

Questions 1-3 refer to the following.

- A. Respiration
- B. Photosynthesis
- C. Decomposition
- D. Nitrogen fixation
- E. Fermentation

B. 1. This process converts electromagnetic energy to chemical potential energy.

D. 2. This process breaks a triple bond.

D. 3. This process produces ammonia.

Questions 4-6

Refer to the terms below.

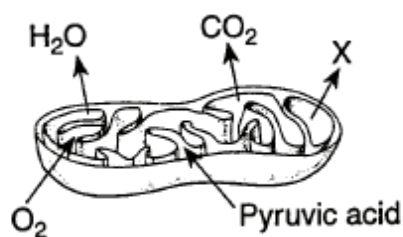
- (A) Thymine
- (B) Deoxyribose
- (C) Ribose
- (D) Uracil
- (E) Guanine

C 4. Sugar found in RNA but not in DNA

D 5. Nitrogenous base found in RNA but not in DNA

E 6. Nitrogenous base that occurs with the same frequency as cytosine

7-8 refer to the following diagram.



D. 7. All the arrows are associated with the process of

- (A) carbon fixation.
- (B) photochemical reactions.
- (C) anaerobic respiration.
- (D) aerobic respiration.
- (E) oxygen fixation.

- B. 8. Letter X most likely represents
- (A) the stroma.
 - (B) the matrix.
 - (C) the thylakoid space.
 - (D) the grana.
 - (E) none of the above

Questions 9-10 refer to the plant groups below.

- I. Angiosperms
- II. Gymnosperms
- III. Horsetails, ferns, club mosses (lycophytes and pterophytes)
- IV. True mosses, liverworts, and hornworts (bryophytes)

D. 9. Which plants contain tracheid and vessel element cells?

- A. I only
- B. II only
- C. I and II
- D. I, II, and III
- E. I, II, III, and IV

D. 10. Which plants produce spores instead of seeds?

- A. I, II, and III
- B. II, III, and IV
- C. II and IV
- D. III and IV
- E. IV only

**Questions 11-12 refer to the following population in Hardy-Weinberg equilibrium:
Approximately 4% of the turtle population in the local pond shows the recessive
phenotype — long nose (nn).**

E. 11. What is the frequency of the dominant allele (N) in the population?

- (A) 0.16
- (B) 0.20
- (C) 0.40
- (D) 0.32
- (E) 0.80

C. 12. What is the frequency of heterozygotes in the population?

- (A) 0.08
- (B) 0.24
- (C) 0.32
- (D) 0.48
- (E) 0.64

D. 13. A horse has 64 chromosomes, while a zebra has 46. In rare cases, it is possible to cause these two species to hybridize, creating offspring that are

- A. fertile, with 46 chromosomes
- B. fertile, with 55 chromosomes
- C. sterile, with 46 chromosomes
- D. sterile, with 55 chromosomes
- E. sterile, with 64 chromosomes

Questions 14-16

- (A) Anaphase II
- (B) Metaphase I
- (C) Prophase II
- (D) Metaphase II
- (E) Prophase I

E 14. Stage of meiosis during which recombination of genetic material occurs

B 15. Stage of meiosis during which pair; of homologous chromosomes align at the center of the cell

A 16. Stage of meiosis during which sister chromatids are separated

Questions 17-19 refer to the following.

- A. Golgi body
- B. Mitochondrion
- C. Ribosome
- D. Endoplasmic reticulum
- E. Lysosome

D 17. This organelle contains enzymes that synthesize lipids and hormones.

C 18. This organelle is present in prokaryotes.

B 19. This organelle is responsible for the production of ATP.

Questions 20-21 refer to the following breeding experiment. The researcher's goal was to develop white mice with short tails.

P: brown mice with short tails x: white mice with long tails

F1 : all offspring are brown and have long tails

F2: 292 mice are brown with long tails ; 97 mice are brown with short tails; 103 mice are white with long tails; 36 mice are white with short tails

C 20. The results of the above cross indicate that among the original parents (P-generation)

- (A) both were heterozygous for coat color and tail length.
- (B) one was homozygous dominant for coat color and tail length, whereas the other was homozygous recessive for both traits.
- (C) one was homozygous dominant for coat color and homozygous recessive for tail length, whereas the other was homozygous recessive for coat color and homozygous dominant for tail length.
- (D) one was homozygous dominant for both traits, whereas the other was heterozygous for both traits.
- (E) one was homozygous recessive for both traits, whereas the other was heterozygous for both traits.

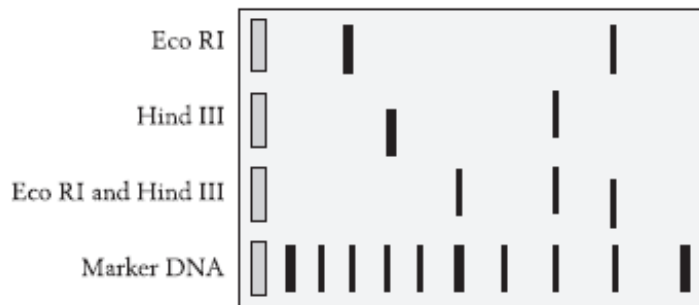
B 21. Based on the results, how many genes control the four traits observed among the F2 progeny (brown coat color, white coat color, short tail, long tail)?

- (A) one
- (B) two
- (C) four
- (D) eight
- (E) sixteen

Questions 22-23 refer to the following.

Scientists cut a linear piece of DNA with restriction enzymes. They then amplified the DNA and performed gel electrophoresis. The resulting agarose gel is shown.

ENZYME	SITE
EcoR I	5'-GAATTC-3'
BamH I	5'-GGATCC-3'
Hind III	5'-AAGCTT-3'



C 22. When both enzymes were added to the DNA, in how many places was the DNA cut?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

B 23. How many times did the sequence 5'-AAGCTT-3' occur in the DNA?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

Questions 24-27

- (A) Marine biome
- (B) Desert
- (C) Taiga
- (D) Temperate grasslands
- (E) Tundra

- A. 24. Has the most stable temperatures
- C. 25. Northern Canada—characterized by coniferous trees, such as spruce and fir
- D. 26. Plains and prairies of the midwestern United States
- E. 27. Permafrost

D. 28. Which of the following terms best encompasses all of the populations of organisms living together and potentially interacting in an area?

- (A) carrying capacity
- (B) biome
- (C) ecosystem
- (D) biological community
- (E) geographical community

D 29. Which of these are relationships in which one species benefits at the expense of another?

- I. Commensalism
 - II. Competition
 - III. Parasitism
 - IV. Predation
- A. III only
 - B. III and IV
 - C. I, II, and III
 - D. II, III, and IV
 - E. I, II, III, and IV

B 30. How does primary succession differ from secondary succession?

- A. Primary succession occurs on soil.
- B. Primary succession begins with lichens.
- C. Primary succession begins with plant species.
- D. Secondary succession involves animal species.
- E. Secondary succession involves the weathering of rock.

E 31. Nitrogen-fixing bacteria are most likely found in which environment?

- A. Stomach of a reptile
- B. Lower epidermis of leaves
- C. Gills of freshwater fish
- D. Large intestine of humans
- E. Root systems of plants