

科目 生物學 科號 0802、1002 共 7 頁第 1 頁 \*請在試卷【答案卷】內作答

I. 問答題(60%)

1. (a) What is insulin? Your answer needs to describe its chemical composition and function. (4%) (b) Describe the route of insulin from its production to its exit from the cell. Your answer needs to include a drawing of cell and cellular compartments for illustration. (6%) (c) Several different microscopes can be used in the study of cell biology like (b). Please list those instruments and describe their functions in the research, respectively. (5%)
2. (a) Describe the difference between mitosis and meiosis. (6%) (b) There are five different drugs: griseofulvin, vancomycin, vinblastin, metronidazole, and taxol. Some of them are useful in the chemotherapy of cancer. Please choose a chemotherapeutic drug used for cancer treatment among these agents and describe the molecular actions of this drug. (5%) (c) Suppose you are the director of research for a pharmaceutical company. What kind of candidate drugs is most likely to be worth developing as a cancer chemotherapy agent? Explain your reason at a molecular basis. (4%)
3. (a) What are the pathways of energy and nutrients through communities? (5%) (b) How does energy flow through communities? (5%)
4. (a) How did evolutionary thought evolve? (5%) (b) How do we know that evolution has occurred? (5%)
5. (a) What is a species? (5%) (b) How is reproductive isolation between species maintained? (5%)

II. 選擇題(單選，如無適當答案請選 0) 40%

1. The supporting structure of our out ears is
  - a. loose connective tissue
  - b. cartilage
  - c. fibrous connective tissue
  - d. adipose tissue
  - e. blood
2. The circulatory system includes all of the following structures *except* the
  - a. heart
  - b. lymph vessels
  - c. lymphocytes
  - d. blood vessels
  - e. lymph nodes
3. Some amino acids are called essential because
  - a. they cannot be made from other amino acids by the animal in question
  - b. they are essential as an energy source
  - c. they are needed by all animals
  - d. they are required for making nucleic acids
  - e. they are required for making protein

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4. A neurotransmitter that is associated with sleep, mood, attention, and learning is

- a. endorphins
- b. acetylcholine
- c. GABA
- d. epinephrine
- e. serotonin

5. Which, if any, of the following substances does *not* cross the placenta?

- a. tetracycline
- b. cocaine
- c. antibody
- d. alcohol
- e. all of the above cross the placenta

6. Reproductive systems with external fertilization are most common in

- a. populations with many more females than males
- b. aquatic animals
- c. populations with more males than females
- d. terrestrial animals
- e. animals that are widely dispersed

7. Steroid sex hormone includes the following hormones *except*

- a. androgens
- b. progestins
- c. prolactin
- d. estrogens
- e. all of the above are steroid sex hormones

8. Hormone is found as one of the following classes of compounds *except*

- a. steroids
- b. proteins
- c. peptides
- d. saccharides
- e. amines

9. The main component of the white material in bird droppings is

- a. uric acid
- b. ammonia
- c. lactic acid
- d. urea
- e. lactic acid

10. The functional unit of the kidney is

- a. Bowman's capsule
- b. renal unit
- c. glomerulus
- d. urethra
- e. nephron

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11. One form of vaccine consists of a solution containing
  - a. inactivated horse serum
  - b. interferon
  - c. a viable but harmless variant strain of a pathogenic microorganism
  - d. antibiotics
  - e. histamine
12. The virus that causes AIDS infects preferentially
  - a. natural killer cells
  - b. cytotoxic T cells
  - c. helper T cells
  - d. plasma cells
  - e. memory cells
13. Which is the largest blood vessel in the human body?
  - a. pulmonary vein
  - b. pulmonary artery
  - c. superior vena cava
  - d. maxims artery
  - e. aorta
14. The primitive Earth's atmosphere is most likely to consist of the following *except*
  - a.  $H_2O$
  - b.  $NH_3$
  - c.  $CH_4$
  - d.  $O_2$
  - e.  $CO_2$
15. Which of the following are pyrimidines?
  - a. adenine and guanine
  - b. thymine and cytosine
  - c. thymine and adenine
  - d. uracil and guanine
  - e. adenine and uracil
16. Why are most plants green?
  - a. chlorophyll reflects green light
  - b. green is the best color light for plant growth
  - c. carotenoids reflect green light
  - d. chlorophyll primarily uses green light as the source of energy for photosynthesis
  - e. chlorophyll absorbs green light
17. The light reactions of photosynthesis produce
  - a. glucose, ADP,  $NADP^+$
  - b. glucose, ADP,  $NADP^+$ ,  $CO_2$
  - c. ATP, NADPH,  $O_2$
  - d. ATP,  $NADP^+$
  - e. ATP, NADPH,  $CO_2$

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18. The Krebs cycles produce the following end-products *except*
- CO<sub>2</sub>
  - ATP
  - NADH
  - FADH<sub>2</sub>
  - pyruvic acid
19. Which of the following substances will be difficult to cross a plasma membrane by diffusion?
- water
  - O<sub>2</sub>
  - CO<sub>2</sub>
  - butane
  - Na<sup>+</sup>
20. Which of the following statements is true?
- A solute is the dissolving agent of a solution.
  - A solution with pH = 1 is weakly acidic.
  - A buffer donates hydrogen ions when conditions become too basic and accepts hydrogen ions when conditions become too acidic.
  - A buffer is an acid used to offset overly basic conditions in the body.
  - A single unit change on the pH scale is equivalent to a 1% change in hydrogen ion concentration.
21. \_\_\_\_\_ and \_\_\_\_\_ generate variation, while \_\_\_\_\_ results in adaptation to the environment.
- genetic drift . . . natural selection . . . mutation
  - mutation . . . sexual recombination . . . natural selection
  - overproduction of offspring . . . mutation . . . sexual recombination
  - natural selection . . . mutation . . . sexual recombination
  - sexual recombination . . . natural selection . . . mutation
22. The smallest unit that can evolve is a
- species.
  - genotype.
  - gene.
  - population.
  - morph.
23. The ultimate source of all genetic variation is
- natural selection.
  - genetic drift.
  - sexual recombination.
  - the environment.
  - mutation.
24. Which of the following taxonomic categories contains all the others?
- genus
  - class
  - family
  - subclass
  - order

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25. Organisms that survive mass extinctions
- often diversify, taking advantage of new opportunities.
  - usually are so reduced in numbers that they soon go extinct.
  - are often living fossils that have existed unchanged for long periods.
  - usually cannot cope with the new conditions that follow.
  - usually lack preadaptations to the new environment.
26. The theory of continental drift helps us to explain all of the following except
- locations of volcanoes.
  - formation of river systems.
  - distribution of animals and plants.
  - formation of mountain ranges like the Himalayas.
  - earthquakes.
27. Koch's postulates
- outline the probable process by which life originated.
  - are used to demonstrate that a microorganism causes a disease.
  - enable researchers to determine whether an organism is a bacterium.
  - suggest how eukaryotes evolved from prokaryotes.
  - are public health standards used to prevent the spread of disease.
28. In general, how do algae and protozoans differ?
- Protozoans can move, and algae cannot.
  - Algae are free-living, and protozoans are parasitic.
  - Protozoans are autotrophic, and algae are heterotrophic.
  - Algae are photosynthetic, and protozoans are heterotrophic.
  - Algae are prokaryotes, and protozoans are eukaryotes.
29. Which of the following is not evidence for the role of endosymbiosis in the origin of eukaryotes?
- Chloroplasts have their own DNA.
  - The inner membrane of a chloroplast is similar to prokaryotic membranes.
  - Mitochondria and chloroplasts are surrounded by two membranes.
  - Mitochondria reproduce by binary fission.
  - The DNA in the eukaryotic nucleus codes for some enzymes in mitochondria.
30. A microbiologist found that a clone of bacteria infected by phages had developed the ability to make a particular amino acid that they could not make before. This new ability was probably a result of
- transformation.
  - natural selection.
  - conjugation.
  - spontaneous mutation.
  - transduction.
31. The correct sequence of DNA segments composing an operon is
- regulatory gene, operator, promoter, structural genes.
  - lacI, operator, promoter, lacZ, lacY.
  - structural genes, promoter, operator.
  - promoter, operator, structural genes.
  - prophage, operator, structural genes.

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32. A mature cell of a mature plant can develop into a new mature adult. This demonstrates that plant cells are
- zygotic.
  - differentiated.
  - meristematic.
  - anucleate.
  - totipotent.
33. The ultimate source of all genetic variation is
- natural selection.
  - genetic drift.
  - sexual recombination.
  - the environment.
  - mutation.
34. Which of the following is the first step in allopatric speciation?
- genetic drift
  - geographical isolation
  - polyploidy
  - hybridization
  - formation of reproductive barrier
35. Sympatric speciation is
- the appearance of a new species in the same area as the parent population.
  - the process by which most animal species have evolved.
  - initiated by the appearance of a geographical barrier.
  - the emergence of many species from a single ancestor.
  - especially important in the evolution of island species.
36. Which of the following abiotic factors affect the distribution of life in the biosphere?
- temperature
  - sunlight
  - wind
  - all are correct
  - both a & c
37. Marine communities are classified on the basis of
- light penetration
  - water depth and distance from shore
  - open water or bottom
  - all of the above
  - none of the above
38. An important factor in warming the Earth's atmosphere is
- oxygen
  - nitrogen
  - carbon dioxide
  - ammonia
  - water

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39. Destruction of tropical forests may cause
- a. world-wide changes in rain patterns
  - b. increase in atmospheric CO<sub>2</sub> levels
  - c. increased concentrations of minerals in nearby lakes and creeks
  - d. all of the above
  - e. both b & c
40. Because of biological magnification, the organisms most severely affected by toxic compounds in the food chain are
- a. top-level carnivores
  - b. producers
  - c. primary consumers
  - d. none of the above
  - e. both b & c