

Cell Energetics

1 Which process will result in a gain of energy in an ecosystem?

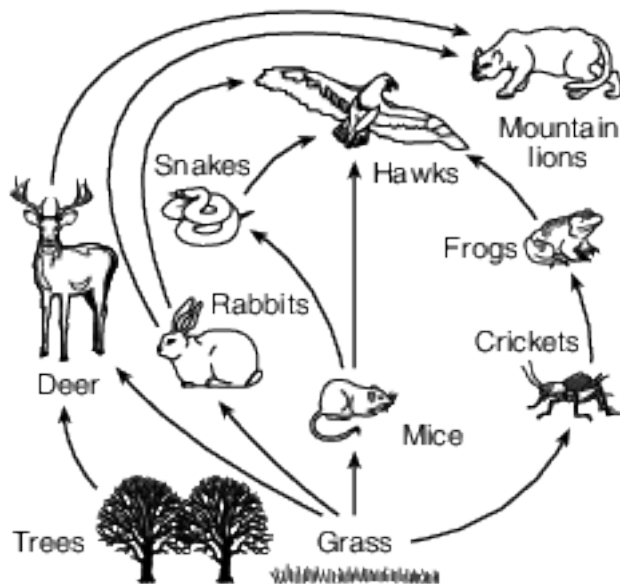
- (1) photosynthesis in algae cells
- (2) digestion in hummingbirds
- (3) ATP synthesis in fungi
- (4) respiration in maple tree cells

2 What is the primary source of energy for all the organisms in the ecosystem represented below?



- (1) photosynthesis in the producers
- (2) respiration in the heterotrophs
- (3) light energy from the Sun
- (4) minerals from the rocks

Base your answers to questions 3 on the diagram below and on your knowledge of biology.



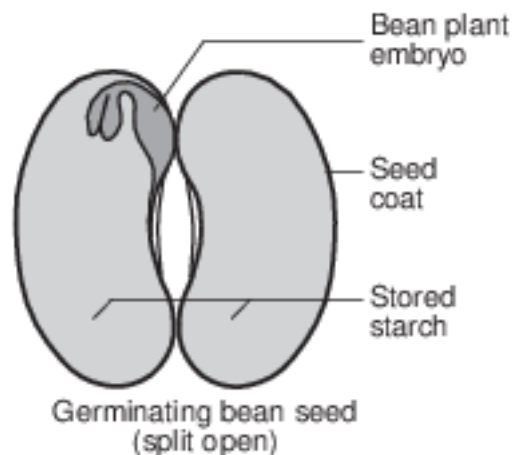
3 A factor not shown in the diagram that provides energy for living organisms is

- (1) carbon dioxide
- (2) water
- (3) the Sun
- (4) oxygen

- 4 Some sea slugs store chloroplasts obtained from algae they have ingested. The chloroplasts continue to carry out photosynthesis within the slugs. What advantage would this activity be to these sea slugs?
- (1) The slugs with chloroplasts can synthesize some of their own food.
 - (2) The slugs with chloroplasts no longer need to carry out respiration.
 - (3) The chloroplasts provide the slugs with camouflage that protects them from UV radiation.
 - (4) The chloroplasts contain enzymes that allow the slugs to digest starch.

- 5 Which process uses energy to combine inorganic molecules to synthesize organic molecules?
- | | |
|-----------------|--------------------|
| (1) respiration | (3) photosynthesis |
| (2) digestion | (4) decomposition |

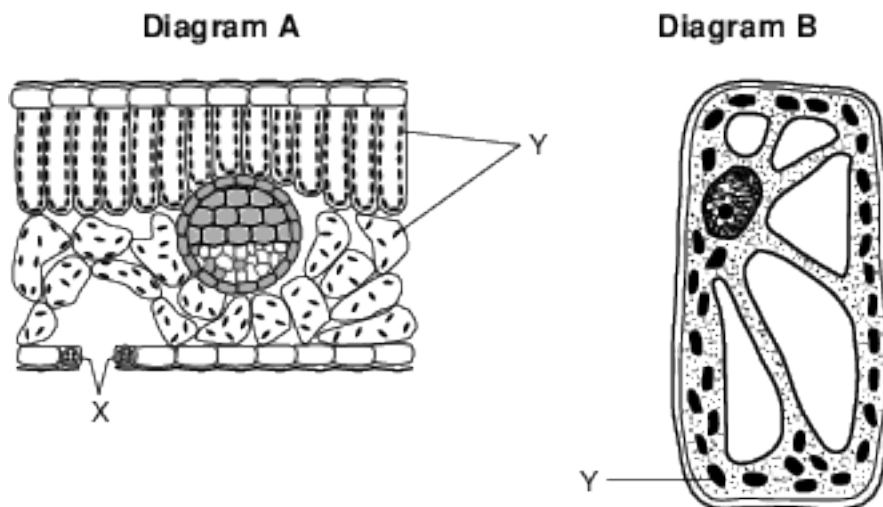
Base your answers to questions 6 on the diagram and information below and on your knowledge of biology. The diagram represents a germinating bean seed that has been split open.



- 6 Plants are able to continue to grow and develop once the starch supply in the seed is gone, because they
- (1) develop roots to absorb starch from the environment
 - (2) grow leaves, which use light energy for cell respiration
 - (3) have chloroplasts and use light energy to make more food
 - (4) produce more seeds, which contain additional food reserves
- 7 A cell in the leaf of a corn plant contains more chloroplasts than a cell in the stem of a corn plant. Based on this observation, it can be inferred that, when compared to the cell in the stem, the cell in the leaf
- | | |
|-----------------------------------|------------------------------|
| (1) synthesizes more sugar | (3) produces fewer proteins |
| (2) has a higher chromosome count | (4) uses less carbon dioxide |

Base your answers to questions 8 on the information and diagram below and on your knowledge of biology.

An investigation was conducted to compare two different types of plants. A student used a microscope to observe the cells in a cross section of a lilac leaf (diagram A) and a cell from the leaf of a freshwater plant (diagram B).



(Not drawn to scale)

8 Which row in the chart below correctly identifies the structure labeled Y in both diagrams and the process it performs?

Row	Structure	Process
(1)	mitochondrion	excretion
(2)	nucleus	regulation
(3)	chloroplast	photosynthesis
(4)	ribosome	protein synthesis

(1) 1

(3) 3

(2) 2

(4) 4

9 In the 1660s, Flemish physician Jan van Helmont grew a small willow tree in a pot of soil. He added only water to the pot. At the end of five years, he found that the tree had gained 75 kilograms, but there was very little change in the mass of the soil. Van Helmont concluded that the plant gained weight directly from the water. We now know that this conclusion is only partially correct because, in addition to water, photosynthesis also requires

(1) oxygen from the atmosphere

(3) proteins from animal prey

(2) carbon dioxide from the atmosphere

(4) carbohydrates from the soil

10 During the process of photosynthesis, energy from the Sun is converted into

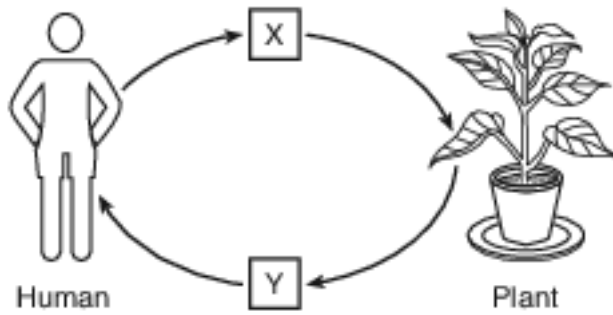
(1) chemical energy in the bonds of inorganic molecules

(2) chemical energy in the bonds of organic molecules

(3) enzymes used to produce inorganic molecules

(4) enzymes used to produce organic molecules

11 The diagram below represents a cycling of materials.



Which row in the chart below shows the substances represented by X and Y?

Row	X	Y
(1)	oxygen	carbon dioxide
(2)	glucose	oxygen
(3)	carbon dioxide	oxygen
(4)	amino acids	carbon dioxide

(1) 1

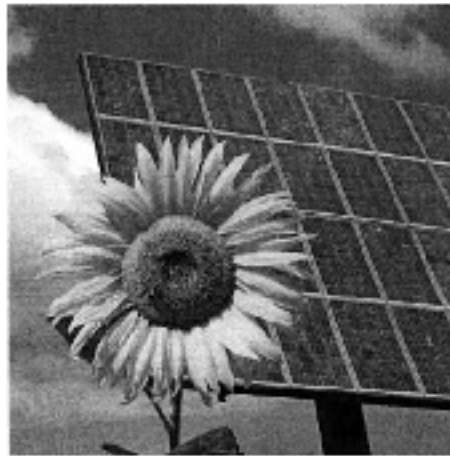
(3) 3

(2) 2

(4) 4

Base your answer to question 12-14 on the information and photograph below and on your knowledge of biology.

The photograph below is part of an advertisement used by a company selling solar panels. The company claims that their panels, like plants, provide clean, renewable energy. They also claim that using solar panels will have a positive effect on the biosphere by reducing global warming.



Source: <http://www.stockwatch.in/files/Energy.jpg>

12-14 Explain why these claims are valid. In your answer, be sure to:

- explain why both plants and solar panels provide renewable energy, rather than nonrenewable energy [1]
- state how the widespread use of solar panels to generate electricity can help to reduce global warming [1]
- state how the energy-capturing process used by plants worldwide can help to reduce global warming [1]

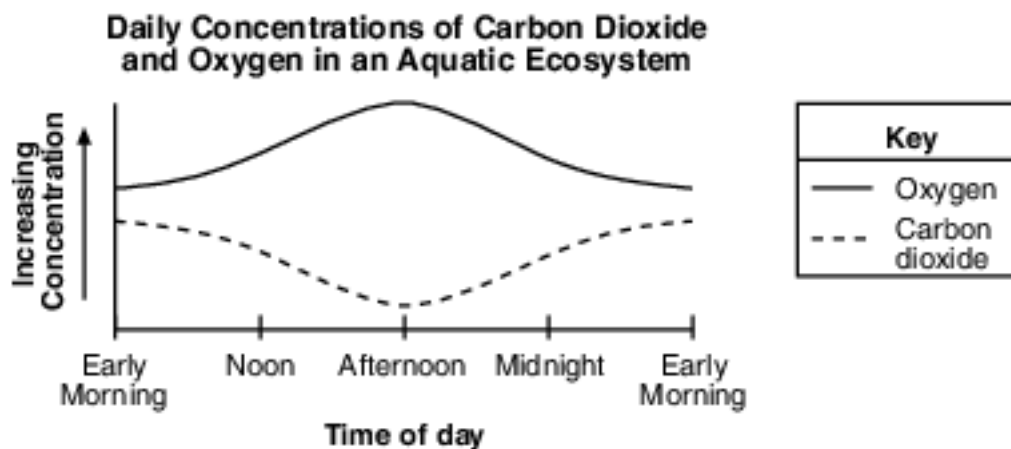
Base your answers to questions 15 on the information below and on your knowledge of biology.

Photosynthesis is a process that is important to the survival of many organisms on Earth.

15 State one reason why photosynthesis is necessary for animals to survive. [1]

Base your answer to question 16 on the information below and on your knowledge of biology.

A student measured oxygen and carbon dioxide concentration levels in an aquatic ecosystem during a 24 hour period. The data are represented in the graph below.

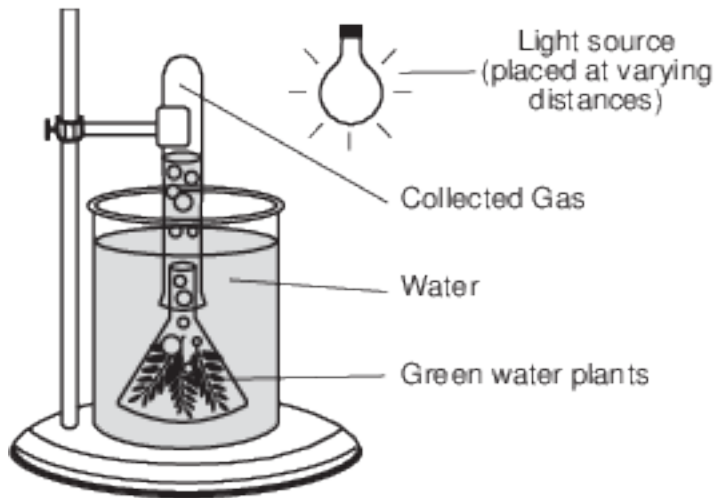


16 Identify two biological processes that are responsible for the production of varying amounts of carbon dioxide and oxygen within the aquatic ecosystem. [1]

Processes: _____ and _____

Base your answers to questions 17 on the information, diagram, and data table below and on your knowledge of biology.

The laboratory setup represented below was used to investigate the effect of light on aquatic plants. Equal amounts of a green water plant were placed in beakers with gas- collecting tubes. The beakers were placed in a temperature-controlled environment. The light source was placed at different distances from the beakers. After an hour, the amount of gas collected from the plants in each tube was measured and recorded in the data table.



Basic Setup

Gas Collected with Light Source at Different Distances from Plant

Distance of Light Source from Plant (cm)	Gas Collected in Tube (mm)
5	85
10	37
15	15
20	8
25	5

Directions: Using the information given, construct a line graph on the grid following the directions below.

17 Identify the gas being produced by the plants. [1]

Answer Keys

1 1

2 3

3 3

4 1

5 3

6 3

7 1

8 3

9 2

10 2

11 3

12-14 The student's response to the bulleted items in the question need not appear in the following order.

- 12. Allow 1 credit for explaining why both plants and solar panels provide renewable energy, rather than nonrenewable energy. Acceptable responses include, but are not limited to:
 - — The Sun provides energy for both solar panels and plants that is continually being released.
 - — The Sun is the energy source for both solar panels and plants and the energy is renewable.
- 13. Allow 1 credit for stating how the widespread use of solar panels to generate electricity can help to reduce global warming. Acceptable responses include, but are not limited to:
 - — Fewer fossil fuels would be used, resulting in a decrease of global warming.
 - — Using solar panels would decrease the amount of greenhouse gasses/carbon dioxide.
- 14. Allow 1 credit for stating how the energy-capturing process used by plants worldwide can help to reduce global warming. Acceptable responses include, but are not limited to:
 - — Carbon dioxide increases global warming and photosynthesis takes carbon dioxide out of the air.
 - — Plants remove carbon dioxide from the air.
 - — Photosynthesis removes carbon dioxide from the air.

15 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Photosynthesis provides the raw materials for cell respiration.
- — A product of photosynthesis is glucose/other energy-containing compounds that heterotrophs use for food.
- — It is the source of stored energy for the ecosystem.
- — Photosynthesis produces oxygen.
- Note: Do not accept “photosynthesis makes energy.” It stores, transfers, or transforms energy.

16 Allow 1 credit. Acceptable responses include, but are not limited to:

- — respiration and photosynthesis
- — photosynthesis and aerobic respiration
- — photolysis and respiration

17 Allow 1 credit for oxygen/O₂.