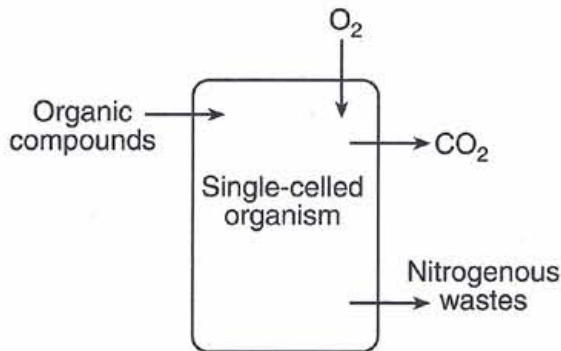


Packet # 4

1. The arrows in the diagram below indicate the movement of materials into and out of a single-celled organism.



The movements indicated by all the arrows are directly involved in

- (1) the maintenance of homeostasis
- (2) photosynthesis, only
- (3) excretion, only
- (4) the digestion of minerals

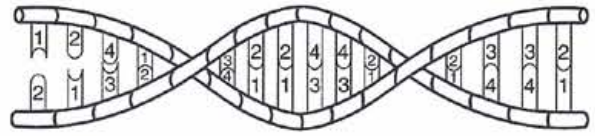
2. The chart below shows relationships between genes, the environment, and coloration of tomato plants.

Inherited Gene	Environmental Condition	Final Appearance
A	Light	Green
B	Light	White
A	Dark	White
B	Dark	White

Which statement best explains the final appearance of these tomato plants?

- (1) The expression of gene A is not affected by light.
- (2) The expression of gene B varies with the presence of light.
- (3) The expression of gene A varies with the environment.
- (4) Gene B is expressed only in darkness.

3. The diagram below represents a section of a molecule that carries genetic information.



The pattern of numbers represents

- (1) a sequence of paired bases
- (2) the order of proteins in a gene
- (3) folds of an amino acid
- (4) positions of gene mutations

4. In the human pancreas, acinar cells produce digestive enzymes and beta cells produce insulin. The best explanation for this is that

- (1) a mutation occurs in the beta cells to produce insulin when the sugar level increases in the blood
- (2) different parts of an individual's DNA are used to direct the synthesis of different proteins in different types of cells
- (3) lowered sugar levels cause the production of insulin in acinar cells to help maintain homeostasis
- (4) the genes in acinar cells came from one parent while the genes in beta cells came from the other parent

5. If mitotic cell division is the only way a particular species of single-celled organism can reproduce, it is most likely that

- (1) mutations can *not* occur in this species
- (2) the rate of evolution in this species is slower than in one that reproduces sexually
- (3) the number of organisms of this species in an area will remain constant
- (4) this species belongs to the animal kingdom

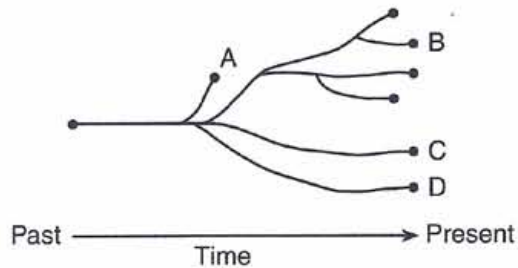
6. In order for new species to develop, there *must* be a change in the

- (1) temperature of the environment
- (2) migration patterns within a population
- (3) genetic makeup of a population
- (4) rate of succession in the environment

7. Which statement is *not* part of the concept of natural selection?

- (1) Individuals that possess the most favorable variations will have the best chance of reproducing.
- (2) Variation occurs among individuals in a population.
- (3) More individuals are produced than will survive.
- (4) Genes of an individual adapt to a changing environment.

8. The diagram below shows the evolution of some different species of flowers.



Which statement about the species is correct?

- (1) Species A, B, C, and D came from different ancestors.
- (2) Species C evolved from species B.
- (3) Species A, B, and C can interbreed successfully.
- (4) Species A became extinct.

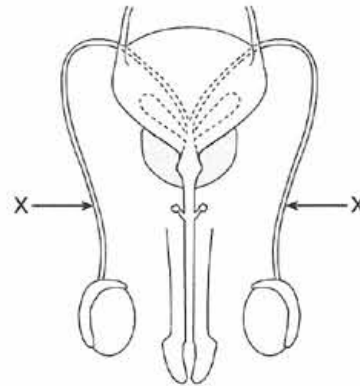
9. In sexually reproducing species, the number of chromosomes in each body cell remains the same from one generation to the next as a direct result of

- (1) meiosis and fertilization
- (2) mitosis and mutation
- (3) differentiation and aging
- (4) homeostasis and dynamic equilibrium

10. One function of the placenta in a human is to

- (1) surround the embryo and protect it from shock
- (2) allow for mixing of maternal blood with fetal blood
- (3) act as the heart of the fetus, pumping blood until the fetus is born
- (4) permit passage of nutrients and oxygen from the mother to the fetus

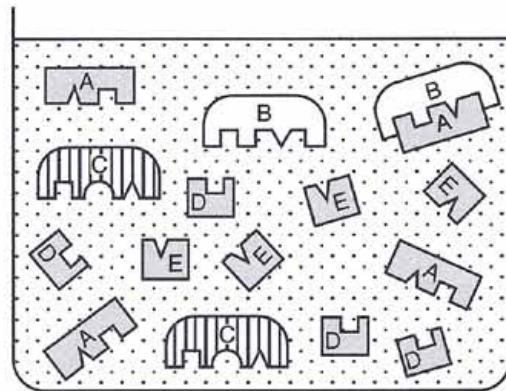
11. Some body structures of a human male are represented in the diagram below.



An obstruction in the structures labeled X would directly interfere with the

- (1) transfer of sperm to a female
- (2) production of sperm
- (3) production of urine
- (4) transfer of urine to the external environment

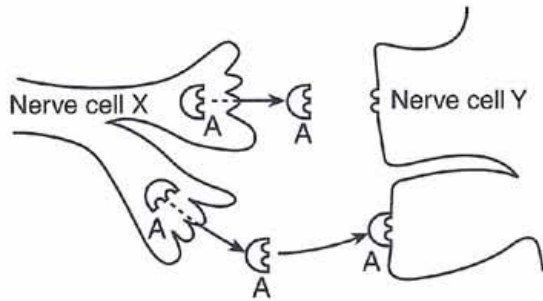
12. The diagram below represents a beaker containing a solution of various molecules involved in digestion.



Which structures represent products of digestion?

- (1) A and D
- (2) B and C
- (3) B and E
- (4) D and E

Base your answers to questions 13 through 15 on the diagram below and on your knowledge of biology.



13. The process represented in the diagram best illustrates

- (1) cellular communication
- (2) muscle contraction
- (3) extraction of energy from nutrients
- (4) waste disposal

14. Which statement best describes the diagram?

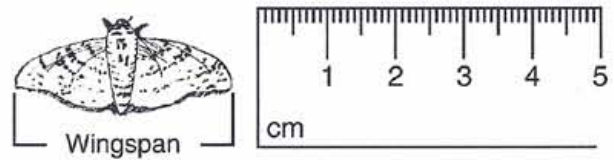
- (1) Nerve cell X is releasing receptor molecules.
- (2) Nerve cell Y is signaling nerve cell X.
- (3) Nerve cell X is attaching to nerve cell Y.
- (4) Nerve cell Y contains receptor molecules for substance A.

15. A drug is developed that, due to its molecular shape, blocks the action of substance A. Which shape would the drug molecule most likely resemble?



- (1) (2) (3) (4)

16. A peppered moth and part of a metric ruler are represented in the diagram below.



Which row in the chart below best represents the ratio of body length to wingspan of the peppered moth?

Row	Body Length:Wingspan
(1)	1:1
(2)	2:1
(3)	1:2
(4)	2:2

17. Enzymes are used in moving sections of DNA that code for insulin from the pancreas cells of humans into a certain type of bacterial cell. This bacterial cell will reproduce, giving rise to offspring that are able to form

- (1) human insulin
- (2) antibodies against insulin
- (3) enzymes that digest insulin
- (4) a new type of insulin

Base your answers to questions 18 through 19 on the information below and on your knowledge of biology.

**For Teacher
Use Only**

In an investigation, plants of the same species and the same initial height were exposed to a constant number of hours of light each day. The number of hours per day was different for each plant, but all other environmental factors were the same. At the conclusion of the investigation, the final height of each plant was measured. The following data were recorded:

8 hours, 25 cm; 4 hours, 12 cm; 2 hours, 5 cm; 14 hours, 35 cm;
12 hours, 35 cm; 10 hours, 34 cm; 6 hours, 18 cm

18. Organize the data by completing both columns in the data table provided, so that the hours of daily light exposure *increase* from the top to the bottom of the table. [1]

Data Table

Daily Light Exposure (hours)	Final Height (cm)

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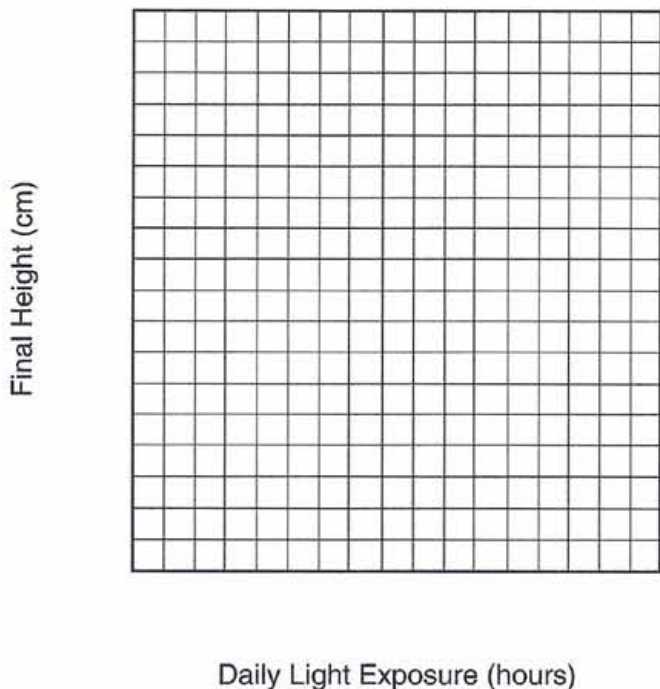
19. State *one* possible reason that the plant exposed to 2 hours of light per day was the shortest. [1]

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Directions (20-22): Using the information given, construct a line graph on the grid provided, following the directions below.

**For Teacher
Use Only**

Effect of Light Exposure on Plant Growth



20. Mark an appropriate scale on each axis. [1]

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21. Plot the data for final height on the grid. Surround each point with a small circle and connect the points. [1]



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22. If another plant of the same species had been used in the investigation and exposed to 16 hours of light per day, what would the final height of the plant probably have been? Support your answer. [1]

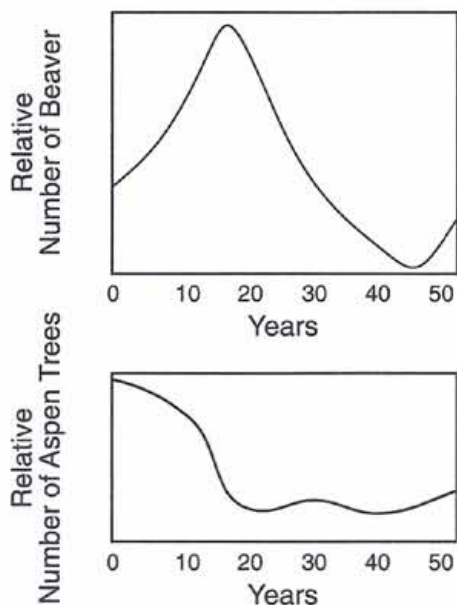
62

Answer all questions in this part.

Directions (23–25): For those questions that are followed by four choices, circle the *number* of the choice that best completes the statement or answers the question. For all other questions in this part, follow the directions given in the question and record your answer in the spaces provided.

Base your answers to questions 41 through 43 on the graphs below, which show changes in the number of aspen trees and the beaver population in an area over a 50-year period.

**For Teacher
Use Only**



23. State the relationship that exists between the number of aspen trees and the beaver populations in this region during the first 15 years. [1]

24. State *one* possible reason for the relationship between the aspen tree and the beaver populations. [1]

25. Predict how the number of aspen trees would change if a parasite that targets the beaver population were introduced into the area during year 5. Explain your answer. [1]
