

一、單選題 (每題 2 分)/Multiple choice questions (2 points for each question)

1. Which of the following processes does **NOT** occur in the mitochondria?
 - A. Glycolysis
 - B. Pyruvate oxidation
 - C. Citric acid cycle
 - D. Electron transport chain
2. Which of the following is **NOT** a mechanism of genetic variation in populations?
 - A. Mutation
 - B. Natural selection
 - C. Gene flow
 - D. Genetic drift
3. Which of the following is **NOT** a function of the smooth endoplasmic reticulum?
 - A. Synthesis of lipids
 - B. Detoxification of drugs and poisons
 - C. Storage of calcium ions
 - D. Synthesis of proteins
4. Which of the following is true of facilitated diffusion?
 - A. It requires energy input
 - B. It moves solutes against their concentration gradient
 - C. It requires the use of transport proteins
 - D. It is a type of active transport
5. Which of the following is **NOT** a stage of cellular respiration?
 - A. Glycolysis
 - B. Pyruvate oxidation
 - C. Krebs cycle
 - D. Calvin cycle
6. Which of the following is the correct order of stages in mitosis?
 - A. Prophase, metaphase, anaphase, telophase
 - B. Telophase, anaphase, metaphase, prophase
 - C. Metaphase, prophase, anaphase, telophase
 - D. Anaphase, prophase, telophase, metaphase
7. Which of the following is a process by which prokaryotic cells can transfer genetic material to other cells?
 - A. Mitosis
 - B. Meiosis
 - C. Fertilization
 - D. Conjugation
8. Which of the following is a product of the light-dependent reactions of photosynthesis?
 - A. Glucose
 - B. ATP
 - C. Water
 - D. Carbon dioxide
9. Which of the following is a function of the endoplasmic reticulum (ER)?
 - A. Protein synthesis
 - B. Lipid synthesis
 - C. Calcium storage
 - D. All of the above

10. Which of the following is **NOT** a function of the Golgi apparatus?
- A. Protein modification
 - B. Protein sorting
 - C. Lipid synthesis
 - D. Vesicle formation
11. Which of the following is **NOT** a component of the endomembrane system?
- A. Endoplasmic reticulum
 - B. Golgi apparatus
 - C. Mitochondria
 - D. Lysosomes
12. Which of the following is a key feature of epigenetic regulation?
- A. Changes in the DNA sequence
 - B. Regulation of gene expression through non-coding RNA
 - C. Alterations in the chromatin structure
 - D. Protein-protein interactions during translation
13. Which of the following is **NOT** a type of hormone produced by the human pituitary gland?
- A. Growth hormone (GH)
 - B. Adrenocorticotrophic hormone (ACTH)
 - C. Thyroid-stimulating hormone (TSH)
 - D. Adrenaline
14. Which of the following statements is true regarding mitosis and meiosis?
- A. Mitosis results in the production of genetically identical daughter cells, while meiosis results in the production of genetically diverse daughter cells.
 - B. Mitosis results in the production of genetically diverse daughter cells, while meiosis results in the production of genetically identical daughter cells.
 - C. Both mitosis and meiosis result in the production of genetically identical daughter cells.
 - D. Both mitosis and meiosis result in the production of genetically diverse daughter cells.
15. Which of the following statements is true regarding transcription and translation?
- A. Transcription occurs in the cytoplasm, while translation occurs in the nucleus.
 - B. Transcription results in the production of RNA, while translation results in the production of proteins.
 - C. Transcription results in the production of proteins, while translation results in the production of RNA.
 - D. Transcription and translation both occur in the nucleus.
16. Which of the following is **NOT** a characteristic of enzymes?
- A. Enzymes are specific to a particular substrate.
 - B. Enzymes are consumed in the chemical reaction they catalyze.
 - C. Enzymes lower the activation energy required for a chemical reaction to occur.
 - D. Enzymes can be regulated by inhibitors and activators
17. Which of the following is **NOT** a type of cell junction found in animal tissues?
- A. Tight junctions
 - B. Desmosomes
 - C. Gap junctions
 - D. Plasmodesmata
18. Which of the following is an example of negative feedback in the human body?
- A. The release of insulin in response to high blood glucose levels
 - B. The release of cortisol in response to stress
 - C. The contraction of the uterus during childbirth
 - D. The release of oxytocin during breastfeeding

19. In meiosis, homologous chromosomes pair up during which phase?
- Prophase I
 - Metaphase I
 - Anaphase I
 - Telophase I
20. Which of the following is an example of a secondary messenger in signal transduction pathways?
- Epidermal growth factor (EGF)
 - RNA
 - cAMP
 - ATP
21. What is the role of the Krebs cycle (also known as the citric acid cycle) in cellular respiration?
- To generate ATP by oxidative phosphorylation
 - To convert glucose into pyruvate
 - To produce NADH and FADH₂ for use in the electron transport chain
 - To synthesize glucose from pyruvate
22. Which one of the following statements is **NOT** true for human immune system?
- T cells belong to specific immunity.
 - Neutrophils belong to nonspecific immunity.
 - Inactivated antigens are eliminated from the body by nonspecific defenses such as complementation.
 - IgA is the first to be produced during an initial immune response
23. Which one of the following statements is **NOT** true for the mammalian circulation system?
- Both arteries and veins have an endothelium, smooth muscle, and connective tissue.
 - Both arteries and veins contain valves to maintain unidirectional blood flow.
 - Blood flow in capillaries is necessarily slow for exchange of materials.
 - The recoil of elastic arterial walls plays a role in maintaining blood pressure.
24. Which one of the following statements is **NOT** true regarding the human reproductive system?
- In the human male reproductive system, the function of seminal vesicles is to store sperms.
 - Human ovulation is triggered by surge of luteinizing hormone (LH).
 - Cilia in the oviduct convey the eggs to the uterus.
 - In human, the main sex hormones are steroid hormones.
25. Which one of the following statements is **NOT** true regarding the respiration system?
- In fish gills, more than 80% of the O₂ dissolved in the water is removed as water passes over the respiratory surface.
 - Respiratory surfaces are always thin and moist.
 - Fish gills use a countercurrent exchange system to increase blood flow.
 - In human lungs, cilia and mucus line the epithelium of the air ducts and move particles up to the pharynx.
26. Which one of the following statements is **NOT** true regarding the human endocrine system?
- The posterior pituitary is an extension of the hypothalamus.
 - The parathyroid glands play a major role in blood Ca²⁺ regulation.
 - Many neurohormones regulate endocrine signalling.
 - All the hormones secreted from anterior pituitary have effects on other endocrine glands.
27. The inheritance pattern in which both alleles of a gene contribute to the phenotype of the heterozygous individual is called:
- Dominant inheritance
 - Recessive inheritance
 - Codominant inheritance
 - X-linked inheritance

28. A couple is planning to have children. The man is colorblind (X^{cb}, Y) and the woman, who is not colorblind, is a carrier for color blindness (X^{cb}, X). What is the probability that their first child will be colorblind?
- A. 25%
B. 50%
C. 75%
D. 100%
29. What is the process by which two species evolve adaptations in response to each other over time?
- A. Symbiosis
B. Coevolution
C. Mutualism
D. Commensalism
30. A specimen has 35% guanine in its DNA. How much adenine does it have?
- A. 15%
B. 25%
C. 35%
D. 45%
31. Which of the following plant hormones is responsible for promoting seed dormancy and inhibiting germination?
- A. Gibberellin
B. Cytokinin
C. Ethylene
D. Abscisic acid
32. What is the primary function of the pericycle in plant roots?
- A. Lateral root initiation
B. Nutrient uptake
C. Water absorption
D. Mechanical support
33. Which one of the following statements is **NOT** true regarding the human digestive system?
- A. Cholecystokinin (CCK) is a hormone that induces gallbladder contraction to increase release of stored bile.
B. Secretin is produced in the duodenum and suppresses the release of gastric acid from the stomach.
C. Bile is produced by the liver, stored in the gallbladder and released intermittently into the duodenum, when needed to digest proteins.
D. Gastrin stimulates secretion of gastric acid.
34. Which one of the following statements is **NOT** true for the human circulation system?
- A. The lymphatic system returns fluid that leaks out from the capillary beds.
B. Precapillary sphincters that control flow of blood between arterioles and venules.
C. Blood flows through only 5–10% of the body's capillaries at any given time.
D. The lymphatic system drains into capillaries in the neck.
35. Which of the following is **NOT** an example of an innate immune response?
- A. Phagocytosis by macrophages
B. Activation of complement proteins
C. Production of antibodies by B cells
D. Release of antimicrobial peptides
36. What is the primary function of the hippocampus in the brain?
- A. Regulation of body temperature
B. Storage and retrieval of memories
C. Control of balance and coordination
D. Modulation of emotional responses

37. Which neurotransmitter is associated with reward, pleasure, and motivation?
- Dopamine
 - Serotonin
 - Acetylcholine
 - GABA
38. What is the significance of alternative splicing in gene expression?
- It increases the stability of mRNA molecules.
 - It allows for the production of multiple protein isoforms from a single gene.
 - It facilitates the transport of mRNA from the nucleus to the cytoplasm.
 - It prevents the degradation of mRNA molecules.
39. The process of programmed cell death that eliminates unnecessary or damaged cells during development is called:
- Apoptosis
 - Cessation
 - Autophagy
 - Differentiation
40. Which of the following is **NOT** a post-transcriptional mechanism of gene expression regulation?
- Alternative splicing
 - mRNA degradation
 - DNA methylation
 - Translation regulation
41. Which of the following is a characteristic of gene expression regulation in prokaryotes?
- Presence of introns in the mRNA
 - Transcription and translation occur simultaneously
 - Extensive alternative splicing of pre-mRNA
 - Involvement of multiple RNA polymerases
42. Which enzyme is responsible for the synthesis of mRNA during transcription?
- DNA polymerase
 - RNA polymerase I
 - RNA polymerase II
 - RNA polymerase III
43. The "Founder effect" is an example of:
- Natural selection
 - Genetic drift
 - Gene flow
 - Mutation
44. The action potential is generated when:
- Sodium ions enter the neuron
 - Potassium ions leave the neuron
 - Calcium ions bind to the neuron
 - Chloride ions are released from the neuron
45. Which of the following is the primary function of the myelin sheath in neurons?
- Increase the speed of nerve impulse conduction
 - Generate action potentials
 - Regulate neurotransmitter release
 - Provide structural support to the neuron

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46. Xylem and phloem are two types of vascular tissues in plants. Which of the following statements is true?
- A. Xylem transports water and minerals upward, while phloem transports sugars downward.
 - B. Xylem transports sugars downward, while phloem transports water and minerals upward.
 - C. Both xylem and phloem transport water and minerals upward.
 - D. Both xylem and phloem transport sugars downward.
47. Which of the following best describes the concept of keystone species?
- A. Species that are at the top of the food chain
 - B. Species that have a significant impact on the ecosystem structure and function
 - C. Species that are abundant and have a high population density
 - D. Species that are native to a specific ecosystem
48. The enzyme responsible for phosphorylating target proteins in many cellular signaling pathways is:
- A. Protein kinase
 - B. Protein phosphatase
 - C. G protein
 - D. Ligase
49. Which of the following is an example of an intracellular receptor?
- A. Insulin receptor
 - B. G protein-coupled receptor (GPCR)
 - C. Receptor tyrosine kinase (RTK)
 - D. Steroid hormone receptor
50. Which of the following is **NOT** a major germ layer formed during gastrulation?
- A. Ectoderm
 - B. Mesoderm
 - C. Endoderm
 - D. Epiderm