

1 Complete the word equation for photosynthesis.
 _____ + _____ → _____ + _____

2 Write the name of each chemical next to its formula. Which elements make up each chemical?
 CO₂ _____
 H₂O _____
 O₂ _____
 C₆H₁₂O₆ _____

3 Choose the correct answer:
 Photosynthesis is an exothermic/endothermic reaction.
 Fill in the blanks:
 In photosynthesis, _____ is transferred from the _____ to the _____ by _____.

4 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.

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

6 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.

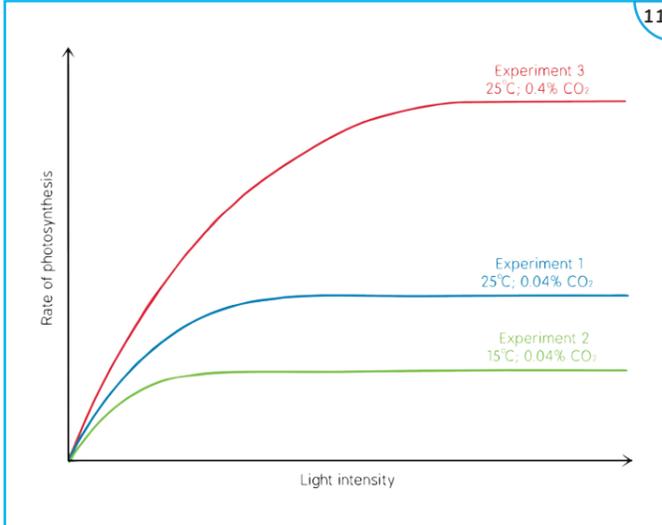
7 Explain how farmers manipulate the environment of their crops to help them make a profit.

8 Fill in the gaps:
 As the distance of the light from the plant _____, the light intensity _____. This is called an _____ relationship.
 The light intensity changes in inverse proportion to the square of the distance.
 You would write this as:
 _____ α
 If you double the distance between the light and the plant, how much will the light intensity fall by?

9 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.

 Respiration transfers _____ into a form we can use for living processes.
 Respiration can take place _____ (using oxygen), or _____ (without oxygen).

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



11 Compare the graphs for experiments 1 and 2, explain what they tell you about the rate of photosynthesis.

 Now compare these graphs with experiment 3, explain what this tells you about the rate of photosynthesis.

 Describe how light intensity affected the rate of photosynthesis.

12 Complete the word equation for aerobic respiration.
 _____ + _____ → _____ + _____
 Complete the formula equation for aerobic respiration.
 _____ + _____ → _____ + _____

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

What is the oxygen debt?

How does your body clear the oxygen debt?

16 Explain what happens to your heart rate when you exercise.

18 When does anaerobic respiration happen?

Complete the word equation for anaerobic respiration in muscles.
 _____ → _____

Why is anaerobic respiration not as efficient as aerobic respiration?

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

carbohydrates → _____

_____ → _____

proteins → _____

14 Explain what happens to your breathing rate when you exercise.

17 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?

19 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.

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

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

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

Why is respiration important in this process?

15 Complete the word equation for anaerobic respiration in plant and yeast cells.
 _____ → _____ + _____

What is anaerobic respiration in yeast called?

Why does this process have economic importance?

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?

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

What is the oxygen debt?

How does your body clear the oxygen debt?

22 Explain what happens to your heart rate when you exercise.

Give three reasons why organisms need energy.

23

What is metabolism?

24

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.

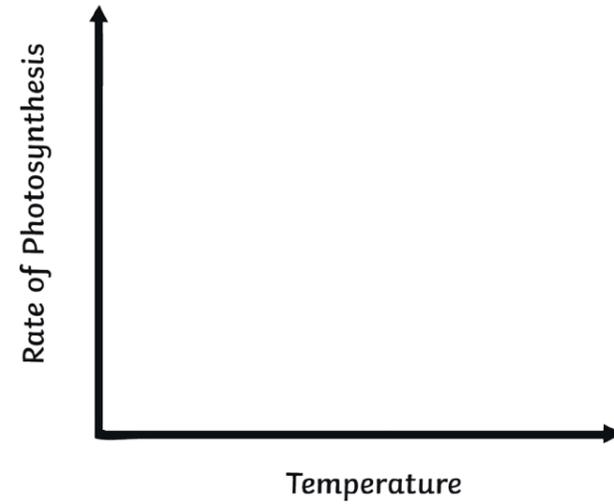
1. Glucose is converted to _____, _____ and _____.
2. Glycerol and _____ molecules of fatty acid are used to form _____.
3. Glucose and _____ ions are used to form _____, which are used to form _____.

What happens to excess proteins in the body?

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

25

Temperature

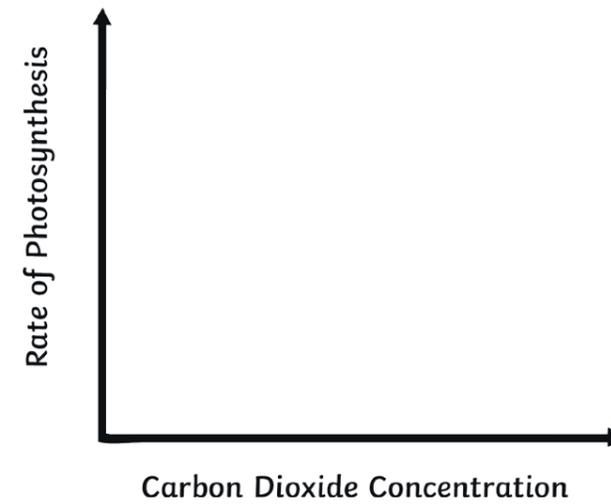


Explain how temperature affects the rate of photosynthesis.

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

26

Carbon Dioxide

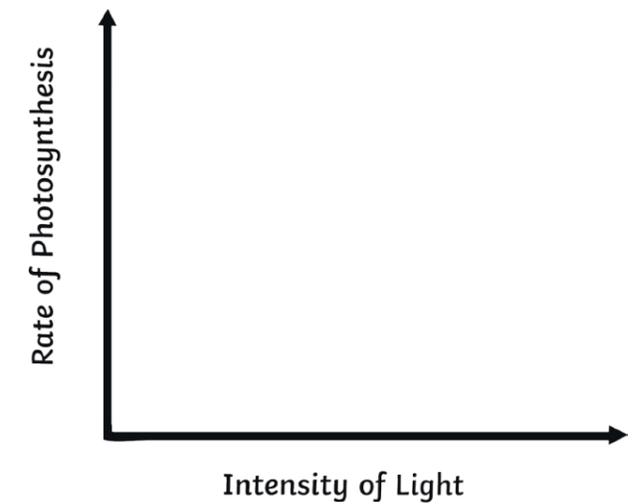


Describe how carbon dioxide affects the rate of photosynthesis.

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

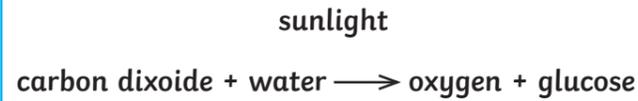
27

Light



Describe how light intensity affects the rate of photosynthesis.

Complete the word equation for photosynthesis.



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

CO₂ **carbon dioxide - carbon and oxygen**

H₂O **water - hydrogen and oxygen**

O₂ **oxygen**

C₆H₁₂O₆ **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.

1. For respiration.
2. Converted into insoluble starch for storage.
3. Used to produce fat or oil for storage.
4. Used to produce cellulose, which strengthens the cell wall.
5. 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.

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

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.

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:

$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$

If you double the distance between the light and the plant, how much will the light intensity fall by?

$\frac{1}{4}$

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.

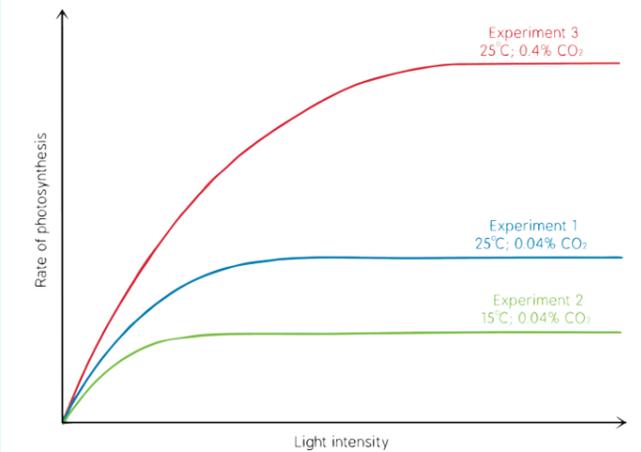
muscle cells, sperm cells, ciliated epithelial cells, phloem companion cells

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

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

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.**



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.

Complete the word equation for aerobic respiration.



Complete the formula equation for aerobic respiration.



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.

13

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.**

16

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 \longrightarrow 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.

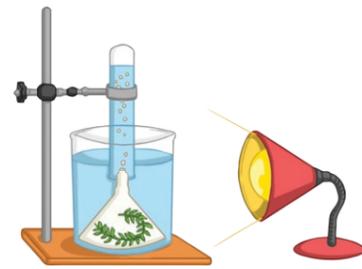
18

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.**

14

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

17

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).

19

Complete the word equation for anaerobic respiration in plant and yeast cells.

glucose \longrightarrow 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.

15

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?

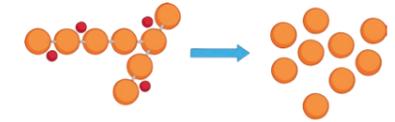
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How does your body clear the oxygen debt?

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

20

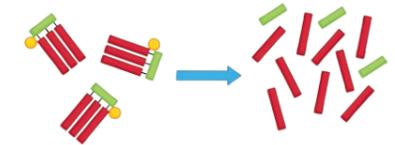
The illustrations show the macromolecules in the foods that we eat. Complete the labels to identify the molecules they are broken down into.



carbohydrates

 \longrightarrow

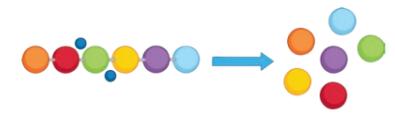
sugars/glucose



lipids

 \longrightarrow

fatty acids & glycerol



proteins

 \longrightarrow

amino acids

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.

21

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.

Give three reasons why organisms need energy.

1. For chemical reactions that build bigger molecules.
2. For movement.
3. For keeping warm.

What is metabolism?

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

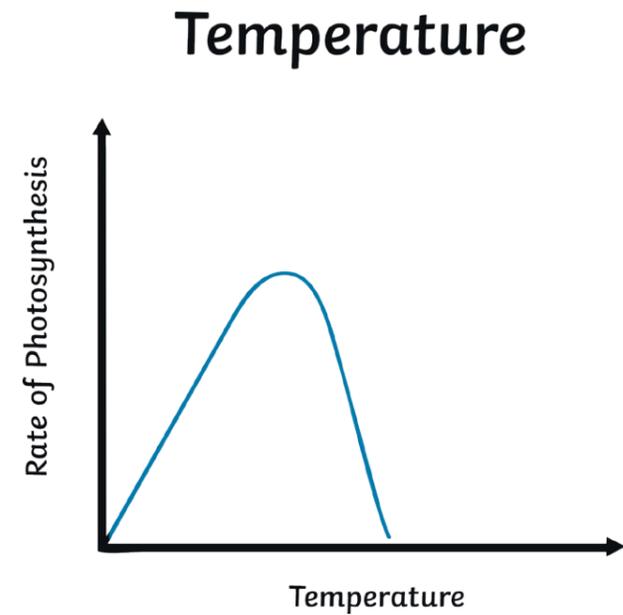
Metabolism includes the synthesis of new molecules. Complete the sentences to identify some of the molecules that are made in plant and/or animal cells.

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.

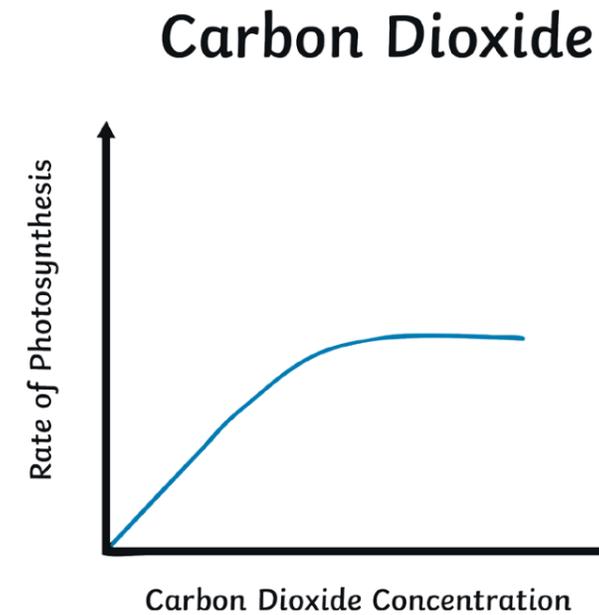
Draw a line on the graph to show how temperature affects the rate of photosynthesis.



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.

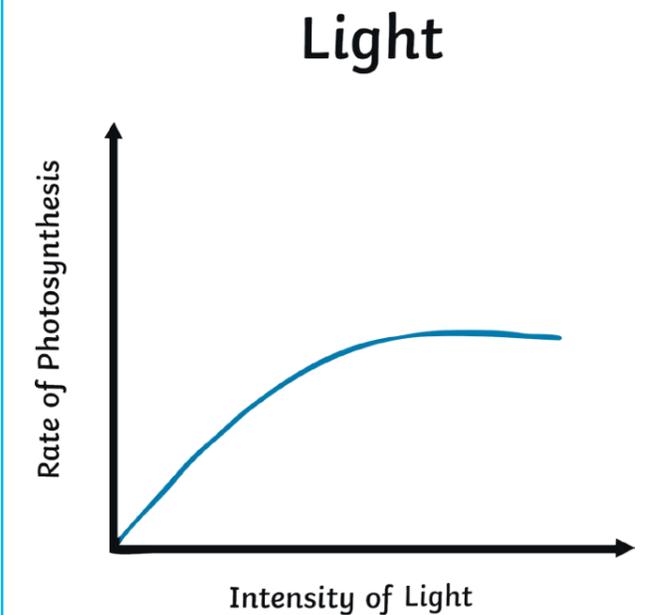
Draw a line on the graph to show how carbon dioxide affects the rate of photosynthesis.



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 of photosynthesis decreases.

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.