

科目 普通生物學 類組別 A1

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單選題，每題 2.5 分，共計 100 分

1. Which of the following characteristics does not contribute to chemical diversity of carbon-containing organic molecules?
 - A. Length of carbon chain.
 - B. Functional groups attached to the carbon by covalent bonds.
 - C. Double bonds between carbons.
 - D. Carbon isotopes.
2. Which of the following descriptions concerning a cell is correct?
 - A. A eukaryotic cell is enclosed by a membrane but a prokaryotic cell is not.
 - B. A prokaryotic cell is usually larger than a eukaryotic cell.
 - C. A eukaryotic cell contains membrane-enclosed organelles but a prokaryotic cell does not.
 - D. Prokaryotic cells' genetic materials are chemically different than the eukaryotic cells' genetic materials.
3. Which of the following descriptions concerning hydrophobicity and hydrophilicity is correct?
 - A. Hydrophilic substances are poorly dissolved in water.
 - B. Hydrophilic substances are generally nonpolar.
 - C. Hydrophobic substances tend to aggregate in water.
 - D. Hydrophobic substances form hydrogen bonds with water.
4. Which of the following descriptions concerning protein structure is corrected?
 - A. Protein primary structure is the sequence of amino acids in the protein.
 - B. α -helix and β -sheet are two commonly seen protein secondary structures.
 - C. The secondary and tertiary protein structures are results of collective effects of interactions of amino acids (including side chains) and its surrounding water, including hydrogen bonds, hydrophobic interactions and van der Waals interactions.
 - D. All of the above.
5. Which of the following descriptions concerning electron transport chain is correct?

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- A. Electron transport chain is located in the outer membrane of the mitochondria.
 - B. In electron transport, O_2 is the final electron receiver.
 - C. In electron transport, H_2O is the first electron donor.
 - D. All of the above.
6. Which of the following descriptions concerning Golgi apparatus is correct?
- A. The side of Golgi apparatus that receives vesicles from ER is considered *cis*.
 - B. The side of Golgi apparatus that sends vesicles to downstream organelles (such as lysosome) is considered *cis*.
 - C. The Golgi apparatus is connected to the outer membrane of the nuclear envelope.
 - D. The Golgi apparatus is connected to the inner membrane of the nuclear envelope.
7. Which of the following descriptions concerning active transport is not correct?
- A. Active transport requires energy input.
 - B. Active transport accelerates the movements of the substance across the membrane.
 - C. Active transport uses the concentration gradient of the substance to drive the transport of the substance across the membrane.
 - D. Some forms of active transport generate electrochemical potentials across the membrane.
8. Which of the following is not a membrane receptor for cell signaling?
- A. G protein-coupled receptor.
 - B. Receptor tyrosine kinase.
 - C. Ligand-gated ion channel.
 - D. Steroidal hormone receptor.
9. What is the complementary sequence of the following DNA sequence: 5'-TAGGCCT-3'?
- A. 3'-TAGGCCT-5'.
 - B. 3'-ATCCGGA-5'.
 - C. 3'-AGGCCTA-5'.
 - D. 3'-TCCGGAT-5'.

10. Which of the following descriptions concerning endomembrane system is

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correct?

- A. The endomembrane system starts from the endoplasmic reticulum.
- B. The endomembrane system ends at the Golgi apparatus.
- C. The components of the endomembrane system are either continuous or connected via transfer vesicles.
- D. The components of the endomembrane system are independent of each other.

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11. What is the following description concerning photosynthesis is correct?

- A. Photosystems harvest light energy to oxidize NADPH to NADP⁺ for fixation of CO₂.
- B. The photosynthesis is best described by the following chemical formula: "energy + C₆H₁₂O₆ + 6O₂ → 6CO₂ + 6H₂O".
- C. Electrons in the chlorophylls are excited after chlorophylls receive light energy.
- D. Calvin cycle uses photosystem I and II to harvest light energy.

12. Which of the following descriptions concerning mitosis is correct?

- A. Duplicated chromosomes align at center of the cell during prophase.
- B. Nuclear envelope disintegrates during metaphase.
- C. Duplicated chromosomes start to move to opposite poles of the cell during prometaphase.
- D. Nuclear envelop re-appears during telophase.

13. Suppose a trait is determined by a dominant allele (A) versus a recessive allele (a). After crossing a dominant phenotype to a recessive phenotype, a scientist found that half (1/2) of the progenies displayed the dominant phenotype and half (1/2) of the progenies displayed the recessive phenotype. What can be concluded from the experiment?

- A. The genotype of the dominant parent is AA.
- B. The genotype of the dominant parent is Aa
- C. The phenotype is X-linked.
- D. The data is inconclusive to tell the genotype of the dominant parent.

14. During the early stage of frog zygote development, the zygote undergoes repeated cell cycles consisting of S phase and M phase only. What would be the most obvious outcome of cells during this period of time?

- A. Cells would not be able to replicate their DNA.
- B. The mitotic spindle could not assemble.

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- C. Cells would become larger and larger.
D. The cells produced would become smaller and smaller.
15. DNA is recognized as the right kind of material that passes the genetic information from generation to generation in almost all known living organisms. Which of the following features that DNA has makes it stable enough to serve as the genetic material? Please select the best answer.
- A. The double helix structure.
B. Hydrogen bonds between complementary bases.
C. Higher order structures of DNA.
D. All of the above.
16. Which of the following statements about enzyme is not true?
- A. An enzyme is a catalyst for biological reactions.
B. An enzyme is a chiral molecule.
C. An enzyme changes the equilibrium constant of a reaction.
D. An enzyme does not change the net free energy change of the reaction.
17. Which of the following statements is the best description of the Chargaff's rules?
- A. Single-stranded RNA molecules contain the same amount of A and U.
B. All DNA molecules contain the same proportions of A, C, G and T.
C. The amount of T equals the amount of C in the double-stranded DNA.
D. The amount of G equals the amount of C in the double-stranded DNA.
18. Which of the following statements is not true?
- A. Mitochondria are responsible for generating ATP.
B. Mitochondria are surrounded by a double-membrane system.
C. Replication of mitochondria genome is independent to the replication of nuclear genome.
D. Mitochondria ribosomes are encoded by the mitochondria genome.
19. Which of the following processes mostly contributes to increase the diversity of gene products in the eukaryotic cells?
- A. Capping of RNA.
B. Alternative splicing.
C. Polyadenylation.
D. RNA base modification.

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20. Which of the following reactions is involved in the proofreading process of DNA polymerase?
- A. 5' to 3' exonuclease activity.
 - B. 5' to 3' endonuclease activity.
 - C. 3' to 5' exonuclease activity.
 - D. 3' to 5' endonuclease activity.
21. Which of the following events will likely lead to mutation in DNA genome? Please select the best answer.
- A. Missing bases in the DNA.
 - B. Insertion of a foreign DNA fragment.
 - C. Insertion of a transposon element.
 - D. All of the above.
22. Which of the following RNA species is most abundant in the human cells?
- A. mRNA.
 - B. rRNA.
 - C. tRNA.
 - D. microRNA.
23. Which of the following statements is not correct?
- A. Transcription and translation in bacterial are coupled.
 - B. rRNA is transcribed by a RNA polymerase in eukaryotes.
 - C. Most of the eukaryotic genes are transcribed as poly-cistronic mRNAs.
 - D. Most genes in the prokaryotic genome have no introns.
24. Which of the following DNA elements that locates several thousand base pairs upstream or downstream of a eukaryotic promoter and is capable of up-regulating gene expression when appropriate signal pathways are activated?
- A. TATA-box.
 - B. Initiator sequences.
 - C. Enhancers.
 - D. Silencers.
25. Which of the following is not required for a PCR reaction?
- A. Primers.

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- B. Topoisomerases.
- C. DNA polymerases.
- D. dNTPs.

26. Which of the following enzymatic activity is the best functional description of telomerase?

- A. DNA-dependent DNA polymerase.
- B. DNA-dependent RNA polymerase.
- C. RNA-dependent DNA polymerase.
- D. RNA-dependent RNA polymerase.

27. Which of the following phylogenetic history is considered correct?

- A. Jawed animals appeared earlier than vertebrates.
- B. Vertebrate appeared earlier than notochord.
- C. Mineralized skeleton appeared earlier than lungs or lung derivatives.
- D. Amniotic egg appeared earlier than jawed animals.

28. Extracellular compartmentalization of digestive processes is an evolutionary adaptation in many animal phyla. Which of the following phyla is correctly paired with the compartment that first evolved in that phylum?

- A. Cnidaria gastrovascular cavity.
- B. Arthropoda stomach.
- C. Chordata liver.
- D. Annelida complete alimentary canal.

29. A puppy is born with a malformed right leg. A veterinarian studies the animal and determines that all of the correct types of cells are present, but that the leg simply took on the wrong shape. Which of the following is most likely the problem?

- A. Morphogenesis.
- B. Cell differentiation.
- C. Histogenesis.
- D. Fertilization.

30. Assume that successful reproduction in a rare salamander species, wherein all individuals are females, relies on those females having access to sperm from males of another species but that the resulting embryos show no signs of a genetic contribution from the sperm. In this case, the sperm appear to be used only for which of the following?

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- A. Egg activation
 - B. Creation of a diploid cell.
 - C. Epigenesis.
 - D. Cell differentiation.
31. The fluid under a blister or the lymph that bathes the interstitial spaces between organs is very watery compared with the viscosity of blood plasma. Why?
- A. The viscosity of blood is completely due to blood cells that never leave the vessels.
 - B. These fluids are primarily water produced by cell respiration, and they are discarded interstitially.
 - C. The capillaries use active transport to retrieve large molecules that leaked away.
 - D. Large molecules, such as plasma albumin, rarely cross the capillary wall.
32. Which of the following is the pacemaker of the cardiac conduction system?
- A. Sinoatrial node.
 - B. Medulla oblongata.
 - C. Purkinje fibers.
 - D. Atrioventricular node.
33. Which of the following is the primary function of the pulmonary circulatory circuit?
- A. Release of oxygen and absorption of carbon dioxide by the blood.
 - B. Release of carbon dioxide and absorption of oxygen by blood.
 - C. To supply the force to propel blood throughout the body.
 - D. Nutrient exchange
34. The pH of the gastric juice of the stomach is about 2 due to the formation of HCl. Where does this formation of HCl occur?
- A. In the transformation of pepsinogen to pepsin.
 - B. In the secretions of the esophagus.
 - C. In the chief cells of the stomach.
 - D. In the parietal cells of the stomach.
35. Which of the following excretory systems is partly based on the filtration of fluid under high hydrostatic pressure?

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- A. Protonephridia of rotifers.
- B. Malpighian tubules of insects.
- C. Metanephridia of earthworms.
- D. Kidneys of vertebrates.

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36. Which of the following statements about hormones is not correct?
- A. They are modified amino acids, peptides, or steroid molecules.
 - B. They are used to communicate between different organisms.
 - C. They are produced by endocrine glands.
 - D. They are carried by the circulatory system.
37. The endocrine system and the nervous system are chemically related. Which of the following substances best illustrates this relationship?
- A. Calcium.
 - B. Estrogen.
 - C. Calcitonin.
 - D. Norepinephrine
38. Plants are affected by an array of pathogens. Which of the following is a plant defense against pathogens?
- A. Plants produce chemicals that kill pathogens.
 - B. Plant cells near the point of infection destroying themselves to prevent the spread of the infection.
 - C. Waxy cuticle at the leaves blocks penetration by pathogens.
 - D. All of the above.
39. What is the difference between pollination and fertilization in flowering plants?
- A. If fertilization occurs, pollination is unnecessary.
 - B. Pollination is the transfer of pollens to a stigma. Fertilization is the fusion of haploid nuclei.
 - C. Pollen is formed within megasporangia so that male and female gametes are near each other.
 - D. Pollination easily occurs between plants of different species, fertilization is within a species.
 - E. Fertilization precedes pollination.

40. Which of the following descriptions concerning evolution in nature is correct?

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- A. All individuals in a population display same heritable traits.
- B. Evolution selects non-heritable traits among the individuals.
- C. Individuals that best fit the environment reproduce more offspring as compared to less fit individuals.
- D. Evolution is a non-scientific hypothesis.

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