

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?
  - a. the same disease as acromegaly
  - b. a condition that arises from lack of growth hormone (GH)
  - c. condition that arises from GH hypersecretion that occurs prior to puberty
  - d. a condition that arises from (GH) hypersecretion in adults
  - e. 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)?
  - a. ghrelin
  - b. anti-Müllerian hormone
  - c. insulin-like growth factor-1 (IGF-1)
  - d. somatostatin
  - e. 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)?
  - a. insulin
  - b. IGF-1
  - c. dopamine
  - d. testosterone
  - e. thyroid hormone
  
8. Which of the following is NOT a means by which growth hormone (GH) opposes the action of insulin??
  - a. GH increases uptake of glucose in adipose tissue.
  - b. GH decreases glucose uptake in muscle.
  - c. GH stimulates lipolysis.
  - d. GH increases gluconeogenesis in the liver.
  - e. 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??
  - a. IGF-1 administration after puberty
  - b. GH administration after puberty
  - c. GH administration prior to puberty
  - d. IGF administration prior to puberty
  - e. lifetime GH supplementation

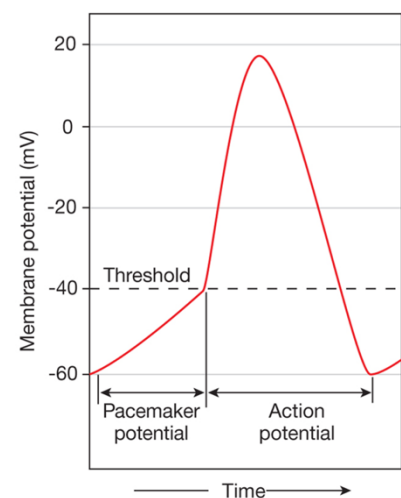
10. Which of the following is FALSE concerning calcitriol (the active form of vitamin D)?
- a. Calcitriol increases dietary calcium uptake.
  - b. Parathyroid hormone (PTH) increases the synthesis of Calcitriol.
  - c. GHRH regulates Calcitriol secretion.
  - d. Calcitriol is a steroid hormone.
  - e. 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?
- Increased aggression (a common effect of anabolic steroid use) frightens the testis.
  - Excess muscle development (a common effect of anabolic steroid use) restricts blood flow to the testis.
  - Anabolic steroids promote excess gonadotropin-releasing hormone secretion (GnRH).
  - Anabolic steroids exert negative feedback on gonadotropin (LH and FSH) hormone secretion.
  - 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?
- estrogen
  - thyroid hormone (T3, T4)
  - aldosterone
  - dihydrotestosterone (DHT)
  - cortisol
22. What kind of ovarian follicle contains a primary oocyte?
- primordial follicle
  - primary follicle
  - secondary follicle
  - tertiary follicle
  - ALL of the above
23. In a human female who exhibits a 28-day menstrual cycle, what day would you expect ovulation to occur?
- day 1
  - day 4
  - day 14
  - day 21
  - day 28

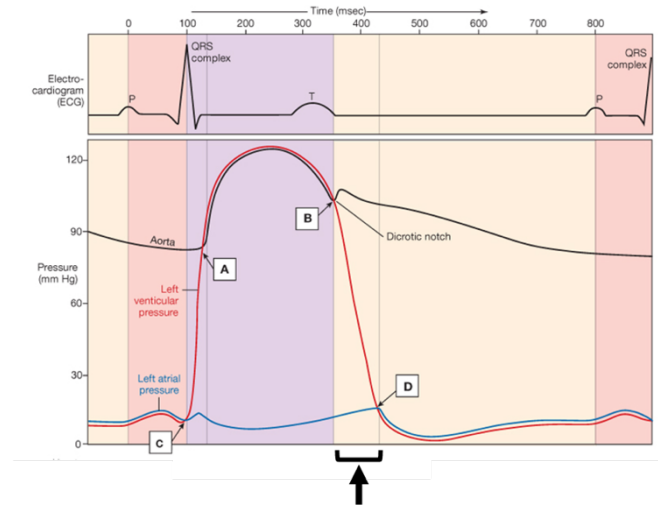
24. What is required in females to trigger a switch from estrogen exerting normal negative feedback on gonadotropin (FSH, LH) secretion to a positive feedback effect that triggers a surge in luteinizing hormone (LH) secretion?
- high progesterone
  - sustained rising estrogen levels
  - human chorionic 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

- ventricles are relaxing
- volume in ventricles is rapidly changing
- all of the valves are closed
- second heart sound occurs at the beginning of this phase
- pressure in the ventricles is higher than pressure in the atria



34. How does acetylcholine affect the cardiovascular system?

- causes hyperpolarization at the SA node to slow the heart rate
- increases peripheral resistance by causing vasoconstriction
- increases the opening time of  $I_f$  channels to speed up the pacemaker potential
- increases contractility in cardiac muscle
- 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?

- edema (swelling) as side effect
- increased contraction of vascular smooth muscle
- decreased formation of angiotensin II
- increased secretion of aldosterone
- increased contractility in the heart

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

- increases
- decreases
- has no effect

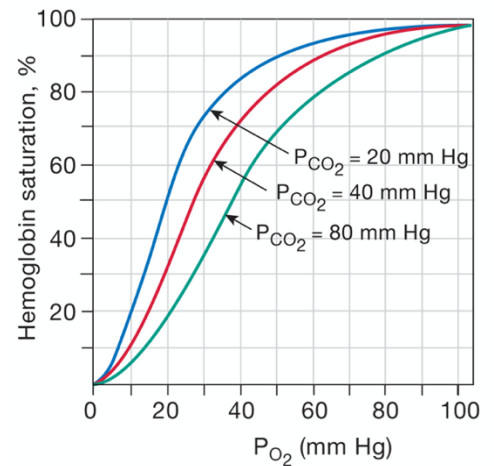
37. Which of the following is TRUE about surfactant?

- decreases the compliance of the lungs
- increases the surface tension in the fluid lining the alveoli
- surfactant is what causes the pleural membranes to stick together
- deficiency of surfactant causes emphysema
- 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>



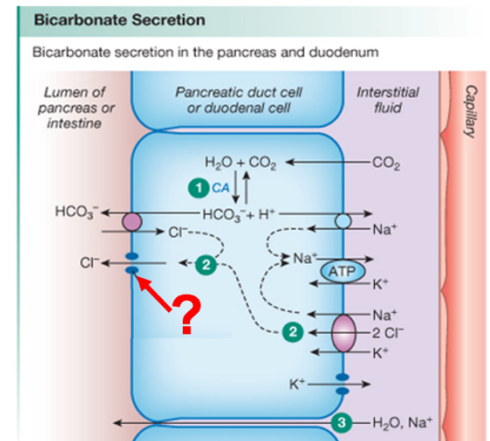
39. Fill in the blank. In a healthy young adult without respiratory disease, the principal factor regulating ventilation is the \_\_\_\_\_ of arterial blood, which is detected by the central chemoreceptor.
- PO<sub>2</sub>
  - PCO<sub>2</sub>
  - pH
40. At the peak of exercise, ventilation increases 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)?
- glucagon
  - IGF-1
  - gastrin
  - somatostatin
  - insulin
48. Which of the following is MOST characteristic of type 1 diabetes mellitus?
- The pancreas fails to produce insulin.
  - The pancreas over-produces insulin.
  - Urine production decreases severely.
  - Metabolic syndrome precedes the development of this type of diabetes.
  - Target tissues fail to respond to insulin.
49. Which of the following is secreted by the posterior pituitary?
- FSH
  - oxytocin
  - TSH
  - GnRH (gonadotropin releasing hormone)
  - GH
50. Which of the following is FALSE regarding Addison's disease (also called primary adrenal insufficiency)?
- can cause skin hyperpigmentation
  - often results from autoimmune damage to the adrenal glands
  - can be detected by under-response to an ACTH stimulation test
  - can be caused by excess cortisol exposure or ingestion
  - often accompanied by adrenal atrophy (shrinkage)