

1. How can helper T cells stimulate both humoral and cell-mediated immunity? (8 分)
2. Please explain: (1) The functions of the Calvin cycle. (2) Why a chemical that inhibits an enzyme of the Calvin cycle will also inhibit the light reactions of photosynthesis? (12 分)
3. 請比較單子葉植物(monocots)與雙子葉植物(dicots)於(1) Seed leaves, (2) Leaf veins, (3) Stems, (4) Flowers, 及(5) Roots 之主要差異。(10 分)
4. 請描述被子植物(angiosperm)之生活史(life cycle), 需提及配子體發育(gametophyte development)與受精(fertilization)等過程。(10 分)
5. 請描述野火(wildfire)發生於森林時, 對生態系(ecosystem)之植物、動物或微生物之影響為何?(10 分)
6. To study the inheritance of the white-eye trait in *Drosophila melanogaster*, Morgan crossed the white-eyed male to a red-eyed female and found that all of the F1 offspring had red eyes. The F1 offspring were then mated to each other, which generated 2,459 red-eyed females, 1,011 red-eyed males, and 782 white-eyed males.
 - (1) How will you interpret these experimental data? (4 分)
 - (2) If you are asked to get white-eyed female offspring, how will you do it? (2 分)
7. Using *Neurospora* as the experimental system to study biosynthetic pathways of niacin, George Beadle and E. L. Tatum concluded from their studies that genes control the production of enzymes required for niacin biosynthesis. They then proposed the 'one-gene-one-enzyme hypothesis'. What might be wrong with this hypothesis? (5 分)
8. Regarding the cell cycle and chromosome replication in eukaryotes:
 - (1) Why are most fungi and some protists known as 'haploid-dominant species'? (2 分)
 - (2) What is meant by aneuploidy and polyploidy, respectively? (2 分)
9. Please explain: (每 1 小題 2 分)
 - (1) Allopatric speciation
 - (2) DNA fingerprinting
 - (3) Operon
 - (4) Pleiotropy
 - (5) Transcriptome
10. 選擇題, 每 1 小題 1 分: ※ 注意: 請於試卷內之「選擇題作答區」依序作答。
 - (1) Characteristic of simple epithelium is that they
 - A. are arranged indiscriminately
 - B. continue to divide and help in organ function
 - C. Make a definite layer
 - D. None of above
 - (2) Collagen is
 - A. lipid
 - B. fibrous protein
 - C. globular protein
 - D. carbohydrate
 - (3) Which of the following best illustrates homeostasis?
 - A. Most adult humans are between 5 and 6 feet tall.
 - B. The lungs and intestines have large surface areas
 - C. When blood salt concentration goes up, the kidney expels more salt.
 - D. All the cells of the body are about the same size
 - E. When oxygen in the blood decrease, you feel dizzy.
 - (4) Negative-feedback mechanisms are:
 - A. most often involved in maintaining homeostasis
 - B. activated only when a variable rises above a set point

- C. analogous to a furnace that produces heat
D. involved in contractions during childbirth
E. found only in birds and mammals
- (5) The energy content of fats
A. is released by bile salts
B. may be lost unless an herbivore eats some of its feces
C. is more than two times that of carbohydrates or proteins
D. can reverse the effects of malnutrition
E. Both 3 and 4 are correct
- (6) Which of the following is mismatched with its function?
A. most B vitamins – coenzymes
B. Vitamin E – antioxidant
C. Vitamin K – blood clotting
D. Iron – component of thyroid hormones
E. Phosphorous –bone formation, nucleotide synthesis
- (7) What is the function of the cilia in the trachea and bronchi?
A. to sweep air into and out of the lungs
B. to increase the surface area for gas exchange
C. to vibrate when air is exhaled to produce sounds
D. to dislodge food that may have slipped past the epiglottis
E. to sweep mucus with trapped particles up and out of the respiratory tract
- (8) Which one of the following mammalian cells is not capable of metabolizing glucose to carbon dioxide aerobically?
A. liver cells
B. red blood cells
C. white bold cells
D. un-striated muscle cells
- (9) Which organ receives only oxygenated blood?
A. lung
B. liver
C. spleen
D. gill
- (10) If pancreas is removed, the compound which remain undigested is
A. proteins
B. carbohydrates
C. fats
D. all of the above
- (11) Uric acid is the chief nitrogenous wasters in
A. frog
B. birds
C. fishes
D. man
- (12) During fasting, in what sequence that are the following organic compounds used up by the body?
A. First fats, next carbohydrates and lastly proteins
B. First carbohydrates, next proteins and last lipids
C. First proteins, next lipids and lastly carbohydrates
D. First carbohydrates, next fats and lastly proteins

- (13) The functional unit of contractile system in striated muscle is
- myofibril
 - cross bridges
 - Z band
 - Sarcomere
- (14) The contractile protein of skeletal muscle involving ATPase activity is
- actin
 - myosin
 - troponin
 - tropomyosin
- (15) What is the name of the iron-containing protein that gives red blood vessel their color?
- hemocyanin
 - pyrite
 - hemoglobin
 - myoglobin
- (16) A rise in blood cholesterol may lead to a deposition of cholesterol on the walls of blood vessels. This causes the arteries to lose their elasticity and get stiffened. This is called:
- hypertension
 - hypotension
 - arteriosclerosis
 - systolic pressure
- (17) Cornea transplant in humans is almost never rejected. This is because
- it is composed of enucleated cells
 - it is a non living layer
 - it has no blood supply
 - its cells are least penetrable by bacteria
- (18) During the propagate ion of a nerve ion of a nerve impulse, the action potential results from the movement of
- K⁺ ions from intracellular fluid to extracellular fluid
 - K⁺ ions from extracellular fluid to intracellular fluid
 - Na⁺ ions from extracellular fluid to intracellular fluid
 - Na⁺ ions from intracellular fluid to extracellular fluid
- (19) Alzheimer's disease in human is associated with the deficiency of
- dopamine
 - glutamic acid
 - acetylcholine
 - gamma aminobutyric acid
- (20) The cells responsible for color vision in vertebrates are called
- rod cells
 - cone cells
 - bipolar cells
 - cupula cells
 - ampullae
- (21) Two antagonistic hormones are
- MSH and TSH
 - calcitonin and parathyroid hormone
 - ADH and GH

D. oxytocin and prolactin

(22) Which of the following statements about prostaglandins is true?

- A. They are one of the types of target cells
- B. They are produced by endocrine glands.
- C. They travel throughout the body by circulating in the blood.
- D. All of the above are true.
- E. None of the above is true.

(23) Type I diabetes mellitus is caused by a deficiency of

- A. exercise
- B. glucagon
- C. glucose
- D. glycol
- E. insulin

(24) Which of the following is an example of an autocrine regulator?

- A. insulin
- B. prostaglandins
- C. nitric oxide
- D. all of the above
- E. none of the above

(25) Nerve impulses are normally carried toward a neuron cell body by the neuron's

- A. Synaptic cleft
- B. Axon
- C. Hormones
- D. Dendrites

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