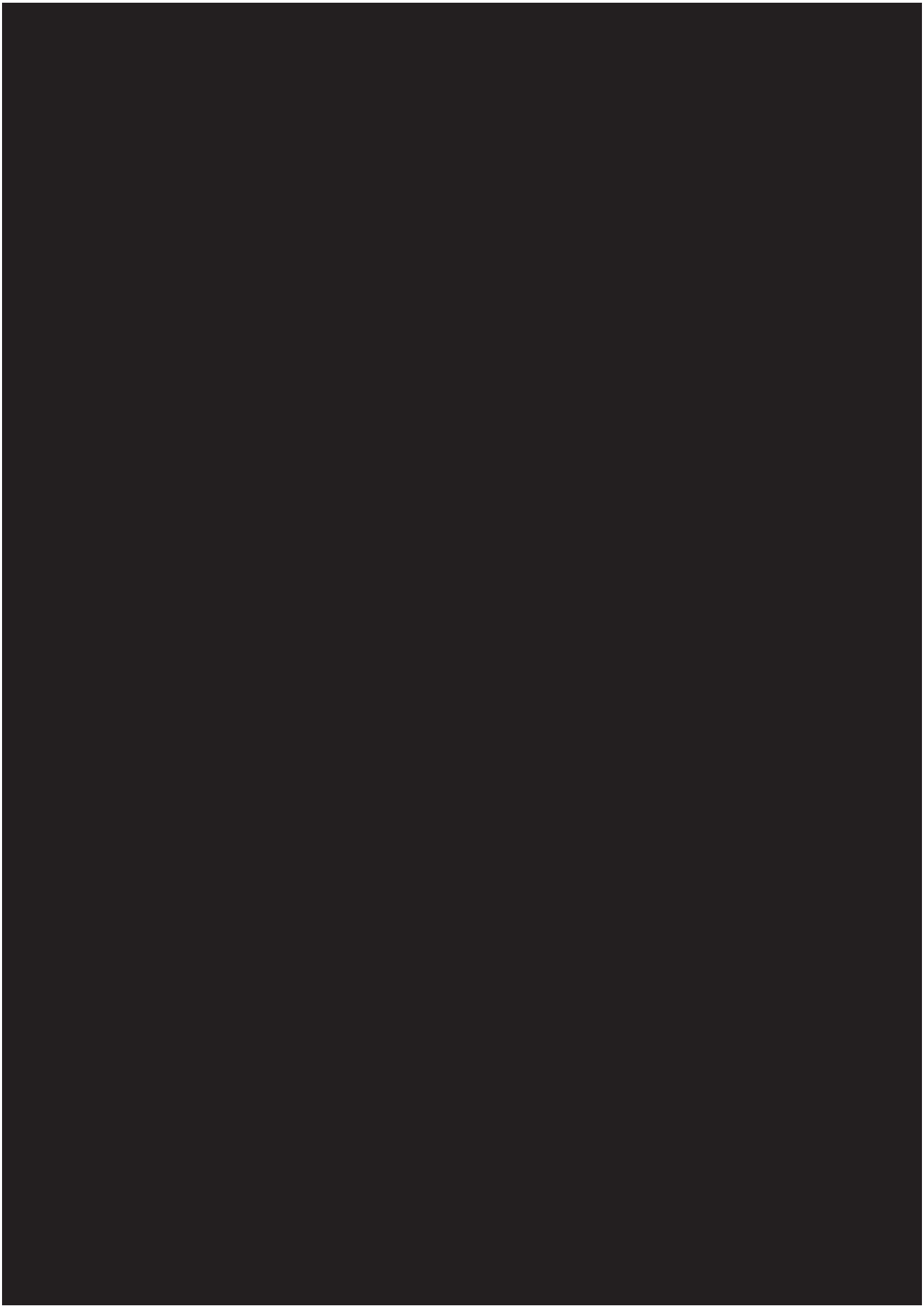
d．同時期に複数のプロジェクトまたはサブジェクトに従事している場合でも頁順に使用し、各頁上部にプロジェクト、サブジェクトなど必要事項を記入する。

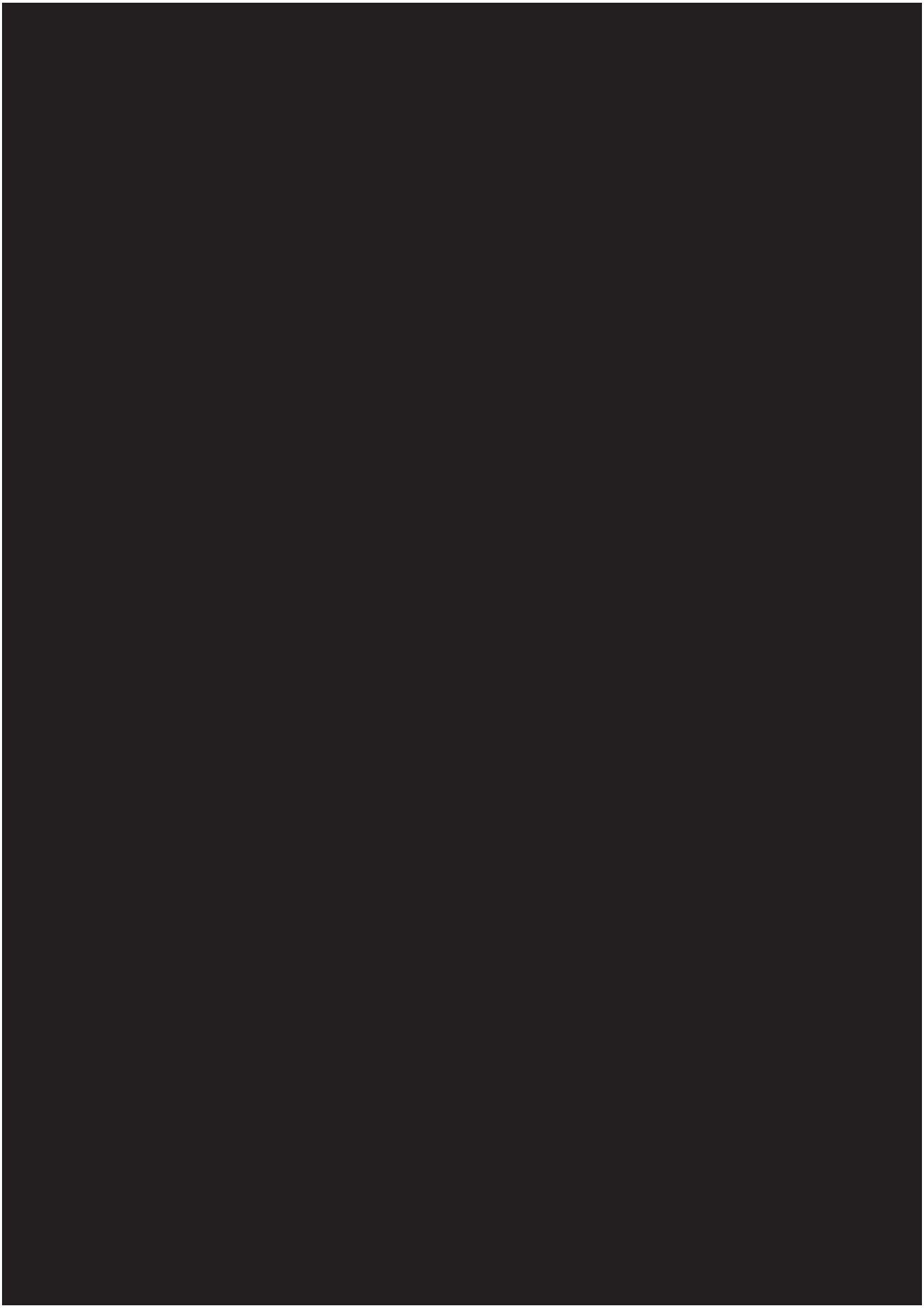
e．記入事項が次頁または他頁に継続する場合、該当各頁にそのつながりを記入する。

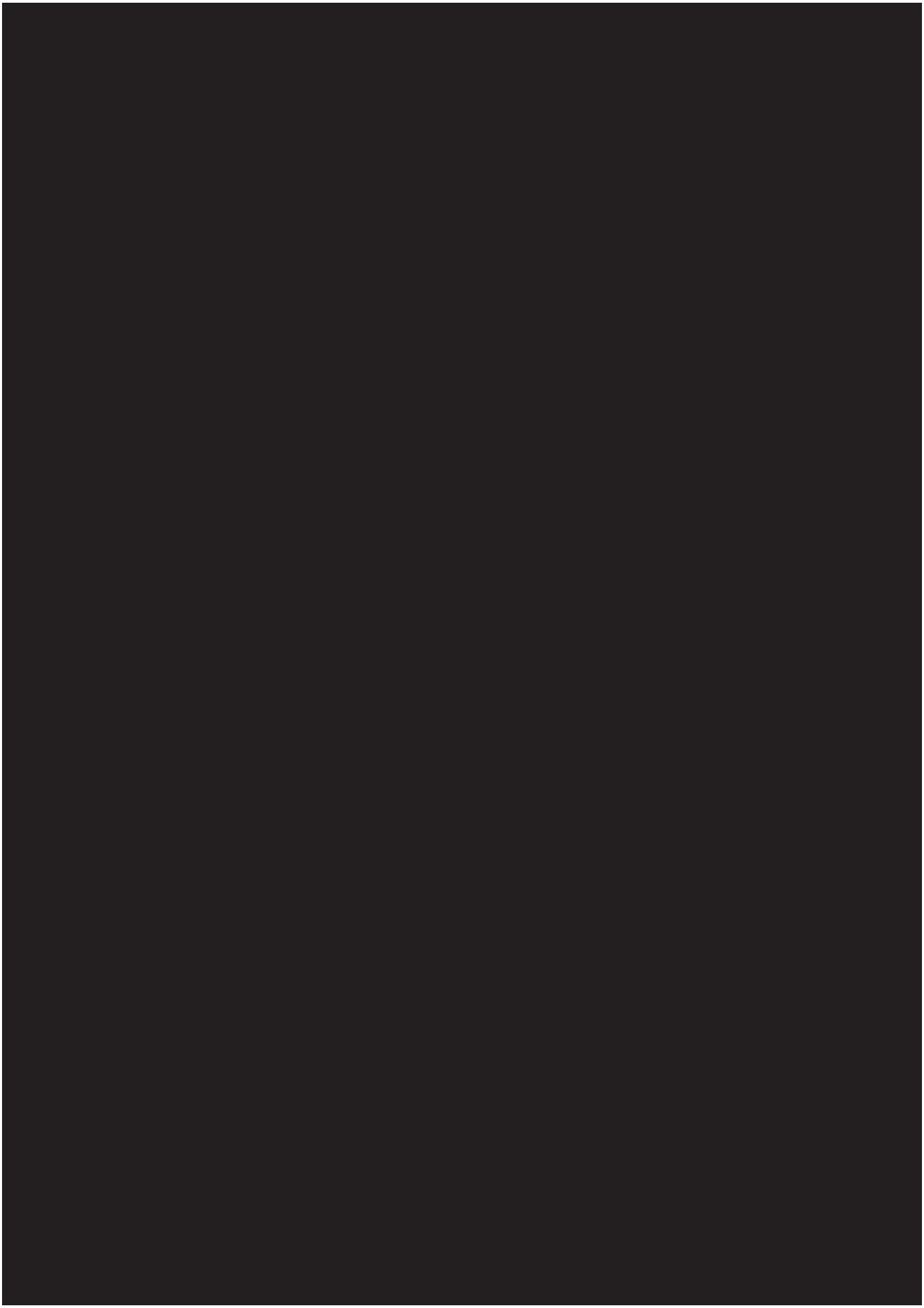
f．記入事項の間に空白部分が生じないように詰めて記入し、万一空白部分が生じた場合には斜線でその部分を埋める。

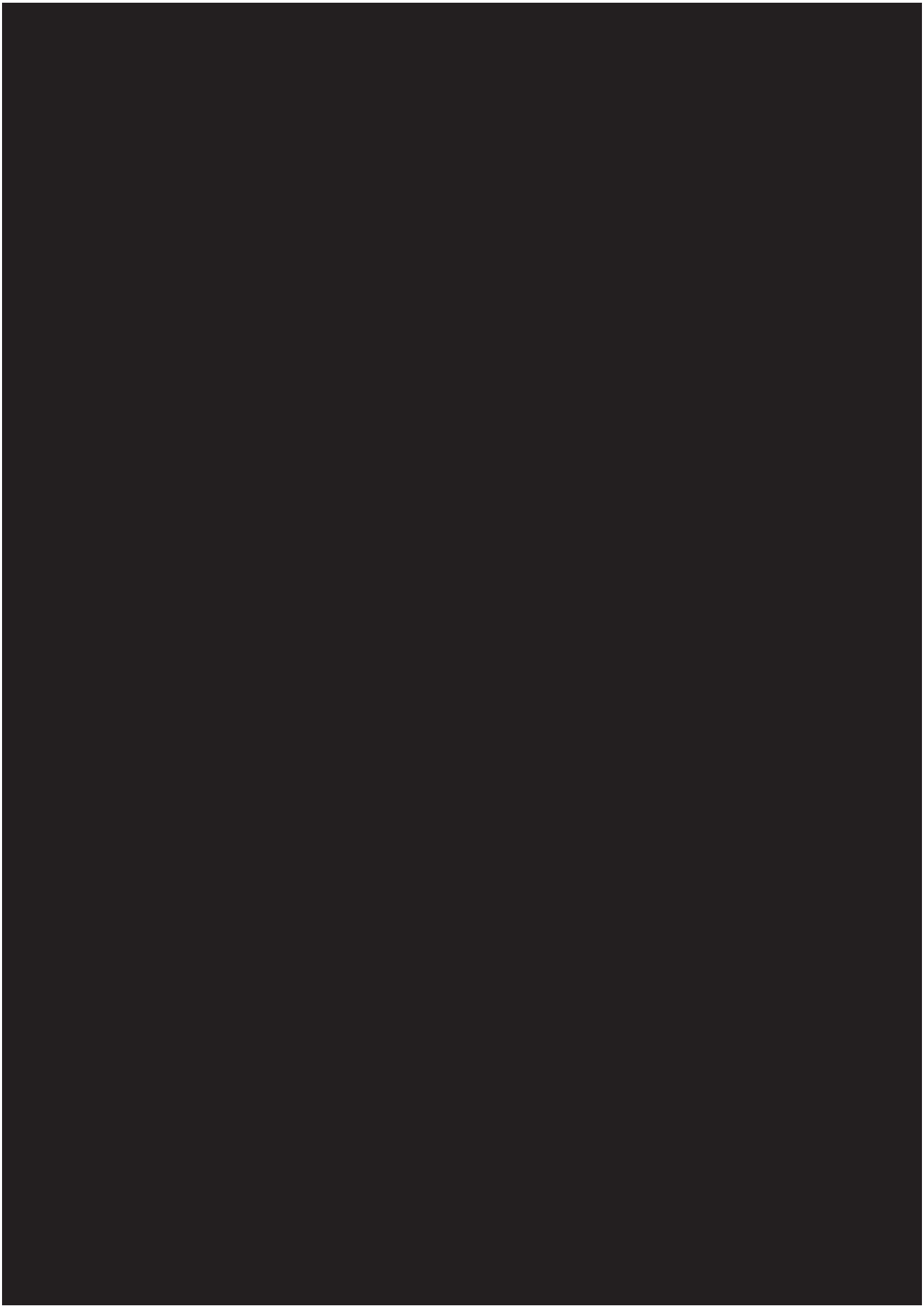
g．訂正、削除を行なう場合には消しゴムや修正液、修正テープなどを使用せず、二重線で消しその部分には小さくイニシャルか署名、修正日を付記する。

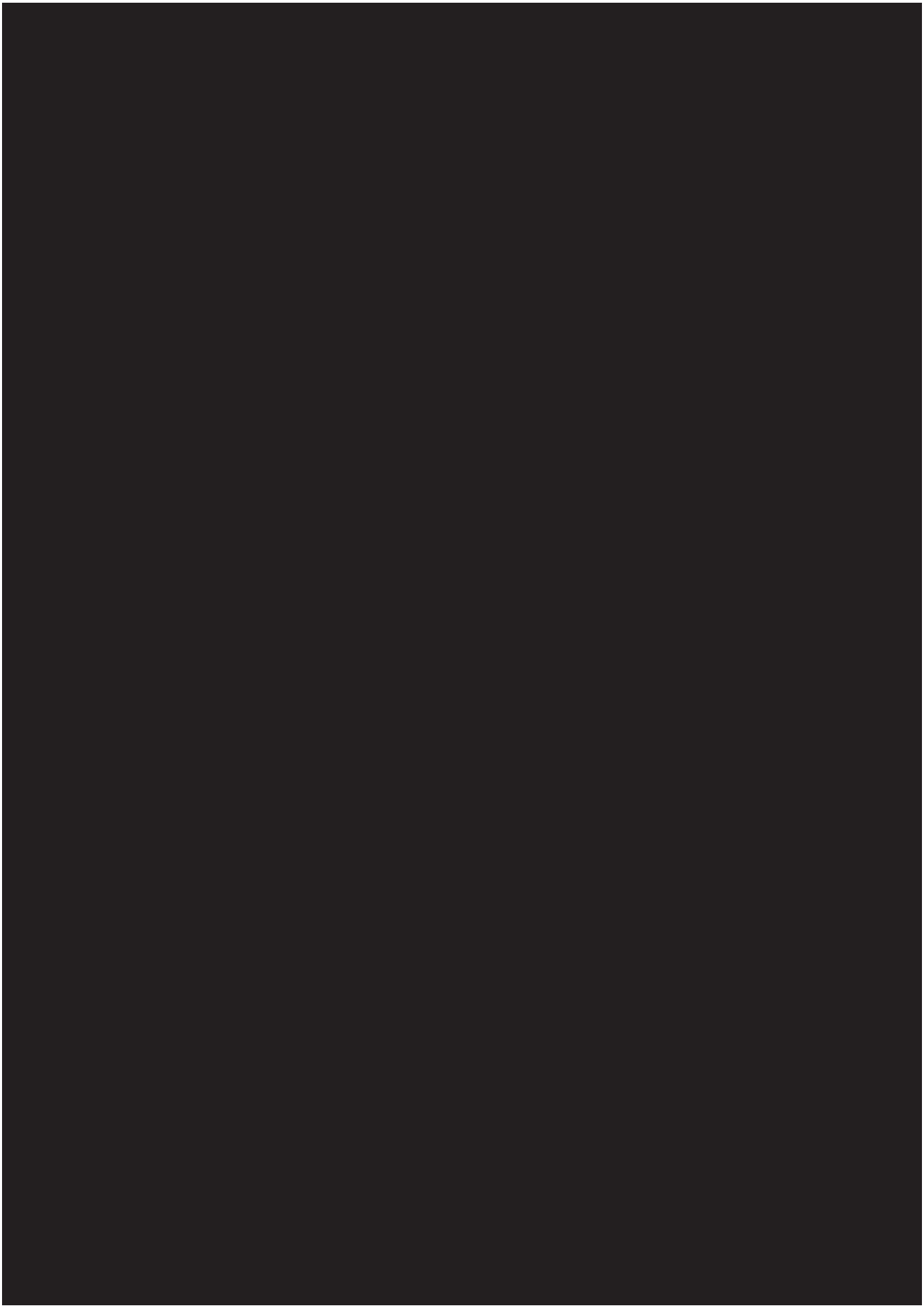
h．以前、記入した内容に後日追加・修正・削除が生じた場合には該当部分に小さくイニシャルか署名、追加・修正・削除日を付記し、証人の署名および署名日を記入してもらうこと。

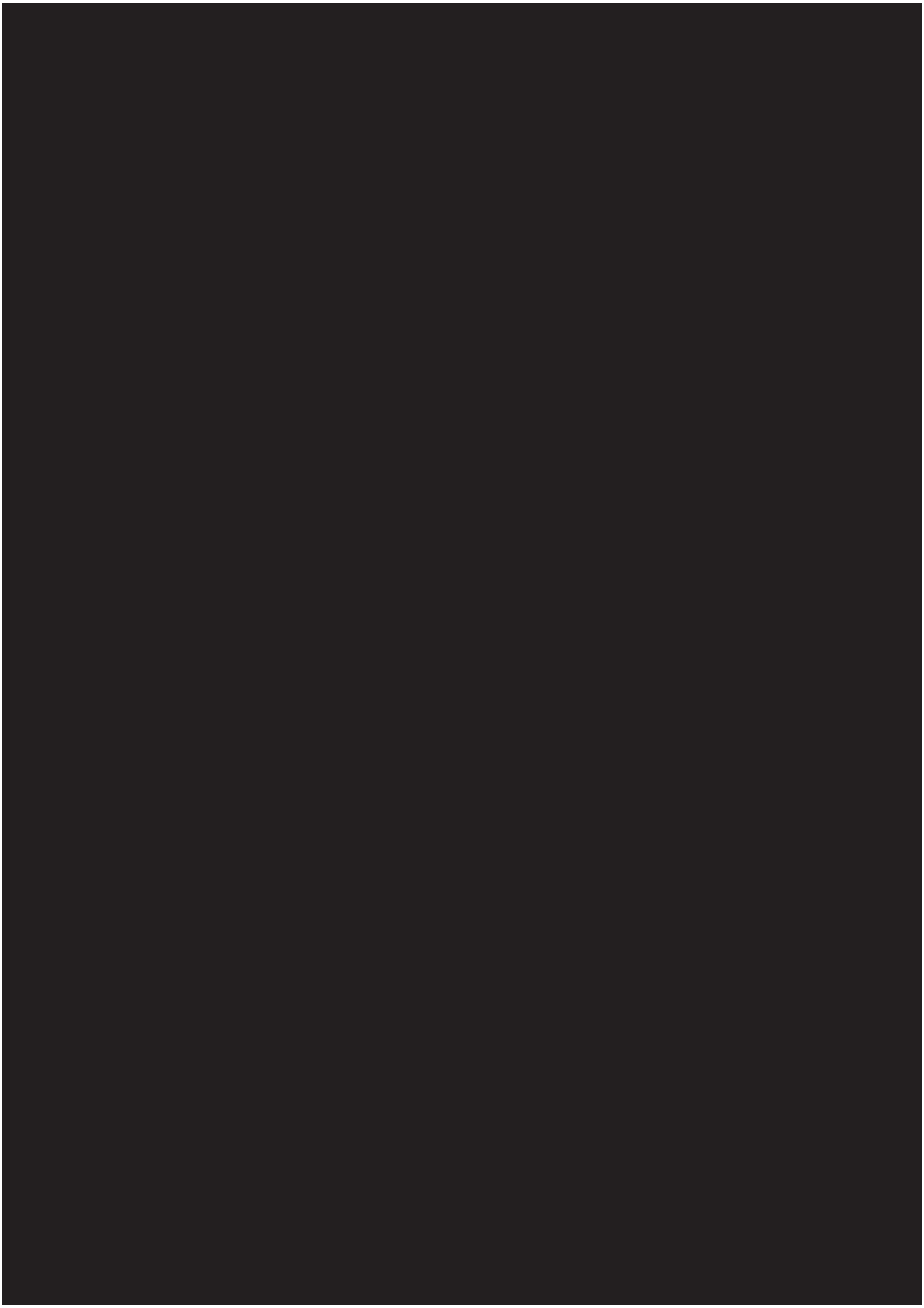


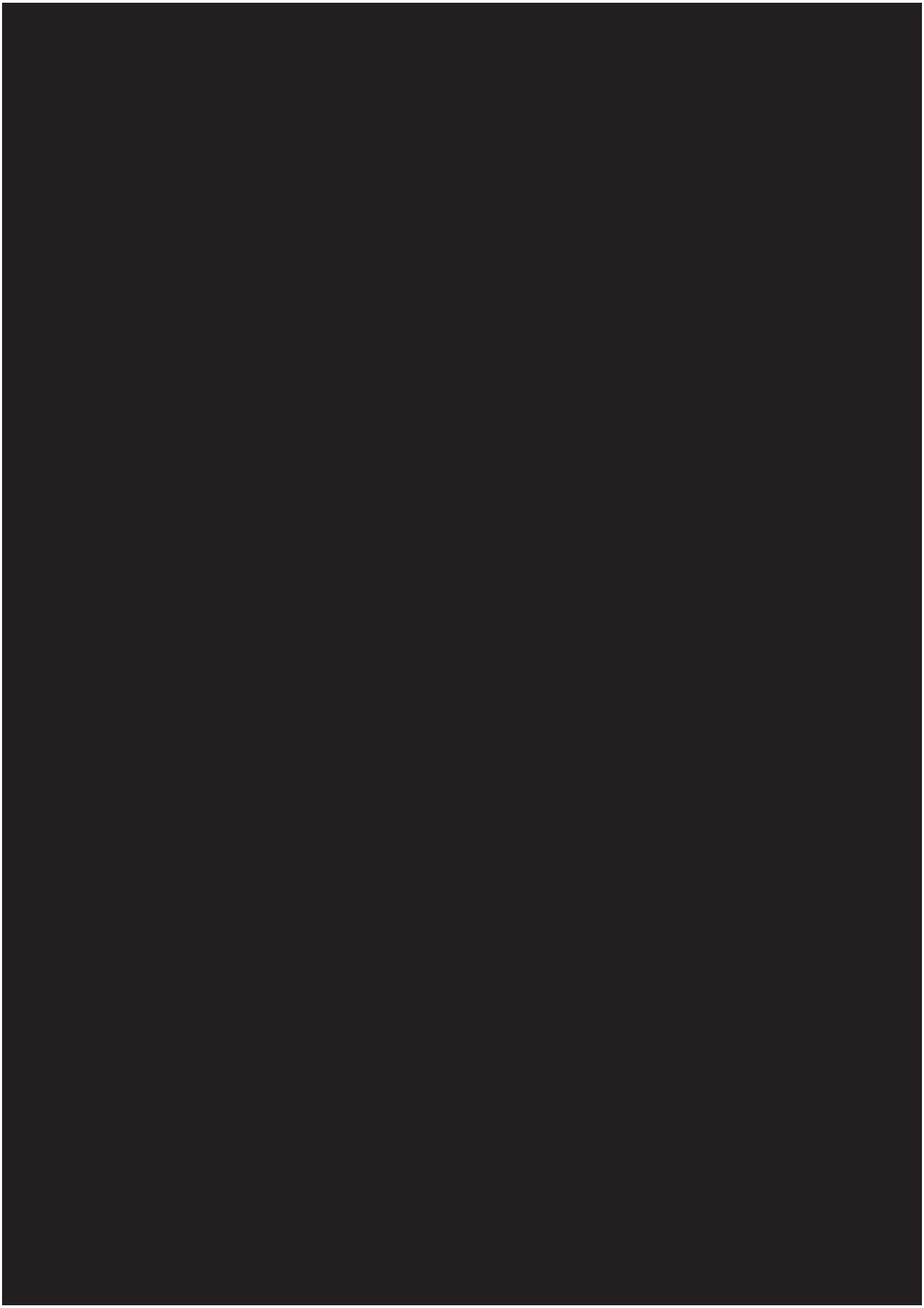


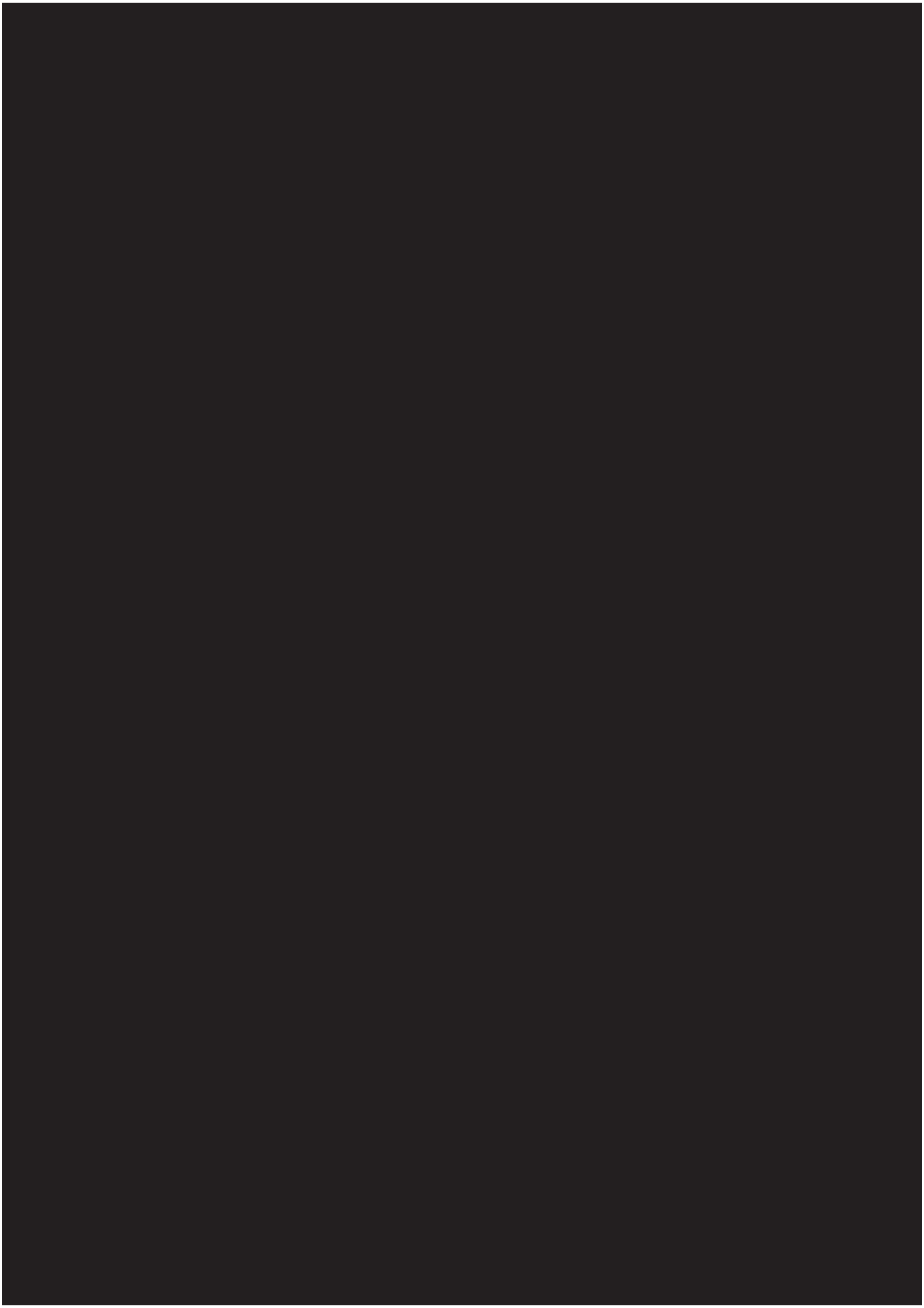


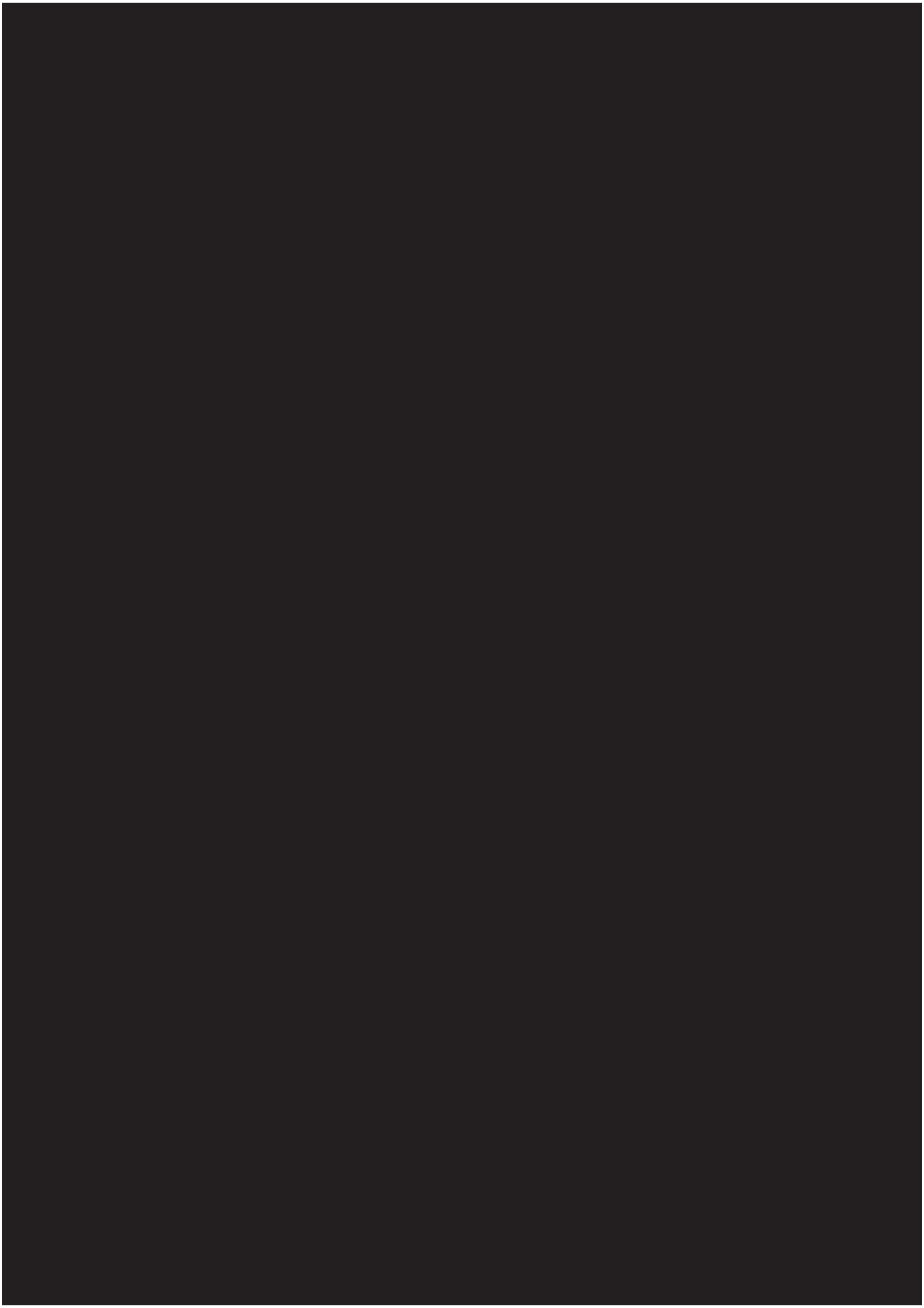


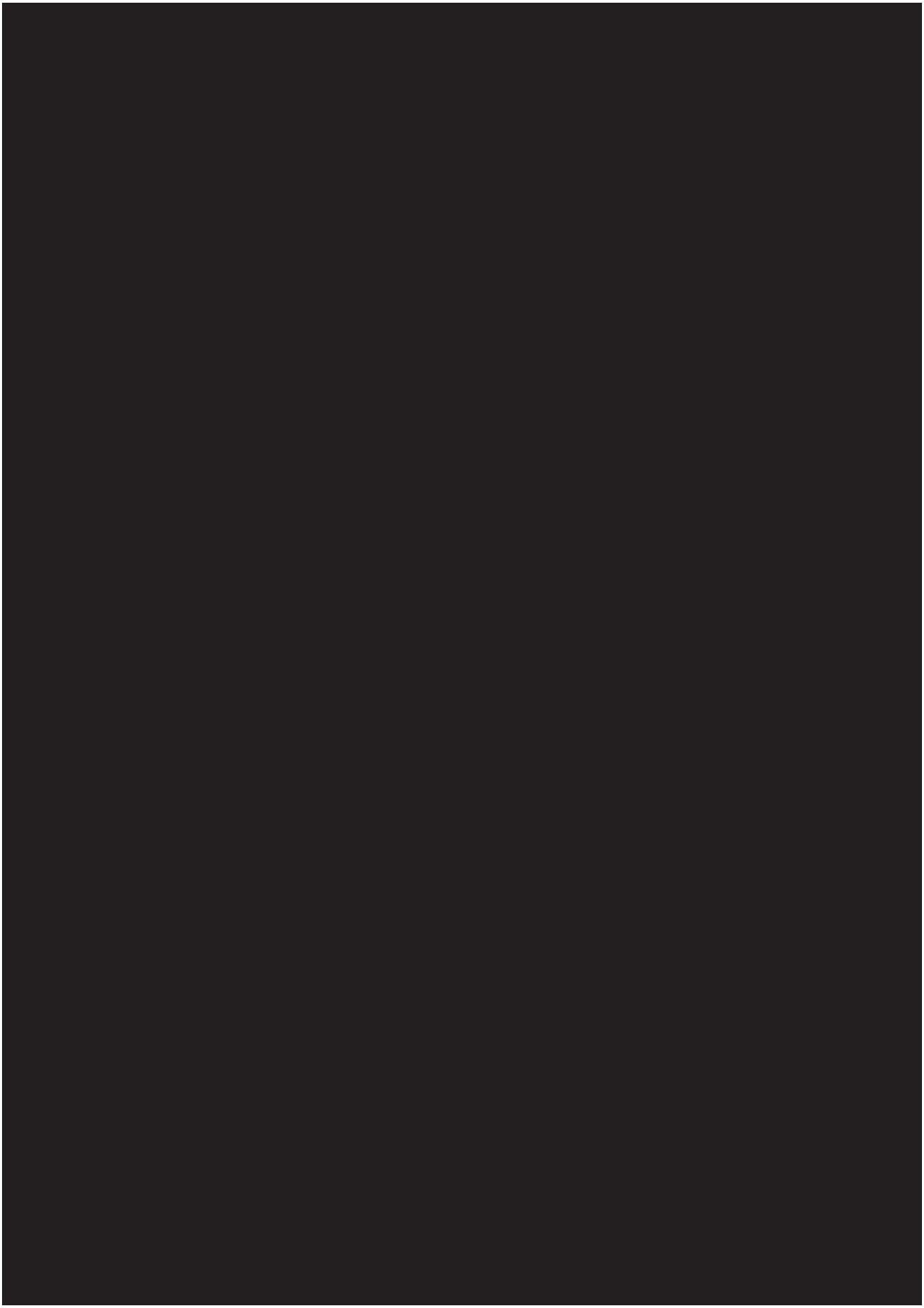


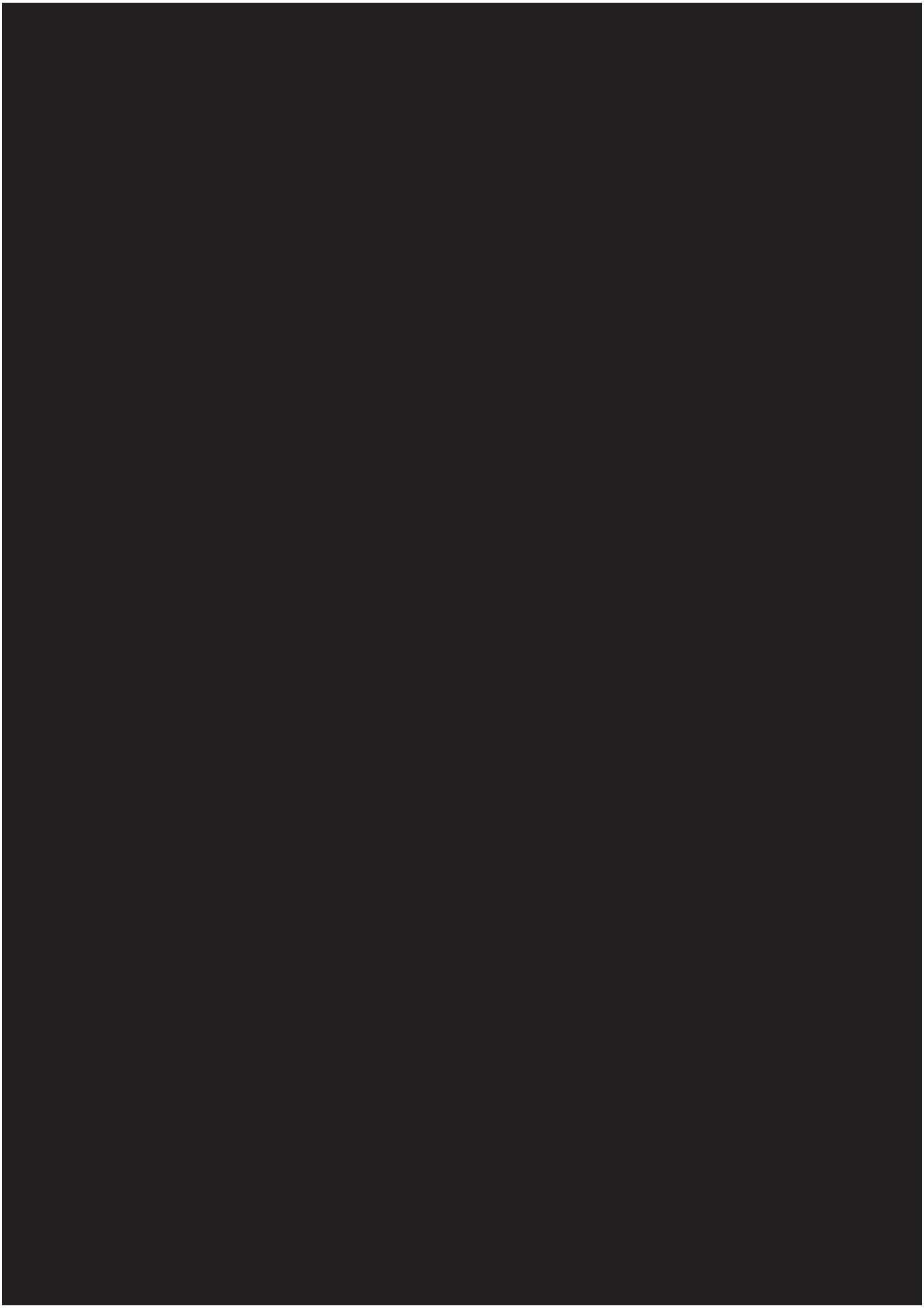


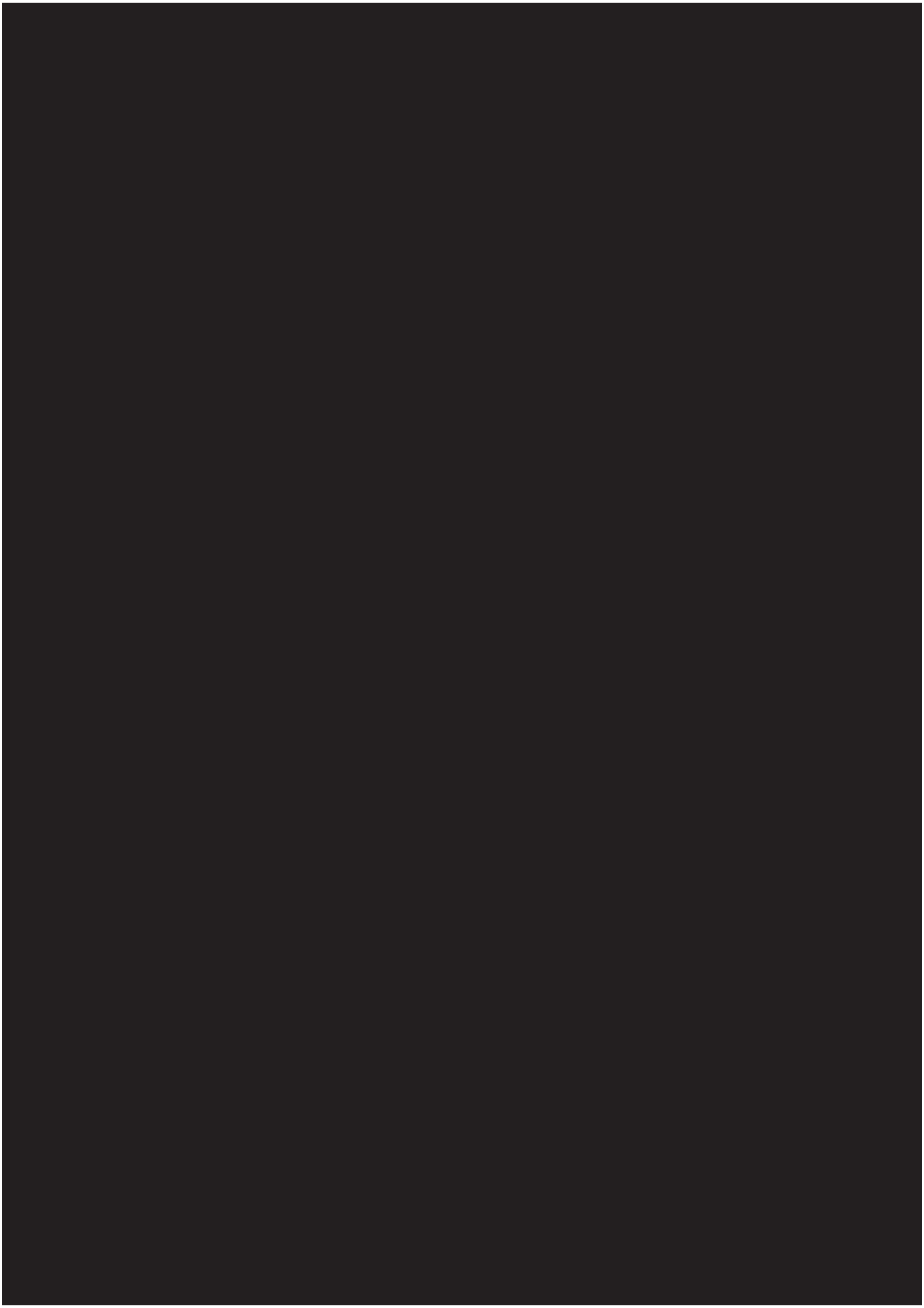


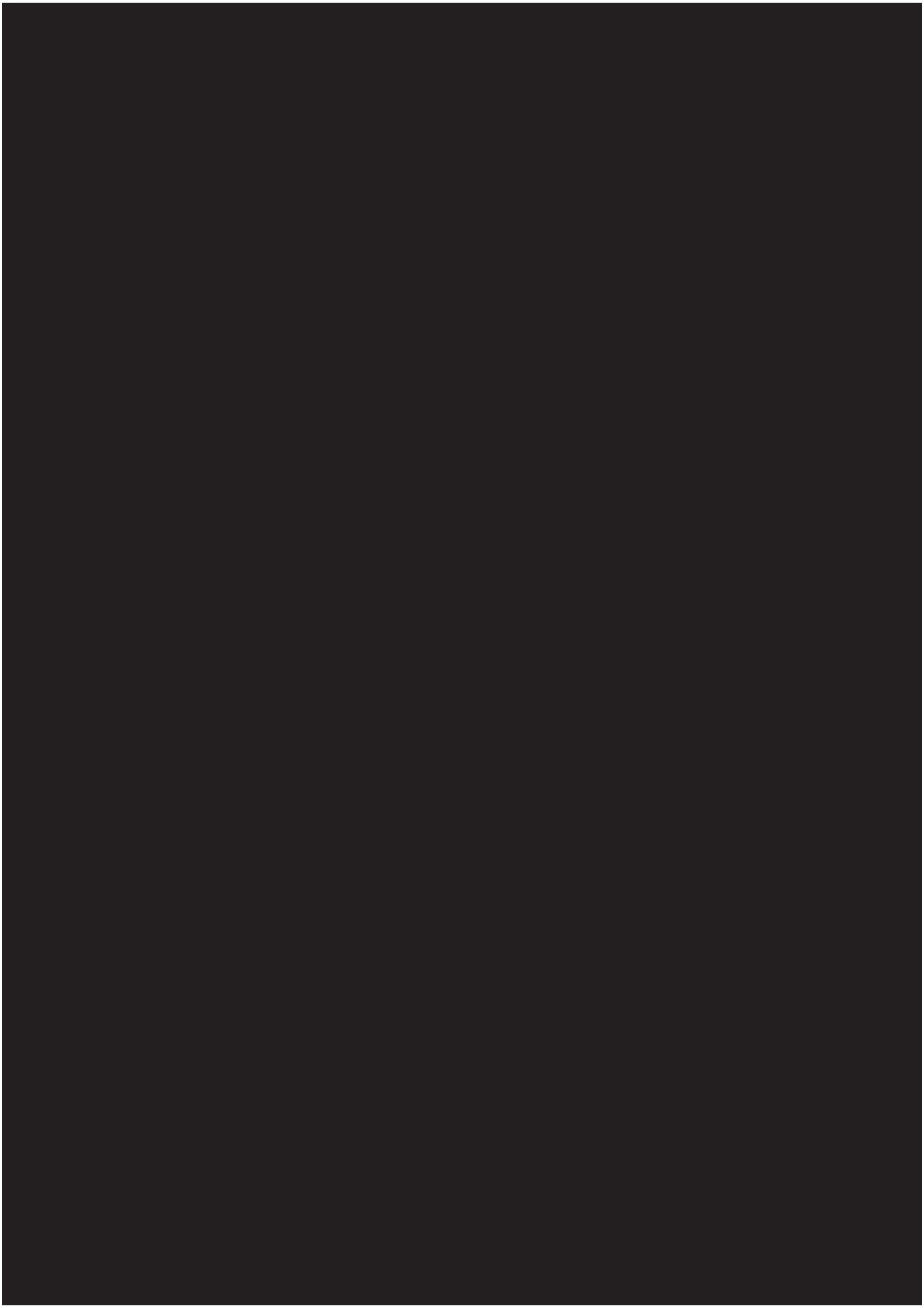


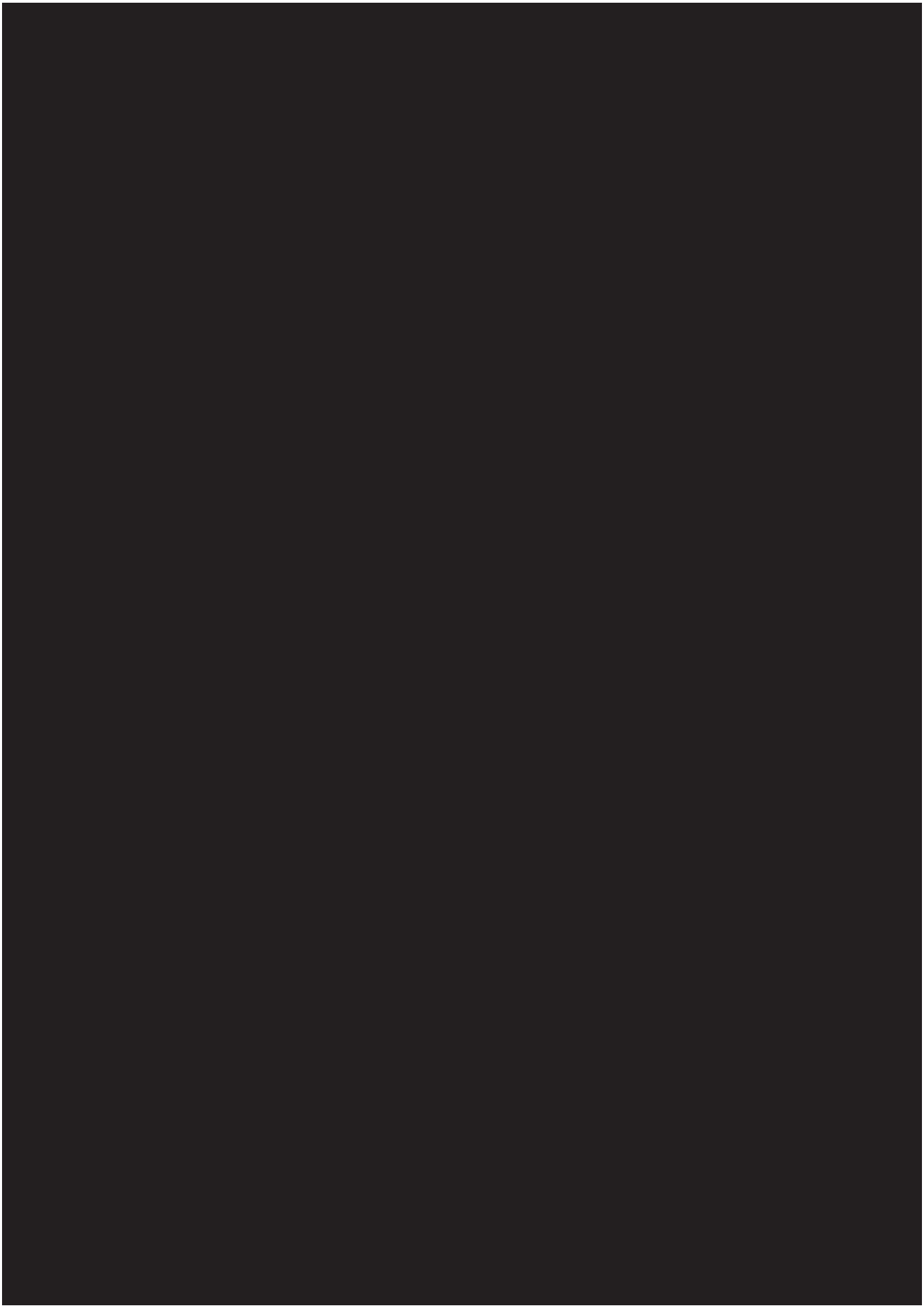


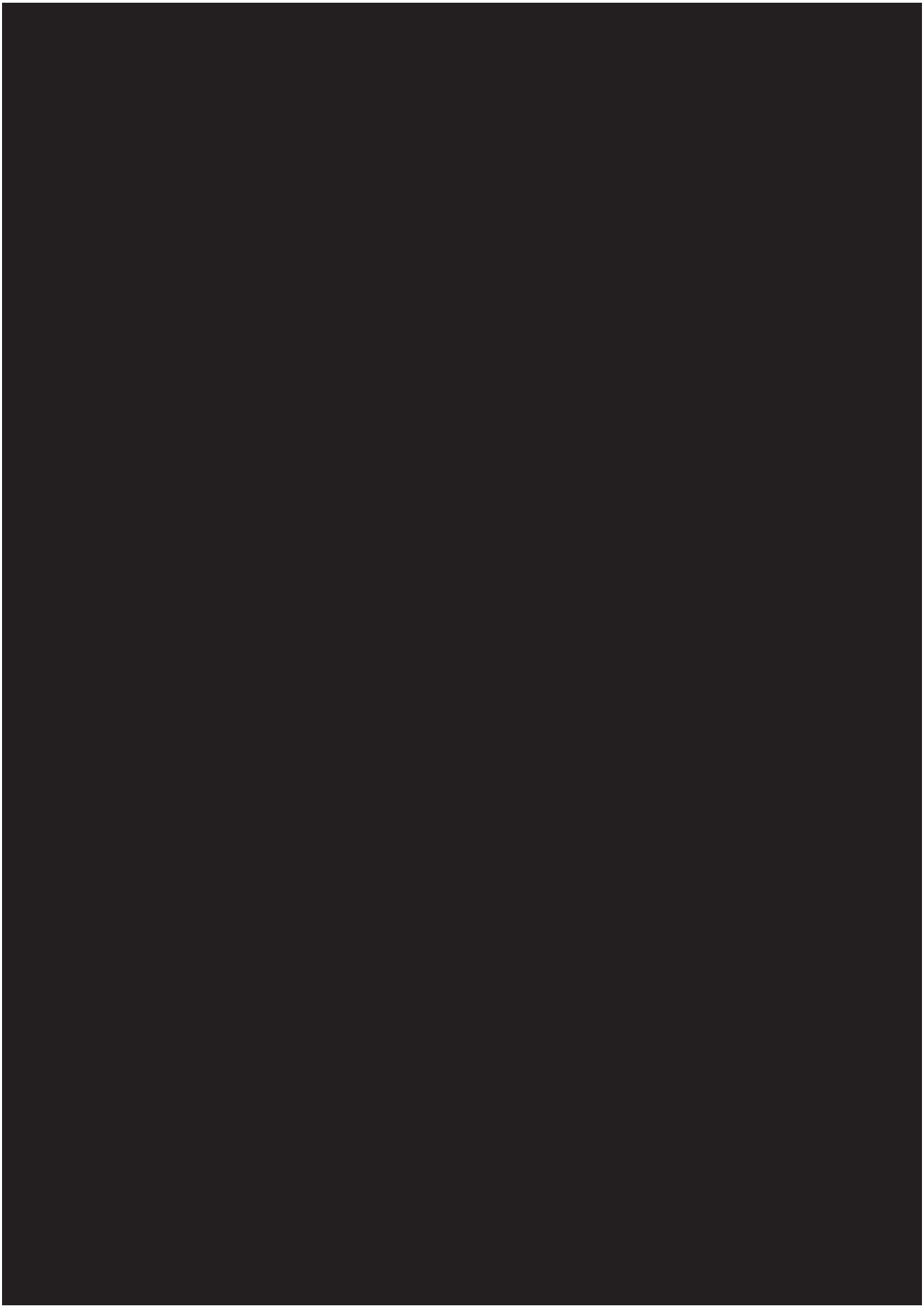


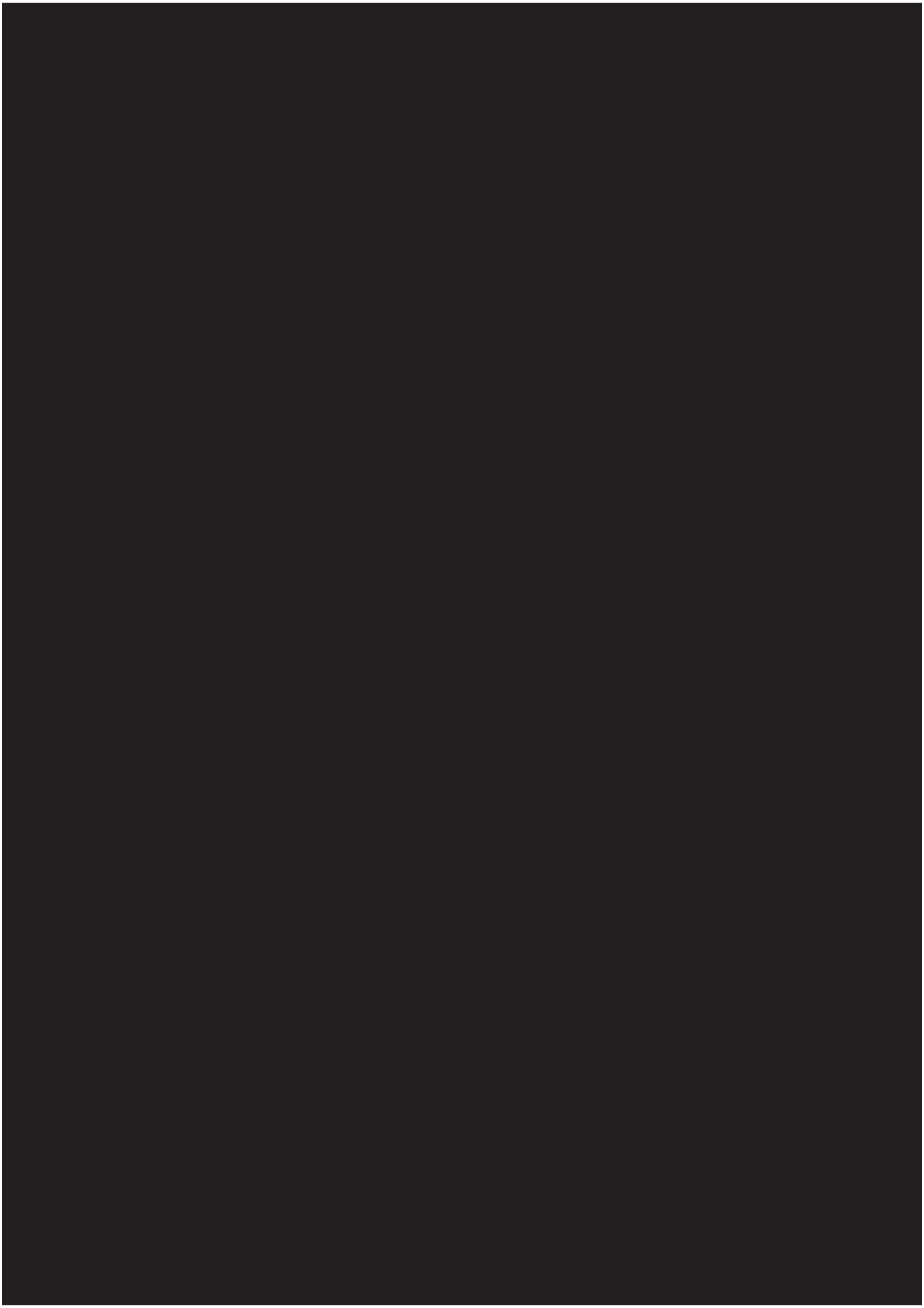


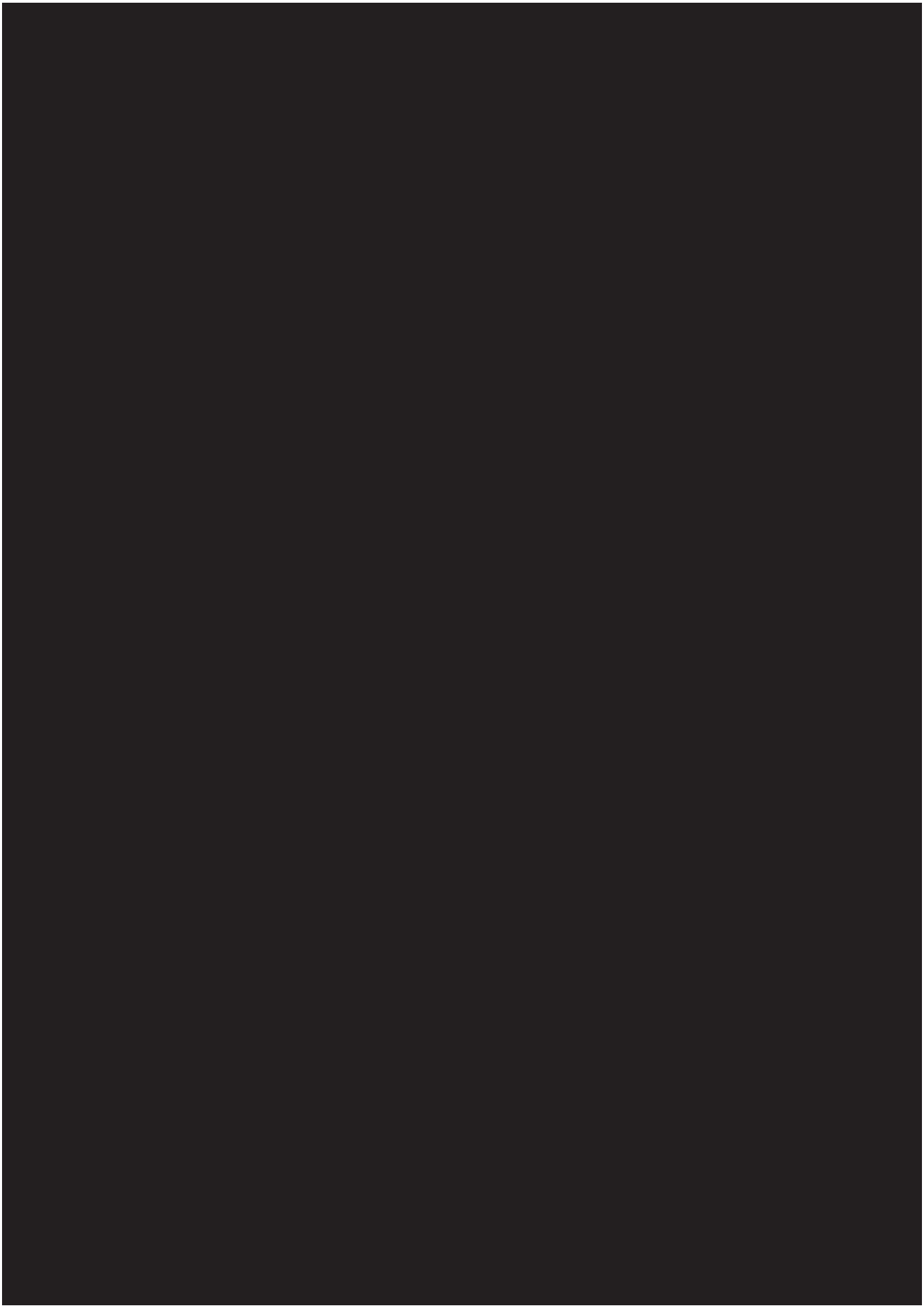


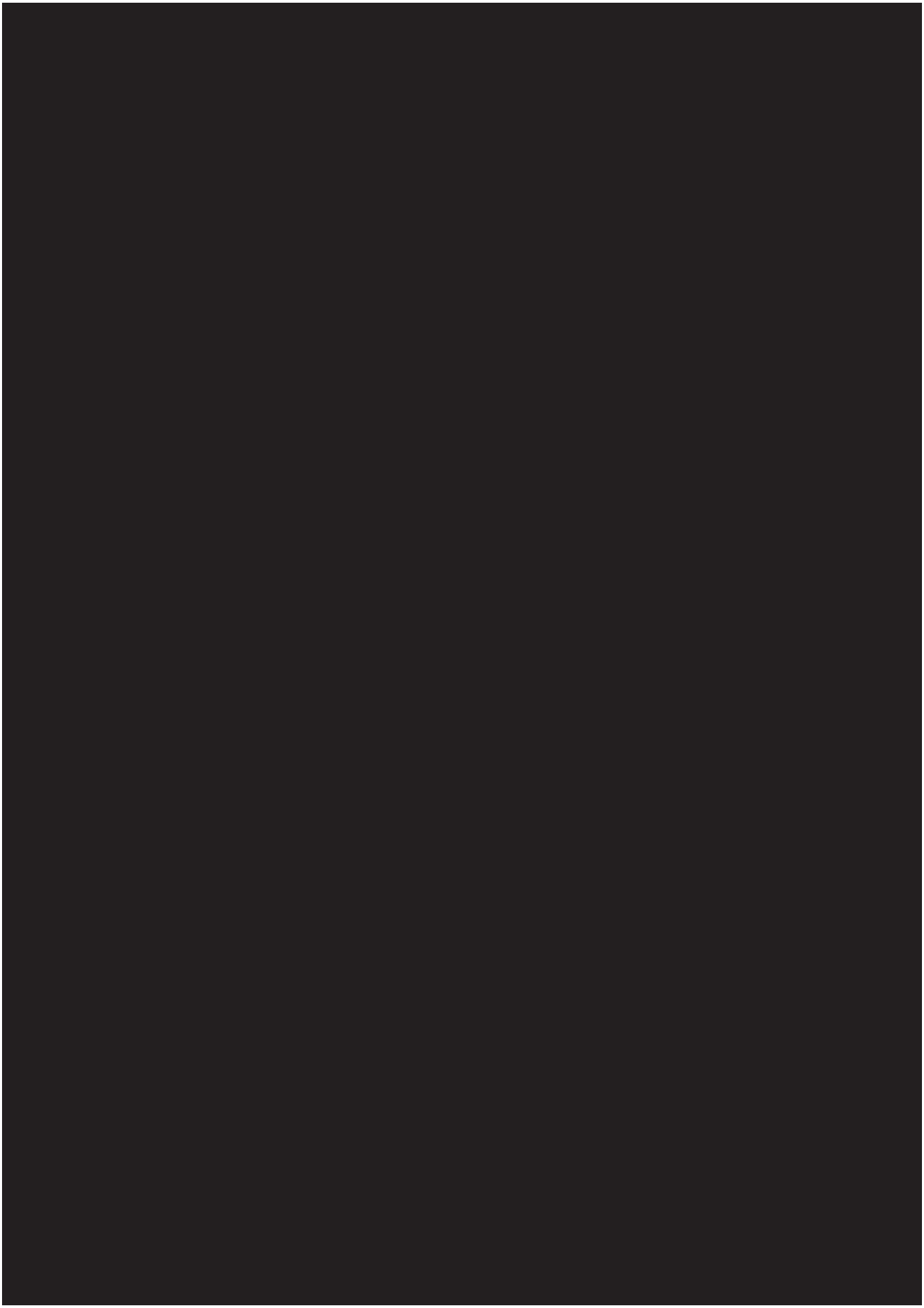


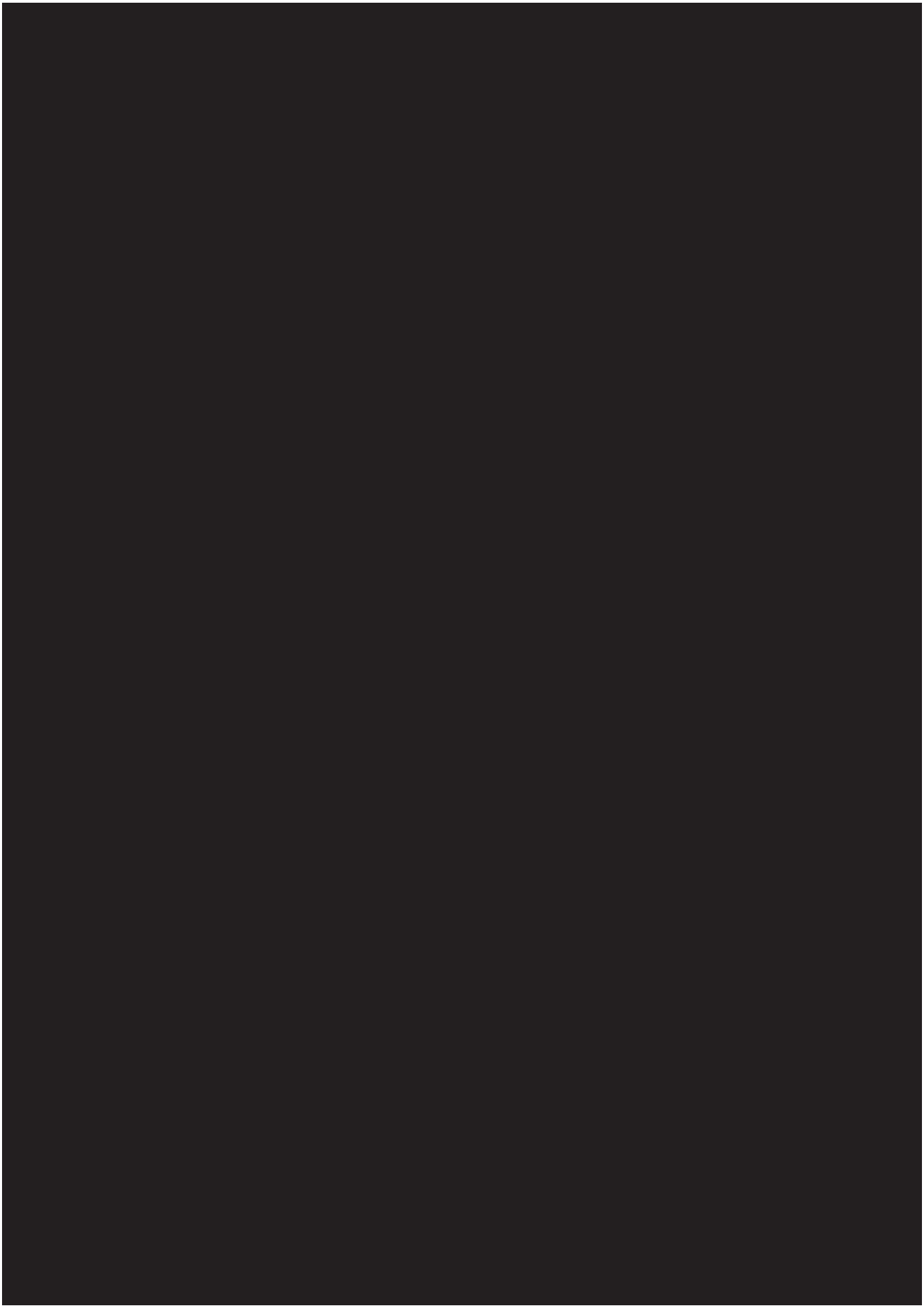


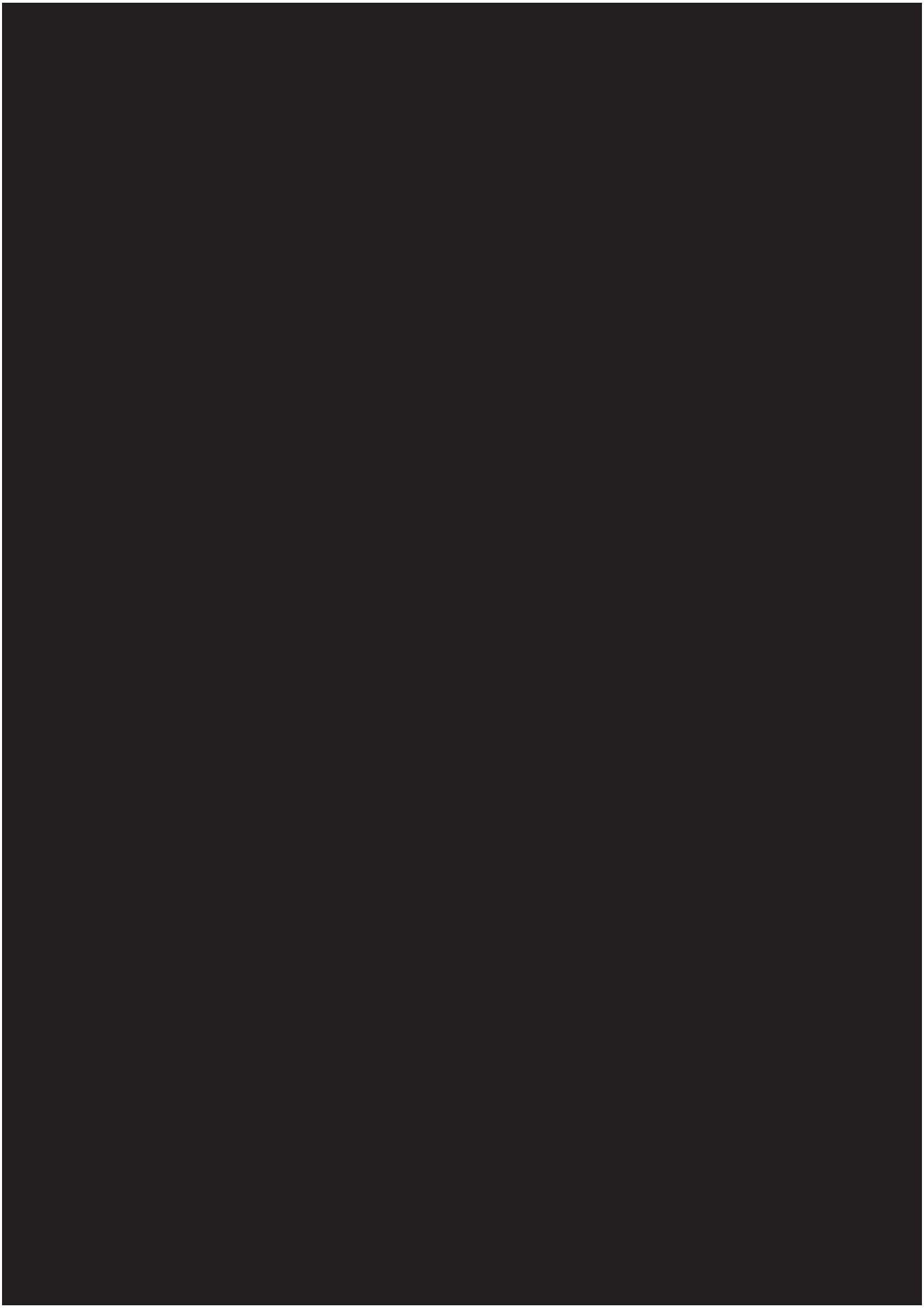


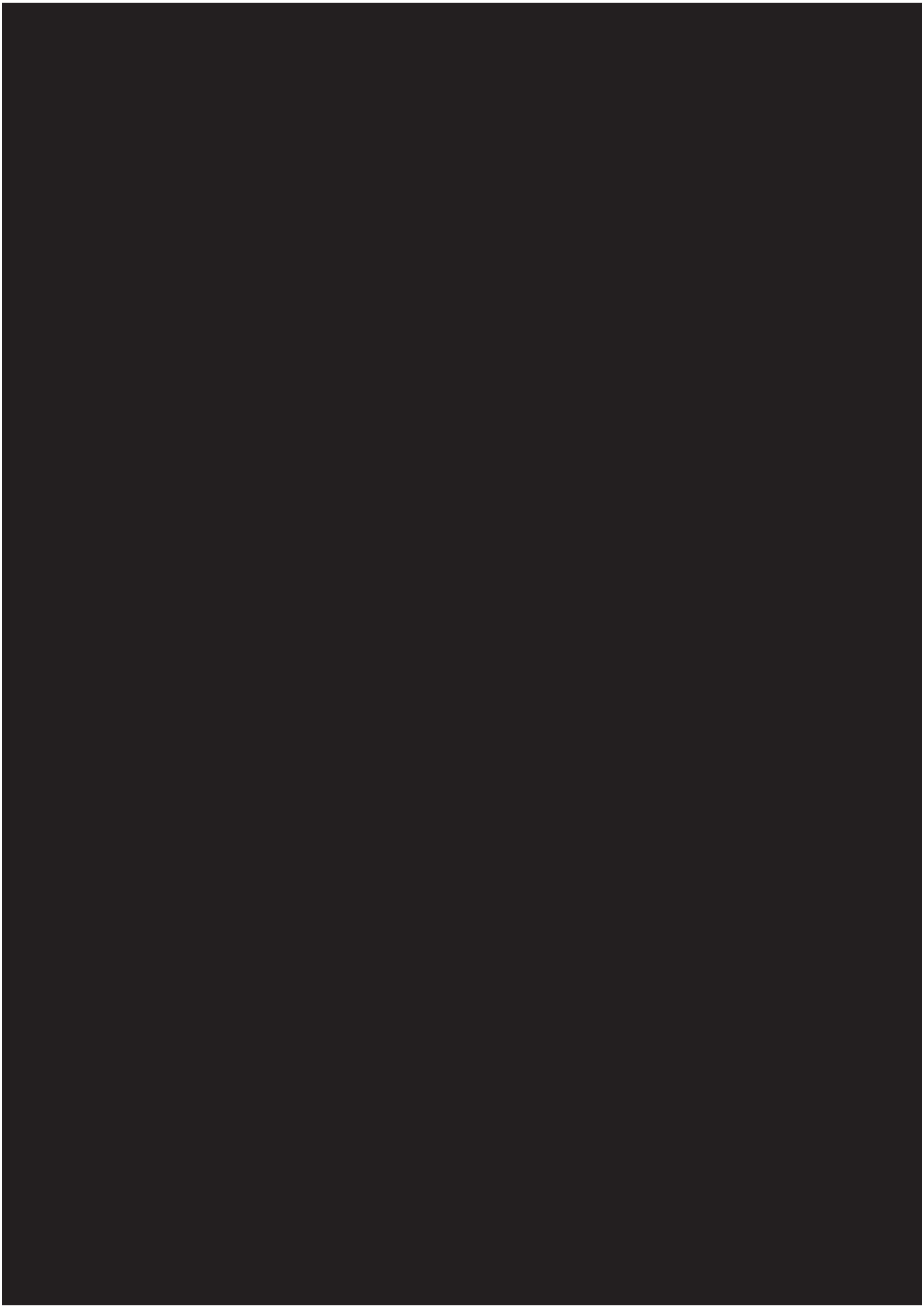


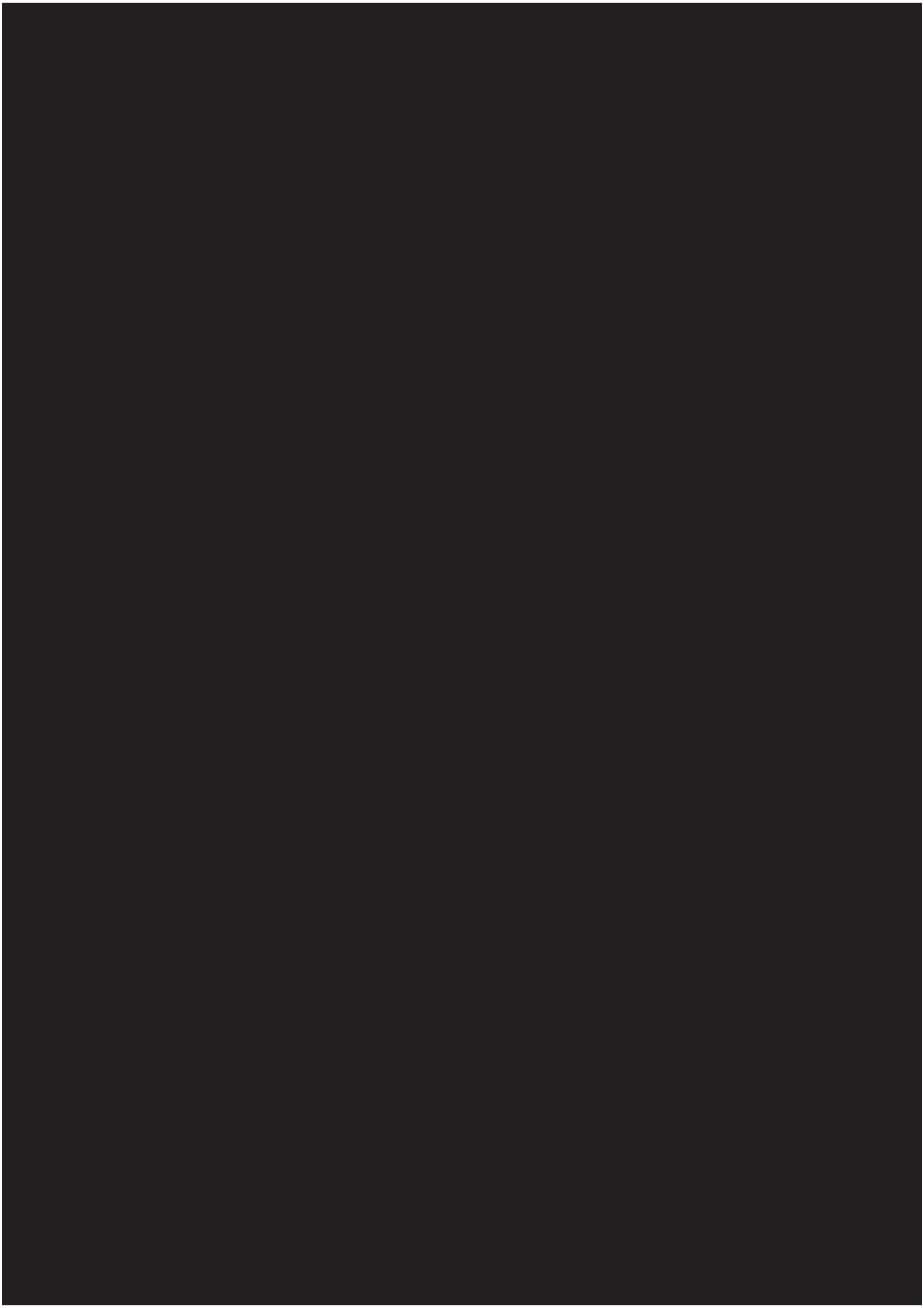


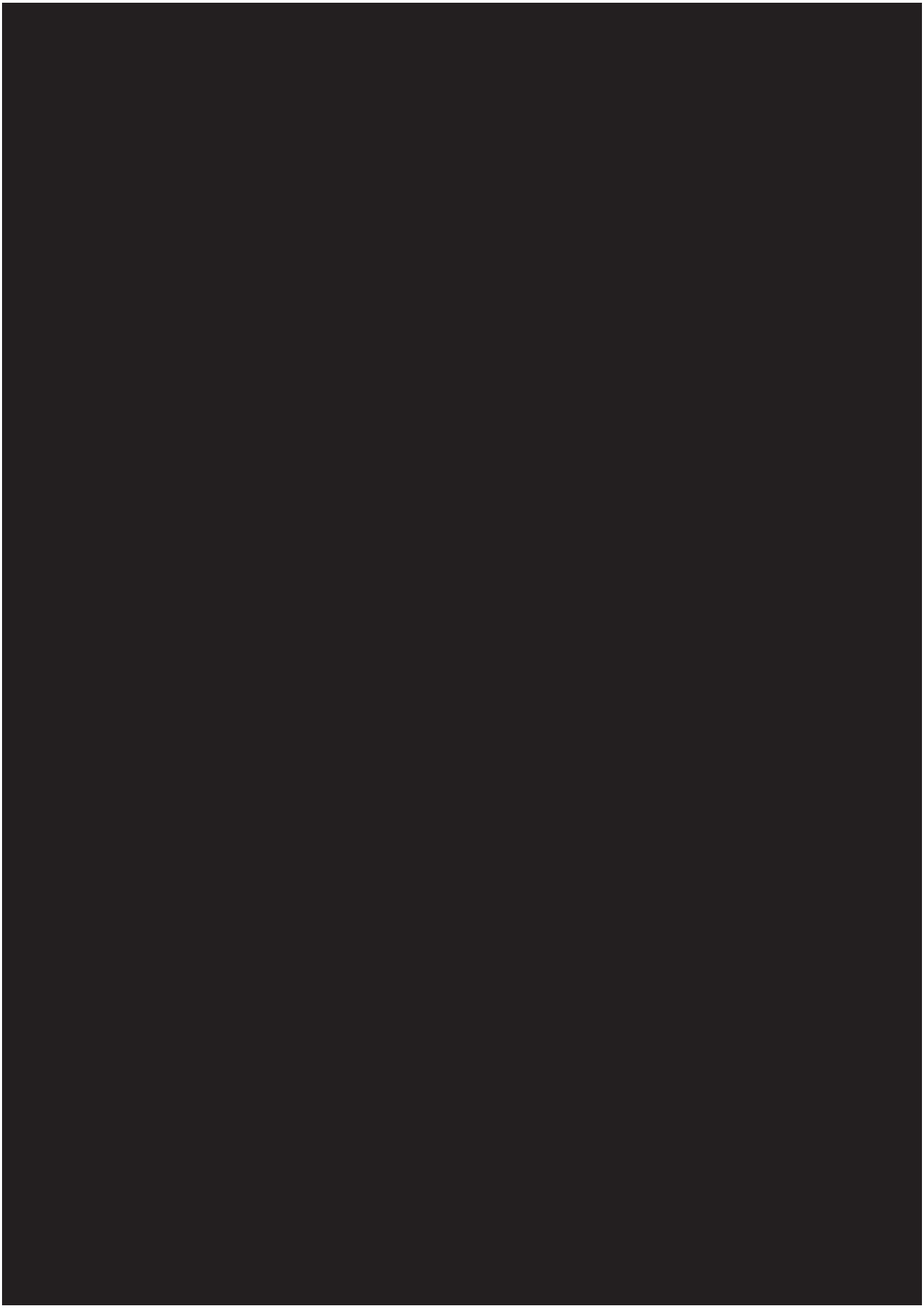


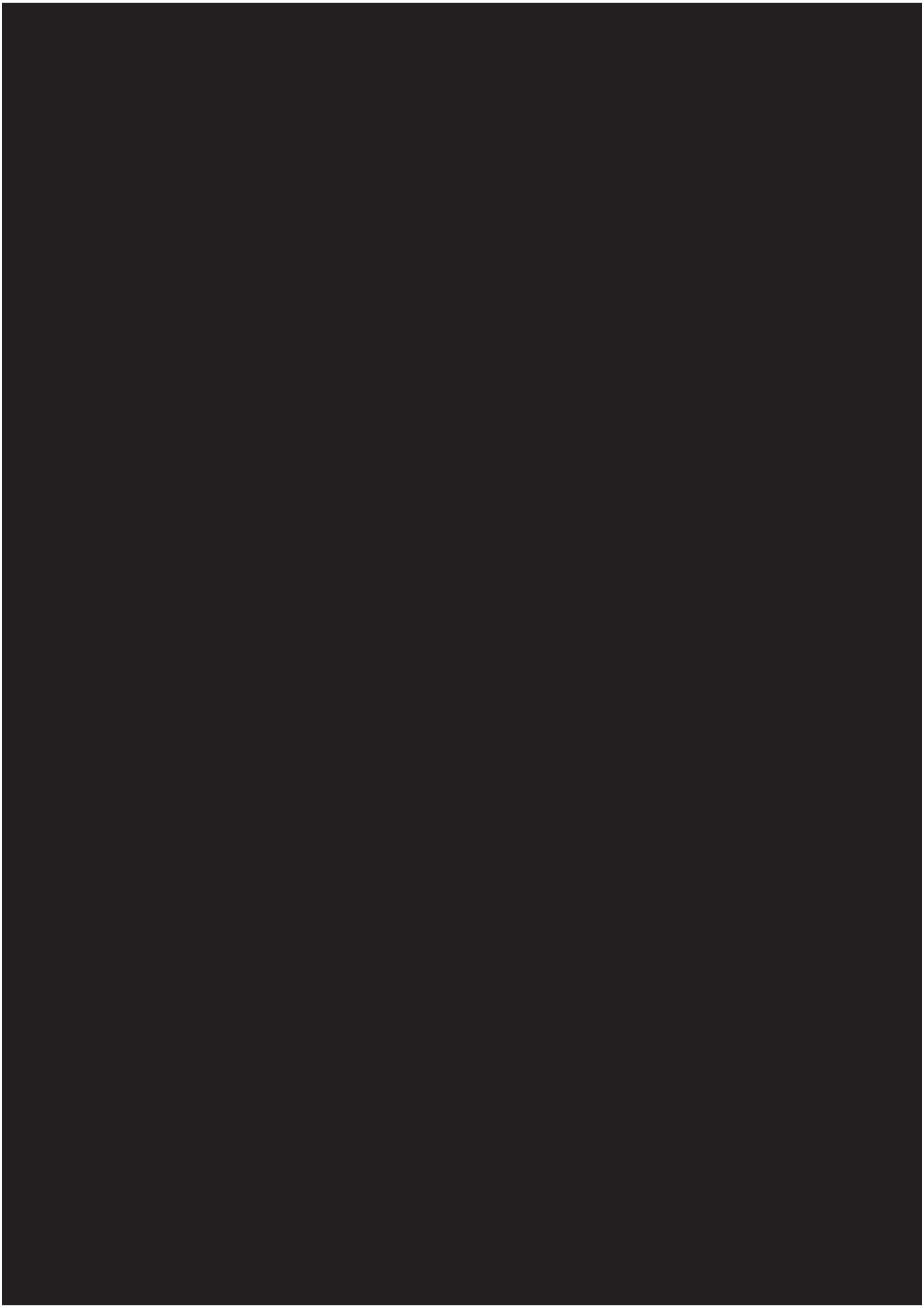


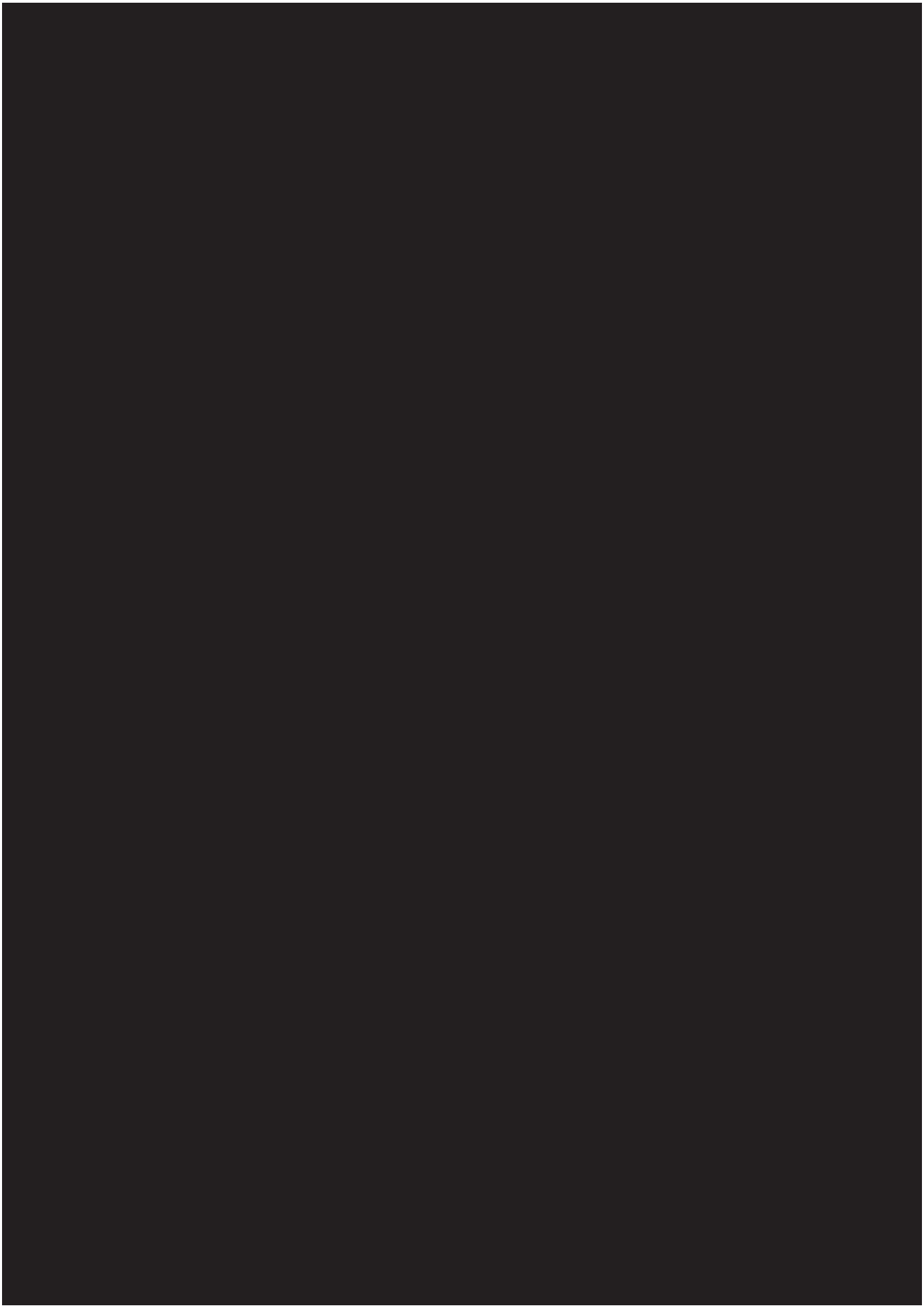


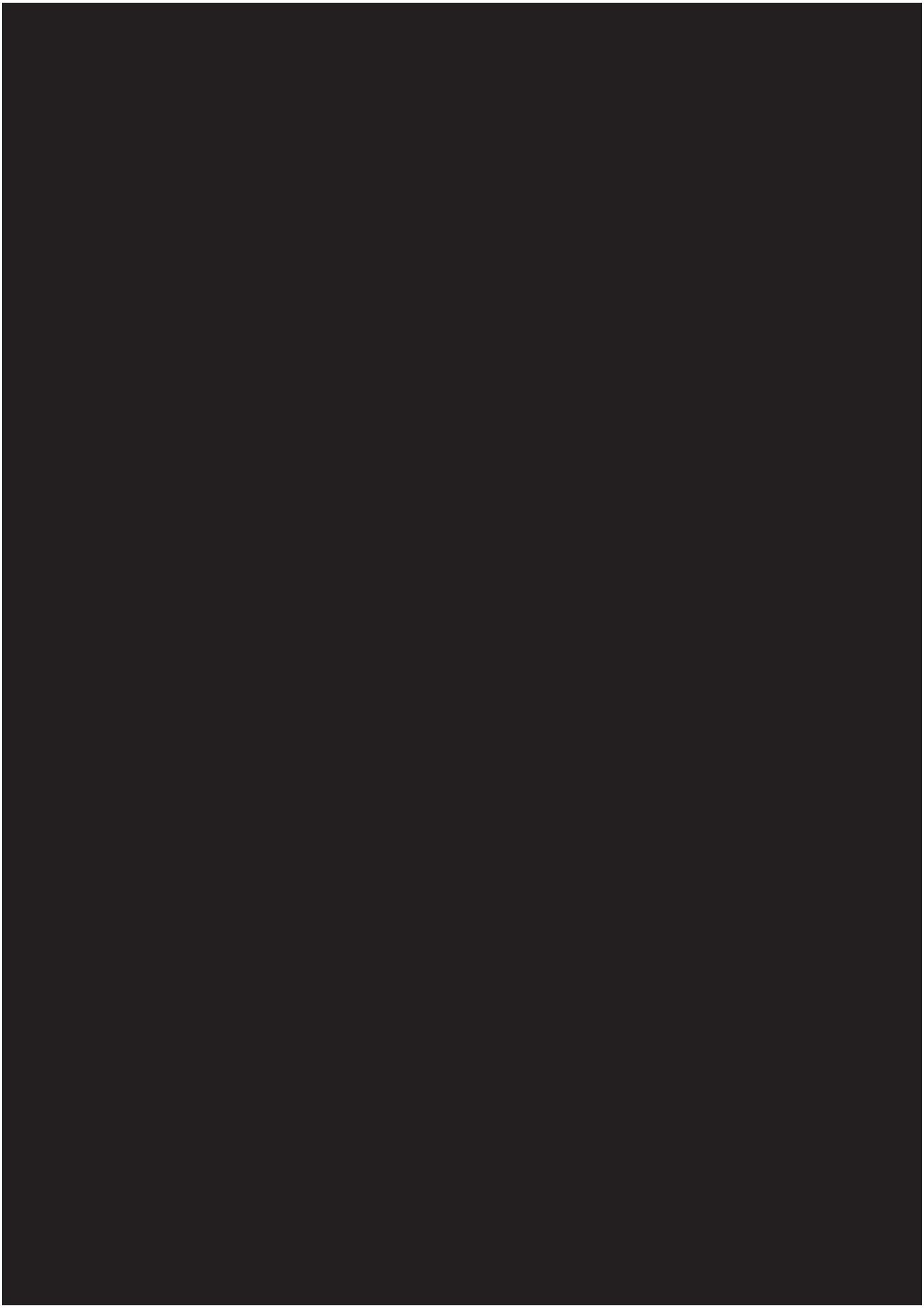


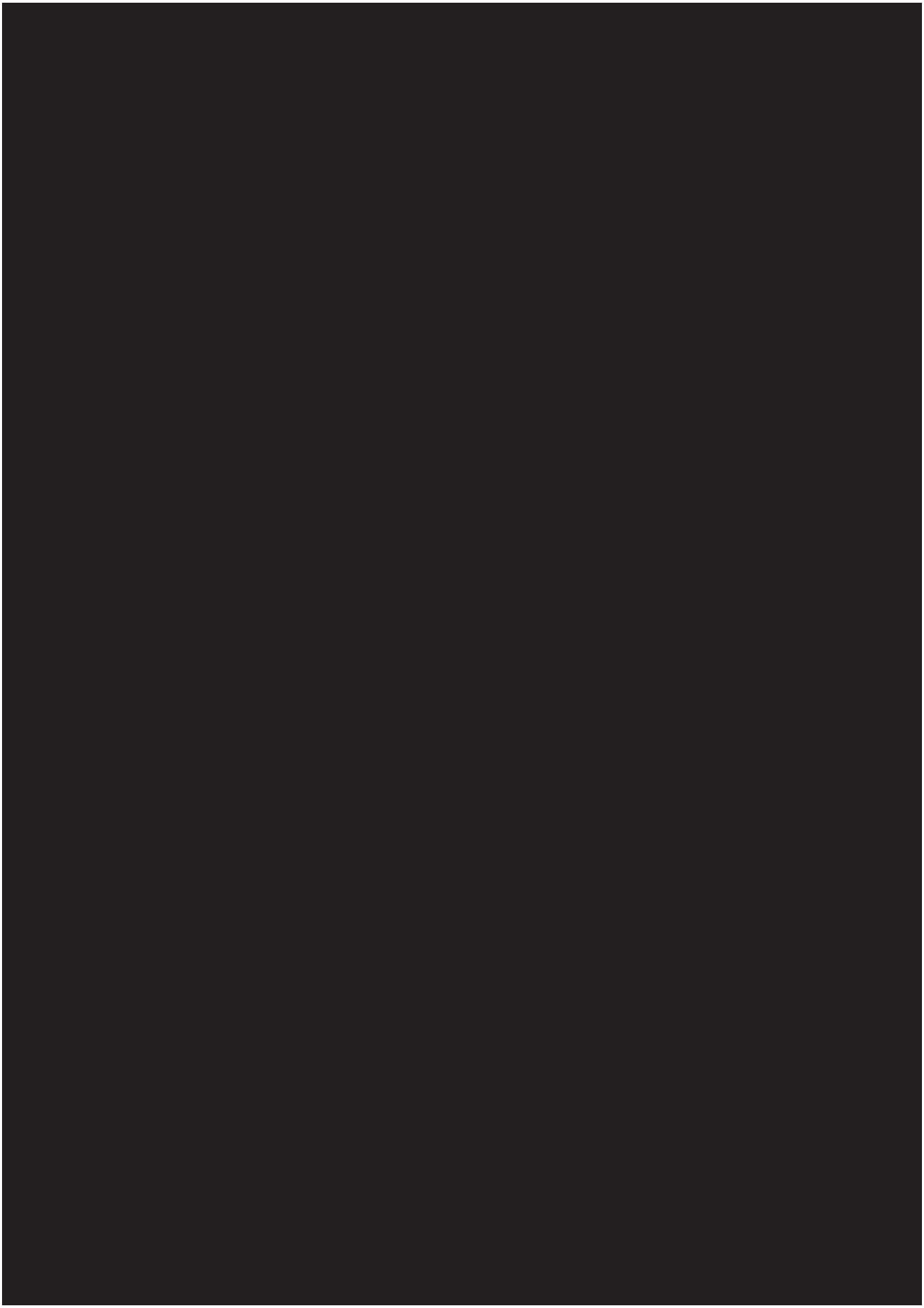


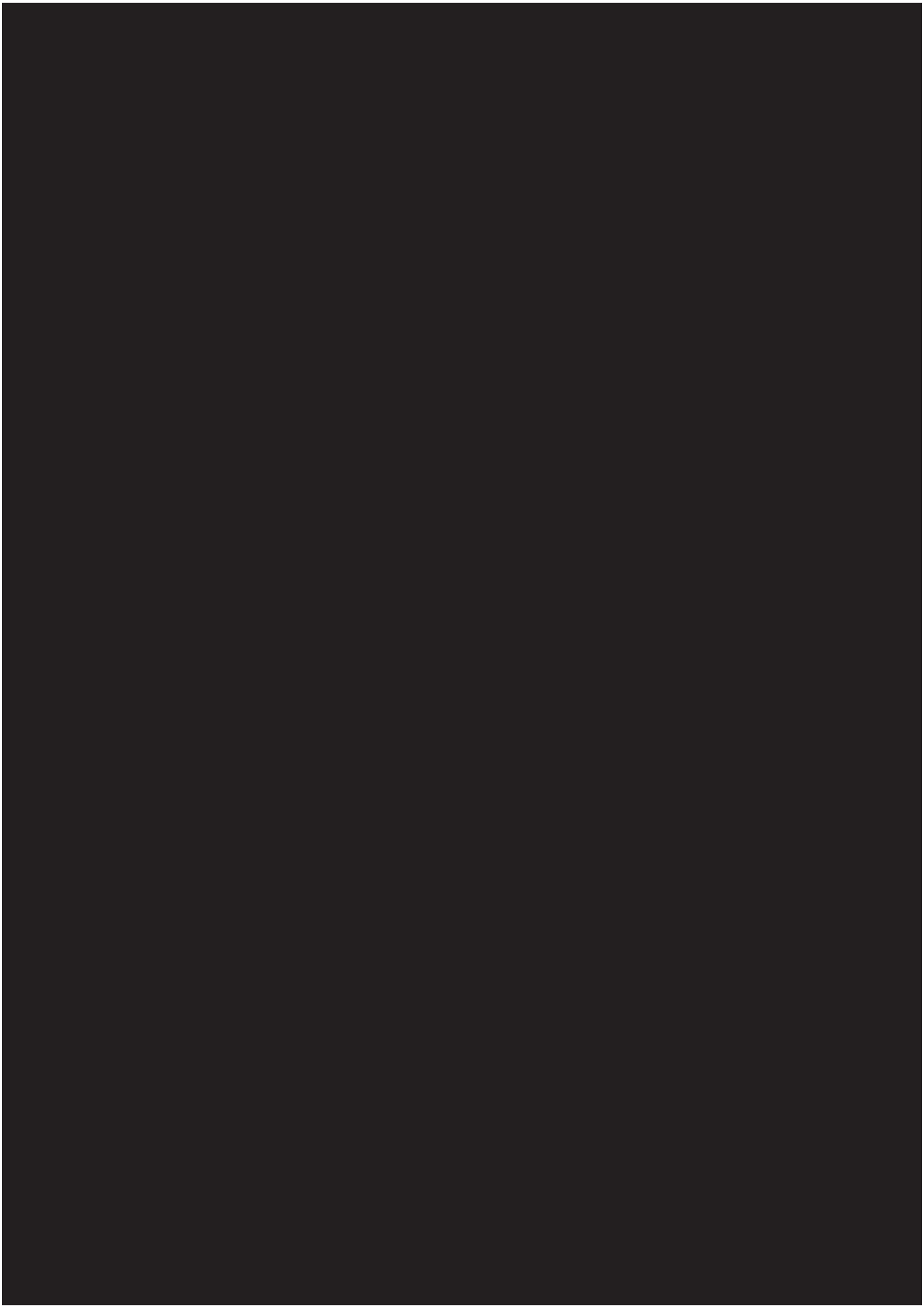


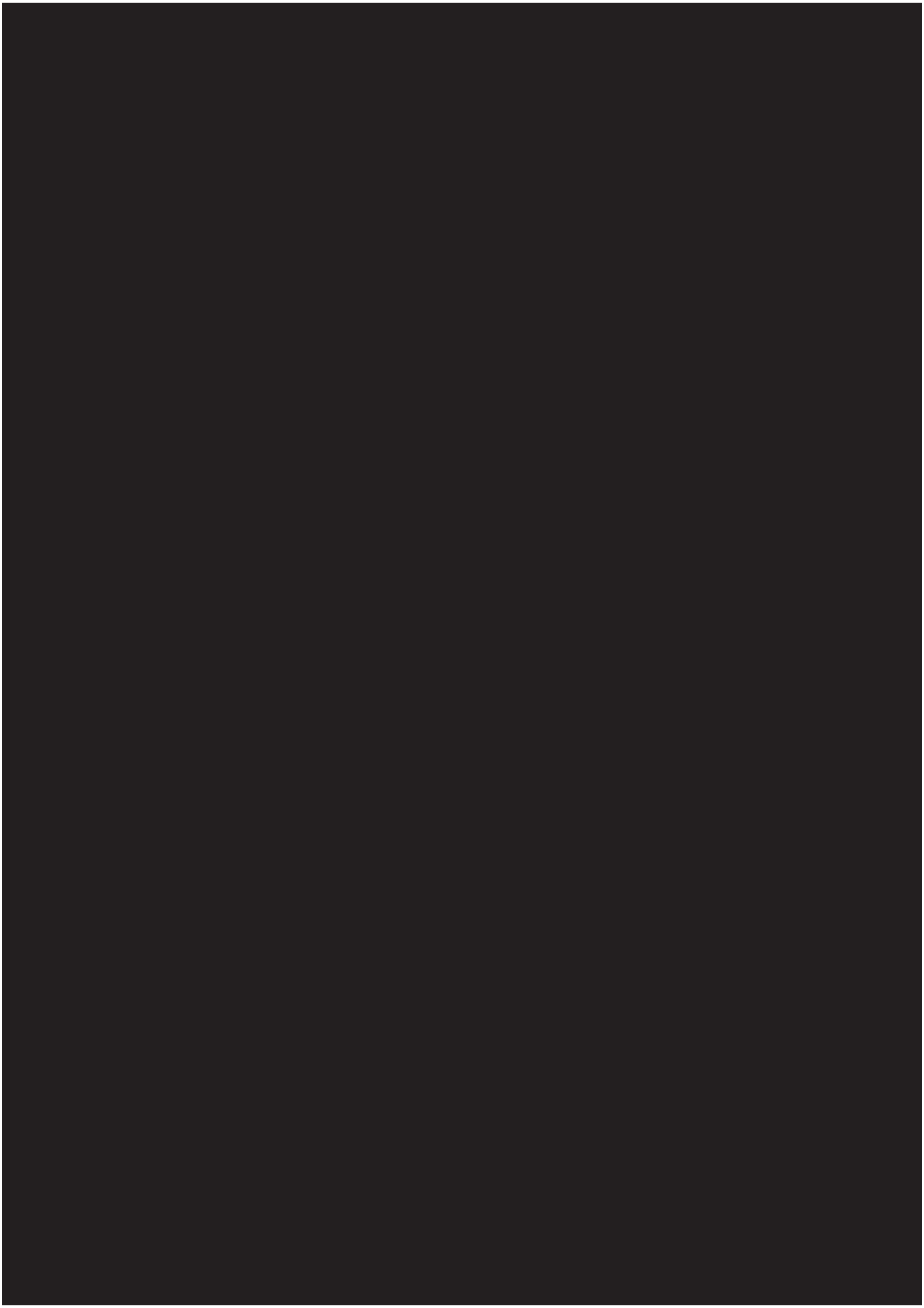


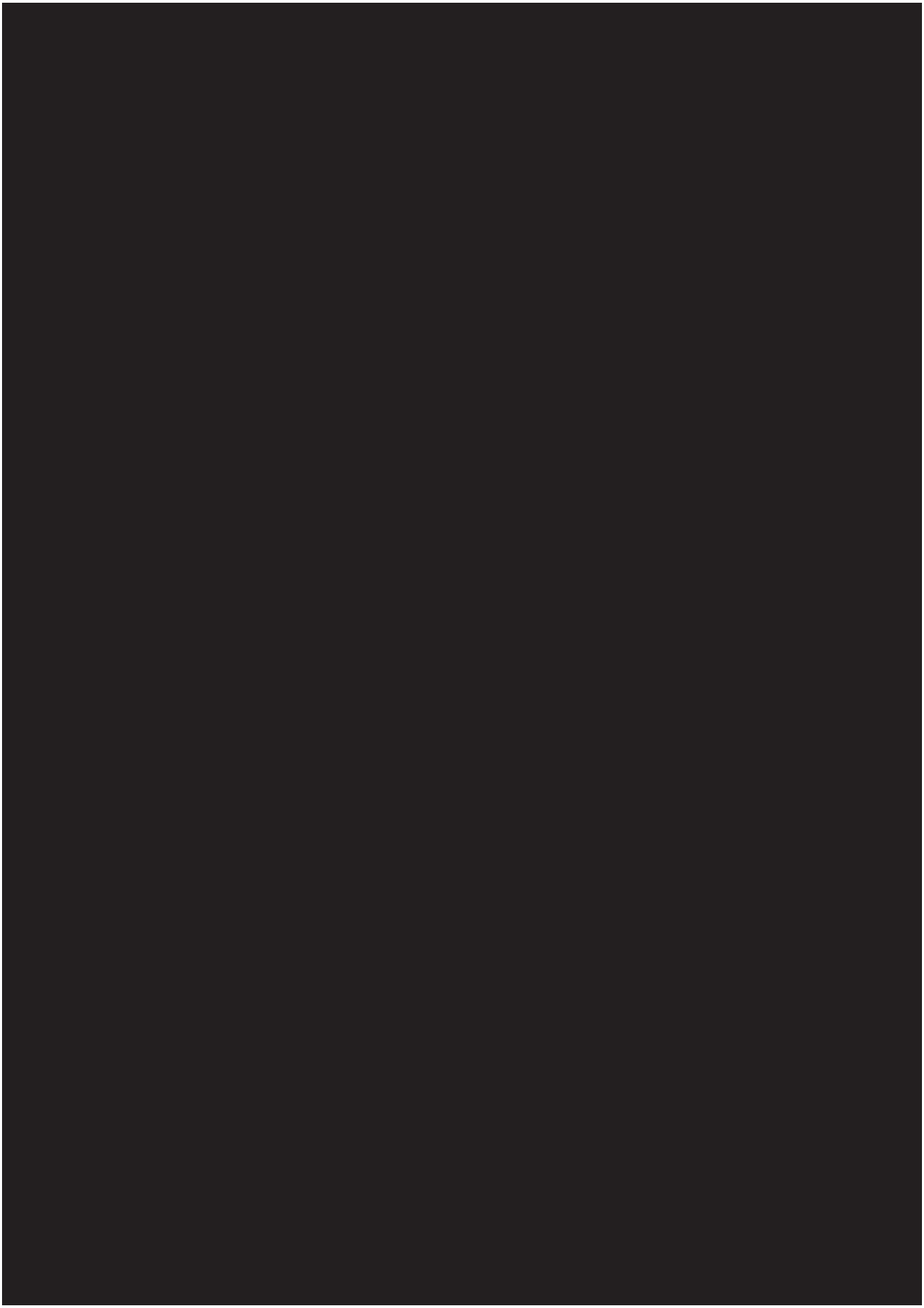


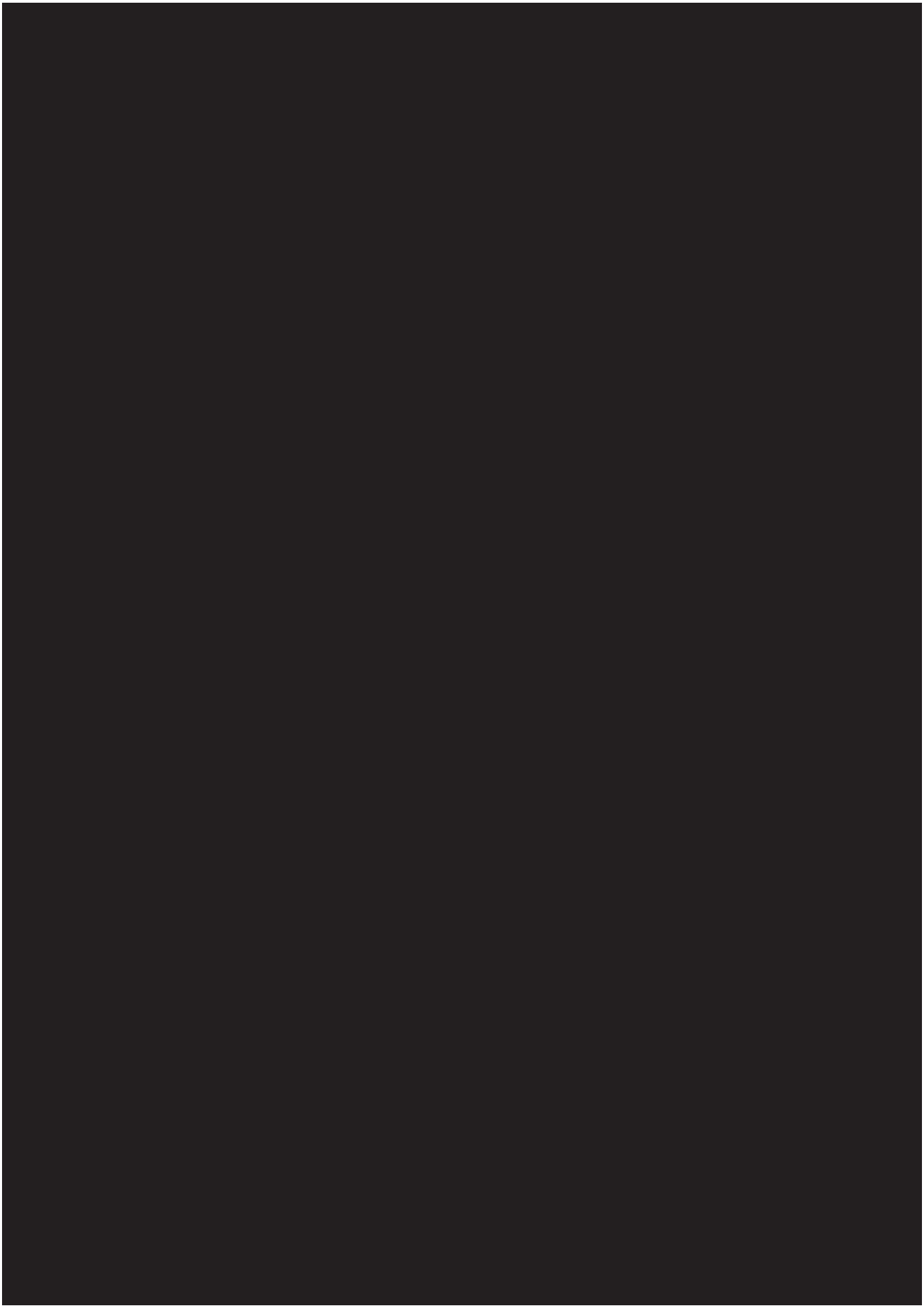


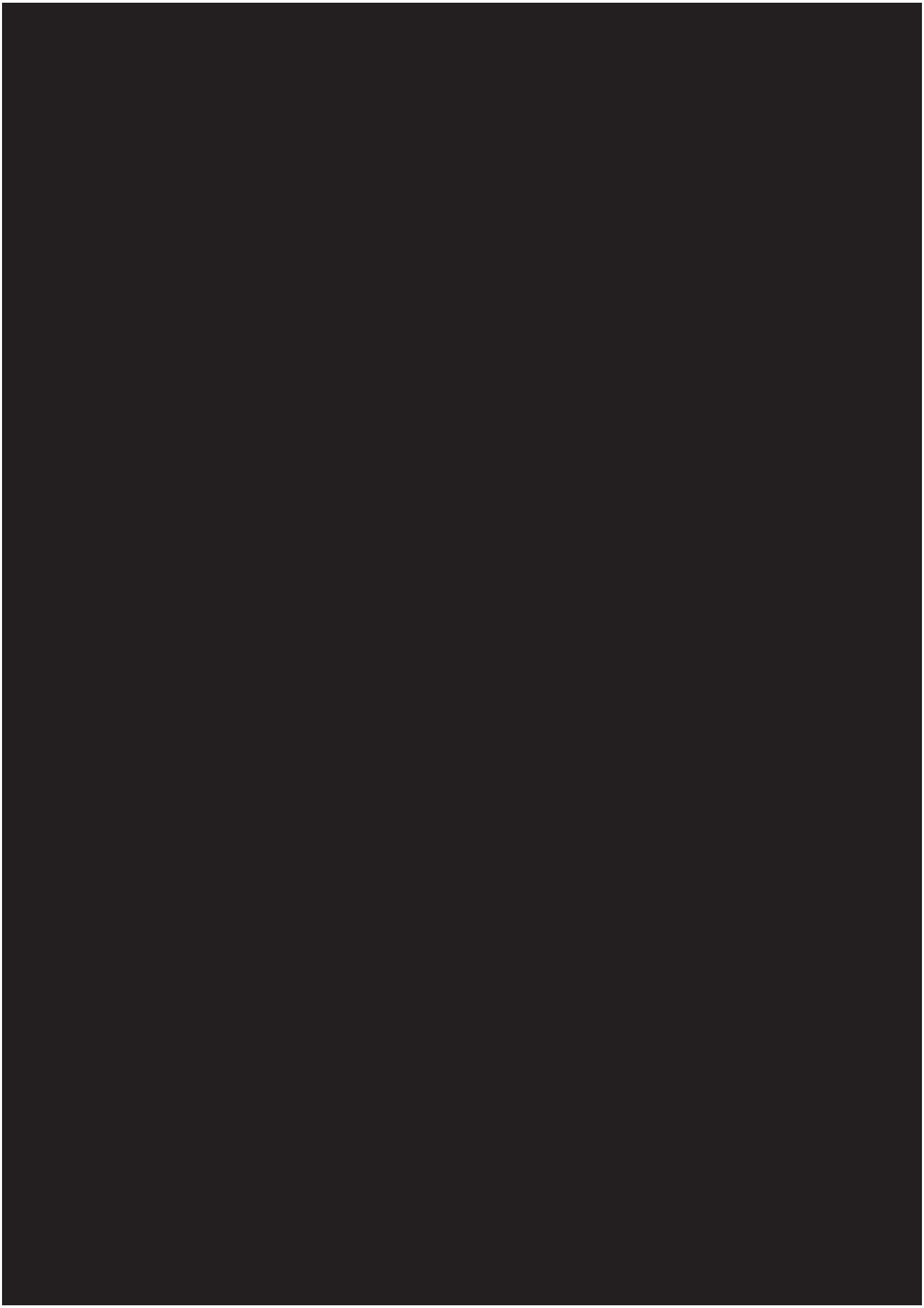


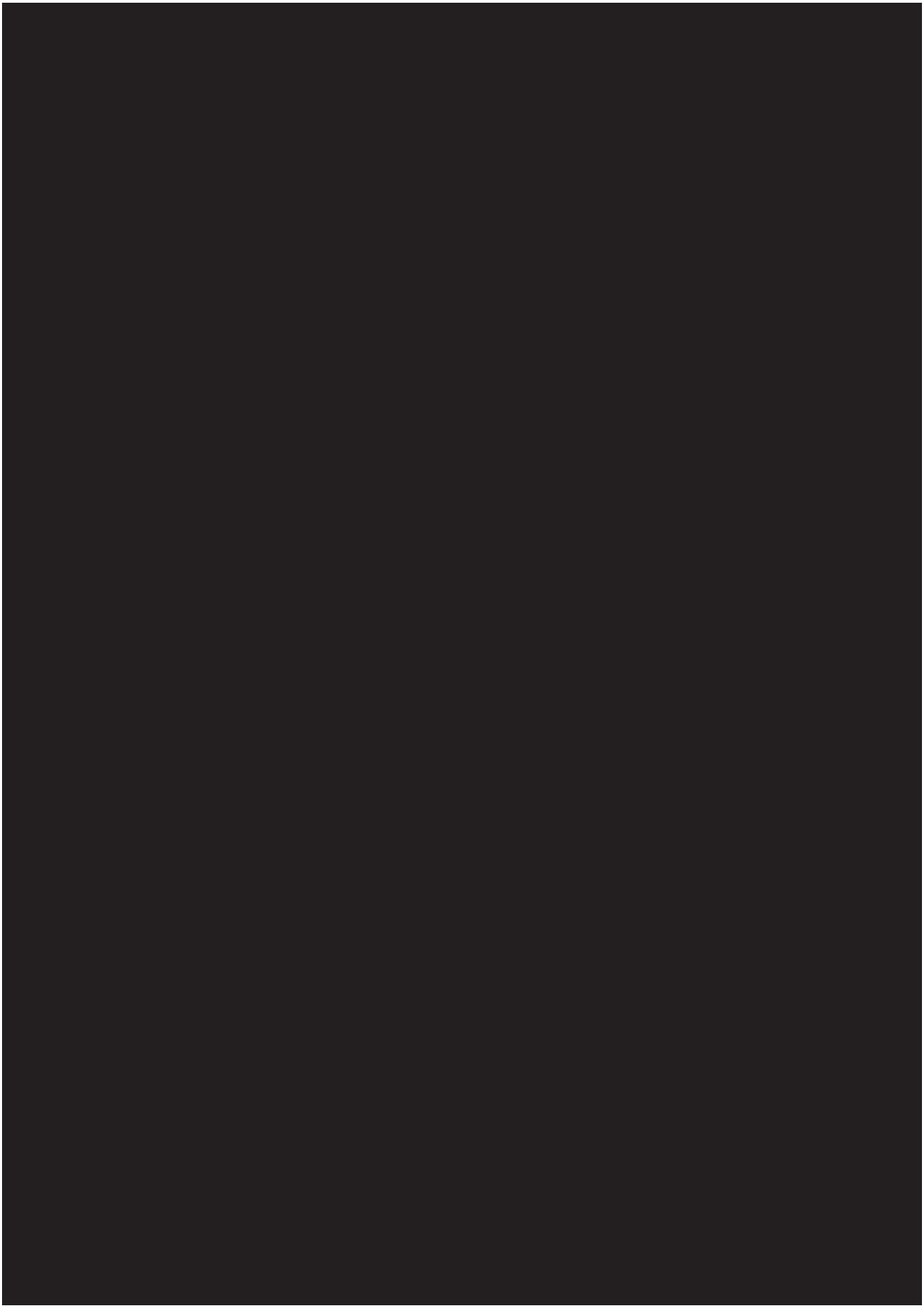


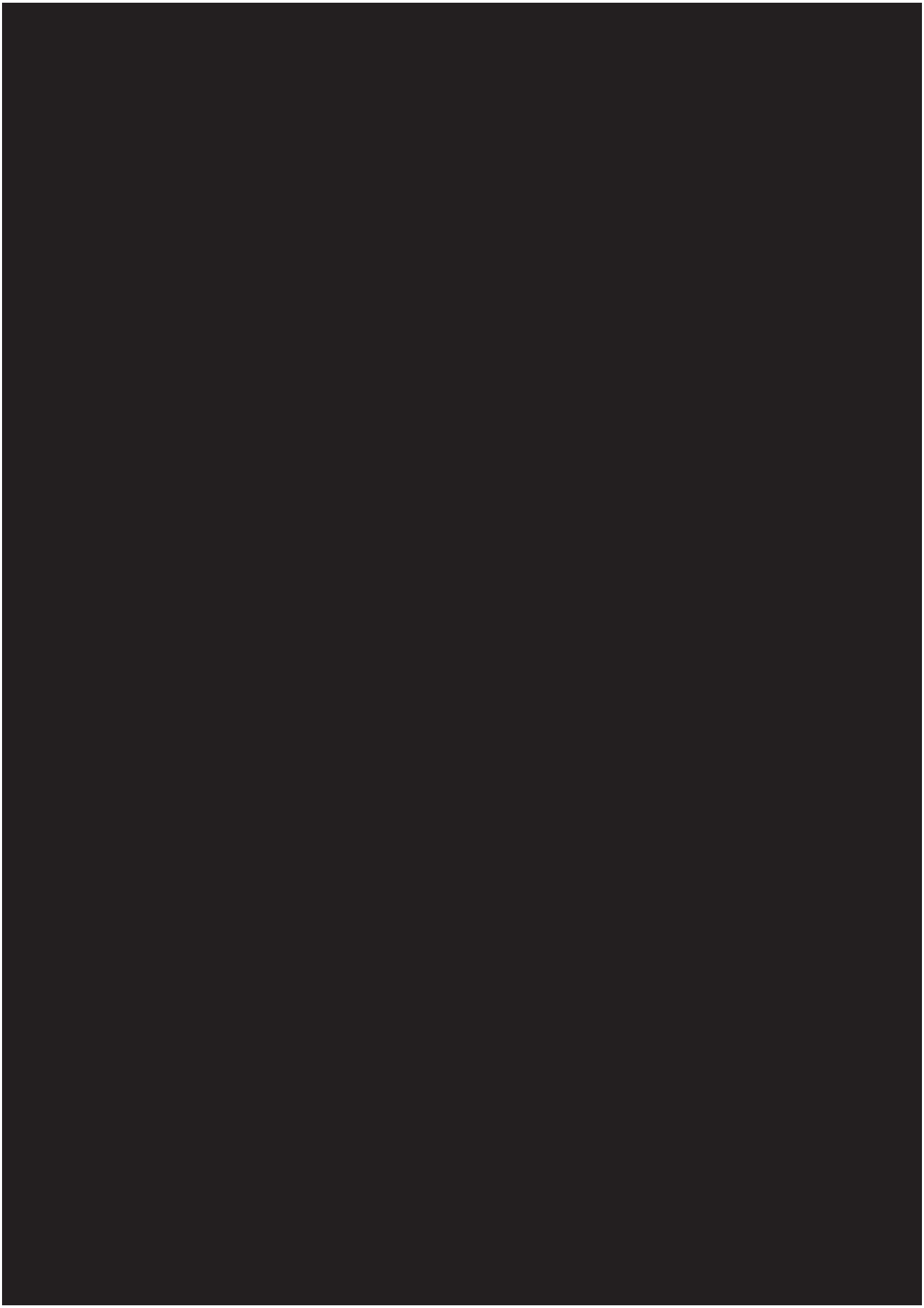


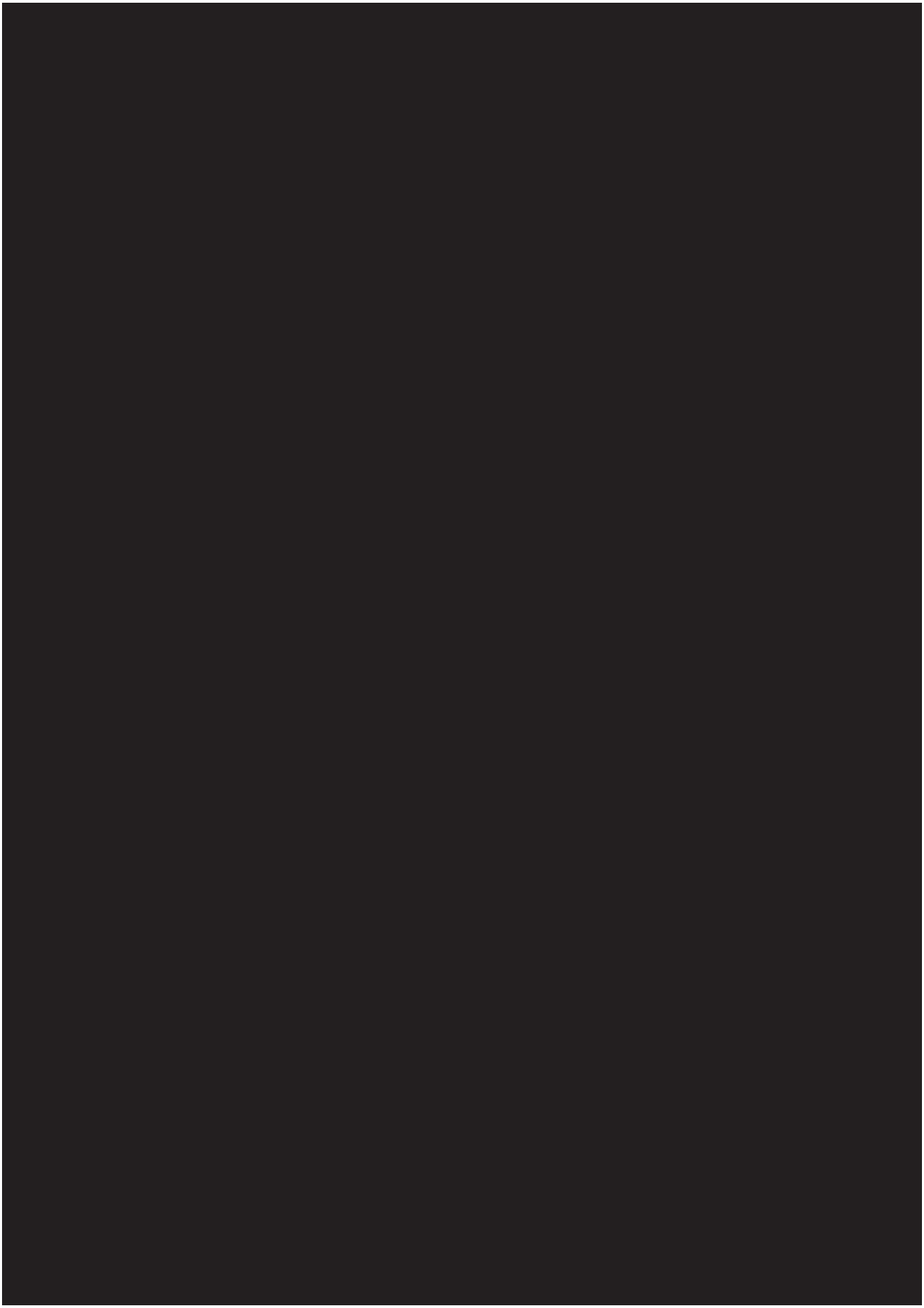


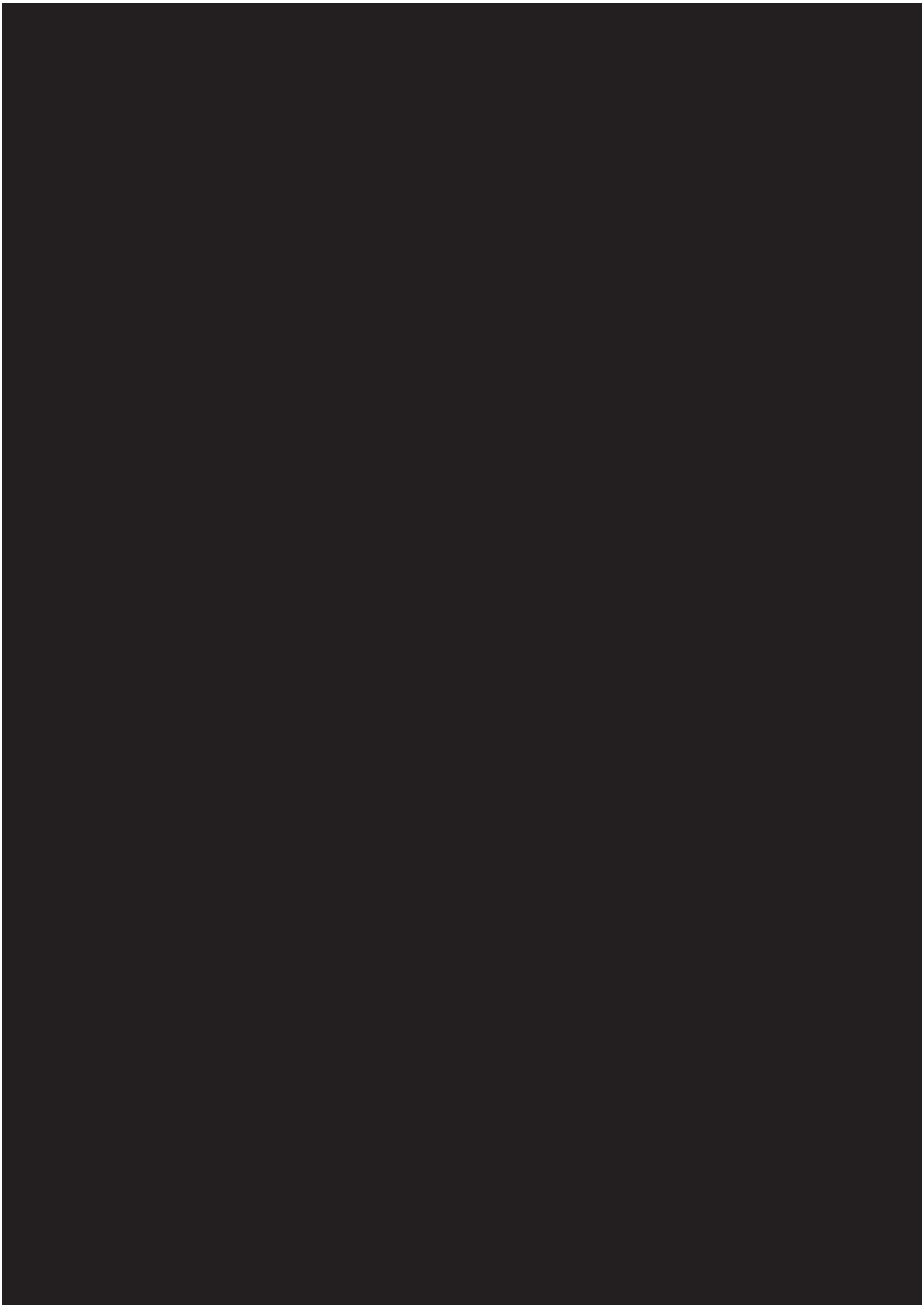












34

Notebook No : 12001637

Date 年 月

Project プロジェクト	Subject サブジェクト

From Page No :

2008、1、29

2週報会

月報作成

2008、1、30

大そうじ

月報修正

MAP方式をSTPに説明する為の資料作成

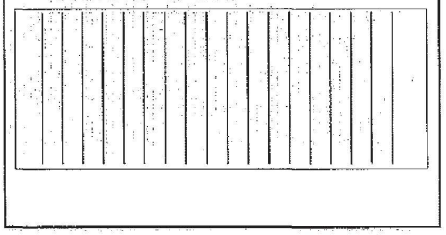
技術 '08.1.30 市川

MAP(Molded Array Packaging)方式

リードフレーム

47×100mm(一例)

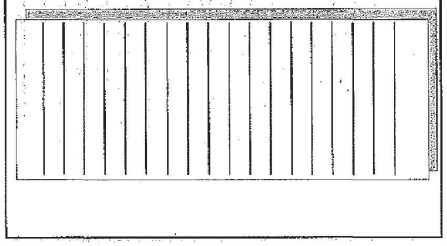
LEDになった時、ギャップになるスリット入り。



MAP(Molded Array Packaging)方式

アセンブリテープ貼り付け

貼らないと樹脂がスリットから漏れる。

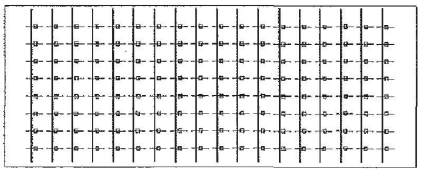


技術 '08.2.04 三木

技術 '08.1.30 市川

MAP(Molded Array Packaging)方式

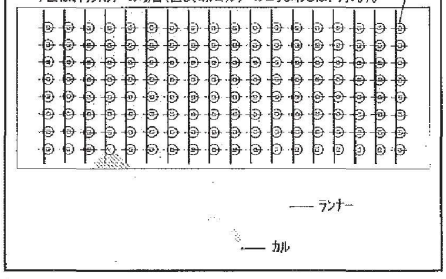
DB、WB



MAP(Molded Array Packaging)方式

トランスファー or 圧縮成形

下図は、トランスファーの場合(但し、カルとランナーのとりまわしはデフラメ。)。



技術 '08.1.30 市川

To Page No :

(日付) Date

(発明者) Invented by 市川 博史 2008年1月30日

技術 '08.2.04 三木

(記入者) Recorded by 年 月 日

(証人) Understood and Witnessed by

(日付) Date

Signed 武市順子 08年2月5

Signed 年 月

Notebook No : 12001637

Date 年 月 日

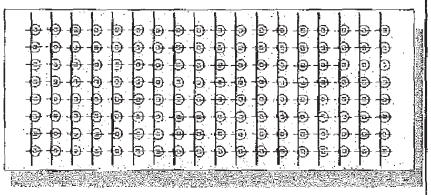
Project
プロジェクト

Subject
サブジェクト

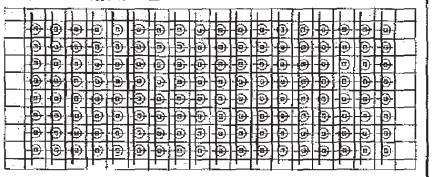
From Page No :

技術 '08.1.30 市川

MAP (Molded Array Packaging) 方式
アセンブリテープ剥離



MAP (Molded Array Packaging) 方式
ダイシング
LED (□5mm) 144個完成
47×200mmであれば288個



[redacted]

技術 '08.1.31 市川

(発明者) Invented by 市川博史 2008年 1月 31日

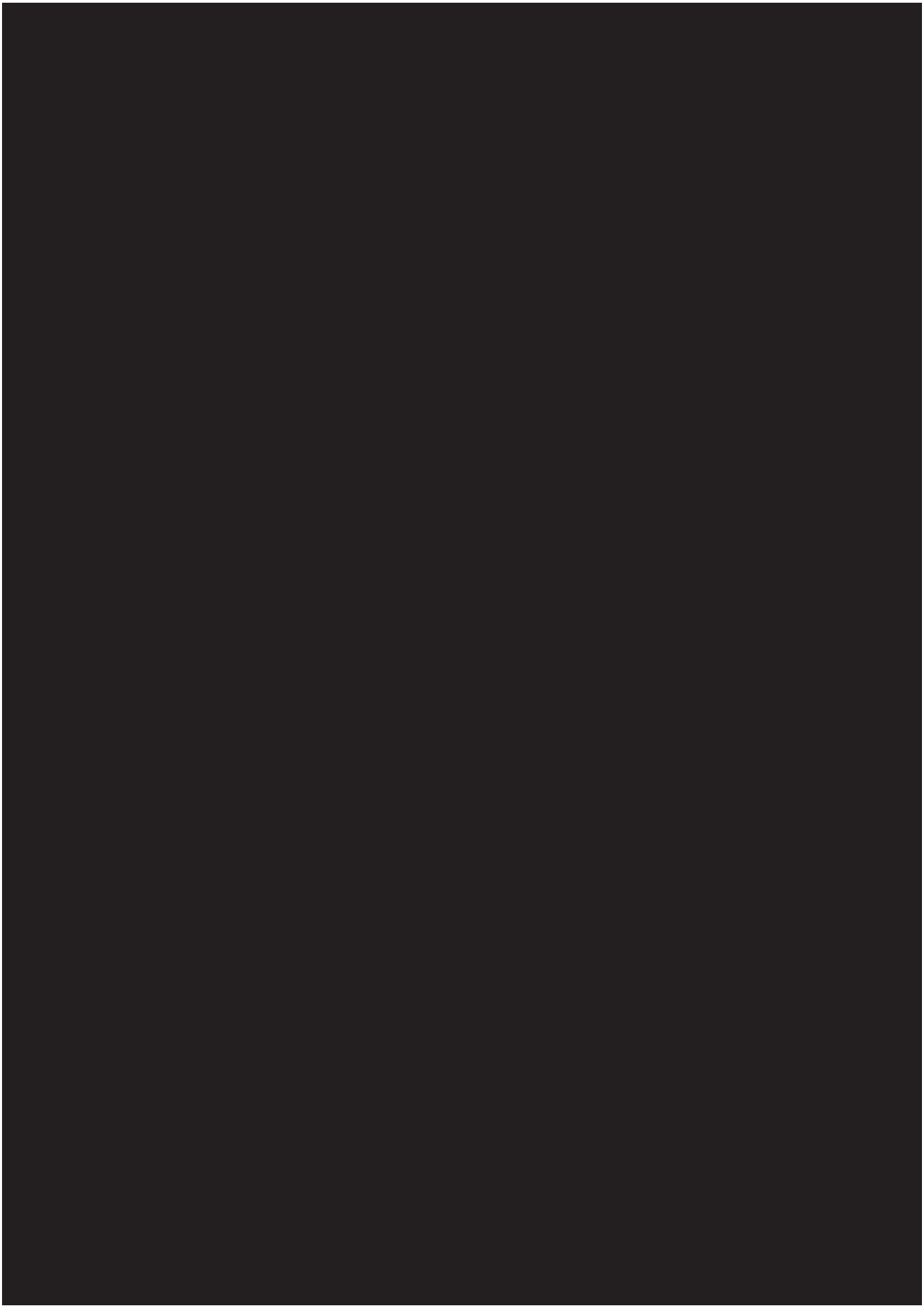
技術 '08.2.04 三木

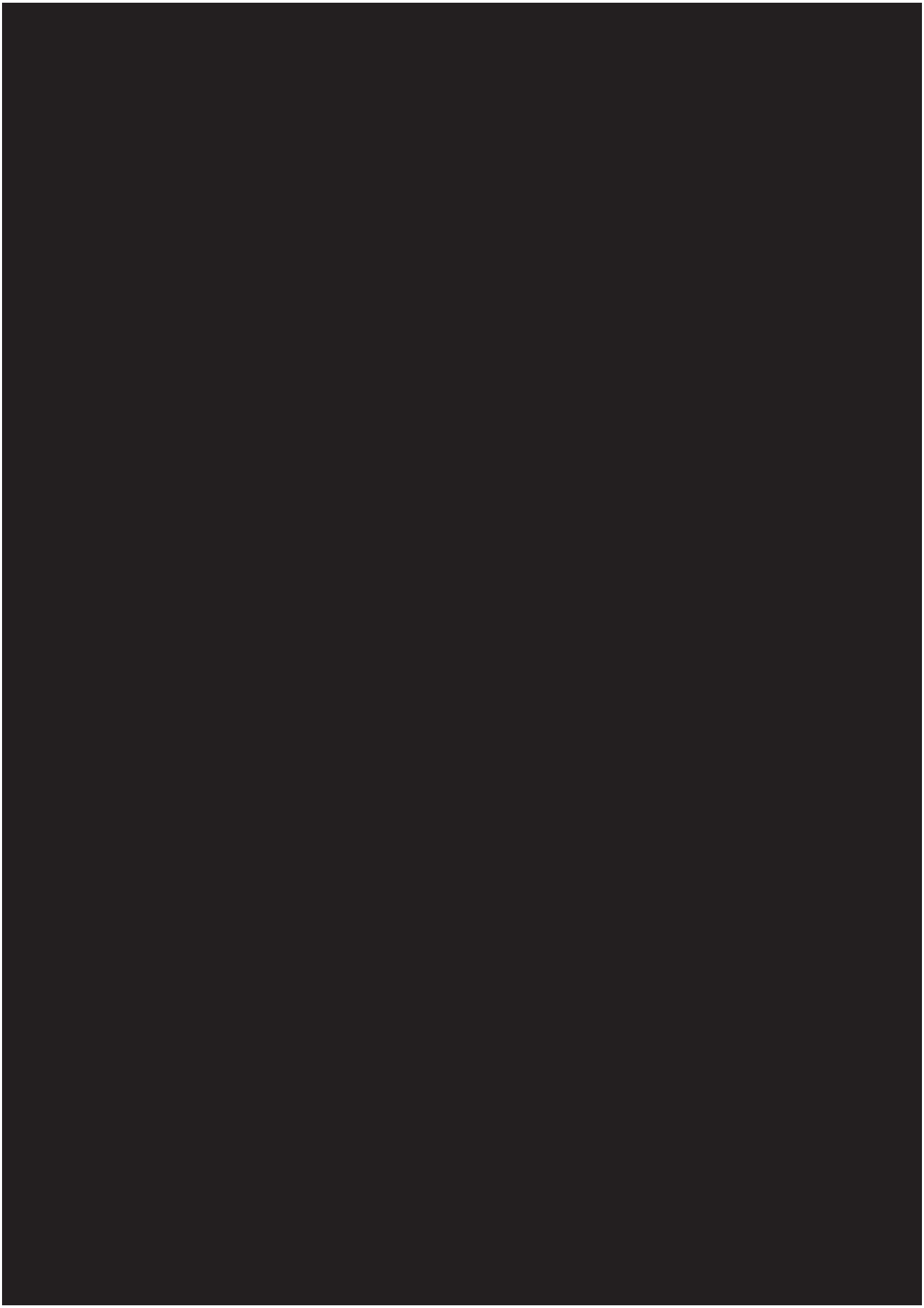
(証人者) Witnessed by 年 月 日

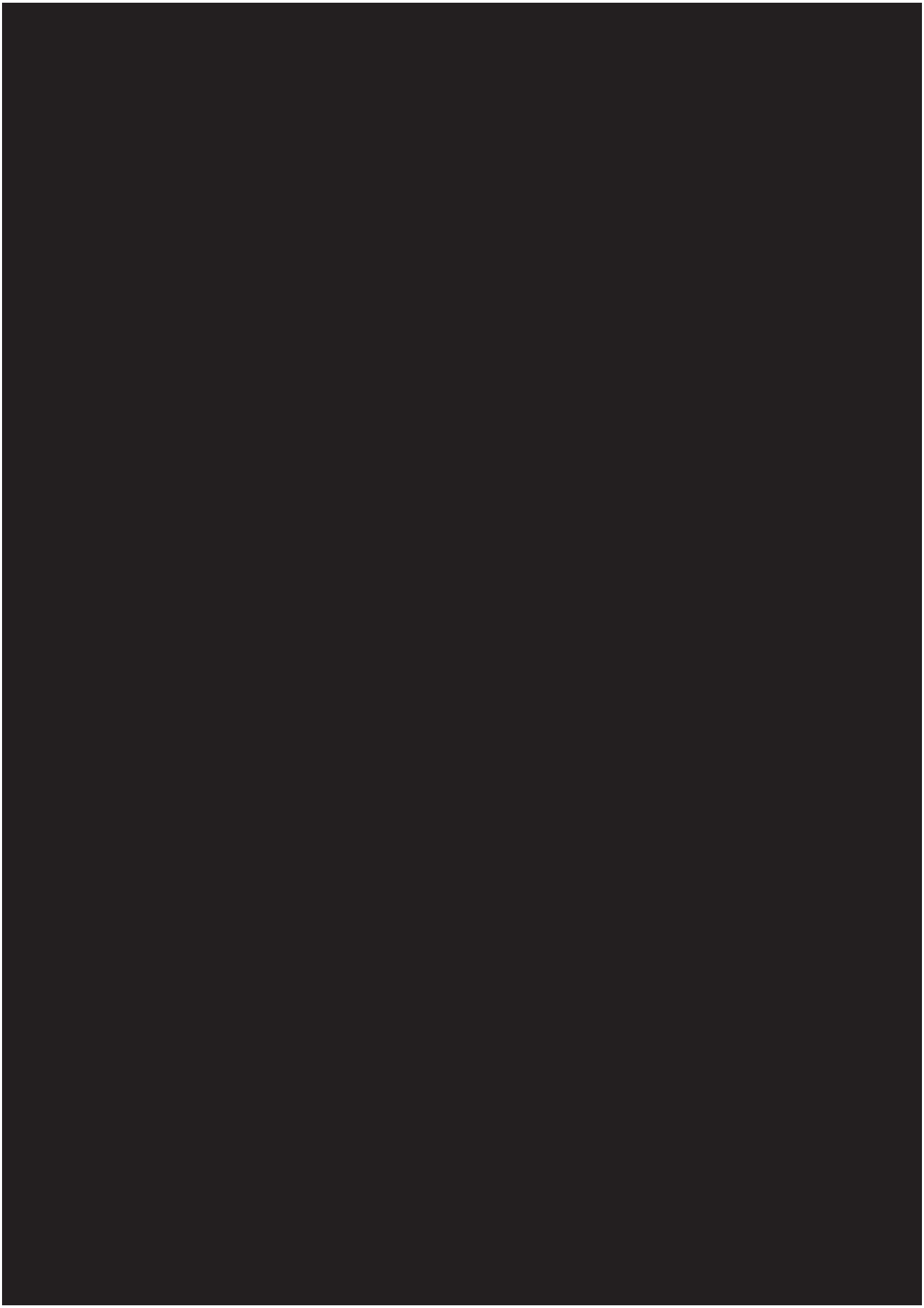
Understood and Witnessed by

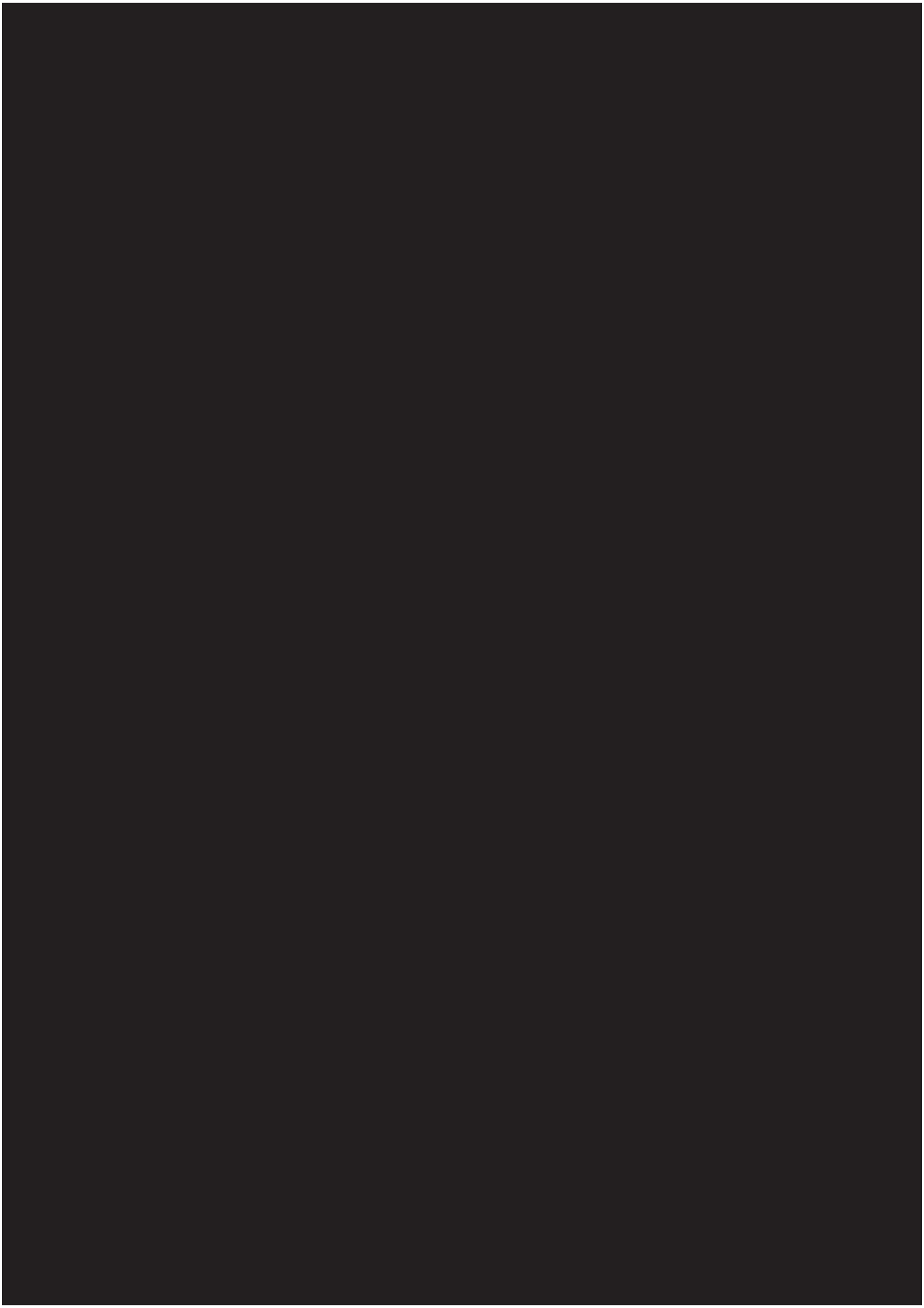
Signed 武井順子 08年 2月 15日

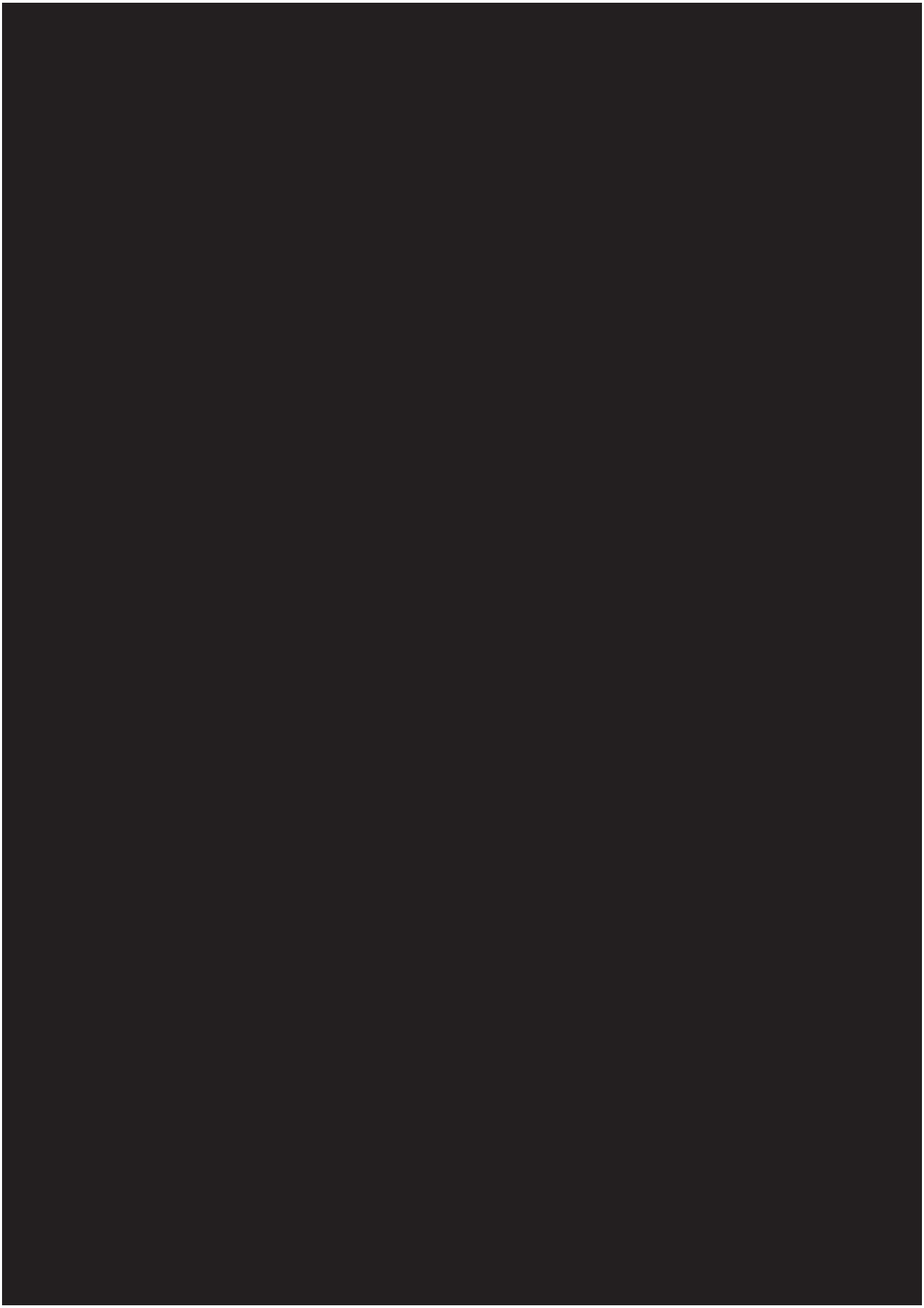
Signed 年 月 日

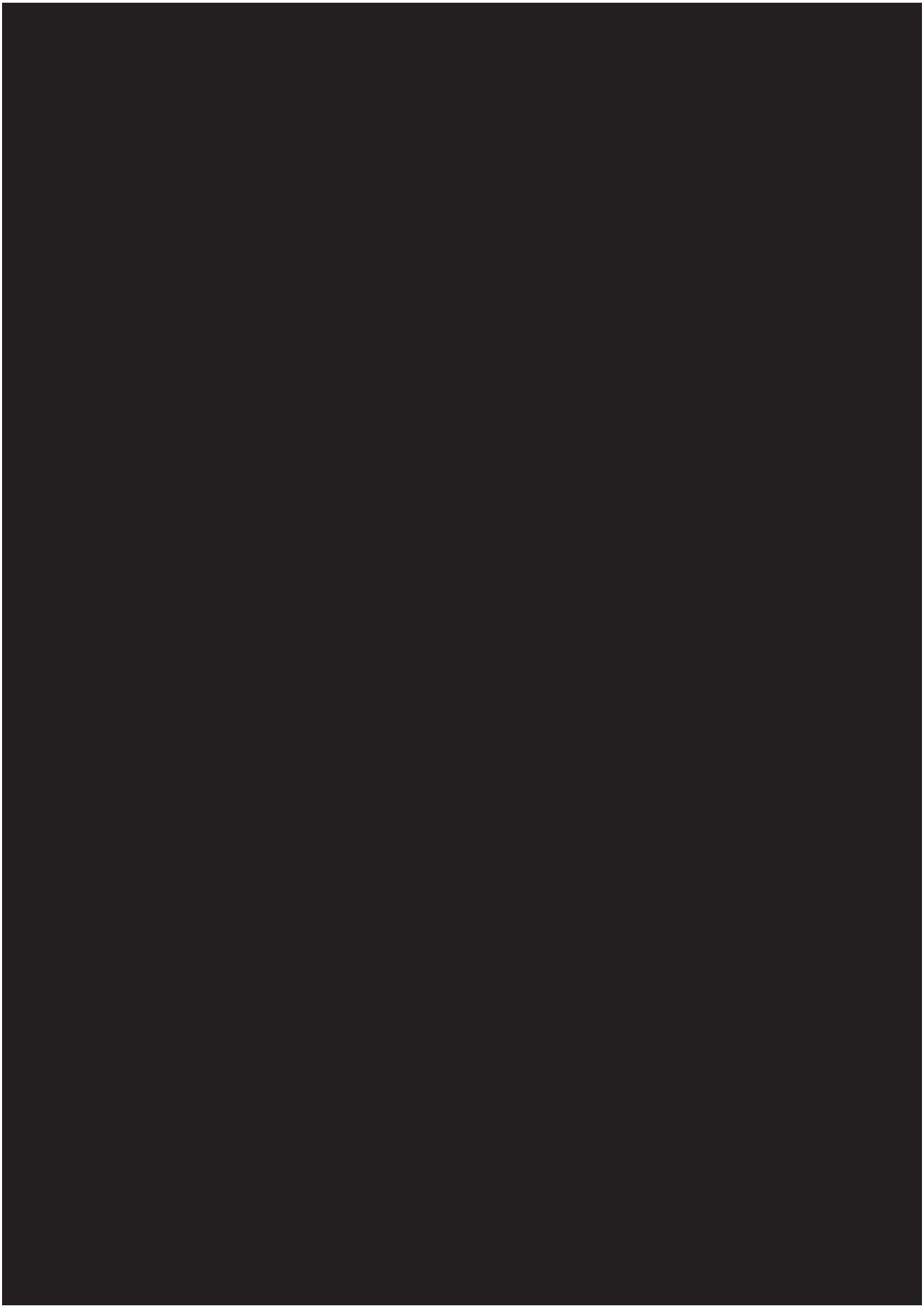


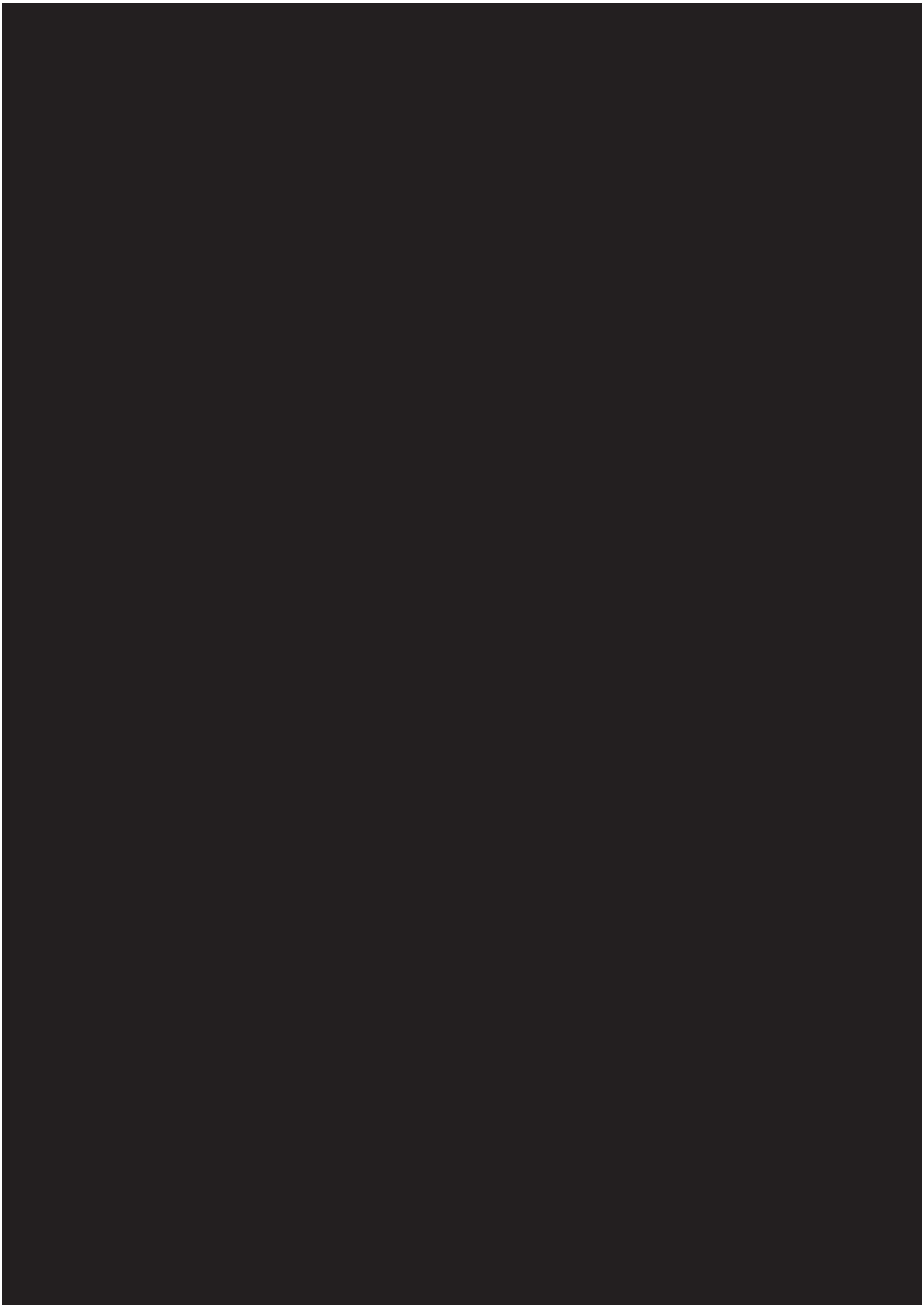


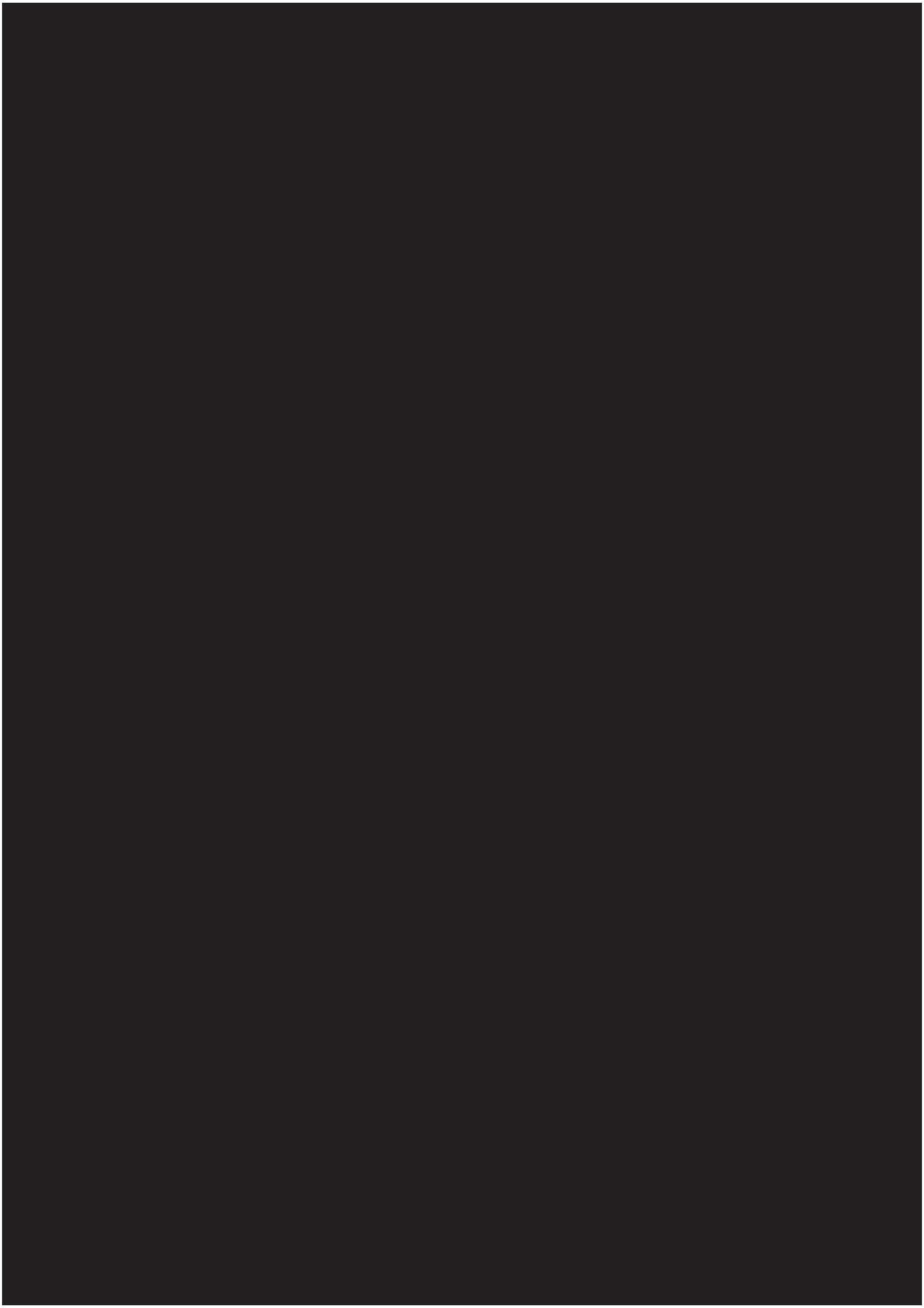












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Project プロジェクト

Subject サブジェクト

From Page No :

2008、2、12

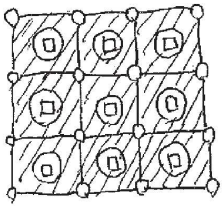
・週報会

・ダイレクトモールド 特許まとめ

2008、2、13

・ダイレクトモールド 特許まとめ

・ダイレクトモールド PKG 形状のうち合わせ (STPと)



キャビ有

キャビ無(ト)

5x5
or
3x2

↑このような183が集合した基板をLFとEMCで試作してみようということになった。

STPより2/16までに設計のスケジュールを出してもらう。

・UL試験片寸法調整とULへの送付

SCR-1012

2008、2.14

①リードフレームを成形して集合基板を作成。
アセンブリして、少なくとも1面ダイシングして作るLEDとその製造方法

②キャスター構造があるリードフレームのLED

上記出願アイデアの先行特許調査用資料作成

次回

To Page No :

(日付) Date

(発明者) Invented by 市川博史 2008年2月14日

(記入者) Recorded by 技術 08.2.16 三木 年 月 日

(証人) Understood and Witnessed by

Signed 長井秀幸 2008年2月15日

Signed 年 月 日

Notebook No : 12001637

(発明者) Invented by 市川博史 2008年2月14日

(記入者) Recorded by 年 月 日

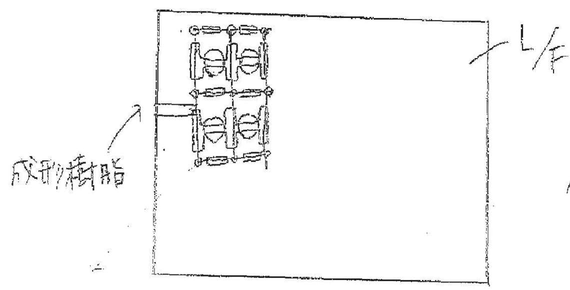
(証人) Understood and Witnessed by

Signed 長井秀幸 2008年2.15

Signed 年 月 日

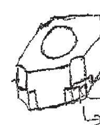
Project
プロジェクト
From P

② キャスター構造があるリードフレームのLED



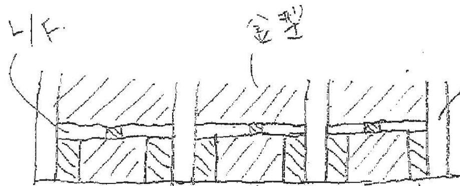
L/Fにキャスターになる穴がある

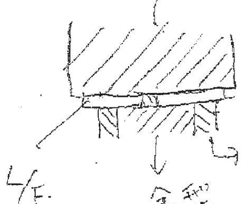
⇒ 個片化



↳端子（キャスター あり ⇒ 半田フィレットが作くれる）

但し、このタイプ^の基板~~は~~は、圧縮成形でレンズを付けること~~もできる~~ができない。





← 183とか 従来 ⇒ 金型でカットする部分が少なくする為端子を出す必要あり。⇒ ムダなスペースが必要

技術 '08.2.14 市川

技術 '08.2.16 三木

（発明者）Invented by 市川博史 2008年2月14日

（記入者）Recorded by 技術 '08.2.16 三木 年 月 日

Signed

Signed 長井 2008年2月15日

No.
Date

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Project プロジェクト	Subject サブジェクト

From Page No :

・来客.
ロームアンドハース.
日亜アメリカ経由で過去紹介があった。
改めて、封止樹脂のプレゼンあり。
アクリルで有名. ポリマー、モノマーともあり.
2006年 83億 US ドル売り上げ
変わったところでは、塩だけで1000億円の売り上げあり
高屈折率 1.60 と1.57のシリコーン系の樹脂の紹介あり.
日亜から、Oシリコーンの変性方法.
③シリコーン原材料などの段階で入手
②特ちょう
④ ダウの JCR との比較データ. 水蒸気透過率
低分子シロキサン量等のデータ
~~等~~ 等依頼した。
この材料の市場での実績なし。
NDA (案) と日本語訳を提出してもらう。

・日立化成の成形材料の耐光(熱)性試験用 ref. 作成'
NS104-2. (Lot S1482E-0314)
100°C X 3hr + 150°C X 4hr
OE-6340 (Lot 000501675 1)
083の硬化条件で

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(発明者) Invented by	(日付) Date	(証人) Understood and Witnessed by	(日付) Date
市川博史	2008年2月14日	Signed 長井秀幸	2008年2月15日
(記入者) Recorded by 技術 08.2.15	年 月 日	Signed	年 月 日

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Project プロジェクト	Subject サブジェクト

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2008. 2. 15

、旭化成の成形材料 耐熱 耐光性 試験 ref. 作成

9ZR

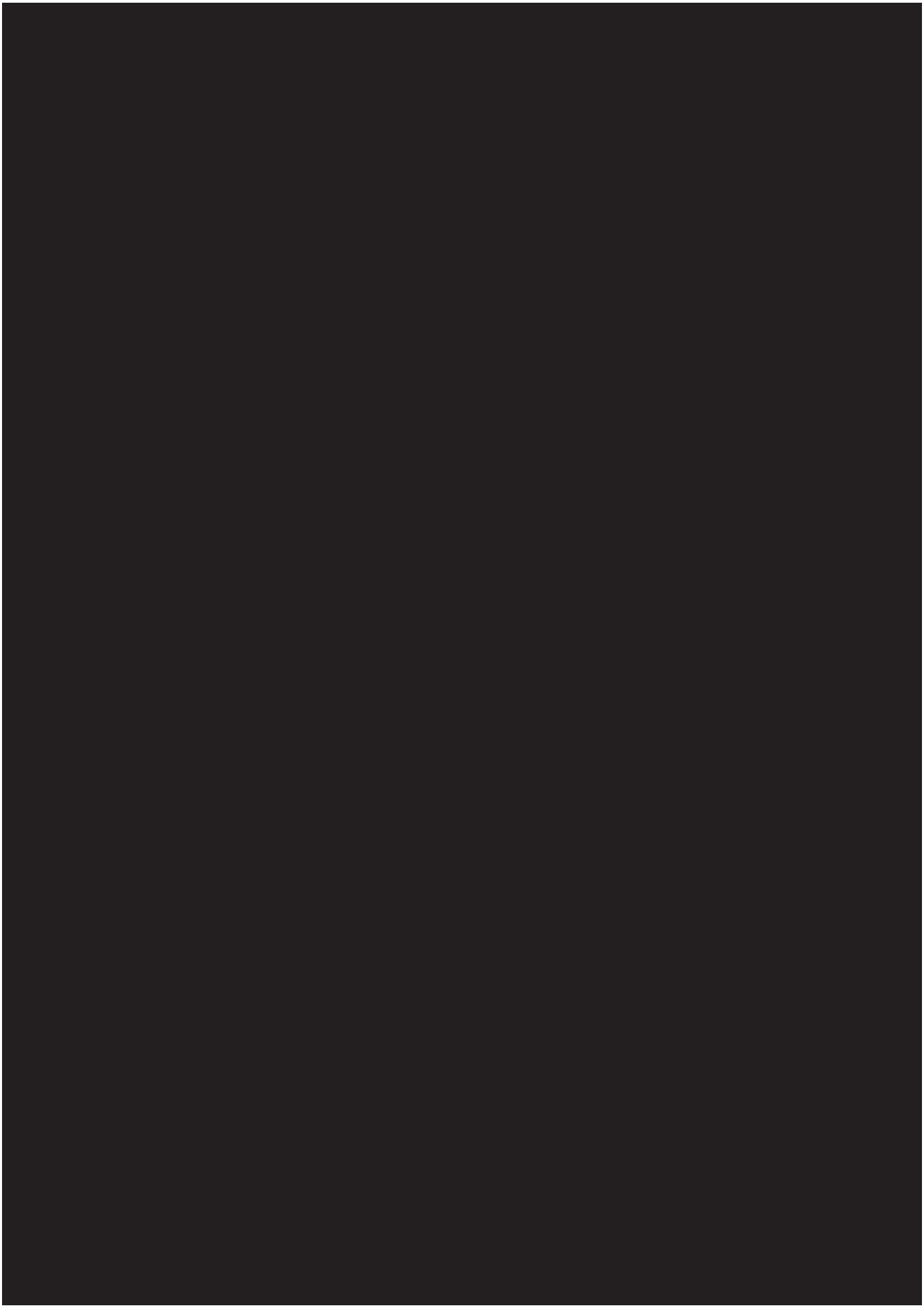
FSX X0510

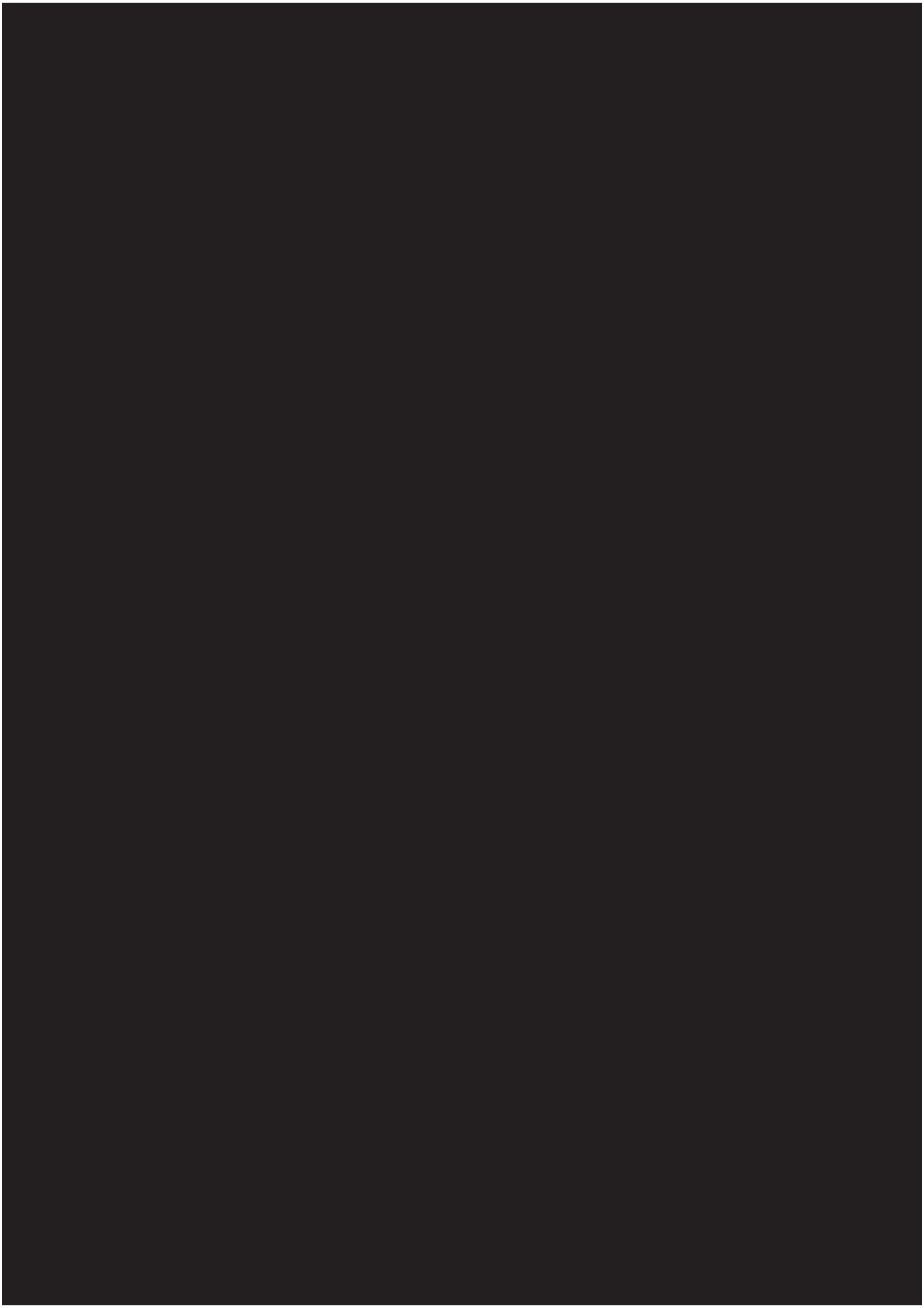
、インストロン 高温引張試験の為の装置対応
(K社)
向け

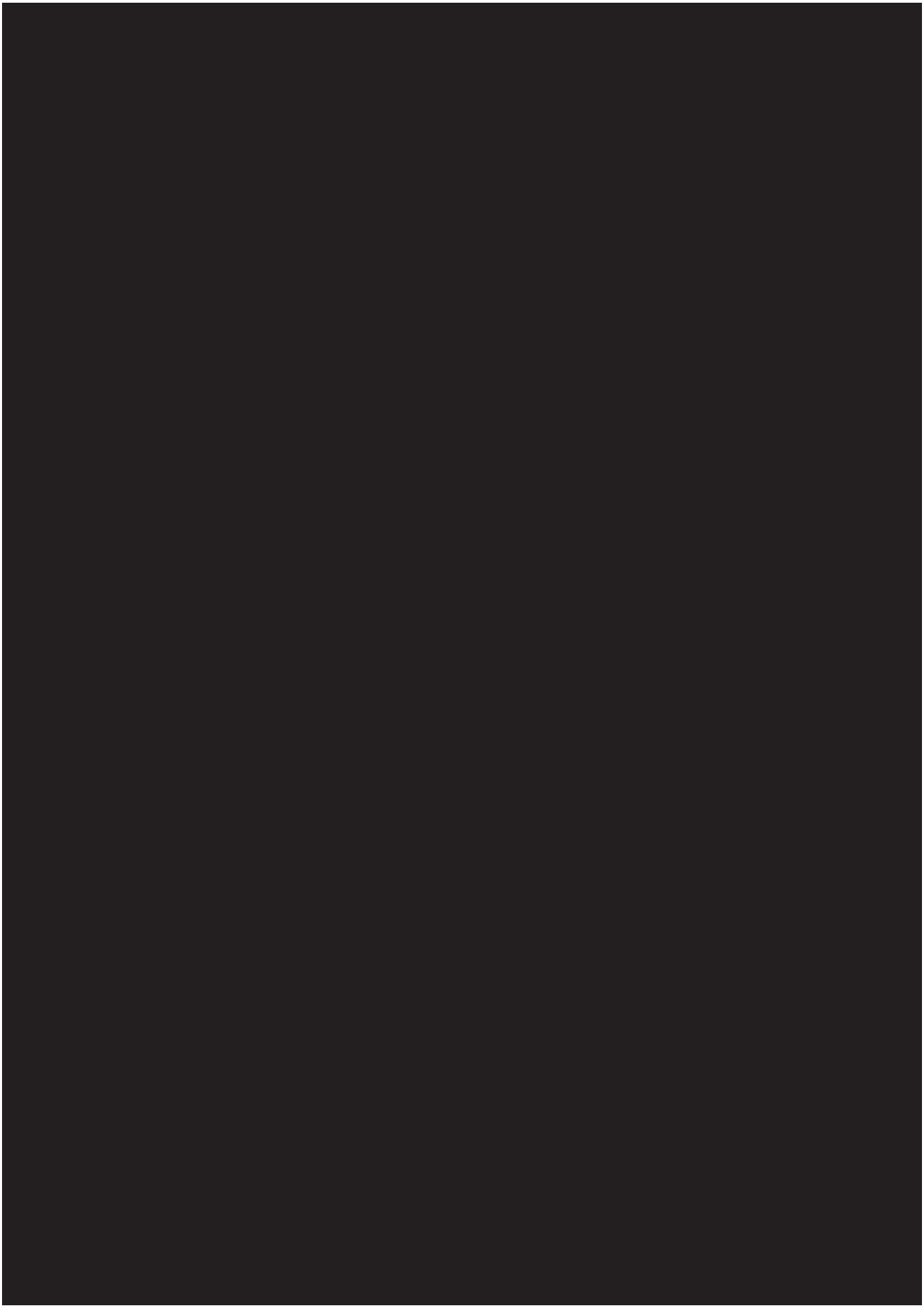
、IPに前日の特許アイデアの先行技術の調査依頼にいく。

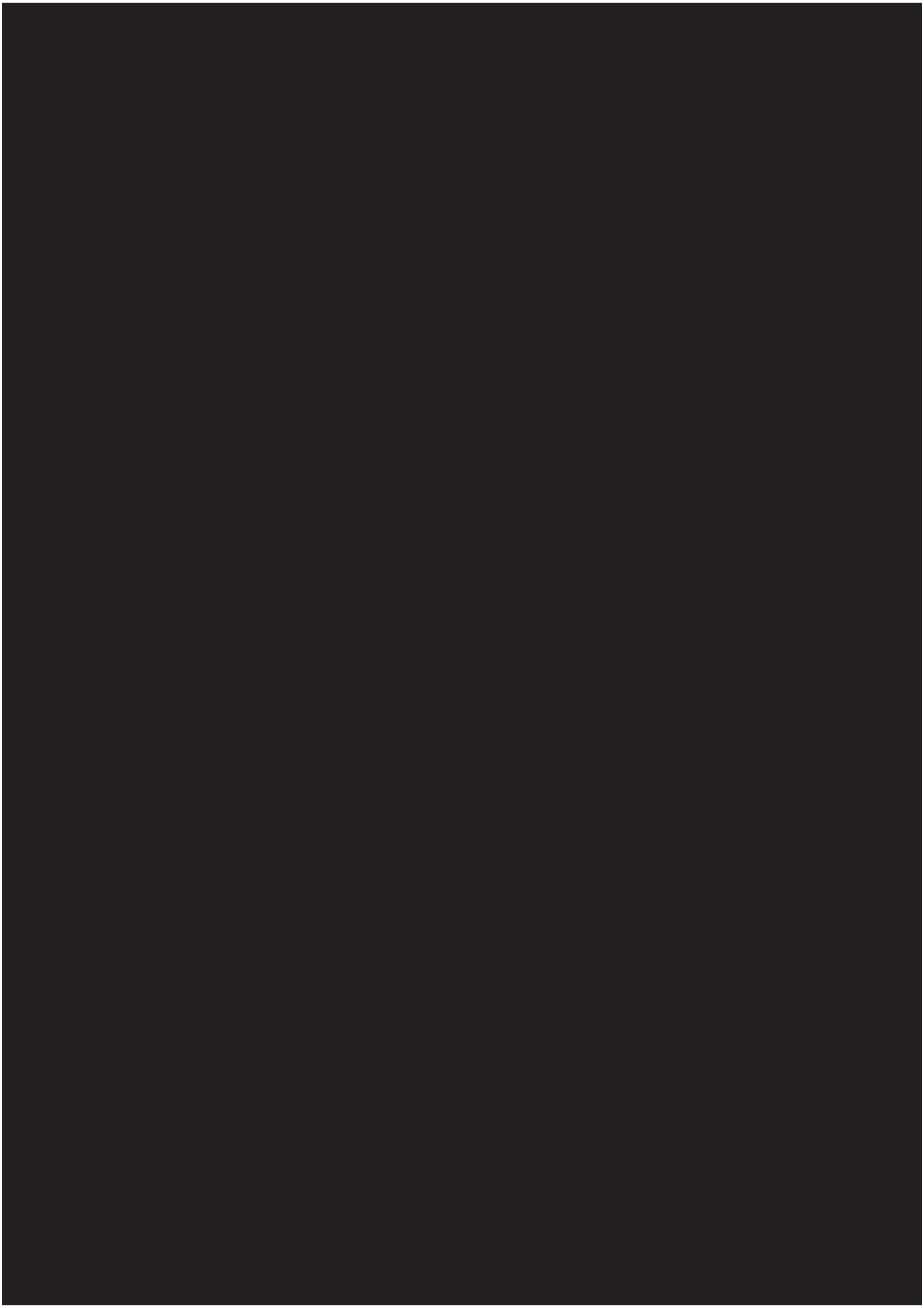
To Page No :

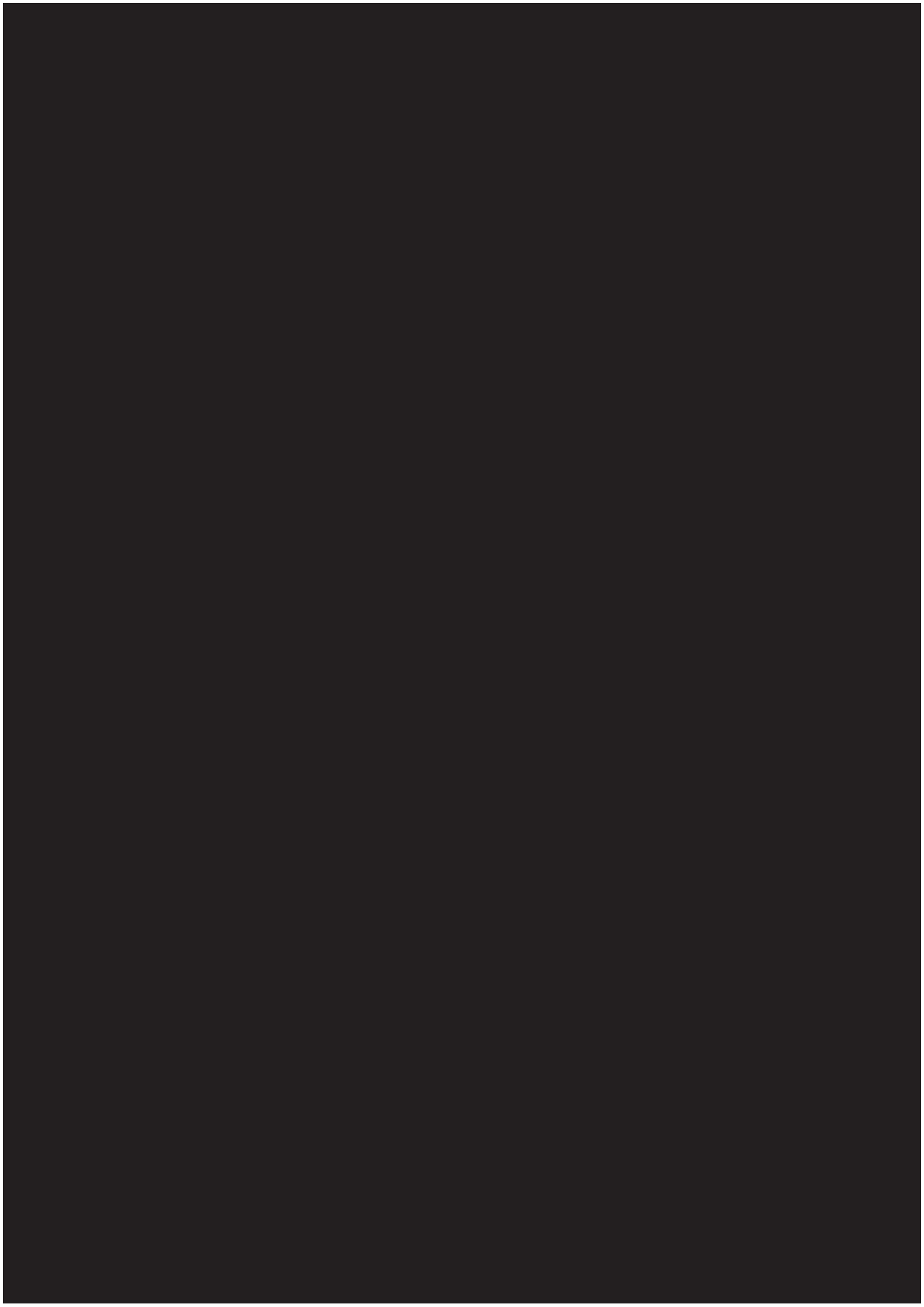
(発明者) Invented by	市川 博史	(日付) Date 2008年2月15日	(証人) Understood and Witnessed by Signed	長井 [illegible]	(日付) Date 2008年2月15日
(記入者) Recorded by	技術 '08.2.16 三木	年 月 日	Signed		年 月 日

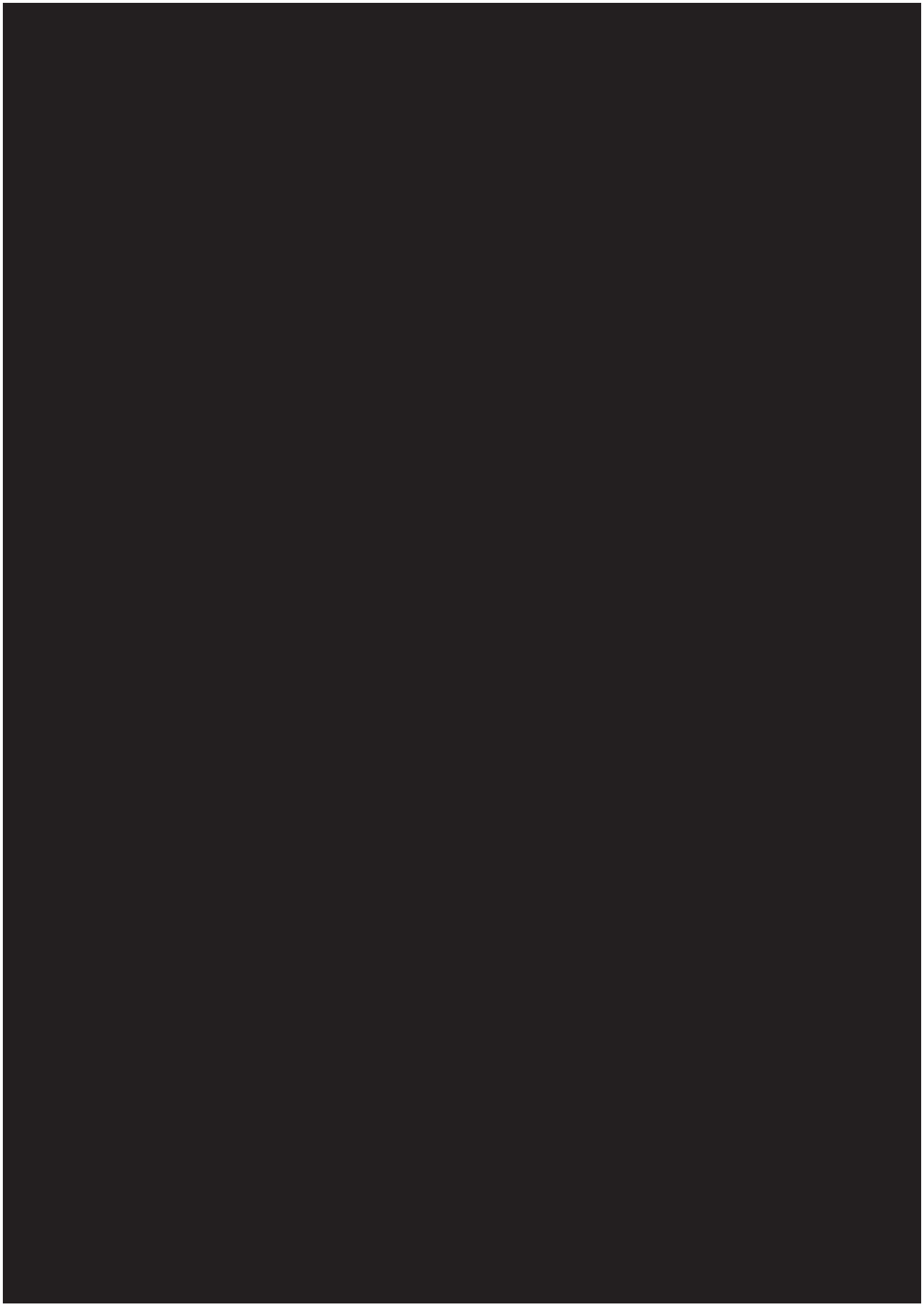


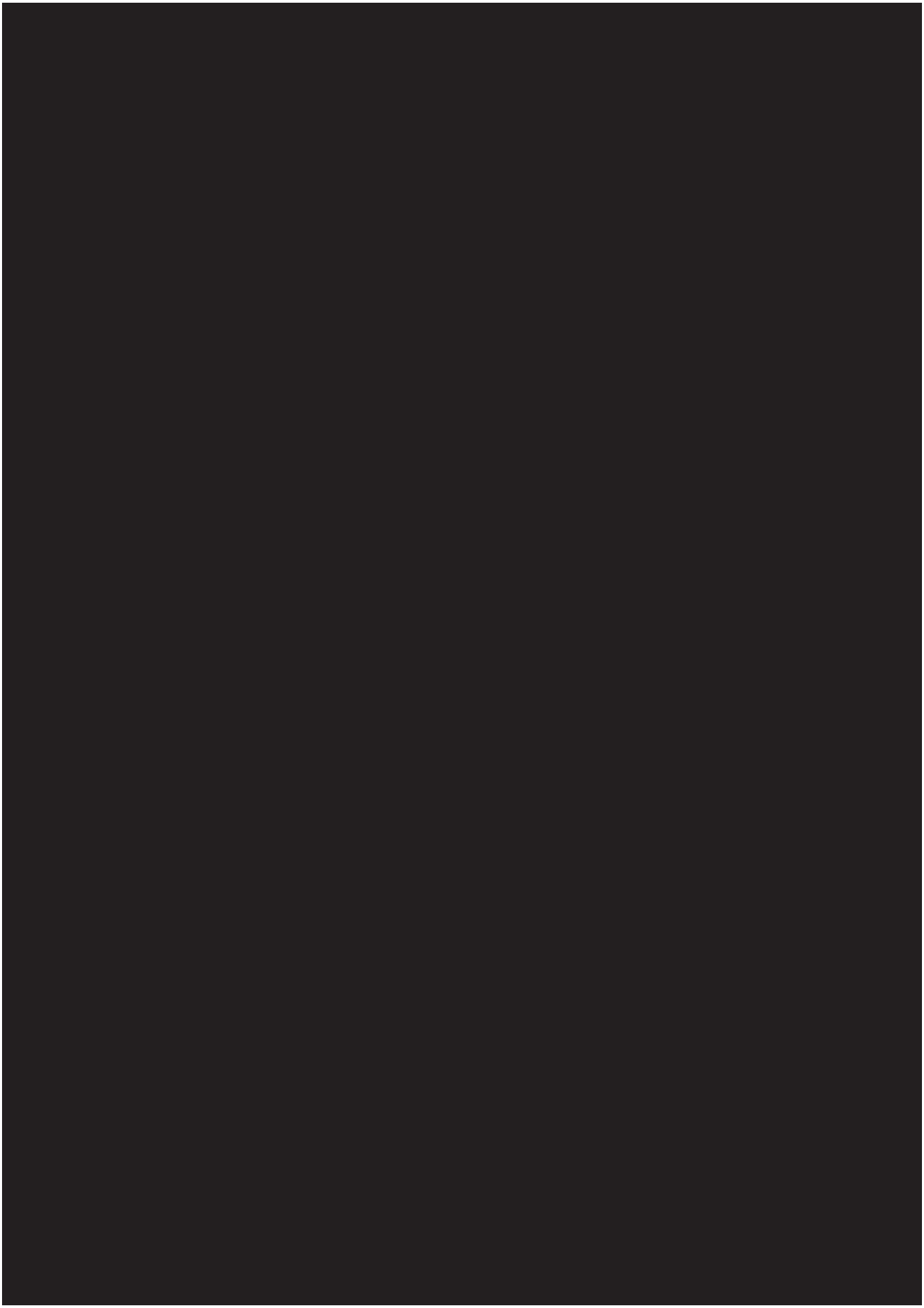


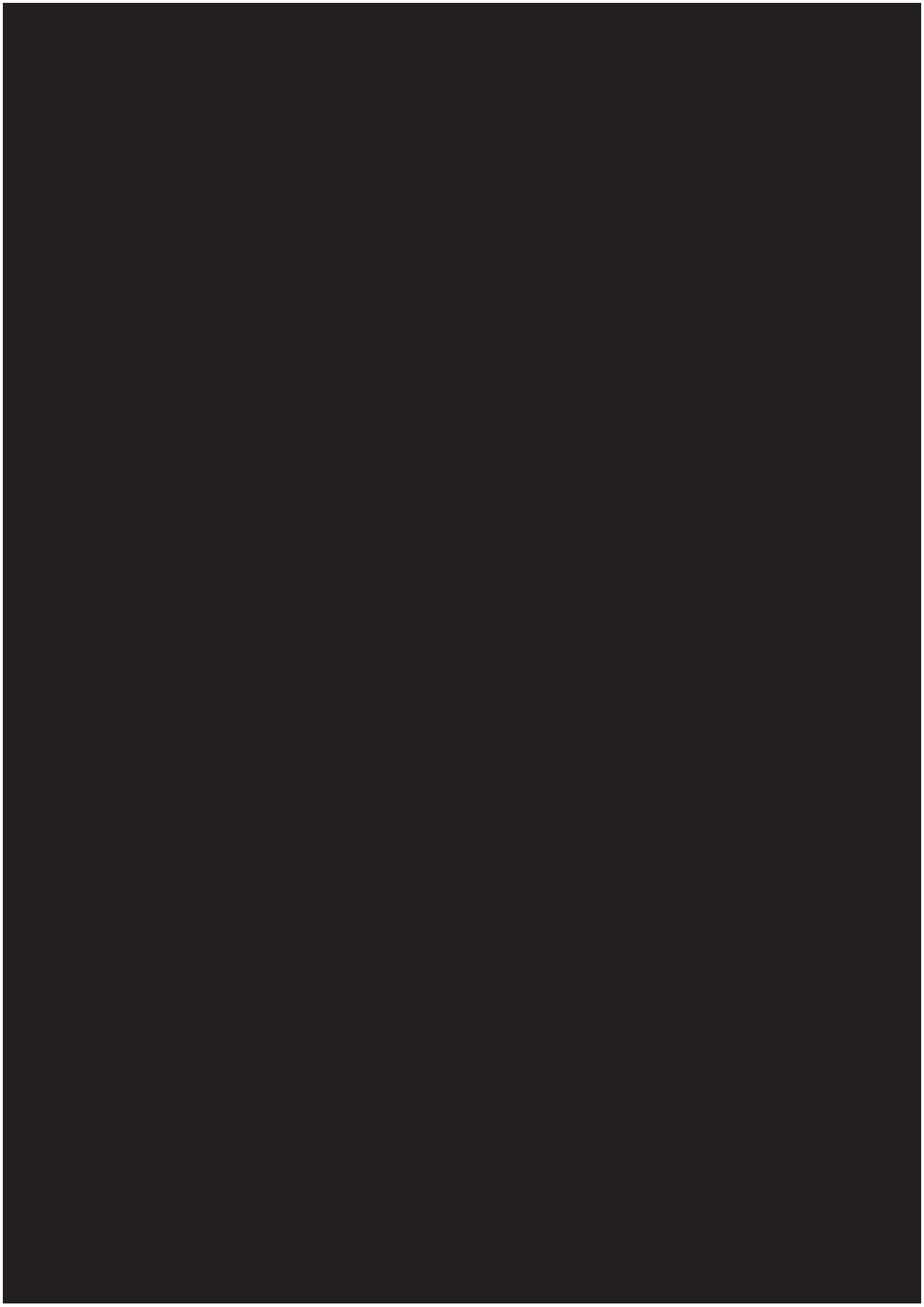


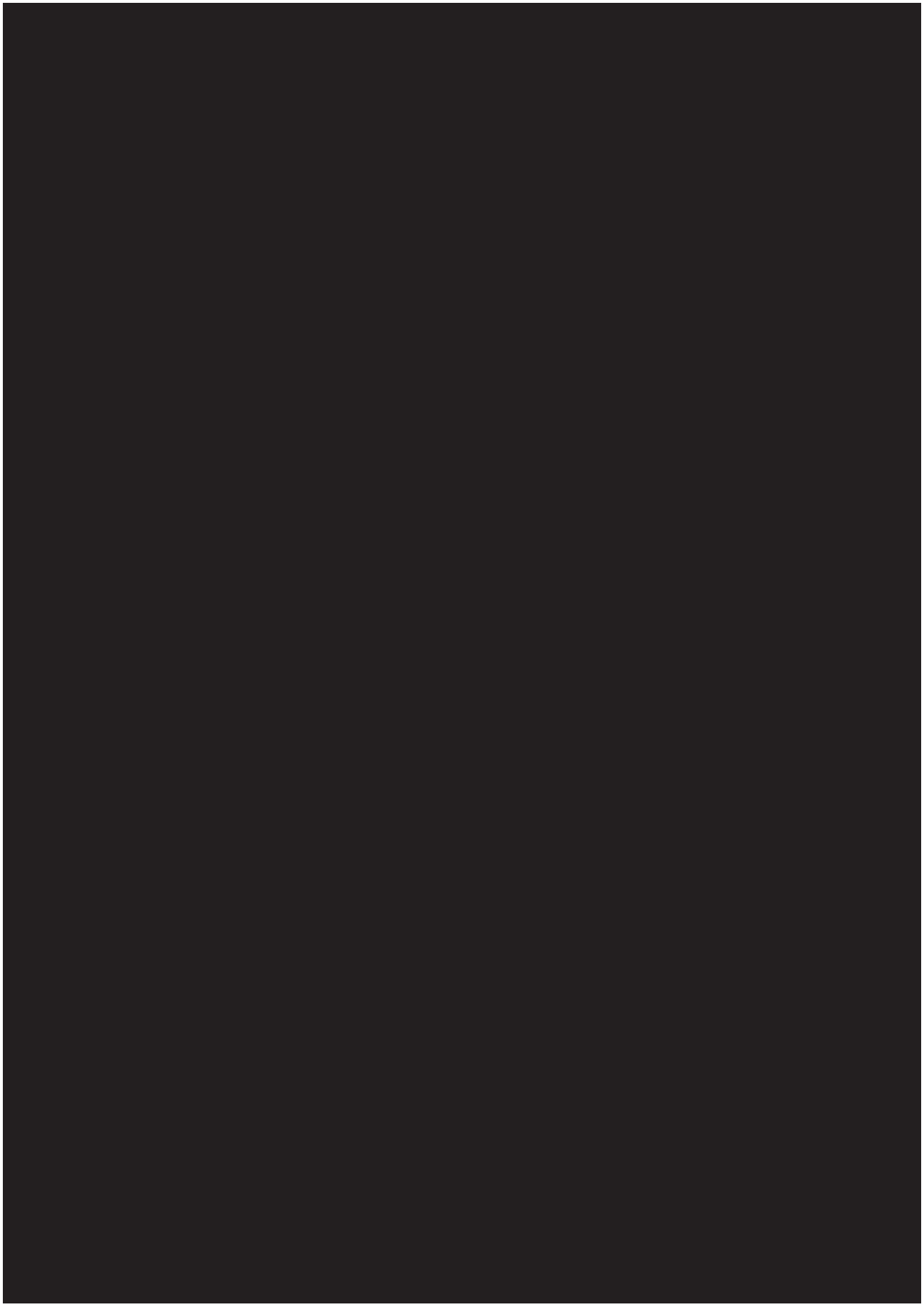


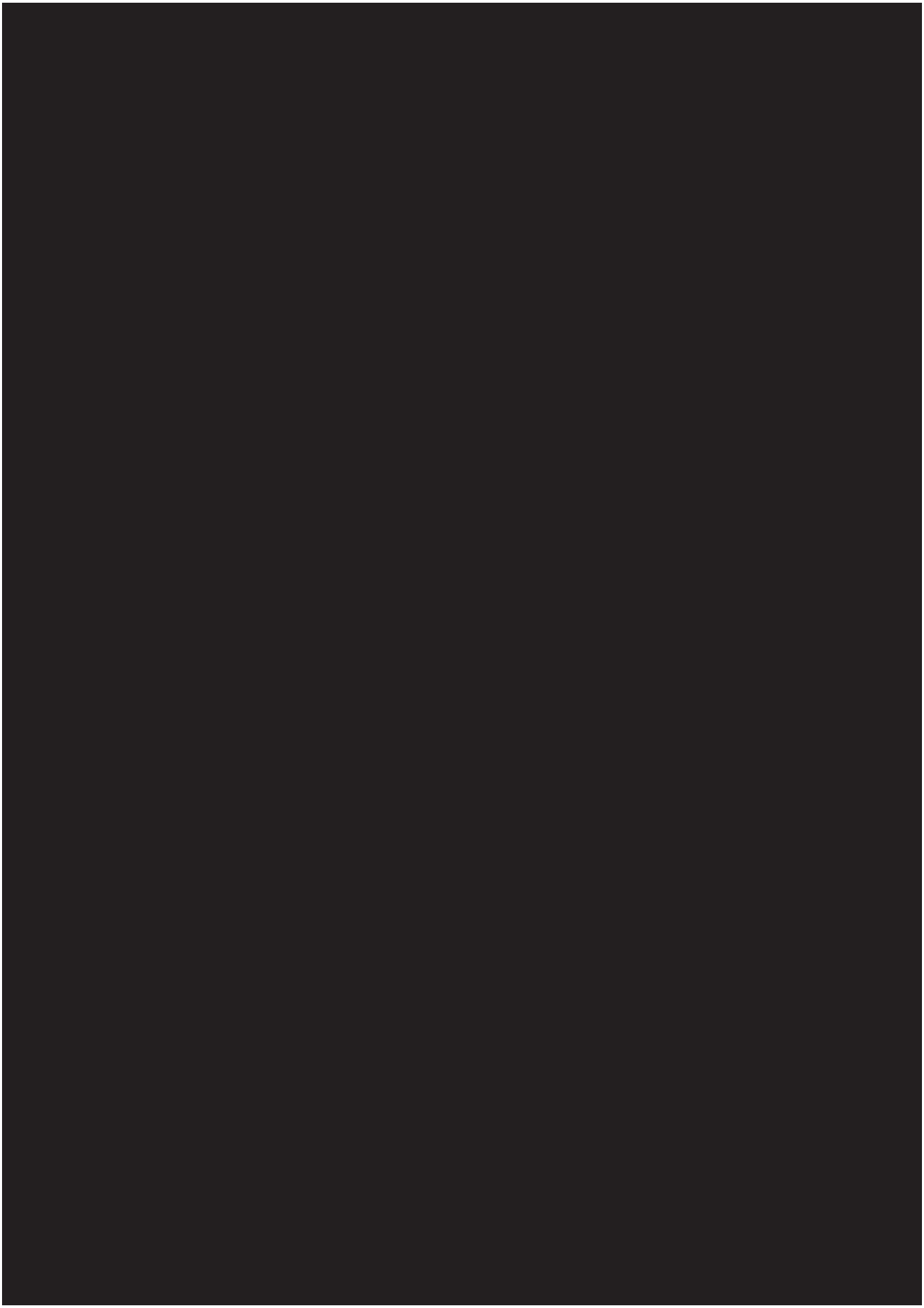


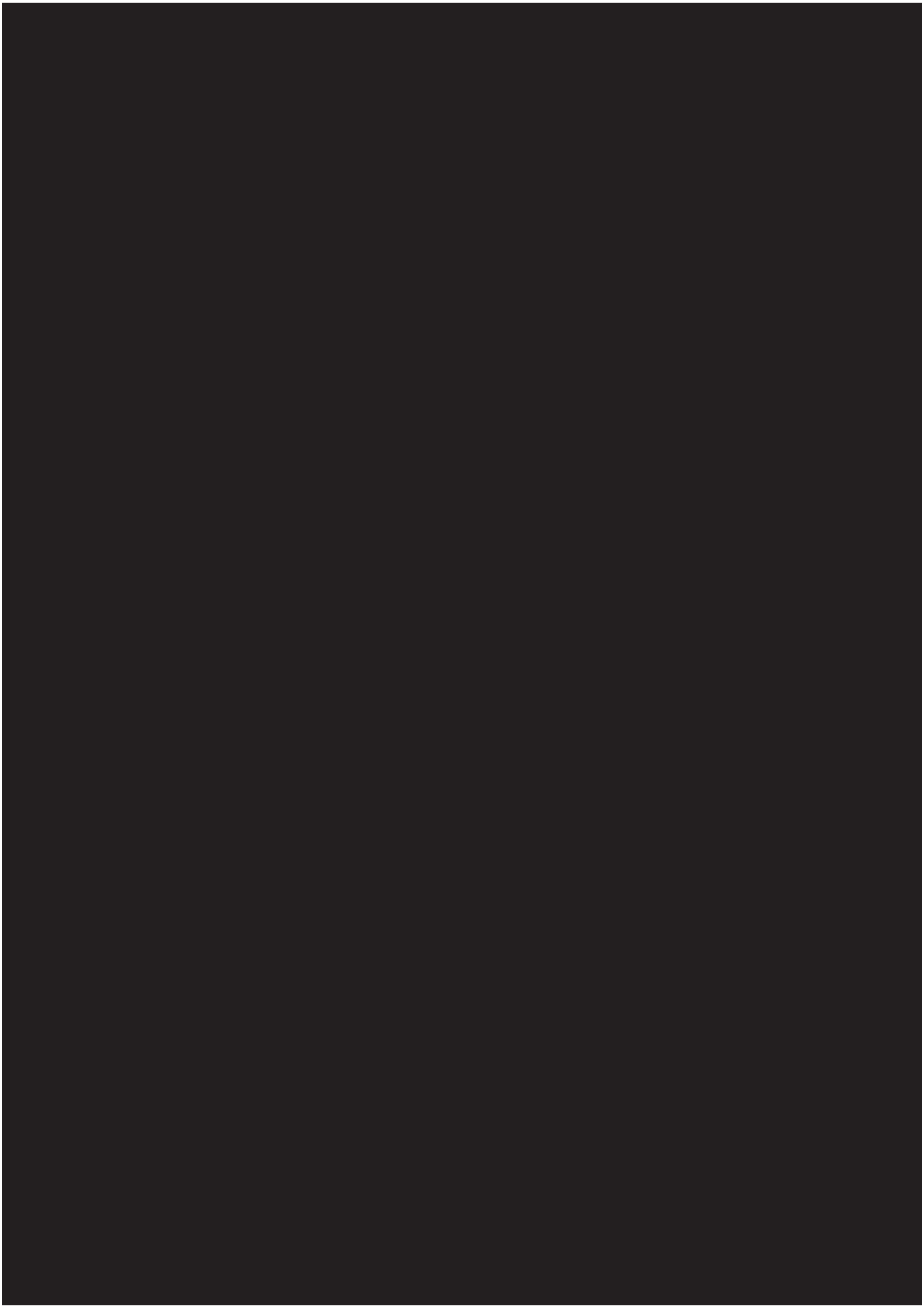


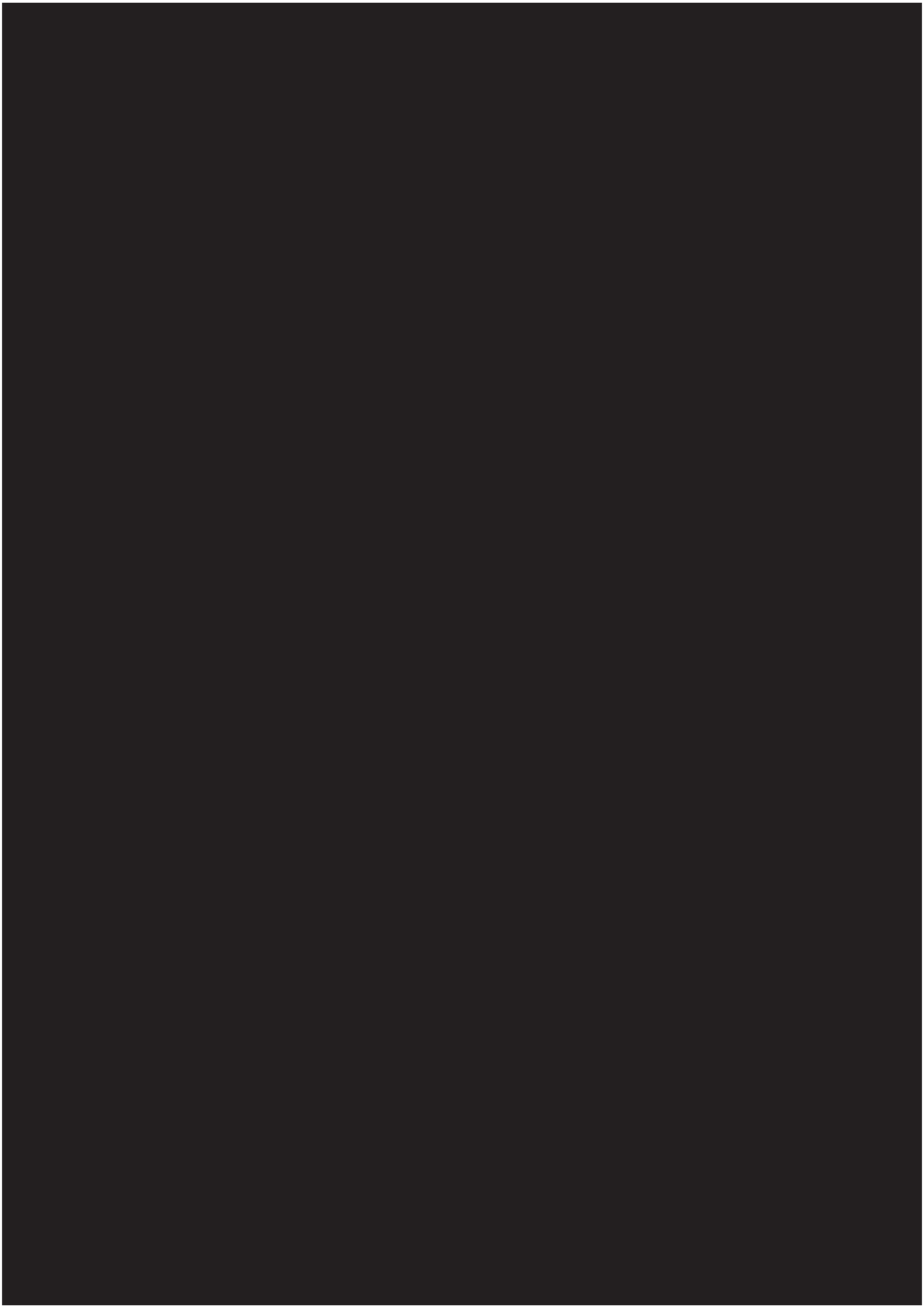


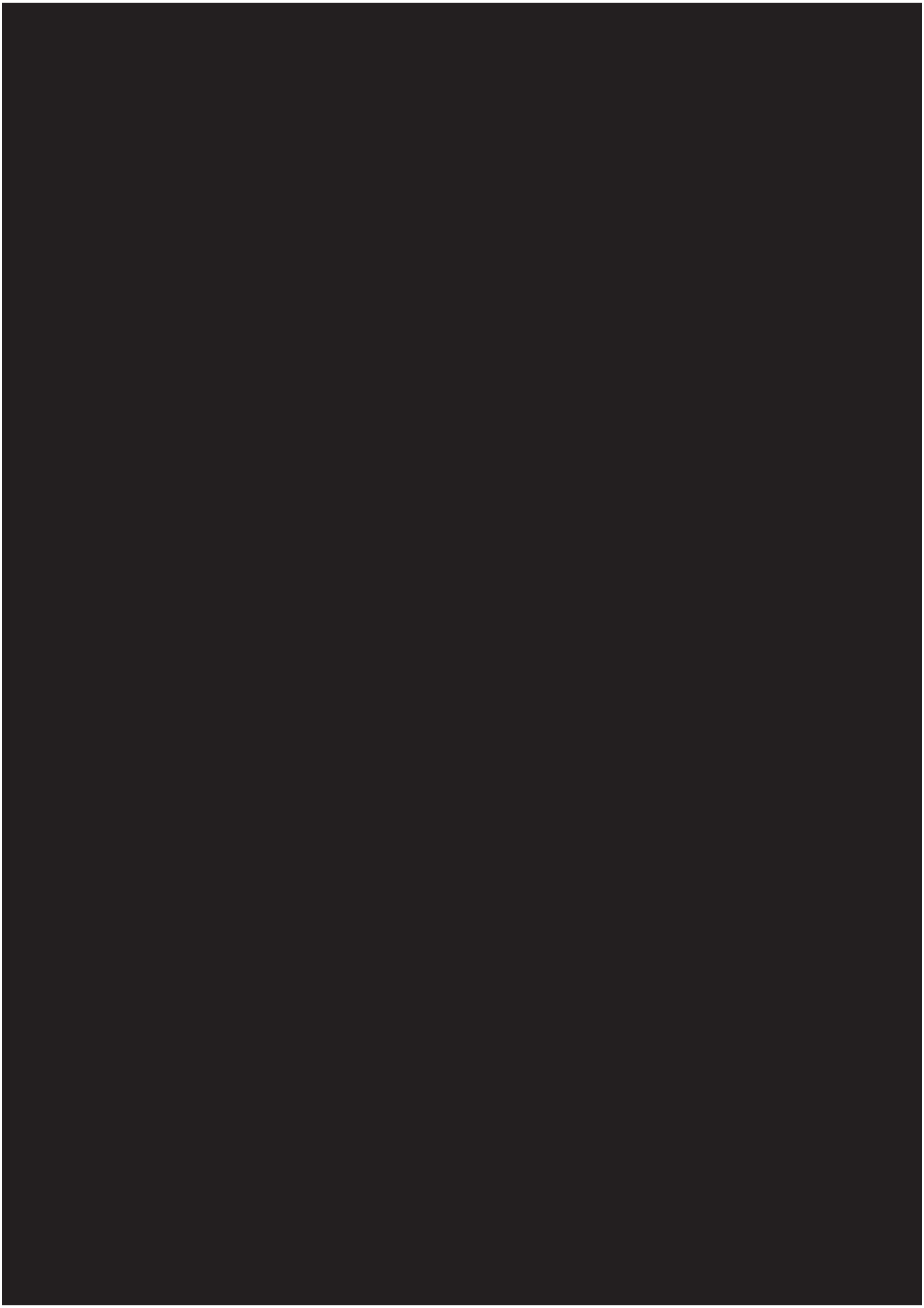


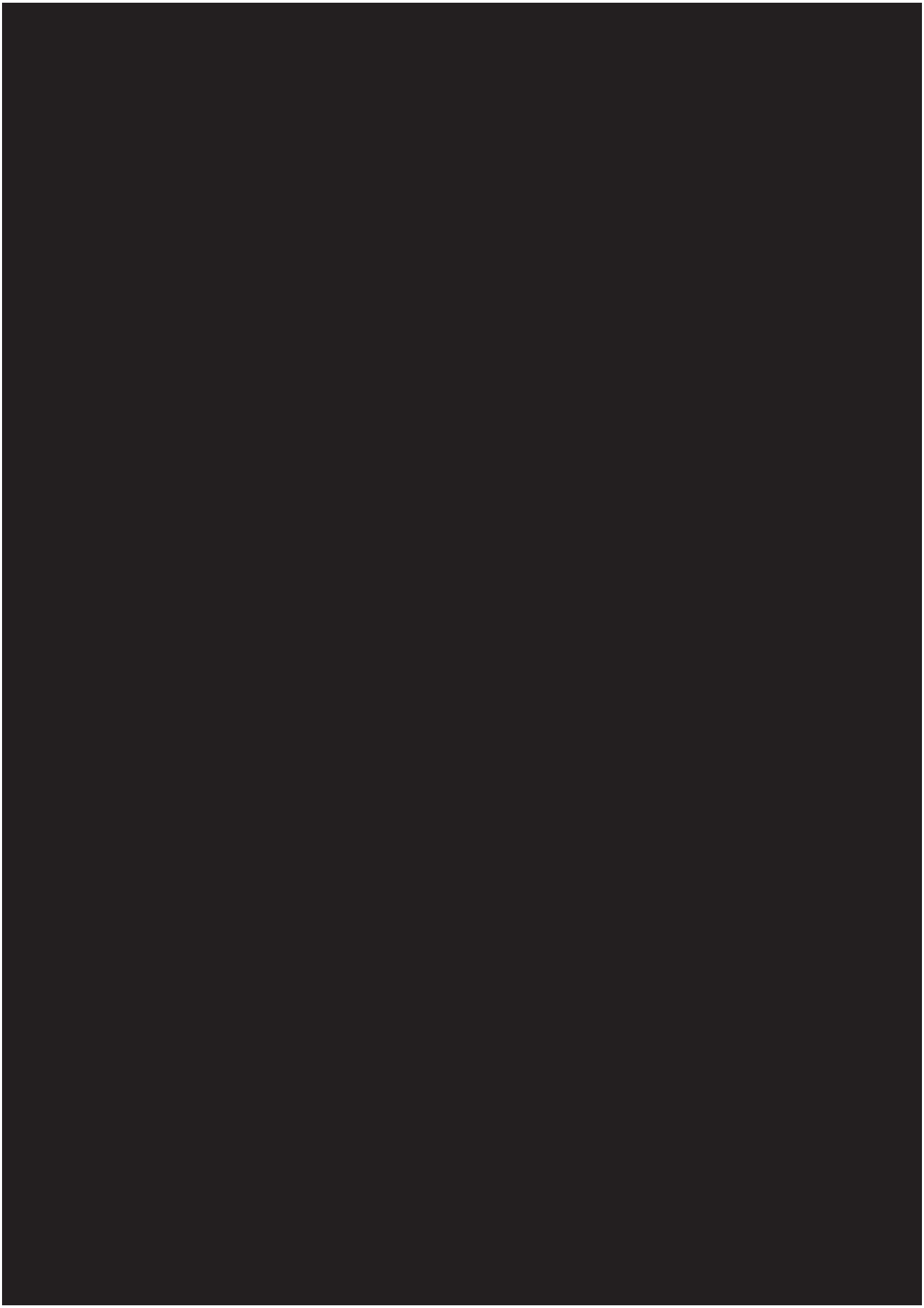


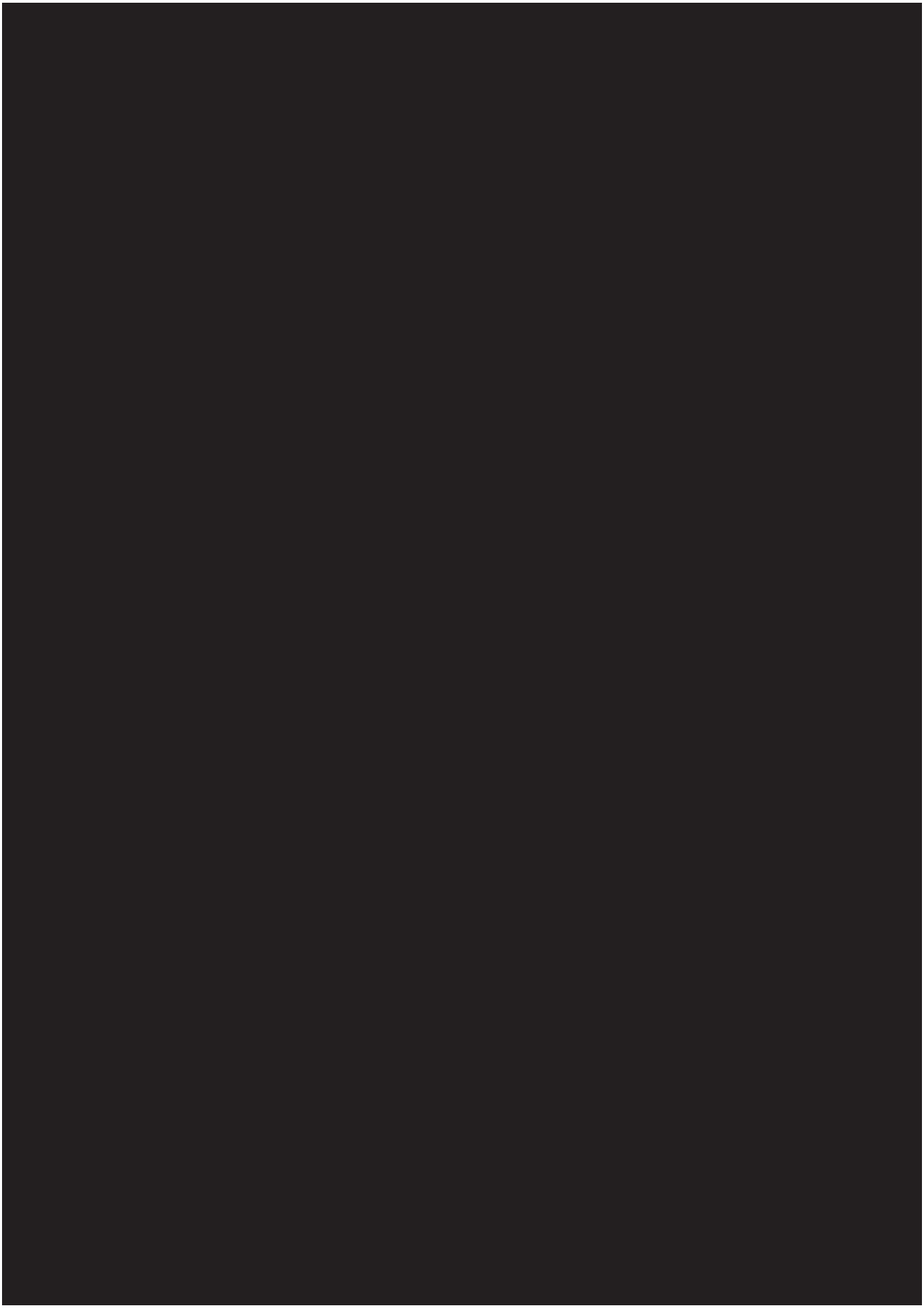


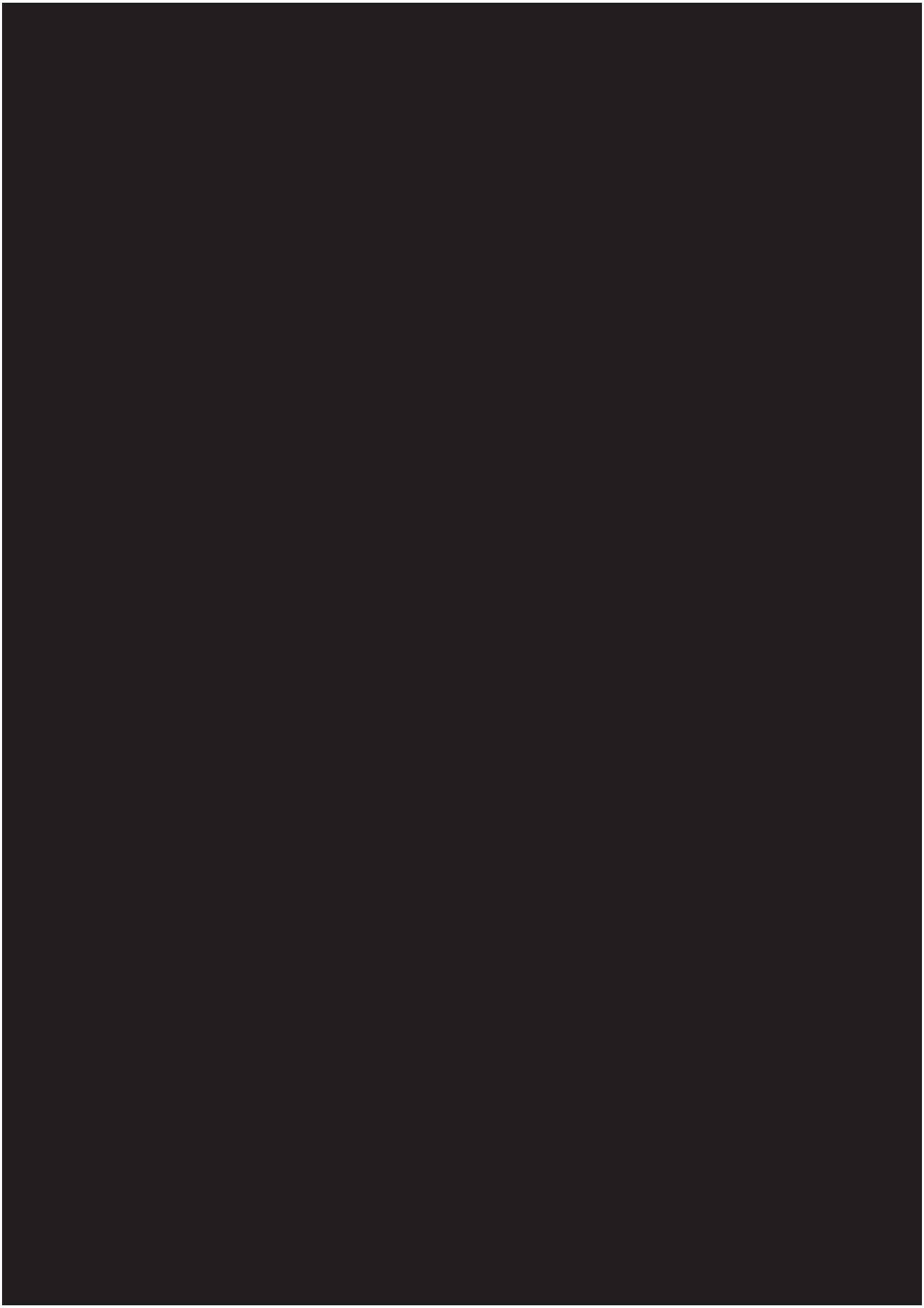


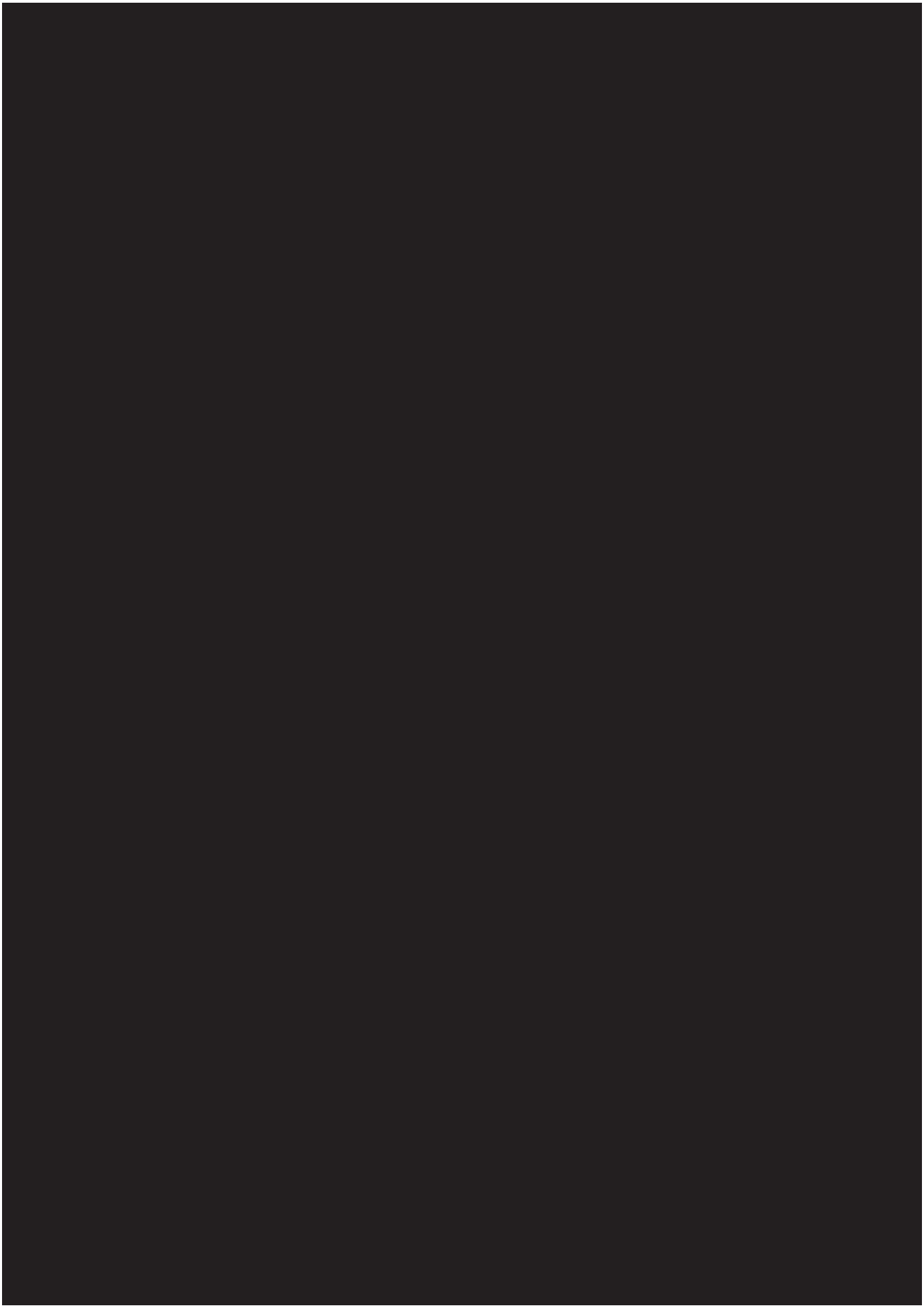


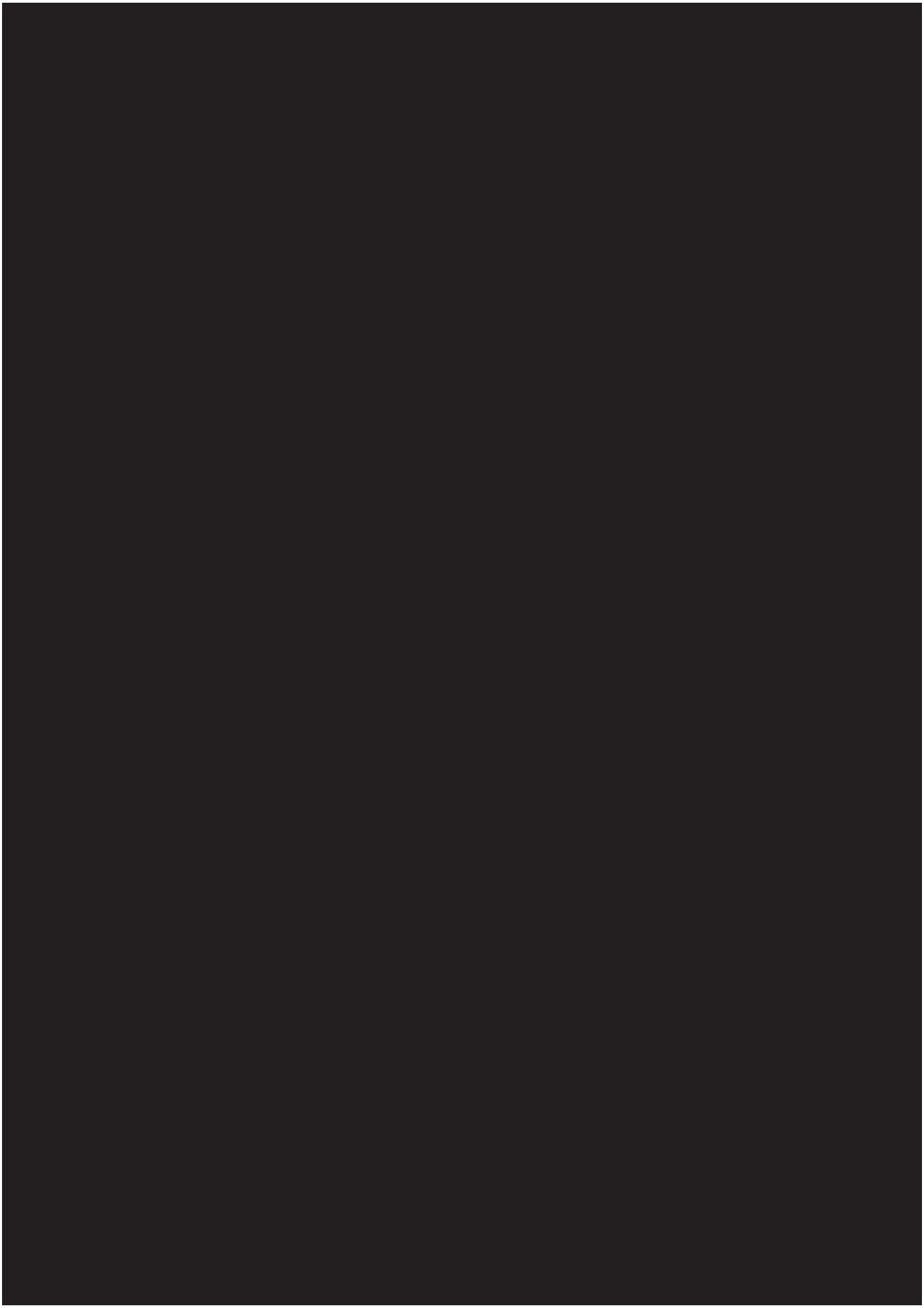












Notebook No : 12001637 Date 年 月 日

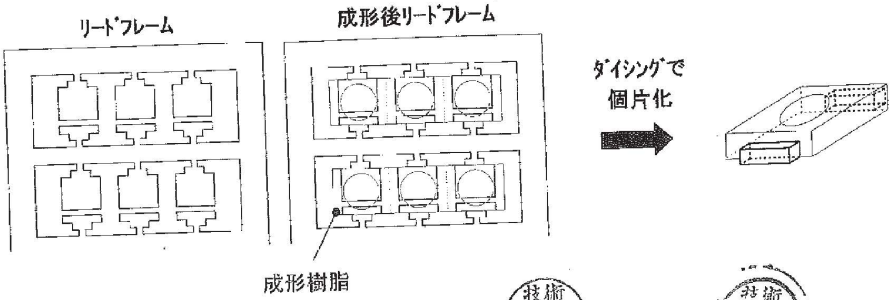
Project プロジェクト | Subject サブジェクト

From Page No : EMC 集合基板 特許特徴まとめ

技術 '08.3.09 市川

特徴

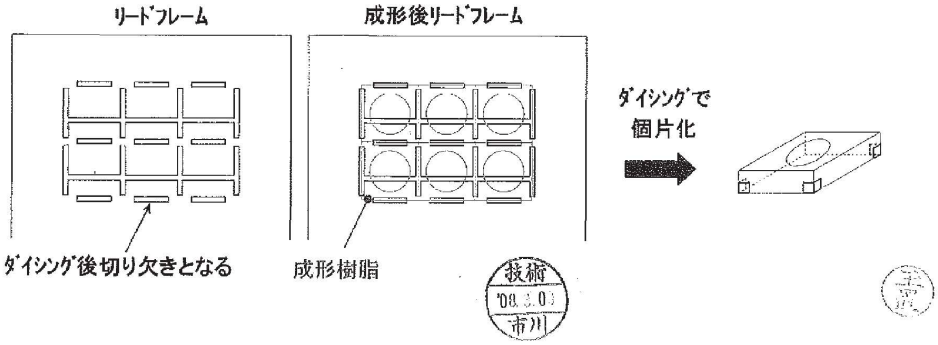
①. 取り個数を増やす為に、リードフレームに樹脂成形したハウジングの集合体に、ダイボンディング、ワイヤボンディング、樹脂封止し、少なくともハウジングの1面をダイシングにより 個片化して作ることを特徴とするLEDとその製造方法



技術 '08.3.10 市川

技術 3.10 三木

②. ①の取り個数を更に増やす為、ハウジングを2次元に集合させた基板に、ダイボンディング、ワイヤーボンディング、樹脂封止し、ダイシングにより個片化して 作ることを特徴とするLEDとその製造方法。リードフレームには成形樹脂との密着性を向上させる為の切り欠きを設けている。



技術 '08.3.03 市川

To Page No :

(発明者) Invented by	(日付) Date	(証人) Understood and Witnessed by	(日付) Date
市川博史	2008年3月9日	Signed	年 月 日
(記入者) Recorded by 技術 '08.3.10 三木	年 月 日	Signed	年 月 日

Project プロジェクト | Subject サブジェクト

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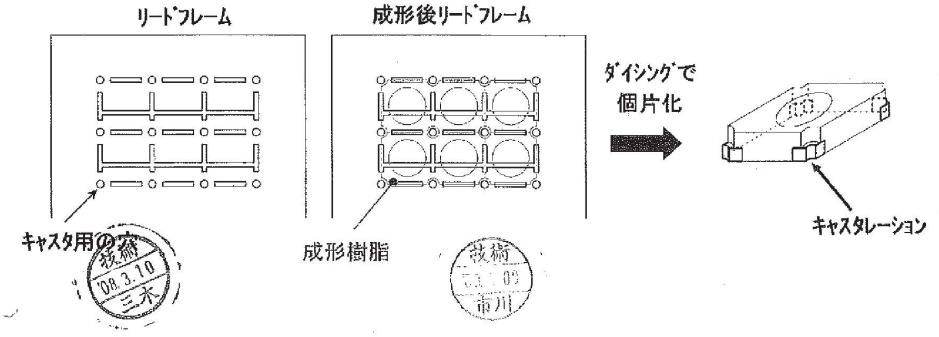
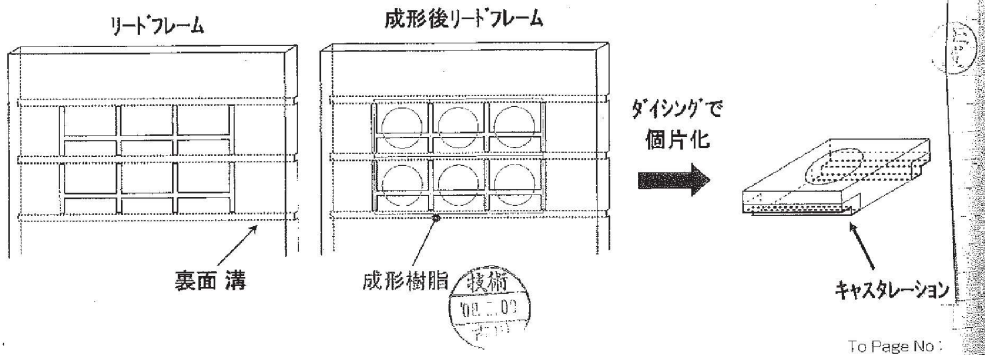
③. ②のLEDのリードの側面部は全てメッキ面ではなく、Cu等母材の切断面が露出するため、酸化され易い。従って、ハンダ濡れが悪く接合信頼性が低い。それを改良するため、個片化後キャスタレーションになるメッキの施された穴のあるリードフレームを使用すると、キャスタレーション部はメッキ面の為酸化されにくく、接合信頼性を向上させることができる。



④. 個片化後、キャスタレーションとなるメッキの施された、裏面に溝のあるリードフレームを使用すると、③と同様の効果が得られる。



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(発明者) Invented by 市川博史 (日付) Date 2008年 3月 9日

(記入者) Recorded by 三木 (日付) Date 年 月 日

(証人) Understood and Witnessed by

Signed (日付) Date 年 月 日

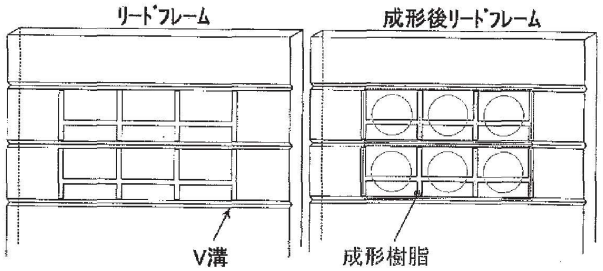
Signed (日付) Date 年 月 日

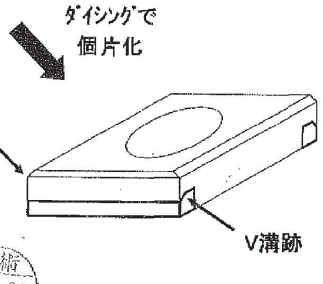
Notebook No : 12001637 Date 年 月 日

Project プロジェクト | Subject サブジェクト

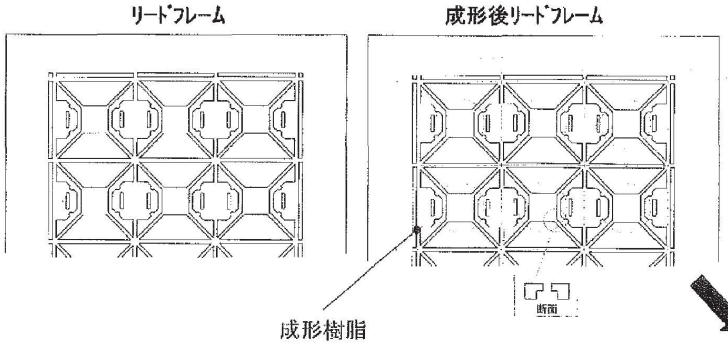
Fror

⑤. ①②③④は、ﾀﾞｲｼﾝｸﾞする厚みを薄くし加工を容易にするため、ﾘｰﾄﾞﾌﾚｰﾑ、成形樹脂に溝を設けてもよい（例えばV溝）。





⑥. ﾀﾞｲｼﾝｸﾞ時のﾌﾞﾚｰﾄﾞ振れを抑制するために、ﾀﾞｲｼﾝｸﾞﾗｲﾝにﾌﾚｰﾑを残した構造をとる。かつ、成形樹脂との密着性向上のため、ﾌﾚｰﾑには、段付き形状、ホール、切り欠きなどを設けている。ﾀﾞｲｼﾝｸﾞﾗｲﾝ上のﾌﾚｰﾑは、ﾀﾞｲｼﾝｸﾞ時に切り代となり、個片化すると無くなる。個片化後のLEDは、端子を2個以上有する。



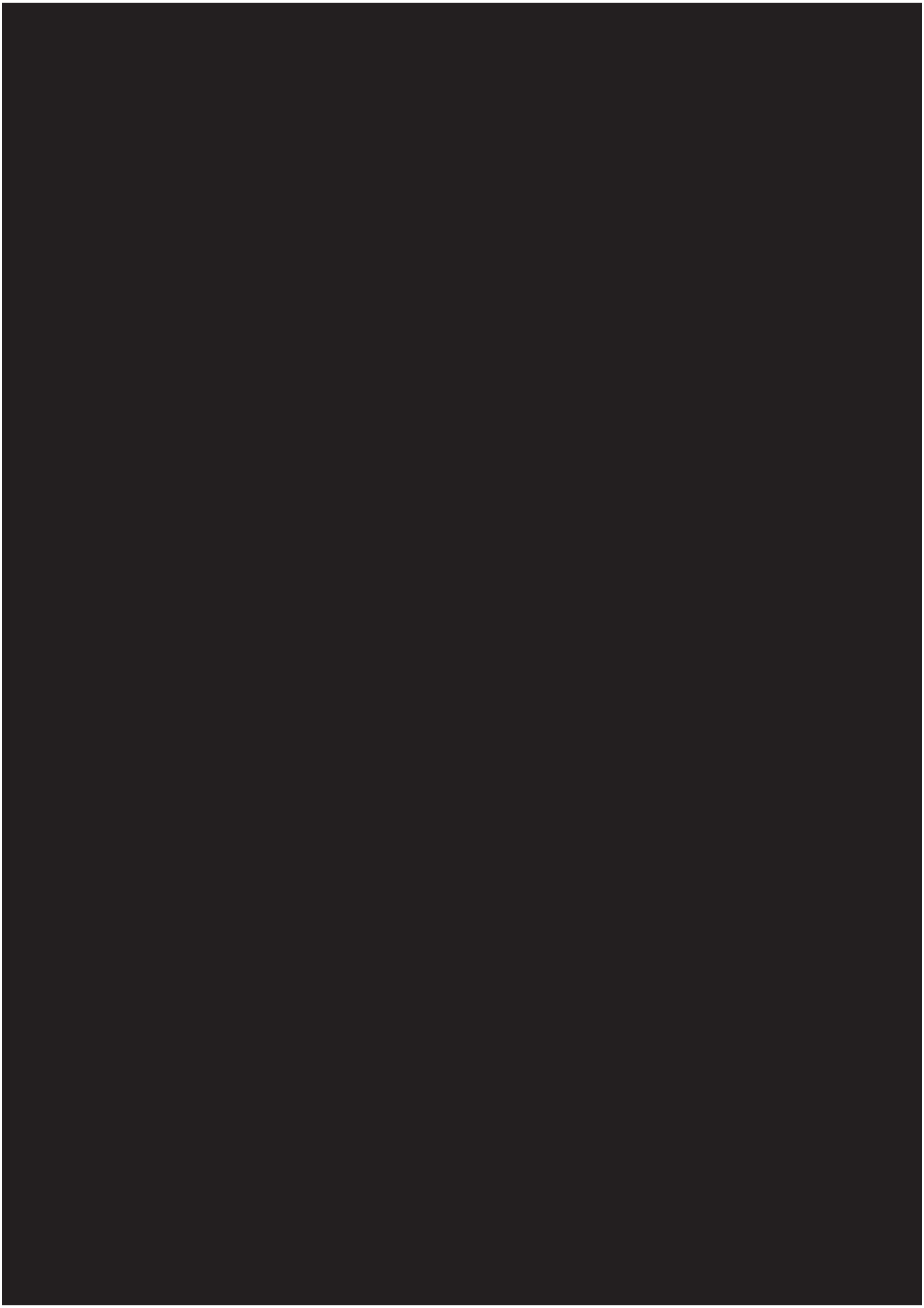
(日付) Date | Understood and Witnessed by | (日付) Date

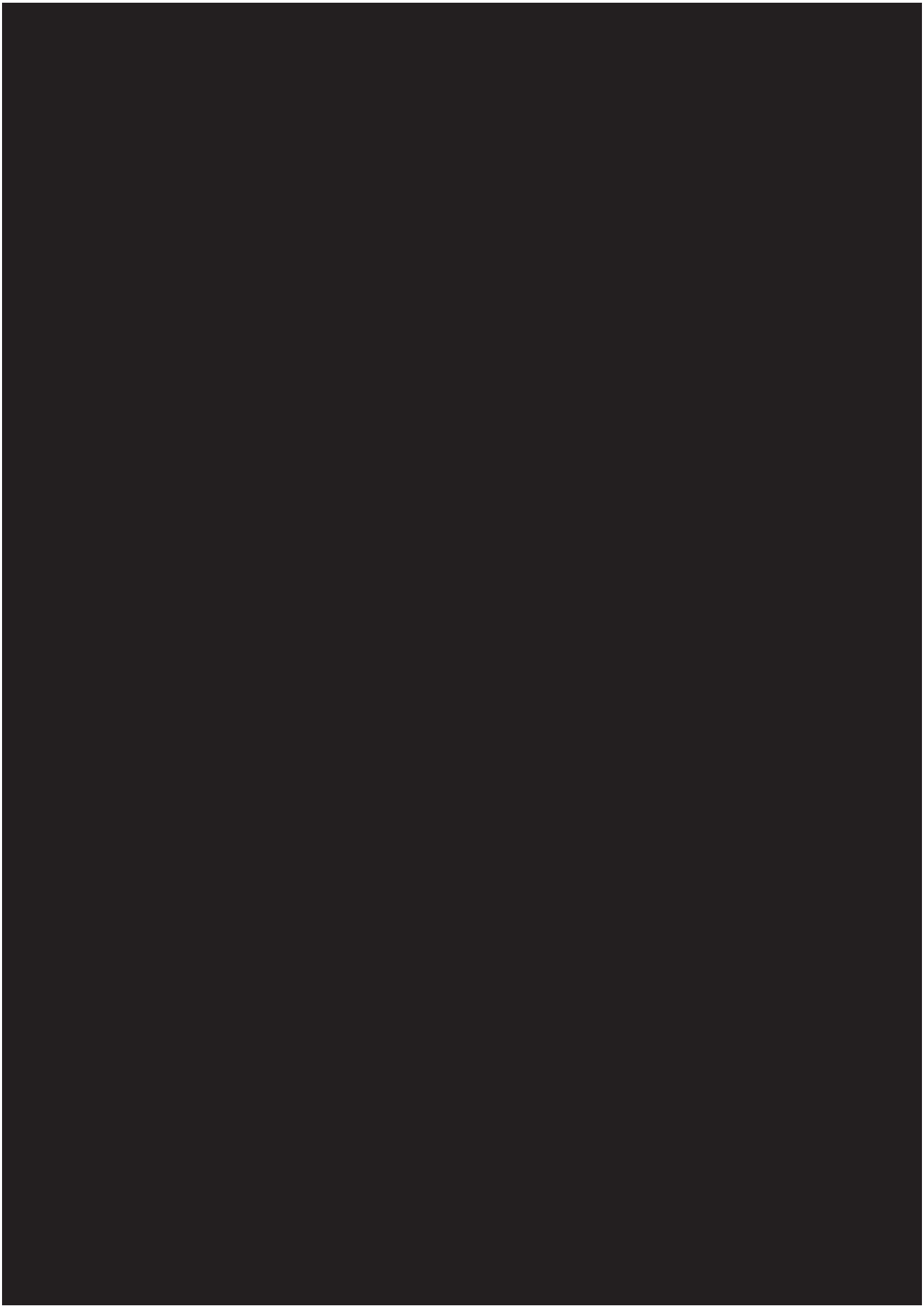
(発明者) Invented by 市川博史 2008年3月9日

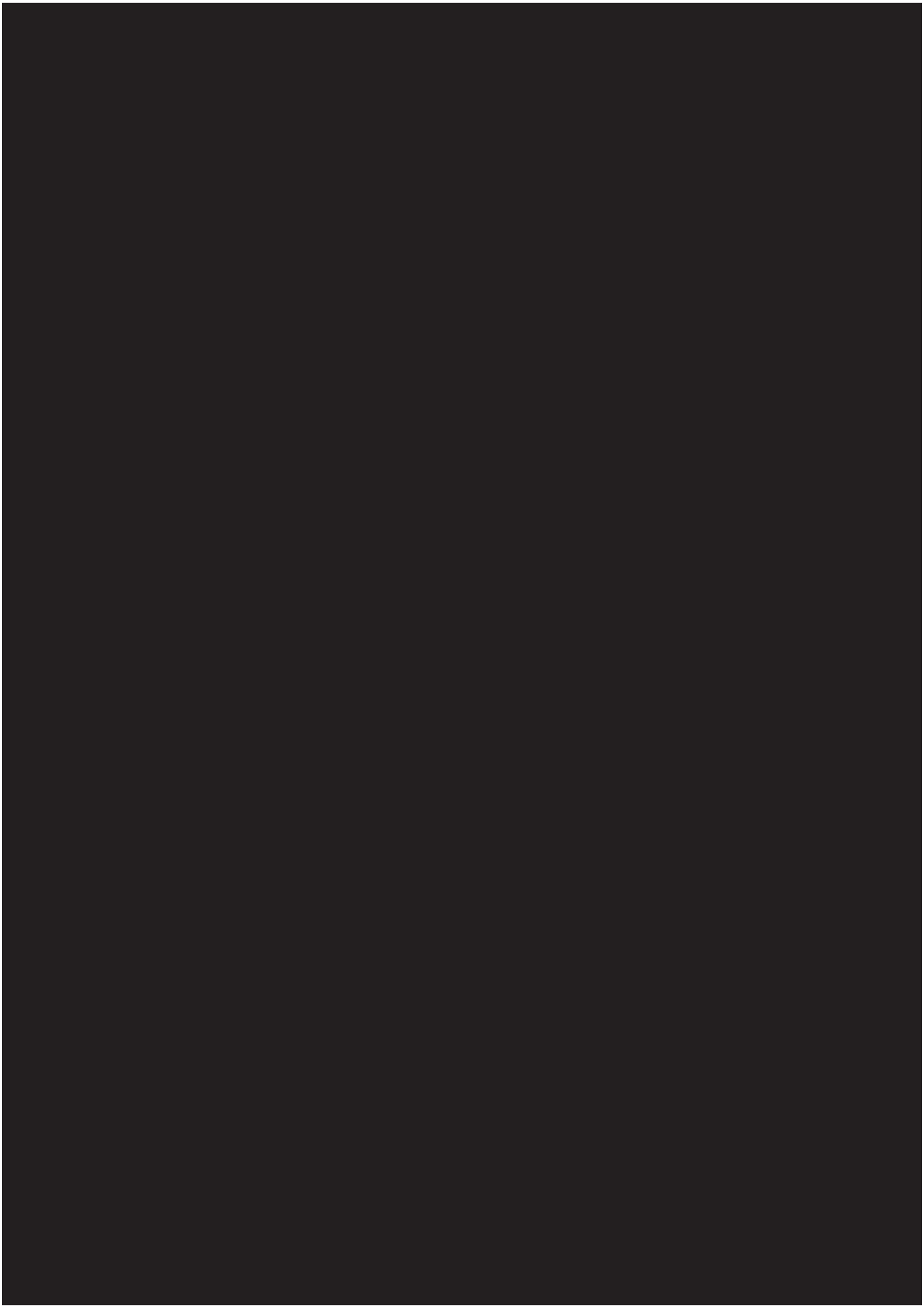
(記入者) Recorded by 年 月 日

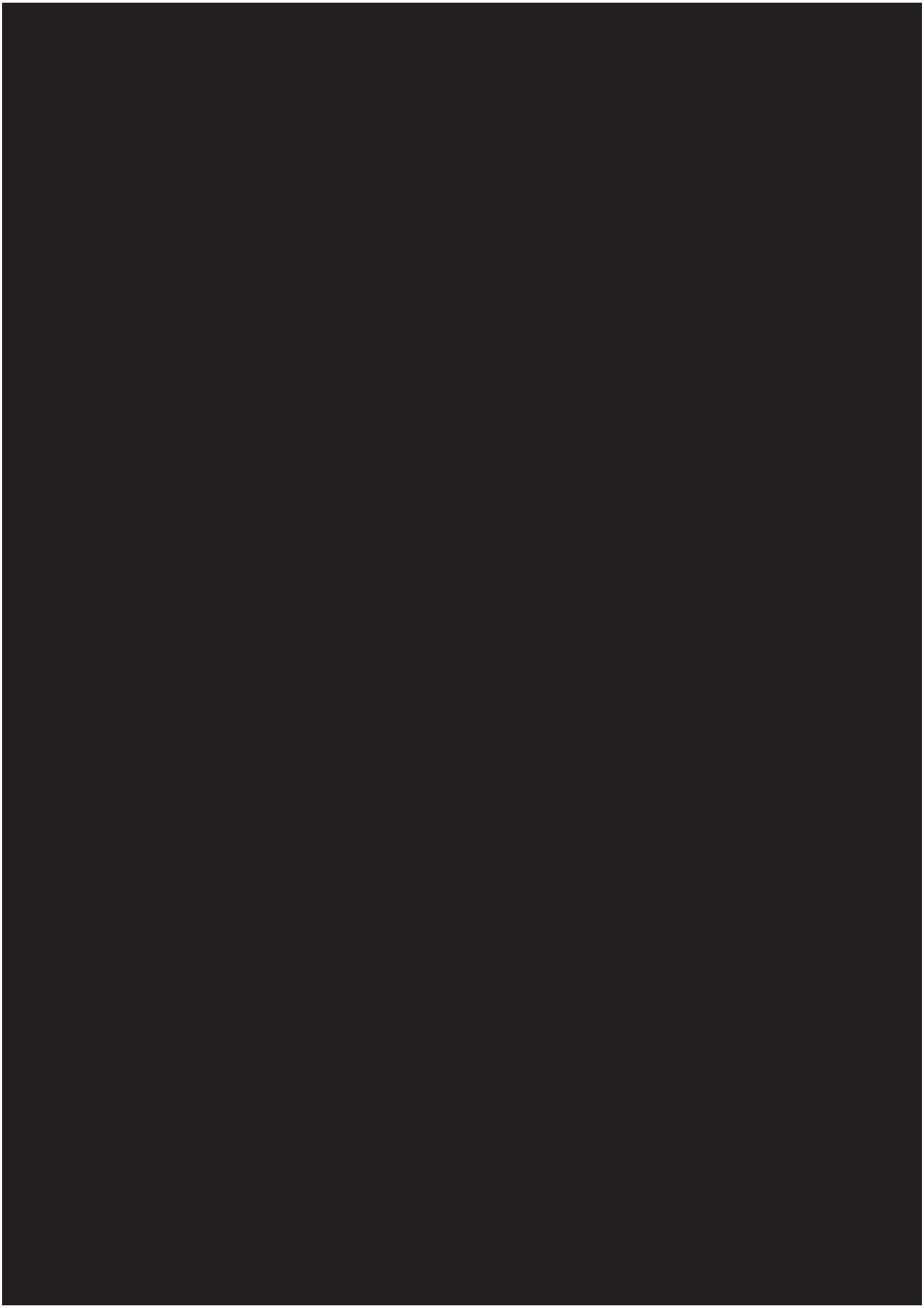
Signed 年 月 日

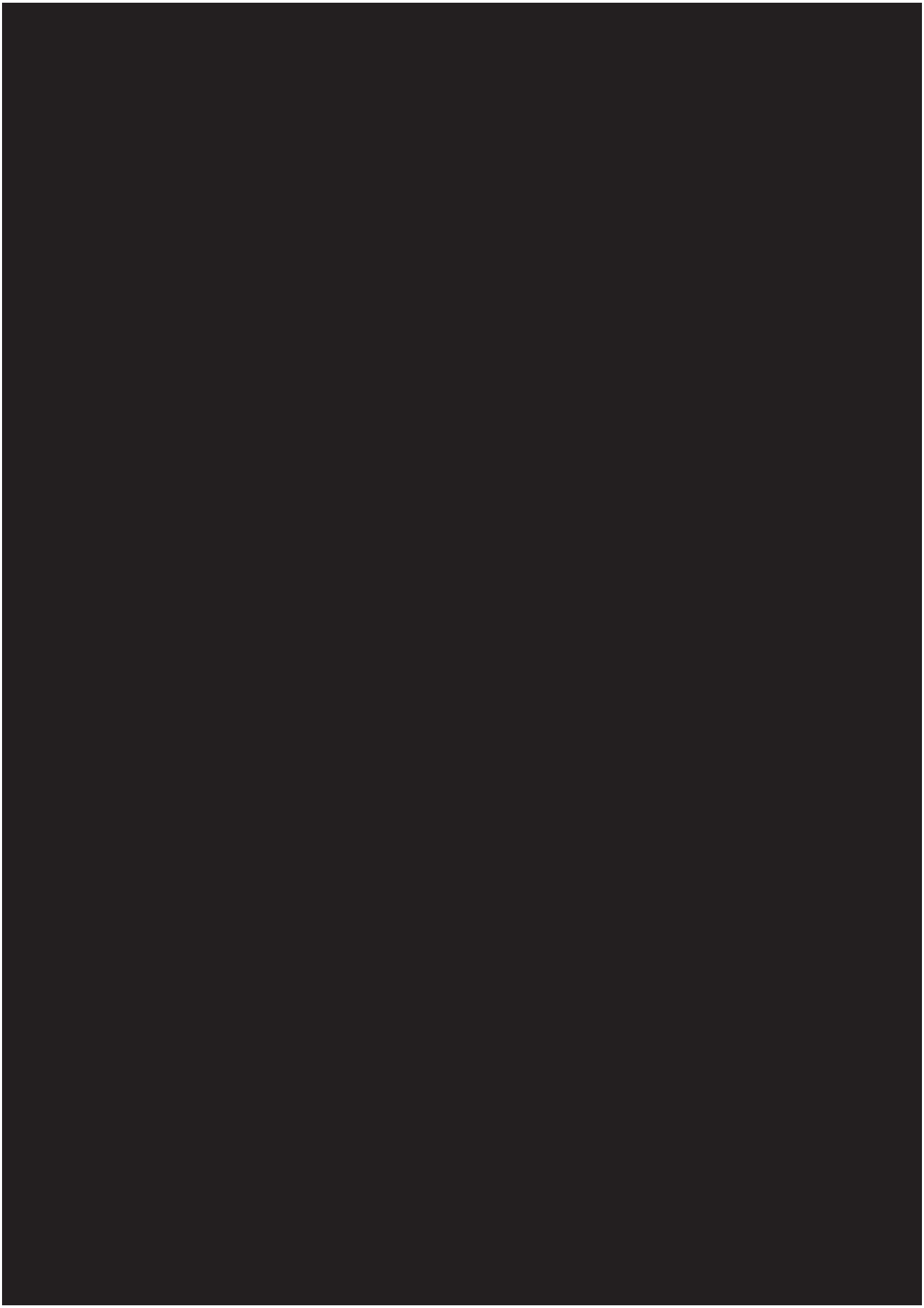
Signed 年 月 日

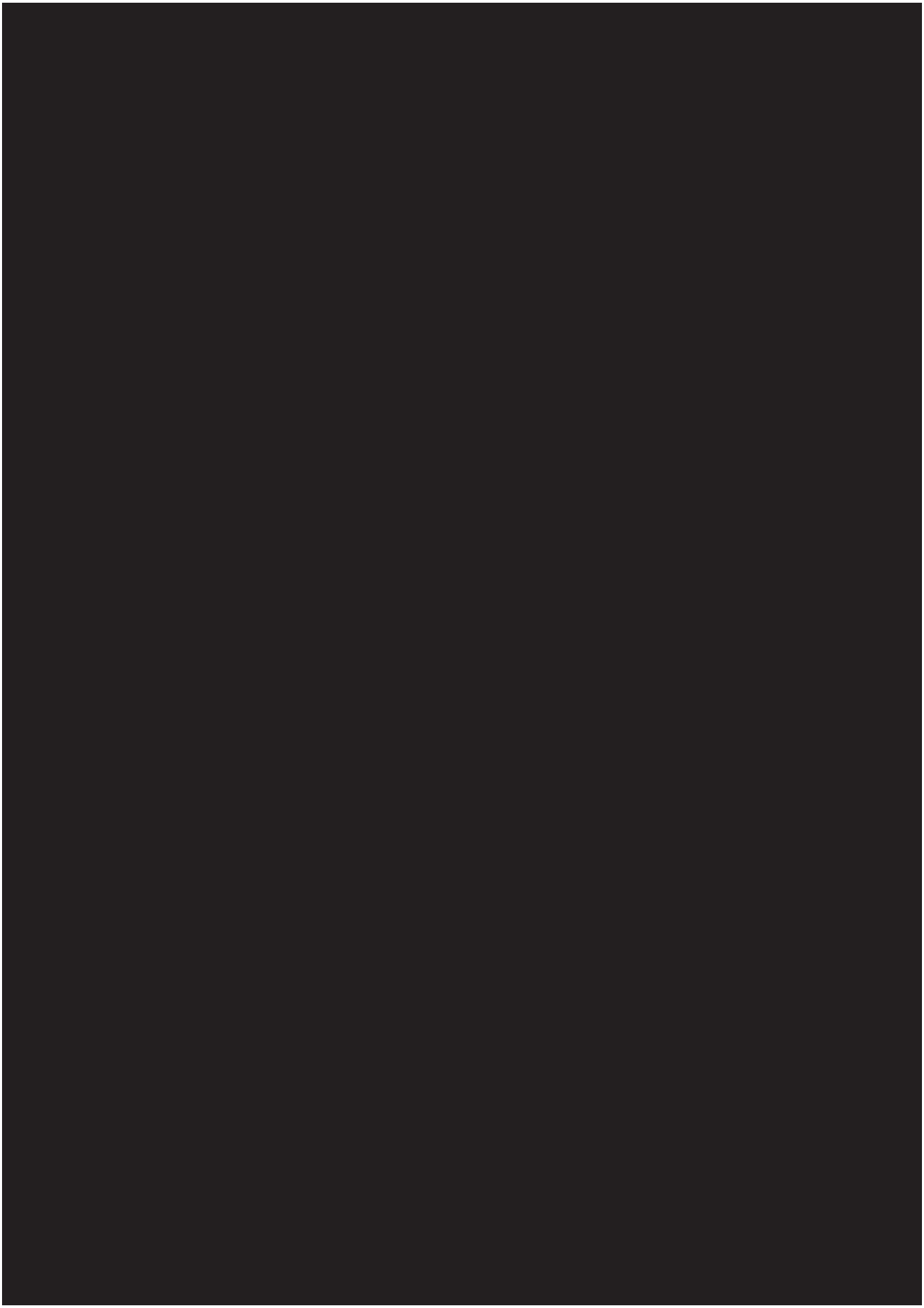


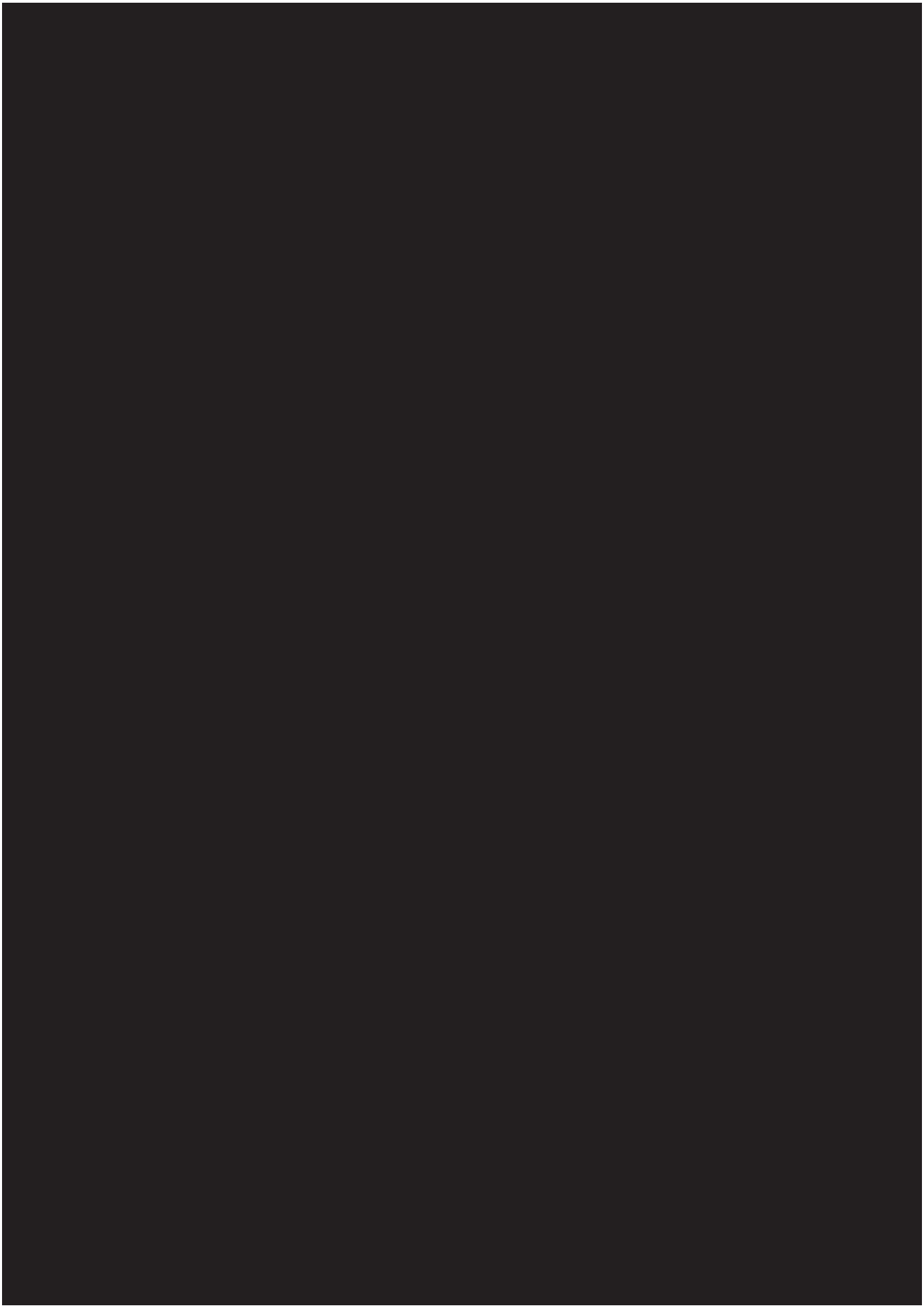


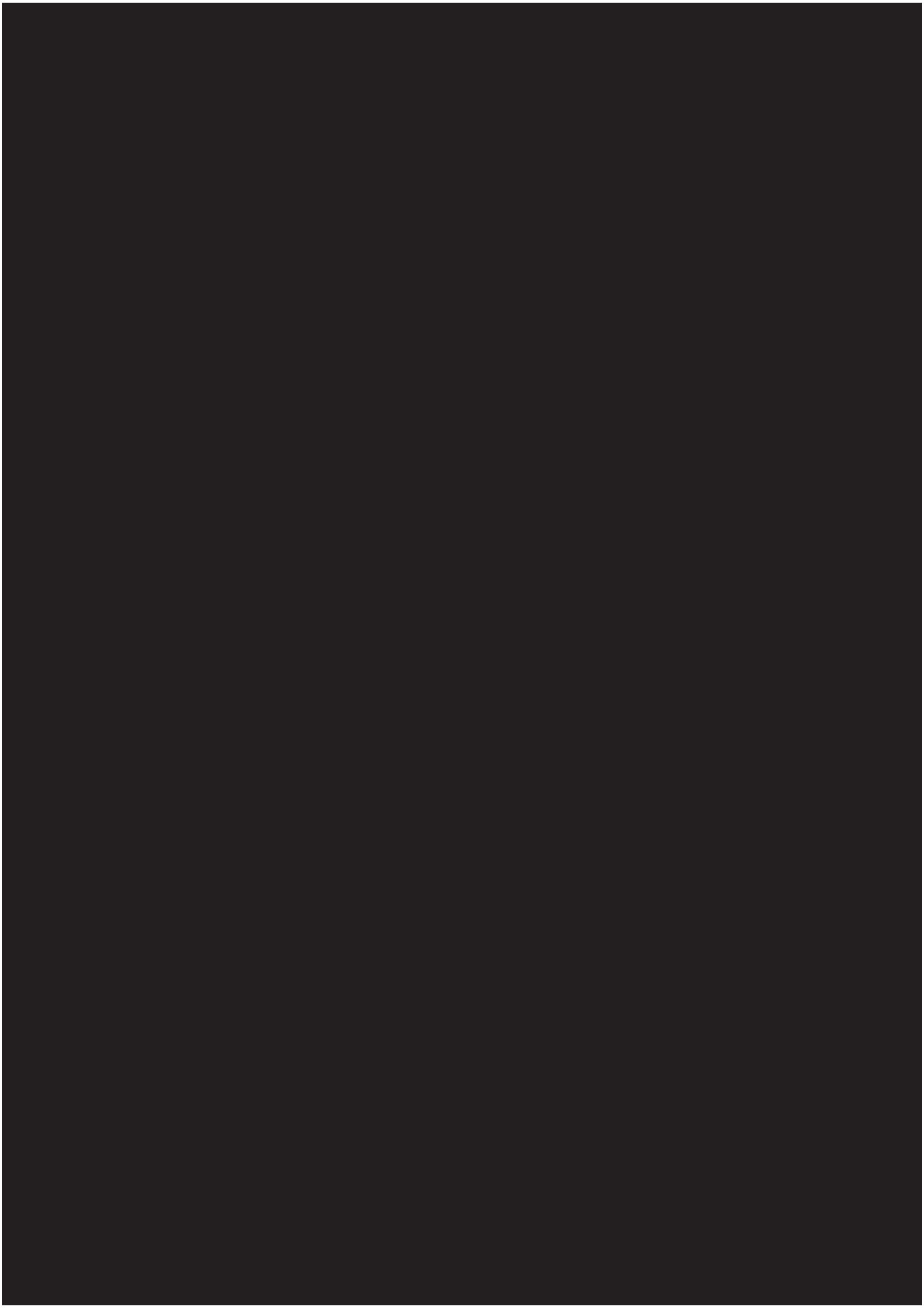












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・EMC集合基板 図面打ち合わせ

・特許打ち合わせ （林KK、IP田村、笹岡）

丸穴及び裏みぞのキャスター構造を持ったLEDとして出願する方向

その場合、セラミックタイプとの違いを明かくにする必要があるので、

セラミックは半田クラックの問題を抱えているので、実装基板

（ガラエポ、アルミ）との線ぼう張係数の近い金属L/Fを使用

したキャスターの付いた樹脂成形PKGとして出願する方向。

キャスターの必要性については、製産性を上げる為ダイシングで作る

と金属母材がむき出しになる為、Agメッキの残ったキャスターで接合信頼性をアップするというストーリー。

・日立化成 透明封止樹脂 耐熱、耐光性試験スタート。

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(日付) Date	(証人) Understood and Witnessed by (日付) Date
(発明者) Invented by 市川博史 2008年3月14日	Signed 年 月 日
(記入者) Recorded by 年 月 日	Signed 年 月 日

金型構造との整合性

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.C 集合基板 図面打ち合わせ
許打ち合わせ （林KK、IP田村、笹岡）

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(日付) Date
市川 博史 2008年3月14日

(証人)
Understood and Witnessed by
Signed ________
(日付) Date 年 月 日

(発明者)
Invented by

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Notebook No : 12001637 Date 年 月 日

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概要

PKG

①. 通常、セラミックPKGには、半導体を半田接合強度を向上させるため、
PKG側面にキャスタレーションと呼ばれるフィレット形成のための凹み部を設けている。

②. しかし、PKGと実装基板（樹脂、金属etc）の線膨張係数差が大きいため、
基板実装後に熱衝撃が加えられた際に半田部にクラックが発生し易く、
①の対策のみでは不十分である。
※特に、セラミックPKGサイズが□3.5mm以上であると、上記の症状が顕著である。

③. ②を解決するため、実装基板との線膨張係数差が小さい金属（例. 鎖、銅合金、42アロイ、鉄、アルミ）
リードフレームを使用し、また、半田接合強度向上のためのキャスタレーションを設けた
樹脂成型PKGを提供する。

④. PKG樹脂材料は、熱可塑性樹脂、熱硬化性樹脂。より好ましくは、膨張率が金属に近い熱硬化性樹脂。

⑤. 封止材料としては、エポキシ、シリコーンなどがあり、耐光耐熱の優れたシリコーンが、より好しい。

製法

①. 上記PKGは、リードフレーム内製品の取り個数を向上（生産性向上・コスト低減）させるため、
カットフィーミングではなく、個片化方法としてダイシングを採用している。

②. 金属リードフレームをダイシングを行った際に、ダイシング面に母材が露出し、酸化され易い。
そのため半田の濡れ性が悪く、基板実装後の半田接合信頼性が低い。

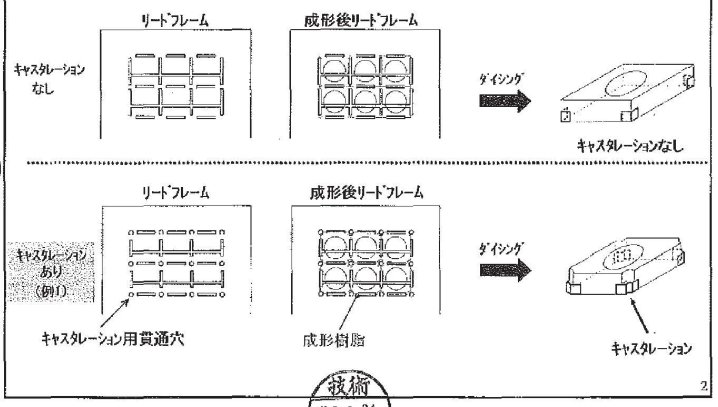
③. ②を解決するため、リードフレーム裏面に、プレス、ハーフエッチ、ダイシング等で
貫通穴・ザグリ・溝を設けて、その後メッキを施すことで、ダイシングを実施しても、
リードフレーム母材を露出させずキャスタレーションを設けることができる。（ページ2～6 例2～4）

④. また、ダイシングラインに成型樹脂／リードフレームがあるPKGにもキャスタレーションを
設置することができる。
（ページ7 例5）

1

試作型は、例1、3を予定

LEDのリードの側面部は全てメッキ面ではなく、Cu等母材の切断面が露出するため、酸化され易い。
従って、ハンダ濡れが悪く接合信頼性が低い。それを改良するため、個片化後キャスタレーションになる
メッキの施された貫通穴を設けたリードフレームを使用すると、キャスタレーション部はメッキ面のため
酸化されにくく、接合信頼性を向上させることができる。



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技術

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(記入者) Recorded by 年 月 日

Signed 年 月 日

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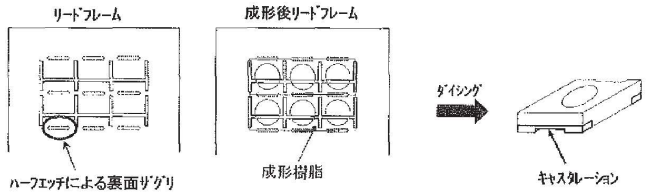
例2. 前ページのPKGで、貫通穴ではなく、裏面にメッキの施された
ハーフエッチによるザグリを設けてもよい。



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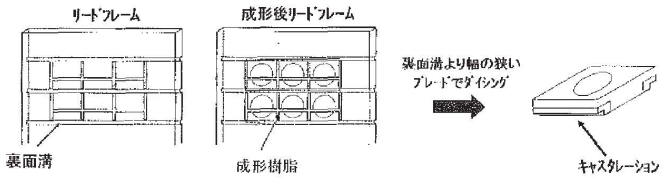
例3. 前ページのPKGで、ザグリではなく、裏面にメッキの施された
溝を設けてもよい。



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(日付) Date

(発明者)
Invented by 市川博史 2008年3月21日

(記入者)
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(証人)
Understood and Witnessed by

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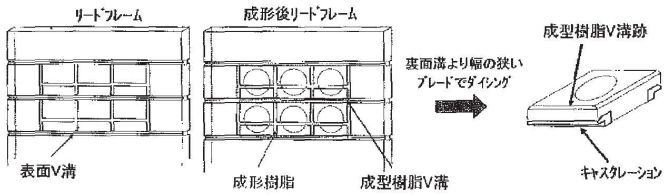
例3：前ページのPKGで、成型樹脂密着性の向上・ダイシング性を向上させるため、成型樹脂、及びリードフレーム表面にV溝を設けてもよい。



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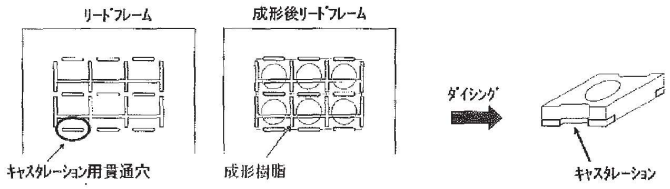
例4：ページ20のPKGで、PKG4隅ではなく、PKG端面にメッキの施された貫通穴を設けてもよい。



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(日付) Date

Understood and Witnessed by

(発明者) Invented by 市川博史 2008年3月21日

Signed 年 月 日

(記入者) Recorded by 年 月 日

Signed 年 月 日

Notebook No : 12001637 Date 年 月 日

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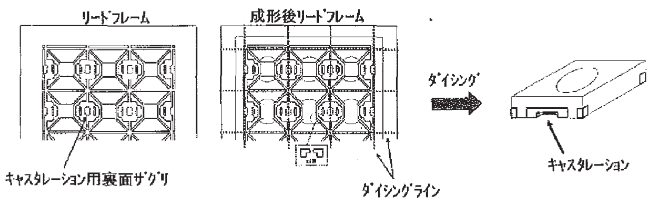
'08.3.21 市川

例5. ダイシングラインにリードフレームがあるPKGでも
キャスタレーションを設置することができる



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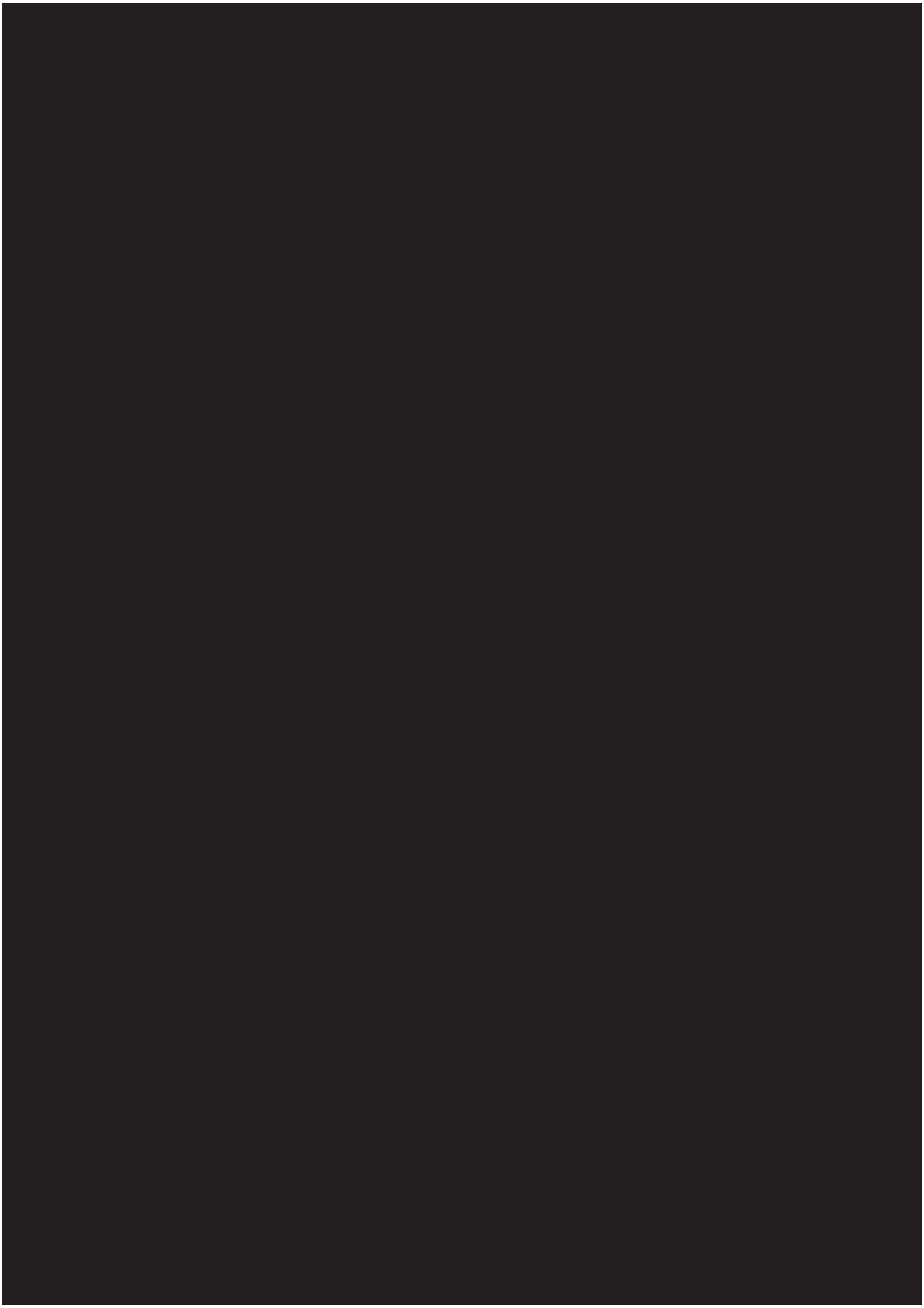

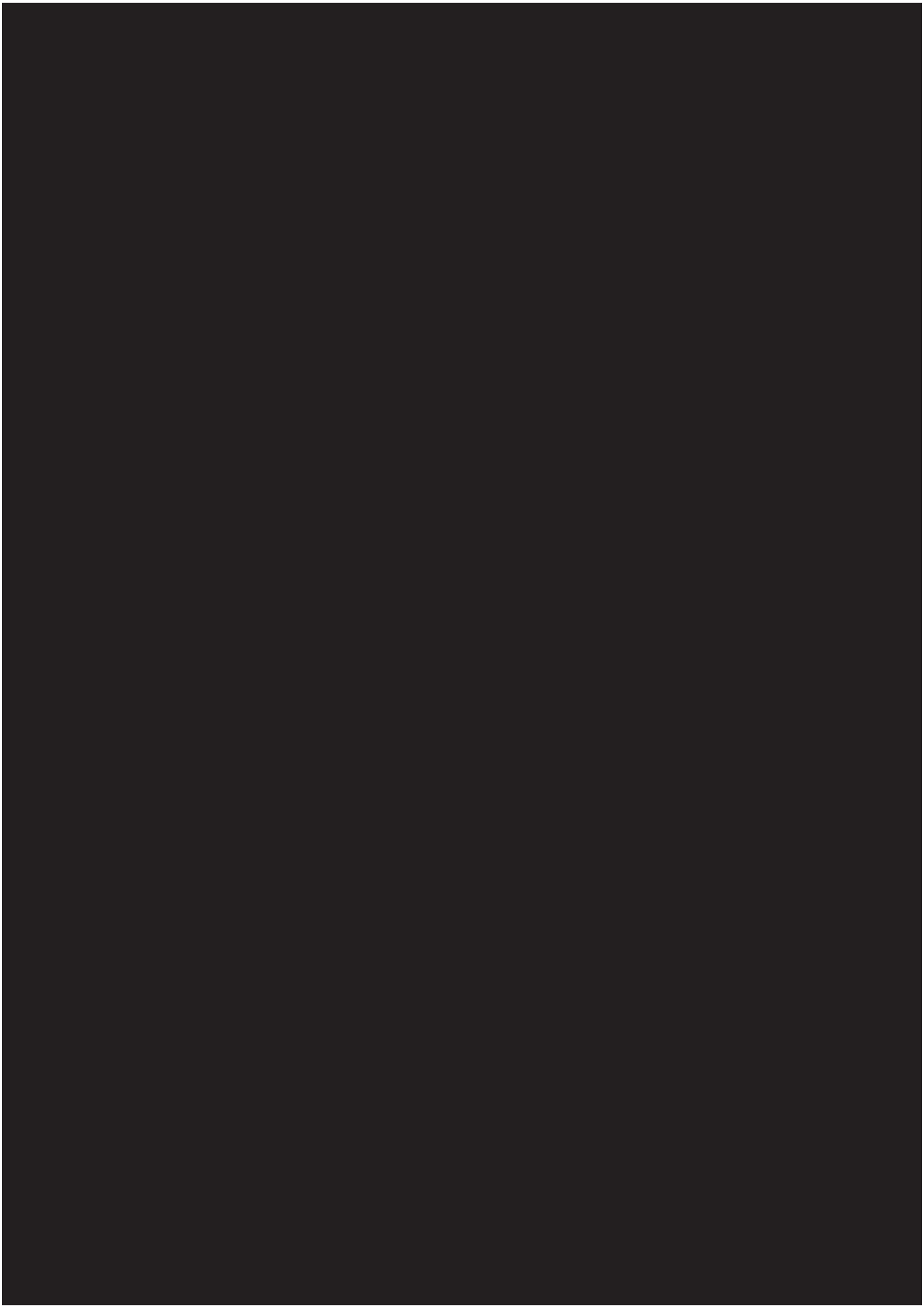

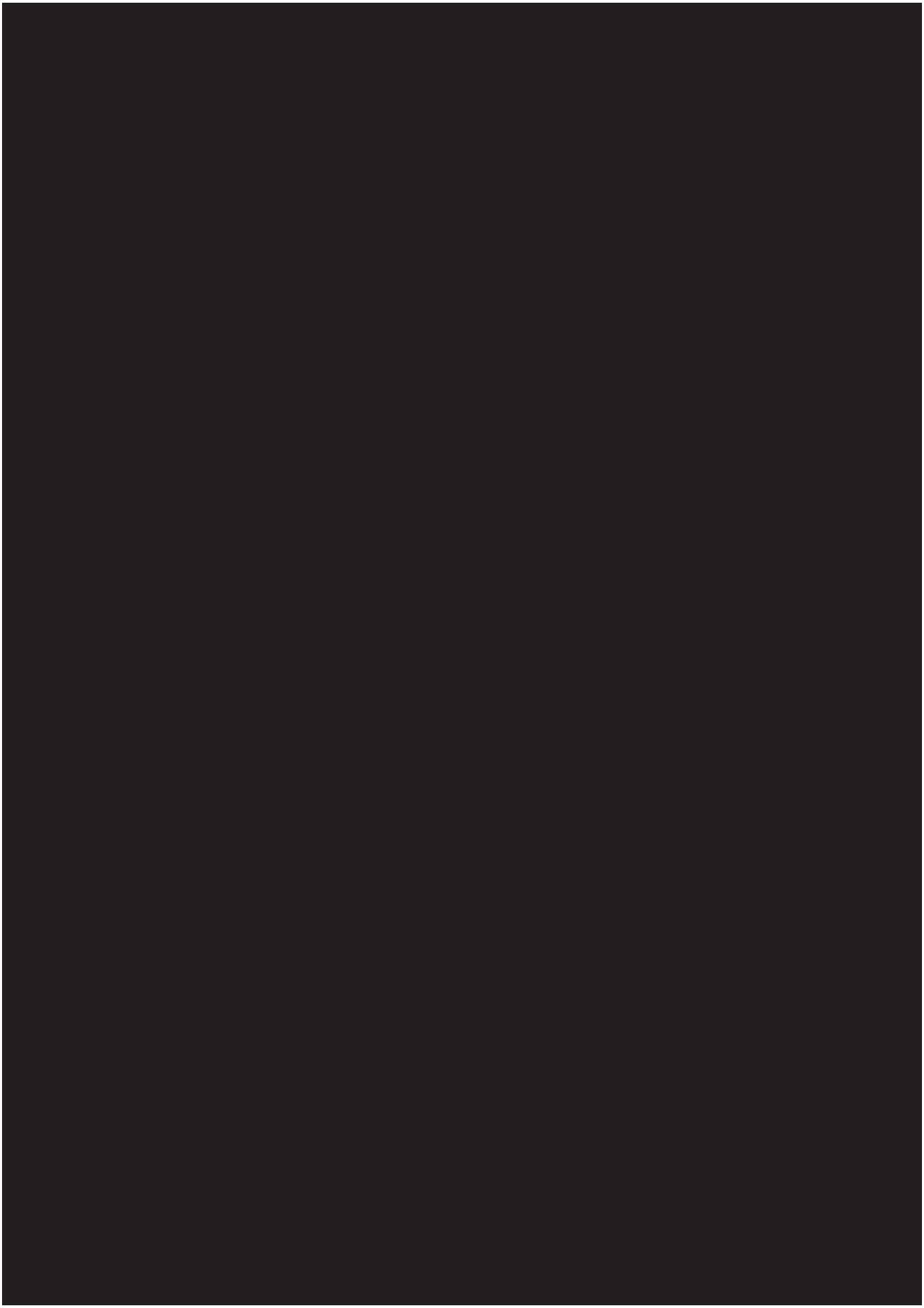

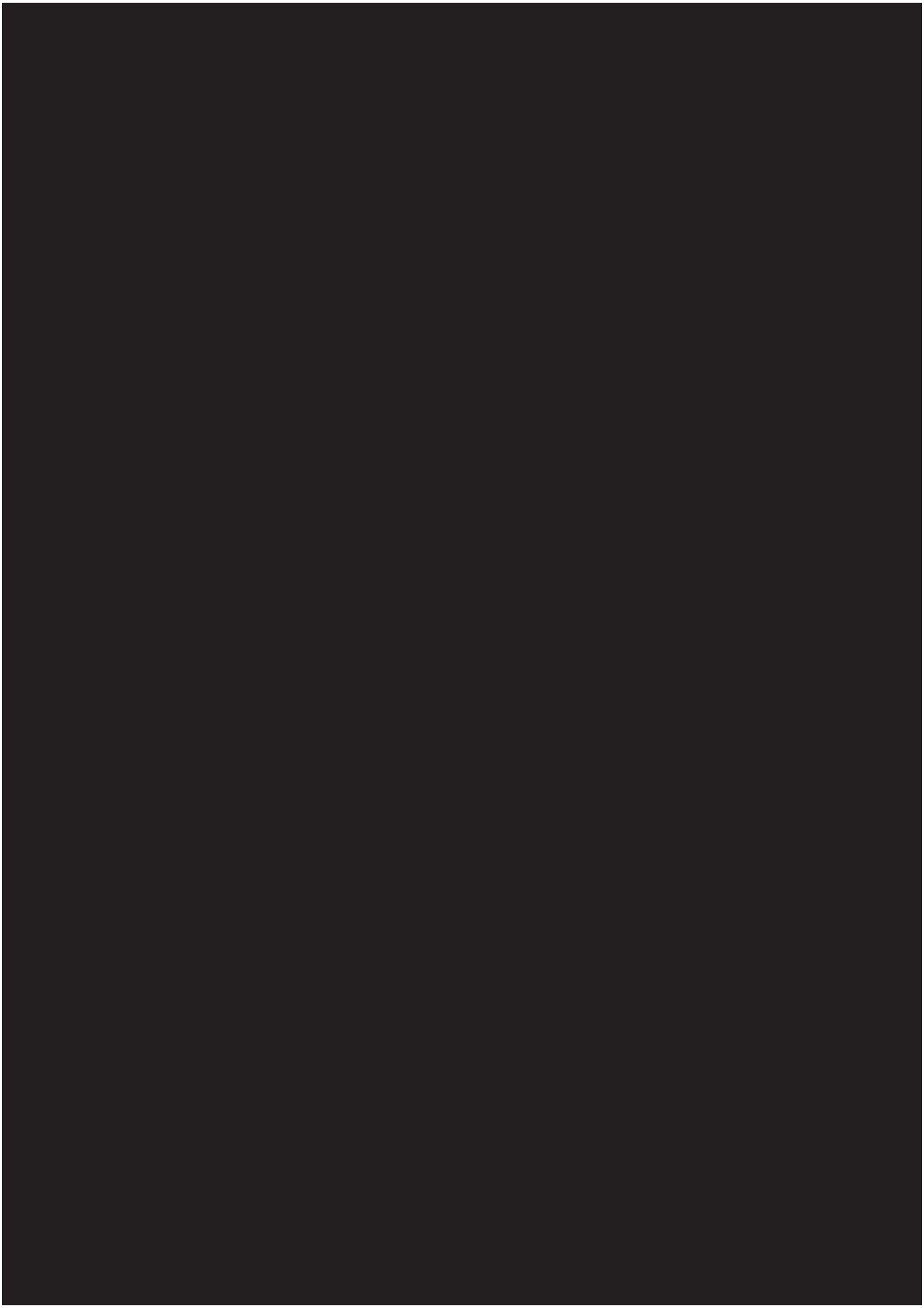

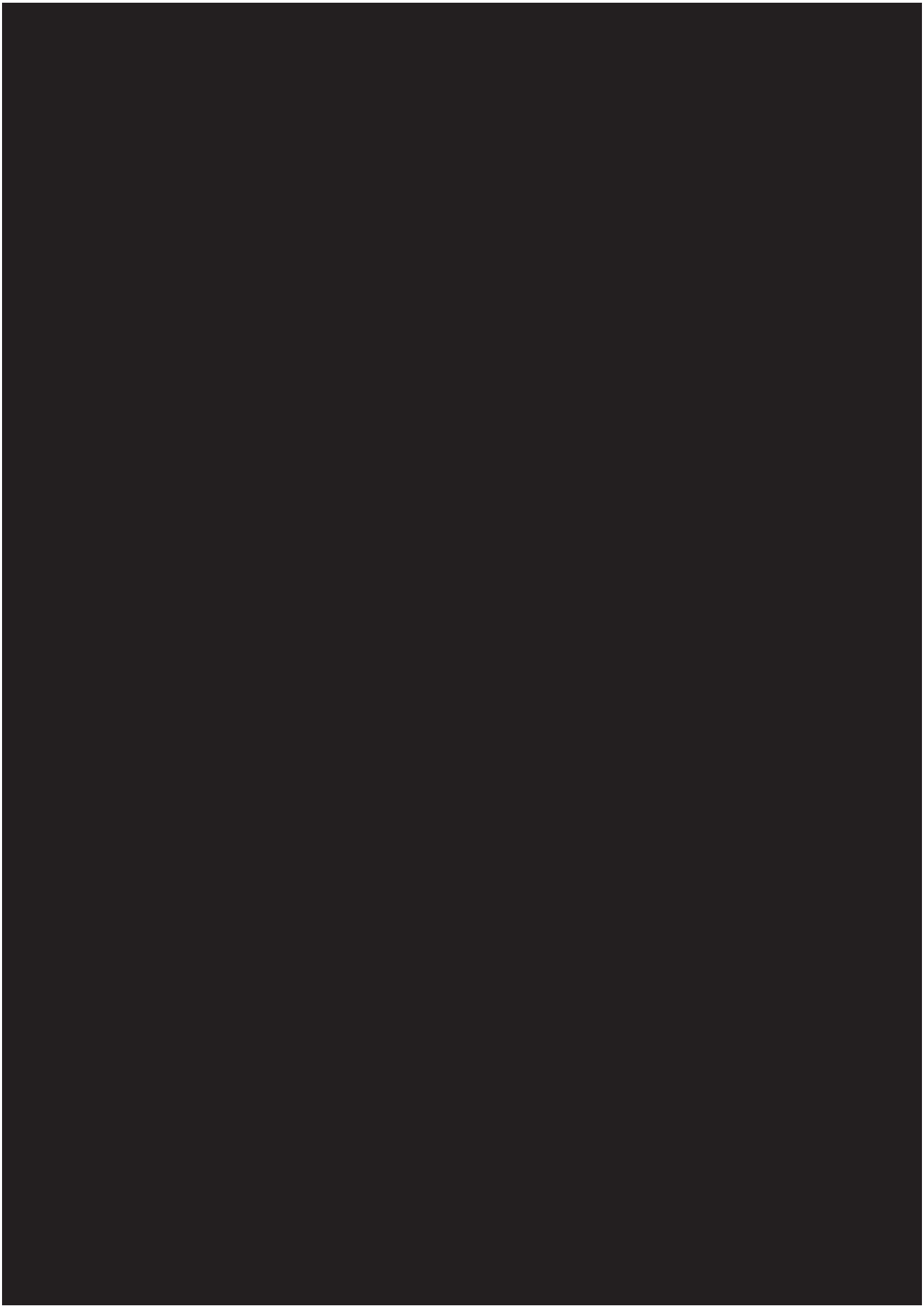

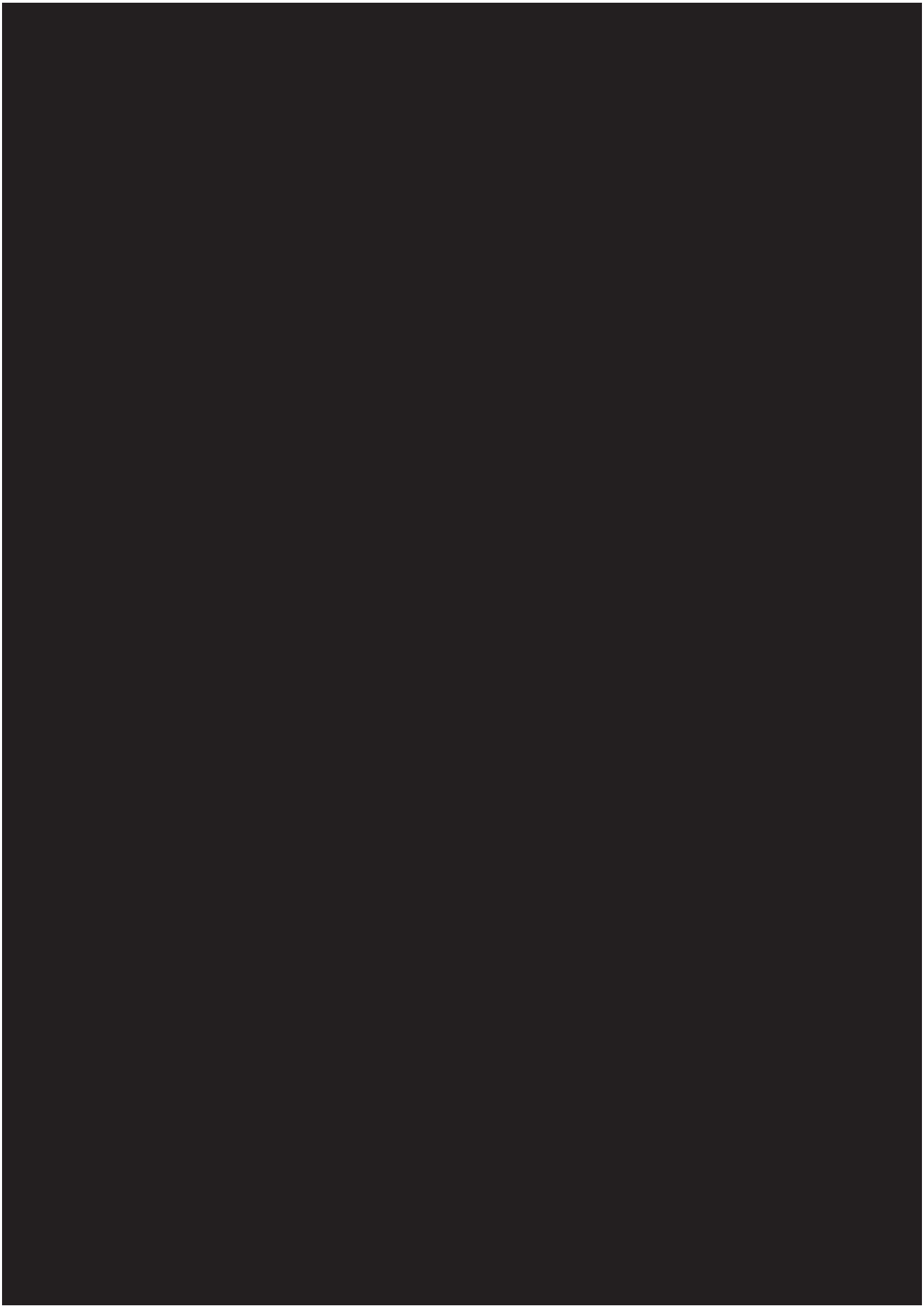

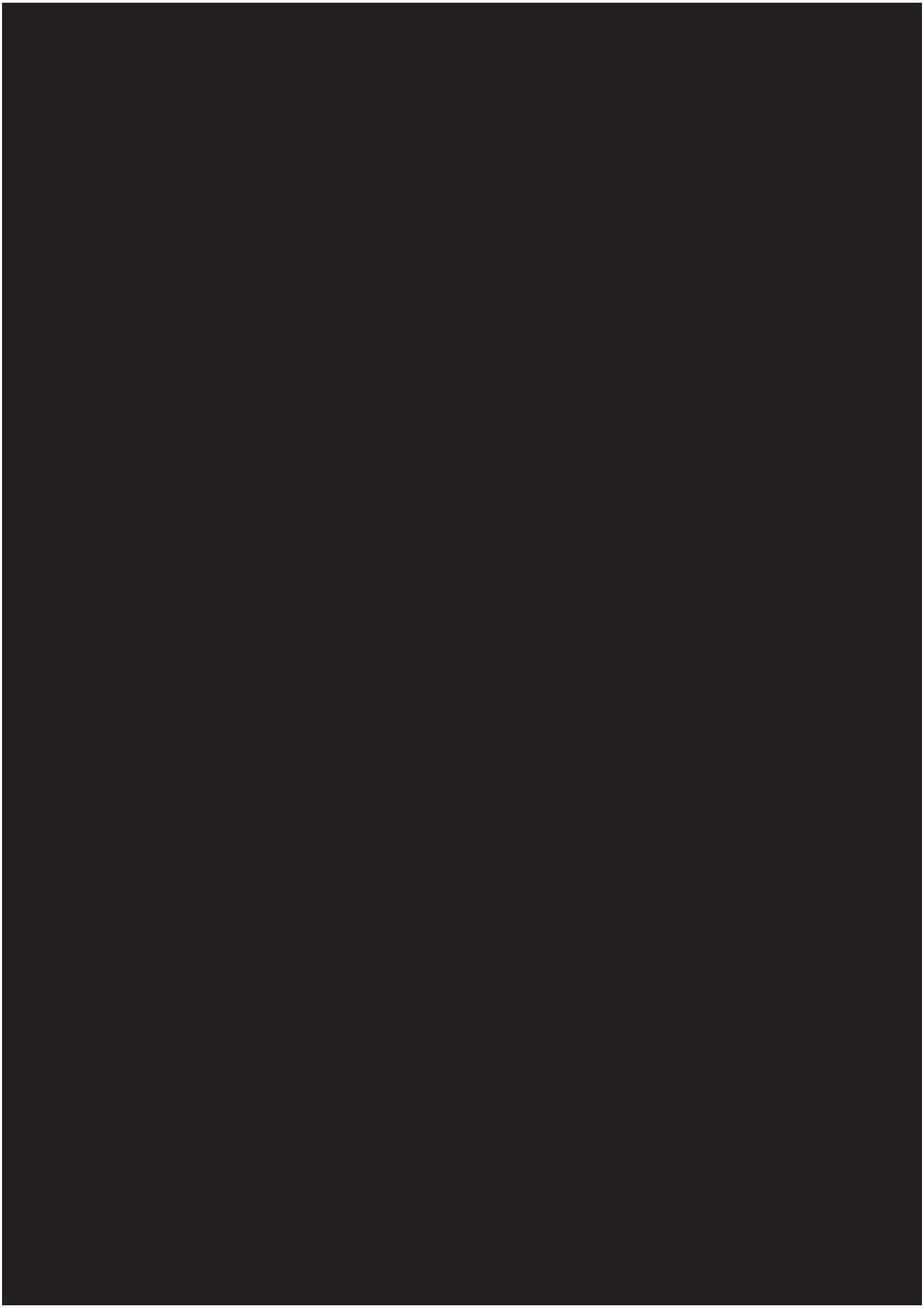

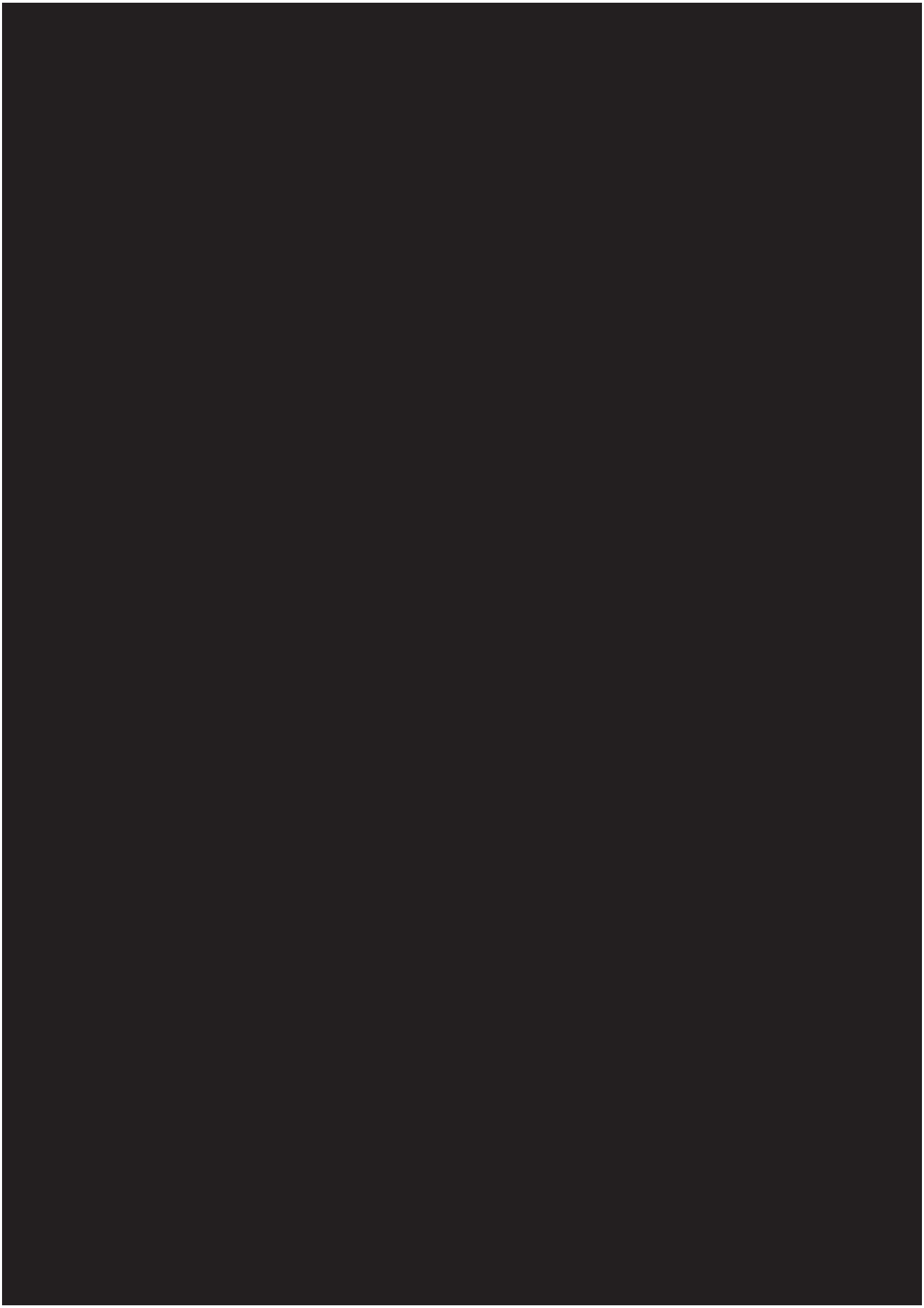

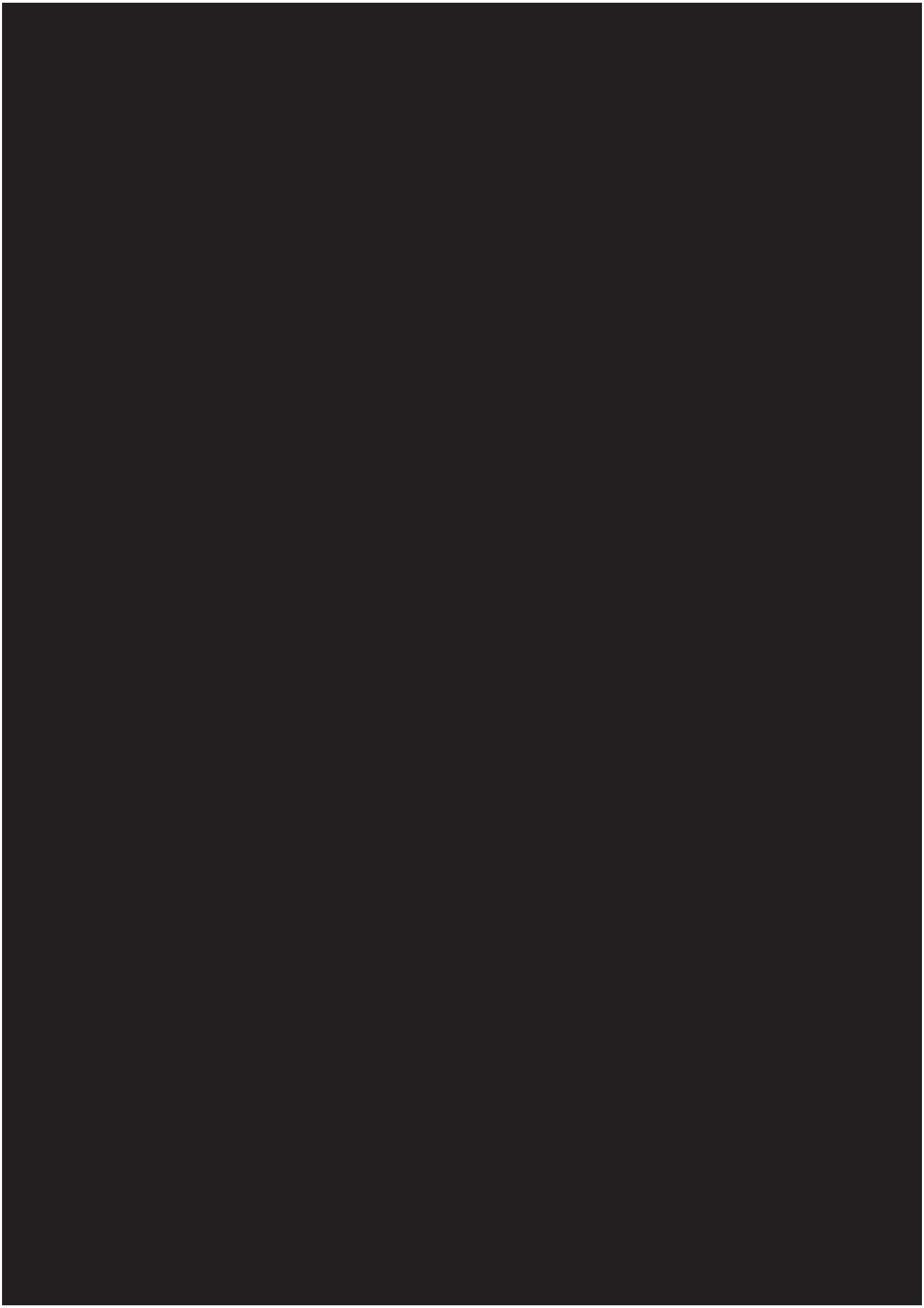

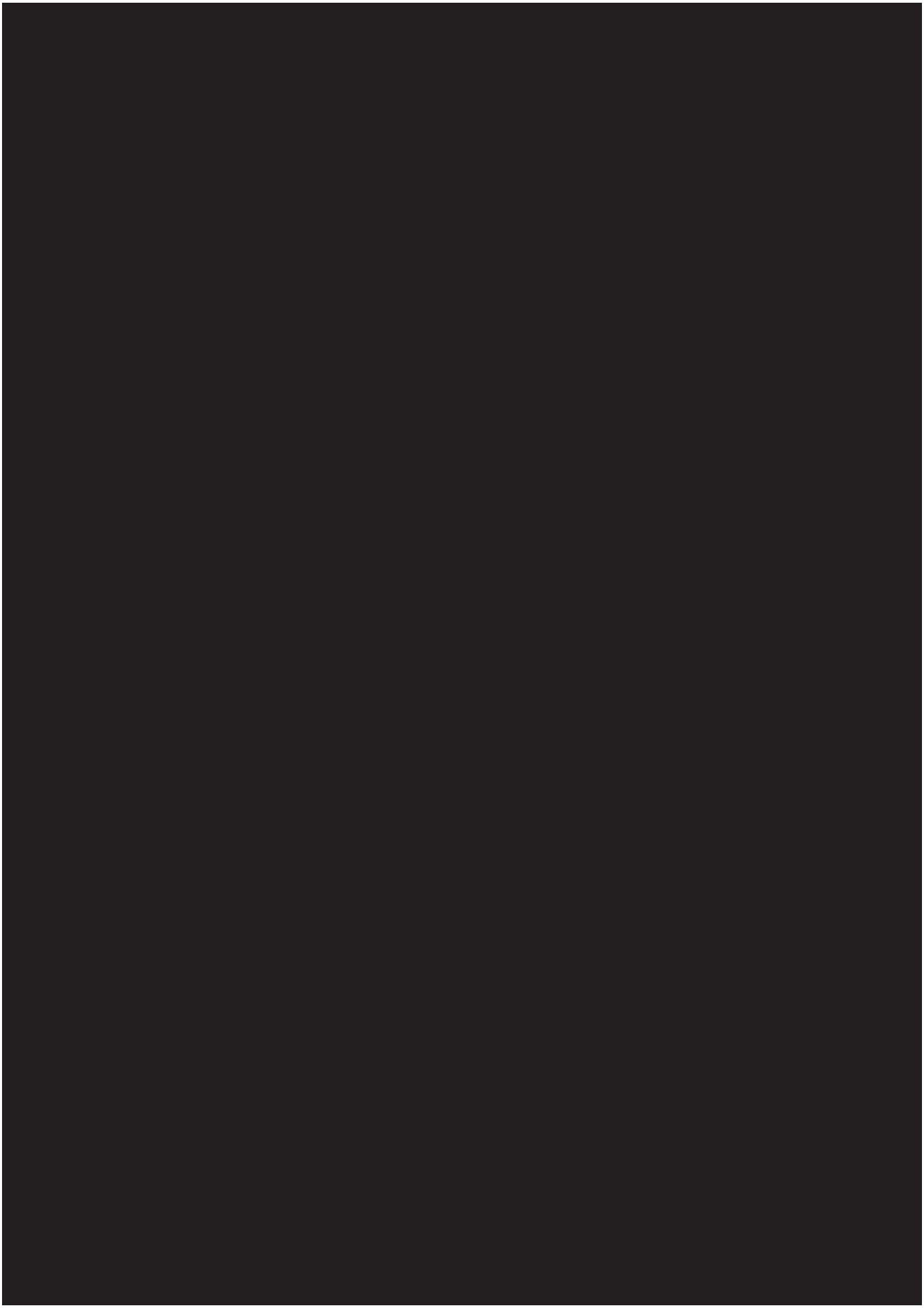

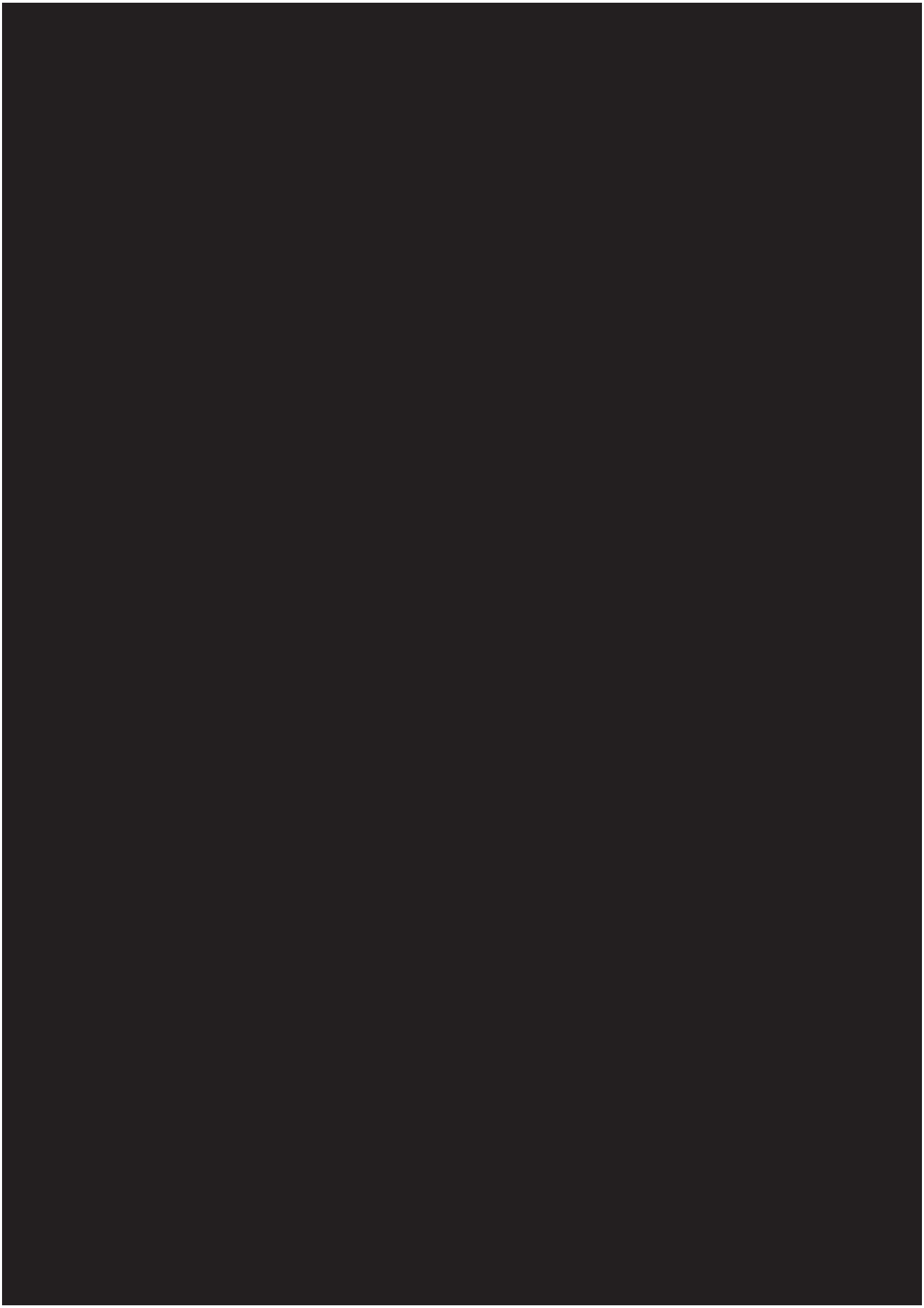

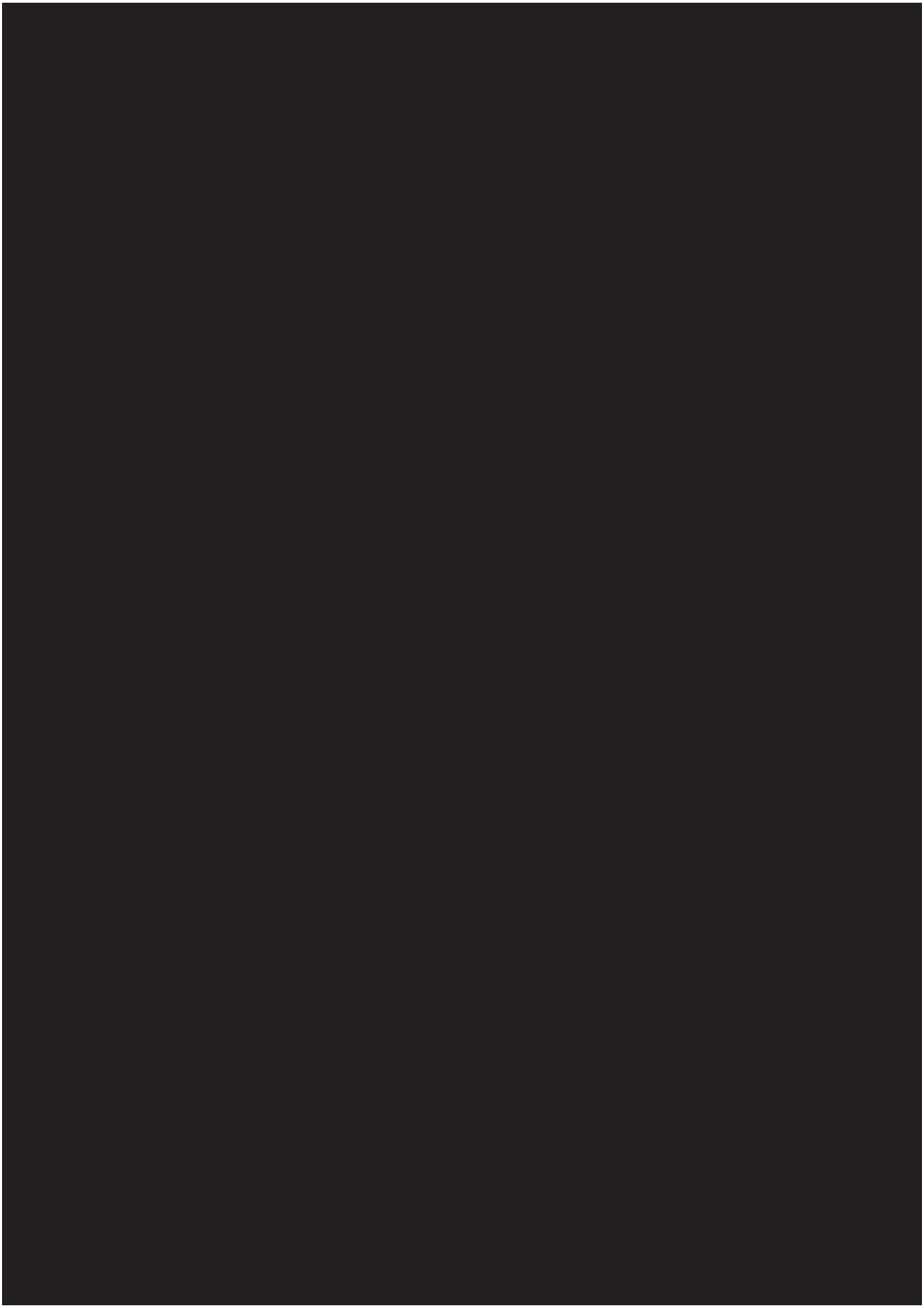

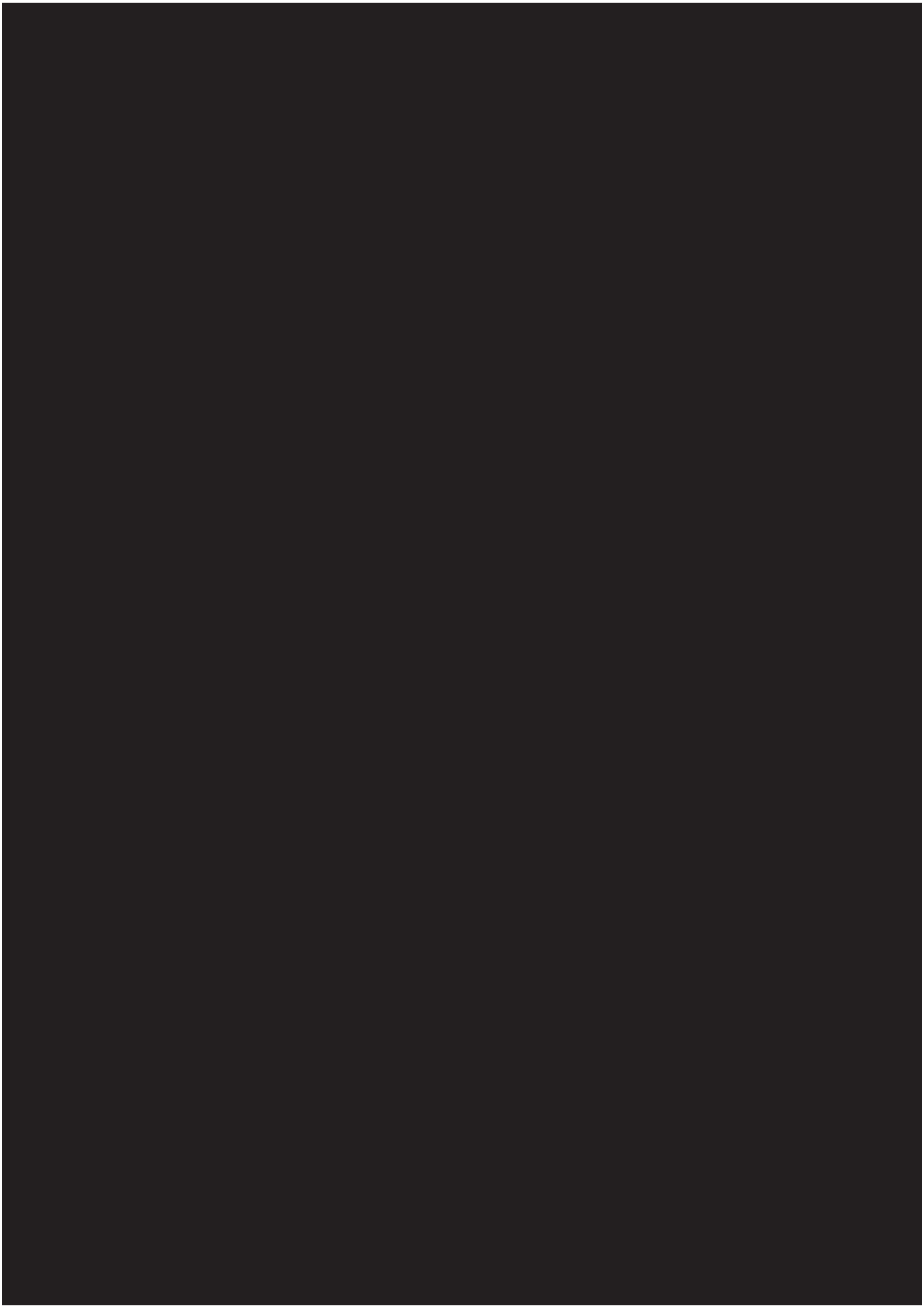

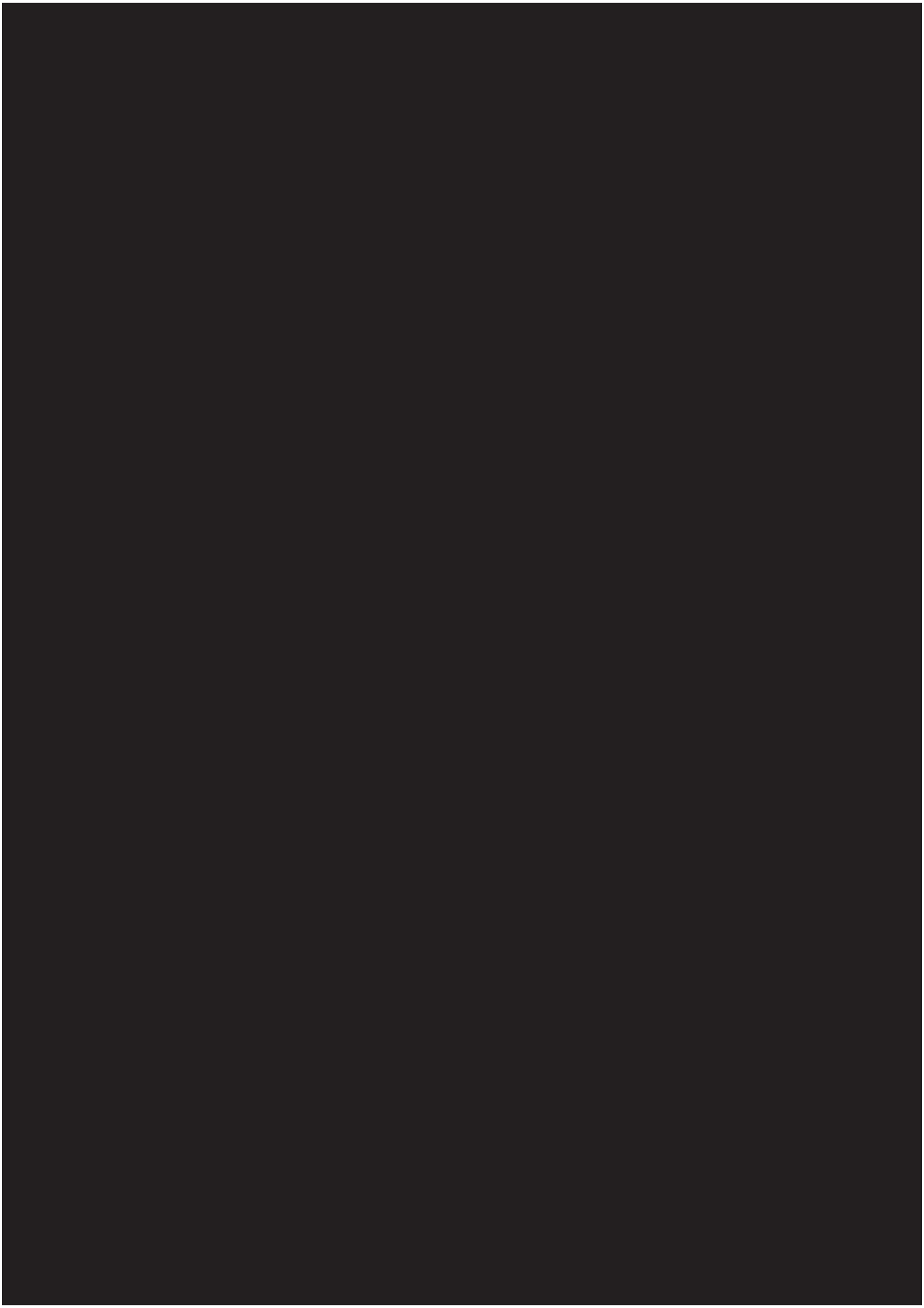

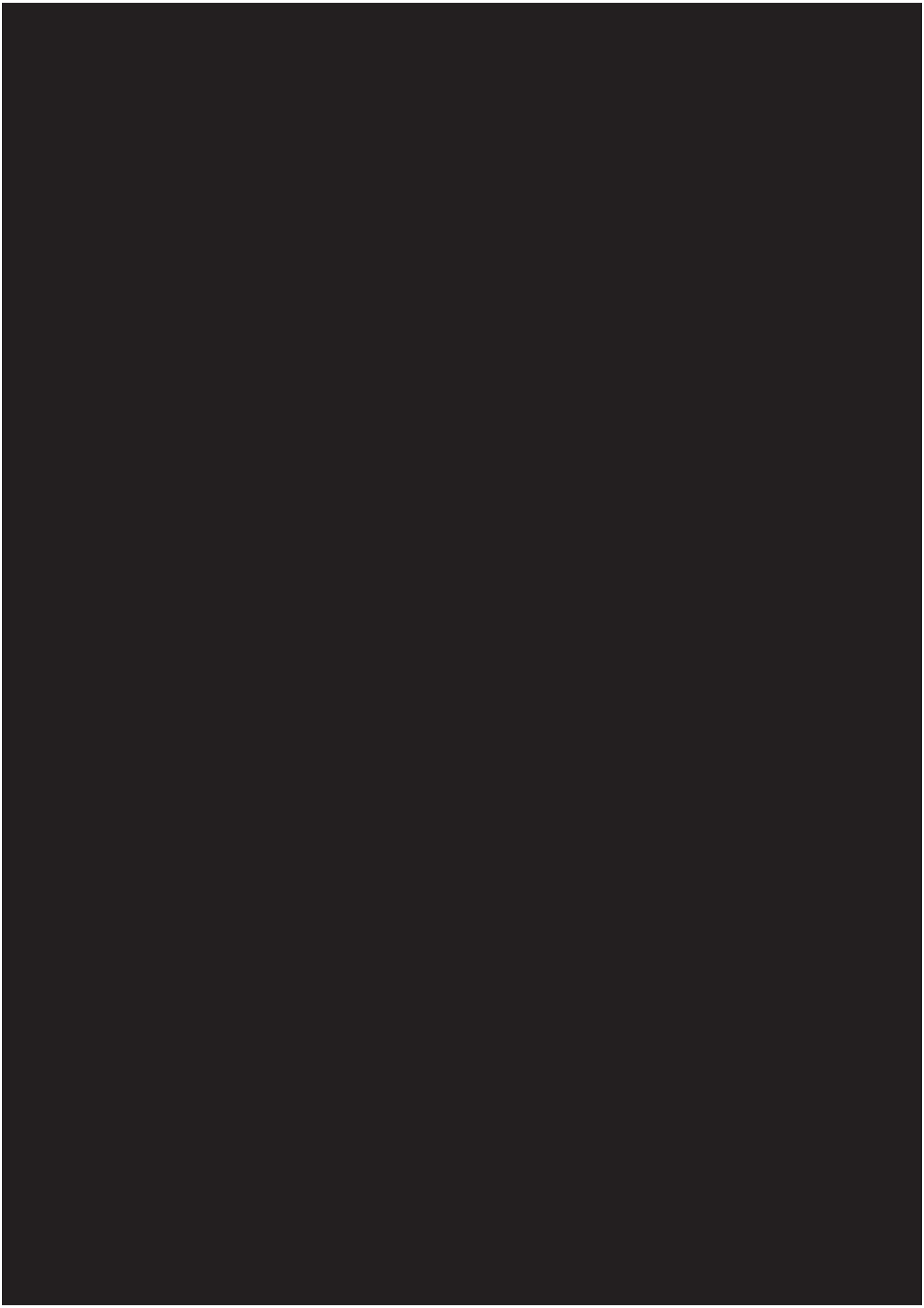

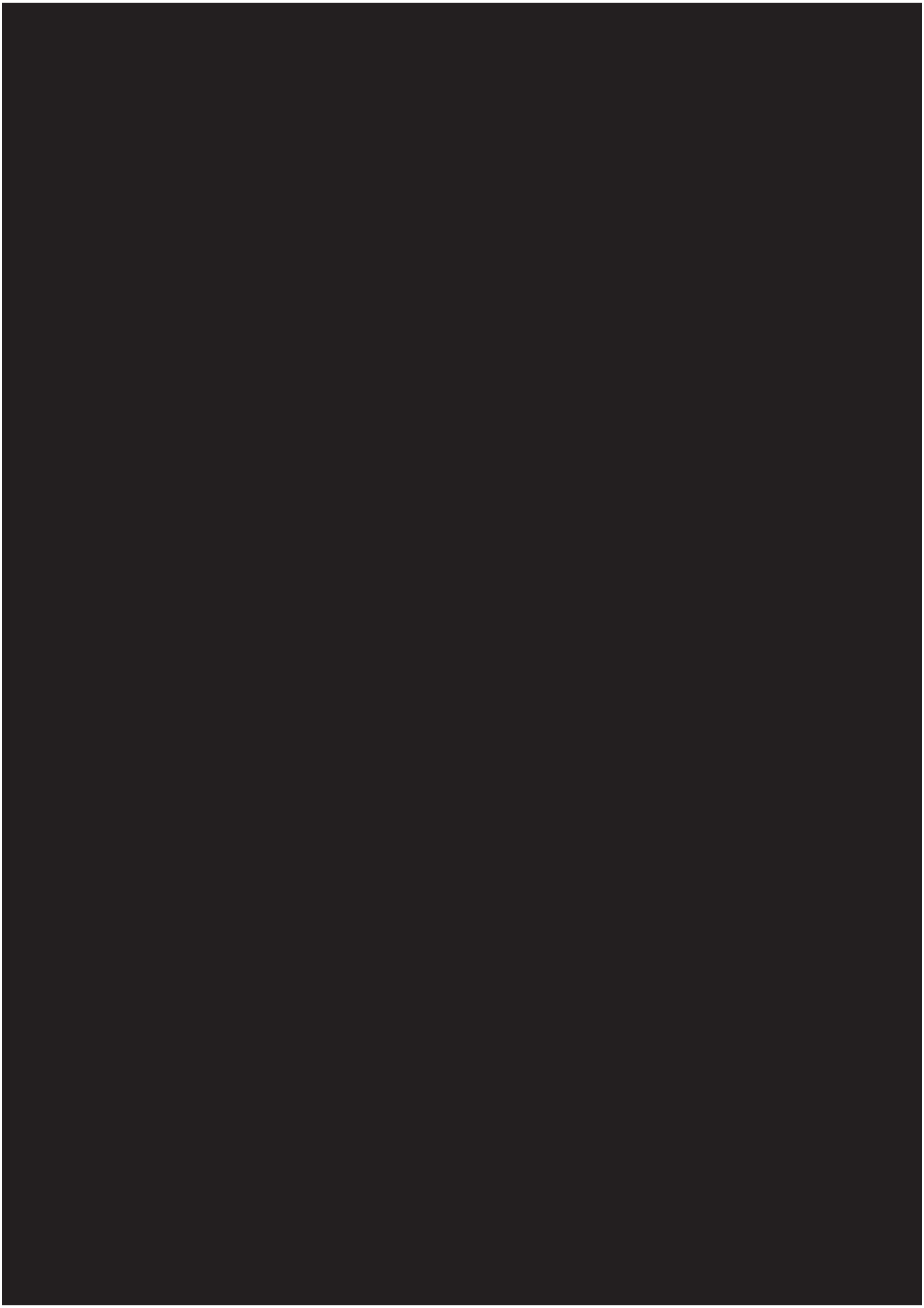

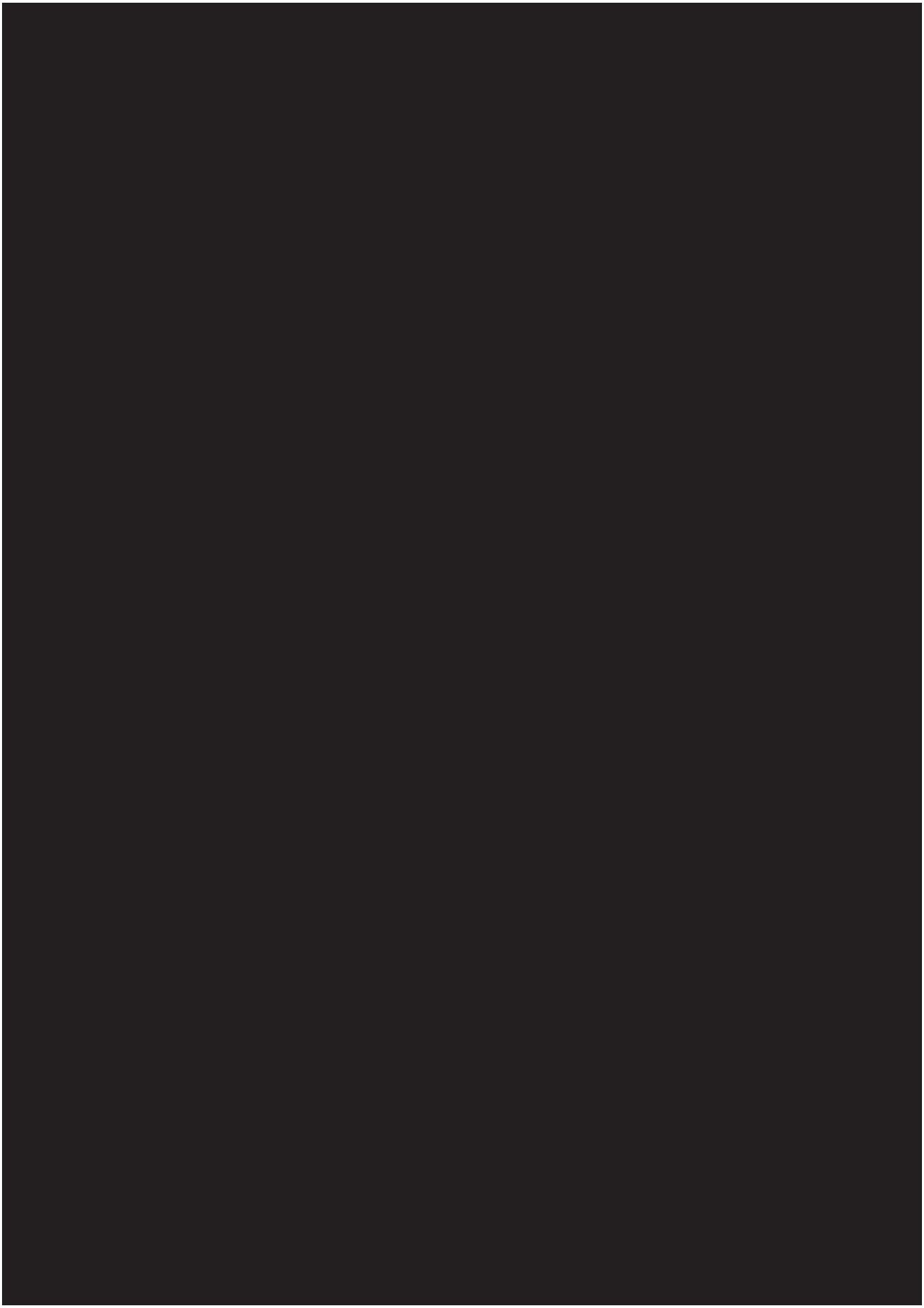

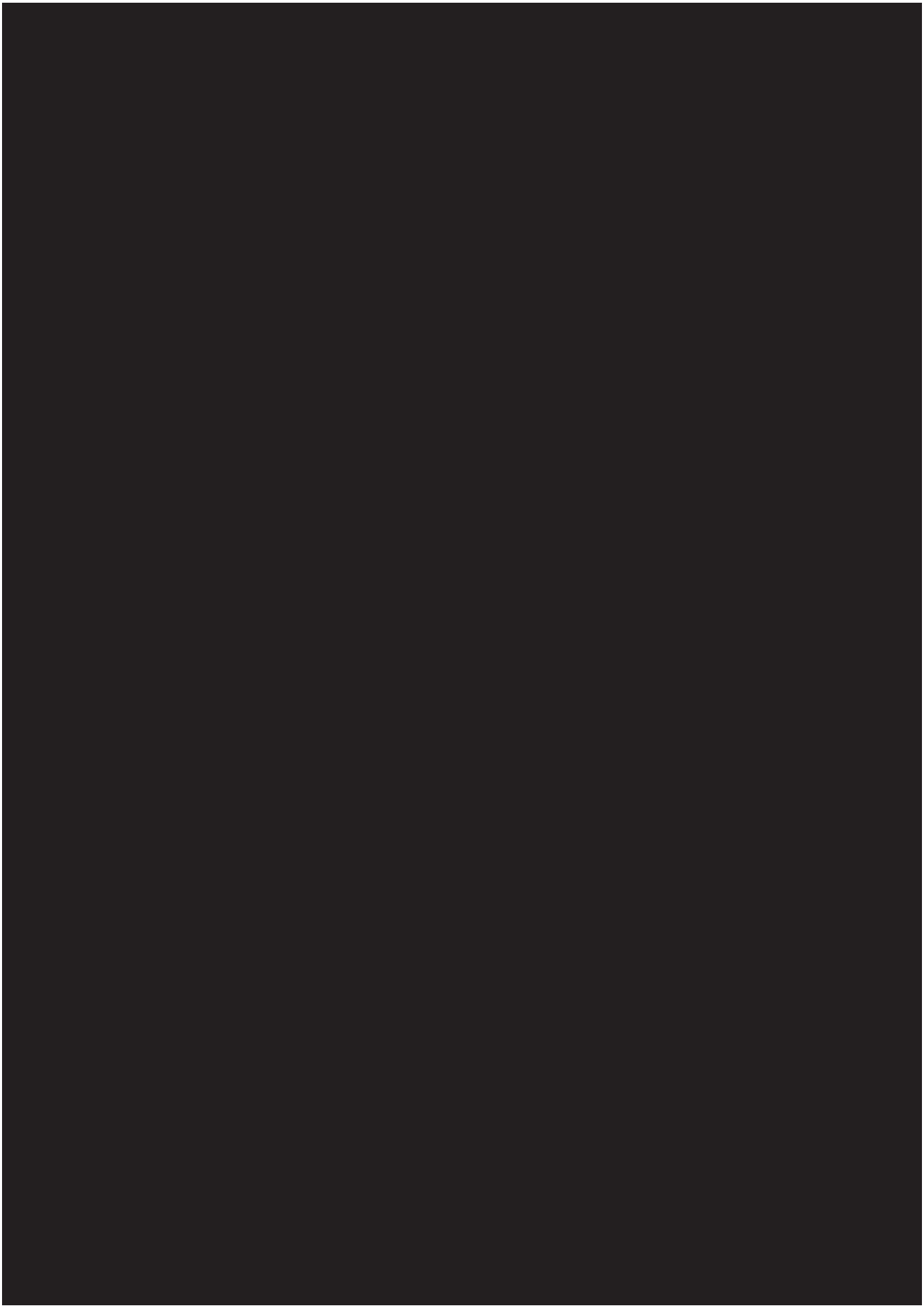

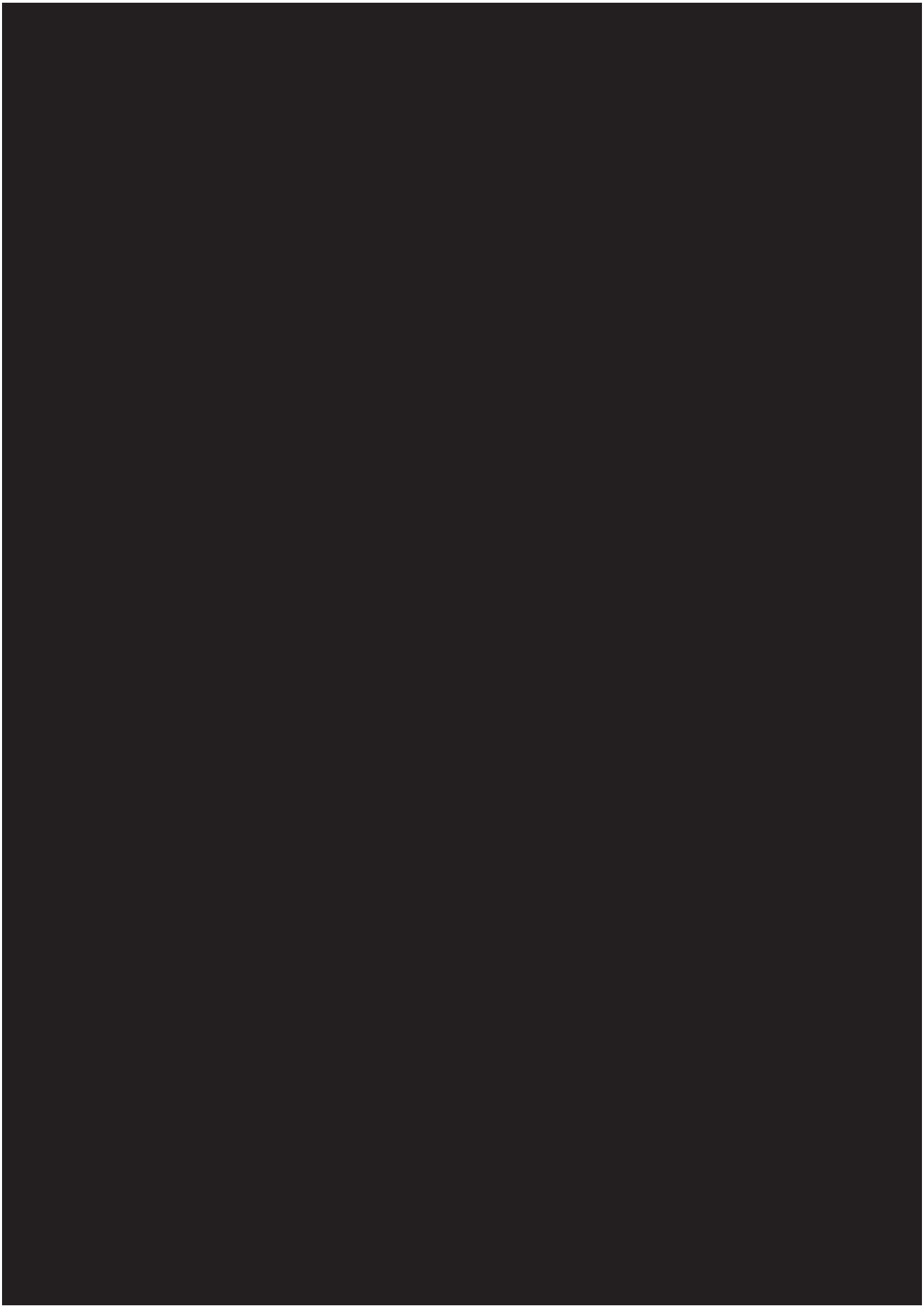

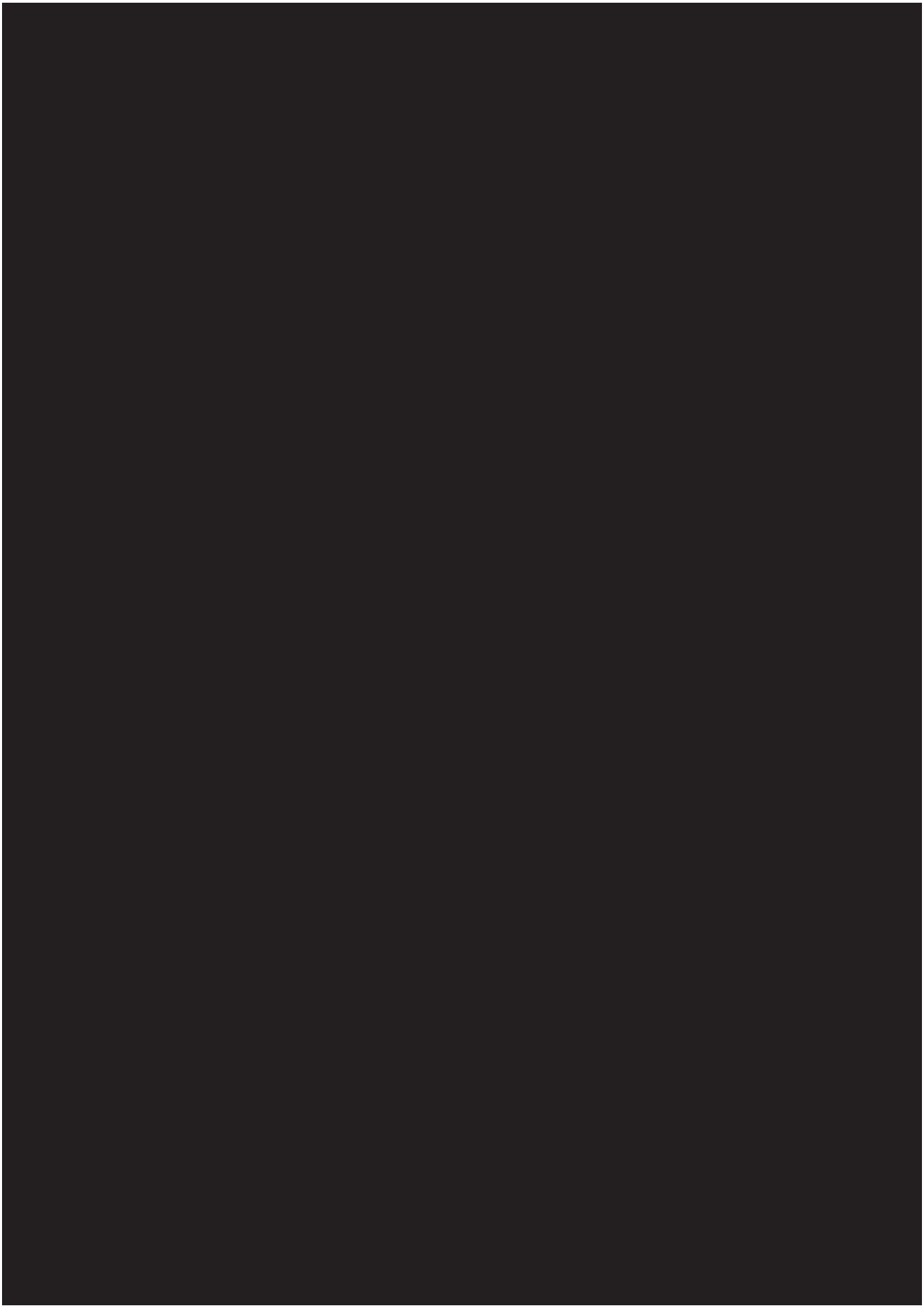

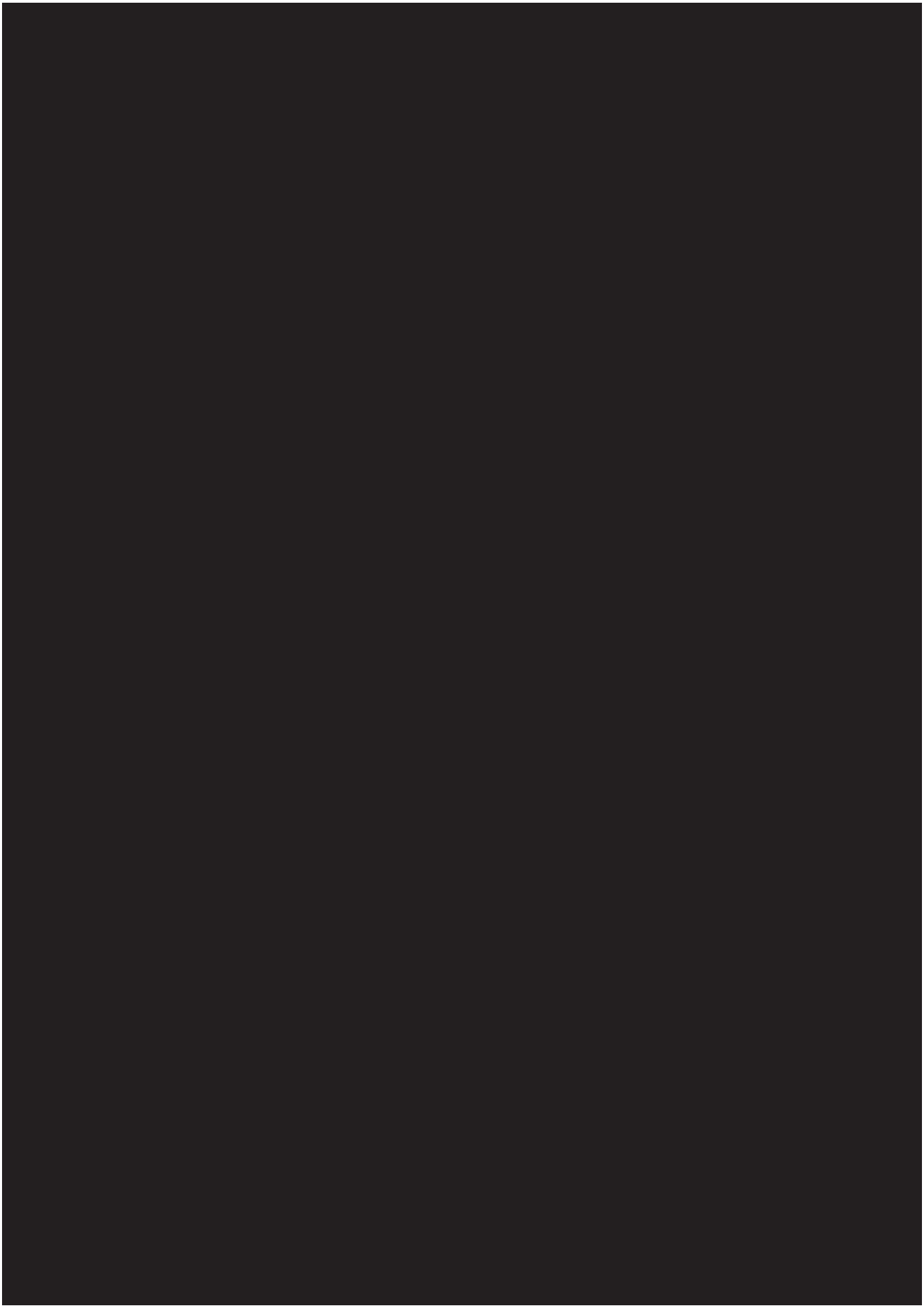

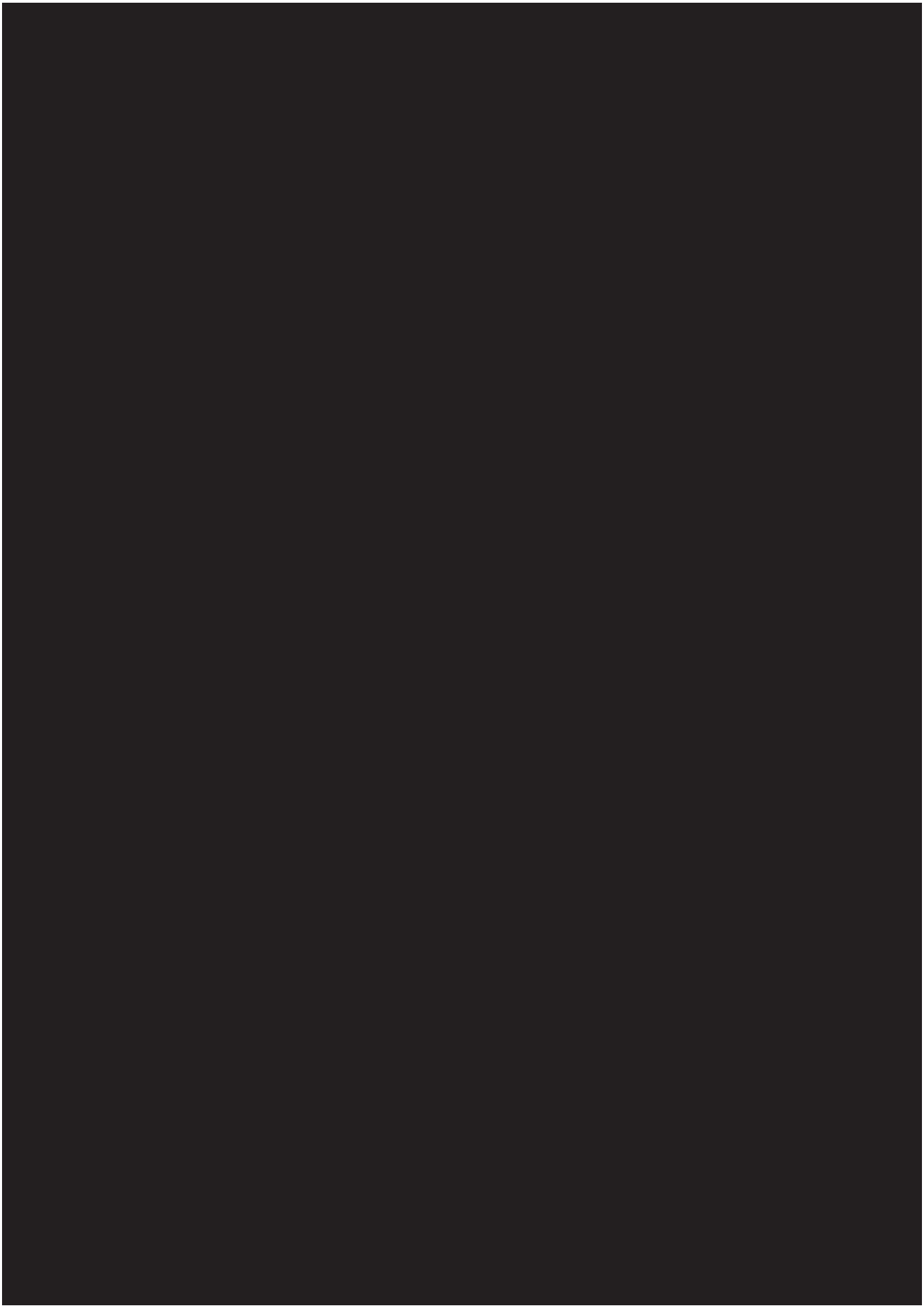

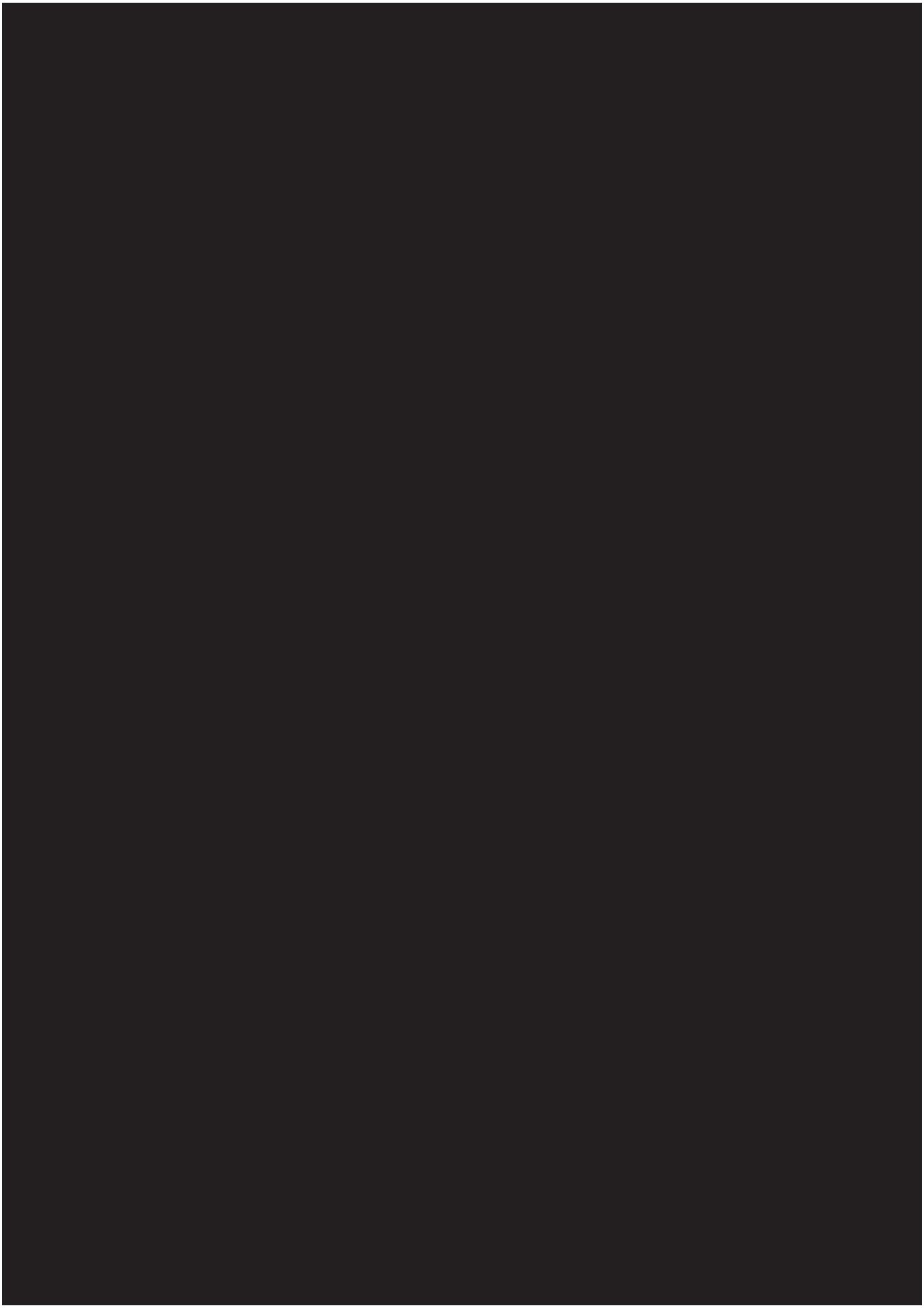

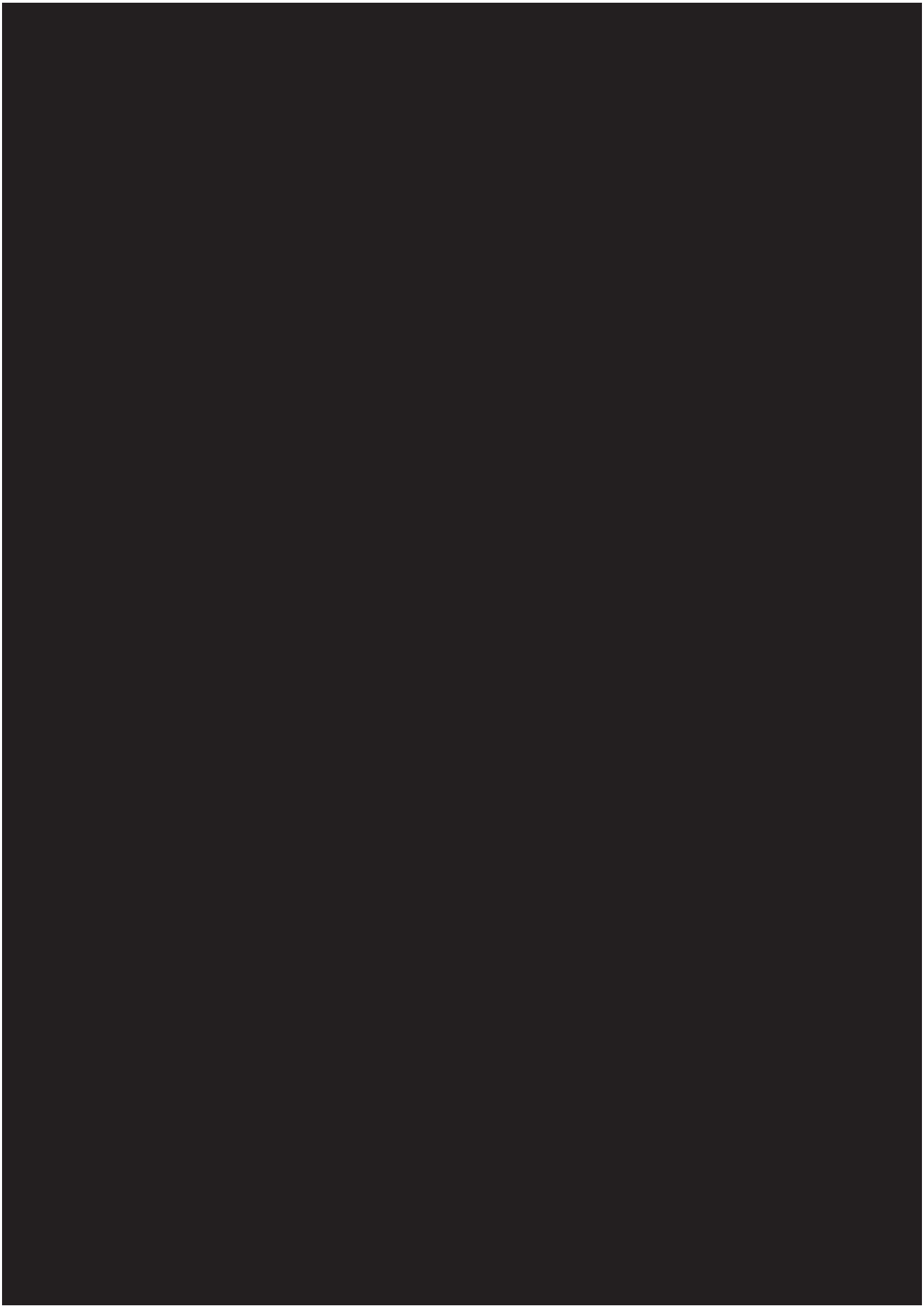

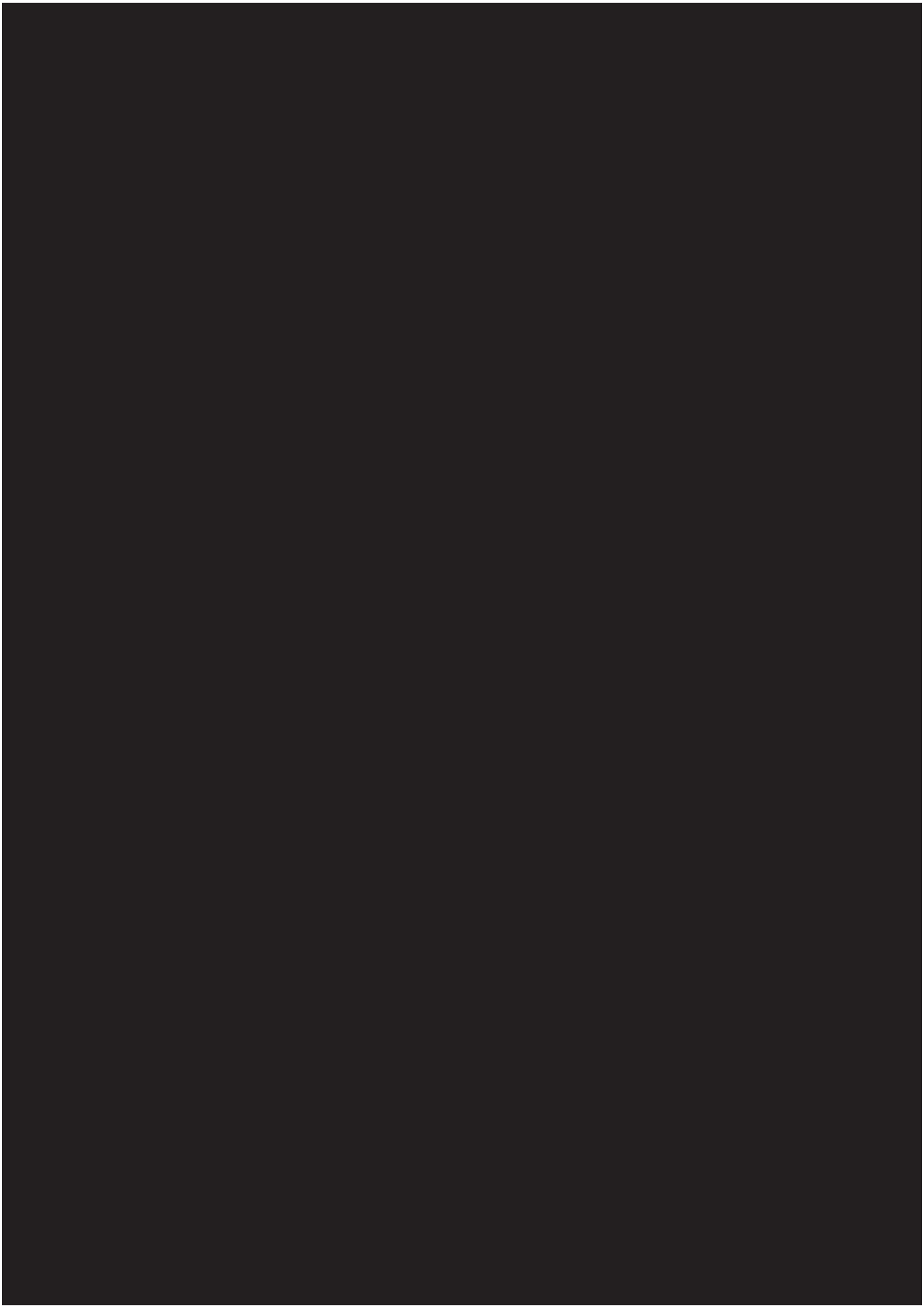

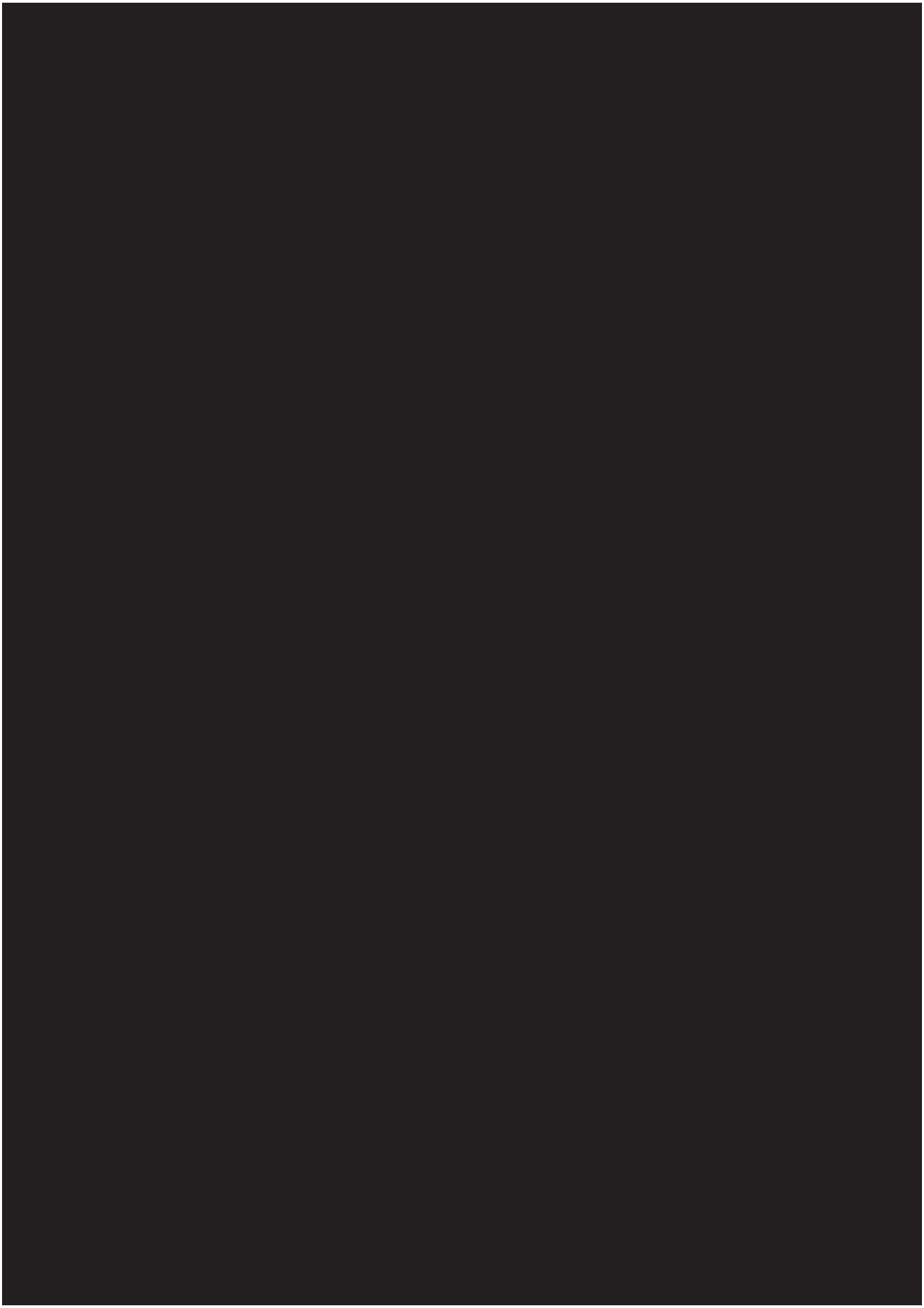

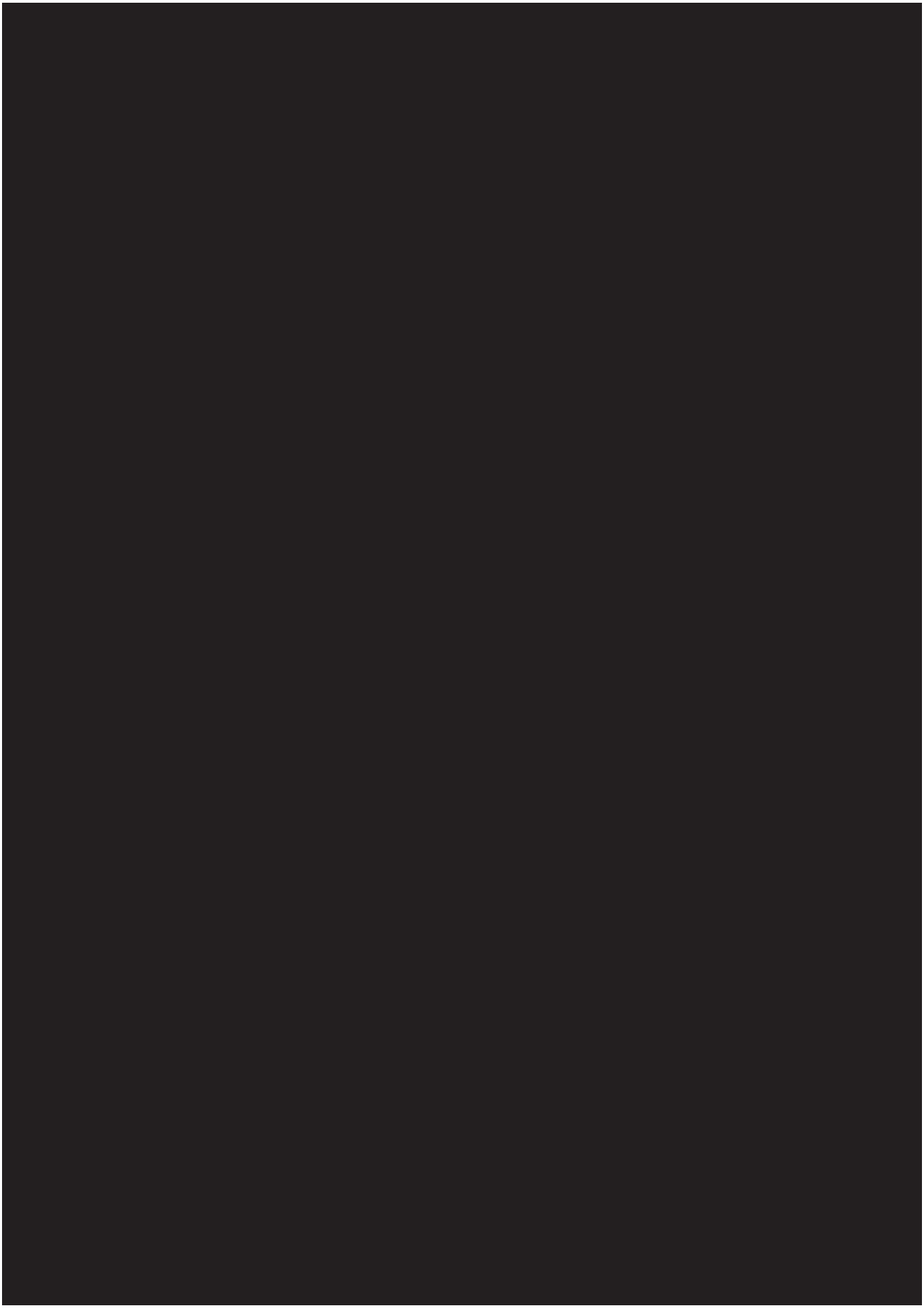

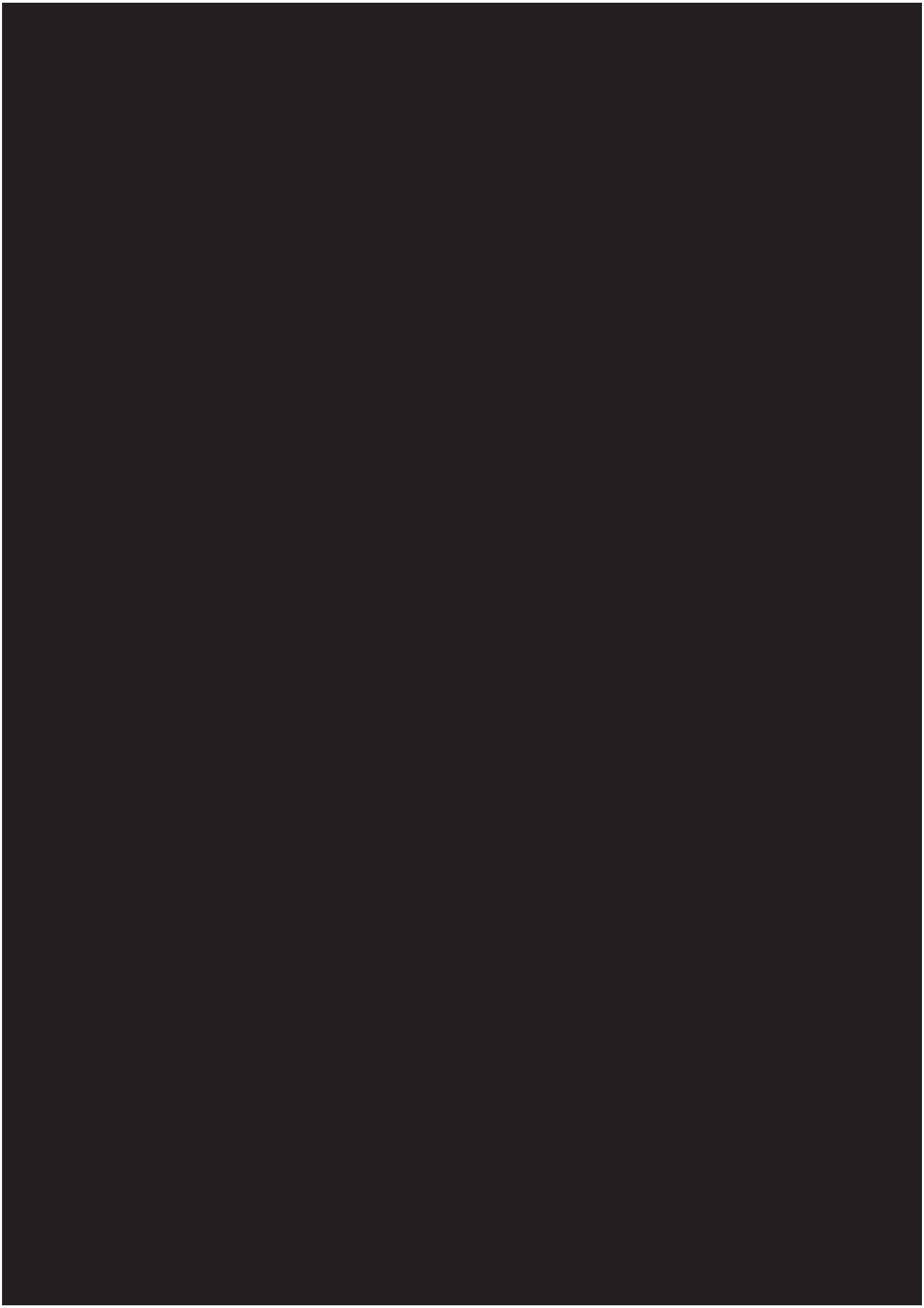

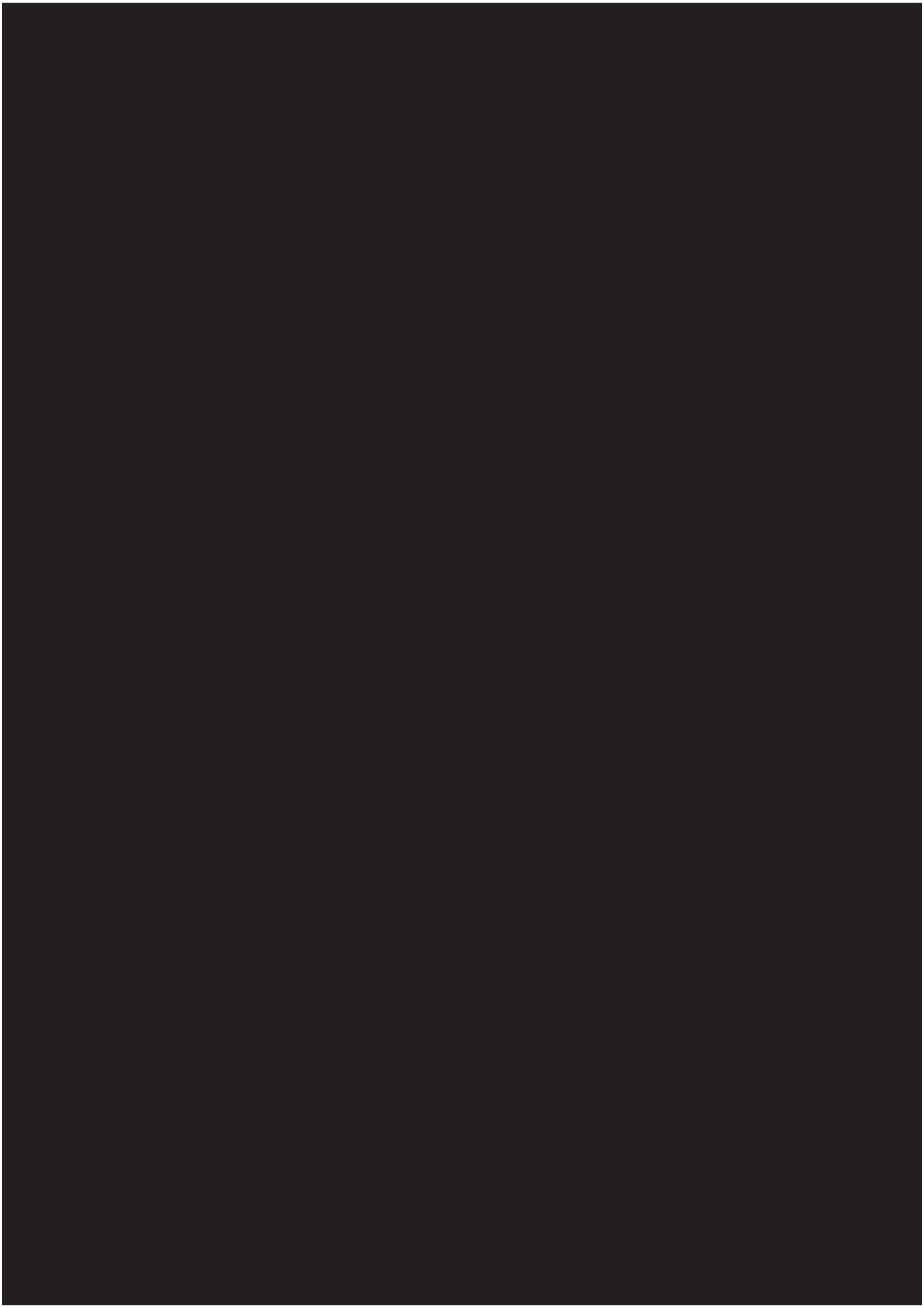

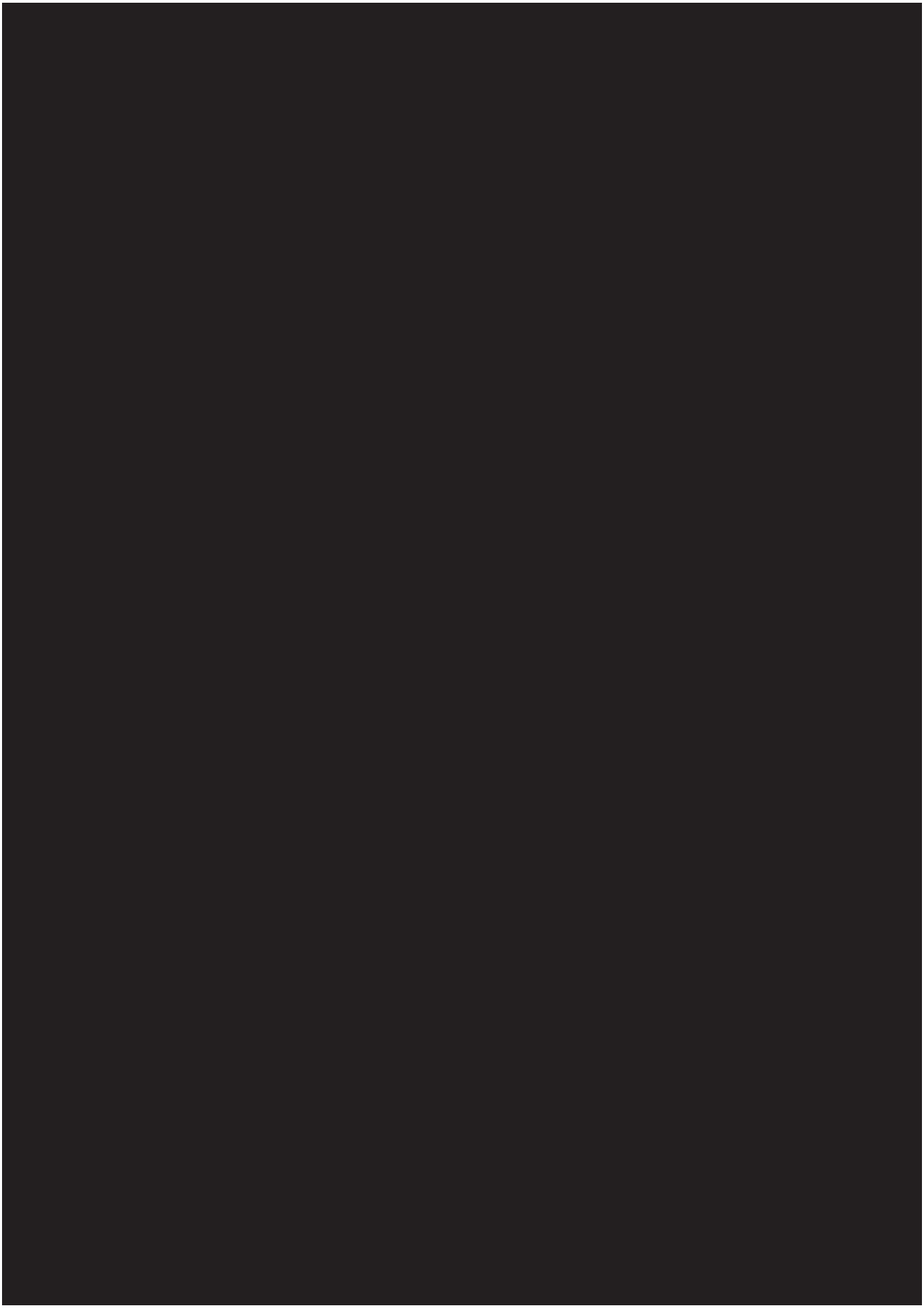

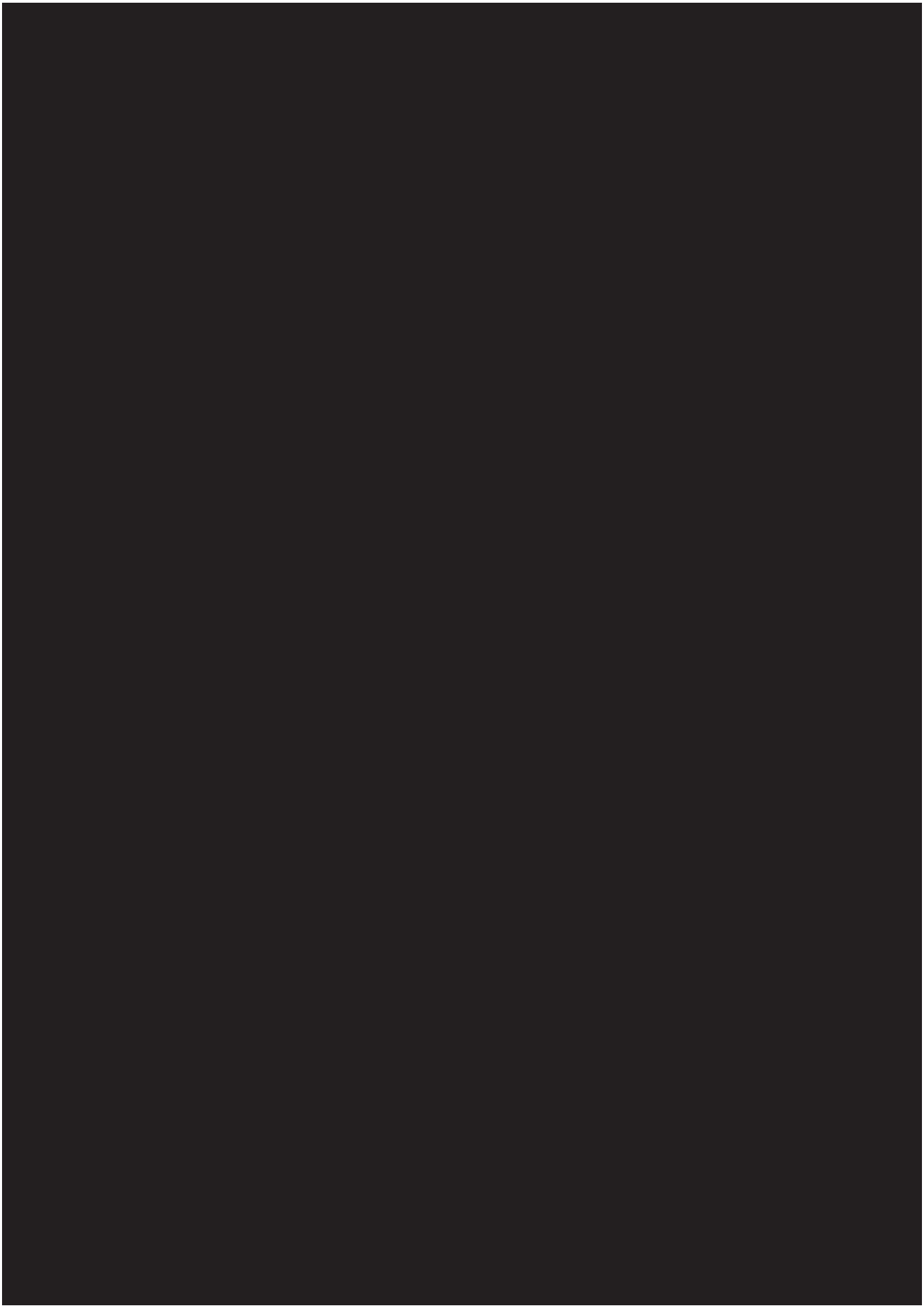

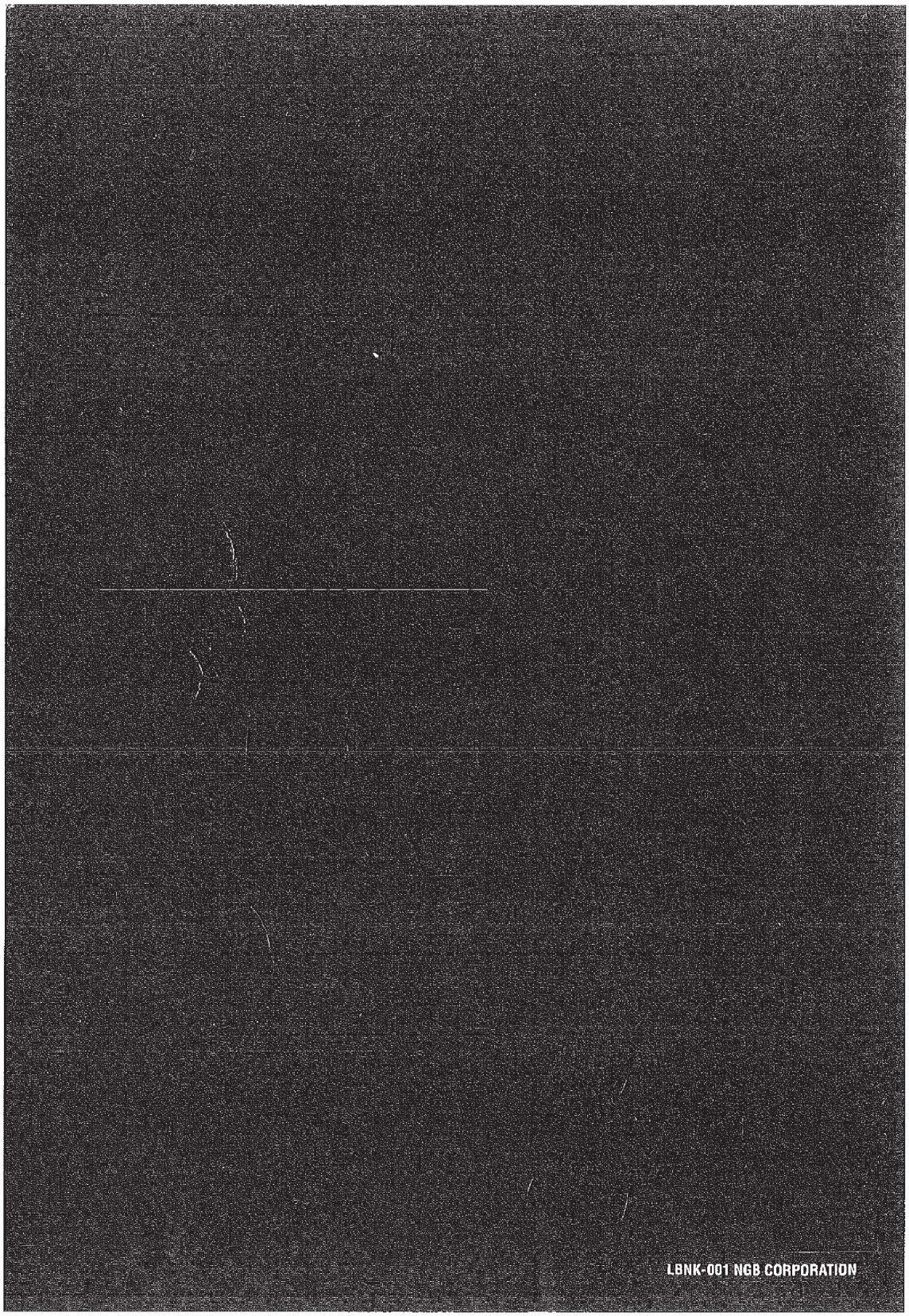
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