

a Complete the word equation for photosynthesis.

\_\_\_\_\_ + \_\_\_\_\_ → \_\_\_\_\_

b Write the name of each chemical next to its formula. Which elements make up each chemical?

CO<sub>2</sub> \_\_\_\_\_

H<sub>2</sub>O \_\_\_\_\_

O<sub>2</sub> \_\_\_\_\_

C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> \_\_\_\_\_

c Choose the correct answer:

Photosynthesis is an exothermic/endothermic reaction.

Fill in the blanks:

In photosynthesis, \_\_\_\_\_ is transferred from the \_\_\_\_\_ to the \_\_\_\_\_ by \_\_\_\_\_.

d Name five ways the glucose produced in photosynthesis could be used.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Fill in the blanks:

To produce \_\_\_\_\_, plants also need \_\_\_\_\_ ions that are absorbed from the soil.

e How does the rate of photosynthesis affect the biomass of a plant?

\_\_\_\_\_

\_\_\_\_\_

f Explain how the amount of chlorophyll in a leaf affects the rate of photosynthesis.

\_\_\_\_\_

\_\_\_\_\_

Give two reasons there may be less chlorophyll in the leaf.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

g Explain what happens to your muscles during long periods of vigorous activity.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

h What happens to the waste lactic acid produced during anaerobic respiration?

\_\_\_\_\_

\_\_\_\_\_

What is the oxygen debt?

\_\_\_\_\_

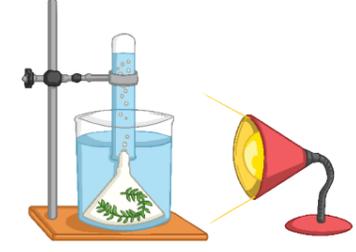
\_\_\_\_\_

How does your body clear the oxygen debt?

\_\_\_\_\_

\_\_\_\_\_

i The illustration shows a method for investigating the effect of light intensity on photosynthesis.



How could you measure the rate of photosynthesis using this equipment?

\_\_\_\_\_

\_\_\_\_\_

What is the independent variable in this experiment and what additional equipment would you need to measure it?

\_\_\_\_\_

\_\_\_\_\_

We often add a heat shield to the apparatus shown, what is the purpose of this?

\_\_\_\_\_

\_\_\_\_\_

j Respiration is an exothermic/endothermic reaction that takes place in the mitochondria of cells.

The more active a cell is, the more mitochondria it needs. Name two cell types that have lots of mitochondria.

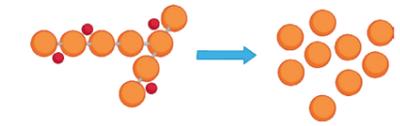
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\_\_\_\_\_

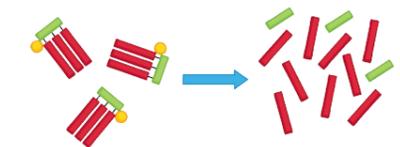
Respiration transfers \_\_\_\_\_ into a form we can use for living processes.

Respiration can take place \_\_\_\_\_ (using oxygen), or \_\_\_\_\_ (without oxygen).

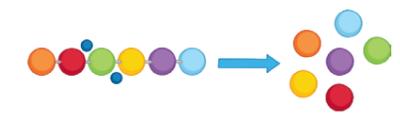
k The illustrations show the macromolecules in the foods that we eat. Complete the labels to identify the molecules they are broken down into.



carbohydrates → \_\_\_\_\_



lipids → \_\_\_\_\_



proteins → \_\_\_\_\_

What do the small dots on each of the macromolecules above represent?

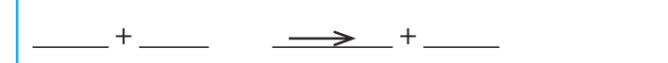
\_\_\_\_\_

Why is respiration important in this process?

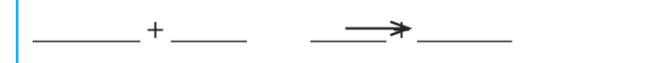
\_\_\_\_\_

\_\_\_\_\_

l Complete the word equation for aerobic respiration.



Complete the formula equation for aerobic respiration.





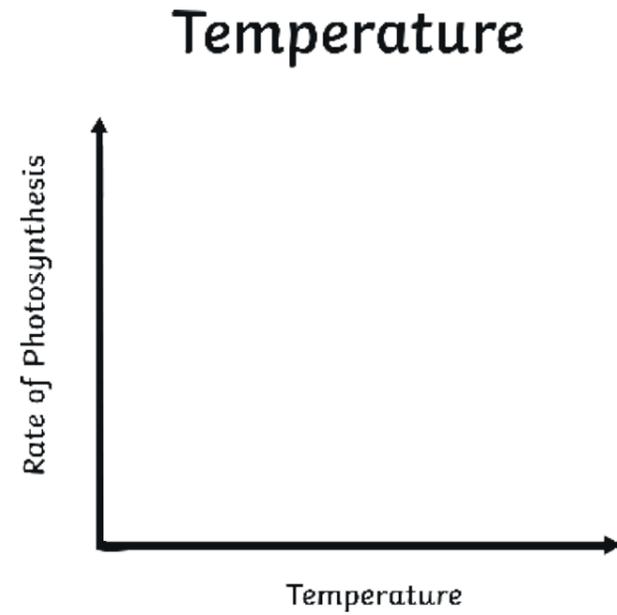
What is metabolism?

Metabolism includes the synthesis of new molecules. Complete the sentences to identify some of the molecules that are made in plant and/or animal cells.

1. Glucose is converted to \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
2. Glycerol and \_\_\_\_\_ molecules of fatty acid are used to form \_\_\_\_\_.
3. Glucose and \_\_\_\_\_ ions are used to form \_\_\_\_\_, which are used to form \_\_\_\_\_.

What happens to excess proteins in the body?

Draw a line on the graph to show how temperature affects the rate of photosynthesis.



Explain how temperature affects the rate of photosynthesis.

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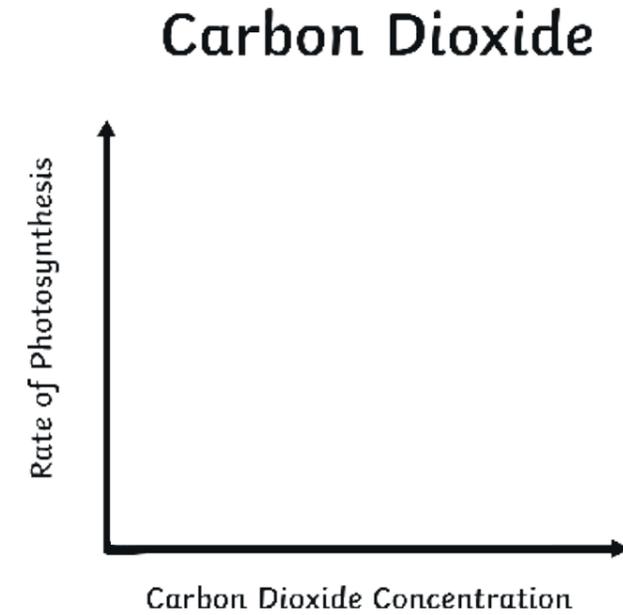
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Draw a line on the graph to show how carbon dioxide affects the rate of photosynthesis.



Describe how carbon dioxide affects the rate of photosynthesis.

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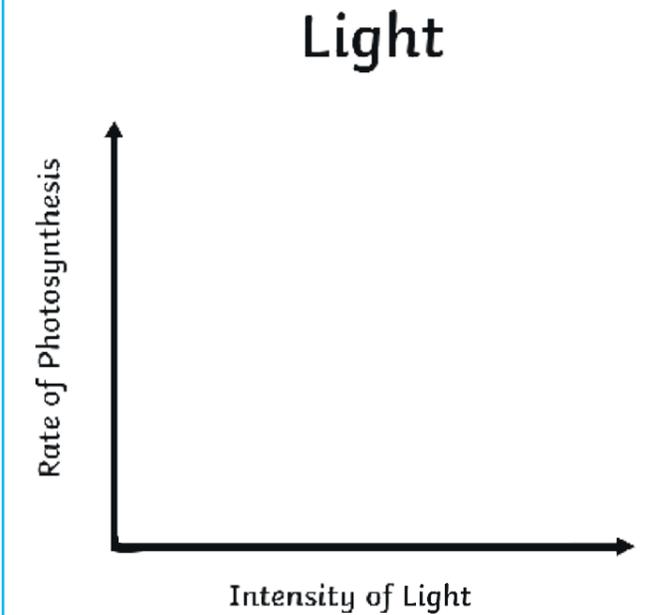
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Draw a line on the graph to show how light intensity affects the rate of photosynthesis.



Describe how light intensity affects the rate of photosynthesis.

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Complete the word equation for photosynthesis.

sunlight

carbon dioxide + water  $\longrightarrow$  oxygen + glucose

Write the name of each chemical next to its formula. Which elements make up each chemical?

CO<sub>2</sub> carbon dioxide - carbon and oxygen

H<sub>2</sub>O water - hydrogen and oxygen

O<sub>2</sub> oxygen

C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> glucose - carbon, hydrogen, oxygen

Choose the correct answer:

Photosynthesis is an **exothermic**/endothermic reaction.

Fill in the blanks:

In photosynthesis, energy is transferred from the environment to the chloroplasts by light.

Name five ways the glucose produced in photosynthesis could be used.

- For respiration.
- Converted into insoluble starch for storage.
- Used to produce fat or oil for storage.
- Used to produce cellulose, which strengthens the cell wall.
- Used to produce amino acids for protein synthesis

Fill in the blanks:

To produce proteins, plants also need nitrate ions that are absorbed from the soil.

How does the rate of photosynthesis affect the biomass of a plant?

The more photosynthesis, the more biomass the plant makes, so the faster it grows.

Explain how the amount of chlorophyll in a leaf affects the rate of photosynthesis.

The less chlorophyll in a leaf, the less photosynthesis.

Give two reasons there may be less chlorophyll in the leaf.

- If the plant has diseases, like tobacco mosaic virus or rose black spot.
- If the plant does not have enough minerals, like magnesium.

Explain what happens to your muscles during long periods of vigorous activity.

- There is a build up of lactic acid which contributes to muscle fatigue.
- Muscles stop contracting effectively.
- An oxygen debt is created.

What happens to the waste lactic acid produced during anaerobic respiration?

It is transported to the liver where it is converted back to glucose.

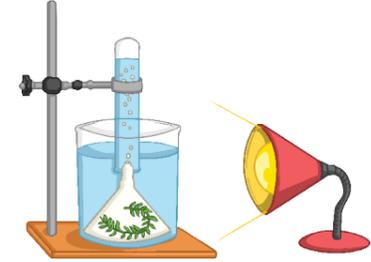
What is the oxygen debt?

The amount of extra oxygen the body needs after exercise to oxidise the lactic acid.

How does your body clear the oxygen debt?

You keep a higher breath volume and breathing rate after exercise.

The illustration shows a method for investigating the effect of light intensity on photosynthesis.



How could you measure the rate of photosynthesis using this equipment?

Count the number of bubbles released in a given time (e.g. per minute).

What is the independent variable in this experiment and what additional equipment would you need to measure it?

Distance of the lamp from the pondweed, measured using a ruler or tape measure.

We often add a heat shield to the apparatus shown, what is the purpose of this?

To absorb any heat given off by the lamp so that we can control the temperature of the pondweed.

Respiration is an **exothermic**/endothermic reaction that takes place in the mitochondria of cells.

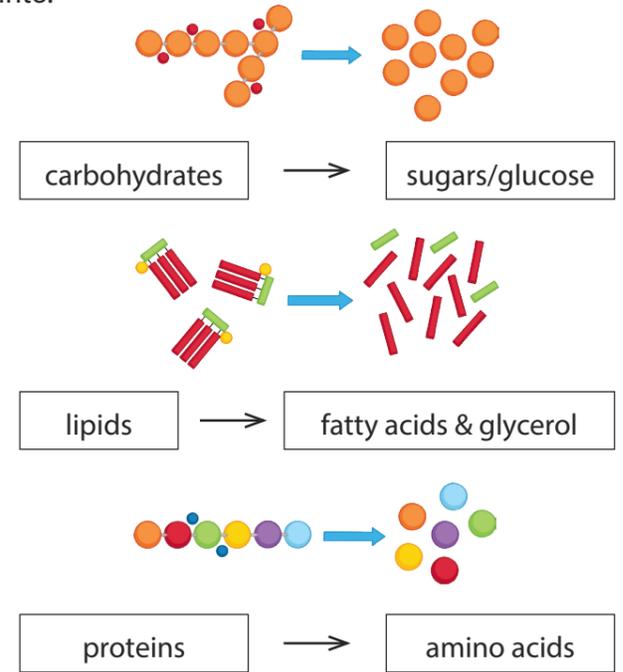
The more active a cell is, the more mitochondria it needs. Name two cell types that have lots of mitochondria.

muscle cells, sperm cells, ciliated epithelial cells, phloem companion cells

Respiration transfers energy into a form we can use for living processes.

Respiration can take place aerobically (using oxygen), or anaerobically (without oxygen).

The illustrations show the macromolecules in the foods that we eat. Complete the labels to identify the molecules they are broken down into.



What do the small dots on each of the macromolecules above represent?

enzymes

Why is respiration important in this process?

The energy transferred in respiration is used for enzyme controlled processes.

Complete the word equation for aerobic respiration.

glucose + oxygen  $\longrightarrow$  carbon dioxide + water

Complete the formula equation for aerobic respiration.

C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + O<sub>2</sub>  $\longrightarrow$  CO<sub>2</sub> + H<sub>2</sub>O

**a**  
 Explain how farmers manipulate the environment of their crops to help them make a profit.  
 Farmers control the temperature and levels of light and carbon dioxide to get the fastest possible rates of photosynthesis. This means that they produce bigger crops, faster.  
 They have to use expensive monitoring equipment, electricity, and gas to maintain the optimum conditions. However, they need less staff, the crops are clean and soil free, they can use land where the ground is poor, turnover of crops is quicker, and the crops are larger.  
 Farmers balance the cost of the systems they use against the increased income from more harvests of larger crops each year.

**b**  
 Explain what happens to your breathing rate when you exercise.

- Your breathing rate and breath volume increase.
- The rate at which oxygen is brought into your body is increased.
- The rate at which carbon dioxide is removed is increased.
- This means more oxygen is available to be transported to cells for respiration.

**c**  
 Complete the word equation for anaerobic respiration in plant and yeast cells.  
 glucose  $\rightarrow$  ethanol + carbon dioxide  
 What is anaerobic respiration in yeast called?  
 fermentation  
 Why does this process have economic importance?  
 Is it used to make alcohol and bread.

**d**  
 Explain what happens to your heart rate when you exercise.

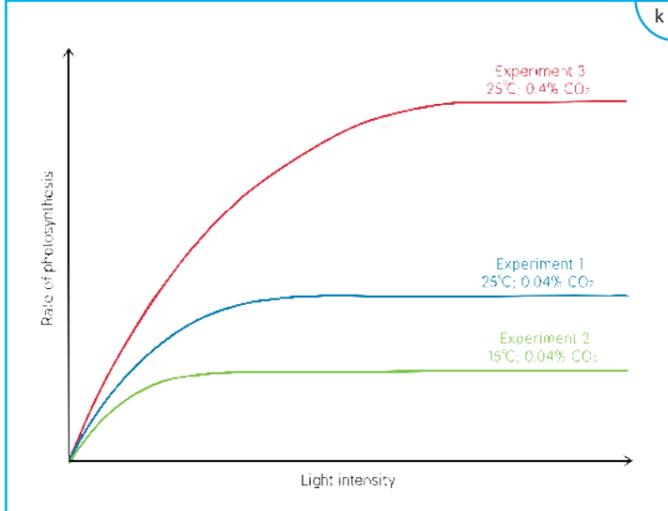
- Your heart rate increases so that more oxygenated blood is carried to your muscles.
- Therefore, more oxygen and glucose reach the cells.
- The rate of respiration can increase to transfer more energy for muscle contraction.
- Carbon dioxide is removed from the muscles at a faster rate.

**e**  
 Fill in the gaps:  
 As the distance of the light from the plant increases, the light intensity decreases. This is called an inverse relationship.  
 The light intensity changes in inverse proportion to the square of the distance.  
 You would write this as:  
 light intensity  $\propto \frac{1}{\text{distance}^2}$   
 If you double the distance between the light and the plant, how much will the light intensity fall by?  
 $\frac{1}{4}$

**f**  
 Give three reasons why organisms need energy.

- For chemical reactions that build bigger molecules.
- For movement.
- For keeping warm.

**g**  
 When does anaerobic respiration happen?  
 When your body can't supply oxygen to the muscles fast enough.  
 Complete the word equation for anaerobic respiration in muscles.  
 glucose  $\rightarrow$  lactic acid  
 Why is anaerobic respiration not as efficient as aerobic respiration?  
 The glucose molecules are not completely broken down, so much less energy is transferred.



Compare the graphs for experiments 1 and 2, explain what they tell you about the rate of photosynthesis.  
 As the temperature increases, the rate of photosynthesis increases.  
 Now compare these graphs with experiment 3, explain what this tells you about the rate of photosynthesis.  
 When the carbon dioxide is increased, the rate of photosynthesis increases.  
 Describe how light intensity affected the rate of photosynthesis.  
 Initially, as the light intensity increased so did the rate of photosynthesis. However, the line levelling indicates that at that point, the light intensity was no longer the limiting factor for photosynthesis.

What is metabolism?

The sum of all the reactions in a cell, or the body.

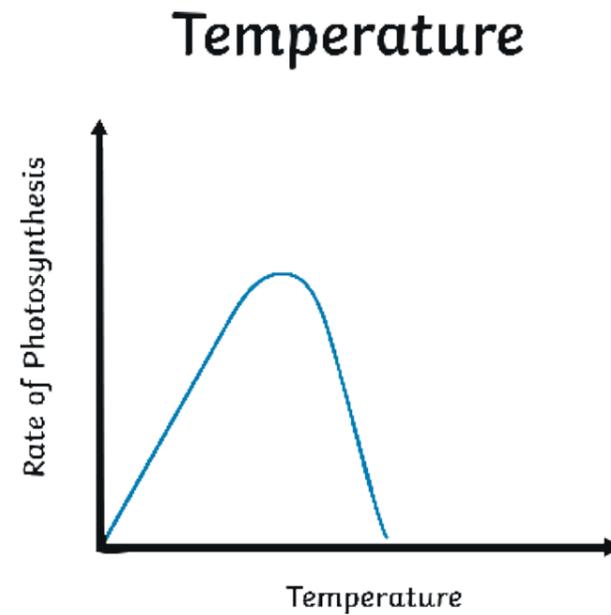
Metabolism includes the synthesis of new molecules. Complete the sentences to identify some of the molecules that are made in plant and/or animal cells.

1. Glucose is converted to starch, glycogen and cellulose.
2. Glycerol and three molecules of fatty acid are used to form lipids.
3. Glucose and nitrate ions are used to form amino acids, which are used to form proteins.

What happens to excess proteins in the body?

They are broken down to form urea for excretion.

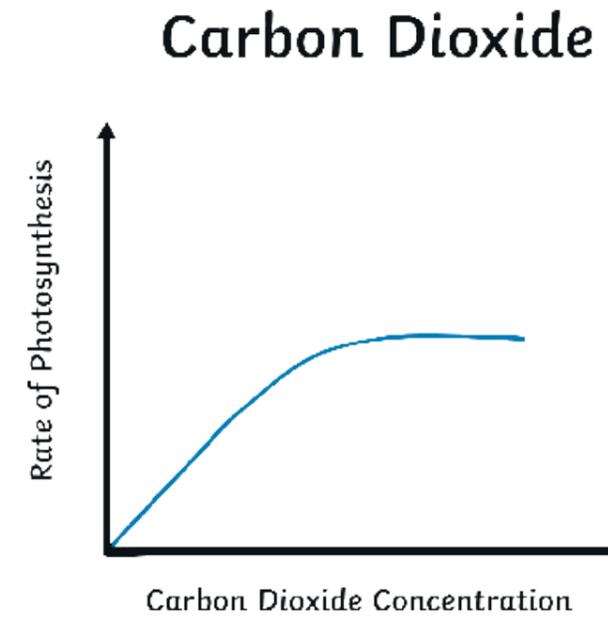
Draw a line on the graph to show how temperature affects the rate of photosynthesis.



Explain how temperature affects the rate of photosynthesis.

As the temperature increases, the rate of photosynthesis increases. When the temperature gets too high, the enzymes that control photosynthesis denature and the rate of photosynthesis decreases.

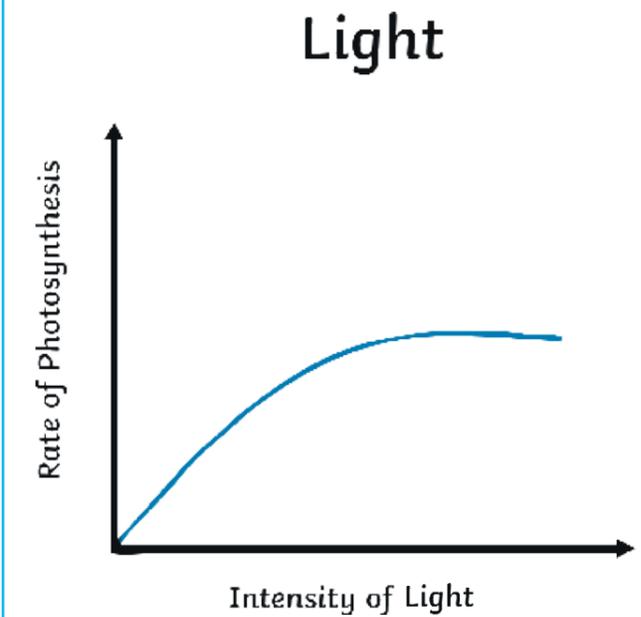
Draw a line on the graph to show how carbon dioxide affects the rate of photosynthesis.



Describe how carbon dioxide affects the rate of photosynthesis.

Increasing the concentration of carbon dioxide will increase the rate of the photosynthesis, until another factor limits the rate.

Draw a line on the graph to show how light intensity affects the rate of photosynthesis.



Describe how light intensity affects the rate of photosynthesis.

Increasing light intensity increases the rate of photosynthesis, until another factor limits the rate.