

※ 注意：請於試卷上「非選擇題作答區」標明大題及小題題號，並依序作答。

一、單選題 (每題兩分, 共 40 分)

1. Which of the following statements regarding DNA packing is *false*?
(A) A nucleosome consists of DNA wound around a protein core of eight histone molecules.
(B) DNA packing tends to promote gene expression.
(C) Highly compacted chromatin is generally not expressed at all.
(D) Prokaryotes have proteins analogous to histones.
(E) None of above
2. Which of the following animals has a three-chambered heart?
(A) snake
(B) crocodile
(C) human
(D) bird
(E) shark
3. The main function of the AV node is to
(A) initiate the heartbeat.
(B) set the rhythm of the heartbeat.
(C) relay the signal for the heart to contract from the right ventricle to the right atrium.
(D) relay a signal for the ventricles to contract.
(E) detect the vibration of heart muscle
4. Which of the following organisms has a respiratory system that does not require assistance from a circulatory system for gas exchange?
(A) turtle
(B) mouse
(C) carp
(D) crayfish
(E) grasshopper
5. Which of the following is the mechanism of post-transcriptional regulation of gene expression.
I. RNA interference. II. Alternative splicing. III. Histone modification.
IV. miRNA-mediated gene silencing V. DNA methylation.
(A) I, II, III
(B) II, IV
(C) I, II, IV,
(D) I, II, IV, V
(E) I, II, III, IV, V

見背面

6. What prompts a newborn baby to start to breathe?
 - (A) an increase in the concentration of carbon dioxide in the baby's blood
 - (B) a decrease in the concentration of oxygen in the baby's blood
 - (C) a change in the temperature on the surface of the skin
 - (D) exposure to air
 - (E) all of above

7. Natural killer cells
 - (A) are phagocytes that attack and kill pathogenic microorganisms.
 - (B) are a kind of epithelial cells
 - (C) tag pathogenic microorganisms with antibodies.
 - (D) "eat" microorganisms that have been tagged with antibodies.
 - (E) attack virus-infected cells by releasing chemicals that lead to cell death.

8. Human saliva performs all of the following functions *except*
 - (A) neutralizing food acids.
 - (B) controlling bacterial populations.
 - (C) hydrolyzing starch.
 - (D) hydrolyzing proteins.
 - (E) none of above

9. When a B cell first interacts with its particular antigen, the B cell
 - (A) dies after destroying the antigen.
 - (B) engulfs the antigen and digests it.
 - (C) differentiates and develops into a clone of antibody-producing effector cells.
 - (D) alters the chemical configuration of the antigen.
 - (E) activates macrophage

10. Which of the following pairs of hormones have opposite effects?
 - (A) testosterone and melatonin
 - (B) progesterone and insulin
 - (C) parathyroid hormone and calcitonin
 - (D) oxytocin and prolactin
 - (E) estrogen and TSH

11. Increased activity in the sympathetic nervous system leads to _____
 - (A) decreased heart rate
 - (B) increased secretion by the pancreas
 - (C) increased contractions of the stomach
 - (D) relaxation of the airways in the lungs
 - (E) induction of sleeping

12. Emotional responses and memories are linked in which part of the brain?
(A) amygdala
(B) cerebellum
(C) cerebrum
(D) pons
(E) none of above
13. The structure of the mammalian middle ear is adapted to convert _____.
(A) air pressure waves to electric signal
(B) fluid pressure waves to air pressure waves
(C) air pressure waves to nerve impulses
(D) fluid pressure waves to nerve impulses
(E) air pressure waves to fluid pressure waves
14. Connective tissues typically have _____.
(A) little space between the membranes of adjacent cells
(B) the ability to transmit electrochemical impulses
(C) the ability to shorten upon stimulation
(D) relatively few cells and a large amount of extracellular matrix
(E) pigments
15. Which of the following is present in double-stranded cDNA but absent in the corresponding genomic DNA?
(A) Promoter sequences
(B) A homopolymeric sequence of A:T base pairs
(C) Intron sequences
(D) 5' and 3' UTRs
(E) Exon sequences
16. The sodium-potassium pump is called an electrogenic pump because it _____.
(A) pumps equal quantities of Na⁺ and K⁺ across the membrane
(B) contributes to the membrane potential
(C) ionizes sodium and potassium atoms
(D) is used to drive the transport of other molecules against a concentration gradient
(E) does not pump water.
17. Which of the following genotypes due to nondisjunction of sex chromosomes is lethal?
(A) XXX
(B) OY
(C) XXY
(D) XO
(E) none of above

見背面

18. A genetic analysis of an unknown infectious agent reveals that it contains only the nucleotides G, A, U, and C in the proportion 30%, 35%, 15%, and 20%, respectively. Based on this information, this infectious agent is most likely a
- (A) double-stranded DNA virus
 - (B) double-stranded RNA virus
 - (C) single-stranded DNA virus
 - (D) single-stranded RNA virus
 - (E) bacterium.
19. Why must some hormones bind to a membrane receptor on a target cell's surface in order to activate it?
- (A) for activation by ATP
 - (B) because they are not water-soluble
 - (C) because they are not positive charged
 - (D) to stimulate endocytosis to internalize the hormone
 - (E) because they cannot cross cell membranes
20. The steroid hormone aldosterone affects only a small number of cells in the body because _____
- (A) only target cells are exposed to aldosterone
 - (B) only target cells contain aldosterone receptors
 - (C) aldosterone is unable to enter nontarget cells
 - (D) nontarget cells destroy aldosterone before it can produce any effect
 - (E) aldosterone is hydrophobic

二、解釋名詞：(每題四分，共 28 分)

1. Telomere
2. Nephron
3. Microbiome
4. Programed cell death
5. Gastrulation
6. Convergent evolution
7. Phylogenetic tree

三、問答題 (共 32 分)

1. 請舉出植物體內三大組織系統。(六分)
2. 請描述植物初級生長和次級生長的區別 (四分)
3. 請敘述 symplastic 和 apoplastic 運輸方式的差別 (四分)

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4. 請描述光合作用中 Photosynthetic carbon reduction cycle (六分)
5. 當植物體內缺乏具有高移動性的元素時, 植物病徵會出現在植物體的甚麼位置? (兩分)
請解釋原因 (四分)
6. 植物吸收外界養分的方式有三種, 其中一種為 facilitated diffusion, 請列舉出另外兩種 (四分)
7. 目前全球正面臨溫室效應的威脅, 請解釋導致溫室效應的原因, 以及其影響 (兩分)

試題隨卷繳回

