CHAPTER 1

Reproductive System and Human Development Worksheet

CHAPTER OUTLINE

1.1 Male Reproductive System
1.2 Female Reproductive System
1.3 Fertilization, Gestation, and Development
1.4 Sexually Transmitted Diseases
1.5 References

Chapter 25: Reproductive System and Human Development

• Lesson 25.1: Male Reproductive System
• Lesson 25.2: Female Reproductive System
• Lesson 25.3: Fertilization, Gestation, and Development
• Lesson 25.4: Sexually Transmitted Diseases
Lesson 25.1: True or False

Write true if the statement is true or false if the statement is false.

1. Testosterone is a masculinizing hormone.
2. All of a baby boy’s reproductive organs are present at birth.
3. During puberty in boys the long bones stop growing.
4. Underarm hair appears in boys during stage 3 of puberty.
5. Testosterone receptors are located on the nucleus of cells.
6. Puberty begins at the same age in all boys.
7. The urethra passes through the testes and scrotum.
8. The seminiferous tubules join together to form the epididymis.
9. Sperm consist of semen and glandular secretions.
10. The connecting piece of a sperm contains the nucleus.
11. The nucleus of a sperm carries copies of the male’s chromosomes.
12. Sperm are released from the body during fertilization.

Lesson 25.1: Critical Reading

Read this passage from the lesson and answer the questions that follow.

**Spermatogenesis**

Spermatogenesis is the process of producing mature sperm. Sperm are haploid cells, meaning they have half the number of chromosomes as other cells of the body, which are diploid cells. Sperm must be haploid in order for normal sexual reproduction to occur. During reproduction, a sperm unites with another cell, called an egg. This is called fertilization. Unless both sperm and egg are haploid, the resulting offspring will not have the diploid number of chromosomes (see chapter titled Cell Division and Reproduction).

Sperm are produced in the seminiferous tubules of the testes and finish maturing in the epididymis. The entire process takes about 9 to 10 weeks. As shown in Table 1.1, the production of sperm occurs in several steps, each involving a different type of cell and process.

Spermatogenesis begins when a spermatogonium with the diploid number of chromosomes undergoes mitosis to form primary spermatocytes, also with the diploid number. It proceeds as a primary spermatocyte undergoes the first cell division of meiosis to form secondary spermatocytes with the haploid number of chromosomes. A secondary
spermatocyte undergoes the second meiotic cell division to form haploid spermatids. Spermatids mature into sperm, which are also haploid.

**TABLE 1.1: Spermatogenesis and Cell Division**

<table>
<thead>
<tr>
<th>Type of Cell</th>
<th>Number of Chromosomes</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spermatogonium</td>
<td>Diploid</td>
<td>Mitosis</td>
</tr>
<tr>
<td>Primary Spermatocyte</td>
<td>Diploid</td>
<td>Meiosis 1</td>
</tr>
<tr>
<td>Secondary Spermatocyte</td>
<td>Haploid</td>
<td>Meiosis 2</td>
</tr>
<tr>
<td>Spermatid</td>
<td>Haploid</td>
<td>Maturation</td>
</tr>
<tr>
<td>Spermatozoon (sperm)</td>
<td>Haploid</td>
<td>Fertilization</td>
</tr>
</tbody>
</table>

**Spermatogonia.** which line the seminiferous tubules in the testes, are diploid cells. They begin the process of spermatogenesis when they divide by mitosis to produce cells called primary spermatocytes, which are also diploid cells. Some spermatogonia divide just to produce copies of themselves. This ensures a constant supply of spermatogonia for future sperm production.

Primary spermatocytes go through the first cell division of meiosis to produce secondary spermatocytes. These are haploid cells. Secondary spermatocytes then quickly complete the meiotic division to become spermatids, which are also haploid cells.

Spermatids slowly mature into sperm, like the one shown in **Figure 1.1**. Among other changes, they lose excess cytoplasm from the head and grow a tail. The tail is a flagellum that lets them move by rotating like a propeller. The acrosome that covers part of the head produces digestive enzymes that help the head penetrate an egg. The mitochondria in the connecting piece produce energy that the sperm needs to “swim” through the female reproductive tract to reach an egg. However, sperm do not develop the ability to move until they complete their maturation in the epididymis. It takes sperm four to six weeks to travel through the epididymis and become fully mature. After they mature, they remain in the epididymis until they leave the body.

**FIGURE 1.1**

A mature sperm cell has several structures that help it reach and penetrate an egg. These structures include the acrosome, mitochondria, and tail. The nucleus, which makes up most of the head, carries copies of the father's chromosomes.

**Questions**

1. Define the term spermatogenesis.

2. Explain why sperm must be haploid cells.
3. What is the first step in sperm production? Where does it take place?

4. What are two changes that take place in sperm as they mature?

5. When do sperm develop the ability to move? Where does this occur?

Lesson 25.1: Multiple Choice

Name____________________________ Class_______ Date ________

Circle the letter of the correct choice.

a. What hormone stimulates an embryo’s reproductive organs to develop into male organs?
   a. acrosomal hormone
   b. secondary sex hormone
   c. testosterone
   d. luteinizing hormone

b. Which is the best definition of puberty?
   a. age when males reach adulthood
   b. period when humans become sexually mature
   c. stage when male reproductive organs form
   d. age when males start the adolescent growth spurt

c. Which of the following is not a secondary sex characteristic of males?
   a. Adam’s apple
   b. apocrine sweat production
   c. mature testes
   d. wide shoulders

d. Which choice shows the correct sequence of changes during puberty in males?
   a. testes grow, penis becomes longer, facial hair appears
   b. facial hair appears, testes grow, penis becomes longer
   c. penis becomes longer, testes grow, facial hair appears
   d. penis becomes longer, facial hair appears, testes grow
e. For the average U.S. boy, puberty lasts about
   a. 1 year.
   b. 3 years.
   c. 6 years.
   d. 10 years.

f. Sperm travel from the epididymis to the urethra through the
   a. vas deferens.
   b. seminal vesicles.
   c. prostate gland.
   d. testes.

g. Of the following cells, the only diploid cells are
   a. spermatogonia.
   b. spermatozoa.
   c. spermatids.
   d. secondary spermatocytes.

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Lesson 25.1: Vocabulary

Name____________________________ Class_______ Date ________

Match the vocabulary term with the correct definition.

Term

____ 1. acrosome
____ 2. cells of Leydig
____ 3. epididymis
____ 4. luteinizing hormone
____ 5. semen
____ 6. seminiferous tubules
____ 7. Sertoli cells
____ 8. sperm
____ 9. spermatogonia
____ 10. testosterone

Definition

a. coiled tube where sperm are stored
b. fluid that is ejaculated from the urethra
c. sperm-producing cells
d. male sex cells
e. chief sex hormone in males
f. cells that secrete testosterone
g. functional units of the testes
1.1. Male Reproductive System

h. pituitary hormone that stimulates the testes  
i. cells that protect and nourish developing sperm  
j. covering of the head of a sperm
1.2 Female Reproductive System

Lesson 25.2: True or False

Write true if the statement is true or false if the statement is false.

____ 1. Females continue to produce eggs throughout their lifetime.
____ 2. The changes of puberty usually happen in the same order for most females.
____ 3. The majority of U.S. girls start puberty by the age of 10 years.
____ 4. Internal female reproductive organs include the uterus and vulva.
____ 5. The upper ends of the Fallopian tubes are attached to the ovaries.
____ 6. One role of the cells of a follicle is to help an egg mature.
____ 7. Both primary and secondary oocytes are diploid cells.
____ 8. A polar body disintegrates and disappears from the ovary.
____ 9. Fertilization normally occurs in the uterus or vagina.
____ 10. The ovarian menstrual cycle begins with ovulation.
____ 11. The corpus luteum develops in the follicular phase of the menstrual cycle.
____ 12. The events of the menstrual cycle always occur in the same sequence.

Lesson 25.2: Critical Reading

Read this passage from the lesson and answer the questions that follow.

Sexual Development in Females

The main differences between boys and girls at birth are their reproductive organs. Unlike males, females are not influenced by the male sex hormone testosterone during embryonic and fetal development. This is because they lack a Y-chromosome. As a result, females do not develop male reproductive organs.

Development Before Birth

Unless an embryo is stimulated by testosterone, the reproductive organs develop into female organs, such as the ovaries and uterus. By the third month of fetal development, most of the internal female organs have formed. Immature ova, or eggs, also form in the ovary before birth. Whereas a male produces sperm throughout his lifetime (after puberty), a female produces all the eggs she will ever make before birth.

Like baby boys, baby girls are born with all their reproductive organs present but immature and unable to function. Female reproductive organs grow very little during childhood. They begin to grow rapidly and to mature during puberty.
Changes of Puberty

You know that puberty is the period during which humans become sexually mature. Puberty in girls differs from puberty in boys in several ways, including when it begins, how long it lasts, and the hormones involved. Girls begin puberty a year or two earlier than boys, and they complete puberty in about four years instead of six. In females, the major sex hormone is estrogen rather than testosterone.

Puberty in girls starts when the hypothalamus in the brain stimulates the pituitary gland to secrete hormones that target the ovaries. The pituitary hormones are luteinizing hormone, or LH, and follicle-stimulating hormone, or FSH. These hormones stimulate the ovary to produce estrogen.

Estrogen has many functions that you will read more about below. During puberty, estrogen promotes growth and other physical changes in females. For example, estrogen stimulates growth of the breasts and uterus. It also stimulates development of bones and contributes to the adolescent growth spurt in height. These and several other changes in females during puberty are listed in Table 1.2:

Table 1.2: Physical Changes in Females During Puberty

<table>
<thead>
<tr>
<th>Changes in Reproductive Organs</th>
<th>Other Physical Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovaries and follicles grow</td>
<td>Uterus grows and endometrium thickens</td>
</tr>
<tr>
<td>Other reproductive structures grow</td>
<td>Menstrual cycle begins</td>
</tr>
<tr>
<td><strong>Other Physical Changes</strong></td>
<td></td>
</tr>
<tr>
<td>Breasts develop</td>
<td>Long bones grow and mature</td>
</tr>
<tr>
<td>Pubic hair grows</td>
<td>Underarm hair grows</td>
</tr>
<tr>
<td>Body fat increases</td>
<td>Apocrine sweat glands develop</td>
</tr>
<tr>
<td>Pelvis widens</td>
<td></td>
</tr>
</tbody>
</table>

Some of the changes involve the maturation of organs, such as ovaries, that are necessary for reproduction. Mature reproductive organs are primary sex characteristics. Other changes, such as growth of pubic hair, lead to traits that are secondary sex characteristics. One of the most significant changes in females during puberty is menarche. Menarche is the beginning of menstruation, or monthly periods.

Questions

1. What are the main differences between boys and girls at birth? What causes these differences?
   -
   -
   -
   -

2. How does puberty in girls differ from puberty in boys?
   -
   -
   -
   -

3. What signals the start of puberty in girls?
   -
   -
   -
   -
4. What role does estrogen play in puberty?

- 
- 
- 

5. Define menarche. When does it occur?

- 
- 
- 

Lesson 25.2: Multiple Choice

Name____________________________ Class_______ Date ________

_circle the letter of the correct choice._

a. Females do not develop male reproductive organs because females
   a. produce estrogen.
   b. lack a Y-chromosome.
   c. have an X-chromosome.
   d. develop more slowly than males.

b. The first observable change in females during puberty is usually the
   a. beginning of breast development.
   b. growth of underarm hair.
   c. end of the growth spurt.
   d. first menstrual period.

c. The passageway from the uterus to the vagina is called the
   a. Fallopian tube.
   b. cervix.
   c. vulva.
   d. ovary.

d. Oogenesis begins with a(n)
   a. ovum.
   b. oogonium.
   c. polar body.
   d. primary oocyte.

e. The release of a secondary oocyte from an ovary is called
   a. ovulation.
   b. maturation.
   c. fertilization.
   d. menstruation.

f. During what phase of the menstrual cycle does the endometrium develop?
1.2. Female Reproductive System

- a. menstrual phase
- b. follicular phase
- c. uterine phase
- d. ovarian phase

- g. Menopause is caused by a natural decline in the secretion of
  - a. LH.
  - b. FSH.
  - c. estrogen.
  - d. progesterone.

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**Lesson 25.2: Vocabulary**

**Name____________________________ Class_______ Date ________**

*Match the vocabulary term with the correct definition.*

**Term**

___ 1. corpus luteum
___ 2. estrogen
___ 3. Fallopian tube
___ 4. follicle
___ 5. follicle-stimulating hormone
___ 6. luteinizing hormone
___ 7. ovary
___ 8. progesterone
___ 9. uterus
___ 10. vulva

**Definition**

- a. structure that carries eggs from an ovary to the uterus
- b. structure in the ovary that contains an egg
- c. structure that forms in the ovary and produces progesterone
- d. egg-producing organ of the female reproductive system
- e. name for the external female reproductive structures
- f. organ where a fetus grows and develops until birth
- g. main pituitary hormone that triggers puberty in females
- h. major female sex hormone
- i. pituitary hormone that stimulates the production of estrogen
- j. hormone that promotes gestation
Lesson 25.3: True or False

Write true if the statement is true or false if the statement is false.

1. A human zygote is a diploid cell.
2. A fertilized egg first starts dividing when it reaches the uterus.
3. The embryoblast is a cell layer of the morula.
4. The endoderm forms the lungs, liver, and pancreas.
5. Arm buds appear during the eighth week of gestation.
6. The fetus starts breathing on its own by week 18.
7. Fetal body fat rapidly increases toward the end of gestation.
8. A fetus born before 38 weeks is unlikely to survive.
9. A fetus is more sensitive than an embryo to most toxins.
10. Growth during infancy is faster than growth during puberty.
11. Children usually start losing their deciduous teeth by age six.
12. The immune system becomes more efficient as adults age.

Lesson 25.3: Critical Reading

Read this passage from the lesson and answer the questions that follow.

Placenta and Related Structures

The placenta is a temporary organ in which nutrients and wastes are exchanged between a mother and her embryo or fetus. The placenta begins to form in the second week after fertilization. It continues to develop and grow to meet the needs of the growing fetus. A fully developed placenta is made up of a large mass of blood vessels from both the mother and the fetus. The maternal and fetal vessels are close together but separated by empty space. This allows the mother’s and fetus’s blood to exchange substances without actually mixing.

How the Placenta Works

Blood from the mother enters the maternal blood vessels of the placenta under pressure, forcing the blood into the empty spaces surrounding the vessels. When the mother’s blood contacts the fetal blood vessels, gases are exchanged. Oxygen from the mother’s blood is exchanged with carbon dioxide from the fetus’s blood. A release of pressure brings the mother’s blood back from the placenta and into her veins.

The fetus is connected to the placenta through the umbilical cord, a tube that contains two arteries and a vein.
Blood from the fetus enters the placenta through the umbilical arteries, exchanges gases with the mother’s blood, and travels back to the fetus through the umbilical vein.

In addition to gas exchange, the placenta transfers nutrients, hormones, and other needed substances from the mother’s blood to the fetus’s blood. The placenta also filters many harmful substances out of the mother’s blood so they are not transferred to the fetus. In addition, the placenta secretes hormones that maintain the corpus luteum in the mother’s ovary. The corpus luteum secretes progesterone, which is needed to prevent the endometrium of the uterus from breaking down.

**Amniotic Sac and Fluid**

Attached to the placenta is the **amniotic sac**, which surrounds and protects the embryo or fetus. It begins to form in the second week after fertilization. It soon fills with water and dissolved substances to form **amniotic fluid**. The fluid allows the fetus to move freely until the fetus grows to fill most of the available space. The fluid also cushions the fetus and helps protect it from injury.

**Questions**

1. What is the placenta, and what are its functions?

2. Describe the fully developed placenta. How is the fetus connected to the placenta?

3. Explain how gases are exchanged between a mother and fetus.

4. Besides oxygen, what substances are transferred from the mother to the fetus through the placenta?

5. Identify the functions of the amniotic sac and amniotic fluid.
Lesson 25.3: Multiple Choice

Name____________________________ Class_______ Date ________

Circle the letter of the correct choice.

a. When a sperm and an egg unite, they form a(n)
   a. embryo.
   b. zygote.
   c. infant.
   d. fetus.

b. A blastocyst is called an embryo when it
   a. moves through the Fallopian tube.
   b. embeds in the uterine lining.
   c. develops two layers of cells.
   d. forms a fluid-filled cavity.

c. Cellular differentiation begins during the
   a. third week after fertilization.
   b. morula stage of the embryo.
   c. fetal stage of development.
   d. third month of gestation.

d. The embryo’s heart starts to beat during week
   a. 4.
   b. 12.
   c. 20.
   d. 28.

e. The fetal stage begins during week
   a. 2.
   b. 8.
   c. 26.
   d. 38.

f. The fetus is forced out of the mother’s body during childbirth by
   a. contractions of the uterus.
   b. tension in the vagina.
   c. the pull of gravity.
   d. the fetus’ weight.

g. Children between the ages of one and three years are generally referred to as
   a. babies.
   b. infants.
   c. toddlers.
   d. newborns.

Lesson 25.3: Vocabulary

Name____________________________ Class_______ Date ________

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**Match the vocabulary term with the correct definition.**

**Term**
- 1. blastocyst
- 2. cleavage
- 3. differentiation
- 4. ectoderm
- 5. endoderm
- 6. gastrulation
- 7. implantation
- 8. mesoderm
- 9. morula
- 10. trophoblast

**Definition**
- a. embedding of the blastocyst in the lining of the uterus
- b. embryonic cell layer that forms tissues involved in digestion and breathing
- c. initial ball of cells formed in the first few days after fertilization
- d. embryonic cell layer that forms tissues that provide movement and support
- e. embryonic cell layer that forms tissues that cover the outer body
- f. outer layer of blastocyst cells that develop into the placenta
- g. process by which unspecialized cells become specialized into different cell types
- h. ball of cells containing a fluid-filled cavity and distinct layers
- i. development of different layers of cells in the embryo
- j. initial cell divisions that increase the number of cells but not their overall size
### 1.4 Sexually Transmitted Diseases

#### Lesson 25.4: True or False

Name____________________________ Class_______ Date ________

Write true if the statement is true or false if the statement is false.

_____ 1. Any disease that can spread through sexual contact is an STD.
_____ 2. Most sexually transmitted diseases are caused by protozoa.
_____ 3. STDs can spread through oral sexual behaviors.
_____ 4. Females are more likely than males to develop chlamydia.
_____ 5. Untreated chlamydia leads to a serious liver disease.
_____ 6. Chlamydia can be passed to a baby before or during birth.
_____ 7. Gonorrhea is no longer common in the United States.
_____ 8. Gonorrhea always causes symptoms in infected females.
_____ 9. Untreated syphilis can eventually cause brain damage.
_____ 10. HSV-2 is the pathogen that causes genital warts.
_____ 11. There is no known cure for hepatitis B.
_____ 12. A PAP test is used to diagnose cervical cancer.

#### Lesson 25.4: Critical Reading

Name____________________________ Class_______ Date ________

Read this passage from the lesson and answer the questions that follow.

**Sexually Transmitted Diseases**

Common STDs include chlamydia, gonorrhea, syphilis, human immunodeficiency virus (HIV) infection, genital herpes, hepatitis B, and genital warts. To be considered an STD, a disease must have only a small chance of spreading naturally in ways other than sexual contact. Many diseases that can spread through sexual contact spread more commonly by other means. These diseases are not considered STDs.

**Pathogens that Cause STDs**

STDs may be caused by several different types of pathogens, including protozoa, insects, bacteria, and viruses.

- The protozoa *Trichomonas vaginalis* causes an STD called trichomoniasis. This is an infection of the vagina in females and the urethra in males.
- Pubic lice, like the one in Figure 1.2, are insect parasites that can be transmitted sexually. They suck the blood of their host and irritate the skin in the pubic area.
Although these STDs are common, the majority of STDs are caused by bacteria or viruses. Several bacterial and viral STDs are described below. It is important to note that most bacterial STDs can be cured with antibiotics, whereas viral STDs do not have cures, although some can be prevented with vaccines.

How STDs Spread

Most of the pathogens that cause STDs enter the body through mucous membranes of the reproductive organs. All sexual behaviors that involve contact between mucous membranes put a person at risk for infection. This includes vaginal, anal, and oral sexual behaviors.

Many STDs can also be transmitted through body fluids such as blood, semen, and breast milk. For example, in the past, HIV and hepatitis B were transmitted through blood transfusions. This no longer occurs because donated blood is now screened for the pathogens. Use of shared injection or tattoo needles is another way in which blood and pathogens can be transferred from one person to another. A number of STDs can also be transmitted from a mother to her baby through her blood during childbirth or through her breast milk after birth.

STDs are much more common in young adults and teens than in older people. One reason is that young people are more likely to take risks and to think “It can’t happen to me.” They also may not know how STDs are spread. In addition, younger people may be more sexually active than older people.

Questions

1. When is a disease classified as an STD?

2. List four types of pathogens that cause STDs.

3. Describe how pathogens that cause STDs enter the body.

4. Besides sexual activity, what are other ways that some STDs can spread?
5. Why are STDs more common in young adults and teens than in older people?

Lesson 25.4: Multiple Choice

Name____________________________ Class_______ Date ________

Circle the letter of the correct choice.

a. STDs may be caused by all of the following except
   a. diet.
   b. viruses.
   c. insects.
   d. protozoa.

b. Many STDs can be transmitted through
   a. blood.
   b. semen.
   c. breast milk.
   d. all of the above.

c. Why are newborns treated routinely with eye drops?
   a. to prevent chlamydia eye infections
   b. to improve their distance vision
   c. to help them see more clearly
   d. to protect them from HIV

d. During which stage of syphilis does a small sore appear on the genitals?
   a. primary stage
   b. secondary stage
   c. latent stage
   d. tertiary stage

e. Which statement is true about genital herpes?
   a. It is caused by bacteria.
   b. It does not have symptoms.
   c. It can be cured with antibiotics.
   d. It can cause blindness in newborns.

f. Vaccines have been developed to prevent infection with
   a. syphilis.
b. gonorrhea.
c. hepatitis B.
d. chlamydia.

g. Cervical cancer is caused by
   a. HPV.
b. HSV.
c. HIV.
d. PID.

Lesson 25.4: Vocabulary

Match the vocabulary term with the correct definition.

Term
___ 1. chlamydia
___ 2. genital herpes
___ 3. genital warts
___ 4. gonorrhea
___ 5. hepatitis B
___ 6. HIV
___ 7. pelvic inflammatory disease
___ 8. sexually transmitted disease
___ 9. syphilis
___ 10. trichomoniasis

Definition
a. STD caused by a protozoan
b. STD caused by the bacterium Neisseria gonorrhoeae
c. infection of the uterus, Fallopian tubes, and/or ovaries
d. STD caused by the bacterium Treponema pallidum
e. STD caused by the human papillomavirus
f. most common STD in the U.S.
g. virus that causes acquired immunodeficiency disease
h. any disease caused by a pathogen that spreads mainly through sexual contact
i. inflammation of the liver caused by a virus
j. STD caused by the virus HSV-2
1.5 References

1. Mariana Ruiz. Public Domain
2. Centers for Disease Control and Prevention. Public Domain