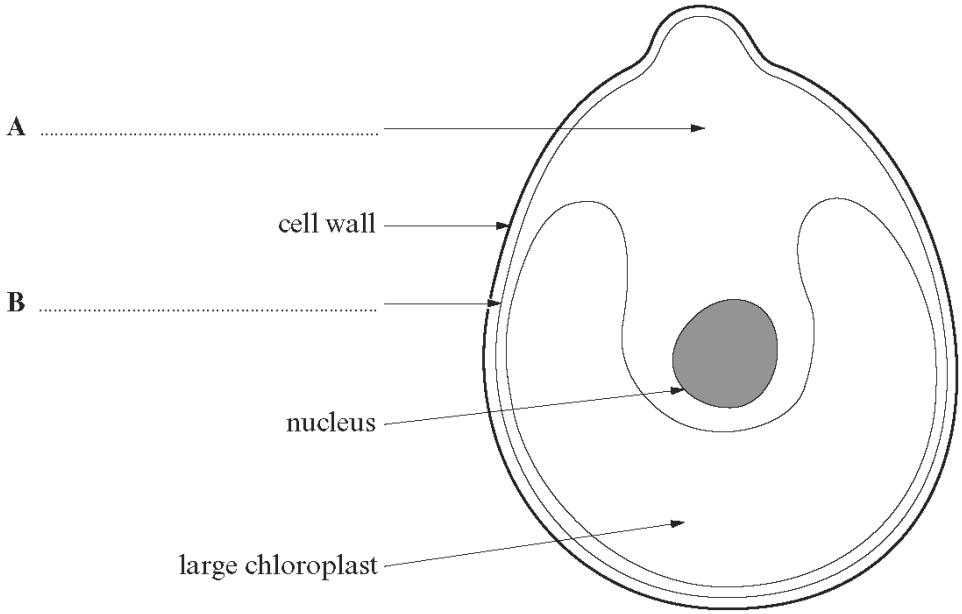
WJEC (Wales) Biology GCSE
Topic 1.1 Cells and Movement Across Membranes
Questions by Topic

1.

The diagram below shows an algal cell.



(a) Complete labels **A** and **B** on the diagram above. [2]

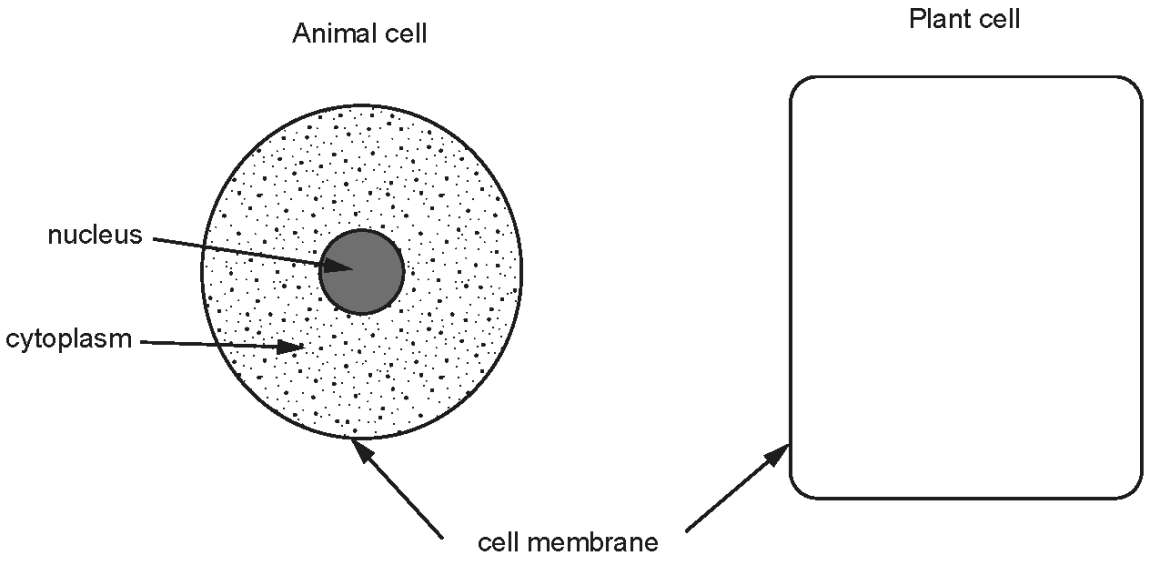
(b) (i) Complete the table. [3]

Part of algal cell	Function
nucleus	.....
.....	photosynthesis
cell wall	.....

(ii) I. Name **one** part of the algal cell, shown in the diagram above which is **not** present in an animal cell. [1]

2.

(a) (i) The diagrams below show an animal cell and the **cell membrane** of a plant cell. Complete the drawing of the plant cell. *No labels are required.* [2]



(ii) State the function of the cell membrane. [1]

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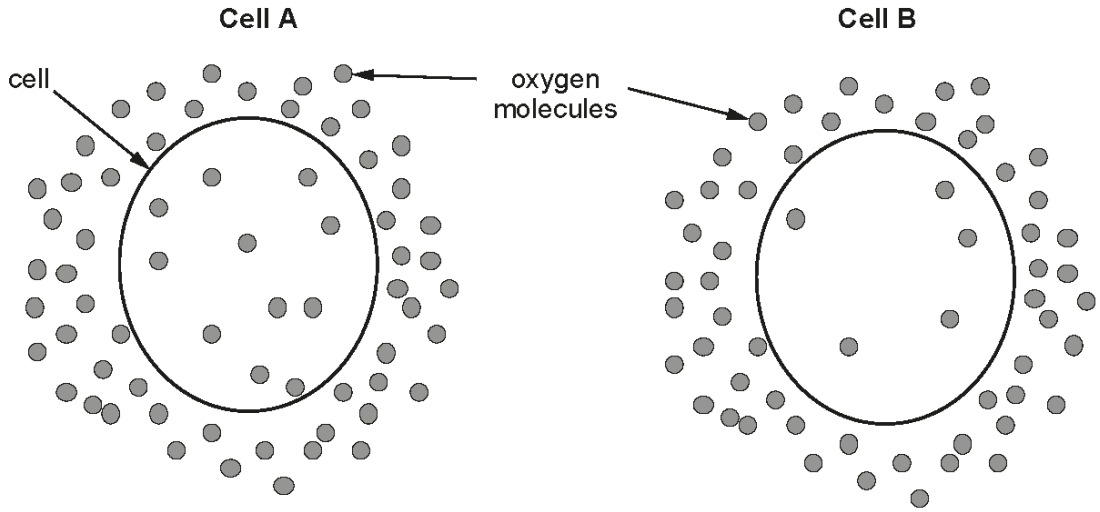
.....

(b) The diagrams below show two cells which are carrying out respiration. Oxygen molecules are shown inside and outside both cells.



(i) Answer the following questions by placing a tick [✓] in the correct box. [3]

I. In cell **A** the oxygen molecules move:

into the cell ☐

out of the cell ☐

no net movement. ☐

II. In cell **B** the oxygen molecules move:

into the cell ☐

out of the cell ☐

no net movement. ☐

III. Into which cell could there be the greater net movement of oxygen:

cell **A** ☐

cell **B**? ☐

(ii) Name the process by which the oxygen molecules are moving. [1]

.....

☐

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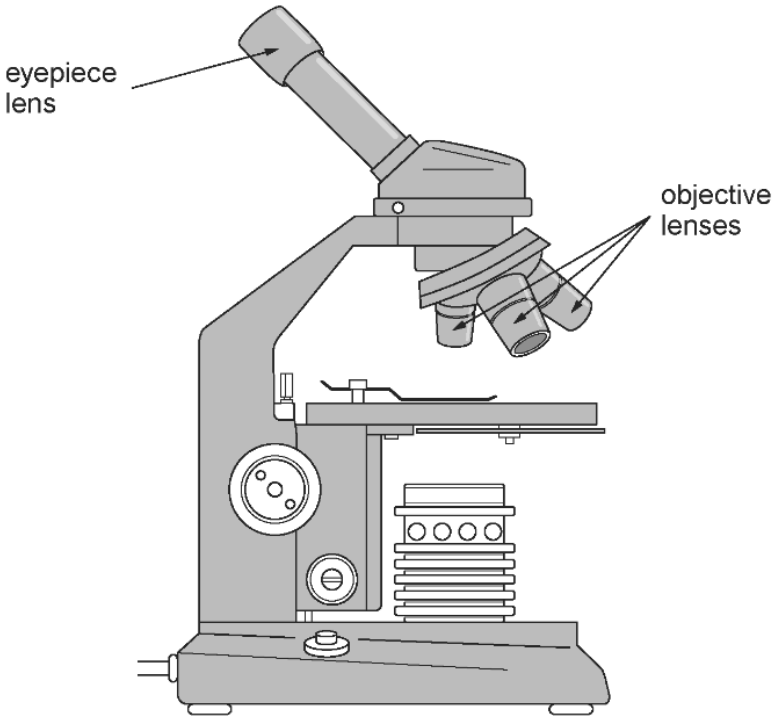
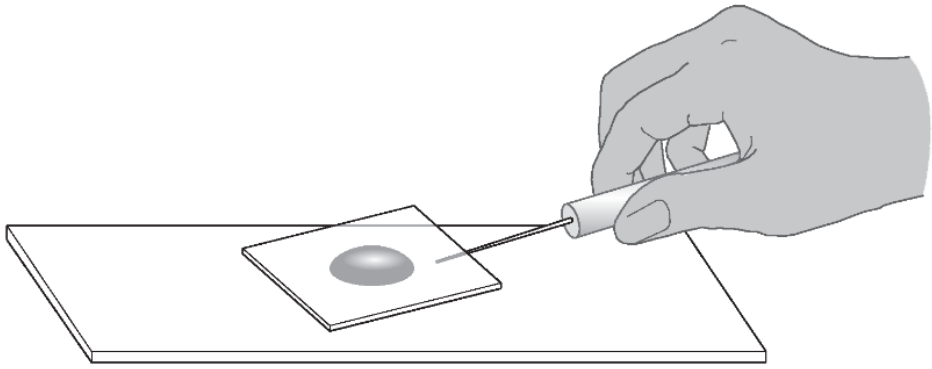
3. Rhys studies some plant tissue using the instrument shown below.

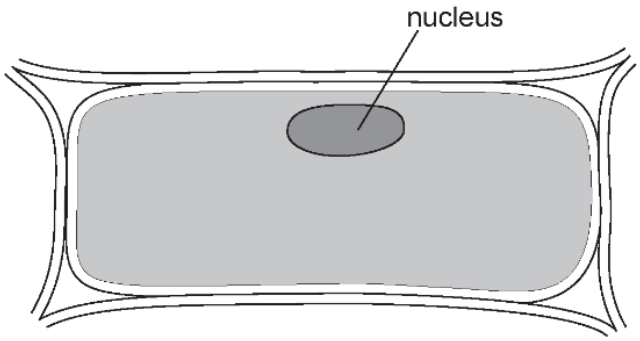


(a) State the name of the instrument shown in the diagram. [1]

Rhys places some of the plant tissue in water on a slide and lowers a cover slip on top as shown below.



He draws one cell from the tissue as seen under the maximum magnification.
His drawing is shown below.



(d) State the function of the nucleus. [1]

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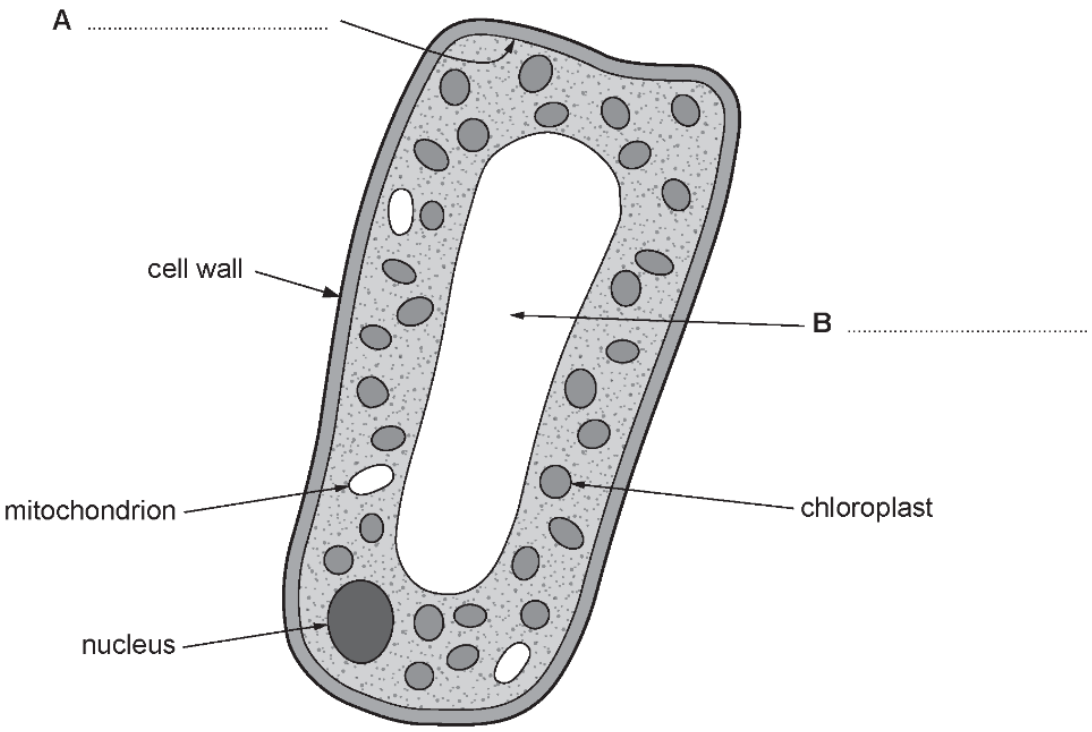
4. The diagram below shows a section through a plant cell as seen with a light microscope.



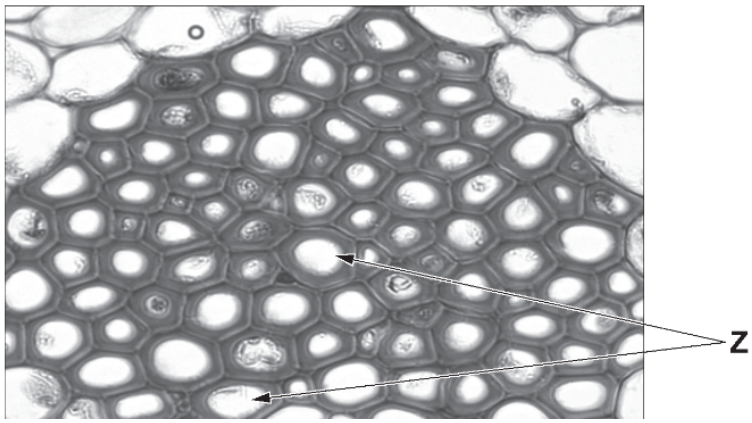
(a) (i) Label parts **A** and **B** on the diagram. [2]

(ii) Complete the table below. [3]

Part of cell	Function	Cell part present (✓) or absent (×) in animal cell
.....	photosynthesis	.....
mitochondrion	.....	✓
.....	contains the chromosomes	.....

(b) The photograph below shows some plant cells as seen under a light microscope.

The group of cells labelled **Z** has been treated using a procedure to make their cell walls more clearly visible.



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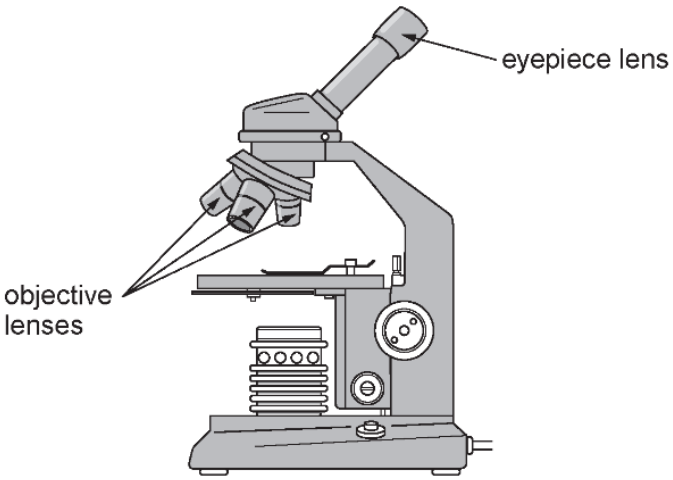
(ii) When the microscope was used to view these plant cells the magnification of the eyepiece lens was ×10 and the magnification of the objective lens used was ×10.



Using this information, calculate the total magnification of the image. [1]

Magnification = × .....

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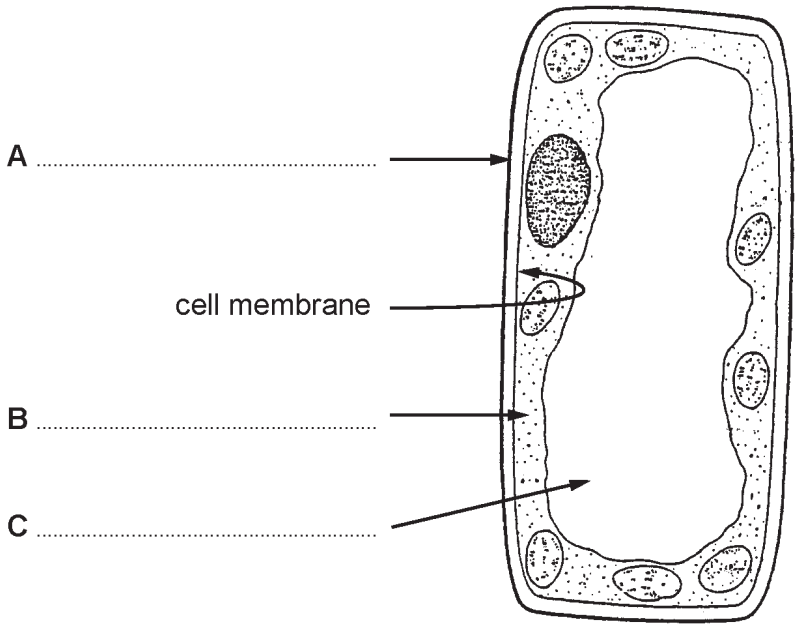
Turn over.

5.

(a) (i) Complete the labels **A**, **B** and **C** on the diagram of a plant cell below. [3]



(ii) State the function of the cell membrane. [1]

.....

(b) (i) Which two structures shown on the diagram would **not** be present in an animal cell? Underline your answer. [1]

A and B **A and C** **B and C**

(ii) Name a structure shown in the diagram which would be present in both an animal cell and a yeast cell. [1]

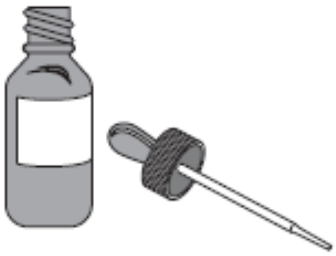
.....

6. 6. *(a)* Describe the method you would use to make a slide of your own cheek cells using the apparatus below. [6 QER]

glass slide

cover slip

cotton wool bud



methylene blue stain

mounted needle

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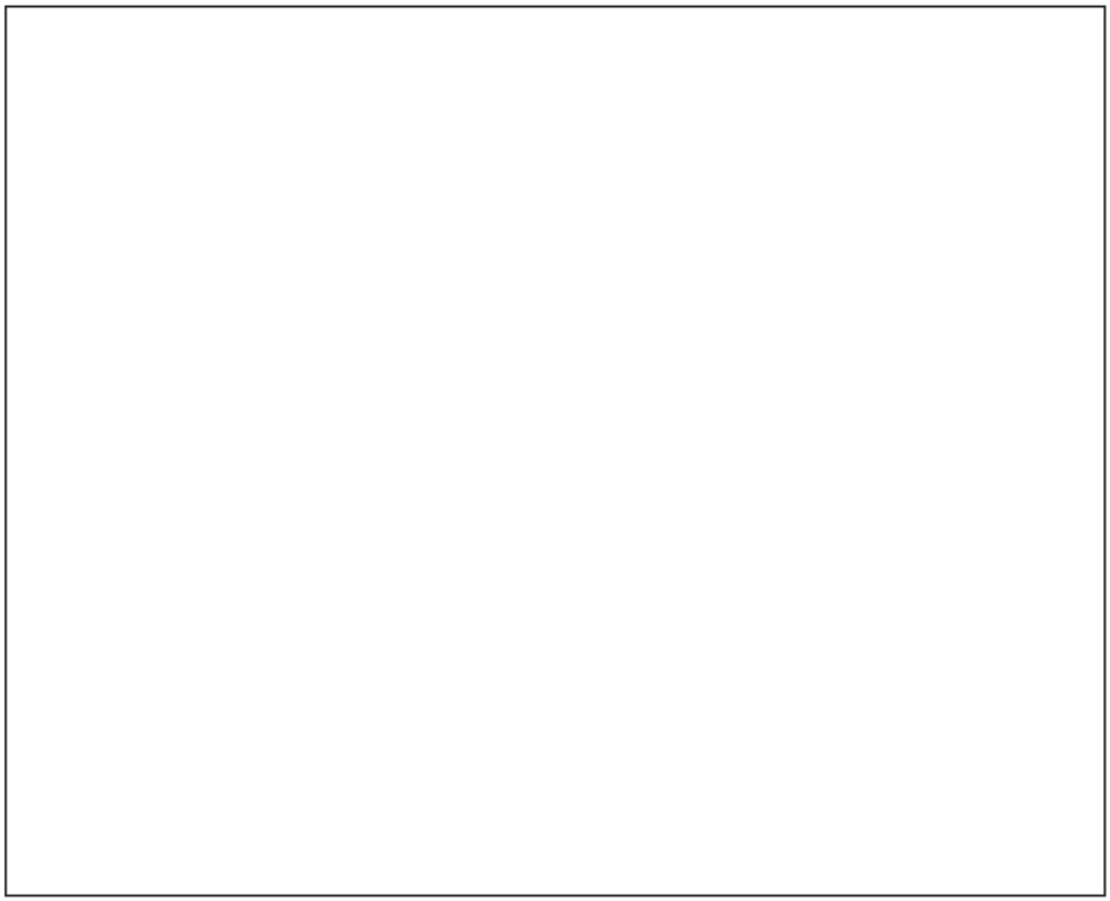
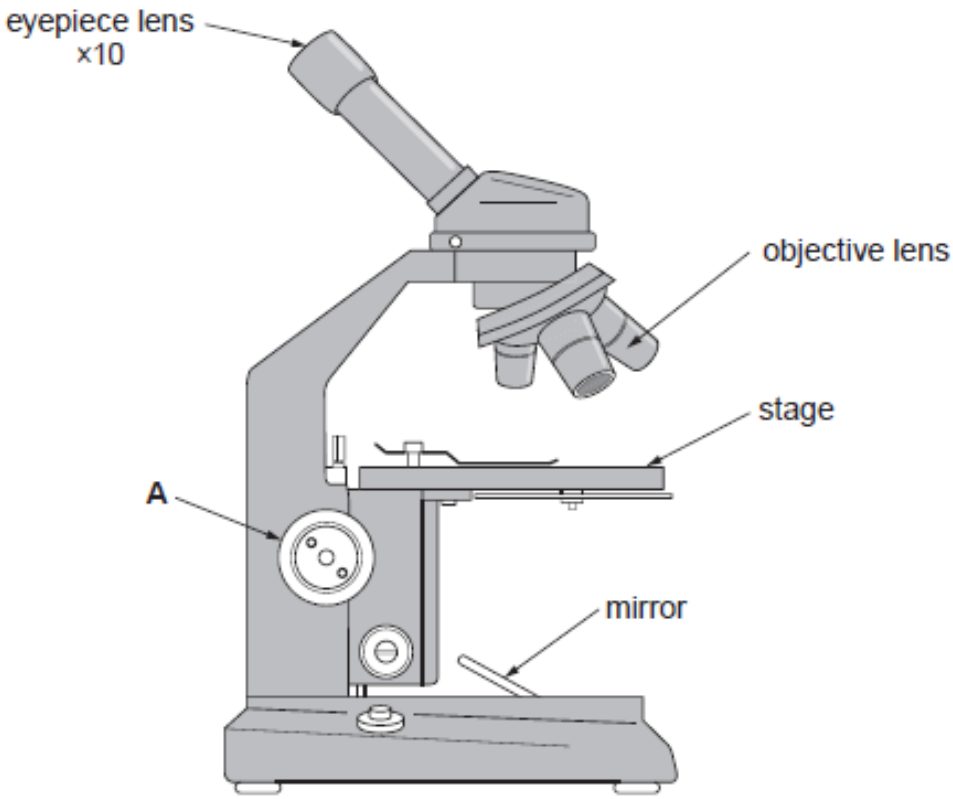
(b) Make a large drawing of one cheek cell in the box below.

Include the cell structures you would see when viewed at the highest magnification of a light microscope. No labels are required. [1]



7. 7. Rhys was asked by his teacher to set up a light microscope so that he could view some cells at a magnification of ×100. The microscope had three objective lenses of ×4, ×10 and ×40 magnifications. Rhys was also given a prepared slide of muscle cells.



(a) Explain how Rhys could view the muscle cells at a magnification of ×100. [2]

.....

.....

.....

(b) State the function of structure **A** on the diagram. [1]

.....

(c) When Rhys viewed the muscle cell under the microscope he could see that the cells were not found on their own, but were grouped together in large numbers.

(i) Muscle cells are described as being specialised cells. State the advantage to the organism of having specialised cells. [1]

.....

.....

(ii) State the name given to a large number of the same cells grouped together. [1]

.....

(d) In biology, what is meant by the term organ? [1]

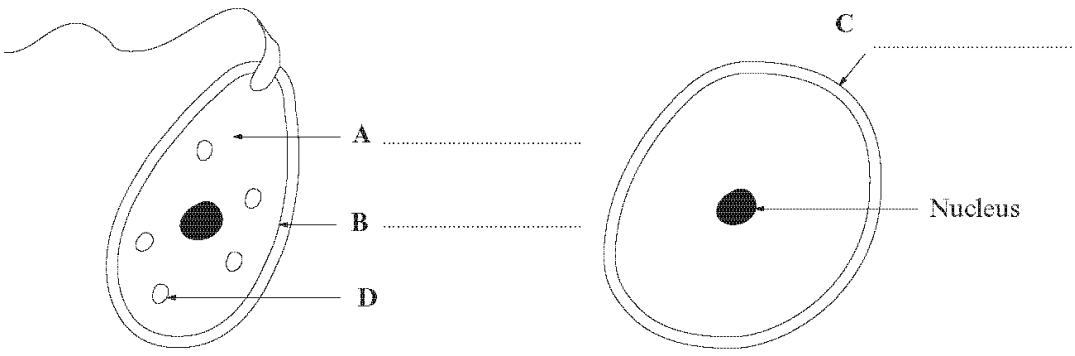
.....

.....

8.

(a) The diagrams below show two micro-organisms.

[3]



Algal Cell Yeast Cell

(ii) Structure **D** contains chlorophyll. Name this structure and state its function. [2]

Name .....

Function .....

(b) Scientists use light microscopes to study living cells. Why is an electron microscope *unsuitable* for this task? [1]

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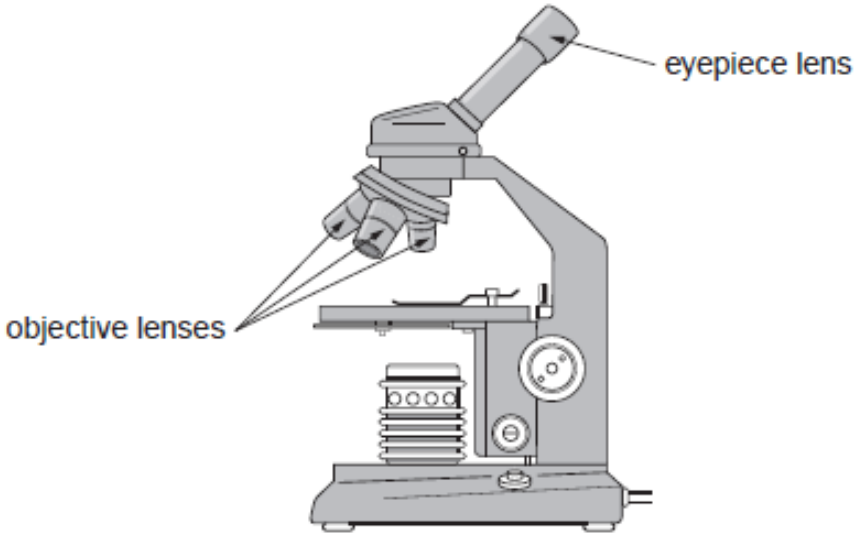
9. Rheinallt observed some plant cells using a light microscope.



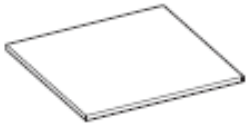
(a) He set up the microscope so that it had a total magnification of ×240.

The magnification of the eyepiece lens on his microscope was ×6. Which of the following objective lenses did he use? [1]

Objective lens power	Magnification
low	×8
medium	×15
high	×40

Objective lens magnification = × .....

(b) The diagram shows the apparatus Rheinallt used to prepare a slide of onion cells.



glass coverslip

mounted needle

glass microscope slide

Iodine solution

onion

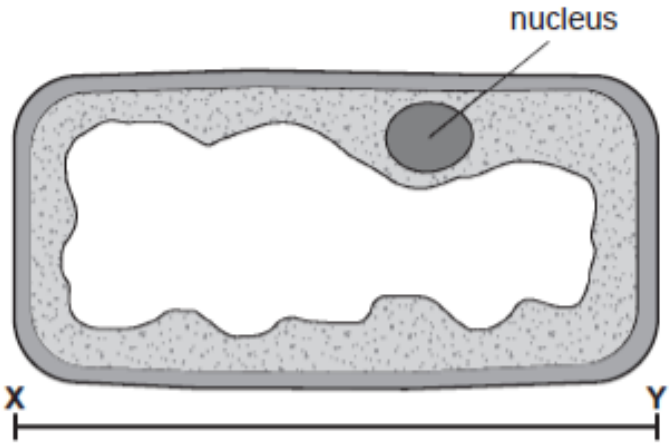
forceps

Continue and complete the method below, which he used to prepare his slide for observation under the microscope. [3]

Method

- Take a piece of freshly cut onion.
- Use forceps to carefully peel a thin layer of cells from the inner surface of the onion.
- Place the layer of onion cells onto the centre of a microscope slide.
- .....
- .....
- .....

(c) Rheinallt made a large drawing of one of the cells he observed.



(i) I. Measure the length of the cell in Rheinallt's drawing along line **X–Y**. [1]

Length of cell in drawing = ... mm

II. The actual length of cells of this type is usually 0.02 mm.
Use your answer to part I. to calculate the magnification of Rheinallt's drawing. [2]

Magnification of drawing = × .....

(ii) From the drawing, give **one** feature of the cell which shows that it is a plant cell. [1]

.....

(d) Rheinallt compared his drawing with an image obtained from an electron microscope. Why would the electron microscope image give more information about the structure of an onion cell? [1]

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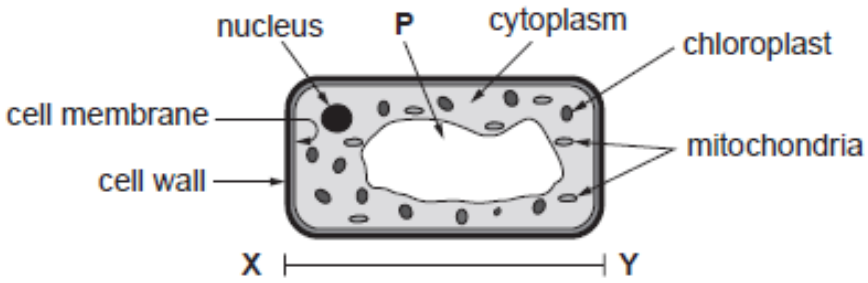
10. The diagram shows a plant cell. Some structures have been labelled.



(a) (i) Use a ruler to measure the length of the cell at **X – Y** in mm. [1]

length at **X – Y** = ... mm

(ii) The diagram is magnified ×400.

Use your answer to part (i) to calculate the actual length of the cell. [1]

actual length = ... mm

(b) State the name of structure **P**. [1]

.....

(c) Complete the following table about plant cells. [4]

Name of structure	Function
.....	respiration
.....	controls entry and exit of materials
chloroplasts	.....
.....	contains chromosomes

11. *(a)* State the meaning of the term diffusion. [1]

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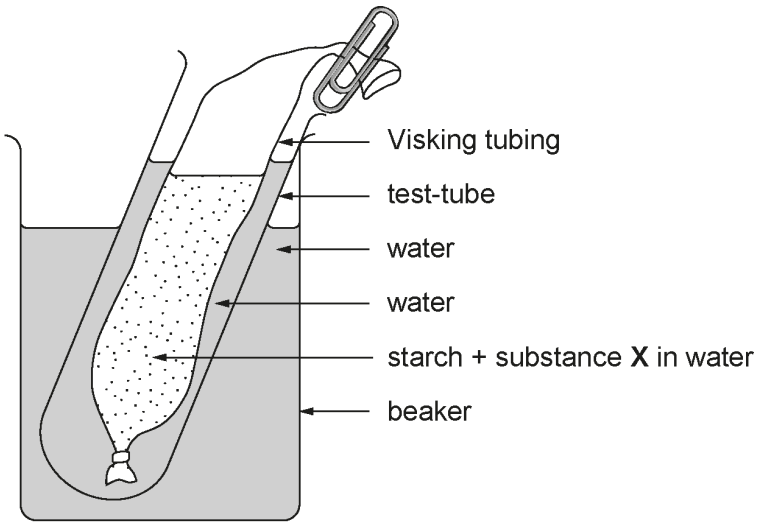
(b) The diagram below shows a piece of Visking tubing that has been set up to represent the way molecules pass through the wall of the small intestine into the bloodstream.



Every 30 minutes for the next two hours the water in the test tube was tested for the presence of both starch and glucose.

The results are shown in the table below.

	time (minutes)				
	0 (at start)	30	60	90	120
starch	-	-	-	-	-
glucose	-	+	++	+++	++++

\- substance not present
\+ substance present
+++ increasing concentration of substance

(i) State why starch does not appear in the water in the test tube. [1]

.....

.....

(c) Suggest the temperature at which the reaction would work at its fastest rate by circling **one** answer below. [1]

0 °C

10 °C

35 °C

100 °C

12. *(a)* State the meaning of the term diffusion. [1]

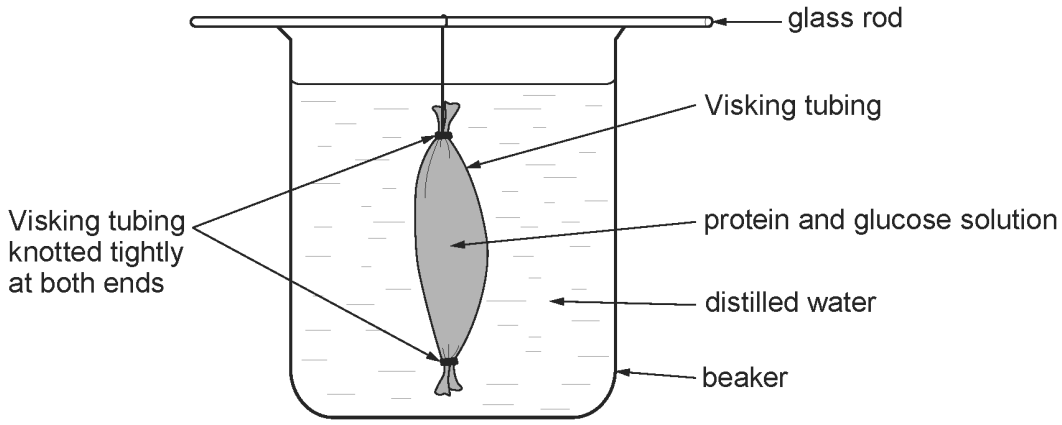
.....

.....

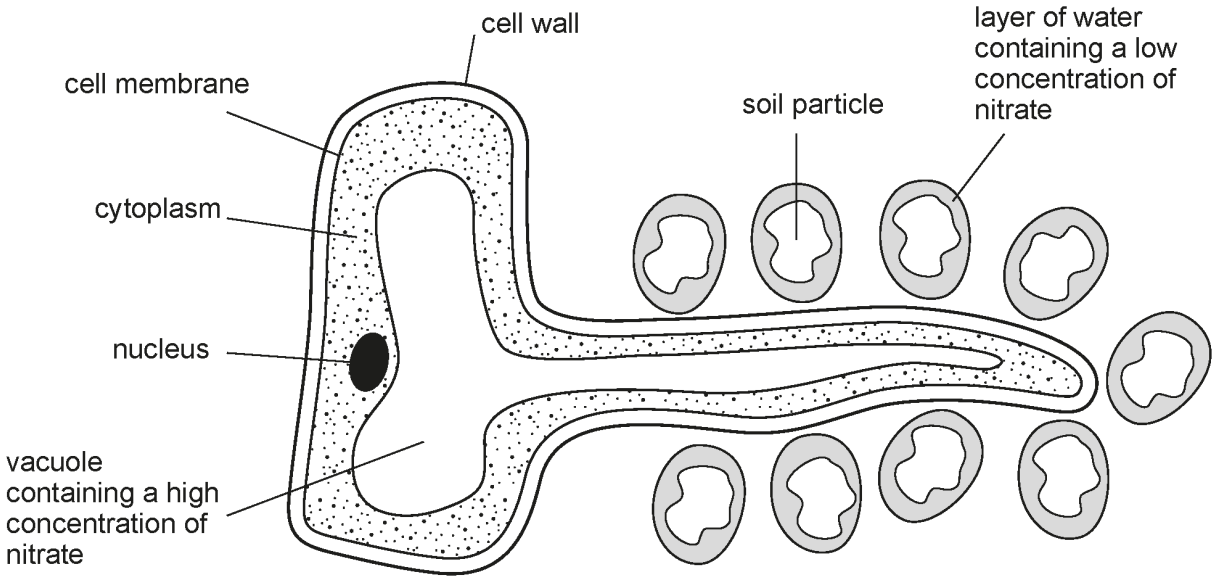
(b) After a lesson on the properties of cell membranes a year 10 class was asked to investigate some of these properties using Visking tubing. They were given the following instructions:

- Soak a 15 cm length of Visking tubing in water to soften it.
- Tie a knot in one end of the tube.
- Fill the tube with a solution made up of protein and glucose dissolved in water.
- Tie a knot in the open end of the tube.
- Wash the tube under a stream of tap water for 15 seconds.
- Using a glass rod suspend the Visking tubing in a beaker of distilled water.

The diagram below shows how your apparatus should appear.



13. The diagram below shows a **section** through a root hair cell in well-watered soil.



(a) State the method used by the root hair cell to take up nitrate from the soil. [1]

(c) Describe how the root hair cell takes up water by osmosis. [3]

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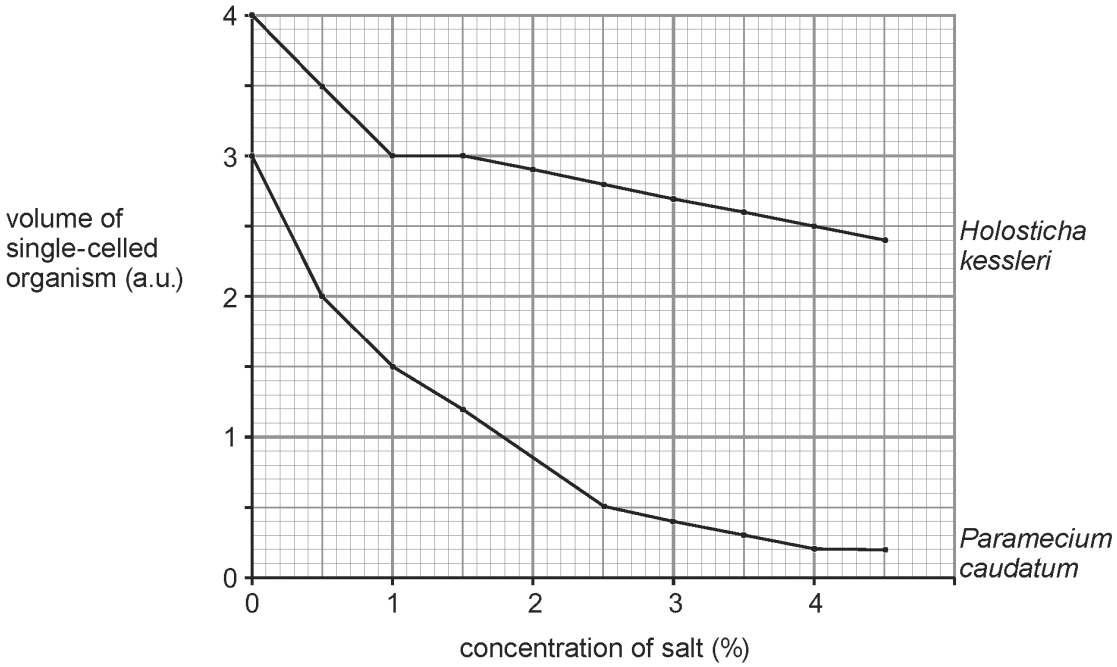
14.

An investigation into the role of cell membranes in diffusion was carried out using two similar species of single-celled organisms, *Paramecium caudatum* and *Holosticha kessleri*. Both species were the same volume (3 a.u.) at the start of the investigation. The two species were then placed in water containing different concentrations of salt for 30 minutes. The volumes of the single celled organisms were then measured again using a microscope fitted with a microscale. The results are shown in the graph below.



(a) How do the graphs provide evidence that

(ii) *Holosticha kessleri* normally lives in salt solutions of concentration between 1% and 1.5%? [1]

.....

.....

(b) State **two** factors that should have been kept constant during this investigation for it to have been a fair comparison. [2]

(i) .....

(ii) .....

(c) State the name of the type of diffusion taking place and explain fully how it affects *Paramecium caudatum* in sea water. [4]

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15. *(a)* What is meant by the term selectively permeable membrane? [1]

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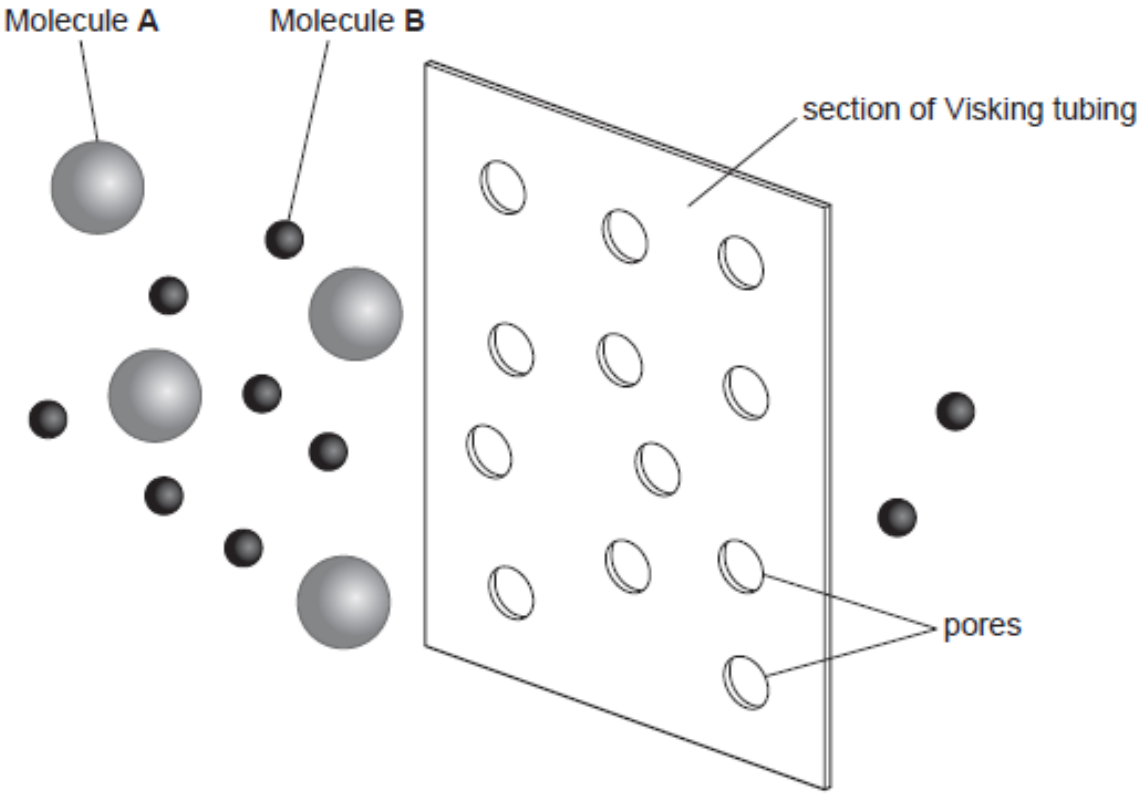
Visking tubing can be used as a model of the cell membrane.

The diagram below shows a section of Visking tubing working in the same way as a selectively permeable membrane.



Use the diagram above and your own knowledge to answer the following:

(b) (i) State the process by which molecules could pass through the Visking tubing. [1]

.....

(ii) Identify which molecules pass through the Visking tubing. Explain your answer. [2]

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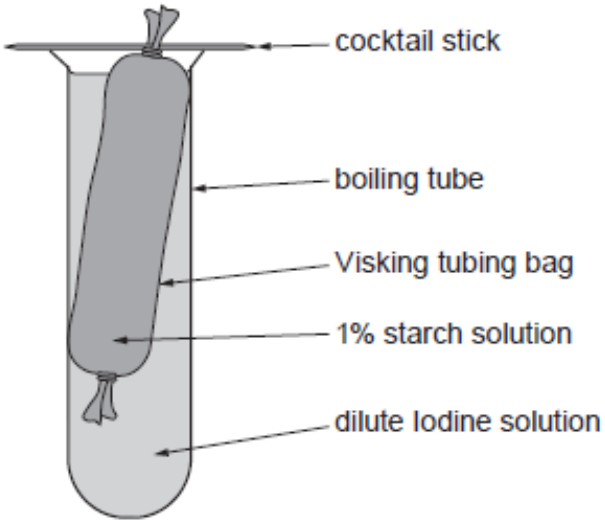
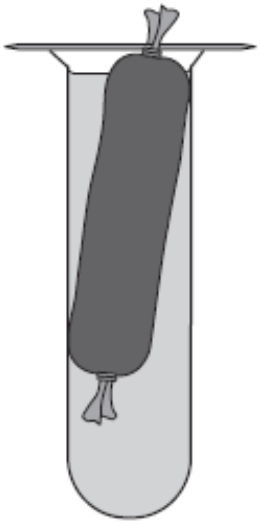
(c) Students were instructed to set up the following apparatus.



The appearance of the apparatus after 15 minutes is shown below.



(i) Explain why the colour of the contents inside the Visking tubing turned blue black. [3]

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.....

(ii) Explain why the colour of the Iodine solution in the boiling tube did not change. [2]

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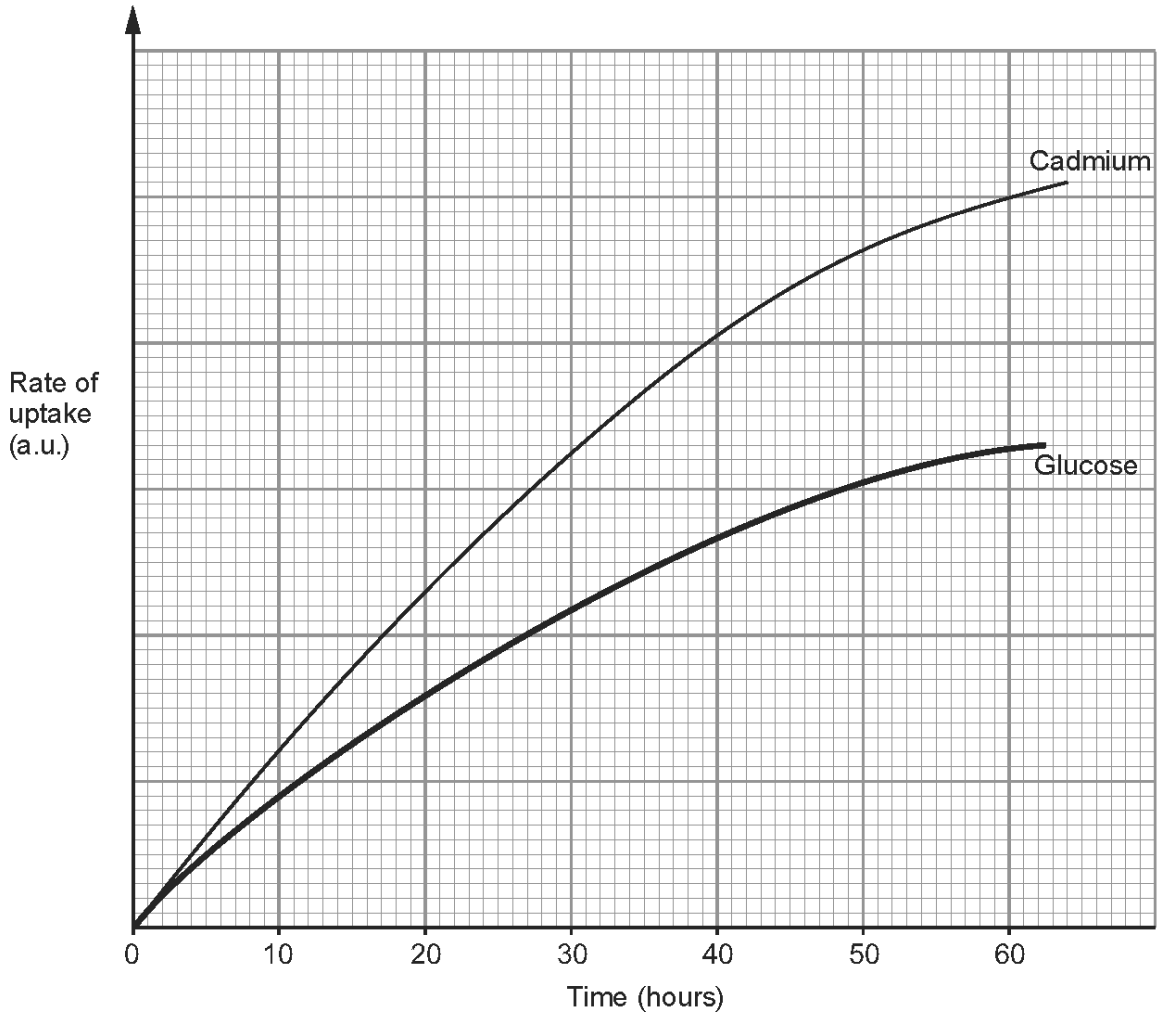
(d) Name **one** substance required for respiration that would pass into a cell. [1]

16. The fungus, *Aspergillus* has been used in Malaysia to extract the heavy metal, cadmium, from the waste produced in the production of palm oil. The graph below shows the rate of uptake of glucose and cadmium by *Aspergillus* over a sixty hour period.



The table below shows the effect of oxygen and glucose on the uptake of cadmium by *Aspergillus* over a sixty hour period.

Conditions	Uptake of cadmium by Aspergillus over a sixty hour period (a.u.)
With glucose and oxygen	50
NO glucose or oxygen	0
With glucose but NO oxygen	0

What do you conclude from the data given in the graph and table opposite? [4]
Give a full explanation of your conclusion.

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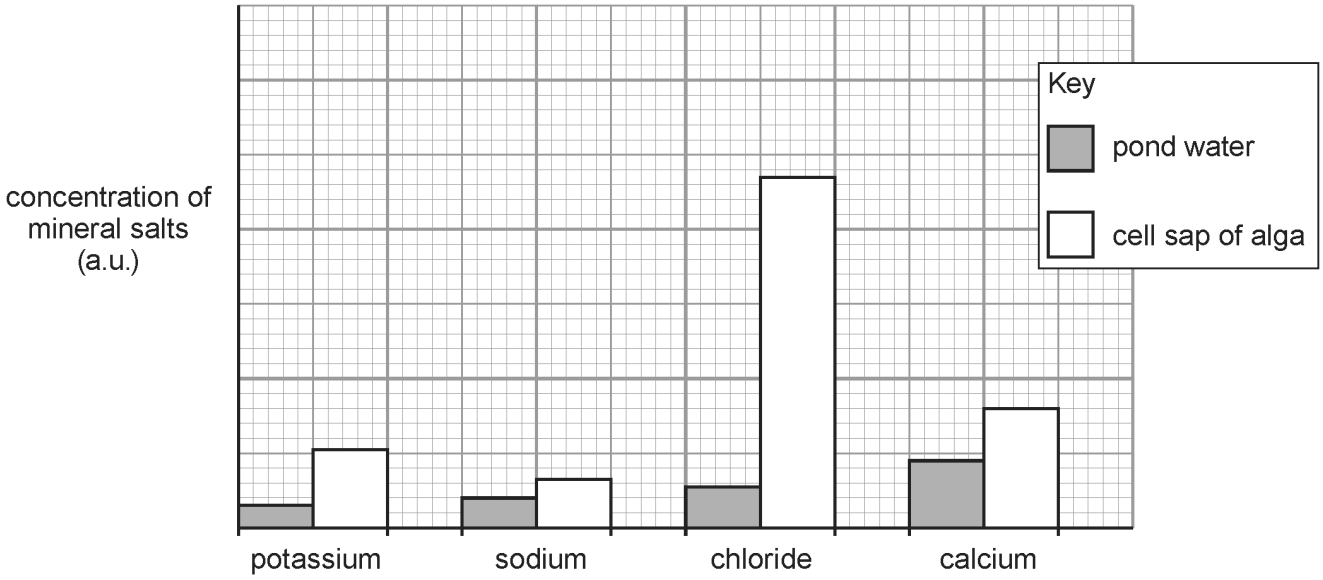
17. The bar chart shows the relative concentrations of different mineral salts in the cell sap of a green alga and in the pond water in which it lives.



(a) Explain how the alga obtains the mineral salts from the pond water. [2]

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(b) Suggest, giving your reasons, the expected effect on the uptake of the mineral salts into the cell sap of:

(i) raising the temperature of the pond water from 5ºC to 15ºC; [3]

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.....

(ii) adding a poison to the pond water. [2]

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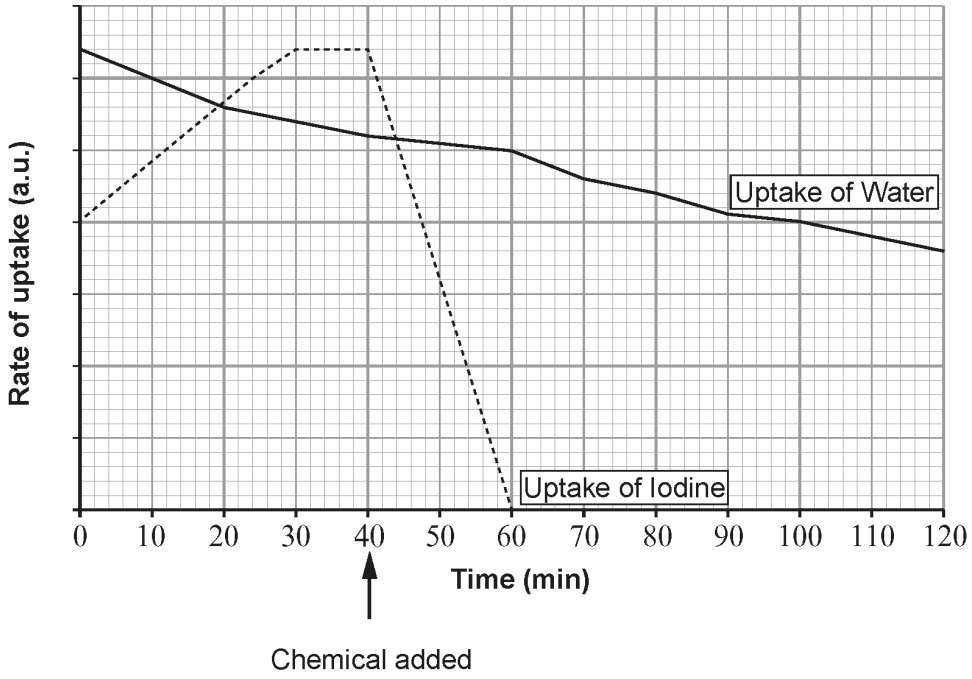
18.

Kelp, *Laminaria digitata*, is an alga which lives in the sea.

The graph below shows the rate of uptake of water and iodine from sea water into kelp in a laboratory.



At forty minutes, a chemical was added to the sea water which stopped respiration taking place in the cells of the kelp.

(a) (i) Use the graph opposite to **describe** the effect of adding the chemical on the uptake of iodine **and** water. [3]

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(ii) **Explain** the effect of adding the chemical on the uptake of iodine. [3]

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(b) What process is responsible for the uptake of the water? [1]

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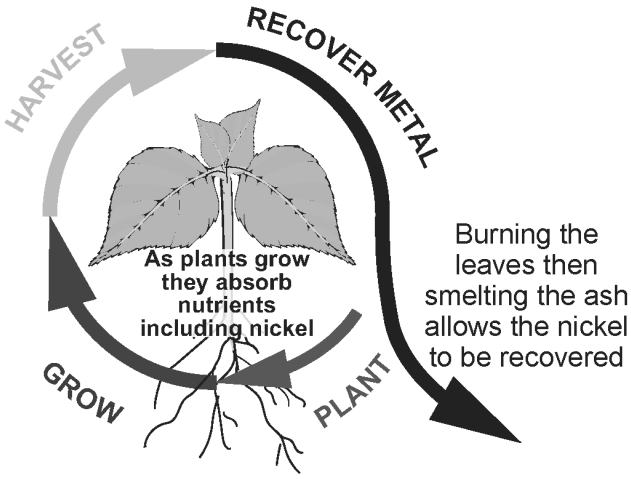
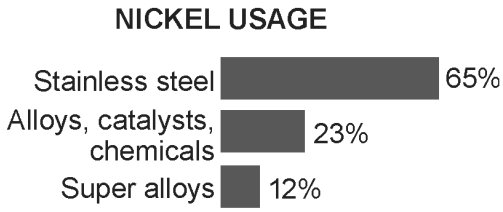
19. Some plants can be used to extract metals from the soil as an alternative to mining. Toxic, heavy metals such as nickel can be removed by some plants in this way.





(a) On the island of Palawan in the Philippines, a plant called *Phyllanthus balgooyi* grows on soil containing 0.1% nickel but its cell sap contains 9.0% nickel.

(i) How many times is the nickel in the cell sap of *Phyllanthus balgooyi* more concentrated than in the soil? [1]

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(ii) Name, and describe the process by which the plant concentrates nickel in its cell sap. [3]

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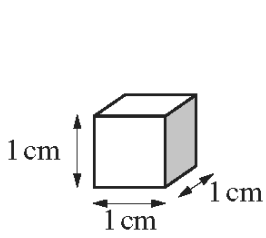
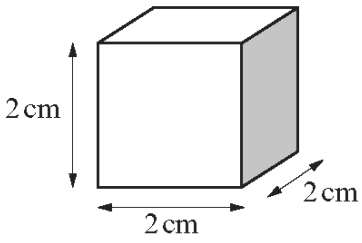
20. An investigation was carried out to find the effect of surface area: volume ratio on the rate of absorption in plants.
Cubes of potato were cut to the following sizes.





Surface area = $6\,cm^2$ Surface area = $24\,cm^2$

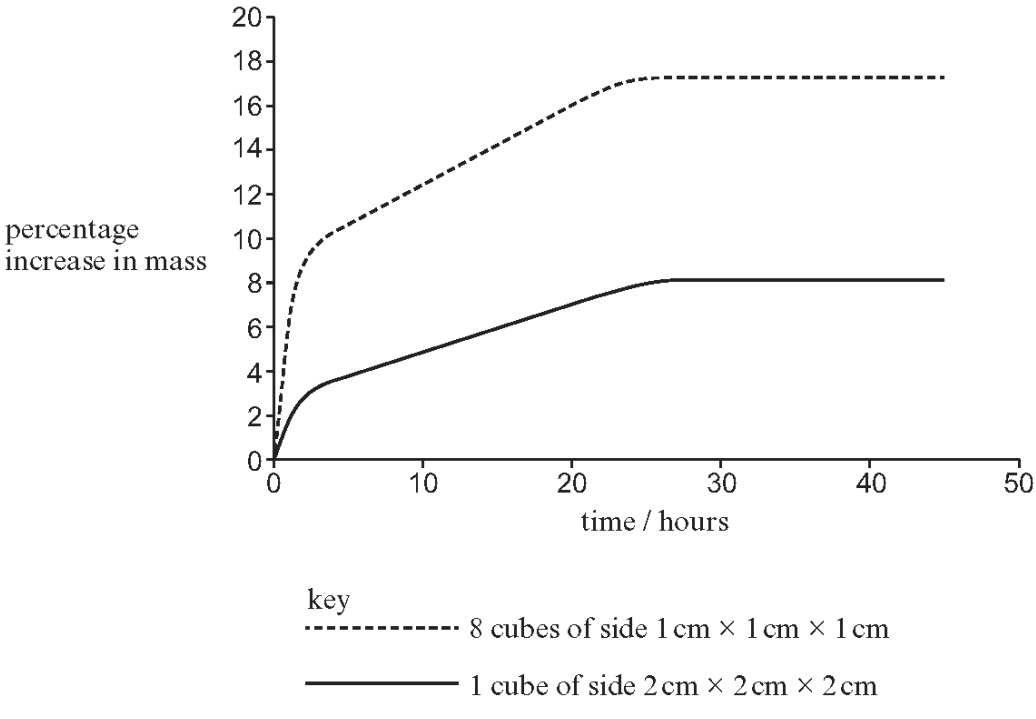
Volume = $1\,cm^3$ Volume = $8\,cm^3$

The cubes were carefully blotted dry, weighed and their masses recorded.

One cube, 2 cm × 2 cm × 2 cm, was put into a beaker and completely covered with distilled water.

Eight cubes, each measuring 1 cm × 1 cm × 1 cm, were put into another beaker and completely covered with distilled water.

At regular intervals for a period of 45 hours, the cubes were removed from the beakers, blotted dry, reweighed and then replaced into fresh distilled water. The percentage increase in mass was measured for the eight cubes of side 1 cm and the one cube of side 2 cm. The results are shown in the graphs below.



(b) (i) Name the process which caused the cubes to gain mass. [1]

.....

(ii) Describe the process by which the cubes of potato gained mass. [3]

.....

.....

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.....

(iii) Use the evidence gained by the investigation to describe the importance of root hairs in the absorption of water from the soil. [3]

.....

.....

.....

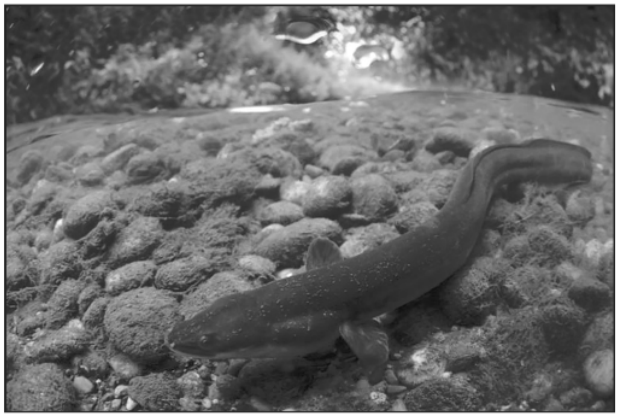
.....

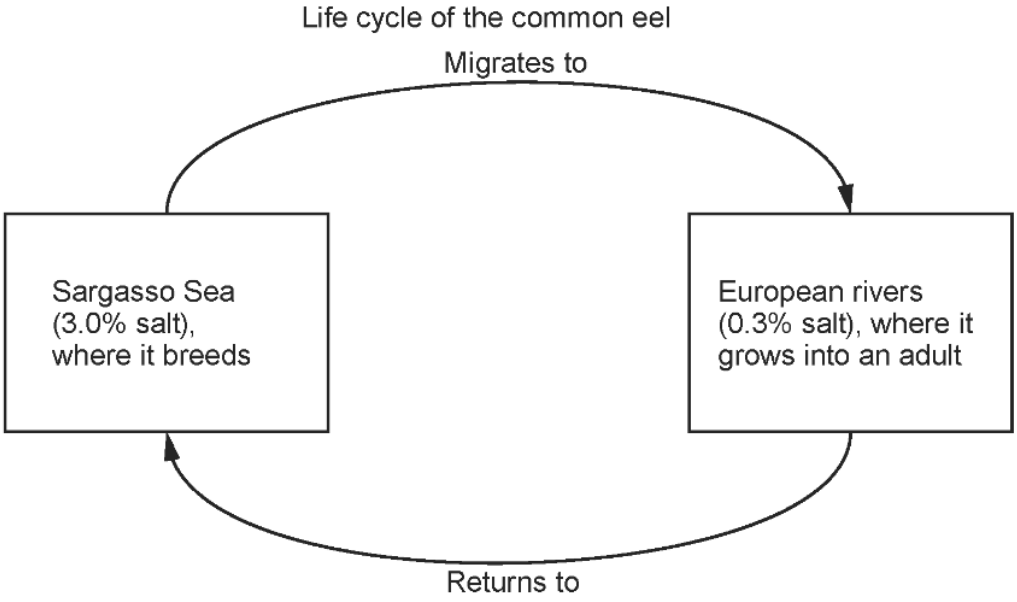
.....

(c) Name the process by which mineral salts are absorbed into the roots of plants. [1]

.....

21. The common eel *(Anguilla anguilla)*, spends some of its life in fresh water and some of its life in sea water. It breeds in the Sargasso Sea near Central America and migrates to European rivers where it becomes an adult. After several years, it becomes sexually mature and returns to the Sargasso Sea to breed.





(a) Explain why osmosis could be a problem to the eels when they return from fresh water (0.3% salt) to sea water (3.0% salt). [3]

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(b) Eels are able to absorb salt against a concentration gradient.

Name the process responsible for this and the **two** chemicals that are needed for the process. [3]

Name of process .....

Chemicals 1 .....

2 .....

6

22.

(a) Complete the sentence below. [2]

Enzymes, which are made of ..... , control the rate of

..... reactions in living cells.

(b) Students investigated the activity of the enzyme amylase, at different pH values. They used the same volumes of solutions and the same time at each pH.

Results of investigation

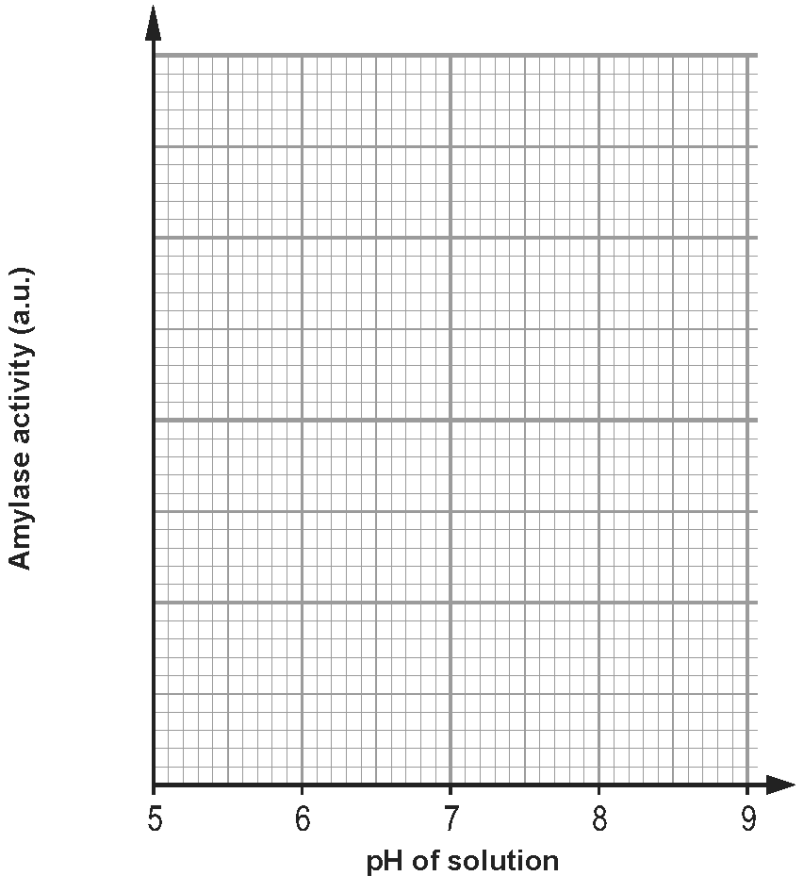
pH of solution	amylase activity (a.u.)
6.0	18
6.5	27
7.0	52
7.5	66
8.0	50
8.5	21

(i) Draw a line graph of the results of the investigation on the grid below by [4]

I. choosing a suitable scale for the amylase activity;

II. plotting the results onto the grid;

III. joining your plots with a ruler.



(ii) I. From the graph opposite, describe in detail the effect of pH on the activity of amylase. [2]

.....

.....

.....

II. Calculate the difference in activity of amylase between pH 6.2 and pH 7. Show your working. [2]

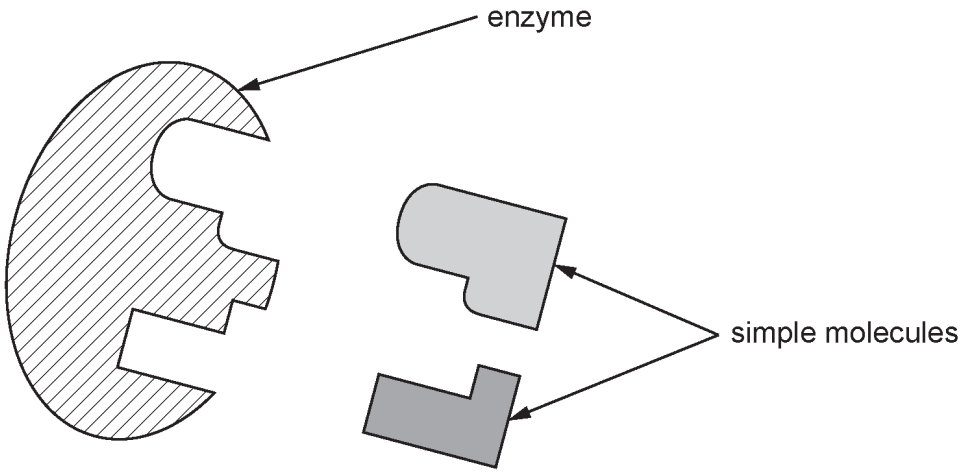
Answer ..... a.u.

(iii) The students did not keep the temperature constant during their investigation. Why did this prevent their investigation from being a fair test? [1]

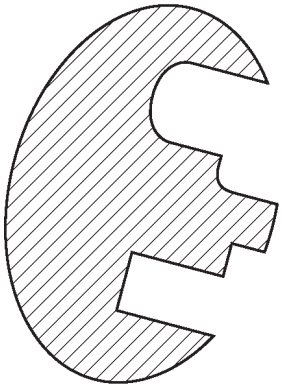
.....

23.

(a) (i) The diagram shows an enzyme which builds up complex molecules from simple molecules.



Complete the diagram below to show the next stage in the reaction between this enzyme and the two simple molecules shown above. [2]



(ii) What name is given to this **model** of enzyme action?

[1]

.....

(iii) Explain how boiling would affect the action of the enzyme shown in the diagrams above. [2]

.....

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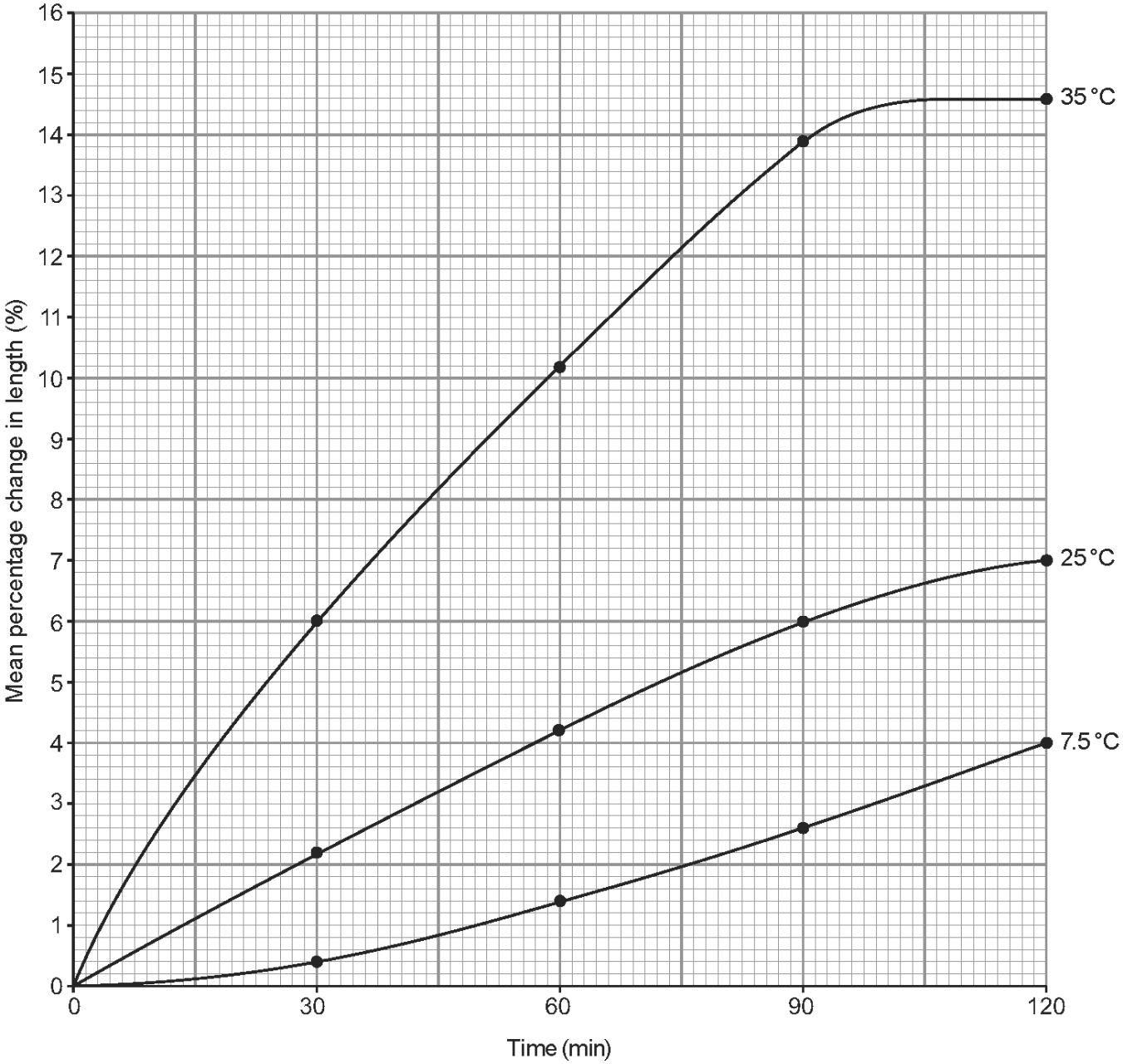
25. Five identical cylinders of potato were placed in water at each of the following temperatures: 7.5 °C, 25 °C and 35 °C.
After 30 minutes, they were removed and the length of each cylinder measured. This was repeated every 30 minutes for 120 minutes.
The mean percentage change in length for the cylinders was plotted on the graph below.



(a) Explain why the cylinders increased in length and name the process involved.

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(b) Suggest why at 60 minutes the percentage increase in length of the cylinders at 35 °C is greater than the increase in length at 25 °C. [1]

.....

.....

(c) The cylinders at 35 °C have reached their maximum length by 120 minutes. State how this length is maintained. [1]

.....

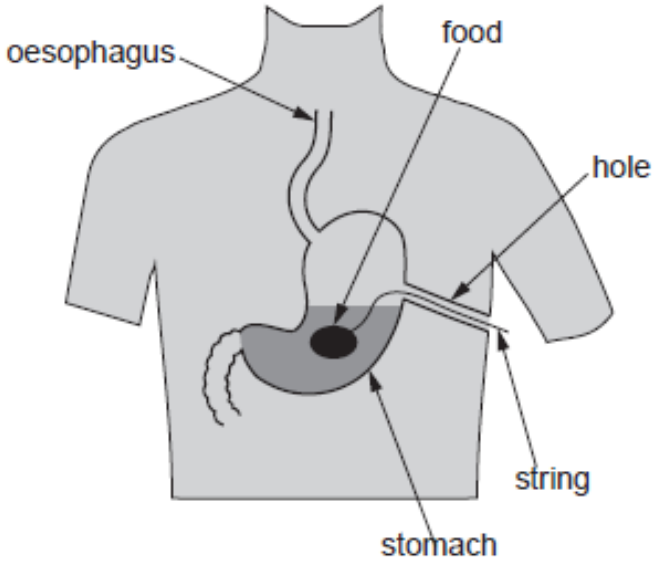
.....

6

26. On June 6, 1822 Alexis St. Martin, was accidentally shot in the stomach from close range. Dr. William Beaumont treated his wound, but expected Alexis to die from his injuries. Alexis survived, but with a hole through his abdomen wall into his stomach that never fully healed.

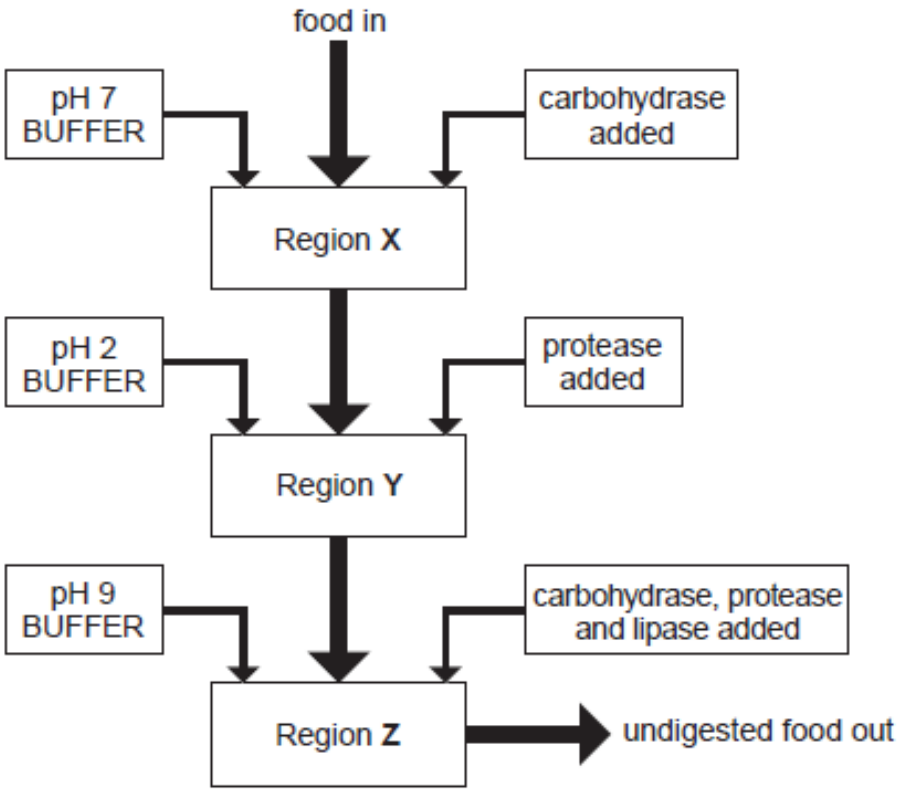
Dr. Beaumont began to carry out experiments on digestion by tying a piece of food to a string and inserting it through the hole into Alexis' stomach. Every few hours, Beaumont would remove the food and assess how much digestion had happened. Beaumont also extracted a sample of gastric juice from the stomach. Analysis showed that the gastric juice was acidic.

Fig 1 – Diagram showing Dr. Beaumont's experiment



Scientists can now follow the digestion of food in detail by using an artificial gut. The diagram below shows how an artificial gut works. (Note: a pH buffer is a chemical that keeps pH constant.)

Fig 2 – Flow chart of an artificial gut



(a)

(ii) Explain why the pH of each region needs to be different. [2]

.....

.....

(iii) State **one** *other* factor that would need to be controlled to ensure valid results from an artificial gut. [1]

.....

(iv) State the role of lipase in region **Z**. [1]

.....

(b) One of Dr. Beaumont's experiments involved inserting meat on a piece of string through the hole in Alexis' stomach and observing the time taken for the meat to disappear.

Explain why the meat disappeared. [2]

.....

.....

(c) Suggest **two** reasons why scientists prefer to use an artificial gut rather than using human trials. [2]

.....

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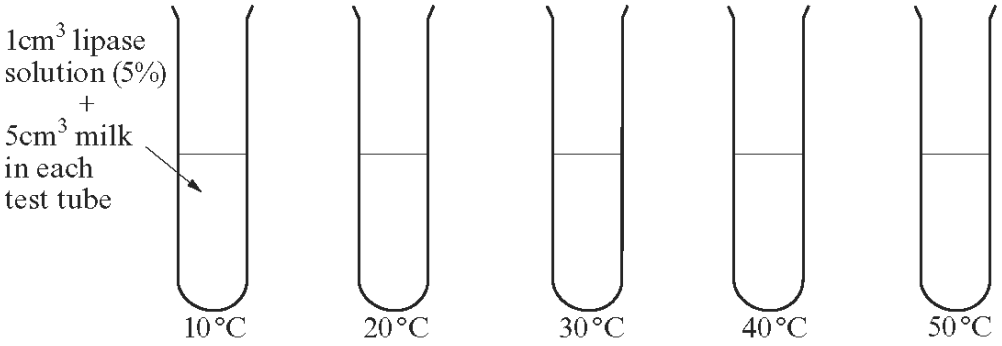
27. Students investigated the activity of the enzyme lipase, in milk at different temperatures.

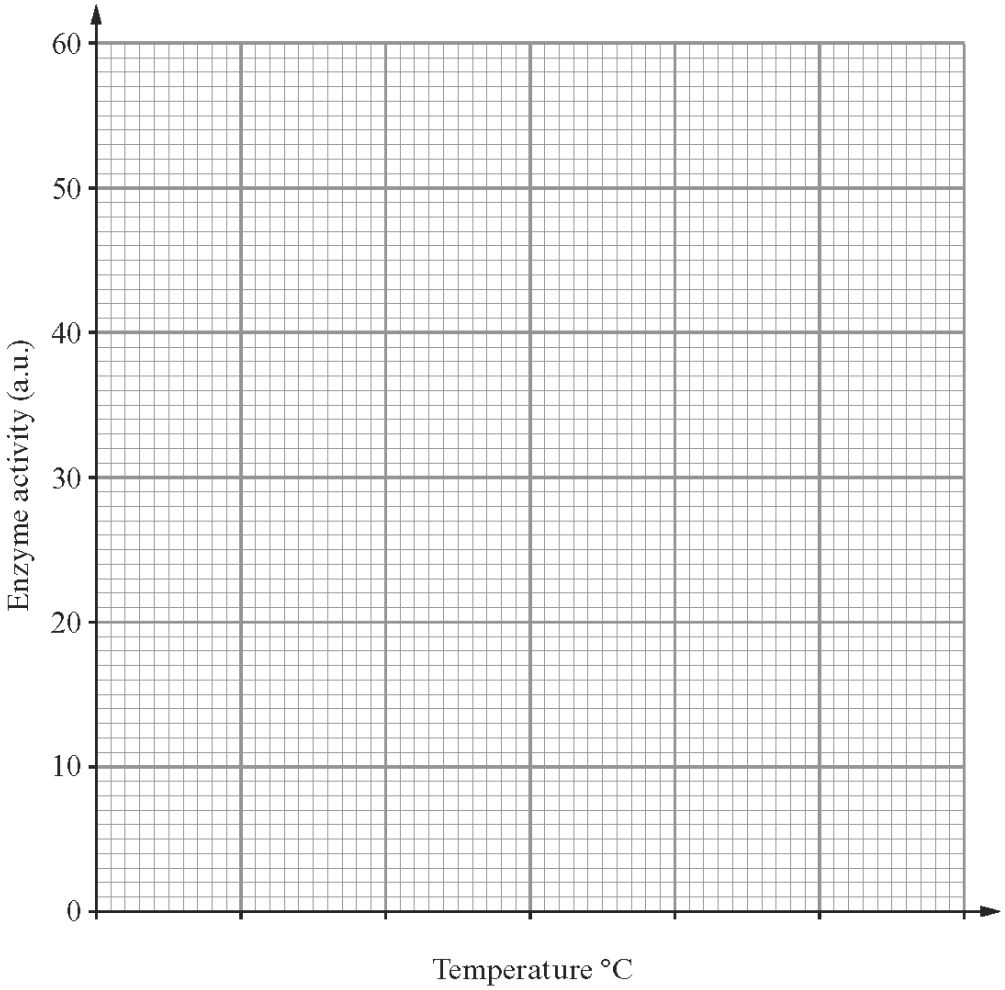
They set up a test tube for each temperature as shown in the diagram below.



Results of investigation

Temperature (°C)	Enzyme activity (a.u.)
10	15
20	32
30	48
40	54
50	36

Graph of results



(a) Plot the results onto the grid opposite by:

(i) choosing a scale for the temperature axis; [1]

(ii) plotting the results for enzyme activity shown in the table opposite; [2]

(iii) joining your plots with a ruler. [1]

(b) From your graph.

(i) Describe how the activity of the enzyme changes between the temperatures of 25 °C and 45 °C. [1]

.....

.....

(ii) Calculate the change in enzyme activity between 15 °C and 35 °C.
Show your working. [2]

..... a.u.

(c) The students set up a control test tube using boiled lipase.

(i) State the volumes of boiled lipase solution and milk which should be used in this tube. Give a reason for your answer. [2]

boiled lipase solution ..... cm^3

milk ..... cm^3

Reason .....

.....

(ii) Give the reason why there was no enzyme activity in the control tube. [1]

.....

.....

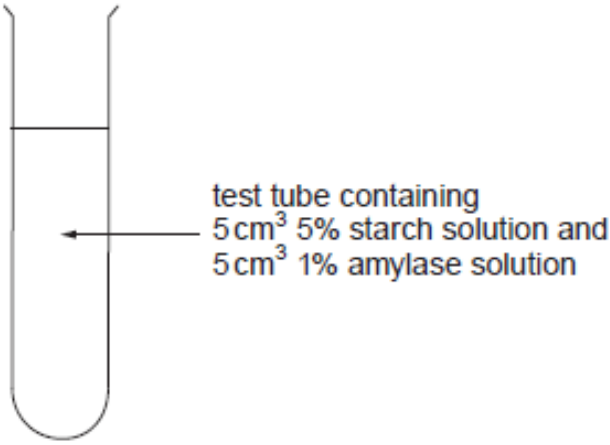
(d) On which substance in milk does lipase act? Underline your answer. [1]

protein sugar fat calcium

11

28. Students investigated the activity of amylase enzyme from the bacterium *Bacillus licheniformis* which is used in industry. Amylase digests starch.

They set up six test tubes, each as shown in the diagram below, at a range of temperatures from 10–60°C and measured the amylase activity after 5 minutes.



(a) The students tried to ensure that their investigation was a fair test.

State **one** *other* variable which they should have kept constant in all the test tubes. [1]

.....

The results of the investigation are shown in the table below.

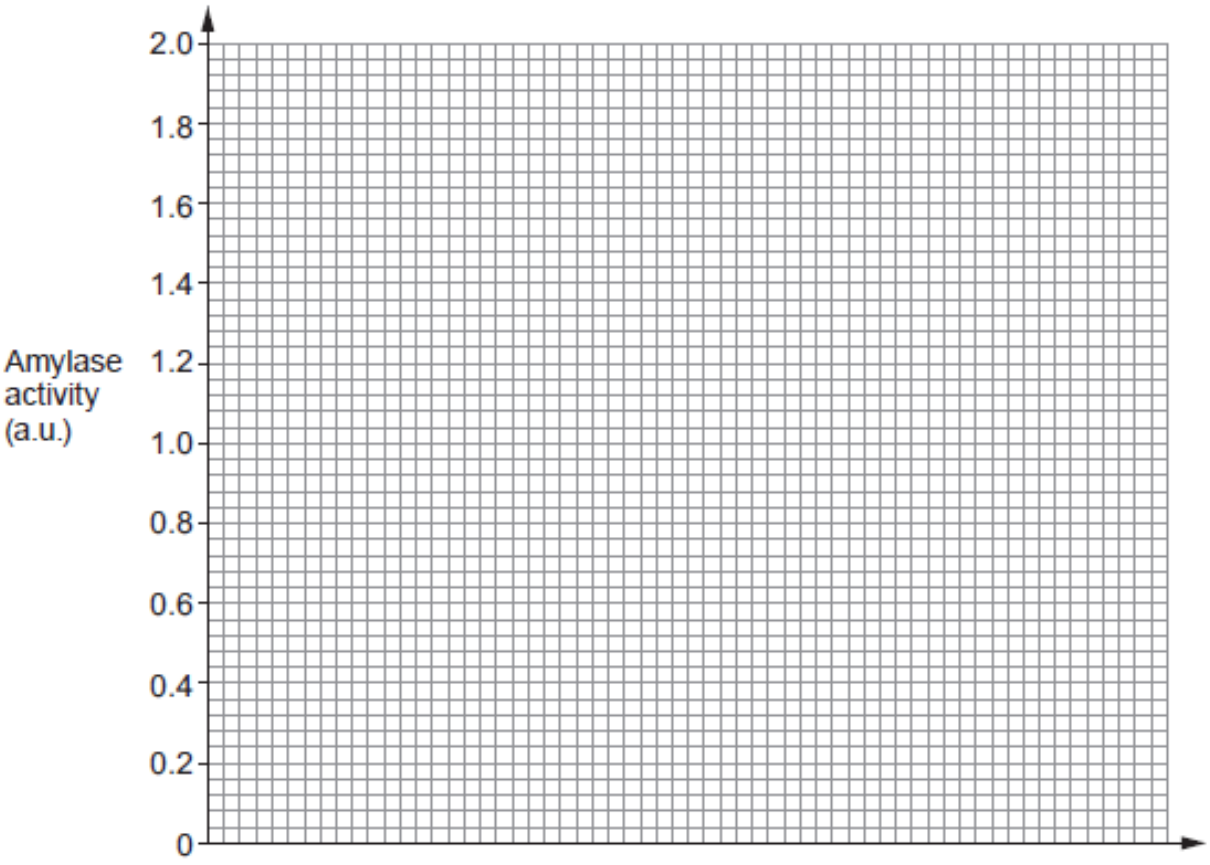
Temperature (°C)	Amylase activity (a.u.)
10	0.3
20	0.9
30	1.4
35	1.6
40	1.8
60	0.4

(b) Draw a graph of the results on the grid opposite by

(i) Choosing a scale for temperature and labelling the axis. [1]

(ii) Plotting the points. [2]

(iii) Join your plots using a ruler. [1]



(c) From your graph,

(i) State how the amylase activity changes between 15°C and 35°C and explain the reason for this change. [2]

.....

.....

(ii) State the reason for the change in the amylase activity between 40°C and 60°C. [1]

.....

(iii) I. Use your graph to suggest the optimum temperature for this enzyme. [1]

Optimum temperature = ... °C

II. State why the optimum temperature cannot be identified with accuracy from these results. Suggest how the investigation could be improved to allow this temperature to be identified more accurately. [2]

.....

.....

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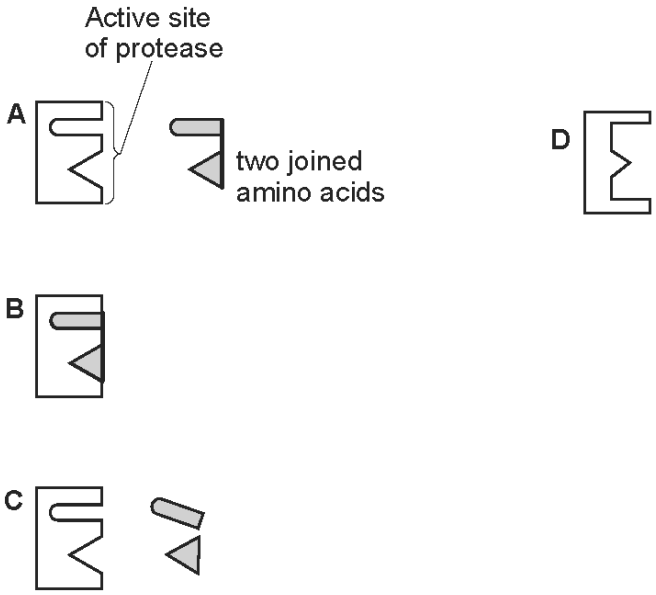
29. Diagrams **A** - **C** illustrate the 'lock and key' theory of enzyme action. It shows how a protease is able to catalyse the separation of two joined amino acids. Diagram **D** shows the protease after it has been denatured.

The "lock and key" theory of enzyme action



(a) What name is given to the structure represented by diagram **B**? [1]

.....

(b) Explain why the denatured protease **D**, is unable to catalyse the separation of the two amino acids. [2]

.....

.....

.....

(c) State **two** factors which affect the rate of enzyme controlled reactions. [2]

I. .....

II. .....

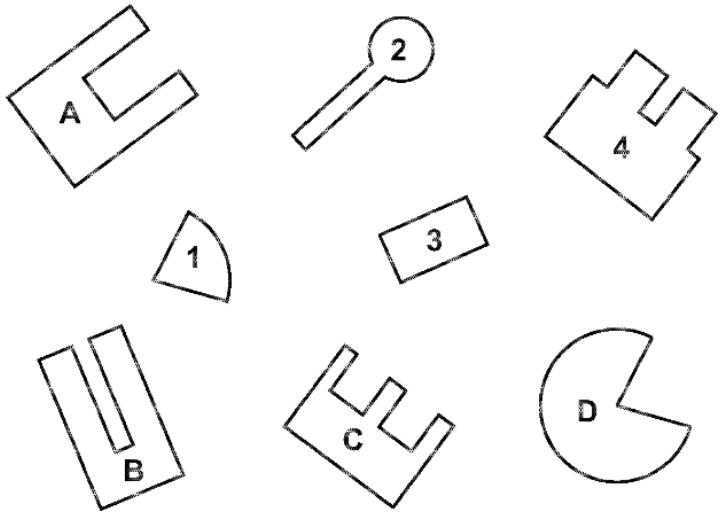
5

30. *(a)* Use some of the following words to complete the table about enzymes. [3]

fatty acids **lipids** **amino acids** **glucose** **glycerol**

Enzyme	Substrate	Products
protease	protein	.....
lipase	.....	..... and .....

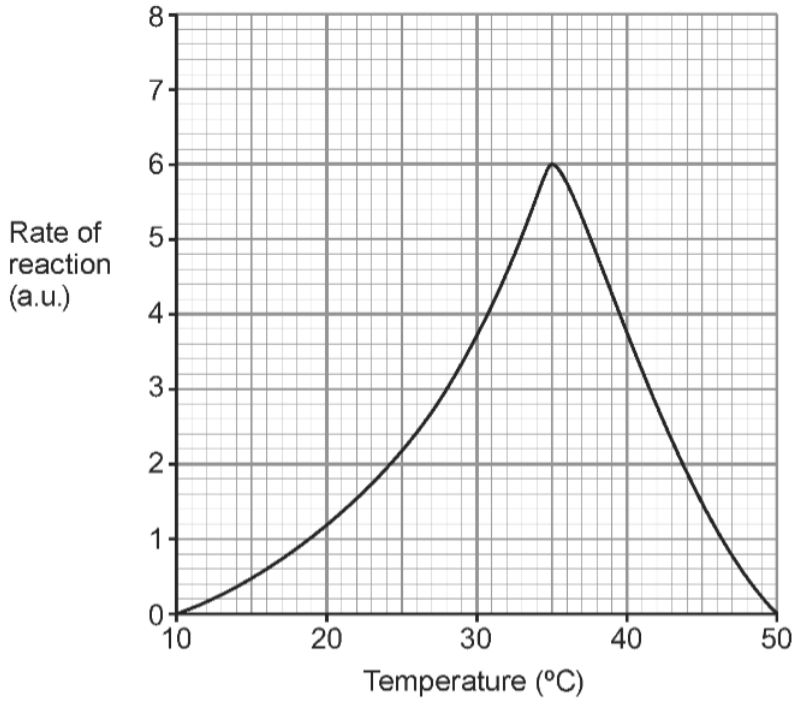
(b) The diagram shows four enzymes **A – D** and four substrates **1 – 4**.



Use your knowledge of the lock and key theory to complete the table below by matching each enzyme to its substrate. [1]

Enzyme	Substrate
A	.....
B	.....
C	.....
D	.....

(c) The graph shows the effect of temperature on the rate of an enzyme controlled reaction between 10 °C and 50 °C.



(i) From the graph, describe the effect of temperature on the rate of the reaction between 10 °C and 50 °C. [3]

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(ii) Most enzymes are denatured by boiling.
Use your answer to part *(b)* to help explain why a denatured enzyme can no longer work. [2]

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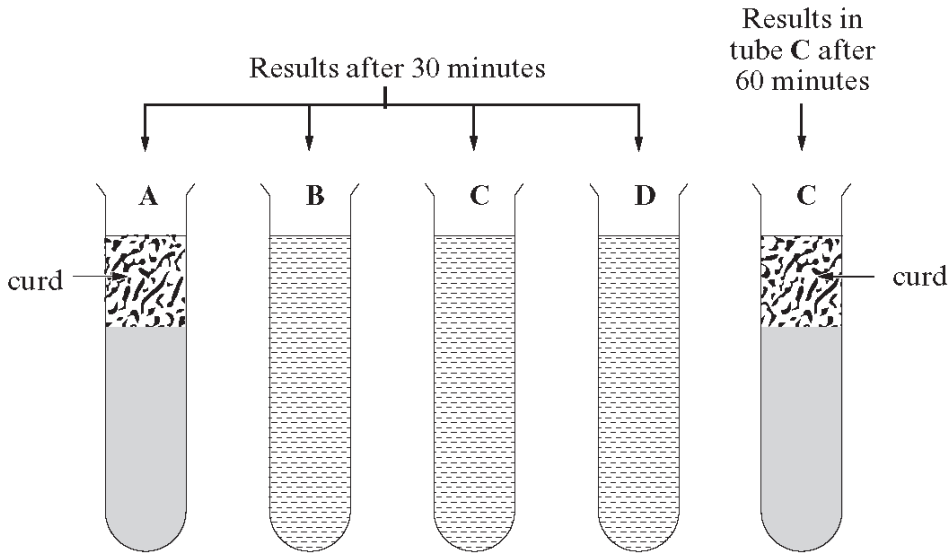
31. Rennilase is an enzyme which acts on milk during cheese making. It turns milk protein into solid milk curd.
An experiment using rennilase was set up as shown by the table below.

Tube	A	B	C	D
Contents of test tube at start	rennilase	rennilase	rennilase	boiled, cooled rennilase
	milk	milk	milk	milk
pH	4.5	9	4.5	4.5
Temperature (°C)	30	30	15	30



(a) (i) State the effect of pH on the action of rennilase. [1]

.....

(ii) Explain why no curd was produced in tube **D**. [1]

.....

(iii) Explain why no curd was produced in tube **C** after **30** minutes. [2]

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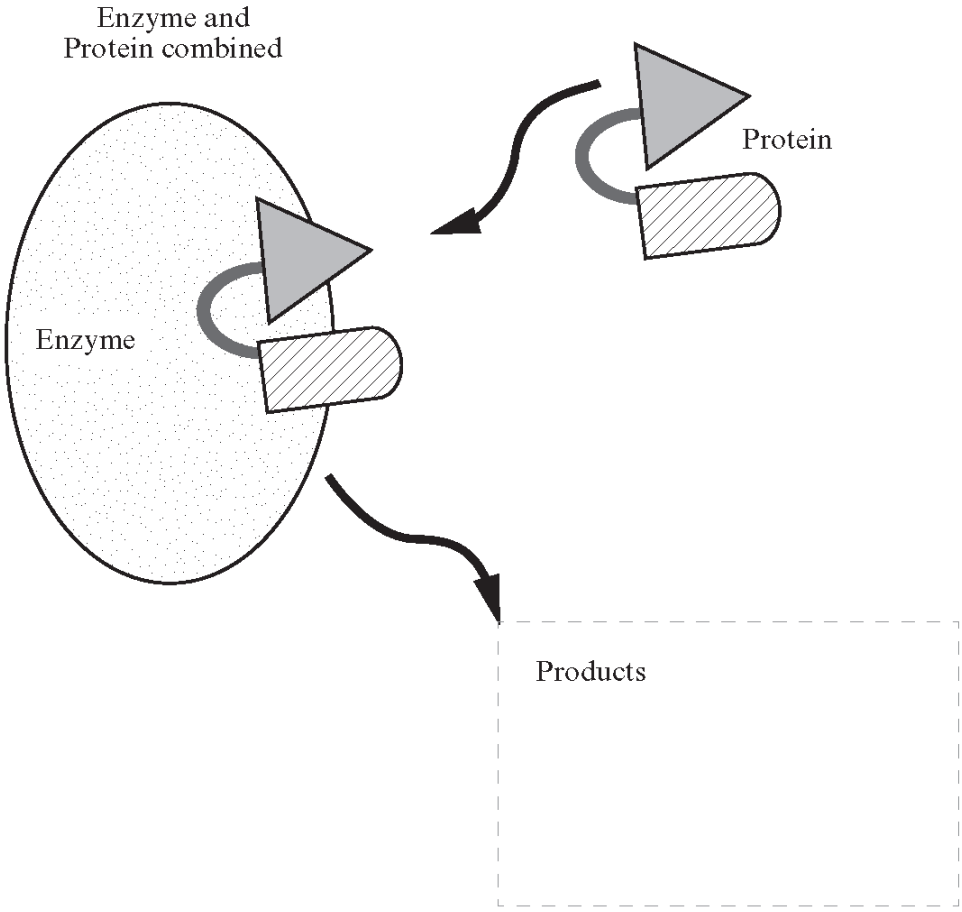
(b) The diagram below shows a model of an enzyme reacting with a protein molecule.

(i) In the box below, sketch the products that would result from this enzyme reaction. [1]



(ii) State the name given to this model of enzyme action. [1]

.....

6