

# Photosynthesis and Cellular Respiration

Photosynthesis and cellular respiration are opposite reactions. This means that the products (end result) of one reaction are the reactants (beginning state) of the other. This is evident in the equations that express these reactions:

Cellular Respiration       $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

Photosynthesis               $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$



During photosynthesis, a plant makes the glucose (that is used in cellular respiration) to make ATP. ATP is energy from the sun that is stored in the form of chemical energy in a plant's cells. This glucose is then turned back into carbon dioxide, which is used in photosynthesis. During photosynthesis, water is broken down to form oxygen. During cellular respiration, oxygen is combined with hydrogen to form water. Photosynthesis requires carbon dioxide and gives off oxygen. Cellular respiration is just the opposite: it requires oxygen and gives off carbon dioxide.

Together, photosynthesis and cellular respirations are the basis of all life on Earth. The oxygen that is released by plants during photosynthesis is used by humans and almost all other organisms for our cellular respiration. When we breathe in oxygen, our blood carries it to our cells, where cellular respiration takes place. We breathe back out carbon dioxide.

Photosynthesis and cellular respiration are both parts of the carbon cycle. The carbon cycle is the means by which carbon is recycled in the biosphere. This continual cycle happening everywhere all the time keeps the levels of oxygen and carbon dioxide in the atmosphere at stable levels.

Name \_\_\_\_\_ **Photosynthesis**

### **QUESTIONS: Photosynthesis and Cellular Respiration**

1. What is the relationship between photosynthesis and cellular respiration?
2. What is ATP?
3. What is water broken down to form during photosynthesis?
4. What does oxygen combine with during cellular respiration to form water?
5. Which process requires carbon dioxide and gives off oxygen?
6. Together, photosynthesis and cellular respiration are the basis of what?
7. How does cellular respiration inside a human or animal cell work?
8. What is the carbon cycle?
9. Which process, photosynthesis or cellular respiration, is part of the carbon cycle?

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Scientific Method – Effect of Light on Fall Leaf Colors

Remember that the steps in the scientific method are:

1. Identify the *Problem*
2. Form a *Hypothesis*
3. List the *Materials* that are needed
4. Define the steps in the *Procedure*
5. Analyze the *Results/Observations*
6. Form a *Conclusion*

1. **Identify the Problem**

Do leaves need sunlight in order to change color in the fall?

2. **What is the hypothesis?**

3. **Materials are needed to conduct this experiment**

- A growing tree, like a maple, sweet gum or flowering dogwood whose leaves turn bright red in the fall
- Aluminum foil
- Masking tape

4. **Define the steps in the procedure**

- Make sure that the tree receives lots of sunlight
- Just before it's time for the leaves to change color in the fall pull down a branch of the tree and make a tent with the aluminum foil to enclose some of the leaves
- Wait patiently for the rest of the tree to turn colors

5. **Analyze the results/observations**

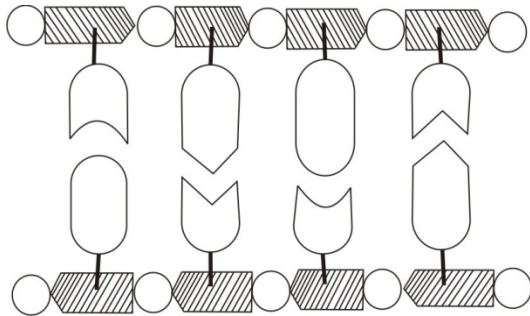
6. **Form a conclusion**

Name \_\_\_\_\_

Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_

## STRUCTURE OF DNA

DNA molecules consist of a sequence of nucleotides, each of which consists of a phosphate, a deoxyribose sugar and a nitrogenous base. In the diagram, label these three nitrogenous bases are shown in the nucleotides at the right. On the blanks below, write the name of the nitrogenous base corresponding to the letter symbol.



A = \_\_\_\_\_

C = \_\_\_\_\_

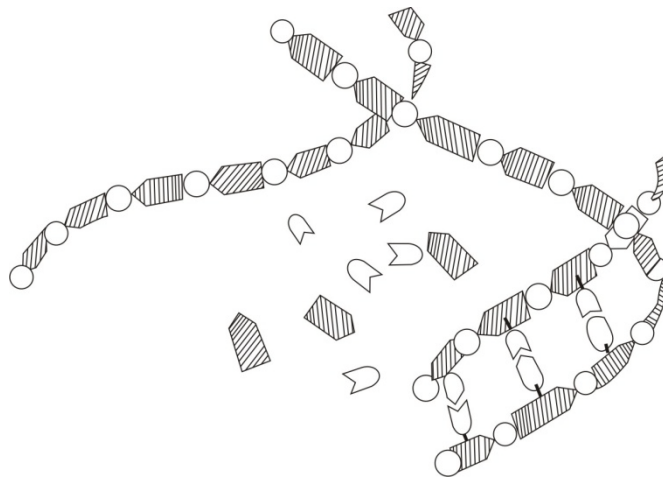
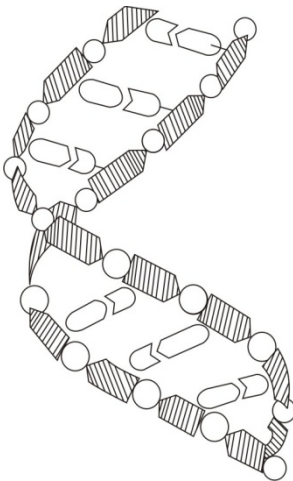
G = \_\_\_\_\_

T = \_\_\_\_\_

DNA molecules have a double helix shape. Two strands of DNA twist around one another and are attached by hydrogen bonds between the matching bases on each chain. Adenine always pairs with thymine, and cytosine always pairs with guanine.

In the illustration at the left below, label a phosphate, a deoxyribose sugar, and a nitrogenous base.

The diagram at the right shows the replication of DNA. Label the original strand and the new strand.



Provide the missing terms in the blanks below.

The three-dimensional structure of DNA was determined by two scientists named \_\_\_\_\_ and \_\_\_\_\_. They determined that the DNA molecule was shaped like a \_\_\_\_\_. During replication, \_\_\_\_\_ identical strands of \_\_\_\_\_ are produced. These strands contains sequences of \_\_\_\_\_ and some of these code for proteins and are called \_\_\_\_\_.

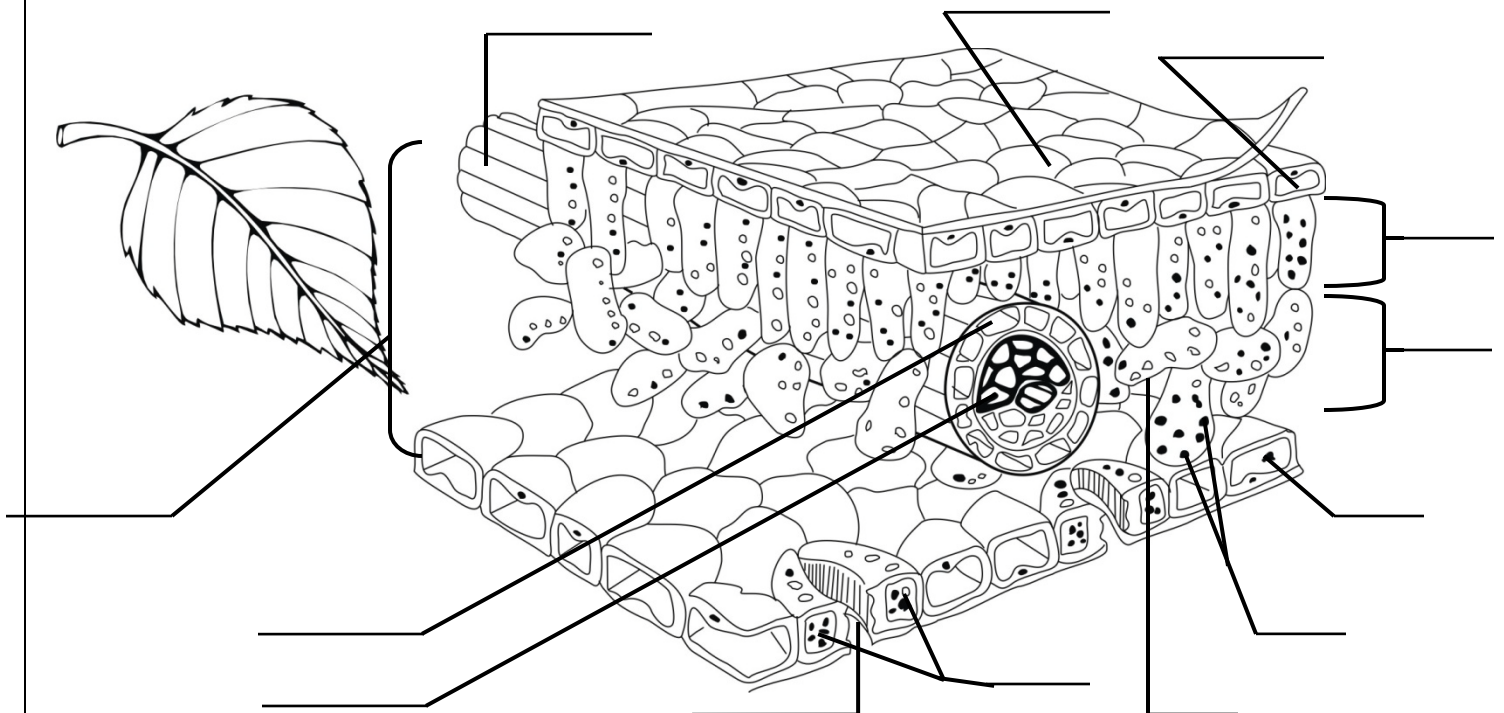
Name \_\_\_\_\_

Date \_\_\_\_ / \_\_\_\_ / \_\_\_\_

## LEAF ANATOMY

Provide the label for the indicated structures on the diagram of the leaf below. Also, provide the purpose or function of each structure.

- a. Chloroplasts \_\_\_\_\_
- b. Mesophyll \_\_\_\_\_
- c. Palisade layer \_\_\_\_\_
- d. Cuticle \_\_\_\_\_
- e. Stoma \_\_\_\_\_
- f. Guard cells \_\_\_\_\_
- g. Vein \_\_\_\_\_
- h. Spongy layer \_\_\_\_\_
- i. Air space \_\_\_\_\_
- j. Xylem \_\_\_\_\_
- k. Phloem \_\_\_\_\_
- l. Lower epidermis \_\_\_\_\_
- m. Upper epidermis \_\_\_\_\_





## Plant Adaptation

The natural world is a fascinating place. There are hundreds of thousands of unique plant and animal species that have adapted to living in every type of biome and niche in the world. Let's look at some specialized plants that have adapted to extreme conditions somewhere on earth.

Most plants need soil nutrients, sunlight and moisture in order to survive yet many plants have adapted to living in the dry and often extremely hot desert biome. The best known desert plants are the many species of cactus. Nearly all cactus plants live only in desert areas of North, Central and South America. Cactus plants survive on little rainfall by having a thick leathery skin, spines or spikes instead of leaves, and a hollow core for storing moisture. Besides conserving moisture, spines discourage animals from eating cactus plants for the water they contain. Cactus flowers bloom when there is moisture in the spring.

Other plants are adapted to living in the hot and rainy tropical rainforest. With so much rainfall most soil nutrients wash away so tropical plants have adapted to living in poor soil. Most tropical plants have sturdy waxy leaves that are unaffected by the huge amounts of rainfall. The tropical rainforest has dense growth with plants filling just about all the available space. Trees that form the top layer, the canopy, grow extremely tall and survive the hot sunlight for about 12 hours per day. At the opposite end, plants on the rainforest floor must survive dense shade. Rainforest plants show all kinds of adaptations to their biome.

Specialized plants are adapted to the harsh conditions of the arctic tundra. Plants of the tundra grow close to the ground, away from the constant wind that blows in the arctic. Tundra plants are usually 12 inches or less in height and grow in clumps (several plants close together) for extra protection from wind and cold. Arctic plants are dark green or red-green because dark colors absorb more heat from the sun.

There are even a few hardy plants that grow in the warmest area of Antarctica, the coldest continent on earth. Only a small part of the Antarctic Peninsula thaws during the brief summer and a few species of mosses and two species of flowering plants come to life.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Multiple Choice Questions

Circle the correct answer.

1. What do most plants need in order to survive?
  - a. Soil
  - b. Water
  - c. Sunlight
  - d. All of the above
2. Cactus plants grow on which one of these continents?
  - a. Asia
  - b. Europe
  - c. North America
  - d. Australia
3. Cactus plants are adapted to life in the desert because they
  - a. Are low-growing
  - b. Have spikes or spines instead of leaves
  - c. Have dense growth
  - d. Have waxy leaves
4. Rainforest plants usually
  - a. Grow tall
  - b. Have waxy leaves
  - c. Grow in clumps
  - d. Have leathery skin
5. Artic plants
  - a. Are low-growing
  - b. Grow tall
  - c. Have waxy leaves
  - d. Have spikes or spines instead of leaves
6. The main type of plants that grow in Antarctica is
  - a. Cactus
  - b. Trees
  - c. Shrubs
  - d. Mosses

## 32 Disease - transmission and control

- 1 Classify the following diseases under the headings 'Transmissible' and 'Non-transmissible'.  
lung cancer, whooping cough, rickets, arthritis, appendicitis, food poisoning, tuberculosis, measles, diabetes, anaemia, syphilis, influenza, AIDS, coronary heart disease, haemophilia
- 2 (a) In droplet infection (i) where do the droplets come from, (ii) what infective agents might they contain?  
(b) Give two examples of diseases normally spread by droplets.
- 3 (a) Give two examples of diseases which can be spread by contaminated drinking water.  
(b) How can the spread of such diseases be prevented?
- 4 Suggest three ways in which food might become contaminated by harmful bacteria.
- 5 Which one of the following is least important in preventing the contamination of food?  
(a) Keeping food away from flies.  
(b) Washing the hands before preparing food.  
(c) Not coughing or sneezing over food.  
(d) Not smoking while preparing food.
- 6 The following events explain an outbreak of food poisoning in a factory canteen. Put the events in the appropriate order.  
(a) Pathogenic bacteria in intestine.  
(b) Unwashed hands prepare food.  
(c) Kitchen worker has intestinal disease.  
(d) Outbreak of food poisoning.  
(e) Pathogenic bacteria in faeces.  
(f) Pathogenic bacteria get into food.  
(g) Hands not washed after defecation.  
(h) Faeces expelled in lavatory.  
(i) Food ingested by healthy people.
- 7 Which one of the following is the most appropriate description of a contagious disease?  
A contagious disease is one which is spread by  
(a) contaminated food,  
(b) contaminated drinking water,  
(c) contact with an infected person,  
(d) droplets from an infected person.
- 8 In the air passages, a layer of ..... (A) ..... traps bacteria. This ..... (B) ..... is carried away from the lungs by the action of ..... (C) ..... cells which line the air passages.
- 9 The ..... (A) ..... layer of the skin is a barrier to the entry of bacteria. Also the ..... (B) ..... glands and ..... (C) ..... glands produce bacteriocidal substances. If bacteria get through damaged skin they are attacked by ..... (D) ..... and ..... (E) ..... in the blood.
- 10 What is the purpose of the gauze mask worn by surgeons during an operation?
- 11 What sources of water are (a) most likely, (b) least likely to contain pathogenic bacteria?



**Disease - transmission and control (continued)**

**12** Put the following in the correct order for a water purification plant.

- (a) Chlorination plant.
- (b) Settling tank,
- (c) Water tower.
- (d) Slow sand filter.
- (e) Coarse screen.

**13** Which one of the following is least likely to prevent contamination of food by houseflies?

- (a) A well-fitting dustbin lid.
- (b) Swatting flies.
- (c) Covering food with cling-film.
- (d) Efficient sewage disposal.

**14** Complete the following sentences by selecting the appropriate words from the list below.

In many cases, when you catch an infectious disease, your blood produces ..... (A) ..... against the infective organism. These ..... (B) ..... remain in the blood or can be rapidly made so that you are ..... (C) ..... to further attacks of the disease. You can acquire ..... (D) ..... by receiving injections of a ..... (E) ..... form of the pathogen or its inactivated ..... (F) ..... The injected substance is called a ..... (G) .....

*immune, immunity, pathogens, disease, vaccine, antibodies, toxin, harmless, antigens*

**15** Which of the following diseases can be prevented by inoculation?

rubella, syphilis, tuberculosis, polio, gonorrhoea, common cold, measles, haemophilia, mumps, tetanus, AIDS

**16** Match each disease with its correct type of vaccine.

- |                    |                                 |
|--------------------|---------------------------------|
| (a) tuberculosis   | (i) harmless forms of virus     |
| (b) whooping cough | (ii) inactivated toxin          |
| (c) diphtheria     | (iii) killed bacteria           |
| (d) polio          | (iv) harmless form of bacteria. |

**17** Antiseptics and disinfectants both kill ..... (A) ..... but only ..... (B) ..... are safe to use on the skin (if sufficiently dilute).

**18** Complete the following sentence, selecting the most appropriate words from the list below.

An ideal ..... (A) ..... against an infectious disease would be one which destroyed the ..... (B) ..... but did not harm the ..... (C) .....

*pathogen, host, drug*

**19** A person with a cough takes a patent cough syrup. In three days, the cough is better. Does this mean that the syrup has cured the cough? Justify your answer.

- 20** (a) What kind of food is most likely to contain *Salmonella* bacteria?  
(b) What illness is caused by *Salmonella typhimurium* ?  
(c) What is the usual method of killing *Salmonella* bacteria in food?
- 21** When a particular strain of bacteria is called 'resistant', what is it resistant to?
- 22** Which one of the following is least likely to give rise to food poisoning?  
(a) Cooking and eating a partially defrosted turkey.  
(b) Eating a cooked chicken leg straight from the refrigerator.  
(c) Preparing a fresh chicken for the oven and immediately making a lettuce and tomato salad.  
(d) putting an uncooked chicken on the same plate as some cold ham.
- 23** Which of the following are not ways in which gonorrhoea and syphilis can be transmitted?  
(a) Using a towel that has been used by an infected person.  
(b) Touching an infected person.  
(c) Kissing an infected person.  
(d) Having sexual intercourse with an infected person.
- 24** How can a baby become infected with (a) gonorrhoea, (b) syphilis?
- 25** Which body cells are attacked by the malarial parasite?
- 26** By what means can malarial parasites be transmitted from an infected person to a healthy person?
- 27** (a) Anti-malarial drugs kill the parasites in the blood but they do not cure the disease. Why is this?  
(b) Why was the use of DDT insecticide not successful in eradicating malaria?

### 3 Energy from respiration

1 Select the most appropriate word from the list below to complete the following paragraph:

Respiration is the release of ..... from .....and takes place in all ..... of the body..... In the course of respiration, ..... is broken down to .....and ..... . If oxygen is used for this process, the respiration is called ..... . If oxygen is not used in the process, the respiration is called .....  
Each stage of respiration is speeded up by a particular .....

*cells, food, carbon dioxide, enzyme, muscles, aerobic, oxygen, water, vitamin, protein, energy, anaerobic.*

2 Complete the following equation which summarises aerobic respiration of glucose:



3 What are the products of alcoholic fermentation?

4 In which cell structures does respiration mainly occur?

5 If a person is lying quite still, what does he or she need energy for?

6 Which of the two forms of respiration (aerobic and anaerobic) provides more energy from a given quantity of food?

7 (a) What are the intermediate products of anaerobic respiration in an active muscle?

(b) Which of them is associated with oxygen debt?

(c) In what way is this product associated with the 'oxygen debt'?

8 Which two of the following statements are **incorrect**?

(a) Anaerobic respiration uses oxygen to release energy from food.

(b) Aerobic respiration releases oxygen from food during oxidation.

(c) Aerobic respiration converts food to carbon dioxide and water.

(d) Anaerobic respiration releases energy from food without using oxygen.

9 (a) Which one of the following would be acceptable evidence that some form of respiration was taking place in a living tissue

(i) oxygen being taken up

(ii) oxygen being given out

(iii) water vapour being produced

(iv) food being used up

(b) Why are the others unacceptable?

10 If a tissue was heated to 65°C for 10 minutes, respiration would cease even if oxygen and food were supplied. Why is this?

11 What name is given to the whole range of chemical changes which are needed just to keep an organism alive ?

(a) basal metabolism      (c) catabolism

(b) anabolism      (d) metabolism

12 (a) What chemical is normally used to test for the presence of carbon dioxide?

(b) What is the result of the test if carbon dioxide is present?

13 Blood from a donor is sterile and stored in a sealed bag, but it is still kept at 4°C. What is the advantage of keeping it at this low temperature?