

Chapter 14 – The Reproductive System

Complete using BC Biology 12, page 436 - 467

14.1 Male Reproductive System

pages 440 - 443

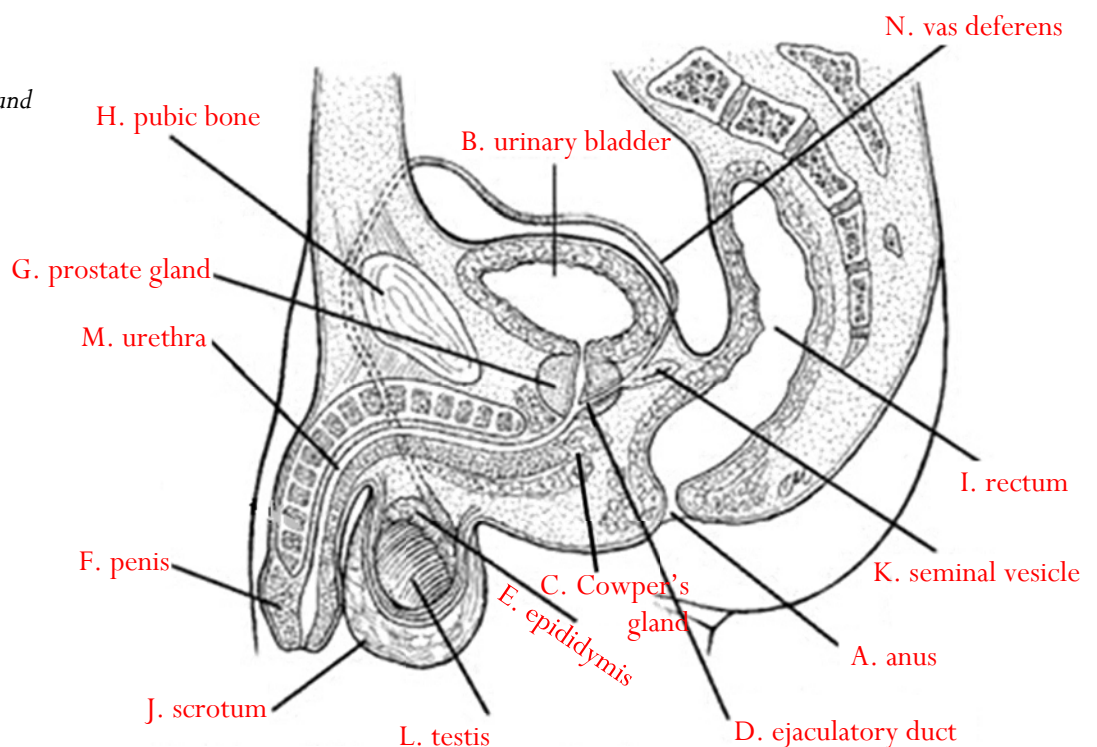
- Distinguish between **gametes** and **gonads**, using specific examples. Gametes are the haploid sex cells (egg or sperm) that carry the genetic information of the female or male. The gonads are what produce the gametes (ovaries or testes)
- What are the functions of the male reproductive structures?

Organ	Function
Testes	Produce sperm in seminiferous tubules and sex hormones (the male gonad)
Epididymides	Tightly coiled ducts where sperm mature and are stored (~5 to 6 m)
Vas deferens	Conducts and stores sperm (becomes ejaculatory duct once it passes the s. vesicles)
Seminal vesicles (2)	Contributes nutrients and fluid to semen (plus prostaglandins)
Prostate gland (1)	Contributes basic fluid to semen
Urethra	Conducts sperm (continuation of ejaculatory duct)
Cowper's gland (2)	Contribute viscous fluid to semen
Penis	Organ of sexual intercourse (tip is the glands penis which is covered by foreskin)

- Label the diagram

"circumcision" is the surgical removal of the foreskin

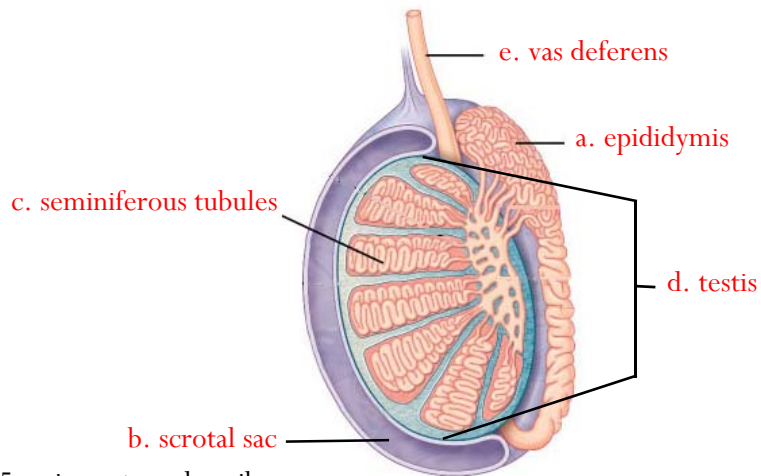
- A. anus
- B. urinary bladder
- C. bulbourethral gland
- D. ejaculatory duct
- E. epididymis
- F. penis
- G. prostate gland
- H. pubic bone
- I. rectum
- J. scrotum
- K. seminal vesicle
- L. testes
- M. urethra
- N. vas deferens



4. What structure connects the vas deferens to the urethra? ejaculatory duct
5. The seminal fluid is composed of...
 - a. fructose sugar (contributed by the seminal vesicles)
 - i. Purpose? energy source for the swimming sperm (reactant in cellular respiration)
 - b. bicarbonate ions (HCO_3^-) (contributed by the prostate gland)
 - i. Purpose? sperm are more viable and neutralizes slight acidity of vagina
 - c. lubricating mucus-rich fluid (contributed by the bulbourethral (Cowper's) glands)
 - i. Purpose? lubricate penis and facilitate penetration during sexual intercourse
 - d. prostaglandins (also contributed by the seminal vesicles)
 - i. Purpose? cause slight uterine contractions that may help propel sperm towards the egg
6. Approximately how many sperm are expelled during ejaculation? ~100-400 million (average is 250 million)
7. Name the structure that holds the testes outside of the abdominal cavity. scrotum
 - a. Why must the testes be held there? allows a lower temperature (~3°C cooler) required to produce viable sperm
8. **Sperm Production:** The testis is composed of compartments called lobules, each of which contains one to three seminiferous tubules which are the site of sperm production which is referred to as spermatogenesis. Sperm go through a series of stages of development before becoming "mature" sperm (also known as spermatozoa) which are then stored in the epididymis that surrounds the testis.

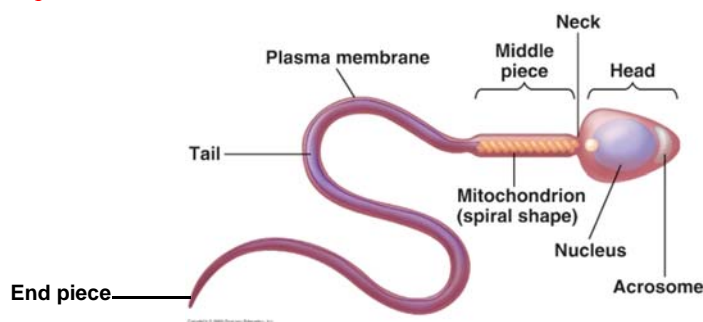
9. Label the diagram

- a. epididymis
- b. scrotal sac
- c. seminiferous tubules
- d. testis
- e. vas deferens



10. Draw a sperm cell and label the 5 main parts as described

- a. middle piece: production of ATP for the movement of the tail
- b. head: contains the nucleus with 23 chromosomes
- c. acrosome: stores enzymes needed to penetrate the egg
- d. tail: propelling the sperm forward
- e. end piece: continuation of the tail but lacks outer covering



11. **Hormone Regulation:** the hypothalamus has ultimate control of the testes function as it secretes a hormone called gonadotropin – releasing hormone (GnRH) which stimulates the anterior pituitary to secrete:
- follicle – stimulating hormone (FSH) that promotes the production of sperm in the seminiferous tubules and the release of the hormone inhibin to stop FSH production
 - luteinizing hormone (LH) also known as interstitial cell-stimulating hormone (ICSH) that controls the production of the main male hormone testosterone.
12. Name several male characteristics caused by **testosterone**.
- Primary characteristic: development and functioning of male reproductive organs
 - Secondary characteristics include:
 - broader shoulders and longer legs (relative trunk length)
 - enlargement of larynx and vocal cords (deeper voice)
 - growth of body hair (face, chest, underarm, pubic, etc)
 - increased skeletal muscle and strength
 - activation of sweat and sebaceous glands (oil)

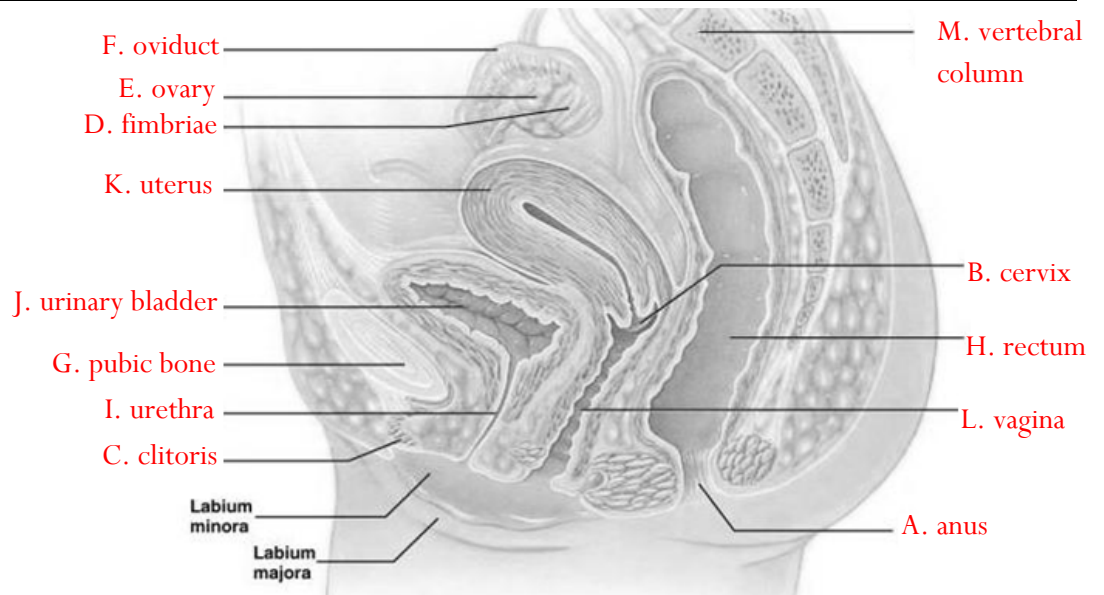
14.2 Female Reproductive System

pages 444 - 445

13. The female gonads are the ovaries. Oogenesis is the production of an egg, or oocyte (the female gamete) which are produced one per month (ovaries alternate). Ovulation is the process by which an egg is released from an ovary and enters the oviduct.
14. What are the functions of the female reproductive structures?

Organ	Function
Ovaries	Produce oocyte and sex hormones (the female gonad)
Oviducts	Conduct oocyte; location of fertilization; transport early zygote
Uterus	Houses developing fetus
Cervix	Contains opening to uterus
Vagina	Receives penis during sexual intercourse; serves as birth canal and as the exit for menstrual flow

15. Label the diagram
- anus
 - cervix
 - clitoris
 - fimbriae
 - ovary
 - oviduct
 - pubic bone
 - rectum
 - urethra
 - urinary bladder
 - uterus
 - vagina
 - vertebral column



16. Since the ovaries are not directly attached how do the eggs get into the oviducts? It is "swept" into an oviduct by the combined action of the fimbriae and the beating of the cilia that line the oviducts
17. How is an egg propelled down the oviduct? Ciliary movement and tubular muscle contraction
18. An embryo that embeds anywhere other than the uterine lining is referred to as an ectopic pregnancy
19. The uterus is also called as the womb which can begin at 5 cm wide and stretch to over 30 cm wide to accommodate a growing baby. The lining of the uterus, the endometrium, participates in the formation of the placenta which supplies the nutrients needed for embryonic and fetal development.
20. How does the male and female reproductive systems differ in regards to the urinary system? In the male, the two systems are connected as the urethra serves to transport both sperm and urine (at different times of course!). Female systems are completely separate.

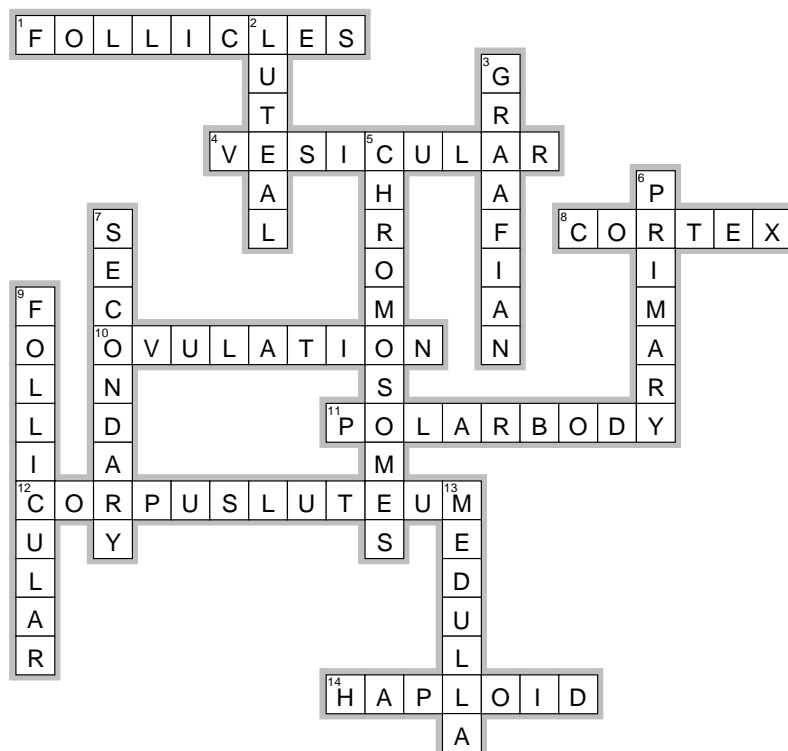
14.3 Ovarian & Uterine Cycles

pages 446 - 450

Ovarian Cycle

21. A female is born with all the ovarian follicles (and therefore eggs) she will ever have. How many...
- follicles are there on average? 700,000 – 1,000,000
 - will mature? ~400
 - are released each month? 1

22. Complete the crossword



EclipseCrossword.com

Across

- Many of these are found in the outer layer of the ovary, each one contains an immature egg.
- A secondary follicle becomes a ____ follicle which increases to the point the follicle wall balloons out on the surface of the ovary.
- Outer layer of the ovary (or any structure).
- Term referring to the bursting of the vesicular follicle and release of the secondary oocyte.
- This is produced when the primary oocyte divides (2 words)
- A gland like structure that produces progesterone; what remains of the vesicular follicle after ovulation.
- The primary oocyte divides, producing two ____ cells.

Down

- This phase occurs for the second half of the ovarian cycle.
- Alternate name for the vesicular follicle.
- An egg contains 23 of these.
- A ____ follicle contains an oocyte and begins producing estrogen (first stage)
- A primary follicle becomes a ____ follicle and produces estrogen and some progesterone.
- The phase that occurs for the first half of the ovarian cycle.
- Inner region of the ovary (or any structure)

23. Match the hormones to where they are produced (one will be used twice).
- | | |
|---|---|
| <u>D</u> _____ gonadotropin-releasing hormone | A. mainly the follicle, some from the corpus luteum |
| <u>B</u> _____ follicle-stimulating hormone | B. anterior pituitary gland |
| <u>B</u> _____ luteinizing hormone | C. mainly the corpus luteum, some from the follicle |
| <u>A</u> _____ estrogen | D. hypothalamus |
| <u>C</u> _____ progesterone | |
24. What happens to the corpus luteum? Begins to degenerate
- a. If a fertilized egg does not implant in the uterine lining, how long before the above occurs?
10 days

Uterine Cycle

25. The uterus undergoes a cyclical series of events known as the uterine cycle. The 28 day cycle is divided as follows (varies by individual):
- Days 1 – 5 menstruation
 - Days 6 – 13 proliferative phase
 - Day 14 ovulation
 - Days 15 – 28 secretory phase
26. Name several male characteristics caused by **estrogen** (and progesterone)
- Primary characteristic: development and functioning of female reproductive organs
 - Secondary characteristics include:
 - growth of body hair (underarm, public, leg)
 - widening of the pelvic girdle (enlarged pelvic cavity)
 - accumulation of fat beneath the skin
 - development of breasts
 - activation of sweat and sebaceous glands (oil)
27. Why does the blood released during menstruation not clot? it contains an enzyme called fibrinolysin that prevents clotting
28. What causes the cramps experienced during menstruation? Prostaglandins cause uterus to contract

Fertilization, Pregnancy & Birth

29. Describe the process from fertilization to birth in point form. Include the terms **placenta**, **human chorionic gonadotropin (HCG)**, **uterine contractions**, and **oxytocin**.
- Once an egg and sperm have joined in the oviduct, a zygote is formed and begins to split by mitosis. The zygote becomes an embryo and implants in the endometrium. The placenta is formed from both maternal and fetal tissues and begins to produce human chorionic gonadotropin (HCG) which prevents menstruation by maintaining the corpus luteum. Late into the 3rd trimester, the uterine contractions begin and become stronger and more frequent marking the onset of labor. The uterine contractions are induced by the stretching of the cervix and the baby pushing down on the cervix. Oxytocin is released by the posterior pituitary which stimulates uterine contractions. This is a positive feedback loop that ends once the baby is born.

30. Match the terms.

- | | |
|--------------------------|---|
| <u>B</u> _____ lactation | A. period in which menstruation slows then stops |
| <u>C</u> _____ colostrum | B. production of milk by mammary glands to feed newborn |
| <u>A</u> _____ menopause | C. thin, yellow, milky liquid; rich in protein (including antibodies) |

14.4 Disorders of the Reproductive System

pages 450 - 455

31. Complete the table. Your knowledge of the disorders will not be tested but rather is provided for interest.

Disorder	Description
Disorders Affecting Male Reproductive System	
Erectile dysfunction	Inability to produce or maintain an erection Affects estimated 50% for men aged 40 to 75
Benign prostatic hyperplasia	Enlargement of the prostate gland
Prostate cancer	Most commonly diagnosed cancer in Canadian males (1 in 7)
Testicular cancer	Most common type of cancer in males aged 15 to 35
Disorders Affecting Female Reproductive System	
Endometriosis	Presence of endometrial-like tissue outside the uterine cavity
Ovarian cancer	Accounts for 4% of all women's cancers in Canada
Dysmenorrhea	Extremely painful menstruation
Ovarian cysts	Fluid-filled sacs that develop on the ovaries
Premenstrual syndrome (PMS)	Group of symptoms related to the menstrual cycle that can begin anytime from 2 weeks to a few days prior.

32. What are the most frequent causes of infertility in...

- a. men? low sperm count and/or large proportion of abnormal sperm
- b. women? blocked oviducts due to pelvic inflammatory disease and endometriosis

33. Name 5 types of **assisted reproductive technologies** (ART) that can increase chances of pregnancy.

- a. artificial insemination by donor (AID)
- b. in vitro fertilization (IVF)
- c. gamete intrafallopian transfer (GIFT)
- d. surrogate mothers
- e. intracytoplasmic sperm injection (ICSI)

1. _____ 10. _____ 19. _____ 28. _____
 2. _____ 11. _____ 20. _____ 29. _____
 3. _____ 12. _____ 21. _____ 30. _____
 4. _____ 13. _____ 22. _____ 31. _____
 5. _____ 14. _____ 23. _____ 32. _____
 6. _____ 15. _____ 24. _____ 33. _____
 7. _____ 16. _____ 25. _____
 8. _____ 17. _____ 26. _____
 9. _____ 18. _____ 27. _____

34. Identify the parts of the male reproductive system as described.

- (1) _____ (6) _____
 (2) _____ (7) _____
 (3) _____ (8) _____
 (4) _____ (9) _____
 (5) _____ (10) _____

35. Identify the structure (write the name)

- a. _____
 b. _____
 c. _____
 d. _____
 e. _____

38. _____

39. _____

44. _____

46. Complete the table

Hormone	Source	Target	Action
Testosterone			
FSH			
LH			
Estrogen			
Progesterone			

55. _____