The biological function of the reproductive system is to produce offspring. The essential organs are those producing the germ cells (testes in males and ovaries in females). The male manufactures sperm and delivers them to the female’s reproductive tract. The female, in turn, produces eggs. If the time is suitable, the egg and sperm fuse, producing a fertilized egg, which is the first cell of the new individual. Once fertilization has occurred, the female uterus protects and nurtures the developing embryo.

In this chapter, student activities concern the structures of the male and female reproductive systems, germ cell formation, the menstrual cycle, and embryonic development.

ANATOMY OF THE MALE REPRODUCTIVE SYSTEM

1. Using the following terms, trace the pathway of sperm from the testis to the urethra: rete testis, epididymis, seminiferous tubule, ductus deferens. List the terms in the proper order in the spaces provided.

   __________ ➡ __________ ➡ __________ ➡ __________

2. How do the scrotal muscles help maintain temperature homeostasis of the testes?

3. Using the key choices, select the terms identified in the following descriptions. Insert the appropriate term(s) in the answer blanks.

   **Key Choices**

   Bulbourethral glands (Cowper’s Gland)  Penis  Scrotum
   Epididymis  Prepuce  Spermatic cord
   Ductus deferens  Prostate  Testes
   Glans penis  Seminal vesicles  Urethra

   __________ a. Organ that delivers semen to the female reproductive tract
   __________ b. Site of testosterone production
   __________ c. Passageway from the epididymis to the ejaculatory duct
   __________ d. Conveys both sperm and urine down the length of the penis
   __________ e. Organs that contribute to the formation of semen
   __________ f. External skin sac that houses the testes
   __________ g. Tubular storage site for sperm; hugs the lateral aspect of the testes
   __________ h. Cuff of skin encircling the glans penis
   __________ i. Surrounds the urethra at the base of the bladder; produces a milky fluid
   __________ j. Produces more than half of the seminal fluid
   __________ k. Produces a lubricating mucus that cleanses the urethra
   __________ l. Connective tissue sheath enclosing the ductus deferens, blood vessels, and nerves.
4. Figure 16-1 is a sagittal view of the male reproductive structures. Label the figure by writing the correct term on the appropriate leader line.

Fill in the blanks with the correct term and locate the structures on the diagram, labeling as necessary.

a. Spongy tissue that is engorged with blood during erection ____________________
b. Portion of the duct system that also serves the urinary system ____________________
c. Structure that provides the ideal temperature conditions for sperm formation ____________________
d. Structure removed in circumcision ____________________
e. Gland whose secretion contains sugar to nourish sperm ____________________
f. Structure cut or cauterized during a vasectomy ____________________

Figure 16-1
5. Figure 16-2 is a longitudinal section of a testis. Label the figure by adding the following terms: **lobule**, **rete testis**, and **septum**.

Fill in the blanks with the correct term and locate the structures on the diagram, labeling as necessary.

   a. Site(s) of spermatogenesis ______________________
   b. Tubular structure in which sperm mature and become motile ______________________
   c. Fibrous coat protecting the testis ______________________

![Diagram of a testis]

**Figure 16-2**

**MALE REPRODUCTIVE FUNCTIONS**

6. This section considers the process of sperm production in the testis. Figure 16-3 is a cross-sectional view of a seminiferous tubule in which spermatogenesis is occurring. First, using the key choices, select the terms identified in the following descriptions.

<table>
<thead>
<tr>
<th>Key Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follicle-stimulating hormone (FSH)</td>
</tr>
<tr>
<td>Primary spermatocyte</td>
</tr>
<tr>
<td>Secondary spermatocyte</td>
</tr>
</tbody>
</table>

____________________ a. Primitive stem cell
____________________ b. Contain 23 chromosomes
____________________ c. Product of meiosis I
____________________ d. product of meiosis II
____________________ e. Functional motile gamete
____________________ f. Two hormones necessary for sperm production

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Then label the cells with leader lines. Label the cells that produce testosterone.

7. Figure 16-4 illustrates a single sperm. On the figure, bracket and label the head and the midpiece and circle and label the tail. Label the structures, using correct terminology.

The DNA-containing area ________________
The enzyme-containing sac that aids sperm penetration of the egg ________________
Metabolically active organelles that provide ATP to energize sperm movement ________________
8. The following statements refer to events that occur during cellular division. Using the key choices, indicate in which type of cellular division the described events occur. Place the correct term or letter response in the answer blanks.

**Key Choices**

<table>
<thead>
<tr>
<th>Mitosis</th>
<th>Meiosis</th>
<th>Both mitosis and meiosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>________a. Final product is two daughter cells, each with 46 chromosomes</td>
<td>________b. Final product is four daughter cells, each with 23 chromosomes</td>
<td>________c. Involves the phases prophase, metaphase, anaphase, and telophase</td>
</tr>
<tr>
<td>________d. Occurs in all body tissues</td>
<td>________e. Occurs only in the gonads</td>
<td>________f. Increases the cell number for growth and repair</td>
</tr>
<tr>
<td>________g. Daughter cells have the same number and types of chromosomes as the mother cell</td>
<td>________h. Daughter cells are different from the mother cell in their chromosomal makeup</td>
<td>________i. Chromosomes are replicated before the division process begins</td>
</tr>
<tr>
<td>________j. Provides cells for the reproduction of offspring</td>
<td>________k. Consists of two consecutive divisions of the nucleus; chromosomes are not replicated before the second division</td>
<td></td>
</tr>
</tbody>
</table>

9. Name four of the male secondary sex characteristics.
   a. 
   b. 
   c. 
   d. 

**ANATOMY OF THE FEMALE REPRODUCTIVE SYSTEM**

10. Identify the female structures described by inserting your responses in the answer blanks.
   a. Chamber that houses the developing fetus
   b. Canal that receives the penis during sexual intercourse
   c. Usual site of fertilization
   d. Erects during sexual stimulation
   e. Duct through which the ovum travels to reach the uterus
   f. Membrane that partially closes the vaginal canal
   g. Primary female reproductive organ
   h. Move to create fluid currents to draw the ovulated egg into the uterine (fallopian) tube
11. Figure 16-5 is a sagittal view of the female reproductive organs. Label all structures on the figure provided with leader lines.

a. Lining of the uterus, endometrium ____________________
b. Muscular layer of the uterus, myometrium ____________________
c. Pathway along which an egg travels from the time of its release to its implantation ____________________
d. Ligament helping to anchor the uterus ____________________
e. Structure producing female hormones and gametes ____________________
f. Homologue of the male scrotum ____________________

FEMALE REPRODUCTIVE FUNCTIONS AND CYCLES

12. Using the key choices, identify the cell type you would expect to find in the following structures. Insert the correct term or letter response in the answer blanks.

Key Choices

<table>
<thead>
<tr>
<th>Oogonium</th>
<th>Primary oocyte</th>
<th>Secondary oocyte</th>
<th>Ovum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Forming part of the primary follicle in the ovary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. In the uterine tube before fertilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. In the mature, or Graafian, follicle of the ovary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. In the uterine tube shortly after sperm penetration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. Figure 16-7 is a sectional view of the ovary. First, identify all structures indicated with leader lines on the figure. Second, select different colors for the following structures, and use them to color the coding circles and corresponding structures on the figure.

a. Cells that produce estrogen ______________________

b. Glandular structure that produces progesterone ______________________

c. Name the event depicted as “Event A” on the figure. ______________________

Figure 16-7

Answer the following questions by inserting your answers in the spaces provided.

____________________ a. Are there any oogonia in a mature female’s ovary?

____________________ b. Into what area is the ovulated cell released?

____________________ c. When is a mature ovum (egg) produced in humans?

____________________ d. What structure in the ovary becomes a corpus luteum?

____________________ e. What are the four final cell types produced by oogenesis in the female? (Name the cell type and number of each.)

____________________ f. How does this compare with the final product of spermatogenesis in males?

____________________ g. What happens to the tiny cells nearly devoid of cytoplasm ultimately produced during oogenesis?

____________________ h. Why?

____________________ i. What name is given to the period of a woman’s life when her ovaries begin to become nonfunctional?
14. What is the significance of the fact that the uterine tubes are not structurally continuous with the ovaries? Address this question from both reproductive and health aspects.

   a. reproductive:

   b. health aspects:

15. The following statements deal with anterior pituitary and ovarian hormonal interrelationships. Name the hormone(s) described in each statement. Place your answers in the answer blanks.

   a. Promotes growth of ovarian follicles and production of estrogen
   b. Triggers ovulation
   c. Inhibit follicle-stimulating hormone (FSH) release by the anterior pituitary
   d. Stimulates luteinizing hormone (LH) release by the anterior pituitary
   e. Converts the ruptured follicle into a corpus luteum and causes it to produce progesterone and estrogen
   f. Maintains the hormonal production of the corpus luteum

16. Name four of the secondary sex characteristics of females.

   a.
   b.
   c.
   d.

17. Use the key choices to identify the ovarian hormone(s) responsible for the following events. Insert the correct term(s) or letter(s) in the answer blanks.

   Key Choices

   Estrogens             Progesterone

   a. Lack of this (these) causes the blood vessels to kink and the endometrium to slough off (menses)
   b. Causes the endometrial glands to begin the secretion of nutrients
   c. The endometrium is repaired and grows thick and velvety
   d. Maintains the myometrium in an inactive state if implantation of an embryo has occurred
   e. Glands are formed in the endometrium
   f. Responsible for the secondary sex characteristics of females

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18. The following exercise refers to Figure 16-8 A-D.

On Figure 16-8A, the blood levels of two gonadotropic hormones (FSH and LH) of the anterior pituitary are indicated. Identify each hormone by appropriately labeling the blood level lines on the figure. Then select different colors for each of the blood level lines and color them in on the figure.

On Figure 16-8B, identify the blood level lines for the ovarian hormones, estrogens and progesterone. Then select different colors for each blood level line, and color them in on the figure.

On Figure 16-8C, select different colors for the following structures and use them to color in the coding circles and corresponding structures in the figure.

- Primary follicle
- Secondary (growing) follicle
- Vesicular follicle
- Corpus luteum
- Ovulating follicle

On Figure 16-8D, identify the endometrial changes occurring during the menstrual cycle by color-coding and coloring the areas depicting the three phases of that cycle.

- Secretory phase
- Menses
- Proliferative phase
Figure 16-8

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18. Relative to events of sperm penetration:

a. What portion of the sperm actually enters the oocyte?

b. What is the functional importance of the acrosomal reaction?

19. Figure 16-10 depicts early embryonic events ($2^\text{o}$ = secondary). In #1-5, identify the events, cell types, or processes referring to the figure. Then respond to question #6. Place your answers in the spaces provided.

a. Event A ______________________

b. Cell resulting from event A ______________________

c. Process B ______________________

d. Embryonic structure B ______________________

e. Completed process C ______________________

f. Assume that a sperm has entered a polar body instead of a $2^\text{o}$ oocyte and their nuclei fuse. Why would it be unlikely for that “fertilized cell” to develop into an embryo?
20. Using the key choices, select the terms that are identified in the following descriptions. Insert the correct term or letter response in the answer blanks.

**Key Choices**

<table>
<thead>
<tr>
<th>Amnion</th>
<th>Fertilization</th>
<th>Umbilical cord</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chorionic villi</td>
<td>Fetus</td>
<td>Zygote</td>
</tr>
<tr>
<td>Endometrium</td>
<td>Placenta</td>
<td></td>
</tr>
</tbody>
</table>

__________ a. The fertilized egg
__________ b. Secretes estrogen and progesterone to maintain the pregnancy
__________ c. Cooperate to form the placenta
__________ d. Fluid-filled sac, surrounding the developing embryo/fetus
__________ e. Attaches the embryo to the placenta
__________ f. Fingerlike projections of the blastocyst
__________ h. The embryo after 8 weeks
__________ i. The organ that delivers nutrients to and disposes of wastes for the fetus
__________ j. Event leading to combination of ovum and sperm “genes”

21. Explain why the corpus luteum does not stop producing its hormones (estrogens and progesterone) when fertilization has occurred.

22. The first “tissues” of the embryo’s body are the primary germ layers:

<table>
<thead>
<tr>
<th>Ectoderm</th>
<th>Mesoderm</th>
<th>Endoderm</th>
</tr>
</thead>
</table>

Indicate which germ layer gives rise to each of the following structures by placing the corresponding letter in the answer blank.

__________ a. Heart and blood vessels
__________ b. Digestive system mucosa
__________ c. Brain and spinal cord
__________ d. Skeletal muscles

__________ e. Skin epidermis
__________ f. Bones
__________ g. Respiratory system mucosa
__________ i. Liver and pancreas

23. What two hormones are essential to initiate labor in humans?

a.

b.
24. a. What hormone is responsible for milk production?

   b. For milk ejection?

25. A pregnant woman undergoes numerous changes during her pregnancy - anatomical, metabolic, and physiological. Several such possibilities are listed below. Check (✔) all that are commonly experienced during pregnancy.

- a. Diaphragm descent is impaired
- b. Breasts decline in size
- c. Pelvic ligaments are relaxed by relaxin
- d. Vital capacity decreases
- e. Lordosis
- f. Blood pressure and pulse rates decline
- g. Metabolic rate declines
- h. Increased mobility of GI tract
- i. Blood volume and cardiac output increase
- j. Nausea, heartburn, constipation
- k. Dyspnea may occur
- l. Urgency and stress incontinence

26. The very simple flowchart in Figure 16-11 illustrates the sequence of events that occur during labor. Complete the flowchart by filling in the missing terms in the boxes. Use color as desired.

![Flowchart illustration](image)

**Figure 16-11**

27. How long will the cycle illustrated in Figure 16-11 continue to occur?

28. Labor is an example of a positive feedback mechanism. What does that mean?
Across
1. An early embryonic phase consisting of rapid mitotic cell divisions without intervening growth periods; product is a blastocyst.
7. Culmination of pregnancy; giving birth.
8. Temporary organ formed from both fetal and maternal tissues that provides nutrients and oxygen to the developing fetus, carries away fetal metabolic wastes, and produces the hormones of pregnancy.
10. Fetal membrane that forms a fluid-filled sac around the embryo.
13. Fusion of the sperm and egg nuclei.
15. A minute cell produced during meiosis in the ovary.
16. Tube through which the ovum is transported to the uterus. Also called fallopian tube or oviduct.
17. Accumulation of cells in the blastocyst from which the embryo develops.
18. Highly convoluted tubes within the testes; form sperm.

Down
2. That portion of the male duct system in which sperm mature. Empties into the ductus (or vas) deferens.
3. Female sex organ in which ova are produced; female gonad.
4. Developmental stage extending from gastrulation to the end of the eight week.
5. The process of sperm (male gamete) formation; involves meiosis.
6. Fluid mixture containing sperm and secretions of the male accessory reproductive glands.
9. An enzyme-containing structure covering the nucleus of the sperm.
11. Fertilized egg.
12. Stage of early embryonic development; the product of cleavage.
14. Outermost fetal membrane; helps form the placenta.
1. primary sex organs are called?

2. produce haploid

3. 

4. 

5. important hormones

6. 

7. 

8. 

9. 

10. produced via

11. meiosis I produces

12. meiosis II produces

13. # of chromosomes

14. completes meiosis I

15. 

16. 

17. 

18. 

19. arrested in

20. ovulated

21. prior to birth

22. starts meiosis

23. pubertal to menopause

24. meiosis II starts

25. meiosis II

26. primary spermatocyte

27. 2 rounds of meiosis

28. oogonium

29. arrest in

30. starts meiosis

31. completes meiosis I

32. meiosis II

33. meiosis II produces

34. meiosis I produces

35. male 

36. female

37. important hormone

38. Miss School, Miss Out!