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台灣聯合大學系統 107 學年度學士班轉學考試題

考試科目：普通生物學

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組別：A1

—作答注意事項—

1. 作答中如發現試題印刷不清，得舉手請監試人員處理，但不得要求解釋題意。
2. 請核對答案卷（卡）上之准考證號、考試科目是否正確。
3. 本考科禁止使用計算器。
4. 選擇題請在答案卡上作答。
5. 考生限在作答區內作答，不可書寫姓名、准考證號或與作答無關之其他文字或符號。
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8. 因字跡潦草或作答未標明題號等情事，致評閱人員無法辨識答案者，該部分不予計分。

I. 單選題 (每題2分, 共60分)

1. Which of the following statement about enzyme is **NOT true**?
- (A) All enzymes are proteins
 - (B) The active site is the region where the substrate binds
 - (C) Each enzyme has an optimal temperature and pH in which it can function
 - (D) Optimal conditions usually favor the most stable and active conformation for the enzyme molecule
2. Why helper T cells play a central role in the immune response?
- (A) Helper T cells are the only immune cell type that can produce immunological memory
 - (B) Helper T cells can be activated through innate immune response by antigen-presenting cells such as macrophages and dendritic cells, setting stage for the adaptive immune response
 - (C) Activated helper T cells release perforin that make pores in the target cell's membrane and enzymes promoting apoptosis leading to cell death
 - (D) Activated helper T cells can produce antibodies
3. For the formation of vertebrate limb, which of the following statement is **NOT TRUE**?
- (A) Pattern formation is the process governing the arrangement of organs and tissues in their characteristic 3-D space
 - (B) Pattern formation requires each embryonic cell to receive some kind of positional information indicating location along three axes of the limb
 - (C) The wings and legs of chicks begins with limb bud consisting of only ectoderm
 - (D) The apical ectodermic ridge (AER) secretes FGF (fibroblast growth factor) that promotes distal-proximal limb bud outgrowth.
4. Which of the following statements about excretory system is **NOT TRUE**?
- (A) Nephron is the functional unit of kidney
 - (B) The nephron consists of a single long tubule and a ball of capillaries called the glomerulus. Filtration occurs as blood pressure forces fluid from the blood in the glomerulus into the lumen of Bowman's capsule

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- (C) Filtration of small molecules passes through three regions of the nephron: the proximal tubule, the loop of Henle, and the distal tubule, which are all permeable to salt but not to water
- (D) The controlled movement of ions (such as H^+ , NH_4^+ , HCO_3^-) in the proximal and distal tubules contributes to constant pH in the body fluid

5. About the digestive system, which of the following statement is **TRUE**?

- (A) Protein digestion occurs only in the stomach
- (B) Polysaccharides digestion starts from small intestine with enzymes from pancrease
- (C) Most digestion occurs in the duodenum, where acid chyme from the stomach mixes with digestive enzymes from the pancreas, liver, gallbladder, and the small intestine itself
- (D) Bile is made in the pancreas and stored in the gallbladder

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6. About the respiration system, which of the following statement is **TRUE**?

- (A) Alveoli is the place where gas exchange occurs
- (B) In the capillaries of alveoli, CO_2 diffuses into the blood and O_2 diffuses into the air
- (C) During inhalation, lung volume increases as the rib muscle contracts and diaphragm relaxes
- (D) The breathing control center is located in the hypothalamus

7. Which of the following is a pair of antagonistic hormones that work against each other to control appetite?

- (A) Insulin, glucagon
- (B) PTH, calcitonin
- (C) Leptin, ghrelin
- (D) Epinephrine, norepinephrine

8. Which of the following statement is **TRUE** about epinephrine?

- (A) It is secreted in response to short term stresses through a hormone cascade pathway
- (B) It is secreted from adrenal cortex and its main function is to mediate various fight-or-flight responses
- (C) Its secretion is only in response to life-threatening danger
- (D) Epinephrine is a hormone with a wide range of effects, because it can binds to different receptors in the same cell

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type, or it can binds to the same receptor located on different cell types

9. Which of the following parameter is **NOT** essential for the resolution of a microscope?

- (A) Magnification
- (B) Imaging wavelength
- (C) Refractive index
- (D) Numerical aperture

10. Thomas Hunt Morgan's choice of *Drosophila melanogaster* (fruit fly) has been proven to be useful even today. Which of the following character has continued to make it one of the most useful and powerful model organisms in research?

- (A) They have compound eyes
- (B) They have large and transparent embryos that can be easily studied
- (C) They have short life cycle with large number of offspring
- (D) They can be used to model almost all human diseases

11. About polysaccharides, which of the following statement is **NOT TRUE**?

- (A) They are polymers formed by dehydration of glucose monomers
- (B) Glycogen is a highly branched polysaccharide of glucose that serves as a form of energy storage in animals
- (C) Chitin is a polysaccharide found in the cell wall of many fungi and formed exoskeleton of anthropods
- (D) Both starch and cellulose are polymers formed by glycosidic bonds. Starch is formed by 1,4 linkage of glucose, whereas cellulose is formed by 1,6 linkage of glucose

12. The main source of genetic variation among humans is

- (A) Gene flow
- (B) Genetic drift
- (C) The reshuffling of alleles in sexual reproduction
- (D) Environmental effects

13. Which of the following ovarian hormone directly controls cyclic changes in the uterus

- (A) Luteinizing hormone (LH)
- (B) Prostaglandin

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- (C) Follicle stimulating hormone (FSH)
- (D) Progesterone

14. About anaerobic and aerobic respirations, which of the following statement is **NOT TRUE**

- (A) Both use glycolysis
- (B) Both use NAD^+ as electron carrier
- (C) Both use oxygen as final electron acceptor
- (D) Aerobic respiration produces about 32 ATP, whereas anaerobic respiration produces 2 ATP

15. Which of the following statement is **NOT TRUE** about photosynthesis

- (A) Light reactions generate ATP and increase the potential energy of electrons by moving them from H_2O to NADPH
- (B) Both ATP and NADPH are produced on the side facing the stroma, where the Calvin cycle takes place
- (C) The Calvin cycle is a carbon fixation process that generates oxygen as a by-product
- (D) Carbon enters the Calvin cycle as CO_2 and leaves as glyceraldehyde 3-phosphate (G3P)

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16. About mutation, which of the following statement is **TRUE**?

- (A) Silent mutations usually do not have observable effects on phenotypes because they are in-frame mutations
- (B) Missense mutations change a codon into a stop codon leading to a truncated protein
- (C) Nonsense mutation is a point mutation in which a single nucleotide change resulted in a change in an amino acid
- (D) Insertions and deletions are additions or losses of nucleotide pairs in a gene that alter the reading frame producing out-of-frame mutations

17. FtsZ is a bacterial cytoskeletal protein that forms a contractile ring involved in binary fission. Its function is similar to

- (A) The cleavage furrow of eukaryotic animal cells
- (B) The cell plate of eukaryotic plant cells
- (C) The mitotic spindle of eukaryotic cells
- (D) The microtubule-organizing center of eukaryotic cells

18. Lipid-soluble signaling molecules, such as aldosterone, cross the membranes of all cells but affect only target cells because

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- (A) Only target cells retain the appropriate DNA segments
- (B) Intracellular receptors are present only in target cells
- (C) Only target cells have enzymes that break down aldosterone
- (D) Only in target cells is aldosterone able to initiate the phosphorylation cascade that turns genes on

19. Homeotic genes

- (A) Encode transcription factors that control the expression of genes responsible for specific anatomical structures
- (B) Are found only in *Drosophila* and other arthropods
- (C) Are the only genes that contain the homeobox domain
- (D) Encode proteins that form anatomical structures in the fly

20. The upper forelimbs of humans and bats have fairly similar skeletal structures, whereas the corresponding bones in whales have very different shapes and proportions. However, genetic data suggest that all three kinds of organisms diverged from a common ancestor at about the same time. Which of the following is the most likely explanation for these data?

- (A) Forelimb evolution was adaptive in people and bats, but not in whales
- (B) Natural selection in an aquatic environment resulted in significant changes to whale forelimb anatomy
- (C) Genes mutate faster in whales than in humans or bats
- (D) Whales are not properly classified as mammals

21. Chemoautotrophs

- (A) Use light as energy source and CO_2 as a carbon source
- (B) Use organic compound as energy source and organic compound as a carbon source
- (C) Use light as energy source and organic compound as a carbon source
- (D) Use inorganic compound (such as methane) as energy source and CO_2 as a carbon source

22. Which of the following is the correct description of the tropical rain forest

- (A) Low temperature, rain uniform during the year
- (B) Long summers, mild winters
- (C) Warm temperatures and continual rains allow plant growth year-round
- (D) Low rainfall and dry weather

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23. Which of the following is a density-independent factor in a population

- (A) Food
- (B) Habitat
- (C) Carrying capacity
- (D) Weather

24. Gymnosperms

- (A) Bear seeds on exposed surfaces of spore-bearing structures
- (B) Undergo double fertilization
- (C) Do not have vascular tissues
- (D) After fertilization, ovary becomes the fruit

25. Which of the following is an example of commensalism

- (A) Lynx (山貓) and hare (兔)
- (B) Clown fish lives in anemones
- (C) Scavengers fight over carcasses (動物屍體)
- (D) Orchids live attached to a tree trunk

26. In a natural community, the primary consumers are

- (A) Herbivores
- (B) Carnivores
- (C) Detritivores
- (D) Decomposers

27. Which of the following is **NOT** the major evolution trend in terrestrial plants

- (A) Production of microspores and megaspores for fertilization
- (B) Development of vascular tissue
- (C) Adaptation to dry environmental conditions
- (D) Increasing dominance of the gametophyte phase

28. Which of the following is an example of post-transcriptional control of gene expression?

- (A) The addition of methyl groups to cytosine bases of DNA
- (B) The binding of transcription factors to a promoter
- (C) The removal of introns and alternative splicing of exons
- (D) Gene amplification contributing to cancer

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29. Which of the following characteristics, structures, or processes is common to both bacteria and viruses?

- (A) Metabolism
- (B) Ribosomes
- (C) Genetic material composed of nucleic acid
- (D) Cell division

30. Which of the following tools of DNA technology is incorrectly paired with its use?

- (A) Electrophoresis—separation of DNA fragments
- (B) DNA ligase—cutting DNA, creating sticky ends of restriction fragments
- (C) DNA polymerase—polymerase chain reaction to amplify sections of DNA
- (D) Reverse transcriptase—production of cDNA from mRNA

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II. 複選題 (每題5分，共40分。計分方式：在 A-E 選項中，每答對一個選項得1分；答錯一個選項倒扣1分；答錯三個選項以上，此題0分)

31. Interaction of helper T cells with antigen presenting cells activates helper T cells through

- (A) Endocrine signaling
- (B) Paracrine signaling
- (C) Autocrine signaling
- (D) Synaptic signaling
- (E) Neuroendocrine signaling

32. Which of the following cell types are connective tissues?

- (A) Fibroblasts
- (B) Dendritic cells
- (C) Plasma cells
- (D) Mast cells
- (E) Macrophages

33. Which of the following solutes contribute to the osmolarity of the interstitial fluid in the kidney?

- (A) NH_4^+
- (B) KCl
- (C) Urea

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- (D) HCO_3^-
- (E) NaCl

34. Which of the following statements about the difference between mitosis and meiosis are **TRUE**

- (A) Mitosis conserves the number of chromosome sets, producing cells that are genetically identical to the parent cell
- (B) Meiosis is a special type of mitosis producing reproductive cells that occurs only in animal cells
- (C) Meiosis reduces the number of chromosomes sets from two (diploid) to one (haploid)
- (D) Synapsis and crossing over occur in both mitosis and meiosis
- (E) Meiosis produces cells that differ genetically from each other and from the parent cell

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35. Which of the following hormones are secreted from posterior pituitary?

- (A) Adrenocorticotrophic hormone (ACTH)
- (B) Anti-diuretic hormone (ADH)
- (C) Growth hormone (GH)
- (D) Oxytocin
- (E) Thyroid stimulating hormone (TSH)

36. About the organization of the body plans, which of the following statements are **TRUE**?

- (A) A complex body plan helps an animal in a variable environment to maintain homeostasis
- (B) Group of cells with a common structure and function organized into **tissues** that have different functions
- (C) Tissues are classified into four main types: epithelial tissue, muscle tissue, nervous tissue, and fat tissue
- (D) Nervous tissue functions in the receipt, processing and transmission of information
- (E) The endocrine system is the only system that is responsible for coordinating and controlling responses to stimuli

37. What are the major roles of antibody in immunity?

- (A) Activation of phagocytotic cells, including neutrophils and macrophages

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- (B) When bound to antigens on the surface of a virus, antibody neutralizes it by blocking its ability to bind to a host cell
- (C) Binding of antibody to antigen on the surface of bacteria promotes phagocytosis by macrophages
- (D) Induction of inflammatory response
- (E) Binding of antibody to antigen on surface of foreign cell activates the complement system, which forms membrane attack complex

38. Which of the following organelles or structures are commonly observed in plant cells but not in animal cells?

- (A) Plasmodesmata
- (B) Central vacuole
- (C) Cytoskeleton
- (D) Chloroplast
- (E) Mitochondria

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