

Correct answers are in **red bold face**.

1. Which of these proteins serves as a backbone for the synthesis of thyroid hormones (T3 and T4)?
  - a. thyroid-stimulating hormone (TSH)
  - b. insulin
  - c. thyrotropin-releasing hormone (TRH)
  - d. thyroglobulin**
  - e. prolactin
  
2. What is a MAJOR effect of thyroid hormone in adults?
  - a. decreases oxygen consumption
  - b. increases cold sensitivity
  - c. increases basal metabolic rate**
  - d. enhances TSH secretion
  - e. promotes normal development of the central nervous system
  
3. Which of the following conditions might possibly promote the development of a goiter (enlarged thyroid) depending on the etiology (cause) of the condition?
  - a. hypothyroidism
  - b. hyperthyroidism
  - c. low dietary iodine
  - d. thyroid gland inflammation
  - e. ALL of the above**
  
4. In the synthesis of thyroid hormone (T3, T4), where does the iodination occur?
  - a. in the lumen of the thyroid gland follicle**
  - b. in the thyroid gland C cells
  - c. in the ovarian follicle cells
  - d. in the thyrotropin cells of the anterior pituitary
  - e. in the adrenal medulla

5. What is gigantism?
- the same disease as acromegaly
  - a condition that arises from lack of growth hormone (GH)
  - condition that arises from GH hypersecretion that occurs prior to puberty**
  - a condition that arises from (GH) hypersecretion in adults
  - a condition that arises from low levels of insulin-like growth factor-1 (IGF-1) in adults.
6. Which of these peptides does NOT regulate the secretion of growth hormone (GH)?
- ghrelin
  - anti-Müllerian hormone**
  - insulin-like growth factor-1 (IGF-1)
  - somatostatin
  - growth hormone releasing hormone (GHRH)
7. Which serum hormone provides the most accurate read-out of GH secretion when diagnosing acromegaly (given that GH itself fluctuates throughout the day)?
- insulin
  - IGF-1**
  - dopamine
  - testosterone
  - thyroid hormone
8. Which of the following is NOT a means by which growth hormone (GH) opposes the action of insulin??
- GH increases uptake of glucose in adipose tissue.**
  - GH decreases glucose uptake in muscle.
  - GH stimulates lipolysis.
  - GH increases gluconeogenesis in the liver.
  - GH raises plasma glucose levels.
9. People who lack functioning GH receptors exhibit Laron-type dwarfism. Which of the following treatment regimens can restore normal average height to these individuals??
- IGF-1 administration after puberty
  - GH administration after puberty
  - GH administration prior to puberty
  - IGF administration prior to puberty**
  - lifetime GH supplementation

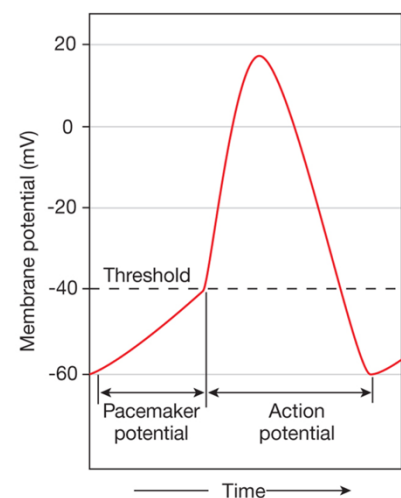
10. Which of the following is FALSE concerning calcitriol (the active form of vitamin D)?
- a. Calcitriol increases dietary calcium uptake.
  - b. Parathyroid hormone (PTH) increases the synthesis of Calcitriol.
  - c. GHRH regulates Calcitriol secretion.**
  - d. Calcitriol is a steroid hormone.
  - e. Calcitriol deficiency can lead to the bone softening disease called rickets.
11. Which of the following serves as the largest calcium reservoir in the body?
- a. liver
  - b. kidney
  - c. intestines
  - d. brain
  - e. bone**
12. Which of the following cells lives within a lacuna (space) within the mineralized matrix of bone?
- a. osteoblast
  - b. osteocyte**
  - c. osteoclast
  - d. chondrocyte
  - e. macrophage
13. Excessive PTH secretion can lead to?
- a. low serum calcium
  - b. excessive bone mineralization
  - c. kidney stones**
  - d. ALL of the above
  - e. NONE of the above
14. What type of gene mutation is likely to manifest itself pathologically much more often in males than females
- a. a silenced gene
  - b. the mansplaining gene
  - c. an autosomal gene
  - d. a misanthropic gene
  - e. an X-linked gene**

15. What does the Müllerian duct in a 6-week old embryo have the potential to become?
- epididymis
  - ovary
  - testis
  - Fallopian tube**
  - vas deferens
16. How many Barr bodies would the cells of a 45, XO female possess?
- 0**
  - 1
  - 2
  - 3
  - 4
17. What does the gene product of the Sex-determining Region of the Y-chromosome (*SRY*) do when expressed?
- directs the development of the female external genitalia
  - directs the development of the testis**
  - dissolves the Müllerian ducts
  - directs the development of the ovary
  - directs the development of the male external genitalia
18. What type of gonads develop in an XY female with complete androgen insensitivity syndrome (CAIS)?
- ovaries
  - no gonads (often called streak ovaries)
  - testes**
  - gonads that are part ovary and part testis
  - one ovary and one testis
19. Which cells are responsible for producing the majority of secreted testosterone in adult men?
- Sertoli cells
  - Leydig (interstitial cells)**
  - granulosa cells
  - thecal cells
  - follicle cells

20. Why does the administration of anabolic steroids sometimes result in a low sperm count in men?
- a. Increased aggression (a common effect of anabolic steroid use) frightens the testis.
  - b. Excess muscle development (a common effect of anabolic steroid use) restricts blood flow to the testis.
  - c. Anabolic steroids promote excess gonadotropin-releasing hormone secretion (GnRH).
  - d. Anabolic steroids exert negative feedback on gonadotropin (LH and FSH) hormone secretion.**
  - e. Increased numbers of red blood cells (a common effect of anabolic steroid use) clog the testicular artery.
21. Proper fetal development of male external genitalia requires which hormone?
- a. estrogen
  - b. thyroid hormone (T3, T4)
  - c. aldosterone
  - d. dihydrotestosterone (DHT)**
  - e. cortisol
22. What kind of ovarian follicle contains a primary oocyte?
- a. primordial follicle
  - b. primary follicle
  - c. secondary follicle
  - d. tertiary follicle
  - e. ALL of the above**
23. In a human female who exhibits a 28-day menstrual cycle, what day would you expect ovulation to occur?
- a. day 1
  - b. day 4
  - c. day 14**
  - d. day 21
  - e. day 28

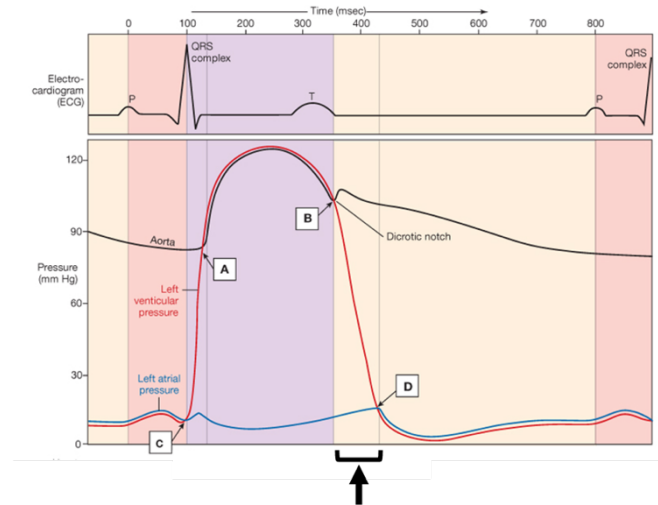
24. What is required in females to trigger a switch from estrogen exerting normal negative feedback on gonadotropin (FSH, LH) secretion to a positive feedback effect that triggers a surge in luteinizing hormone (LH) secretion?
- high progesterone
  - sustained rising estrogen levels**
  - human chorionic gonadotropin (hCG)
  - low estrogen levels
  - anti-Müllerian hormone
25. What is the fate of most the primary oocytes that a human female possesses?
- They will be ovulated with the potential to be fertilized.
  - They will be resorbed into bone marrow.
  - They will finish meiosis II.
  - They will turn into the corpus luteum.
  - They will undergo atresia and die.**
26. Which type of cell in the ovary performs an analogous function for the oocyte that the Sertoli cell performs for the spermatocyte?
- granulosa cell**
  - thecal cell
  - fibroblast
  - Leydig (interstitial) cell
  - thyroid follicle cell
27. Which hormone can be collected from pregnant mare's urine to trigger ovulation in human females?
- luteinizing hormone (LH)
  - follicle stimulating hormone (FSH)
  - thyroid stimulating hormone (TSH)
  - equine chorionic gonadotropin (eCG)**
  - progesterone
28. Where in the female reproductive tract does fertilization most often take place?
- cervix
  - uterus
  - Fallopian tube**
  - vagina
  - ovary

29. Secretion of oxytocin from the posterior pituitary exhibits a rare positive feedback loop in which oxytocin promotes uterine contractions which, in turn, stimulate more oxytocin secretion. What terminates this feedback loop??
- cervical stretch
  - delivery of the baby**
  - sound of a child's cry
  - baby suckling
  - unicorn hoofbeats
30. Which spermatozoan structure facilitates the penetration of the sperm through the jelly-like zona pellucida that surrounds the egg?
- epididymis
  - nucleus
  - spindle apparatus
  - acrosome**
  - mitochondrion
31. What is the role of the papillary muscles?
- their relaxation closes the AV valves
  - their contraction closes the AV valves
  - their contraction closes the pulmonary and aortic valves
  - their contraction prevents prolapse of the AV valves**
  - their contraction prevents prolapse of the pulmonary and aortic valves
32. Refer to the figure. Which of the following is responsible for causing the depolarization during the pacemaker potential?
- opening of  $K^+$  channels
  - closing of  $Ca^{++}$  channels
  - opening of voltage-gated channels that open in response to depolarization
  - opening of voltage-gated channels that open in response to hyperpolarization**



33. Refer to the figure and the phase indicated by the bracket. For this phase of the cardiac cycle, ALL of the following are TRUE, EXCEPT

- a. ventricles are relaxing
- b. volume in ventricles is rapidly changing**
- c. all of the valves are closed
- d. second heart sound occurs at the beginning of this phase
- e. pressure in the ventricles is higher than pressure in the atria



34. How does acetylcholine affect the cardiovascular system?

- a. causes hyperpolarization at the SA node to slow the heart rate**
- b. increases peripheral resistance by causing vasoconstriction
- c. increases the opening time of  $I_f$  channels to speed up the pacemaker potential
- d. increases contractility in cardiac muscle
- e. causes constriction of the veins to increase central venous pressure and end-diastolic volume

35. Which of the following occurs as a result of treatment with an ACE inhibitor drug?

- a. edema (swelling) as side effect
- b. increased contraction of vascular smooth muscle
- c. decreased formation of angiotensin II**
- d. increased secretion of aldosterone
- e. increased contractility in the heart

36. How does decreased ventilation change the pH of the blood

- a. increases
- b. decreases**
- c. has no effect

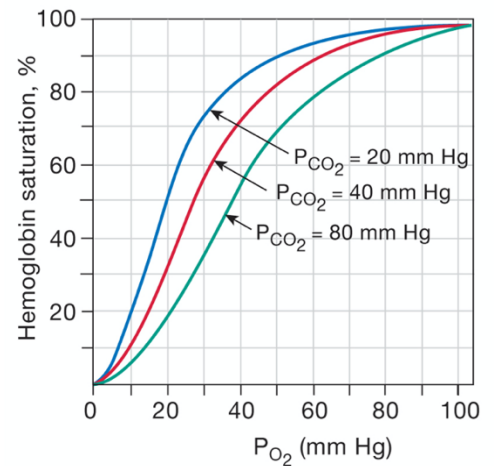
37. Which of the following is TRUE about surfactant?

- a. decreases the compliance of the lungs
- b. increases the surface tension in the fluid lining the alveoli
- c. surfactant is what causes the pleural membranes to stick together
- d. deficiency of surfactant causes emphysema
- e. deficiency of surfactant causes infant respiratory distress syndrome**



38. Refer to the graph. What does the graph show about the effect of metabolic activity on hemoglobin binding of O<sub>2</sub>?
- O<sub>2</sub> dissociates from hemoglobin more readily in metabolically active tissues**
  - O<sub>2</sub> binds more tightly to hemoglobin in metabolically active tissues
  - hemoglobin saturation is higher when there is an increased partial pressure of CO<sub>2</sub>
  - hemoglobin saturation is lower when there is a decreased partial pressure of CO<sub>2</sub>

(e) Effect of P<sub>CO<sub>2</sub></sub>



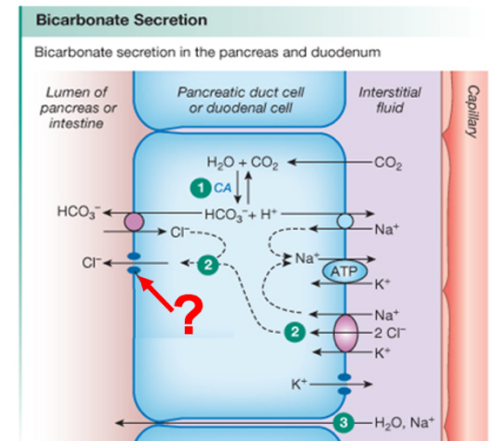
39. Fill in the blank. In a healthy young adult without respiratory disease, the principal factor regulating ventilation is the \_\_\_\_\_ of arterial blood, which is detected by the central chemoreceptor.
- PO<sub>2</sub>
  - PCO<sub>2</sub>**
  - pH
40. At the peak of exercise, ventilation increases steeply because
- PO<sub>2</sub> starts to drop
  - PCO<sub>2</sub> starts to rise
  - the respiratory system is compensating for metabolic acidosis by blowing off more CO<sub>2</sub>**
  - increasing pH is stimulating the central chemoreceptor
41. Which of the following best describes the ICC cells (interstitial cells of Cajal)?
- neurons that coordinate activity between different segments of the enteric nervous system
  - cells that transfer antigen from the lumen of the gastrointestinal tract to the underlying lamina propria
  - neurons that stimulate secretion by submucosal glands
  - afferent neurons that sense stretch in the walls of the gastrointestinal tract
  - pacemaker cells that generate slow waves in gastrointestinal smooth muscle**

42. Which of the following inhibits acid secretion?

- a. food in the stomach
- b. gastrin
- c. histamine
- d. somatostatin**
- e. mucus

43. Refer to the figure depicting bicarbonate secretion by a pancreatic duct cell. Which of the following is the protein indicated by the red arrow?

- a. SGLT2
- b.  $H^+/K^+$ -ATPase (proton pump)
- c. chloride/bicarbonate anion exchanger
- d. epithelial sodium channel (ENaC)
- e. CFTR**



44. Which of the following is most important in promoting bile release into the duodenum?

- a. enteropeptidase
- b. increased  $[H^+]$  in the stomach
- c. CCK (cholecystokinin)**
- d. ghrelin
- e. somatostatin

45. Which of the following is TRUE about lipoprotein lipase?

- a. acts as a co-enzyme in the digestion of fats in the duodenum
- b. digests triglycerides found in micelles
- c. digests triglycerides found in chylomicrons**
- d. is secreted by pancreatic acinar cells
- e. is activated by  $H^+$  ions in the lumen of the stomach

46. Where are the hunger and satiety centers located in the central nervous system?

- a. cerebrum
- b. medulla
- c. brainstem
- d. hypothalamus**
- e. spinal cord

47. Which of the following is the most important hormone of the fasted state (i.e. before a meal)?

- a. **glucagon**
- b. IGF-1
- c. gastrin
- d. somatostatin
- e. insulin

48. Which of the following is MOST characteristic of type 1 diabetes mellitus?

- a. **The pancreas fails to produce insulin.**
- b. The pancreas over-produces insulin.
- c. Urine production decreases severely.
- d. Metabolic syndrome precedes the development of this type of diabetes.
- e. Target tissues fail to respond to insulin.

49. Which of the following is secreted by the posterior pituitary?

- a. FSH
- b. **oxytocin**
- c. TSH
- d. GnRH (gonadotropin releasing hormone)
- e. GH

50. Which of the following is FALSE regarding Addison's disease (also called primary adrenal insufficiency)?

- a. can cause skin hyperpigmentation
- b. often results from autoimmune damage to the adrenal glands
- c. can be detected by under-response to an ACTH stimulation test
- d. **can be caused by excess cortisol exposure or ingestion**
- e. often accompanied by adrenal atrophy (shrinkage)