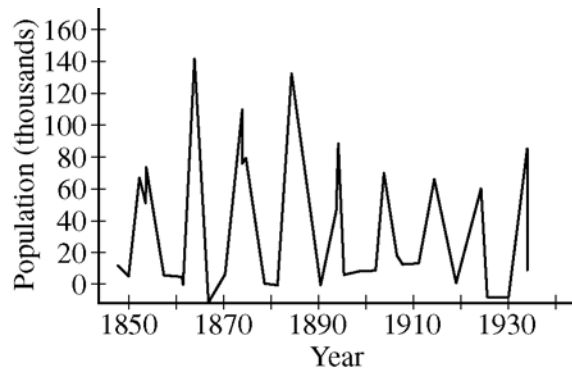


## **MAJOR FIELD TEST IN BIOLOGY**

### **SAMPLE QUESTIONS**

The following questions illustrate the range of the test in terms of the abilities measured, the disciplines covered, and the difficulty of the questions posed. They should not, however, be considered representative of the entire scope of the test in either content or difficulty. An answer key follows the questions.



- The data in the graph above represent the population size of the snowshoe hare—a prey species in northern Canada and Alaska—between 1850 and 1940. If one assumes that the predator and prey have mutual density-dependent effects on one another, the curve drawn for the simultaneous population size of the lynx, a predator on the snowshoe hare, would most likely
  - have peaks simultaneously with the peaks for the prey
  - have peaks halfway between the peaks for the prey
  - have peaks slightly before the peaks for the prey
  - have peaks slightly after the peaks for the prey
  - be essentially a horizontal line
- Cytoplasmic streaming in cells is a phenomenon that
  - depends on intracellular microfilaments
  - depends on extracellular collagen
  - is caused by cilia and flagella
  - occurs only in prokaryotes
  - is absent in green plants
- A circadian rhythm is best exemplified by the
  - emergence patterns of 17-year cicadas
  - annual migration patterns of monarch butterflies
  - daily activity patterns of a rat
  - scheduled mealtimes of a school child
  - menstrual cycle of an adult human female
- Flame cells, green glands, and Malpighian tubules are all specialized structures involved in
  - digestion
  - excretion
  - respiration
  - energy transfer
  - reproduction
- All of the following occur as part of the light-dependent reactions of photosynthesis EXCEPT the
  - transfer of electrons to ferredoxin
  - oxidation of water molecules
  - formation of ADP molecules
  - utilization of photons
  - formation of O<sub>2</sub> molecules
- Compared to a eutrophic lake, an oligotrophic lake tends to have a greater
  - supply of oxygen in the deep waters
  - number of blue-green algae
  - biological oxygen demand
  - amount of hydrogen sulfide
  - amount of degradable organic matter

7. Higher plants have a polar main axis with definite stem and root ends. This polarity is first established
- (A) when the seedling first grows into the light
  - (B) when germination first starts in the soil
  - (C) in the embryo of the seed
  - (D) at the time the plant is old enough to produce leaves
  - (E) just before the flower forms on the parent plant
8. The membranes of mitochondria, chloroplasts, and bacteria are all directly involved with all of the following EXCEPT
- (A) generation of ATP
  - (B) generation of chemical gradients
  - (C) generation of electrical potentials
  - (D) pumping ions against concentration gradients
  - (E) catalyzing the reactions of the Krebs cycle
9. Which of the following is released by the placenta and acts to assist in the maintenance of pregnancy?
- (A) Chorionic gonadotropin
  - (B) Vasopressin
  - (C) Thyroxine
  - (D) Luteinizing hormone
  - (E) Oxytocin
10. The evolutionary process most likely to account for the fixation of neutral or even nonadaptive alleles or allele combinations in small populations is called
- (A) recombination
  - (B) Lamarckian selection
  - (C) Darwinian selection
  - (D) Genetic drift
  - (E) Mutation
11. Evolutionary change in both a pollinator and a flower resulting from their interaction is an example of
- (A) divergent evolution
  - (B) regressive evolution
  - (C) coevolution
  - (D) parallel evolution
  - (E) convergent evolution

### Questions 12 and 13

Directions: The following questions consist of five lettered headings followed by a list of numbered words, phrases, sentences, or figures. For each numbered word, phrase, sentence, or figure, select the one heading that is most closely related to it and fill in the corresponding oval on the answer sheet. One heading may be used once, more than once, or not at all in each group.

- (A) Differentiation
  - (B) Determination
  - (C) Pattern formation
  - (D) Induction
  - (E) Plasticity
12. A group of unspecialized embryonic cells is transplanted from a leg bud to a wing bud in the chick embryo, and develops into toes.
13. The lens of the vertebrate eye develops only after the head ectoderm comes in contact with the optic cup.

### Questions 14-15

Directions: The following questions concern a laboratory or experimental situation. In each case, first study the description of the situation. Then choose the one best answer to each question following it and fill in the corresponding oval on the answer sheet.

#### Percent Representation

<u>Genotype</u>	<u>Residents</u>	<u>Emigrants</u>
$S^A S^A$	42%	18%
$S^A S^B$	40%	64%
$S^B S^B$	18%	18%

The table above summarizes the results of a study that examined the allele frequencies ( $A$  and  $B$ ) at a locus  $S$  in a population of resident meadow voles versus individuals that are leaving the population (emigrants).

14. What is the percent frequency of the  $S^B$  allele in the resident population?

- (A) 18%
- (B) 36%
- (C) 38%
- (D) 58%
- (E) 76%

15. The study strongly suggests that the allele frequencies in the resident population are changing as a result of

- (A) mutation
- (B) genetic drift
- (C) gene flow
- (D) acclimation
- (E) recombination

#### ANSWER KEY

- |      |       |
|------|-------|
| 1. D | 9. A  |
| 2. A | 10. D |
| 3. C | 11. C |
| 4. B | 12. B |
| 5. C | 13. D |
| 6. A | 14. C |
| 7. C | 15. C |
| 8. E |       |

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