台灣聯合大學系統 103 學年度學士班轉學生考試試題

科目 普通生物學 類組別 A1

＊請在答案卡內作答

參考用

單選題，每題 2 分，不倒扣。

1. Which of the following statements concerning van der Waals interaction is correct?
   A. van der Waals interaction is a strong force between molecules.
   B. van der Waals interaction occurs only when two molecules are close together.
   C. van der Waals interaction is a hydrophobic interaction between molecules.
   D. van der Waals interaction is a form of covalent bond.

2. Which of the following statements concerning protein structures is correct?
   A. Protein functions are independent of protein structure.
   B. Protein primary structure refers to the three-dimensional shape stabilized by interactions between side chains of amino acids.
   C. Protein secondary structure refers to the linear sequences of amino acids.
   D. Protein quaternary structure refers to association of multiple polypeptides to form a functional protein complex.

3. Which of the following statements concerning the differentiation of a prokaryotic cell and a eukaryotic cell is correct?
   A. Prokaryotic cells use RNA to store genetic information whereas eukaryotic cells use DNA.
   B. Prokaryotic cells are usually larger than eukaryotic cells.
   C. Eukaryotic cell have membrane-enclosed organelles whereas prokaryotic cells do not.
   D. Eukaryotic cell have cell membranes whereas prokaryotic cells do not.

4. Which of the following statements concerning endomembrane system is correct?
   A. The endomembrane system starts at the endoplasmic reticulum.
   B. The endomembrane system ends at the Golgi apparatus.
   C. The inner leaflet of endoplasmic reticulum membrane is topologically equivalent to the outer leaflet of cell membrane.
   D. The components of the endomembrane system are independent of each other.

5. Which of the following factors does <u>not</u> affect enzyme activity in cellular metabolism?
   A. Free- energy change (ΔG) in the reaction
   B. pH
   C. inhibitors
   D. Temperature

6. Which of the following statements concerning fermentation is correct?
   A. Fermentation is an important process to regenerate NAD^+ when oxygen supply is limited in a cell.
   B. Electron transport in the mitochondrial membranes will stop when there is no O_2.
   C. Glycolysis will stop when there is no NAD^+.
   D. All of the above.

7. Which of the following statements concerning photosynthesis is correct?
   A. Upon photon excitation, electrons travel from photosystem II to photosystem I.
   B. H_2O is split to 2 H^+ and 1/2 O_2 by photosystem I.
   C. Completion of electron transport in the thylakoid membranes ultimately generates $NADP^+$.
   D. Calvin cycle, which fixes CO_2, occurs in thylakoid space.

8. What is the sequence of action for a protein hormone on its target cells?
   A. Hormone → intracellular signaling → cell surface receptor → response
   B. Hormone → cell surface receptor → intracellular signaling → response
   C. Intracellular signaling → hormone → cell surface receptor → response
   D. Intracellular signaling → cell surface receptor → hormone → response

9. Which of the following statements concerning eukaryotic cell cycle control is correct?
   A. Cell cycle follows the sequence of G1 → G2 → S → M.
   B. M phase usually represents the longest period of the cell cycle.
   C. Cell cycle progression is controlled by cyclically fluctuating concentrations of cyclins in the cell.
   D. Cyclins are resistant to degradation in the cell.

10. Homologous chromosomes move toward opposite poles of a dividing cell during
    A. meiosis I.
    B. meiosis II.
    C. mitosis.
    D. fertilization.

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11. What is the source of the extra chromosome 21 in an individual with Down syndrome?
    A. Deletion in either parent
    B. Inversion in either parent
    C. Point mutation of the chromosome
    D. Nondisjunction in either parent

12. Which of the following sex determination systems is for bees and ants?
    A. The X-Y system
    B. The Z-W system
    C. The X-O system
    D. The haplo-diploid system

13. Which of the following is a potent inducer of vasodilation?
    A. Endothelin
    B. Nitric oxide (NO)
    C. Thrombin
    D. O_2

14. In cats, black fur color is caused by an X-linked allele; the other allele at this locus causes orange color. The heterozygote is tortoiseshell. What kinds of offspring would you expect from the cross of an orange female and a black male?
    A. tortoiseshell females; tortoiseshell males
    B. tortoiseshell females; orange males
    C. orange females; orange males
    D. black females; orange males

15. DNA methylation is an example of
    A. genetic mutation.
    B. epigenetic modification.
    C. *in vitro* mutagenesis.
    D. chromosomal rearrangements.

16. Most repressor proteins are allosteric. Which of the following binds with the repressor to alter its conformation?
    A. Inducer
    B. Promoter
    C. cAMP
    D. RNA polymerase

17. Influenza viruses are
    A. double-stranded DNA viruses.
    B. single-stranded DNA viruses.
    C. double-stranded RNA viruses.
    D. single-stranded RNA viruses.

18. Which of the following techniques allows researchers to measure the expression of thousands of genes at one time?
    A. Southern blotting
    B. Northern blotting
    C. DNA microarray assay
    D. Restriction fragment length polymorphism (RFLP)

19. The human genome contains about 20000 genes. However, there is evidence that human cells produce more than 20000 different polypeptides. What processes might explain this discrepancy?
    A. Exon shuffling
    B. Domain shuffling
    C. Gene recombination
    D. Alternative splicing

20. Which of the following observations is not helpful for the inference of natural selection?
    A. Members of a population do not vary in their traits.
    B. Traits are inherited from parents to offspring.
    C. All species are capable of producing more offspring than their environment can support.
    D. Owing to lack of food or other resources, many of these offspring do not survive.

21. Which of the following will not change the allele frequencies in a population?
    A. Mutation
    B. Non-random mating
    C. Genetic drift
    D. Gene flow

22. Which of the following is not related to "reinforcement"?
    A. Sexual selection
    B. Sympatric species
    C. Prezygotic reproductive barrier
    D. Postzygotic reproductive barrier

23. Eukaryotic cells have a nuclear envelope, mitochondria, endoplasmic reticulum, and other internal structures that prokaryotes lack. How did these eukaryotic features evolve from prokaryotic cells?
    A. Cytokinesis
    B. Endosymbiosis
    C. Paedomorphosis
    D. Binary fission

24. Suppose gene A is orthologous in species 1 and species 2, and gene B is paralogous to gene A in species 1. Suggest a sequence of two evolutionary events that could result in the following: Gene A differs considerably between species, yet gene A and gene B show little sequence divergence from each other.
    A. Speciation => gene duplication
    B. Speciation => gene recombination
    C. Gene duplication => speciation
    D. Gene recombination => speciation

25. Which of the following is not the cause of the genetic variation in bacterial populations?
    A. Mutation
    B. Meiosis
    C. Transduction
    D. Transformation

26. Protists contain species belonging to
    A. eukaryotes.
    B. bacteria.
    C. archaea.
    D. all the three domains.

27. In plants, which of the following are produced by meiosis?
    A. Haploid spores
    B. Diploid spores
    C. Haploid gametes
    D. Diploid gametes

28. What human reproductive organ is functionally similar to a seed?
    A. Ovaries
    B. Testis
    C. A pregnant woman's uterus
    D. Embryo

29. Which of the following statements is correct?
    A. All the fungi propagate themselves by producing vast numbers of spores only sexually.
    B. All the fungi propagate themselves by producing vast numbers of spores only asexually.
    C. Most of the fungi propagate themselves by producing vast numbers of spores either sexually or asexually.
    D. All the fungi propagate themselves by producing vast numbers of spores either sexually or asexually.

30. Which of the following statements is incorrect?
    A. Many radial animals are sessile (living attached to a substrate) or planktonic (drifting or weakly swimming).
    B. Bilateral animals typically move actively from place to place.
    C. Most animal phyla are bilateral symmetry and have two germ layers.
    D. Sponges are basal animals that lack true tissues.

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31. Which of the following statements is incorrect?
    A. Nematoda is more closely related to Arthropoda than to Mollusca.
    B. Nematoda and Mollusca are segmented.
    C. Arthropoda is the most species-rich animal phylum.
    D. Echinoderms and chordates are deuterostomes.

32. Which of the following groups is the closest relative to birds?
    A. Mammals
    B. Lizards
    C. Turtles
    D. Dinosaurs

33. Water potential is generally most negative in which of the following parts of a plant?
    A. Xylem vessels in roots
    B. Xylem vessels in leaves
    C. Mesophyll cells of the leaf
    D. Cells of the root cortex

34. Which of the following root tissues gives rise to lateral roots?
    A. Phloem
    B. Pericycle
    C. Cortex
    D. Epidermis

35. Which of the following essential nutrients plays an essential role in the opening and closing of the stomatal aperture?
    A. SO_4^{2-} B. Fe^{2+} C. Mg^{2+} D. K^+

36. Intercalated disks are found in
    A. skeletal muscle.
    B. smooth muscle.
    C. cardiac muscle.
    D. bone cells.

37. Auxins (IAA) in plants are known to affect all of the following phenomena except
    A. maintenance of dormancy.
    B. inhibition of lateral buds.
    C. phototropism of shoots.
    D. fruit development.

38. Which of the following is the key site for glucose homeostasis?
    A. Stomach
    B. Small intestine
    C. Liver
    D. Gallbladder

39. Which of the following statements concerning adaptive immunity in mammals is correct?
    A. Cell-mediated immune responses are mediated by T cells.
    B. Humoral immunity is mediated mainly by antibodies and complements.
    C. Helper T cells play important roles in both cell and humoral immunity.
    D. All of the above.

40. Which of the following statements concerning urine formation in humans is correct?
    A. Most of the useful solutes such as glucose are reabsorbed in the distal tubules.
    B. Descending limb of the Loop of Henle is permeable to both salt and water.
    C. Ascending limb of the Loop of Henle is permeable to water.
    D. Anti-diuretic hormone is released in response to increase of blood osmolarity.

41. Which of the following statements concerning endocrine system in mammals is correct?
    A. Pituitary hormones are involved in the inhibition of downstream endocrine organs such as thyroid gland.
    B. Positive feed-back control is the most commonly seen mode of regulation in the endocrine physiology.
    C. Adrenal gland is divided to cortex and medulla which can be distinguished by the hormones they secrete.
    D. Thyroidal hormones (T_4 and T_3) are involved in regulation of blood pressure.

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42. Which of the following statements concerning animal reproduction is correct?
    A. Animals reproduce exclusively by sexual reproduction.
    B. In humans, female ovarian cycles are controlled by the blood concentration of follicle-stimulating hormone (FSH) and luteal hormone (LH).
    C. In humans, LH and FSH are absent in males.
    D. In humans, maternal blood vessels are directly connected to fetal blood vessels in the placenta.

43. Which of the following statements concerning embryonic developments of humans is correct?
    A. A fertilized egg undergoes many rounds of cell division to form an early embryo called blastocyst when it arrives at the uterus.
    B. Trophoblast cells eventually forms the three germ layers at the end of gastrulation.
    C. Adrenal cortex is developed from ectoderm.
    D. Epidermis and its derivatives such as hair follicles are derived from endoderm.

44. Which of the following statements concerning transmission of nerve signals is correct?
    A. Signal transmission is slower in myelinated axons than unmyelinated axons.
    B. Signal is transmitted along the axon by hyperpolarization of axonal membrane.
    C. Many of the receptors of neurotransmitters are ligand-gated ion channels.
    D. All neurotransmitters are excitatory when they bind to their receptors.

45. Which of the following statements concerning nerve system is correct?
    A. In humans, nerve system is anatomically divided into central nerve system and peripheral nerve system.
    B. In humans, memory function is attributed to cerebellum.
    C. Lower animals such as flatworm do not have nerve cells.
    D. Parkinson's disease is a motor disorder caused by death of Purkinje cells in the cerebellum.

46. Which of the following statements concerning striated muscle is correct?
    A. Striation in the muscle fiber is formed by regularly aligned microtubules and thin filaments.
    B. Contraction of striated muscle is independent of calcium ions.
    C. Myosin heads use energy stored in ATP to propel microtubules.
    D. Calcium binding to troponin complex shifts the position of tropomyosin on the thin filaments.

47. Males of the side-blotched lizard of California can have orange, blue, or tallow throats. Each throat color is associated with a different pattern of behavior. Orange-throat males are the most aggressive and defend large territories that contain many females. Blue-throat males are also territorial but defend smaller territories and fewer females. Yellow-throats are non-territorial males that mimic females and use "sneaky" tactics to gain the chance to mate. Within a population, the fraction of males belonging to each genetically determined type varies over time. In one study population, the most frequent throat coloration changed over a period of several years from blue to orange to yellow and back to blue. Which of the following is not related to the above observation?
    A. Sexual selection
    B. Frequency-dependent selection
    C. A chance event
    D. Game theory

48. A study of red deer in Scotland showed that females that reproduced in a given summer were more likely to die during the next winter than females that did not reproduce. Which of the following can best explain the above observation?
    A. Trade-off
    B. Competition for resources
    C. Density-dependent population regulation
    D. Population dynamics

49. What is "ecological niche"?
    A. Changes in the composition and structure of terrestrial communities
    B. The variety of different kinds of organisms that make up the community
    C. An interaction between species that benefits one of the species but neither harms nor helps the other
    D. The sum of a species' use of the biotic and abiotic resources in its environment

50. What is "effective population size"?
    A. The total size of a population
    B. The population size estimated based on the breeding potential
    C. The population size at which a species is able to sustain its numbers and survive
    D. The difference between birth rate and death rate