

※注意：請於試卷「選擇題作答區」依題號作答。※

一、單選題（每題 2 分，40%）

- (1) The tertiary structure of a protein is the _____.
- (A) bonding together of several polypeptide chains by weak bonds
 - (B) order in which amino acids are joined in a polypeptide chain
 - (C) unique three-dimensional shape of the fully folded polypeptide
 - (D) organization of a polypeptide chain into an α helix or β pleated sheet
 - (E) overall protein structure resulting from the aggregation of two or more polypeptide subunits
- (2) What are the membrane structures that function in active transport?
- (A) peripheral proteins
 - (B) carbohydrates
 - (C) cholesterol
 - (D) cytoskeleton filaments
 - (E) integral proteins
- (3) Why is glycolysis described as having an investment phase and a payoff phase?
- (A) It both splits molecules and assembles molecules.
 - (B) It uses stored ATP and then forms a net increase in ATP.
 - (C) It attaches and detaches phosphate groups.
 - (D) It uses glucose and generates pyruvate.
 - (E) It shifts molecules from cytosol to mitochondrion.
- (4) Which is true of transcription factors?
- (A) They regulate the synthesis of DNA in response to a signal.
 - (B) Some transcribe ATP into cAMP.
 - (C) They initiate the epinephrine response in animal cells.
 - (D) They control which genes are expressed.
 - (E) They are needed to regulate the synthesis of lipids in the cytoplasm.
- (5) The formation of a cell plate is beginning across the middle of a cell and nuclei are re-forming at opposite ends of the cell. What kind of cell is this?
- (A) a plant cell undergoing cytokinesis
 - (B) a plant cell in metaphase
 - (C) an animal cell undergoing cytokinesis
 - (D) an animal cell in metaphase
 - (E) an animal cell in telophase
- (6) What is a karyotype?
- (A) The set of unique physical characteristics that define an individual
 - (B) The collection of all the mutations present within the genome of an individual
 - (C) The combination of chromosomes found in a gamete
 - (D) A system of classifying cell nuclei
 - (E) A display of every pair of homologous chromosomes within a cell, organized according to size and shape

見背面

- (7) Mendel's observation of the segregation of alleles in gamete formation has its basis in which of the following phases of cell division?
- (A) Prophase I of meiosis (B) Prophase II of meiosis
(C) Metaphase I of meiosis (D) Anaphase I of meiosis
(E) Anaphase of mitosis
- (8) One possible result of chromosomal breakage is for a fragment to join a nonhomologous chromosome. What is this alteration called?
- (A) Deletion (B) Translocation (C) Disjunction (D) Inversion (E) Duplication
- (9) Alternative RNA splicing _____.
- (A) can allow the production of proteins of different sizes from a single gene's transcripts
(B) can allow the production of similar proteins from different genes' transcripts
(C) is a mechanism for increasing the rate of transcription
(D) increases the rate of transcription
(E) is due to the presence or absence of particular snRNPs
- (10) For a repressible operon to be transcribed, which of the following must occur?
- (A) A corepressor must be present
(B) RNA polymerase and the active repressor must be present
(C) RNA polymerase must bind to the promoter, and the repressor must be inactive
(D) RNA polymerase cannot be present, and the repressor must be inactive
(E) RNA polymerase must not occupy the promoter, and the repressor must be inactive
- (11) DNA microarrays have made a huge impact on genomic studies because they _____.
- (A) can be used to eliminate the function of any gene in the genome
(B) can be used to introduce entire genomes into bacterial cells
(C) allow the expression of many or even all of the genes in the genome to be compared at once
(D) allow physical maps of the genome to be assembled in a very short time
(E) dramatically enhance the efficiency of restriction enzymes
- (12) Why might the cricket genome have 11 times as many base pairs than that of *Drosophila melanogaster*?
- (A) The two insect species evolved at very different geologic eras.
(B) Crickets have higher gene density.
(C) *Drosophila* are more complex organisms.
(D) Crickets must have more non-coding DNA.
(E) Crickets must make many more proteins.
- (13) Which of Darwin's ideas had the strongest connection to Darwin having read Malthus's essay on human population growth?
- (A) Struggle for existence
(B) Descent with modification
(C) Variation among individuals in a population
(D) The ability of related species to be conceptualized in "tree thinking"
(E) That the ancestors of the Galapagos finches had come from the South American mainland

- (14) Which of these is the most common compound in the cell walls of gram-positive bacteria?
(A) cellulose (B) peptidoglycan (C) lipopolysaccharide (D) lignin (E) protein
- (15) The best time to measure an animal's basal metabolic rate is when the animal _____.
(A) has just completed 30 minutes of vigorous exercise
(B) has not consumed any water for at least 48 hours
(C) has recently eaten a sugar-free meal
(D) is resting and has just completed its first meal of the day
(E) is resting and has not eaten its first meal of the day
- (16) Which of the following hormone actions will occur when more energy is required by a human?
(A) Blood insulin increases. (B) Blood glucagon increases.
(C) Both insulin and glucagon increase. (D) Both insulin and glucagon decrease.
(E) Thyroid hormone is increased.
- (17) What would be the long-term effect if the lymphatic vessels associated with a capillary bed were to become blocked?
(A) More fluid would enter the venous capillaries.
(B) Blood pressure in the capillary bed would increase.
(C) Fewer proteins would leak into the interstitial fluid from the blood.
(D) Fluid would accumulate in interstitial areas.
(E) Nothing would happen.
- (18) Clonal selection is an explanation for how _____.
(A) a single type of stem cell can produce both red blood cells and white blood cells
(B) the V, J, and C gene segments of the immunoglobulin gene are rearranged
(C) an antigen can provoke production of high levels of specific antibodies
(D) HIV can disrupt the immune system
(E) macrophages can recognize specific T cells and B cells
- (19) In animals, nitrogenous wastes are produced mostly from the catabolism of _____.
(A) starch and cellulose (B) triglycerides and steroids
(C) fatty acids and glycerol (D) phospholipids and glycolipids
(E) proteins and nucleic acids
- (20) Which of the following levels of organization is arranged in the correct sequence from most to least inclusive?
(A) ecosystem, community, population, individual
(B) community, ecosystem, individual, population
(C) population, ecosystem, individual, community
(D) individual, population, community, ecosystem
(E) individual, community, population, ecosystem

※下列題目請標明題號，依序作答於試卷內「非選擇題作答區」。可用中文或英文作答※

二、解釋名詞（每題 4 分，20%）

- (1) Adaptive immunity
- (2) Endosymbiosis
- (3) Genetic drift
- (4) Negative feedback
- (5) Selective permeability

三、問答題（每題 10 分，40%）

- (1) 在實驗室中，人為的將一個正在細胞分裂期的培養細胞與剛分裂完成的細胞融合，請問融合後的細胞會發生什麼變化？其原因為何？（10 分）
- (2) 粒線體與葉綠體的光合作用中心（the light-harvesting complex）都涉及電子傳遞鏈（the electron transport chain）的運作，請就能量與產物的觀點來比較這兩者的異同。（10 分）
- (3) 請解釋使神經訊息傳遞維持單一方向之兩個神經傳導的特性。（10 分）
- (4) 請說明防止多重受精（polyspermy）的快速阻斷（fast block）與後期阻斷（slow block）運作的原理。（10 分）

試題隨卷繳回