

## 一、問答題（每題 10 分）

1. Explain how the amino acid sequences of proteins can be used to trace evolutionary relationships among organisms.
2. How do most biologists think that the mitochondria and chloroplasts of eukaryotic cells originated? What is the evidence for this idea?
3. Compare the structure of a planarian (a flatworm) and an earthworm with regard to the following: digestive tract, body cavity, and segmentation.
4. Please describe the taxonomic classification of life.
5. Photosynthesis is not a single process but two.
  - (1) Please describe in brief of these two stages.
  - (2) Please also describe the flow of electrons during photosynthesis.

## 二、選擇題（每題 2 分）

1. A prophage is a(n)
  - A) emerging virus.
  - B) virus that infects bacteria.
  - C) type of retrovirus.
  - D) prion that has been integrated into a bacterial cell's chromosome.
  - E) viral genome that has been incorporated into a bacterial cell's chromosome.
2. Which of the following is not a way that bacteria, which produce asexually, can increase genetic variation?
  - A) transduction
  - B) bacterial sex
  - C) fission
  - D) conjugation
  - E) transformation

3. Sometimes a bacteriophage transfers a gene from one bacterium to another. This process is called
- A) transduction.
  - B) conjugation.
  - C) cloning.
  - D) fission.
  - E) transformation.
4. 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
- A) transformation.
  - B) natural selection.
  - C) conjugation.
  - D) spontaneous mutation.
  - E) transduction.
5. Operons
- A) function in frequently changing environments.
  - B) function at the translation level of regulation.
  - C) correct mutations that might interfere with their genetic instructions.
  - D) degrade and recycle protein.
  - E) mutate and evolve more rapidly.
6. By studying fossils in strata from many locations, scientists can trace
- A) microevolution.
  - B) counterevolution.
  - C) the life habits of extinct organisms.
  - D) macroevolution.
  - E) speciation frequencies.
7. Which of the following are able to convert atmospheric nitrogen into nitrogen compounds such as nitrate and nitrite?
- A) Treponema
  - B) methanogens
  - C) cyanobacteria
  - D) Thiobacillus
  - E) none of the above

8. Plants and green algae share which of the following homologous structures?
- A) cell walls made of cellulose
  - B) starch as a storage molecule for carbohydrates
  - C) chloroplasts and a specific combination of photosynthetic pigments
  - D) all of the above
  - E) only a and c
9. Radial symmetry is exhibited by which of the following animals?
- A) medusas
  - B) polyps
  - C) roundworms
  - D) all of the above
  - E) both a and b
10. Agnathans differ from fishes in which of the following ways?
- A) They lack jaws.
  - B) They lack paired fins.
  - C) They lack an endoskeleton.
  - D) They lack a backbone.
  - E) both a and b
11. Gene expression in animals seems to be regulated largely by
- A) controlling gene packing and unpacking.
  - B) controlling the transcription of genes into mRNA.
  - C) controlling the translation of mRNA into protein.
  - D) selectively eliminating certain genes from the genome.
  - E) selectively breaking down certain proteins so they cannot function.
12. Which of the following is true of gene regulation in both eukaryotes and prokaryotes?
- A) elaborate packing of DNA in chromosomes
  - B) Transcription is the usual point at which gene expression is regulated.
  - C) the addition of a cap and tail to mRNA after transcription
  - D) lac and trp operons
  - E) the removal of noncoding portions of RNA

13. Which of the following produces eggs and sperm? a. b. c. d. e.
- A) the fruiting bodies of a fungus.
  - B) fern sporophytes.
  - C) moss gametophytes.
  - D) the anthers of a flower.
  - E) moss sporangia.
14. The primary difference between bacterial sex and sexual reproduction in plants and animals is that
- A) bacterial sex involves more than two individuals.
  - B) bacterial sex involves the transfer of genetic material from the F<sup>+</sup> cell to the F<sup>-</sup> cell and a reciprocal transfer from the F<sup>-</sup> cell to the F<sup>+</sup> cell.
  - C) bacteria exchange RNA, not DNA.
  - D) bacterial sex does not produce offspring.
  - E) eggs and sperm are different, but bacterial gametes are all alike.
15. A geneticist found that a particular nucleotide sequence was found on different chromosomes in different mouse skin cells. This suggested that
- A) transformation was occurring in some skin cells.
  - B) transposons were moving around.
  - C) the cells were engaging in conjugation.
  - D) the mouse had been exposed to a mutagen.
  - E) the mouse responded to a vaccine.
16. The single greatest current threat to biodiversity is
- A) greenhouse warming.
  - B) the introduction of exotics.
  - C) overhunting.
  - D) habitat destruction.
  - E) reduced genetic variability.
17. Species diversity tends to decrease with
- A) increased habitat heterogeneity.
  - B) increased distance from the poles.
  - C) increased ocean depth.
  - D) increased fragmentation.
  - E) increased distance from the equator.

18. The relationship of genome to organism is the same as \_\_\_ to population.

- A) species
- B) gene
- C) gene pool
- D) mutation
- E) variation

19. The smallest unit that can evolve is a

- A) species.
- B) genotype.
- C) gene.
- D) population.
- E) morph.

20. Two animals are considered of different species if they

- A) look different.
- B) cannot interbreed.
- C) live in different habitats.
- D) are members of different populations.
- E) are geographically isolated.

21. Which of the following is the first step in allopatric speciation?

- A) genetic drift
- B) geographical isolation
- C) polyploidy
- D) hybridization
- E) formation of reproductive barrier

22. The oldest fossils usually

- A) contain more radioactive isotopes than younger fossils.
- B) are found in the deepest strata.
- C) have the longest half-lives.
- D) are found above younger fossils.
- E) are found in sediments from the Cenozoic era.

23. \_\_\_\_\_ are autotrophs that float near the surface of water and serve as the basis of the food chain.
- A) Zooplankton
  - B) Slime molds
  - C) Phytoplankton
  - D) Cyanobacteria
  - E) *Symbionts*
24. They depend on each other for survival. The most specific term that describes their relationship is
- A) parasitism.
  - B) predation.
  - C) commensalism.
  - D) symbiosis.
  - E) mutualism.
25. The ultimate source of all genetic variation is
- A) natural selection.
  - B) genetic drift.
  - C) sexual recombination.
  - D) the environment.
  - E) mutation.