

96 學年度 生醫工程與環境科學 系(所) 甲 分子生醫光電 組碩士班入學考試

科目 普通生物學 科目代碼 2505 共 5 頁第 1 頁 *請在試卷【答案卷】內作答

I. Questions (50%)

1. What would happen if the different tRNAs in cells could bind to just any amino acid? How does the specificity of tRNA for particular amino acids maintain the integrity of the genetic information? (10%)
2. What is VNTR (variable number tandem repeats)? Why does the FBI (聯邦調查局) use 13 different VNTR regions instead of just 1 VNTR region in identifying criminals with DNA evidence? (10%)
3. Describe the movements of sodium-potassium pump that occur across the membrane of a neuron during an action potential. In which direction, into the cell or out of the cell, do they move? What force moves these ions? How are the gradients maintained? (10%)
4. Give a brief description of the processes — transformation, transduction and conjugation in which the DNA is acquired in bacteria exchange genetic information. (10%)
5. Distinguish between the lytic and the lysogenic viral replication cycles. (10%)

II. Multiple choice (Only one best answer for each question) (50%; 2 points/each)

1. Which type of RNA possesses an anticodon?
(A) mRNA
(B) tRNA
(C) rRNA
(D) all of them have anticodons
(E) none of them have anticodons
2. Why can we use ^3H -thymidine or BrdU (5-bromo-2-deoxyuridine) fluorescent dye to label S-phase in cell cycle?
(A) both are the analogs of DNA nucleotide
(B) they can not be incorporated into the nuclei
(C) cells take them all the time during cell cycles
(D) both are detected by autoradiography
3. In which phase of mitosis do the two sister chromatids separate?
(A) prophase (B) anaphase (C) telophase (D) metaphase (E) prophase II

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4. What microtubule-containing structures organize the cytoskeleton prior to mitosis in animal cells?
(A) basal bodies (B) centrioles (C) chromosomes (D) rough ER (E) mitochondria
5. Sickle cell anemia is caused by the substitution of one base for another resulting in a single amino acid variation in the coding for a hemoglobin molecule. What type of mutation would this be called?
(A) frame shift (B) lethal (C) point (D) transforming (E) backward
6. "Sticky ends" is a term that describes
(A) the DNA that is left behind after bacteria have been removed from a culture plate
(B) the affinity of a restriction enzyme for a particular sequence on the DNA strand
(C) the last sequence of a DNA strand that codes for STOP
(D) the bacterial strain that ends with the same initials as its corresponding restriction enzyme
(E) the unpaired DNA bases after the DNA has been exposed to a restriction enzyme
7. Computers designed to scan large amount of DNA sequence easily identify open reading frames by locating
(A) a repeating string of nucleotide bases
(B) a comparable DNA sequence published on the internet
(C) two equally spaced regions of DNA coding for the same amino acid order
(D) the AUG start codon and UGA stop codon
(E) sections of DNA that match the code for a specific gene
8. What is recombinant DNA?
(A) Recombinant DNA is DNA formed by joining together DNA fragments of different organisms.
(B) Recombinant DNA is DNA formed by rearranging the sequence of genes on a single strand of existing DNA.
(C) Recombinant DNA is DNA formed by splicing RNA into existing DNA strands.
(D) Recombinant DNA is DNA formed from synthetic nucleotides.
(E) Recombinant DNA is DNA formed by replication of an existing DNA strand.
9. Which pathway is known as the anaerobic pathway of cellular respiration?
(A) glycolysis
(B) Krebs cycle
(C) electron transport system
(D) photosynthesis
(E) glycolysis and Krebs cycle

10. The maintenance of nearly constant internal conditions is referred to as:
- (A) homeopathy
 - (B) homeotic
 - (C) staticity
 - (D) homeostasis
 - (E) hyperion
11. Which hormone is found in both males and females?
- (A) FSH (B) estrogen (C) testosterone (D) progesterone (E) all of them
12. What kind of cell makes antibodies?
- (A) neutrophils
 - (B) eosinophils
 - (C) T lymphocytes
 - (D) B lymphocytes
 - (E) T lymphocytes and B lymphocytes
13. What is the function of antidiuretic hormone (ADH)?
- (A) It regulates blood glucose levels
 - (B) It causes the retention of water
 - (C) It is responsible for uterine contractions
 - (D) It is released in response to fear
14. Which structure store calcium ions necessary for muscle contraction?
- (A) plasma membrane (B) motor neuron (C) sarcoplasmic reticulum (D) T tubule
15. How is water used in photosynthesis?
- (A) It helps ATP synthase make ATP.
 - (B) It provides electrons to fill electron "hole" in the P680 molecule.
 - (C) Water is not used at all in photosynthesis
 - (D) It carries electrons to the light-independent reactions (Calvin cycle)
16. Gene regulation in eukaryotes includes all of the following levels of control EXCEPT:
- (A) controls that affect the rate of gene transcription
 - (B) controls that govern cutting and splicing of mRNA transcripts
 - (C) controls that affect the precision of mRNA transcription
 - (D) controls that regulate which mRNA transcripts will be translated into polypeptides

17. Which of the following factors can affect the evolution of a population?
- (A) climate
 - (B) mutation
 - (C) food availability
 - (D) introduction of a new predator
 - (E) all of the above
18. Which of the following is the best example of negative feedback?
- (A) An increase in body temperature resulting from shivering due to a decrease in body temperature
 - (B) An increase in body temperature resulting from exercise
 - (C) An increase in body temperature resulting from exposure to sun
 - (D) An increase in body temperature resulting from fever
 - (E) All of the above
19. Arteries are different from veins in which one of the following ways?
- (A) Arteries carry oxygenated blood; veins carry deoxygenated blood.
 - (B) Arteries carry blood away from the heart to capillary beds; veins carry blood toward the heart from capillary beds.
 - (C) Arteries are thin-walled; vein are thick-walled.
 - (D) Arteries have one-way valves to prevent backflow of blood; veins have two-way valves to allow for backflow of blood.
20. What is the name for the number of deaths per year in a population divided by the total number individuals in the population?
- (A) gross birth rate
 - (B) gross fatality rate
 - (C) gross mortality rate
 - (D) net mortality rate
 - (E) net birth rate
21. Sex determination in *Drosophila* is regulated by which cellular mechanism?
- (A) addition of a 5' cap
 - (B) differential splicing
 - (C) post-translational processing
 - (D) choice of alternative poly(A) sites
22. A locally folded region of tertiary structure interconnected by the polypeptide strand into the whole molecule:
- (A) Epitope
 - (B) Ligand
 - (C) Domain
 - (D) Motif

23. To express mammalian genes in a bacterium such as *E. coli*, the vector must have
- (A) a bacterial promoter
 - (B) a Shine-Dalgarno sequence
 - (C) a Goldberg-Hogness box
 - (D) both A and B
 - (E) all of the above
24. Which conformation for a DNA molecule runs *fastest* in electrophoresis?
- (A) linear
 - (B) nicked circle
 - (C) supercoiled
25. What is a high-throughput bio-technique to study many genes at the same time?
- (A) PCR
 - (B) Electrophoresis
 - (C) Flow cytometry
 - (D) microarray / gene chip
 - (E) Western Blot

~End~