

一、選擇題 (Choose the one best answer) (每題 2 分) ※請作答於試卷內之「選擇題作答區」

- Which of the following is a hormone produced by adipose cells that helps to control appetite?
(A) insulin (B) bile (C) glucagon (D) leptin (E) pepsinogen
- In comparing the kidneys of marine and freshwater fish which of the following is NOT true?
(A) marine fish drink greater quantities of water (B) the flow of the filtrate is faster in marine fish
(C) freshwater fish have larger glomeruli (D) the urine is less concentrated in freshwater fish
- Which part of the brain sorts incoming information into categories (such as touch signals from a finger) before relaying it to the cerebral cortex?
(A) Hypothalamus (B) Thalamus (C) Basal ganglia (D) Hippocampus (E) Pons
- The multiple states of sleep can be revealed by recording the electrical activity of the brain in a(n)
(A) EKG (B) MRI (C) EEG (D) PET
- In which of the following vessels is the blood pressure lowest?
(A) arteries in the head (B) arterioles in the head (C) capillaries in the head
(D) venules in the head (E) veins in the head
- When you hold your breath, which of the following blood gas changes leads initially to the urge to breathe again?
(A) rising oxygen concentration (B) rising carbon dioxide concentration (C) falling oxygen concentration
(D) falling carbon dioxide concentration (E) falling nitrogen concentration
- The hydrochloric acid in the stomach
(A) is secreted by the parietal cells (B) increases gastrin secretion (C) activates trypsinogen
(D) is released in response to food entering the small intestine
- Although birds and mammals descended from different ancestors, they both have a four-chambered heart. This is the result of
(A) the simplification of the cardiovascular system (B) the necessity for rapid movement of blood
(C) the importance of entirely filling the chest cavity (D) nature selecting adaptations of two unrelated individuals in response to similar environmental challenges (E) genetic aberrations that resulted from mistakes in somatic cell division
- Arrange the following stages of fertilization and early development into a proper sequence.
I. onset of new DNA synthesis IV. acrosomal reaction; plasma membrane depolarization
II. cortical reaction V. fusion of egg and sperm nuclei complete
III. first cell division
(A) V, I, IV, II, III (B) IV, II, I, V, III (C) IV, II, V, I, III (D) III, V, I, IV, II
- Which of the following is NOT true about helper T cells?
(A) They function in both cell-mediated and humoral immune responses. (B) They bear surface CD4 molecules. (C) They recognize polysaccharide fragments presented by MHC-II molecules. (D) They are subject to infection by HIV. (E) When activated, they secrete cytokines that stimulate other lymphocytes.
- The nucleoid region of a prokaryotic cell
(A) contains the cell's DNA (B) is surrounded by a membrane (C) contains the cell's nucleolus
(D) is a component of the cell wall
- Through which mechanism does ATP synthase obtain energy to synthesize ATP?
(A) glycolysis (B) chemiosmosis (C) fermentation (D) endocytosis

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13. Which of the following is not a component of the endomembrane system?
(A) rough ER (B) Golgi apparatus (C) mitochondria (D) lysosome
14. Which of the following mechanism is involved in both cellular respiration and photosynthesis, although the components and locations are different?
(A) The Krebs cycle (B) The Calvin cycle (C) glycolysis (D) electron transport chain
15. In human, the 22 pairs of chromosomes that don't include the sex chromosomes are called
(A) polysome (B) autosomes (C) somatic chromosomes (D) diploids
16. A micrograph of a dividing cell from a mouse showed 19 chromosomes, each consisting of two sister chromatids. During which of the following stages of cell division could this picture been taken?
(A) prophase I (B) metaphase I (C) metaphse II (D) telophase II
17. When animal cells are grown in a Petri dish, they typically stop dividing once they have formed a single layer on the bottom of the dish. The arrest of division is an example of
(A) density -dependent inhibition (B) growth factor desensitization
(C) cell division suppression (D) nutrient depletion
18. Whether an allele is dominant or recessive depends on
(A) how common the allele is, relative to other alleles
(B) which chromosome it is on
(C) whether it or another allele determines the phenotype when both are present
(D) whether it is inherited from the mother or the father
19. A geneticist found that a particular mutation had no effect on the polypeptide encoded by a gene. This mutation probably involved
(A) deletion of one nucleotide in the coding region
(B) substitution of one nucleotide in the coding region
(C) insertion of one nucleotide in the coding region
(D) alternation of the start codon
20. If the coding strand of a gene has a sequence of 5'-GCCATT-3', what is the corresponding sequence in the mRNA molecule from 5' to 3'
(A) AATGGC (B) UUTGGC (C) GCCAUU (D) AAUGGC
21. Which of the following processes accounts for the tremendous variation in antibody structure?
(A) RNA editing (B) site-specific recombination (C) integrase activity
(D) mutations in the immunoglobulin genes
22. The so-called "second genetic code" is related to the function of
(A) aminoacyl-tRNA synthetase (B) peptidyltransferase (C) the small subunit of ribosome
(D) the large subunit of ribosome
23. Which of the following is true about mutations?
(A) mutations are usually dominant (B) mutation is a nonrandom, adaptive process
(C) mutations always affect the phenotype (D) a new mutation stands for a new allele of the gene
24. Which of the following techniques can be used to monitor global gene expression of a genome?
(A) Western blot analysis (B) NMR (C) PCR (D) DNA microarray
25. Which of the following will not alter the frequency of alleles in the population?
(A) mutation (B) natural selection (C) genetic drift (D) nonrandom mating

※下列題目請標明題號(不必抄題)，依序作答於試卷內「非選擇題作答區」

二、短文閱讀

The lizard *Anolis carolinensis* lives in the woodlands of the southeastern United States. The breeding season begins in April. The eggs produced by a female during the 3-month breeding season will total twice her body mass. A researcher brought a large group of sexually inactive adult lizards into the laboratory during the winter and divided them into 5 treatment groups. The physical environment was the same in all treatment groups, including identical food, daytime and nighttime temperature settings. The researcher also continued to monitor the condition of lizards that remained in natural habitats nearby. The biologist exposed the 5 treatment groups in the laboratory to artificial lighting that simulated the long days and short nights of spring. The social setting was varied among treatment groups, which shown in the Table 1. Each week, the researcher examined the ovaries of females in each group. He also monitored the ovaries of females in nearby natural (winter) habitat. As Table 1 shows, the differences in the animals' reproductive systems were dramatic. Females that were exposed to springlike conditions began producing eggs; females in the natural habitat did not.

Table 1 Percentage of females with mature follicles

Weeks	Female in natural (winter) habitat	Female paired with male	Female with group of males	Female with group of castrated males	All-female group	Female alone
0	0	0	0	0	0	0
1	0	30	0	0	0	0
2	0	100	90	50	10	10
3	0	100	100	66	60	50
4	0	100	100	90	90	90
5	0	100	100	90	90	90
6	0	100	100	90	90	90

根據以上的短文和附表，回答下列問題：

A. 判斷下列敘述是否正確？並請說明你所根據的理由。(12分)

- (1) Females do not need to be exposed to springlike light to produce eggs.
- (2) Females produced more eggs more quickly when exposed to breeding males.
- (3) Females paired with a single male did not have any advantages over the other females in the study.
- (4) Females paired with castrated males had no disadvantages relative to the other females in the study.

B. Some critics contend that the females that remained outside do not represent a legitimate control in this experiment. What conditions would represent a better control? (3分)

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三、Why is the sigmoidal shape of the oxygen-hemoglobin dissociation curve significant? (5分)

四、配合題

A. sponges	B. hydras	C. planarians	D. hookworms	E. squids
F. earthworms	G. lobsters	H. sea stars	I. monkeys	

請由上方選項(A-I)中，選出符合下列各小題的項目。(10分)

- (1) The animals that have true tissues and radial symmetry _____
- (2) The animals that have a notochord _____
- (3) Segmented animals with hydroskeleton _____
- (4) The animals that are bilateral symmetry and no body cavity _____
- (5) The animals that have a pseudocoelom and a complete digestive tract _____

五、名詞解釋(20分)

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|--------------------------------------|------------------------|
| (1) species diversity | (4) receptor potential |
| (2) endotherm | (5) motor unit |
| (3) major histocompatibility complex | |

試題隨卷繳回