

Chapter 14: Review Answers

Student Textbook pages 504-505

Understanding Concepts

1. *seminiferous tubules*: long, coiled tubules in which sperm begin to develop
Sertoli cells: found inside the seminiferous tubules; they nourish the sperm
interstitial cells: surround seminiferous tubules and produce testosterone

sperm: tadpole-shaped structure containing 23 chromosomes; penetrates and fertilizes the egg

2. (a) testosterone is produced in the testes, by the interstitial cells
 (b) progesterone is produced in the ovary
 (c) sperm is produced in the testes, in the seminiferous tubules
 (d) luteinizing hormone is produced in the anterior pituitary
 (e) follicle-stimulating hormone is produced in the anterior pituitary gland
 (f) ovum is produced in a follicle in one of the ovaries
3. Sperm to ovum flow chart: seminiferous tubules (m) → epididymis (m) → ductus deferens (m) → urethra (m) → vaginal orifice (f) → vagina (f) → uterus (f) → oviduct (f)
 Student diagrams should reflect the same information.
4. The components of semen are:
 - sperm cells (contribute the gamete containing 23 chromosomes)
 - mucus from the seminal vesicles, which contains fructose and provides energy
 - mucus-like fluid plus an alkaline fluid from the prostate gland to neutralize the acids in the female reproductive tract
 - fluid from the Cowper's gland plus an alkaline fluid to neutralize the acids in the female reproductive tract
- 5.

STI	Source	Transmission	Effects	Treatment
(a) HIV/AIDS	human immunodeficiency virus (HIV)	sexual contact with infected person; intravenous drug use; mother to child during birth or breast milk	HIV attacks helper T cells; person more vulnerable to infections; can be fatal	no cure; treatments alleviate symptoms of specific diseases and can extend life-expectancy
(b) hepatitis B	hepatitis B virus	sexual contact or through contact with infected body fluids or blood; mother to child before child birth (across the placenta)	initially flu-like symptoms (headache, fever, nausea, loss of appetite); skin may turn yellowish (jaundice); later stages can cause liver failure, liver cancer, or death.	vaccines are available
(c) genital herpes	herpes simplex 1 or herpes simplex 2 viruses	HSV 2 transmitted by genital contact HSV 1 commonly causes infections of the mouth (cold sores)	tingling or itching followed by blisters on genitals, buttocks, thighs	no cure; individual always carries the virus; antiviral medication can help to control outbreaks
(d) human papilloma virus	HPV virus	skin to skin contact	develop flat, raised warts around genital area; linked to serious disorders such as cervical cancer	no cure

STI	Source	Transmission	Effects	Treatment
(e) chlamydia	bacterium (<i>Chlamydia trachomatis</i>)	sexual contact	discharge from the penis or vagina, a burning pain while urinating, or a fever; in women can lead to pelvic inflammatory disease which can block oviducts (sterility); infections in cervix lead to sores that can be the sight of HIV	antibiotics
(f) gonorrhea	bacterium (<i>Neisseria gonorrhoeae</i>)	sexual contact	infection of urethra, cervix, rectum, and throat; pain when urinating and a thick greenish-yellow discharge from the urethra; can lead to PID and may spread to joints, heart, or brain	antibiotics
(g) syphilis	bacterium (<i>Treponema pallidum</i>)	sexual contact	first stage:- forms ulcerated sores (chancres) at infection site; second stage – rash on palms and soles of feet; third stage – affects cardiovascular and nervous systems (mental illness, lameness, blindness)	antibiotics (if treated early)

6. (a) The following chart summarizes transmission of specific STIs to newborn and
(b) the effects of these STIs on infants:

STI	(a) Transmission	(b) Effects on Infants
genital herpes	mother to child during childbirth	infection may cause blindness, neurological disorders, even death
chlamydia	mother to child during childbirth	eye and respiratory tract infections
gonorrhea	mother to child during childbirth	serious eye infections
syphilis	can infect developing embryo at any stage	causes birth defects or stillbirth

7. Genital herpes is a health risk to the individual due to the associated symptoms, as well as to the public, since the virus is easily transmitted, especially if the infected person is asymptomatic. There is also a risk of an infected mother transmitting the virus to her baby during birth. There is no cure for genital herpes; however, antiviral medication can help to control the severity of outbreaks. Syphilis is a bacterial infection that has progressive stages, and if left untreated can result in death. If diagnosed early, the disease can be treated with antibiotics.
8. At the beginning of an ovarian cycle, slightly raised levels of FSH will stimulate a follicle to grow. A follicle matures by growing layers of follicular cells and a central, fluid-filled vesicle. By the midpoint of the cycle, a spike of LH

stimulates the follicle to rupture and release an ovum. LH then stimulates the empty follicle to develop into a corpus luteum and secrete progesterone. If the ovum is not fertilized, the corpus luteum degenerates.

9. At the beginning of the ovarian cycle, the endometrium (in the uterus) is very thin. As a follicle matures in the ovary, it secretes estrogen. By the sixth day of the cycle, the increased levels of estrogen stimulate the thickening of the endometrium. After ovulation and the release of progesterone, the thickening of the endometrium increases dramatically. Between days 15 and 23, the thickness will double or triple. If fertilization does not occur, the degenerating corpus luteum causes the endometrium to break down, and menstruation begins.
10. After the onset of puberty, the levels of sex hormones in the blood of a female increase dramatically and stimulate the final development of the reproductive system. GnRH is secreted by the hypothalamus, and stimulates the release of LH and FSH. These two hormones act on the ovaries to produce estrogen and progesterone, which stimulate the development of the secondary sexual characteristics and launch the menstrual cycle.
11. (a) luteinizing hormone = red line
(b) progesterone = yellow line
(c) progesterone

Applying Concepts

12. Syphilis is caused by a bacterial infection and antibiotics can be used to treat bacterial infections. AIDS is caused

by the HIV virus. Antibiotics do not have any effect on viral infections.

13. The acrosome contains enzymes that help the sperm penetrate the jelly-like layer protecting the egg during fertilization. Without the acrosome, this penetration is not possible, and fertilization would not take place. The male would be sterile.
14. The names of the hormones reflect their functions in the female reproductive system. FSH (follicle-stimulating hormone) stimulates the follicles in the female reproductive system to mature and release increased quantities of estrogen into the bloodstream. In males, it stimulates the production of sperm. LH (luteinizing hormone) stimulates the development of the corpus luteum after the ovum has been released. In males, LH causes the testes to release testosterone.
15. Delayed puberty would be reflected in the blood by lower levels of sex hormones such as estrogen. In addition, secretions of hypothalamus and pituitary hormones (GnRH, LH, and FSH) would be reduced.
16. Castrated farm animals produce no sperm or testosterone and tend to be a smaller size. These animals also tend to have higher fat and less muscle development, which yields meat with richer fat content—for more tender cuts for the market. Farmers also benefit because castrated animals are less aggressive and easier to work with.
17. (a) Students can hypothesize that the most likely reasons are an interruption in the negative feedback loop or not enough of one of the hormones that plays a key role in the cycle.
(b) A simple investigation could be to investigate hormonal levels through urinalysis or blood tests. If levels of estrogen and progesterone were irregular, then the endometrium would not thicken regularly either.
18. (a) The release of the egg corresponds with hormone A (LH) because of the peak in concentration on day 13, the day of ovulation. The build-up of the uterine lining corresponds with hormone B (progesterone) because of the high concentrations from day 17-28 and the reduced concentration on day 1.
(b) If hormone A remained constant, it is likely that the follicle was not releasing the ovum. Since the follicle was not releasing the ovum, the corpus luteum in turn was not developing, so hormone B remained constant (no rise in the progesterone level) and therefore the uterine lining would not be developing. (FSH levels appear normal). Without the release of the ovum and development of the uterine lining, pregnancy would not be possible.
19. Students' responses should focus on the best ways to protect public health. They should acknowledge that the key conflict is between prevention and finding a cure.

Which is more important? Accept all well-reasoned answers.

Making Connections

20. (a) The individual would have ovaries. The Y chromosome contains the gene necessary for testicular formation.
(b) No, this person cannot respond to estrogen. An estrogen receptor is a protein molecule found inside those cells that are targets for estrogen action. Estrogen receptors contain a specific site to which only estrogen (or closely related molecules) can bind. Without these receptors, cells will not respond to estrogen. In breast tissue, for example, estrogen triggers the proliferation of cells lining the milk glands, thereby preparing the breast to produce milk if the woman should become pregnant. Without estrogen receptors, breast tissue would not develop. Estrogen also promotes proliferation of the cells that form the inner lining, or endometrium, of the uterus, thereby preparing the uterus for possible implantation of an embryo. Without estrogen, the lining of the endometrium would not thicken and vascularize.
(c) It is unlikely that this individual would develop male secondary sexual characteristics. It is unlikely that the adrenal cortex would produce enough testosterone.
(d) This individual would not likely be fertile since estrogen is required for the development of the endometrium, preparing the uterus for possible implantation of the embryo. As well, without high levels of estrogen, the hypothalamus will not release GnRH. Without GnRH, LH will not be released and ovulation will not occur.
21. The high mortality rate for sperm is acceptable because hundreds of millions of sperm are formed and only one is needed for fertilization, millions of sperm can be eliminated without compromising the species' survival. In contrast, only one egg is released each month, and if it dies, the opportunity for reproduction is lost.
22. Three reasons why there are so many new cases of chlamydia reported each year:
 - 75% of infected people are asymptomatic and are unknowingly passing the infection on to other people.
 - the age group it is affecting is more likely to be sexually active with less knowledge of STIs and taking fewer precautions, such as using a condom.
 - because the infection rate is double in women, they may unknowingly pass it on to their child during birth
23. (a) When a woman becomes pregnant, menstruation stops for the duration of the pregnancy because the corpus luteum remains and continues to secrete high levels of estrogen and progesterone. These hormones keep the endometrium growing and supporting the fetus, instead of disintegrating and sloughing off.

(b) After pregnancy, estrogen and progesterone levels are low. Their low levels allow GnRH to stimulate the release of LH and FSH from the anterior pituitary. With the release of these hormones, the cycle begins again: a new ovum matures and is released; the endometrium thickens; and if the ovum is not fertilized and implanted, the endometrium will be shed.

24. High testosterone levels generated by anabolic steroids will inhibit the release of GnRH, which subsequently stops the release of LH and FSH from the anterior pituitary gland. Sperm production will decrease and natural production of testosterone will also decrease. If steroid use continues, the testicles and secretory cells will shrink. Since production of testosterone declines, secondary sex characteristics such as facial hair will decrease. Students may also copy or sketch the feedback loop showing testosterone (Figure 14.13) to explain their answer.