

臺灣綜合大學系統 112 學年度學士班轉學生聯合招生考試試題

科目名稱	普通生物學	類組代碼	A04.B04.C07.C08.D06
		科目碼	A0401

※本項考試依簡章規定所有考科均「不可」使用計算機。 本科試題共計 1/8 頁

I. 選擇題(單選, 每題 2 分) 請於答案卡上作答, 否則不予計分。

- A cell lacking which of the following structures is most likely to be a prokaryote?
  - Nuclear membrane
  - Cell membrane
  - Cytoplasm
  - Nucleic acid
- A salamander relies on hydrogen bonding to stick to various surfaces. Therefore, a salamander would have the greatest difficulty clinging to a \_\_\_\_\_.
  - slightly damp surface
  - surface of hydrocarbons
  - surface of mostly carbon-oxygen bonds
  - surface of mostly carbon-nitrogen bonds
- Sulfur is in the same column of the periodic table as oxygen but it is less electronegative than oxygen. Compared to water molecules, how will the H<sub>2</sub>S molecules behave?
  - have greater cohesion to other H<sub>2</sub>S molecules
  - have a greater tendency to form hydrogen bonds with each other
  - have a higher capacity to absorb heat for the same change in temperature
  - not be able to form hydrogen bonds with each other
- Which of the following identifies the chemical relationship between glucose and fructose?
  - They are isotopes.
  - They are enantiomers.
  - They are cis-trans isomers.
  - They are structural isomers.
- During a 12-hour fast in a human, the first macromolecule to get depleted is typically \_\_\_\_\_.
  - glucose
  - protein
  - glycogen
  - starch
- Zinc is an essential trace element for most organisms. Zinc is required in the active site of the enzyme carboxypeptidase where it most likely functions in which of the following ways?
  - as a noncompetitive inhibitor of the enzyme
  - as an allosteric activator of the enzyme
  - as a cofactor necessary for enzyme activity
  - as a coenzyme derived from a vitamin
- The liver is involved in the detoxification of many poisons and drugs. Which of the following structures is abundant in liver cells and primarily responsible for detoxification processes?
  - rough endoplasmic reticulum
  - smooth endoplasmic reticulum
  - Golgi apparatus
  - nuclear envelope

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8. In some cells, there are many different ion electrochemical gradients across the plasma membrane even though there are usually only one or two types of proton pumps present in the membrane. The gradients of the other ions are most likely established by which of the following?

- A) co-transport proteins
- B) ion channels
- C) pores in the plasma membrane
- D) passive diffusion across the plasma membrane

9. Which of the following responses is stimulated by cell signaling the formation of biofilms?

- A) formation of mating complexes
- B) aggregation of bacteria
- C) secretion of substances that inhibit the growth of foreign bacteria
- D) inhibition of quorum sensing

10. Which of the following reactions produces the majority of the CO<sub>2</sub> released by the complete oxidation of glucose?

- A) glycolysis
- B) electron transport
- C) oxidation of pyruvate to acetyl-CoA
- D) the citric acid cycle

11. Carotenoids are often found in foods that are considered to have antioxidant properties in human nutrition. Which of the following statements best describes a related function they serve in plants?

- A) They serve as accessory pigments to increase light absorption.
- B) They protect against oxidative damage from excessive light energy.
- C) They shield the sensitive chromosomes of the plant from harmful ultraviolet radiation.
- D) They reflect orange light and enhance red light absorption by chlorophyll.

12. One difference between cancer cells and normal cells is that cancer cells \_\_\_\_\_.

- A) are unable to synthesize DNA
- B) are arrested at the S phase of the cell cycle
- C) continue to divide even when they are tightly packed together
- D) cannot function properly because they are affected by density-dependent inhibition

13. Meiosis II is similar to mitosis in that \_\_\_\_\_.

- A) sister chromatids separate during anaphase
- B) DNA replicates before the division
- C) the daughter cells are diploid
- D) homologous chromosomes synapse

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14. Glucose-6-phosphate dehydrogenase deficiency (G6PD) is inherited as an X-linked recessive allele in humans. A woman whose father had G6PD is planning a family with a man who has no history of the disease. What proportion of their sons are expected to have the disease?

- A) 100%
- B) 1/4
- C) 1/2
- D) 0

15. DNA strands are antiparallel. Which of the following statements defines "antiparallel"?

- A) The double helix structure of DNA creates nonparallel strands.
- B) A 5' to 3' DNA strand is paired with the 3' to 5' DNA strand.
- C) Hydrogen bonds between base pairs cause DNA strands to cross.
- D) One DNA strand contains bases that complement the bases in the opposite strand.

16. Transcription in eukaryotes requires which of the following molecules in addition to RNA polymerase?

- A) anticodons
- B) ribosomes and tRNA
- C) transcription factors
- D) aminoacyl-tRNA synthetase

17. Muscle cells differ from nerve cells mainly because they \_\_\_\_\_.

- A) express different genes
- B) contain different genes
- C) use different genetic codes
- D) have unique ribosomes

18. When attempting to introduce a particular fragment of DNA into the genome of an animal cell which of the following methods would be most successful?

- A) CRISPR/Cas9 recombination
- B) in vitro hybridization of the DNA with the cell's genome
- C) infecting the mouse cell with a Ti plasmid
- D) RNA-seq followed by genetic profiling

19. Bioinformatics includes all of the following except \_\_\_\_\_.

- A) using computer programs to align DNA sequences
- B) using mathematical tools to make sense of biological systems
- C) developing computer-based tools for genome analysis
- D) using DNA technology to combine DNA from two different sources in a test tube

20. Darwin used the phrase "descent with modification" to explain which of the following ideas?

- A) descent of all organisms from a single, ancient ancestor
- B) the unity of life
- C) the diversity of life
- D) both the unity and diversity of life

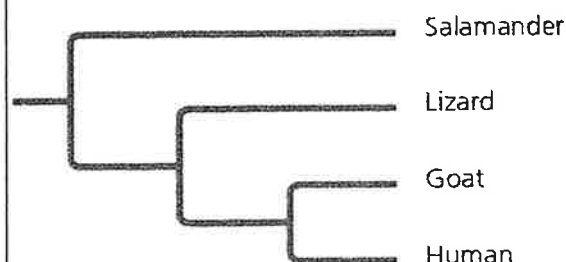
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21. Based on the tree below, which statement is correct?



- A) Lizards and goats form a sister group.
- B) Salamanders are a sister group to the group containing lizards, goats, and humans.
- C) Salamanders are more closely related to lizards than to humans.
- D) Goats and humans are the only sister group shown in this tree.

22. One population of a species has 25 individuals, all with genotype AA; a second population of this species has 40 individuals, all with genotype aa. Assume that these populations live far apart but in similar environmental conditions. Based on this information, the observed genetic variation most likely resulted from \_\_\_\_\_.

- A) genetic drift
- B) gene flow
- C) nonrandom mating
- D) directional selection

23. Which of the following factors is the primary criterion for determining species boundaries when applying the biological species concept?

- A) geographic isolation
- B) niche differences
- C) gene flow
- D) morphological similarity

24. The half-life of carbon-14 is about 5,730 years. A fossil that has 1/16 of the normal proportion of carbon-14 to carbon-12 should be about how many years old?

- A) 2,800
- B) 11,200
- C) 16,800
- D) 22,900

25. What is the function of reverse transcriptase in retroviruses?

- A) It uses viral RNA as a template for DNA synthesis.
- B) It converts host cell RNA into viral DNA.
- C) It translates viral RNA into proteins.
- D) It uses viral RNA as a template for making more viral RNA strands.

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26. Some bacteria possess antibiotic resistance, as well as the ability to survive through adverse conditions. Where in this type of bacteria is the DNA located?
- A) nucleoid, fimbriae, and plasmids  
 B) endospore, fimbriae, and plasmids  
 C) fimbriae, nucleoid, and endospore  
 D) plasmids, nucleoid, and endospore
27. After studying a particular species of protist, you suspect that it has obtained a chloroplast via secondary endosymbiosis. Which of the following information would confirm your hypothesis?
- A) have nuclear and cyanobacterial genes  
 B) are exceptionally small  
 C) have three or four membranes  
 D) have only a single pigment
28. What evidence do paleobotanists look for that indicates the movement of plants from water to land?
- A) waxy cuticle to decrease evaporation from leaves  
 B) loss of structures that produce spores  
 C) sporopollenin to inhibit evaporation from leaves  
 D) remnants of chloroplasts from photosynthesizing cells
29. Many mammals have skins and mucous membranes that are sensitive to secretions of plants like poison oak. These secondary compounds are primarily adaptations that function in which of the following ways?
- A) to favor pollination  
 B) to foster seed dispersal  
 C) to decrease competition  
 D) to inhibit herbivory
30. Fungi produce many compounds that humans use medicinally. Which of the following statements best describes the evolution of these compounds in fungi?
- A) Humans used artificial selection to develop fungi that produced specific compounds.  
 B) The presence of compounds in the fungi was accidentally produced and has no function.  
 C) The compounds probably provide a benefit to the fungi.  
 D) The compounds are produced as a result of sexual reproduction and recombination.
31. Which of the following is an advantage of using molecular data rather than morphological data for phylogenetic analysis?
- A) Molecular data can be gathered in the lab, while morphological data must be gathered in the field.  
 B) Molecular data is based on genetic relationships rather than morphological similarities.  
 C) Morphological changes usually do not result from molecular changes.  
 D) Some phyla vary too widely in morphological characteristics to be classified accurately.

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**32. Our understanding of many of the evolutionary relationships among animals changed after those phylogenies were based on morphological and molecular data (as opposed to only using morphological data). What do these changes indicate?**

- A) molecular and morphological studies rarely agree
- B) molecular studies add additional information to morphological studies and improve our understanding of evolutionary history
- C) molecular studies are less reliable than morphological studies
- D) molecular studies are extremely time consuming and expensive and really don't add additional information to our understanding of evolutionary history

**33. Primate evolution and behavior, such as hunting skills, have been directed in part by the development of depth perception. What anatomical change made depth perception possible?**

- A) a smaller brain
- B) the development of compound eyes
- C) location of the eyes at the front of the head
- D) diurnal activity

**34. The biological molecule specific to woody sclerenchyma cells is**

- A) cellulose
- B) starch
- C) lignin
- D) chlorophyll

**35. A plant developed a mineral deficiency after being treated with a fungicide. What is the most probable cause of the deficiency?**

- A) Mineral receptor proteins in the plant membrane were not functioning.
- B) The genes for the synthesis of transport proteins were destroyed.
- C) Active transport of minerals was inhibited.
- D) Mycorrhizal fungi were killed.

**36. Which answer best describes how roots acidify the soil solution?**

- A) Roots release CO<sub>2</sub> and pump K<sup>+</sup> into the soil.
- B) Roots release CO<sub>2</sub> and pump H<sup>+</sup> into the soil.
- C) Roots release NaCl and pump Na<sup>+</sup> into the soil.
- D) Roots release NaCl and pump Cl<sup>-</sup> into the soil.

**37. The part of a flower that can develop into the pulp of a fleshy fruit is \_\_\_\_\_.**

- A) stigma
- B) style
- C) ovule
- D) ovary

**38. The primary sites of auxin (IAA) production in plants are \_\_\_\_\_.**

- A) shoot apical meristem and young leaves
- B) roots
- C) seeds
- D) ripening fruits

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39. The hypothalamus in the brain releases the hormone corticotropin-releasing hormone (CRH) that triggers the release of adrenocorticotrophic hormone (ACTH) from the pituitary gland. ACTH travels through the blood to cause the release of cortisol from the cortex of the adrenal glands. If cortisol acts with negative feedback on CRH and ACTH, what would you expect to happen when cortisol is released?

- A) CRH and ACTH levels will decrease
- B) CRH levels will increase, but ACTH levels will decrease
- C) CRH levels will decrease, but ACTH levels will increase
- D) CRH and ACTH levels will increase

40. The chemical structure of prostaglandins is derived from \_\_\_\_\_.

- A) oligosaccharides
- B) fatty acids
- C) steroids
- D) amino acids

41. It is important for pregnant women to consume folic acid supplements because \_\_\_\_\_.

- A) the fetus is not able to acquire oxygen by breathing on its own
- B) the fetus stores folic acid in high quantities
- C) folic acid deprivation is associated with neural tube defects in a fetus
- D) folic acid deprivation is a cause of heart abnormalities in a newborn

42. Consider the following reaction. Which of the following would happen if the pH of the blood was decreased?



- A) the amount of carbon dioxide would increase
- B) the bicarbonate concentration in the blood would increase
- C) the amount of oxygen in the blood will decrease
- D) the amount of protons in the blood will increase

43. In animals, the catabolism of which molecules contributes most to the production of nitrogenous wastes?

- A) starch and cellulose
- B) triglycerides and steroids
- C) proteins and nucleic acids
- D) phospholipids and glycolipids

44. Green algae differ from land plants in that many green algae \_\_\_\_\_.

- A) have alternation of generations
- B) have plastids
- C) are unicellular
- D) have cell walls containing cellulose

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45. Retinoic acid, a metabolite of vitamin A, plays a key role in vertebrate development, differentiation, and organogenesis. Retinoic acid normally binds to the RAR receptor to initiate changes in gene expression. Researchers have determined that one type of RAR receptor is found at high levels in muscles, but is not found at all in neurons. How can you explain these findings?
- A) Muscle cells, but not neurons, contain the gene for the RAR receptor.  
 B) The RAR receptor gene is expressed in muscle cells but not neurons.  
 C) Neurons can produce retinoic acid, so they do not need RARs for development.  
 D) RAR transcripts are hydrolyzed by lysosomes in neurons but not in muscle cells.
46. Vertebrate immune cells, which are phagocytic, include which of the following?  
 I) neutrophils; II) macrophages; III) dendritic cells; IV) natural killer cells
- A) I and III only  
 B) II and IV only  
 C) I and IV only  
 D) I, II, and III
47. Stem cell transplants may someday be used to treat Parkinson's disease. How could stem cell transplants alleviate the symptoms of Parkinson's disease?
- A) by preventing temporal lobe seizures  
 B) by repairing sites of traumatic brain injury  
 C) by replenishing missing ion channels  
 D) by secreting the neurotransmitter dopamine
48. Most of the ATP supplies for a skeletal muscle undergoing prolonged exercise come from \_\_\_\_\_.
- A) glucose metabolized by aerobic respiration  
 B) glycolysis  
 C) tropomyosin binding to calcium  
 D) the transfer of a phosphate group from creatine phosphate
49. Coral reefs occur on the southeast coast of the United States, near Florida, but not at similar latitudes on the southwest coast near Los Angeles. Differences in which of the following most likely account for this?
- A) air temperatures driven by precipitation  
 B) day length  
 C) water temperatures driven by ocean currents  
 D) marine salinity differences
50. The feeding relationships among the species in a community determine the community's \_\_\_\_\_.
- A) secondary succession  
 B) ecological niche  
 C) species richness  
 D) trophic structure