



Dental Anatomy
COLORING BOOK

4th Edition



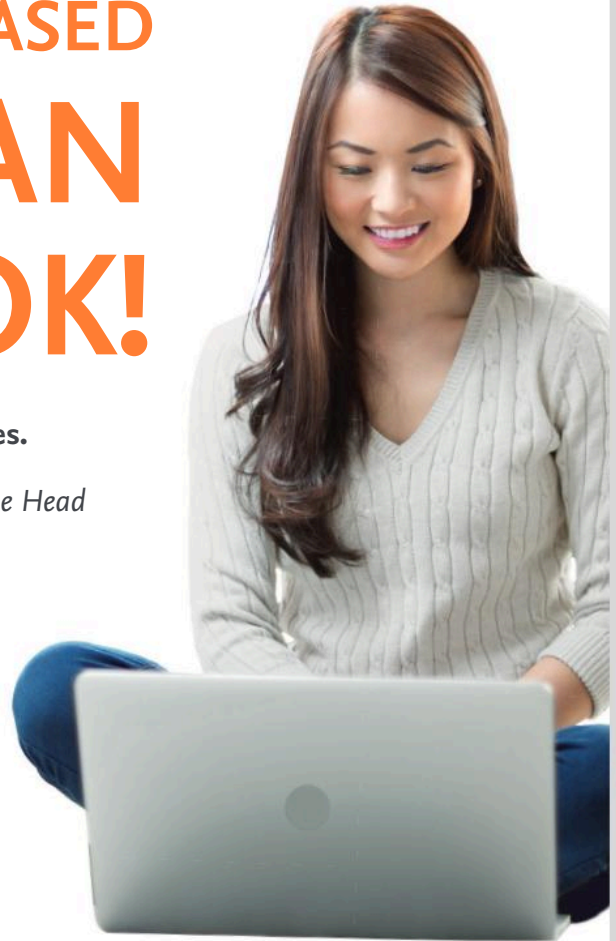
Edited by
MARGARET J. FEHRENBACH

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4th Edition

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A thorough understanding of anatomy related to dentistry is vital for today's dental professionals, and this fourth edition of the *Dental Anatomy Coloring Book* is an ideal companion for anyone studying dentally related anatomy. This latest edition has even more structures to color as well as more details added to previous structures. It will not only help you identify different structures, but also test your knowledge of all dentally related anatomy, with all its intricacies of embryologic background and histologic breakdown, using proven testing methods. Knowledge of related facial landmarks, veins, arteries, nerves, bones, and muscles of the head and neck region as well as dental anatomy is information that every dental professional needs to have to maintain clinical competence, and this resource enhances learning and memory retention in an easy-to-use, always FUN, format!

This fourth edition of the *Dental Anatomy Coloring Book* fully delivers complete anatomic coverage of the head and neck. Beginning with an overview of body systems and then moving on to specific regions of the head and neck as well as the oral cavity, the text follows the anatomic systems, including orofacial anatomy, dental anatomy, as well as the skeletal system, muscular system, vascular system, nervous system, and much more! This book will help you to visually understand the various parts of the head and neck as well as the oral cavity and how they relate to each other. In addition, the final chapter on fasciae and spaces will give the reader a better overall regional feel for the anatomy of the head and neck.

It has been noted that one of the most effective ways to learn about the intricacies of the body is by coloring detailed illustrations of various body parts. This coloring book is additionally helpful since it zeroes in on the specifics of the head and neck to allow focused learning for the dental professional. In addition, you do not have to be an expert artist to color!

Studies also show that adult coloring is therapeutic, reducing stress similarly to meditation. The gentle and repetitive motion of your hand bringing color to paper helps quiet your mind, bringing your usual rapid-fire thoughts down to a much slower pace while leaving the fast-paced digital world behind. We know we get a better night's sleep when avoiding engaging with electronics at night because exposure to the emitted light reduces your levels of the sleep hormone melatonin. Coloring is a relaxing and electronic-free bedtime ritual that will not disturb your level of melatonin and thus intrude on your sleep patterns.

Coloring also fosters creativity. This is because coloring requires the two hemispheres of the brain to communicate. While logic helps us stay inside the lines, choosing colors generates a creative thought process. So we invite you to take a break from your sometimes rote learning of your dental studies and find your creative center! Coloring also requires you to focus, but not so much that it is stressful. It opens up your frontal lobe, which controls organizing and problem solving, and allows you to put everything else aside and live in the moment, generating focus. Thus, regardless of your needs, there is so much to be gained by spending some time coloring.

HOW TO USE THE BOOK

Each page of the new edition contains a brief statement describing the body part featured and its orientation view, followed by a crisp easy-to-color illustration(s). Numbered leader lines clearly identify the structures to be colored and correspond to a numbered list appearing below the illustration. You can create your own "color code" by coloring in the boxed number appearing on the illustration and using the same color to fill in the corresponding numbered box on the list below. An example of a completed illustration can be found on the inside back cover. You can be distinctly creative with your color selections or go the classical route such as using red for arteries and blue for veins.

For review purposes for classroom or national board examination or certification, a numbered list appears at the page bottom or far right, which can be easily covered with a sheet of paper allowing self-examination. Additionally, included are 10 fully updated fill-in-the-blank review questions that appear on the back side of the page with the structures so that additional reviews can occur; the answers appear inverted below on the same page. In addition, textbook

references for each figure are noted at the bottom of the page so the reader can easily obtain more information on each structure presented. Finally, there is a fully comprehensive test with 75 multiple-choice questions using the latest national board format with answers and rationale at the end that will help to summarize your study of dentally related anatomy and allow you to know which areas need more review!

It is suggested that you use colored pencils to avoid bleed through and after you are done coloring a page, carefully remove it from the textbook using its serrated edge and place it in a clear plastic three-hole cover sleeve. Add them to your class notes or purchase a three-ring binder to store them separately for easy reference. Then, take them with you and study while you're waiting for your clinical appointments or class to start, or eating on-the-run meals, etc. Enjoy; and learn!

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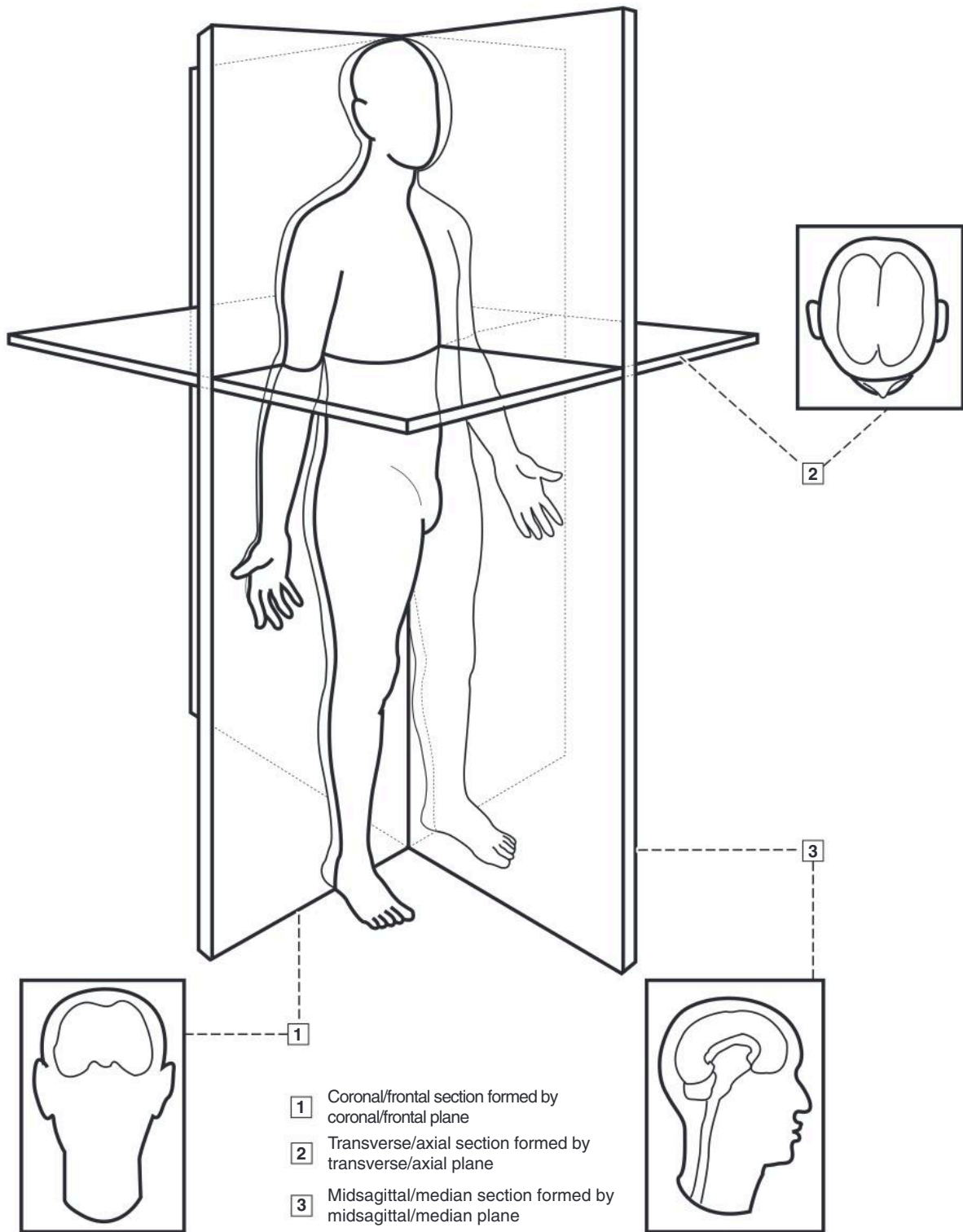
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FIGURE 1.1 Anatomic position with body sections and planes



REVIEW QUESTIONS: Anatomic position with body sections and planes

Fill in the blanks by choosing the appropriate terms from the list below.

1. The anatomic nomenclature is a system of names for _____.
2. In _____ the body can be standing erect with the arms at the sides and the palms and toes directed forward as well as the eyes looking forward.
3. The _____ or *midsagittal section* is a division by the median or midsagittal plane.
4. The _____ or *frontal section* is a division by any coronal or frontal plane.
5. The _____ or *transverse section* is a division by any axial or transverse plane.
6. The _____ or *midsagittal plane* divides the body into equal right and left halves.
7. Dividing the body into anterior and posterior parts at any level is related to a(n) _____ or *coronal plane*.
8. A(n) _____ or *transverse plane* divides the body at any level horizontally into either superior and inferior parts and is always perpendicular to the midsagittal plane.
9. A sagittal plane divides the body parallel to the _____.
10. When the body in the anatomic position is lying down on its front, it is considered the _____, and when the body is lying down on its back, it is considered the supine position.

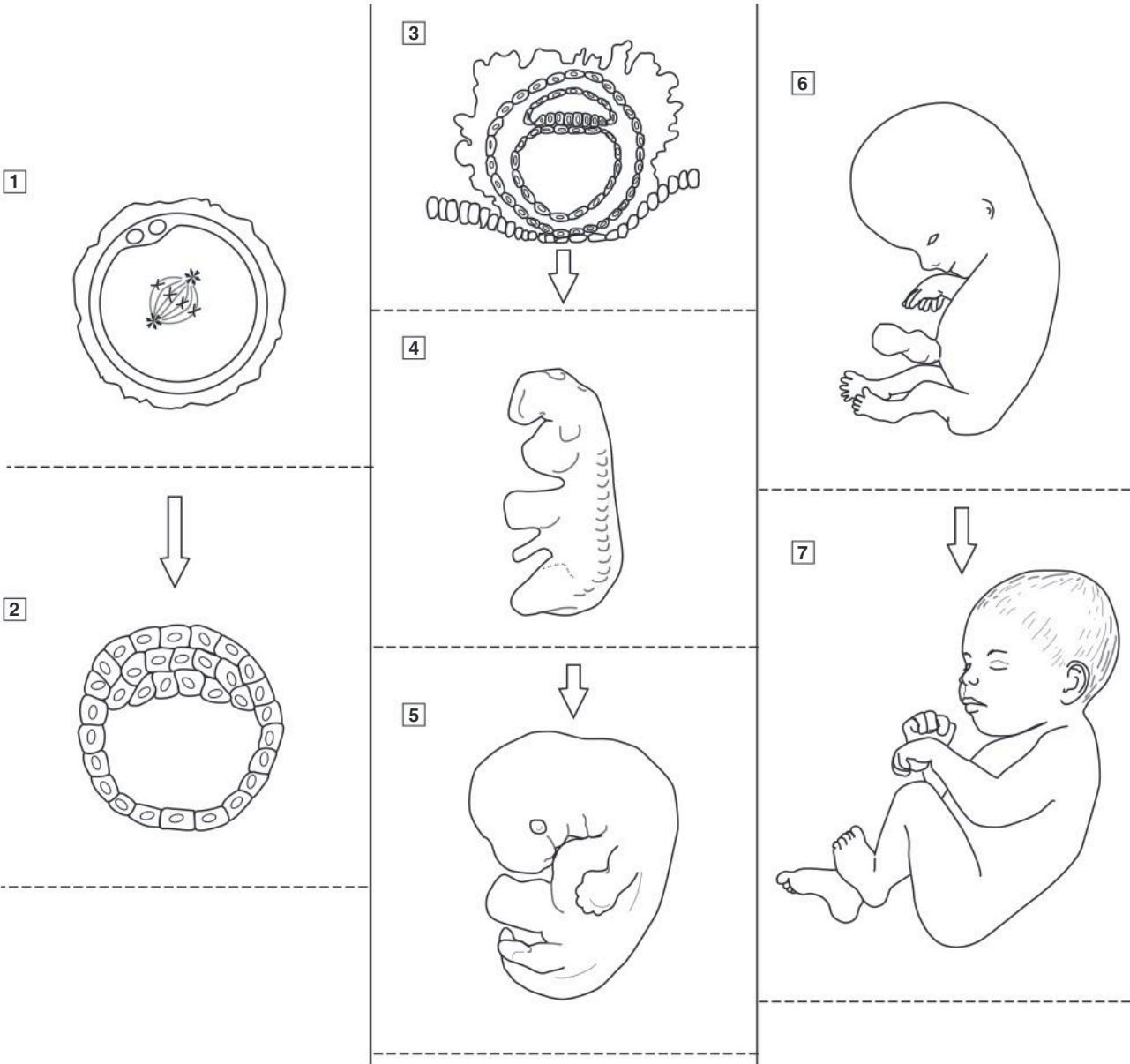
- | | | |
|---------------------|----------------|----------------|
| midsagittal plane | median section | frontal plane |
| coronal section | axial plane | axial section |
| anatomic position | median plane | prone position |
| anatomic structures | | |

Reference Chapter 1, Introduction to head and neck anatomy. In Fehrenbach MJ, Herring SW: *Illustrated anatomy of the head and neck*, ed 6, St. Louis, 2021, Saunders.

NOTES

ANSWER KEY 1. anatomic structures, 2. anatomic position, 3. median section, 4. coronal section, 5. axial section, 6. median plane, 7. frontal plane, 8. axial plane, 9. midsagittal plane, 10. prone position

FIGURE 1.2 Prenatal development overview



- | | | |
|--|---|--|
| PREIMPLANTATION PERIOD: 1ST WEEK | EMBRYONIC PERIOD: 2ND-8TH WEEK | FETAL PERIOD: 3RD-9TH MONTH |
| 1 Zygote | 3 Disc | 6 Embryo |
| 2 Blastocyst | 4 Embryo | 7 Fetus |
| | 5 Folded embryo | |

REVIEW QUESTIONS: Prenatal development overview

Fill in the blanks by choosing the appropriate terms from the list below.

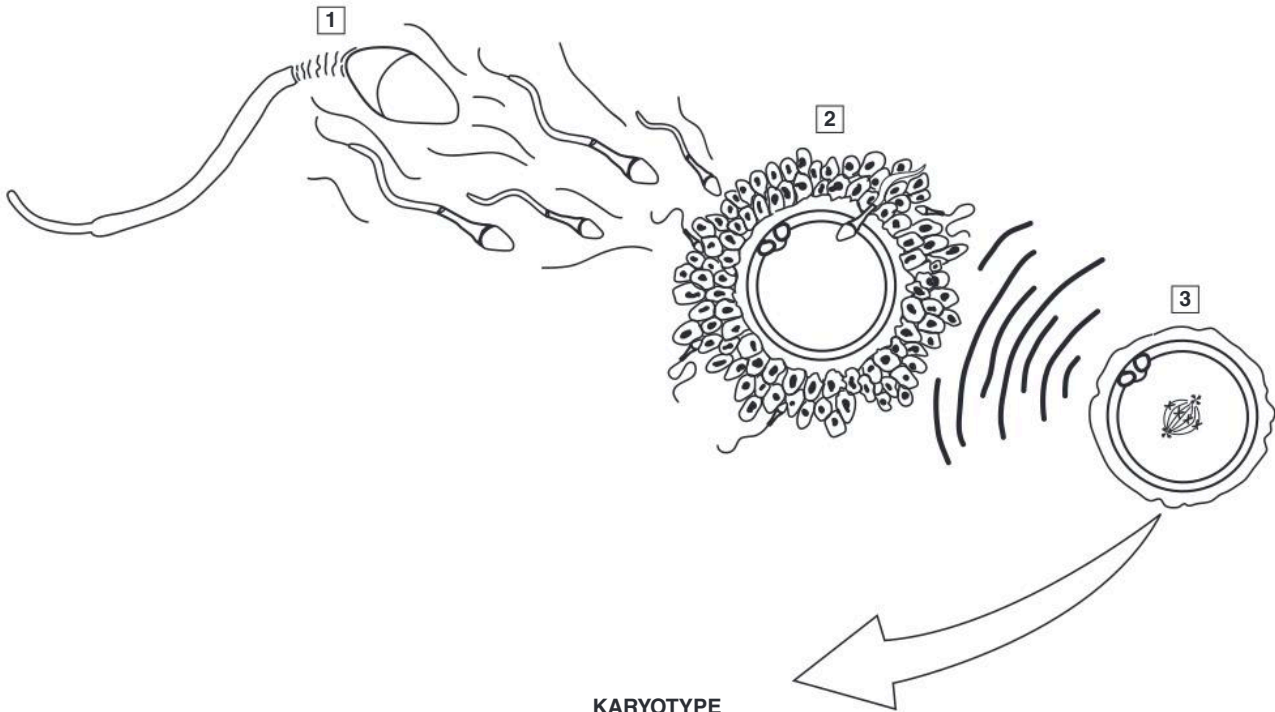
1. The process of _____ begins with the start of pregnancy and continues until the birth of the child.
2. The 9 months of gestation during prenatal development is usually divided into 3-month time spans or _____.
3. The study of prenatal development is also known as _____.
4. Each of the structures of the face, neck, and oral cavity has a(n) _____, the earliest indication of an organ or tissue during prenatal development.
5. At the beginning of the first week, conception takes place where a female's ovum is penetrated by and united with a male's sperm during fertilization; the union of the ovum and sperm subsequently forms a *fertilized egg* or _____.
6. The first period, the _____ of prenatal development, takes place during the first week after conception.
7. Because of the ongoing process of mitosis and secretion of fluid by the cells within the morula, the zygote becomes a(n) _____ (or blastula) that undergoes implantation.
8. During the second week of prenatal development within the embryonic period, a(n) _____ eventually develops from the blastocyst and appears as a three-dimensional but flattened circular plate of bilayered cells.
9. The second period of prenatal development, the embryonic period, extends from the beginning of the second week to the end of the eighth week, with the structure developing further and becoming a(n) _____.
10. The fetal period of prenatal development follows the embryonic period and encompasses the beginning of the ninth week or third month continuing to the ninth month, with the maturation of existing structures occurring as the embryo enlarges to become a(n) _____.

- | | | |
|----------------------|--------------------------|------------------------|
| embryology | fetus | embryo |
| prenatal development | bilaminar embryonic disc | primordium |
| zygote | blastocyst | preimplantation period |
| trimesters | | |

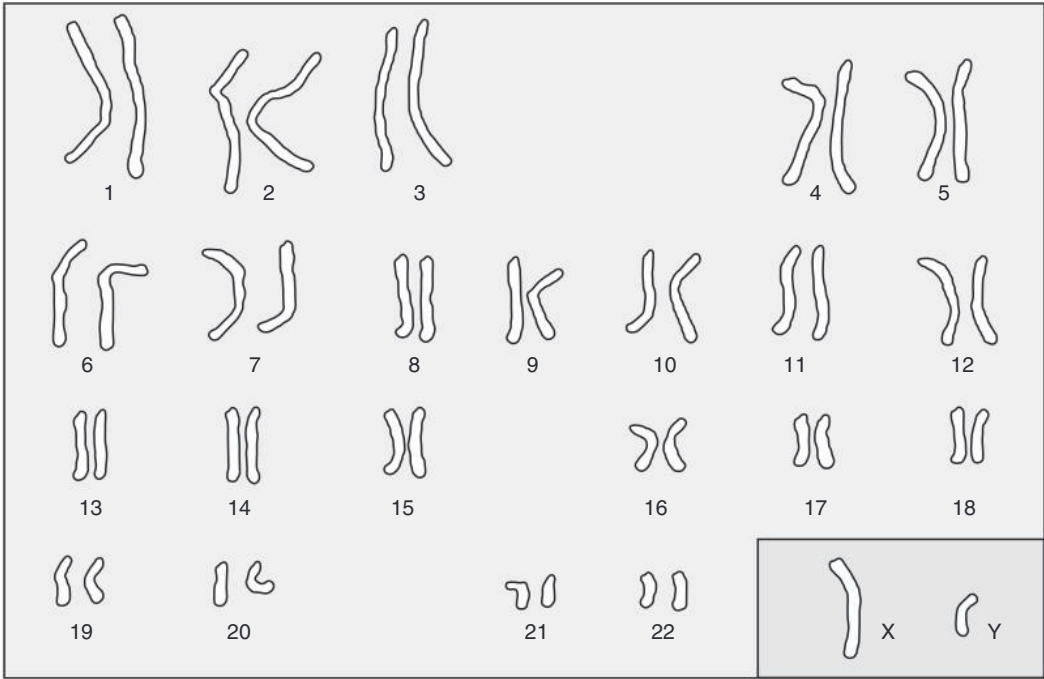
Reference Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders.

ANSWER KEY 1. prenatal development, 2. trimesters, 3. embryology, 4. primordium, 5. zygote, 6. preimplantation period, 7. blastocyst, 8. bilaminar embryonic disc, 9. embryo, 10. fetus

FIGURE 1.3 Fertilization during prenatal development



KARYOTYPE



- 1 Sperm (enlarged)
- 2 Ovum
- 3 Zygote

REVIEW QUESTIONS: Fertilization during prenatal development

Fill in the blanks by choosing the appropriate terms from the list below.

1. At the beginning of the first week of prenatal development _____ takes place where a female's ovum is penetrated by and united with a male's sperm during fertilization.
2. The union of the ovum and sperm subsequently forms a(n) _____ or zygote.
3. During fertilization, the final stages of the process of _____ occur in the ovum, resulting in the joining of the ovum's chromosomes with those of the sperm; this joining of chromosomes from both biologic parents forms a new individual with "shuffled" chromosomes.
4. The zygote receives half its _____ from the female and half from the male, with the resultant genetic material a reflection of both biologic parents through the process of meiosis.
5. The photographic analysis or profile of a person's chromosomes is done in an orderly arrangement of the pairs in a(n) _____; with the sex known by the presence of either having XX chromosomes for female or XY chromosomes for male.
6. Each cell contains 46 chromosomes in the karyotype, with the number 46 being the _____ number for the cell.
7. Two of these are sex chromosomes in the karyotype; the remaining are _____.
8. Each chromosome is paired in the karyotype so that every cell has 22 _____ sets of paired autosomes, with one sex chromosome derived from the female and one from the male.
9. The _____ chromosomes, designated X and Y in the karyotype, are paired as XX in the female and XY in the male.
10. The ovum or sperm is required to have half as many chromosomes, which is the haploid number, so that on _____ the original complement of 46 chromosomes will be reestablished in the new cell.

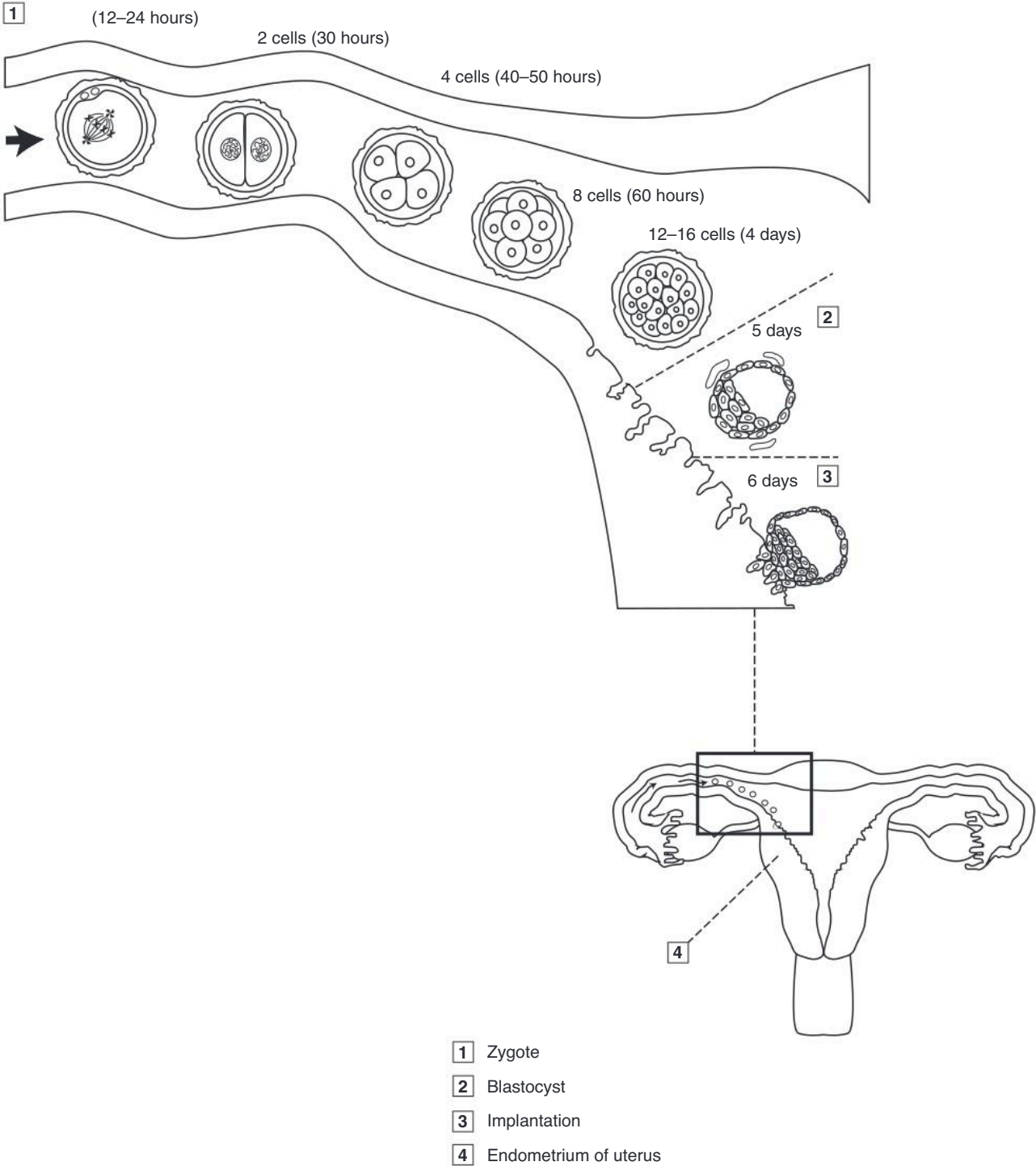
fertilized egg	chromosomes	homologous
karyotype	diploid	sex
meiosis	autosomes	fertilization
conception		

References Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders; Chapter 2, General embryology. In Nanci A, *Ten Cate's oral histology*, ed 9, St. Louis, 2018, Mosby.

NOTES

ANSWER KEY 1. conception, 2. fertilized egg, 3. meiosis, 4. chromosomes, 5. karyotype, 6. diploid, 7. autosomes, 8. homologous, 9. sex, 10. fertilization

FIGURE 1.4 Preimplantation period to implantation during prenatal development (cross section)



REVIEW QUESTIONS: Preimplantation period to implantation during prenatal development

Fill in the blanks by choosing the appropriate terms from the list below.

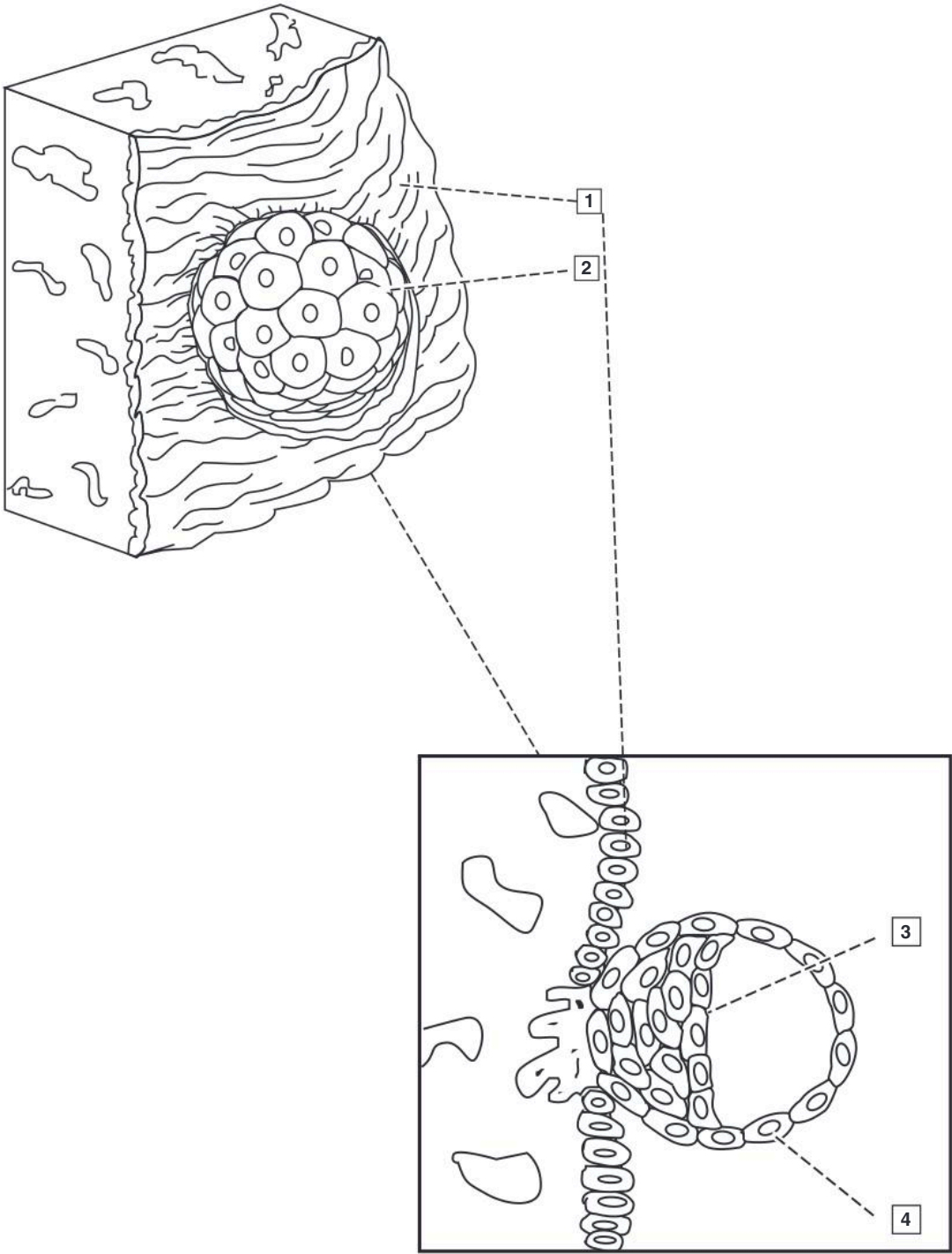
1. The first period of prenatal development, the _____, takes place during the first week after conception, with the union of the ovum and sperm subsequently forming a fertilized egg or *zygote*.
2. After fertilization, the zygote undergoes _____ or individual cell division that splits it into many more cells due to cleavage.
3. After initial cleavage, the solid ball of cells becomes a(n) _____.
4. Because of the ongoing process of mitosis and secretion of fluid by the cells within the morula, the zygote becomes a(n) _____ (or blastula).
5. By the end of the first week, the blastocyst stops traveling and undergoes _____ and thus becomes embedded in the prepared endometrium, the innermost lining of the uterus on its back wall.
6. The process of _____ is key in prenatal development from the initial axial (head-to-tail) specification of the embryo through its segmentation and ultimately to the development of the dentition.
7. Patterning is a spatial and temporal event as exemplified by regional prenatal development of incisors, canines, premolars, and molars, which occurs at different times and involves the processes of _____, competence, and differentiation.
8. All the cells of an individual during prenatal development come from the _____; these cells have differentiated into populations that have assumed particular functions, shapes, and rates of turnover.
9. The process that initiates _____ is induction during prenatal development; an inducer is an agent that provides cells with the signal to enter this process; each compartment of cells must be competent to respond to the induction process.
10. After fertilization, prenatal development involves a phase of rapid _____ and migration of cells, with little or no differentiation; this phase lasts until three embryonic cell layers (or germ layers) have formed.

- | | | |
|-------------------------------|------------------------|----------------------|
| patterning | induction | morula |
| preimplantation period | differentiation | proliferation |
| mitosis | implantation | zygote |
| blastocyst | | |

References Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders; Chapter 2, General embryology. In Nanci A, *Ten Cate's oral histology*, ed 9, St. Louis, 2018, Mosby.

ANSWER KEY 1. preimplantation period, 2. mitosis, 3. morula, 4. blastocyst, 5. implantation, 6. patterning, 7. induction, 8. zygote, 9. differentiation, 10. proliferation

FIGURE 1.5 Implantation during prenatal development (internal view and cross section)



- 1 Endometrium of uterus
- 2 Implanted blastocyst
- 3 Embryoblast layer
- 4 Trophoblast layer

REVIEW QUESTIONS: Implantation during prenatal development

Fill in the blanks by choosing the appropriate terms from the list below.

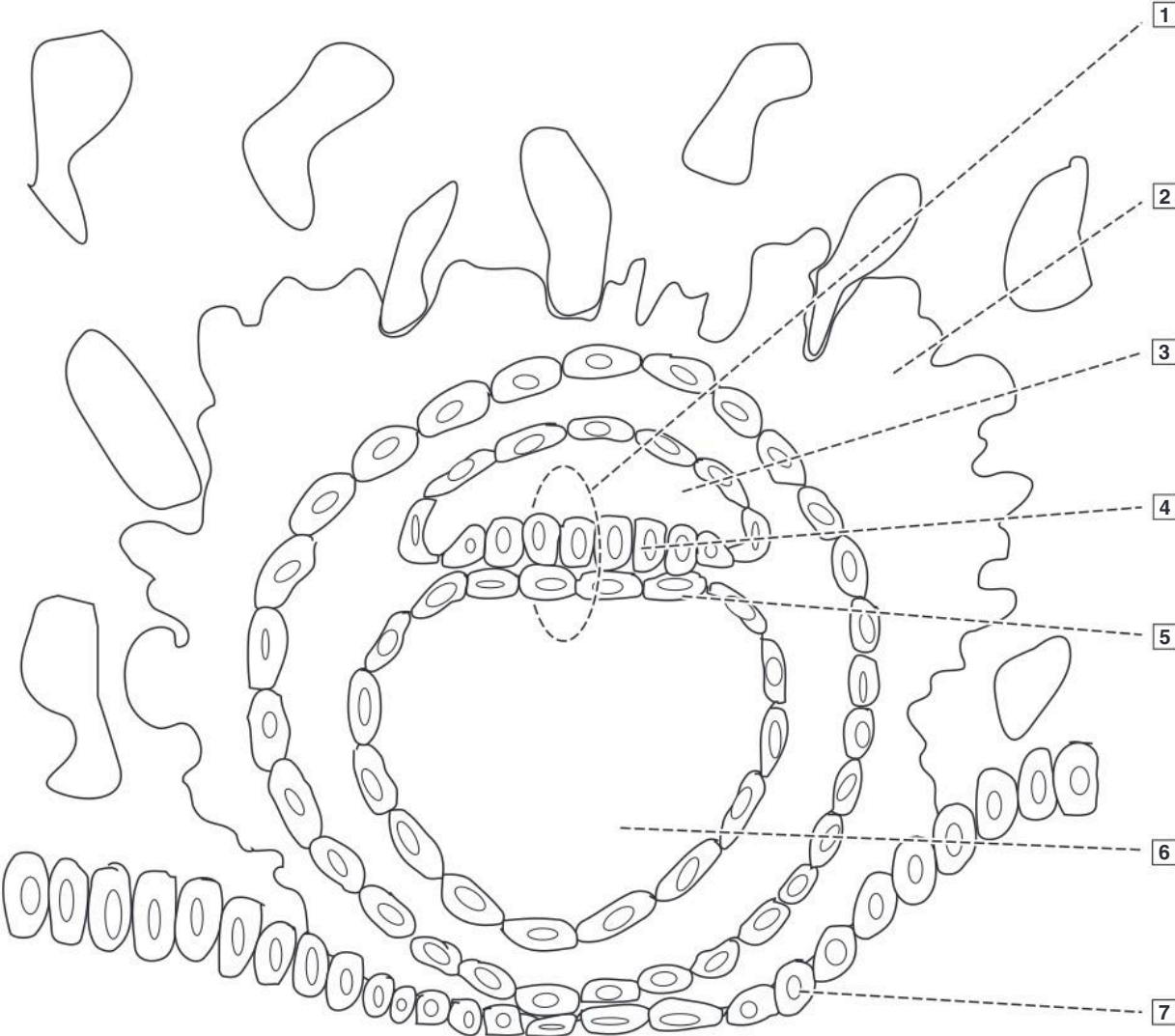
1. Because of the ongoing process of _____ and secretion of fluid by the cells within the morula, the zygote becomes a blastocyst (or blastula).
2. The latter part of the first week of prenatal development is characterized by further mitotic _____, in which the blastocyst splits into smaller and more numerous cells as it undergoes successive cell divisions by mitosis.
3. By the end of the first week, the blastocyst stops traveling and undergoes implantation and thus becomes embedded in the prepared _____, the innermost lining of the uterus on its back wall.
4. After a week of cleavage, the blastocyst consists of a layer of peripheral cells, the trophoblast layer, and a small inner mass of embryonic cells or _____.
5. The trophoblast layer later gives rise to important prenatal support tissue and the embryoblast layer gives rise to the _____ during the embryonic period.
6. After fertilization, prenatal development involves a phase of rapid proliferation and _____ of cells, with little or no differentiation.
7. This proliferative phase of prenatal development lasts until three _____ (or germ layers) have formed.
8. Embryoblast cells form the embryo, whereas the _____ cells are associated with implantation of the embryo and formation of the placenta.
9. Over time, populations of embryonic cells vary their _____ from no response to maximum response and then back to no response during prenatal development; this is defined as the ability of an embryonic cell to react to the stimulation of an inductor, allowing continued growth or differentiation of the embryo.
10. Windows of embryonic competence of varying duration exist for different populations of cells; the concepts of induction, competence, and also _____ apply in the development of the tooth and its supporting tissue as well as development of the head and neck.

- | | | |
|-------------------|-----------------------|----------------------|
| migration | embryonic cell layers | trophoblast |
| embryoblast layer | embryo | differentiation |
| endometrium | mitosis | embryonic competence |
| cleavage | | |

References Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders; Chapter 2, General embryology. In Nanci A, *Ten Cate's oral histology*, ed 9, St. Louis, 2018, Mosby.

ANSWER KEY 1. mitosis; 2. cleavage; 3. endometrium; 4. embryoblast layer; 5. embryo; 6. migration; 7. embryonic cell layers; 8. trophoblast; 9. embryonic competence; 10. differentiation

FIGURE 1.6 Second week of prenatal development during embryonic period (cross section)



- 1 Bilaminar embryonic disc
- 2 Placenta
- 3 Amniotic cavity
- 4 Epiblast layer
- 5 Hypoblast layer
- 6 Yolk sac
- 7 Endometrium of uterus

REVIEW QUESTIONS: Second week of prenatal development during embryonic period

Fill in the blanks by choosing the appropriate terms from the list below.

1. The second period of prenatal development, the _____, extends from the beginning of the second week to the end of the eighth week; it includes most of the latter part of the first trimester.
2. Certain physiologic processes or spatial and temporal events called *patterning* occur during the embryonic period, which are considered key to further development during prenatal development; these physiologic processes include _____, proliferation, differentiation, morphogenesis, and maturation.
3. During the second week of prenatal development, within the embryonic period, the implanted blastocyst grows by increased proliferation of the embryonic cells, with differentiation also occurring resulting in changes in cellular morphogenesis; the increased number of embryonic cells creates the _____ (or germ layers) within the blastocyst.
4. A(n) _____ is eventually developed from the blastocyst and appears as a three-dimensional but flattened circular plate of bilayered cells.
5. The bilaminar embryonic disc has both a superior layer and inferior layer, with the superior _____ composed of high columnar cells and the inferior hypoblast layer composed of small cuboidal cells.
6. After its creation, the bilaminar embryonic disc is suspended in the uterus's endometrium between two fluid-filled cavities, the _____, which faces the epiblast layer, and the yolk sac, which faces the hypoblast layer and serves as initial nourishment for the disc.
7. The bilaminar embryonic disc later develops into the _____ as prenatal development continues.
8. The _____, a prenatal organ that joins together the pregnant female and developing embryo, develops from the interactions of the trophoblast layer and endometrial tissue.
9. The formation of the placenta and the developing _____ permit selective exchange of soluble bloodborne substances between them, which includes oxygen and carbon dioxide as well as nutritional and hormonal substances.
10. During the embryonic period of prenatal development, differentiation occurs at various rates in the embryo affecting cells, tissue types, organs, and systems; this overall process includes different types of differentiation such as cytodifferentiation and _____.

embryo

umbilical circulation

histodifferentiation

induction

bilaminar embryonic disc

epiblast layer

placenta

embryonic period

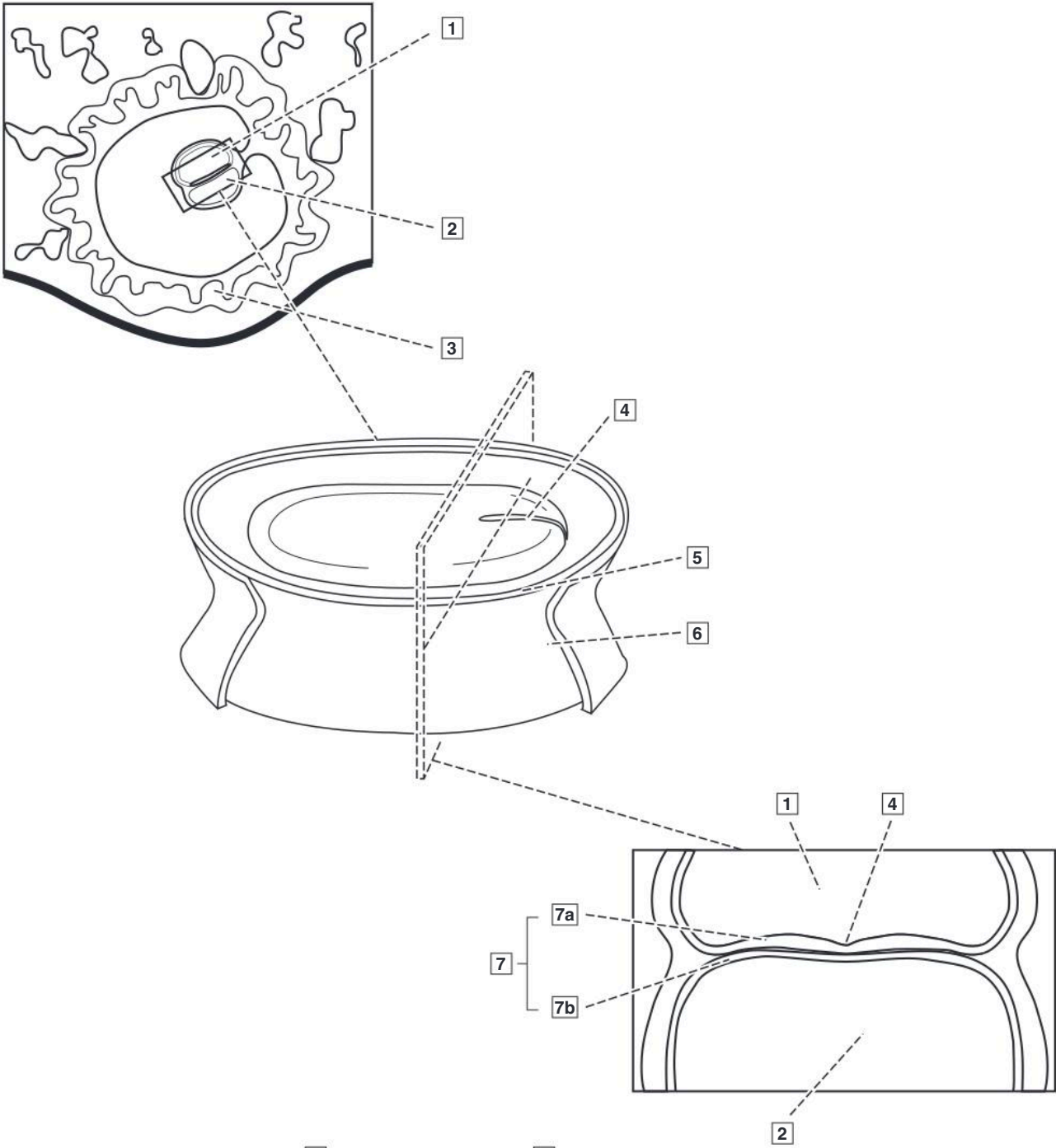
amniotic cavity

embryonic cell layers

Reference Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders.

ANSWER KEY 1. embryonic period, 2. induction, 3. embryonic cell layers, 4. bilaminar embryonic disc, 5. epiblast layer, 6. amniotic cavity, 7. embryo, 8. placenta, 9. umbilical circulation, 10. histodifferentiation

FIGURE 1.7 Third week of prenatal development during embryonic period (superior view and cross section)



- 1** Amniotic cavity
- 2** Yolk sac
- 3** Placenta
- 4** Primitive streak
- 5** Amniotic cavity lining
- 6** Yolk sac lining
- 7** Bilaminar embryonic disc
 - 7a** Epiblast layer
 - 7b** Hypoblast layer

REVIEW QUESTIONS: Third week of prenatal development during embryonic period

Fill in the blanks by choosing the appropriate terms from the list below.

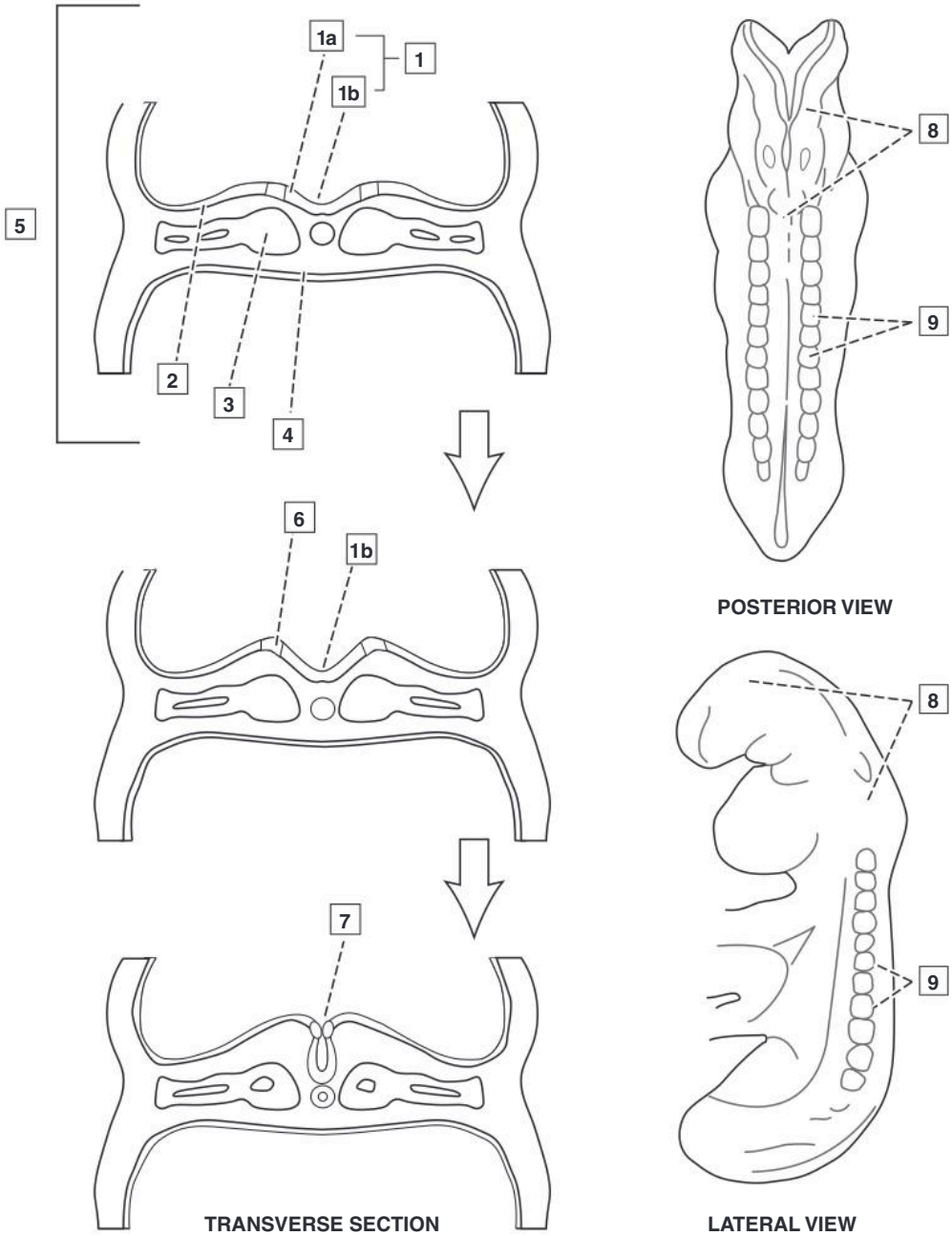
1. During the beginning of the third week of prenatal development within the embryonic period, the _____ forms within the bilaminar embryonic disc; it is a furrowed rod-shaped thickening in the middle of the disc that results from increased proliferation of cells in the midline area.
2. The primitive streak causes the bilaminar embryonic disc to have _____, with a right half and left half; most of the further development of each half of the embryo mirrors the other half.
3. During the beginning of the third week, some cells from the _____ move or migrate toward the hypoblast layer only in the area of the primitive streak of the bilaminar embryonic disc.
4. The migratory cells from the epiblast layer into the hypoblast layer of the bilaminar embryonic disc are located in the middle between the two layers and become _____, an embryonic connective tissue as well as embryonic endoderm.
5. Mesodermal cells have the potential to proliferate and differentiate into diverse types of _____, forming cells such as fibroblasts, chondroblasts, and osteoblasts.
6. When three layers are present, the bilaminar embryonic disc becomes thickened into a(n) _____ during the third week of prenatal development.
7. With the creation of a new embryonic cell layer of mesoderm within the trilaminar embryonic disc, the epiblast layer is now considered _____, and the hypoblast layer has been displaced by the cells migrating into the primitive streak and now becomes extraembryonic endoderm.
8. Because the trilaminar embryonic disc undergoes so much growth during the first 3 weeks, certain anatomic structures of the disc become apparent, and the trilaminar embryonic disc now has a(n) _____ or *head end*.
9. At the cephalic end of the trilaminar embryonic disc, the _____ forms; it consists of only ectoderm externally and endoderm internally without any intermediate mesoderm, which is the location of the future primitive mouth or stomodeum of the embryo and thus the beginning of the digestive tract.
10. The trilaminar embryonic disc has a(n) _____ or *tail end*, which is where the cloacal membrane forms that is the location of the future anus or terminal end of the digestive tract.

- | | | |
|--------------------|---------------------------|------------------|
| connective tissue | trilaminar embryonic disc | primitive streak |
| bilateral symmetry | ectoderm | epiblast layer |
| cephalic end | oropharyngeal membrane | caudal end |
| mesoderm | | |

Reference Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders.

ANSWER KEY 1. primitive streak, 2. bilateral symmetry, 3. epiblast layer, 4. mesoderm, 5. connective tissue, 6. trilaminar embryonic disc, 7. ectoderm, 8. cephalic end, 9. oropharyngeal membrane, 10. caudal end

FIGURE 1.8 Central nervous system and muscular system development during embryonic period (transverse section and posterior and lateral views)



- | | |
|-------------------------|---|
| 1 Neuroectoderm | 4 Endoderm |
| 1a Neural plate | 5 Trilaminar embryonic disc |
| 1b Neural groove | 6 Neural fold |
| 2 Ectoderm | 7 Neural folds about to fuse to form neural tube |
| 3 Mesoderm | 8 Developing nervous system |
| | 9 Somites |

REVIEW QUESTIONS: Central nervous system and muscular system development during embryonic period

Fill in the blanks by choosing the appropriate terms from the list below.

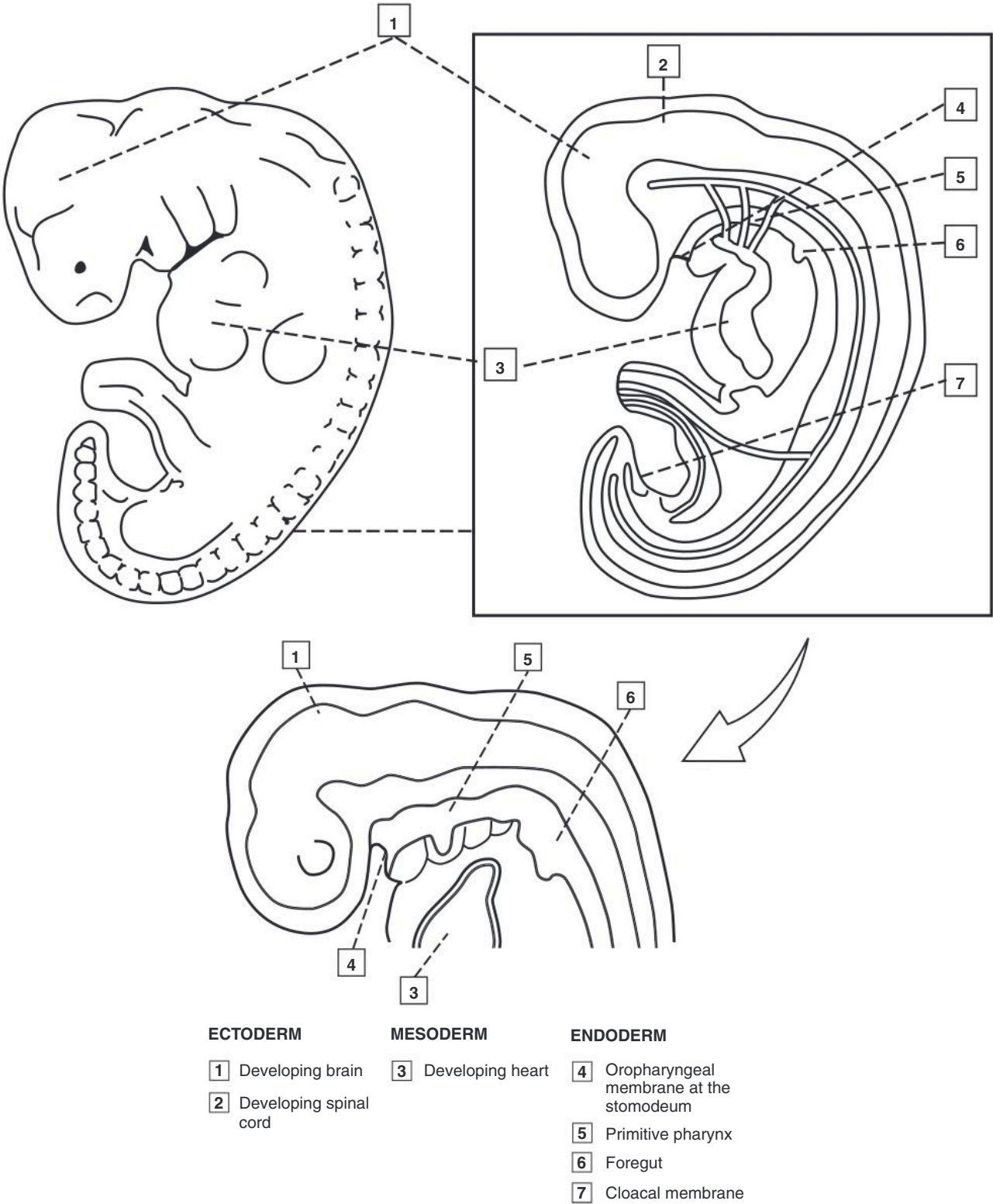
1. During the latter part of the third week of prenatal development, the _____ begins to develop in the embryo; many steps occur during this week to form the beginnings of the spinal cord and brain.
2. A specialized group of cells differentiates from the ectoderm during the latter part of the third week of prenatal development and is now considered _____.
3. The neuroectoderm is localized to the _____ of the embryo, which is a central band of cells that extends the length of the embryo, from the cephalic end to the caudal end.
4. The neural plate of the embryo undergoes further growth and thickening within the third week of prenatal development, which causes it to deepen and invaginate inward, forming the _____.
5. Near the end of the third week of prenatal development, the neural groove deepens further and is surrounded by the _____.
6. As further growth of the neuroectoderm occurs, the _____ is formed during the fourth week by the neural folds undergoing fusion at the most superior part; in the future, this structure forms into the spinal cord as well as other neural tissue of the central nervous system.
7. In addition, during the third week of prenatal development, another specialized group of cells, the _____, develop from neuroectoderm; these cells migrate from the crests of the neural folds and then join the mesoderm to form mesenchyme.
8. The _____ is involved in the development of many face and neck structures, such as the pharyngeal or branchial arches, because they differentiate to form most of the connective tissue of the head.
9. By the end of the third week of prenatal development, the _____ additionally differentiates and begins to divide on each side of the tube within the embryo into 38-paired cuboidal segments of mesoderm forming the somites.
10. The _____ appear as distinct elevations on the surface of the sides of the embryo and continue to develop in the following weeks of prenatal development, giving rise to most of the skeletal structures of the head, neck, and trunk as well as the associated muscles and dermis of the skin.

- | | | |
|--------------------|---------------|------------------------|
| neural tube | neural groove | central nervous system |
| mesenchyme | somites | neural folds |
| mesoderm | neural plate | neuroectoderm |
| neural crest cells | | |

Reference Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders.

ANSWER KEY 1. central nervous system, 2. neuroectoderm, 3. neural plate, 4. neural groove, 5. neural folds, 6. neural tube, 7. neural crest cells, 8. mesenchyme, 9. mesoderm, 10. somites

FIGURE 1.9 Fourth week of prenatal development with embryonic folding and organ development during embryonic period (lateral view with midsagittal sections)



REVIEW QUESTIONS: Fourth week of prenatal development with embryonic folding and organ development during embryonic period

Fill in the blanks by choosing the appropriate terms from the list below.

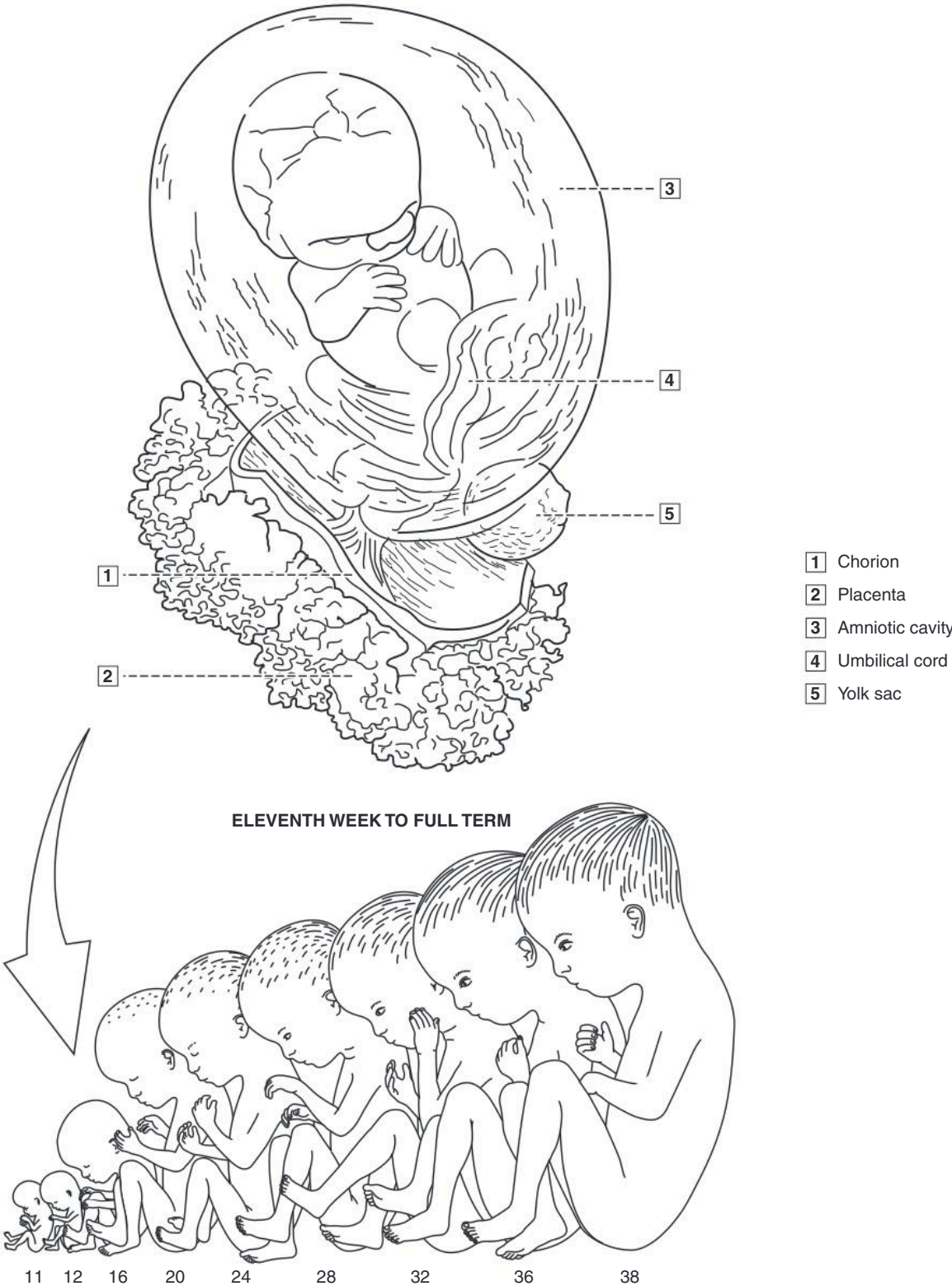
1. During the fourth week of prenatal development within the embryonic period, the trilaminar embryonic disc undergoes anterior (cephalic) and lateral _____, which places forming tissue types into their proper positions for further embryonic development as well as producing a tubular embryo.
2. After folding of the embryonic disc into the embryo, the endoderm now lies inside the _____, with mesoderm filling in the areas between these two layers forming one long hollow tube lined by endoderm from the cephalic end to the caudal end of the embryo; specifically, the tube runs from the oropharyngeal membrane to the cloacal membrane.
3. The tube formed during embryonic folding is the future _____ and is separated into three major regions, the foregut, midgut, and hindgut.
4. The anterior part of the tube in the embryo when it becomes folded is the foregut, which forms the _____ or *primitive throat* and includes a part of the primitive yolk sac as it becomes enclosed with folding; the two more posterior parts, the midgut and hindgut, respectively, go on to form the rest of the mature pharynx as well as the remainder of the digestive tract.
5. During development of the digestive tract, four pairs of _____ form from evaginations on the lateral walls lining the pharynx during the fourth week of prenatal development.
6. A crucial prenatal developmental event is the folding of the _____ in two planes, along the rostrocaudal axis and along the lateral axis.
7. The head fold is critical to the formation of a(n) _____ (or stomatodeum) or primitive mouth, which will form the future oral cavity; the ectoderm comes through this fold to line the stomodeum, with this structure separated from the gut by the oropharyngeal membrane.
8. The lateral folding of the embryo during prenatal development determines the disposition of the middle layer or _____.
9. As another result of embryonic folding, the ectoderm of the floor of the _____ now encapsulates the embryo and forms the surface epithelium.
10. In addition, after folding of the embryo, the paraxial mesoderm remains adjacent to the future _____ and notochord.

- | | |
|--------------------|-------------------|
| embryo | mesoderm |
| primitive pharynx | digestive tract |
| pharyngeal pouches | embryonic folding |
| ectoderm | amniotic cavity |
| stomodeum | neural tube |

References Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders; Chapter 2, General embryology. In Nanci A, *Ten Cate's oral histology*, ed 9, St. Louis, 2018, Mosby.

ANSWER KEY 1. embryonic folding, 2. ectoderm, 3. digestive tract, 4. primitive pharynx, 5. pharyngeal pouches, 6. embryo, 7. stomodeum, 8. mesoderm, 9. amniotic cavity, 10. neural tube

FIGURE 1.10 Fetal period of prenatal development



REVIEW QUESTIONS: Fetal period of prenatal development

Fill in the blanks by choosing the appropriate terms from the list below.

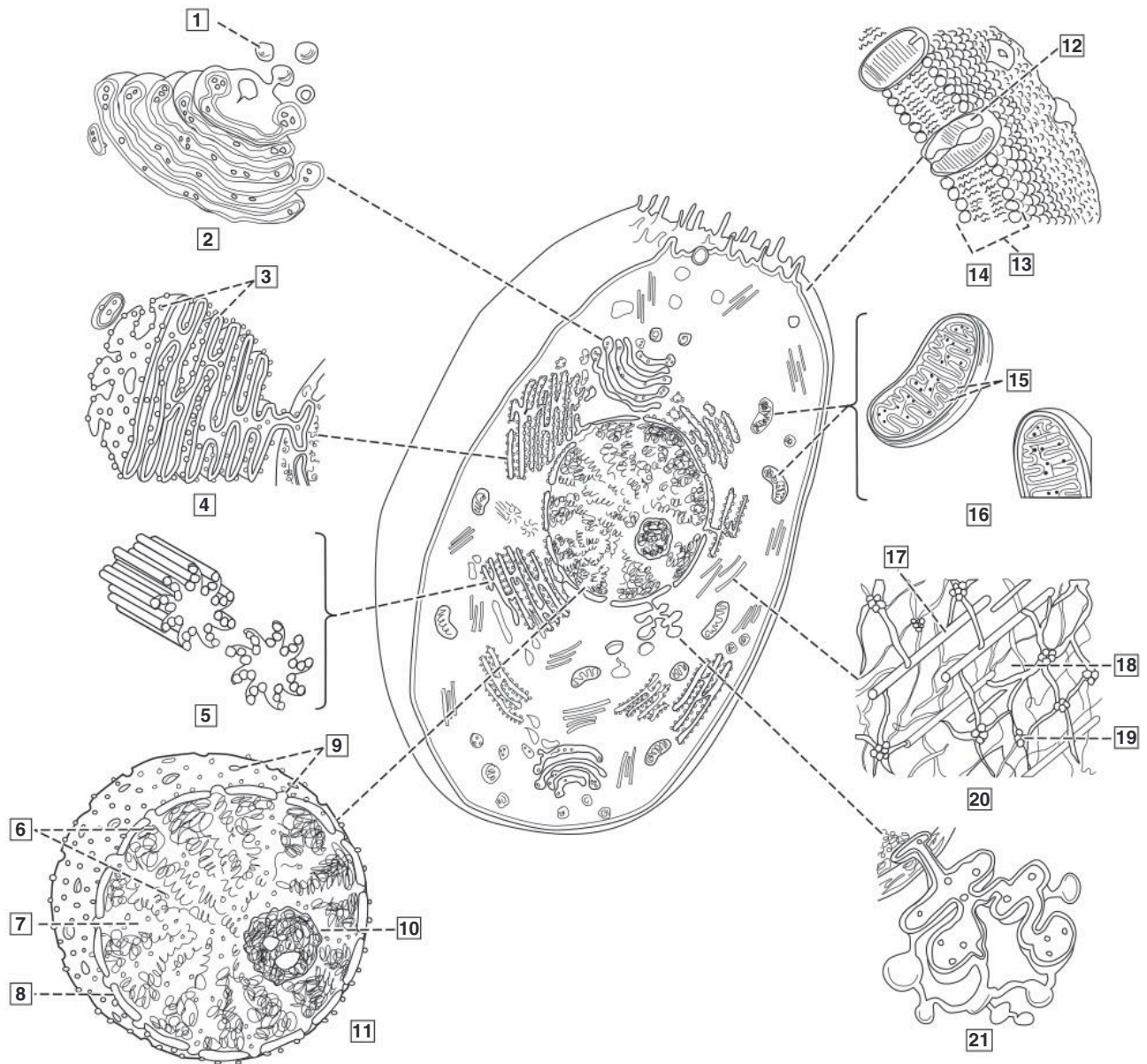
1. As the third and final period of prenatal development, the _____ follows the embryonic period.
2. The fetal period of prenatal development encompasses the beginning of the ninth week or third month continuing to the ninth month; thus, this period includes both the second and third _____.
3. During the fetal period of prenatal development there is maturation of existing structures occurring as the embryo enlarges to become a(n) _____.
4. During the fetal period of prenatal development, the changes involve not only the physiologic process of _____ the individual tissue types and organs but also further proliferation, differentiation, and morphogenesis, similar to the processes occurring before the development of the embryo.
5. Although developmental changes with the fetus during the fetal period of prenatal development are not as dramatic as those that occur earlier during the _____, they are important because they allow the newly formed tissue types and organs to begin to function.
6. The _____ of the fetus during prenatal development is linear up to 37 weeks of gestation, after which it begins to level until birth.
7. The growth rate of an embryo, fetus, or infant can be reflected as the _____ per gestational age and is often given as in relation to what would be expected by the gestational age.
8. An infant born within the usual range of weight at that time is considered appropriate for _____.
9. The growth rate during prenatal development can be roughly correlated with the fundal height, which can be estimated with the _____ of the pregnant female.
10. More exact measurements of either the embryo or fetus and its growth rate can be performed with obstetric _____ using sound waves.

- | | | |
|------------------|-------------|---------------------|
| gestational age | maturation | weight |
| embryonic period | fetus | abdominal palpation |
| trimesters | growth rate | ultrasonography |
| fetal period | | |

References Chapter 3, Prenatal development. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders; Chapter 2, General embryology. In Nanci A, *Ten Cate's oral histology*, ed 9, St. Louis, 2018, Mosby.

ANSWER KEY 1. fetal period, 2. trimesters, 3. fetus, 4. maturation, 5. embryonic period, 6. growth rate, 7. weight, 8. gestational age, 9. abdominal palpation, 10. ultrasonography

FIGURE 1.11 Cell with cell membrane and organelles



- | | | |
|--------------------------------------|--------------------------------|--|
| 1 Lysosome | 8 Nuclear envelope | 15 Cristae |
| 2 Golgi complex | 9 Nuclear pore | 16 Mitochondria |
| 3 Ribosomes | 10 Nucleolus | 17 Microtubule |
| 4 Rough endoplasmic reticulum | 11 Nucleus | 18 Cytoplasm |
| 5 Centrioles of centrosome | 12 Protein | 19 Microfilament |
| 6 Chromatin | 13 Phospholipid bilayer | 20 Cytoskeleton |
| 7 Nucleoplasm | 14 Cell membrane | 21 Smooth endoplasmic reticulum |

REVIEW QUESTIONS: Cell with cell membrane and organelles

Fill in the blanks by choosing the appropriate terms from the list below.

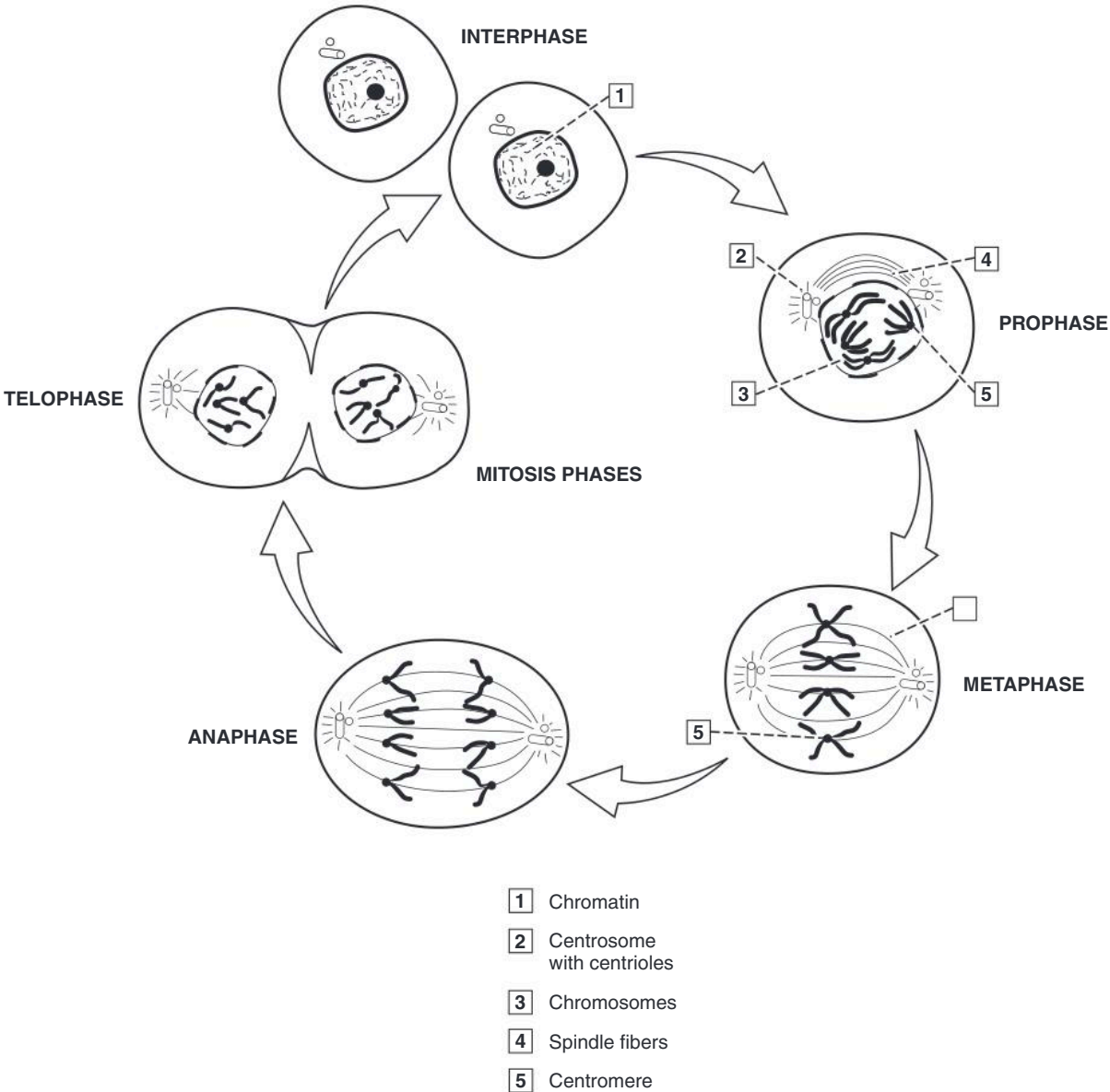
1. The smallest living unit of organization in the body is the _____ because each is capable of performing any necessary functions without the aid of others; each has a cell membrane, cytoplasm, organelles, and inclusions.
2. The _____ (or plasma membrane) surrounds the cell; usually, it is an intricate bilayer, consisting mostly of phospholipids and proteins.
3. The _____ of the cell includes the semifluid part contained within the cell membrane boundary as well as the skeletal system of support or cytoskeleton.
4. The _____ are metabolically active specialized structures within the cell that allow each cell to function according to its genetic code; these structures include the nucleus, mitochondria, ribosomes, endoplasmic reticulum, Golgi complex, lysosomes, and cytoskeleton.
5. The _____ is the largest, densest, and most conspicuous organelle in the cell; it is found in all cells of the body except mature red blood cells, and most cells have a single one.
6. The fluid part within the nucleus is the _____, which contains important molecules used in the construction of ribosomes, nucleic acids, and other nuclear materials; the nucleus is also surrounded by the nuclear envelope, a membrane similar to the cell membrane except that it is double layered.
7. Contained within the nucleus is the _____, a prominent and rounded nuclear organelle that is centrally placed in the nucleoplasm, which mostly produces types of ribonucleic acid.
8. The _____ are the most numerous organelles in the cell and are associated with energy conversion since they are a major source of adenosine triphosphate.
9. The _____ consists of parallel membrane-bound channels that interconnect, forming a system of channels and folds and are continuous with the nuclear envelope so they can modify, store, segregate, and transport proteins; these structures can be classified as either smooth or rough, which is determined by the absence or presence of ribosomes.
10. Once the endoplasmic reticulum has modified a new protein, it is then transferred to the _____ (or apparatus) for subsequent segregation, packaging, and transport of the protein compounds; it is the second largest organelle after the nucleus and is composed of stacks of three to twenty flattened smooth-membrane vesicular sacs arranged parallel to one another.

- | | | |
|---------------|-----------------------|---------------|
| nucleus | nucleoplasm | mitochondria |
| cytoplasm | organelles | nucleolus |
| Golgi complex | endoplasmic reticulum | cell membrane |
| Cell | | |

Reference Chapter 7, Cells. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders.

ANSWER KEY 1. cell, 2. cell membrane, 3. cytoplasm, 4. organelles, 5. nucleus, 6. nucleoplasm, 7. nucleolus, 8. mitochondria, 9. endoplasmic reticulum, 10. Golgi complex

FIGURE 1.12 Cell cycle



REVIEW QUESTIONS: Cell cycle

Fill in the blanks by choosing the appropriate terms from the list below.

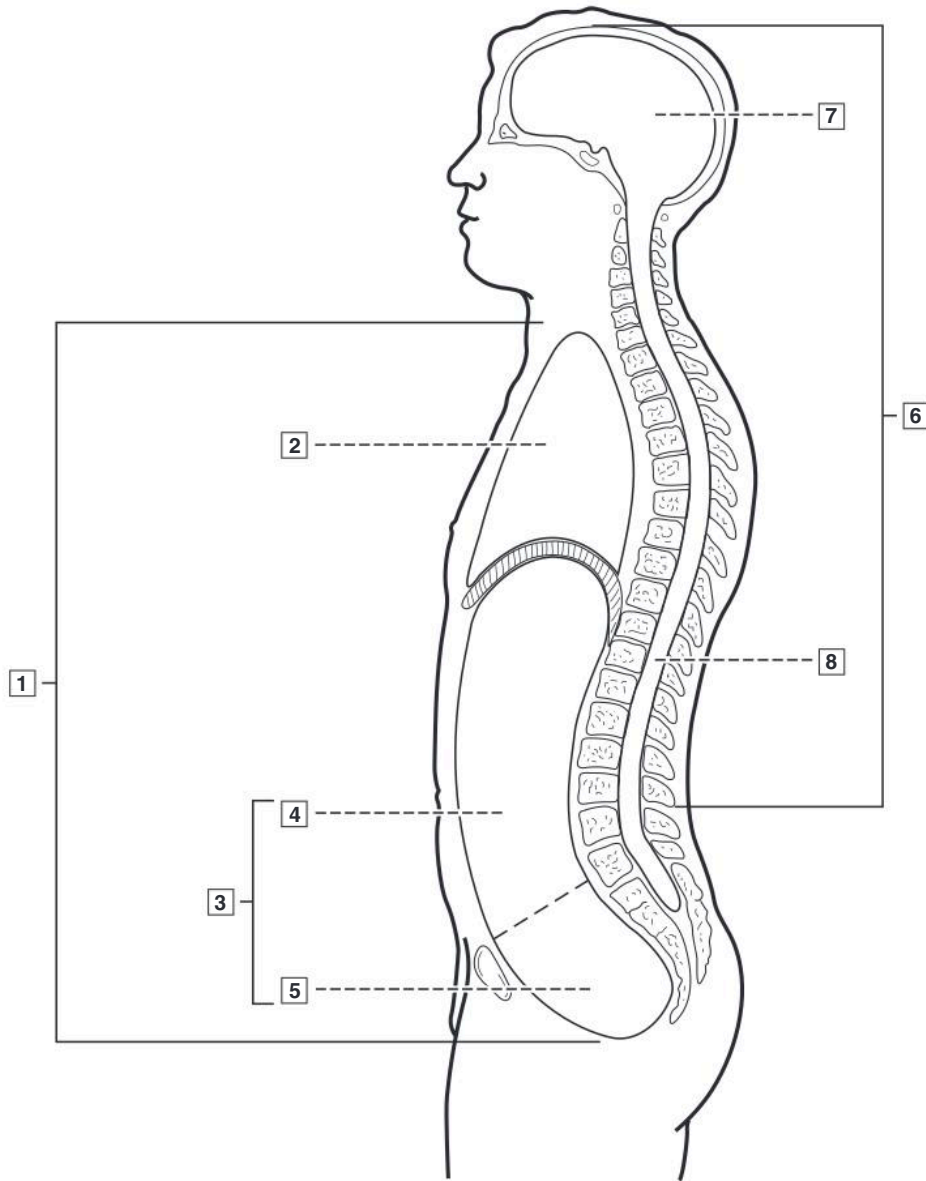
1. The main nucleic acid in the nucleoplasm is _____ in the form of chromatin, which looks like diffuse stippling; in an actively dividing cell, the chromatin condenses into visible and discrete rodlike chromosomes, with each chromosome having a centromere or a clear constricted area near the middle.
2. The _____ then become two filamentous or threadlike chromatids (or daughters) joined by a centromere during cell division; after cell division, major segments again become uncoiled and dispersed between the other components of the nucleoplasm as before.
3. The _____ is a dense somewhat oval-shaped organelle that contains a pair of cylindrical structures, the centrioles, which are always located near the nucleus; there are two centrioles within this organelle and each is composed of triplets of microtubules arranged in a cartwheel pattern.
4. Before cell division, deoxyribonucleic acid is replicated during _____ as part of the cell cycle.
5. Interphase has _____ phases, which include Gap 1 or G1 (or initial resting phase with cell growth and functioning); Synthesis or S (or cell deoxyribonucleic acid synthesis by duplication); and Gap 2 or G2 (or second resting phase that resumes cell growth and functioning).
6. The cell division that takes place during mitosis consists of _____ phases, which include prophase, metaphase, anaphase, and telophase; cell division is followed again by interphase continuing the overall cell cycle.
7. During _____ of cell division, the chromatin condenses into chromosomes in the cell, replicated centrioles migrate to opposite poles, and the nuclear membrane and nucleolus disintegrate.
8. During _____ of cell division, the chromosomes move so that their centromeres are aligned in the equatorial plane and the mitotic spindle forms.
9. During _____ of cell division, the centromeres split and each chromosome separates into two chromatids, while the chromatids migrate to opposite poles by the mitotic spindle.
10. During _____ of cell division, the division into two daughter cells that are identical to the parent cell as well as to each other occurs and the nuclear membrane reappears.

three	chromosomes	telophase
interphase	prophase	anaphase
deoxyribonucleic acid	four	centrosome
metaphase		

Reference Chapter 7, Cells. In Fehrenbach MJ, Popowics T: *Illustrated dental embryology, histology, and anatomy*, ed 5, St. Louis, 2020, Saunders.

ANSWER KEY 1. deoxyribonucleic acid, 2. chromosomes, 3. centrosomes, 4. interphase, 5. three, 6. four, 7. prophase, 8. metaphase, 9. anaphase, 10. telophase

FIGURE 1.13 Major body cavities (midsagittal section)



- | | | | |
|---|-----------------------|---|----------------|
| 1 | Ventral cavity | 5 | Pelvic cavity |
| 2 | Thoracic cavity | 6 | Dorsal cavity |
| 3 | Abdominopelvic cavity | 7 | Cranial cavity |
| 4 | Abdominal cavity | 8 | Spinal cavity |