

一、選擇題(共 50 分；1-10 題每題 2.5 分；11-35 題每題 1 分) ※ 注意：請於試卷內之「選擇題作答區」依序作答。

1. Epistasis is \_\_\_\_\_. A. Another term of over dominance; B. When one gene can mask the expression of a second gene; C. A trait that is only expressed in one sex of the species; D. When two dominant alleles can be expressed in the same individual. E. None of the answers are correct.
2. Which of the following is not correct concerning epistatic interactions? A. They are often associated with enzymatic pathways; B. They produce variations in the expected 9:3:3:1 ratio of a dihybrid cross; C. They always results in a 9:7 ratio of a dihybrid cross; D. They are due to gene interactions.
3. The physical structure that is formed when two chromatids cross over is called a(n) \_\_\_\_\_. A. Synaptomenal complex; B. Bivalent; C. Karyotype; D. Chiasma.
4. The visual proof that chromosomes exchange pieces of information during crossing over was provided by \_\_\_\_\_. A. Bateson and Punnett; B. Morgan and Bridges; C. Creighton and McClintock; D. Watson and Crick.
5. The individual who is credited with producing the first genetic linkage map is \_\_\_\_\_. A. Thomas Hung Morgan; B. Gregor Mendel; C. Alfred Sturtevant; D. Barbara McClintock.
6. When Mendel crossed two plants that were heterozygous for a single trait, what were the phenotypic and genotypic ratios of their offspring? A. 1:2:1 and 3:1; B. 3:1 and 1:2:1; C. 9:3:3:1 and 9:3:3:1; D. 3:1 and 3:1; E. 1:2:1 and 1:2:1.
7. Mendel's work with two-factor (dihybrid) crosses led directly to which of the following? A. Law of segregation; B. Law of independent assortment; C. Chromosomal theory of inheritance; D. Theory of biological evolution.
8. In humans, patterns of inheritance are often studied using which of the following? A. Dihybrid test crosses; B. Pedigree analysis; C. Production of true-breeding lines; D. Self-fertilization.
9. A heterozygote possesses a phenotype that is intermediate between the homozygous dominant and homozygous recessive phenotypes. This is most likely an example of \_\_\_\_\_. A. Lethal alleles; B. Incomplete dominance; C. Gene dosage; D. Sex-influenced inheritance.
10. The general purpose of the synaptonemal complex is to \_\_\_\_\_. A. enable the reformation of the cell wall during cytokinesis; B. provide a link between homologous chromosomes in meiosis; C. separate the sister chromatids during anaphase; D. to independently assort the chromosomes during metaphase of meiosis; E. None of the answers are correct.

**11. 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.

**12. 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

**13. 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

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**14. Collagen is**

- A. lipid
- B. fibrous protein
- C. globular protein
- D. carbohydrate

**15. 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

**16. 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 C and D are correct

**17. 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

**18. 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 blood cells
- D. un-striated muscle cells

**19. If pancreas is removed, the compound which remain undigested is**

- A. proteins
- B. carbohydrates
- C. fats
- D. all of the above

**20. Which organ receives only oxygenated blood?**

- A. lung
- B. liver
- C. spleen
- D. gill

**21. Uric acid is the chief nitrogenous wasters in**

- A. frog
- B. birds
- C. fishes
- D. man

**22. The contractile protein of skeletal muscle involving ATPase activity is**

- A. actin
- B. myosin
- C. troponin
- D. tropomyosin

**23. What is the name of the iron-containing protein that gives red blood vessel their color?**

- A. hemocyanin
- B. pyrite
- C. hemoglobin
- D. myoglobin

**24. 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:**

- A. hypertension
- B. hypotension
- C. arteriosclerosis
- D. systolic pressure

**25. 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

**26. The functional unit of contractile system in striated muscle is**

- A. myofibril
- B. cross bridges
- C. Z band
- D. Sarcomere

**27. Cornea transplant in humans is almost never rejected. This is because**

- A. it is composed of enucleated cells
- B. it is a non living layer
- C. it has no blood supply
- D. its cells are least penetrable by bacteria

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**28. During the propagate ion of a nerve ion of a nerve impulse, the action potential results from the movement of**

- A. K<sup>+</sup> ions from intracellular fluid to extracellular fluid
- B. K<sup>+</sup> ions from extracellular fluid to intracellular fluid
- C. Na<sup>+</sup> ions from extracellular fluid to intracellular fluid
- D. Na<sup>+</sup> ions from intracellular fluid to extracellular fluid

**29. Alzheimer's disease in human is associated with the deficiency of**

- A. dopamine
- B. glutamic acid
- C. acetylcholine
- D. gamma aminobutyric acid

**30. The cells responsible for color vision in vertebrates are called**

- A. rod cells
- B. cone cells
- C. bipolar cells
- D. cupula cells
- E. ampullae

**31. Two antagonistic hormones are**

- A. MSH and TSH
- B. calcitonin and parathyroid hormone
- C. ADH and GH
- D. oxytocin and prolactin

**32. 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.

**33. Type I diabetes mellitus is caused by a deficiency of**

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

**34. 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

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35. Nerve impulses are normally carried toward a neuron cell body by the neuron's

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

二、問答題(共 50 分)： ※ 注意：請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

1. Please describe the procedure for producing monoclonal antibodies. (10 分)
2. What evidences are used to determine the phylogeny of prokaryotes? (5 分)
3. How does the photosynthesis of cyanobacteria differ from that of the photosynthesizing green sulfur bacteria? (10 分)
4. In animals, the cell cycle is controlled by a molecular control system which involves cyclic changes of regulatory proteins. As well, it is regulated at certain checkpoints (G1, G2, and M) by both internal and external signals. Please describe in details exactly how is the cell cycle regulated? (9 points)
5. What are the important factors which might contribute to the evolution of genomes and genes? (6 points)
6. Please explain the following terms: (each 2 points)

- (1) CRISPR
- (2) Epistasis
- (3) Long noncoding RNAs (lncRNAs)
- (4) Genomic imprinting
- (5) Single nucleotide polymorphism (SNP)

試題隨卷繳回