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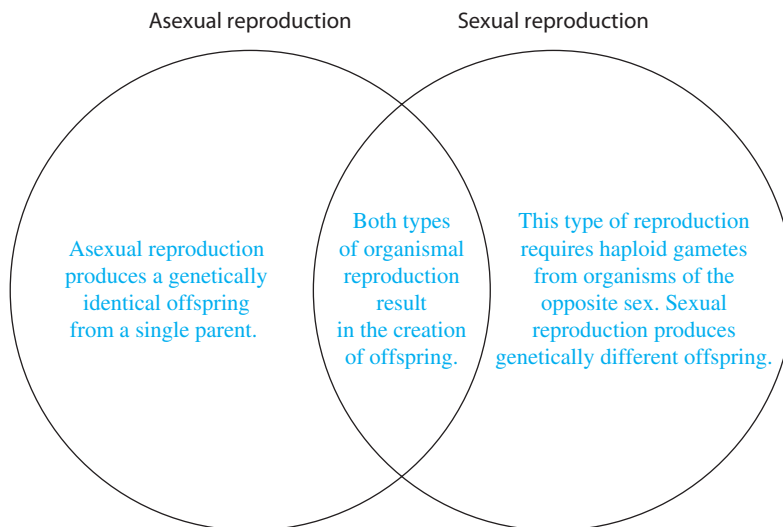
## Chapter 27: Reproduction and Embryonic Development

### Guided Reading Activities

#### Big idea: Asexual and sexual reproduction

Answer the following questions as you read modules 27.1–27.2:

1. The creation of a new organism from an existing organism(s) is known as reproduction.
2. Which of the following types of asexual reproduction involves the splitting of a parent organism into two offspring of equal size?
  - a. Fission
  - b. Fragmentation
  - c. Regeneration
  - d. Budding
3. Complete the Venn diagram that compares asexual reproduction to sexual reproduction.



4. Internal fertilization is a type of fertilization that has evolved in animals that live in terrestrial environments. This type of fertilization requires the act of copulation.
5. What advantage does hermaphroditism have?  
The main advantage is that any two organisms can mate and produce twice as many fertilized eggs.

**Big idea: Human reproduction**

Answer the following questions as you read modules 27.3–27.8:

1. List three similarities between the male and female reproductive systems.  
(1) Both sexes have a pair of organs that produce gametes. (2) Both sexes also have ducts for the storage and delivery of gametes. (3) Both sexes have copulatory structures for mating.
2. Match the following terms with their correct description: gonads, uterus, fetus, follicles, and oviduct.

The site of pregnancy: uterus

Gametes are produced here: gonads

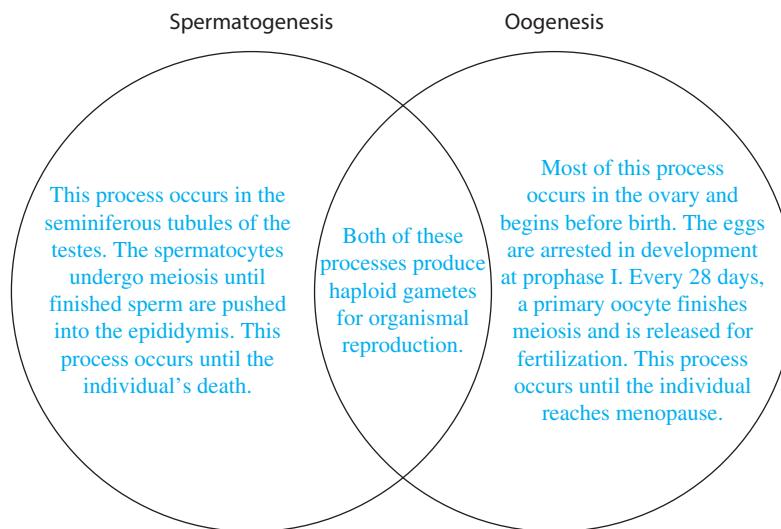
Usually, the site of fertilization: oviduct

The developing egg cell and its support structures: follicles

A developing human from the ninth week of pregnancy until birth: fetus

3. A common misconception deals with the difference between a fetus and an embryo. Briefly explain the difference.  
A developing human is referred to as an embryo from the first division until about the ninth week. From the ninth week on, the developing human is a fetus.
4. Which of the following male reproductive structures is most similar in function to the female oviduct?
  - a. Bulbourethral gland
  - b. Vas deferens
  - c. Seminal vesicles
  - d. Prostate gland

5. True or false: The bulbourethral gland is what is cut during a vasectomy. If false, make it a correct statement.  
**False, the vas deferens is cut.**
6. A medical condition causes a male to stop producing FSH. What is the likely result?  
**This individual would probably produce significantly fewer sperm.**
7. The formation of human sex cells is known as gametogenesis and there are two specific kinds: spermatogenesis and oogenesis.
8. The secondary oocyte of a human is released upon ovulation and is held in metaphase II. How many chromosomes does it have at this point?
- a. 23
- b. 46
- c. 92
- d. None of the above
9. Complete the Venn diagram that compares spermatogenesis to oogenesis.



10. A female's reproductive cycle actually includes what two separate but linked processes?  
**The ovarian cycle and the menstrual cycle**

11. The female reproductive cycle is highly regulated by changes in hormones. List and describe the major hormonal changes that occur in each cycle.  
The hypothalamus releases releasing hormone to stimulate the anterior pituitary to release FSH and LH. The FSH stimulates the growth of the follicle, which releases increasing amounts of estrogen. The estrogen peaks around day 10 and causes a spike in LH and FSH. These surges lead to ovulation. The LH also stimulates the corpus luteum to release estrogen and progesterone, which causes a reduction in FSH and LH. The LH reduction leads to the degeneration of the corpus luteum and a reduction in estrogen and progesterone. As levels of estrogen and progesterone decline, the endometrium will be shed.
12. True or false: The start of menstruation is considered day 1 of the female menstrual cycle. If false, make it a correct statement.  
The releasing hormone from the hypothalamus stimulates the anterior pituitary to release FSH and LH. FSH stimulates the growth of the follicle. Low levels of estrogen work to keep FSH and LH relatively low for about 13 days. The peak in estrogen around day 12 causes the pituitary to release large amounts of FSH and LH. High levels of estrogen and progesterone after ovulation work to inhibit the release of FSH and LH from the pituitary. The falling levels of FSH and LH keep another follicle from developing. Eventually, falling LH levels mark the decline of the corpus luteum. Unless an embryo has implanted in the uterus, the corpus luteum stops producing estrogen and progesterone. This drop in estrogen and progesterone allows the whole process to repeat.
13. The most common bacterial STD is chlamydia.
14. List three common methods of contraception.  
(1) Birth control pills  
(2) Vasectomy  
(3) Condom
15. According to Table 27.8 on page 545 of your textbook, which form of contraception is most effective?  
Birth control pills and vasectomy are tied, with .1 pregnancies per 100 women per year.

### Big idea: Principles of embryonic development

Answer the following questions as you read modules 27.9–27.14:

1. Briefly explain what mechanism keeps the sperm from a different species from fertilizing an egg.  
There are species-specific proteins on the sperm surface that bind to specific receptors on the egg surface.
2. True or false: The egg becomes impenetrable to other sperm following fertilization. If false, make it a correct statement.  
True
3. Nondisjunction (refer back to Chapter 8) occurs in the production of a sperm cell. The sperm ends up being  $2n$  and also happens to fertilize the egg. Assuming the egg has the normal haploid set of chromosomes, how many sets of chromosomes would the zygote have?  
The zygote would have three (3) sets of chromosomes.

4. After a(n) zygote divides for the first time, it is referred to as a(n) embryo.
5. Complete the following table, which compares monozygotic twins to dizygotic twins.

	Monozygotic	Dizygotic
<b>Description</b>	These twins will be identical. They result from a cell that breaks away from the early embryo and returns to what is essentially a zygote. This creates identical embryos.	These twins will not be identical. They result from two separate eggs fusing with two separate sperm.

6. The second major phase of embryonic development is which of the following?
- Gastrulation
  - Cleavage
  - Blastocoel
  - Blastula
7. During gastrulation, the embryo is organized into a stage characterized by three layers called a(n) gastrula.
8. Complete the following table, which compares the three layers of the gastrula.

	Ectoderm	Endoderm	Mesoderm
<b>Future tissues and organs</b>	The ectoderm becomes the nervous system, the cornea and lens of the eye, and different structures associated with skin.	This layer becomes various key organs such as the liver, pancreas, bladder, and reproductive system.	This layer becomes the skeletal and muscular systems. It also becomes the circulatory system and lining of body cavities.

9. The brain and spinal cord develop from the neural tube.
10. List the three phases of embryonic development that are common to nearly all animals.  
The three phases are cleavage, gastrulation, and organ formation.
11. Briefly explain how induction and apoptosis contribute to the developing embryo.  
Induction is a process by which gene products in one group of cells lead to differentiation of adjacent cells into more specific tissues. Apoptosis is programmed cell death and can get rid of unwanted cells to create structures like fingers and toes.

12. The development and shaping of an animal's major components involve pattern formation, which involves the creation of the organs and tissues in the proper places.
13. What is the significance of homeoboxes?  
Homeoboxes help to control gene expression during development and thus direct pattern formation.

**Big idea: Human development**

Answer the following questions as you read modules 27.15–27.18:

1. Pregnancy is to gestation as fertilization is to conception.
2. Complete the following table, which describes the four extraembryonic membranes that develop.

	Amnion	Yolk sac	Allantois	Chorion
Description	The amnion encloses the embryo and contains a fluid that bathes and supports the embryo.	In mammals, the yolk sac provides the embryos first blood cells and produces the germ cells, which eventually give rise to gamete-forming cells in the gonads.	In mammals, the allantois forms part of the placenta and urinary bladder.	The chorion completely surrounds the embryo and the other extraembryonic membranes. It also becomes part of the placenta and produces hCG.

3. True or false: The placenta is an organ that consists of only maternal tissue. If false, make it a correct statement.  
False, it consists of both maternal and embryonic tissues.
4. At what week does the fetus have features that give it a distinctly human appearance? Refer to the images on pages 556 and 557 of your textbook.  
The fetus begins to appear human around the 14th week.
5. Human development is divided into trimesters.
6. Which of the following hormones are involved in childbirth?
- Estrogen
  - Prostaglandin
  - Oxytocin
  - All of the above

7. List the three stages of labor and briefly describe what occurs during each one.  
Dilation: The period of time from the onset of labor until full dilation of the cervix is achieved.  
Expulsion: The period of time from full dilation until delivery is characterized by strong contractions and birth of the child.  
Afterbirth: This stage is characterized by delivery of the placenta.
8. A common misconception is that impotence refers to a low sperm count. Briefly explain what impotence actually refers to.  
Impotence refers to erectile dysfunction.
9. List three options a woman and a man may undergo if they are having trouble conceiving.  
You can use a surrogate mother, you can have hormone injections, you can receive donor eggs, and you can undergo in vitro fertilization (IVF).

### CONNECTING THE BIG IDEAS

Use your knowledge of the information contained within this chapter's "Big Ideas" to answer this question.

A male has a condition that reduces the amount of testosterone produced during puberty. What effect, if any, would this have on secondary sexual characteristics and external genitalia?