

Part A Questions

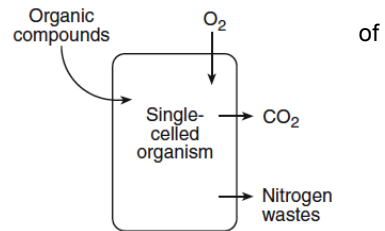
_____ 1. In 1910, Thomas Morgan discovered a certain pattern of inheritance in fruit flies known as sex linkage. This discovery extended the ideas of inheritance that Gregor Mendel had discovered while working with garden peas in 1865. Which principle of scientific inquiry does this illustrate?

- (1) A control group must be part of a valid experiment.
- (2) Scientific explanations can be modified as new evidence is found.
- (3) The same experiment must be repeated many times to validate the results.
- (4) Values can be used to make ethical decisions about scientific discovery.

_____ 2. Which statement describes one function of the placenta in mammals?

- (1) It allows blood of the mother to mix with the blood of the fetus.
- (2) It contains fluid that protects the embryo from harm.
- (3) It removes waste products that are produced in the cells of the fetus.
- (4) It synthesizes food for the embryo.

_____ 3. 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) respiration, only
- (3) excretion, only
- (4) the digestion of proteins

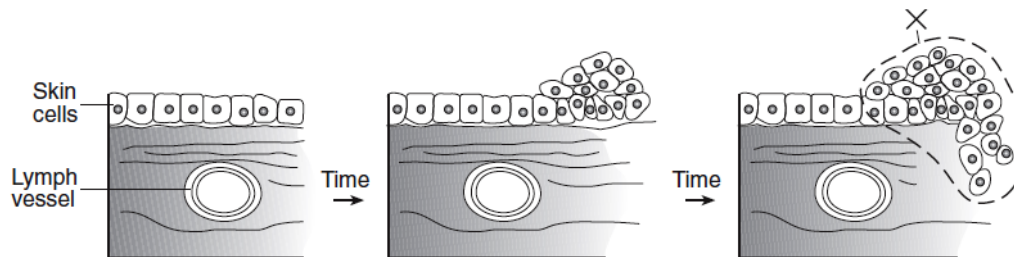
_____ 4. All cells in an embryo have the same DNA. However, the embryonic cells form organs, such as the brain and the kidneys, which have very different structures and functions. These differences are the result of

- (1) having two types of cells, one type from each parent
- (2) rapid mitosis causing mutations in embryo cells
- (3) new combinations of cells resulting from meiosis
- (4) certain genes being expressed in some cells and not in others

_____ 5. A mutation changes a gene in a cell in the stomach of an organism. This mutation could cause a change in

- (1) both the organism and its offspring
- (2) the organism, but not its offspring
- (3) its offspring, but not the organism itself
- (4) neither the organism nor its offspring

_____ 6. The diagram below shows the growth pattern of some skin cells in the human body after they have been exposed to ultraviolet radiation.



The cells in area X are most likely

- (1) red blood cells
- (2) cancer cells
- (3) white blood cells
- (4) sex cells

_____ 7. Worms that had been invaded by bacteria were eaten by a species of bird. Many of these birds died as a result. The most likely explanation for this is that the

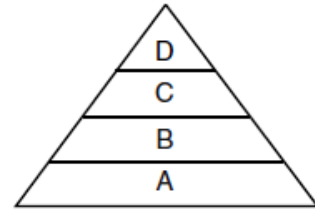
- (1) bacteria interfered with normal life functions of the birds
- (2) disease that killed the birds was inherited
- (3) gene alterations in the bacterial cells killed the birds
- (4) birds produced antigens in response to the bacteria

Part B-1 Questions

_____ 8. The diagram represents a food pyramid.

The concentration of the pesticide DDT in individual organisms at level *D* is higher than the concentration in individuals at level *A* because DDT is

- (1) synthesized by organisms at level *D*
- (2) excreted by organisms at level *A* as a toxic waste
- (3) produced by organisms at level *C* which are eaten by organisms at level *D*
- (4) passed through levels *A*, *B*, and *C* to organisms at level *D*



_____ 9. A student prepared a slide of pollen grains from a flower. First the pollen was viewed through the low-power objective lens and then, without moving the slide, viewed through the high power objective lens of a compound light microscope. Which statement best describes the relative number and appearance of the pollen grains observed using these two objectives?

- (1) low power: 25 small pollen grains; high power: 100 large pollen grains
- (2) low power: 100 small pollen grains; high power: 25 large pollen grains
- (3) low power: 25 large pollen grains; high power: 100 small pollen grains
- (4) low power: 100 large pollen grains; high power: 25 small pollen grains

Base your answers to questions 10 and 11 on the information and data table below and on your knowledge of biology.

Data Table

“A student studied the location of single-celled photosynthetic organisms in a lake for a period of several weeks. The depth at which these organisms were found at different times of the day varied greatly. Some of the data collected are shown in the table to the right.”

Light Conditions at Different Times of the Day	Average Depth of Photosynthetic Organisms (cm)
full light	150
moderate light	15
no light	10

_____ 10. A valid inference based on these data is that

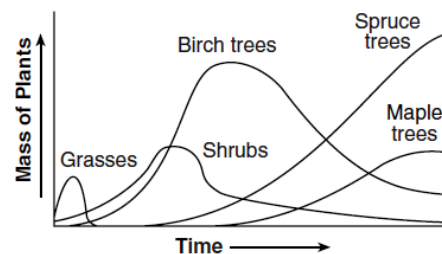
- (1) most photosynthetic organisms live below a depth of 150 centimeters
- (2) oxygen production increases as photosynthetic organisms move deeper in the lake
- (3) photosynthetic organisms respond to changing light levels
- (4) photosynthetic organisms move up and down to increase their rate of carbon dioxide production

_____ 11. Which materials would the student most likely have used in this investigation?

- (1) microscope, pipette, and slides with coverslips
- (2) graduated cylinder, triple-beam balance, and chromatography paper
- (3) thermometer, electric balance, and biological stains
- (4) computer, pH paper, and gel electrophoresis apparatus

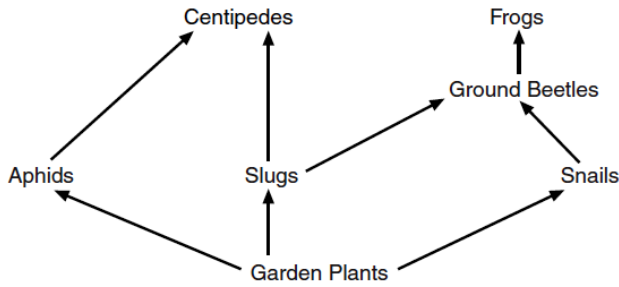
_____ 12. Which concept is represented in the graph below?

- (1) ecological succession in a community
- (2) cycling of carbon and nitrogen in a forest
- (3) energy flow in a food chain over time
- (4) negative human impact on the environment



Part B-2 Questions

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



Organisms in Trap	
Organism	Number in Trap
slugs	8
snails	1
aphids	13
centipedes	1
ground beetles	98

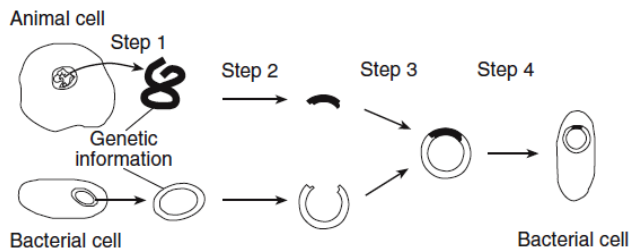
Gardeners sometimes use slug traps to capture and kill slugs. These traps were tested in a garden with a large slug population. Organisms found in the trap after one week are shown in the table.

- _____ 13. How many organisms in the trap were herbivores?
 (1) 5 (3) 22
 (2) 9 (4) 99

14. State *one* reason the slug traps are *not* the best method to control slugs. [1]

15. In a process known as biological control, natural predators that prey on plant or animal pests are used to control the populations of the pests. Identify *one* organism shown in this food web that could be used as a biological control to replace the slug traps. [1]

Base your answers to questions 16 and 17 on the diagram below, which illustrates some steps in genetic engineering and on your knowledge of biology.



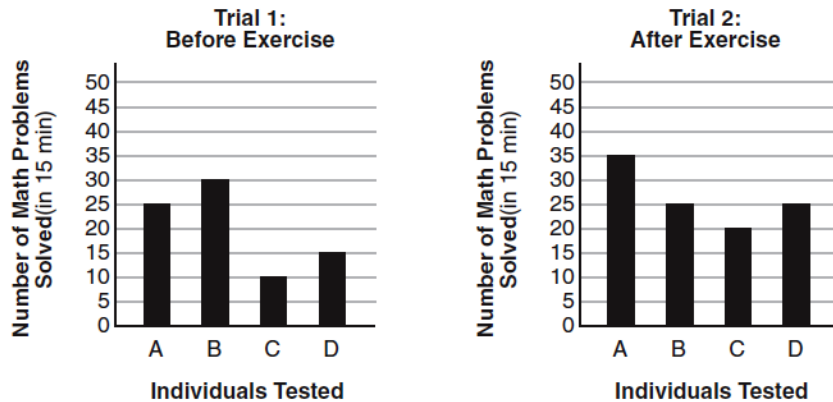
- _____ 16. What is the result of step 3?
 (1) a new type of molecular base is formed
 (2) different types of minerals are joined together
 (3) DNA from the bacterial cell is cloned
 (4) DNA from different organisms is joined together

17. State *one* way that enzymes are used in step 2. [1]

Part D Questions

Base your answers to questions 20 and 21 on the information below and on your knowledge of biology.

A student read a magazine article that claimed people who exercise for 30 minutes are able to solve more math problems than if they had not exercised. The student convinced four of his friends to test this claim. First, he gave them 15 minutes to do 50 math problems. The number each person solved is shown in the trial 1 graph. Next, all four of the students exercised for 30 minutes. At the end of the 30 minutes, they were given another 50 math problems of equal difficulty for the same amount of time. The number of math problems each student solved is shown in the trial 2 graph.



20. Explain why exercise could influence the ability of a student to solve math problems. [1]

21. State whether or not exercising for 30 minutes improved the ability of students to solve math problems. Support your answer using data from the graphs. [1]

____ 22. If frog eggs taken from a freshwater pond are placed in a saltwater aquarium, what will most likely happen?

- (1) Water will leave the eggs.
- (2) Salt will leave the eggs.
- (3) Water will neither enter nor leave the eggs.
- (4) The eggs will burst.

____ 23. A student fills a dialysis membrane bag with a mixture of red dye, yellow dye, and water. He soaks the bag in pure water for 24 hours and then observes that the water outside the bag turns yellow. Which statement best explains the results of this experiment?

- (1) Water diffused into the membrane bag.
- (2) The dialysis membrane actively transported yellow dye molecules.
- (3) Only red dye diffused through the membrane.
- (4) The yellow dye molecules are smaller than the red dye molecules.