

- 1. Which of the following does not belong to four major categories of tissues?**
 - A. Muscle tissue
 - B. Connective tissue
 - C. Nervous tissue
 - D. Epithelial tissue
 - E. Sensory tissue
- 2. Tendons and ligaments are classified as:**
 - A. Adipose tissue
 - B. Loose connective tissue
 - C. Cartilage
 - D. Fibrous connective tissue
 - E. Epithelial tissue
- 3. Which of the following is not an example of negative feedback mechanism?**
 - A. Feedback regulation of T_3 and T_4 hormone secretion from the thyroid gland
 - B. Regulation of blood levels of LH, FSH, and GnRH by testosterone
 - C. Effects of high estrogen level on ovulation due to proliferation of granulosa cells
 - D. Effects of high estrogen and progesterone levels from corpus luteum on GnRH production
 - E. Effects of low estrogen level on hypothalamus and anterior pituitary
- 4. A structural component of a human sperm cell that contains enzymes to help the sperm penetrate the egg is called:**
 - A. Acrosome
 - B. Epididymis
 - C. Prostaglandins
 - D. Blastula
 - E. Cortical granules
- 5. Which of the following statements is true for both oogenesis and spermatogenesis?**
 - A. True diploids come from primordial germ cells
 - B. Unequal cytokinesis in meiotic divisions result in formation of polar bodies
 - C. Testosterone exerts a negative feedback on hypothalamus and anterior pituitary
 - D. Lutenizing hormone binds to its cognate receptor on thecal cells to convert cholesterol to testosterone
 - E. Follicle stimulating hormone binds to its cognate receptor on Sertoli cells to convert testosterone to dihydrotestosterone
- 6. What is the primary function of zona pellucida?**
 - A. Protection of primary oocytes
 - B. Conversion of cholesterol to testosterone upon binding of lutenizing hormone
 - C. Conversion of testosterone to estrongen upon binding of follicle stimulation hormone
 - D. Induction of lutenizing hormone surge during the follicular phase of menstrual cycle
 - E. Secretion of estrogen and progesterone to prevent new follicle development
- 7. A pool of mammalian cells with defective glucagon receptors has been isolated. Sequencing of the receptor gene revealed that the G protein binding domain has been mutated and rendered nonfunctional. What could be the most direct consequence of this mutation?**
 - A. Inability to bind glucagons
 - B. Inability to activate adenylyl cyclase
 - C. Inability to bind cholera toxin
 - D. Inability to induce receptor dimerization
 - E. Inability to phosphorylate the target protein

8. **What is the correct order in which G protein coupled receptor systems are activated?**
- A. Hormone – Receptor – Protein kinase A – Adenyl cyclase – G protein – Cellular response
 - B. Hormone – Receptor – G protein – Adenyl cyclase – Protein kinase A – Cellular response
 - C. Hormone – Receptor – G protein – Protein kinase A – Adenyl cyclase – Cellular response
 - D. Hormone – Receptor – Adenyl cyclase – G protein – Protein kinase A – Cellular response
 - E. Hormone – Receptor – Adenyl cyclase – Protein kinase A – G protein – Cellular response
9. **Which of the following is an example of a single pass transmembrane receptor without an enzymatic activity that associates with signal transduction components?**
- A. Growth hormone receptor
 - B. Glucagon receptor
 - C. Insulin receptor
 - D. Epidermal growth factor receptor (EGFR)
 - E. Ion channel-linked receptor

For questions 8 to 12, select from A through E. Any letter may be used more than once or not at all.

10. **Primordial germ cell in embryo**

11. **Oogonium**

12. **Primary oocyte**

13. **Secondary oocyte**

14. **Ovum**

- A. Direct result of lutenizing hormone surge
- B. Ovary-specific stem cell
- C. Arrested in meiosis I
- D. Maturation triggered by entry of sperm
- E. Undifferentiated cells

15. **Cells that are responsible for converting testosterone to dihydrotestosterone in the male reproductive system are called:**

- A. Sertoli cells
- B. Leydig cells
- C. Granulosa cells
- D. Thecal cells
- E. Blastocyst

For questions 14 to 17, select from A through E. Any letter may be used more than once or not at all.

16. **First trimester**

17. **Second trimester**

18. **Third trimester**

19. **Labor**

- A. Decline of human chorionic gonadotropin (hCG) level and deterioration of corpus luteum
- B. Oxytocin from posterior pituitary stimulates placenta to make prostaglandins
- C. Placenta secretes hCG and makes estrogen and progesterone
- D. Continued rapid growth and activity of fetus, followed by expansion of uterus
- E. Embryo moves down the oviduct

20. **Mifepristone, more commonly referred to as RU-486, is a synthetic steroid compound used as a female contraceptive. This drug works as a competitive antagonist at the progesterone receptor. Which of the following statements is TRUE about the mechanism by which RU-486 works?**

- A. Inducing a response by binding to the progesterone receptor
- B. Inhibiting progesterone binding to its cognate receptor
- C. Inhibiting chorionic somatomammotropin response
- D. Inducing a response by competitively binding to prolactin receptor on the mammary gland
- E. Inhibiting a response by competitively binding to prolactin receptor on the mammary gland

21. Which of the following is **not** considered a negative feedback system?
- A. Effect of estrogen and progesterone from corpus luteum on hypothalamus during first trimester
 - B. Effect of estrogen and progesterone from corpus luteum on mammary gland during first trimester
 - C. Low level of estrogen produced by granulosa cells during follicle development
 - D. Effect of testosterone produced by Leydig cells on anterior pituitary
 - E. Effect of inhibin produced by Sertoli cells on hypothalamus
22. During pregnancy, the anterior pituitary secretes _____, which targets _____ to exert positive feedback.
- A. estrogen / placenta
 - B. human chorionic gonadotropin (hCG) / corpus luteum
 - C. prolactin / mammary gland
 - D. progesterone / mammary gland
 - E. chorionic somatomammotropin (CS) / mammary gland
23. The most direct consequence on amphibian development upon removal of the gray crescent would be...
- A. Inability to develop from the 2-cell stage to the 4-cell stage
 - B. Inability to develop from the 4-cell stage to the 8-cell stage
 - C. Inability to form blastocoel
 - D. Inability to form dorsal structures
 - E. Inability to form ventral structures
24. During early mammalian development, _____ secretes enzymes that allow the blastocyst to penetrate the uterine lining.
- A. Inner cell mass
 - B. Cadherins
 - C. Epiblast
 - D. Trophoblast
 - E. Hypoblast
25. The key difference between mammalian and amphibian zygote with respect to the cell divisions is...
- A. Mammalian zygotes have a defined plane of division while amphibian zygotes do not (random cleavage)
 - B. Amphibian zygotes have a defined plane of division while mammalian zygotes do not (random cleavage)
 - C. Amphibian zygotes undergo an 8-cell stage while mammalian zygotes do not
 - D. Mammalian zygotes undergo an 8-cell stage while amphibian zygotes do not
 - E. Mammalian zygotes have the gray crescent while amphibian zygotes do not
26. Gastrulation refers to a process during which the morphology of the embryo is dramatically restructured by cell migration. The end result of gastrulation is _____. The step that immediately follows gastrulation is called _____.
- A. Implantation of blastocyst / differentiation
 - B. Compaction at the 8-cell stage / implantation of blastocyst
 - C. Compaction at the 8-cell stage / organogenesis
 - D. Formation of a blastomere / gastrulation
 - E. Formation of a three-layered embryo / organogenesis
27. During gastrulation of mammalian developmental stages, inward movement of cells from the epiblast occurs at the structure known as _____.
- A. Chorion
 - B. Blastocoel
 - C. Primitive streak
 - D. Yolk sac
 - E. Blastoderm

- 28. Transplantation of tissue from the zone of polarizing activity (ZPA) in the anterior margin of a chick embryo limb bud results in**
- A. Formation of posterior structures
 - B. Formation of anterior structures
 - C. Abortion of embryo development
 - D. Loss of polarized zygote
 - E. Loss of compaction at the 8-cell stage
- 29. Inside your stomach, breakdown of proteins is mediated primarily by _____ .**
- A. Pepsinogen
 - B. Pepsin
 - C. HCl
 - D. Lipase
 - E. Amylase
- 30. Which of the following enzyme is not released into the small intestine?**
- A. Lipase
 - B. Trypsin
 - C. Pepsin
 - D. Pancreatic amylase
 - E. Nuclease
- 31. Which of the following is an incorrect pairing of a digestive enzyme and its substrate?**
- A. Pepsin / protein
 - B. Pepsinogen / pepsinogen
 - C. Trypsin / protein
 - D. Carboxypeptidase / carbohydrates
 - E. Amylase / polysaccharides
- 32. Microvilli, cells present in the small intestine lining, are an example of _____ .**
- A. Simple squamous cells
 - B. Columnar epithelial cells
 - C. Cuboidal epithelial cells
 - D. Stratified squamous cells
 - E. Stratified columnar epithelial cells
- 33. Which of the following is an incorrect pairing of a digestive hormone and its site of production?**
- A. Cholecystokinin / Duodenum wall
 - B. Gastrin / Stomach wall
 - C. Gastrin / Duodenum wall
 - D. Secretin / Duodenum wall
 - E. Motilin / Duodenum wall
- 34. Regulation of digestion mediated by hormones secreted by walls of stomach and duodenum is an example of _____ system.**
- A. Autocrine
 - B. Endocrine
 - C. Paracrine
 - D. Exocrine
 - E. Synaptic
- 35. Many drugs are designed to release its active ingredients inside the small intestine because...**
- A. Acidic condition inside the small intestine allows breakdown of tablets into smaller molecules
 - B. Only the small intestine contains enzymes to break down tablets into smaller molecules
 - C. Water absorption is the most efficient inside the small intestine
 - D. Only two layers of epithelial cells need to be crossed for drugs to get to the circulatory system
 - E. Lymphatic system is easily accessible through the villi

36. Which of the following is not true about bile?

- A. It is stored in gall bladder before being released into the duodenum.
- B. It is produced in liver.
- C. It is responsible for breakdown of fat into emulsified fat droplets.
- D. Its release into small intestine is regulated by cholecystokinin (CCK).
- E. Its release into small intestine is regulated by secretin.

37. Which of the following structural components is shared by both arteries and capillaries?

- A. Connective tissue
- B. Smooth muscle
- C. Basement membrane
- D. Endothelium
- E. Interstitial fluid

38. Which of the following is not true about the lymphatic system?

- A. It helps maintain the volume and protein concentration of the blood.
- B. It helps defend body against infection.
- C. It transports fats from digestive tract to circulatory system.
- D. Lymph composition is similar to that of interstitial fluid.
- E. Lymph drains directly into the excretory system.

For questions 36 to 41, select from A through E. Any letter could be used more than once or not at all.

39. Neutrophils

40. Monocytes

41. Lymphocytes

42. Erythrocytes

43. Platelets

44. Basophils

- A. Phagocytic cells that engulf bacteria and cell debris
- B. Inhibits blood clotting
- C. Promotes blood clotting
- D. Lack nuclei and mitochondria, but contain hemoglobin
- E. Contains immune cells

45. Which of the following statements best describes the graph that shows the relationship between oxygen partial pressure and oxygen saturation of hemoglobin?

- A. At a partial pressure typical inside the lung, hemoglobin is mostly saturated with CO₂.
- B. At a partial pressure typical in the vicinity of tissues at rest, hemoglobin is mostly saturated with O₂.
- C. At a partial pressure typical inside the lung, hemoglobin is mostly (over 90%) saturated with O₂.
- D. At a partial pressure typical in tissues during exercise, hemoglobin is mostly saturated with O₂.
- E. At a partial pressure typical in the vicinity of tissues at rest, hemoglobin is mostly saturated with CO₂.

46. Which of the following statements about the Bohr shift is false?

- A. A drop in pH in the vicinity of active tissues is due to CO₂ (from respiration) converting into carbonic acid.
- B. The reaction CO₂ + H₂O → H₂CO₃ is catalyzed by carbonic hydratase.
- C. Hemoglobin is capable of releasing more O₂ at lower pH.
- D. The O₂ dissociation curve shifts toward the right as a result of lower pH.
- E. Bohr shift can be observed even from a pH shift of 0.2.

For questions 38 to 41, select from A through D. Any letter could be used more than once or not at all.

47. Partial pressure of O₂ ~ 160 mm Hg / Partial pressure of CO₂ ~ 0.2 mm Hg

48. Partial pressure of O₂ ~ 40 mm Hg / Partial pressure of CO₂ ~ 45 mm Hg

49. Partial pressure of O₂ ~ 100 mm Hg / Partial pressure of CO₂ ~ 40 mm Hg

50. Partial pressure of O₂ < 40 mm Hg / Partial pressure of CO₂ > 45 mm Hg

- A. Tissue cells
- B. Blood leaving tissue (systemic) capillaries
- C. Inhaled air
- D. Blood entering tissue (systemic) capillaries

Answer Key

1	E	26	E
2	D	27	C
3	C	28	A
4	A	29	B
5	A	30	C
6	A	31	D
7	B	32	B
8	B	33	C
9	A	34	C
10	E	35	D
11	B	36	E
12	C	37	D
13	A	38	E
14	D	39	A
15	A	40	A
16	C	41	E
17	A	42	D
18	D	43	C
19	B	44	B
20	B	45	C
21	B	46	B
22	C	47	C
23	D	48	B
24	D	49	D
25	B	50	A