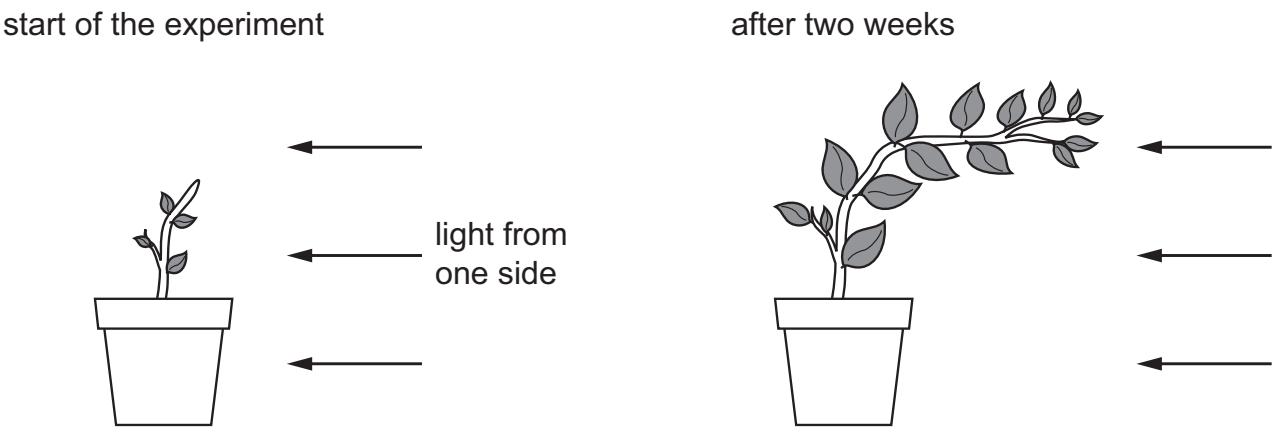
1 The diagrams show a plant at the start of an experiment, and the same plant two weeks later.



Which characteristics of living organisms are demonstrated by this experiment?

A excretion and growth

B excretion and reproduction

C growth and sensitivity

D sensitivity and reproduction

2 What can be used to classify organisms?

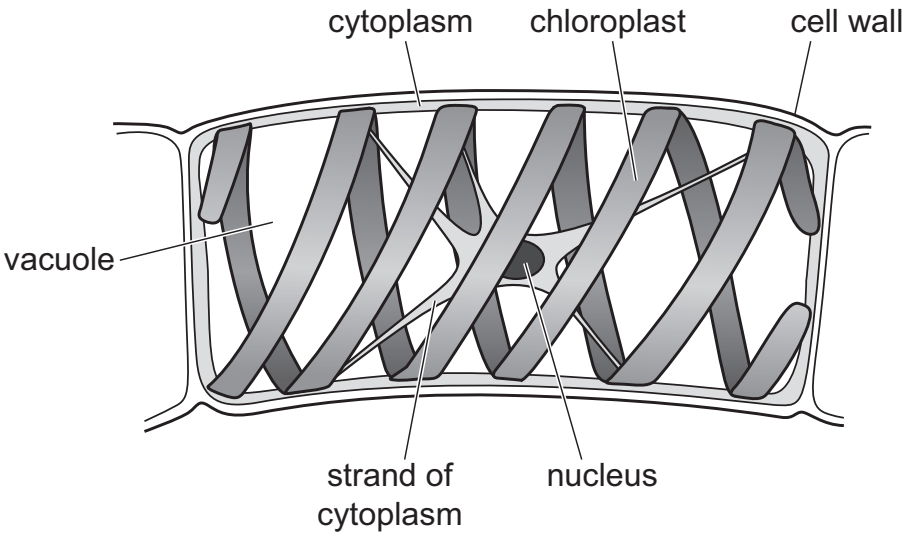
A the number of bases in DNA

B the number of different types of bases in DNA

C the sequence of bases in DNA

D the sequence of bases in one protein

3 The diagram shows a single cell from an organism called *Spirogyra*.



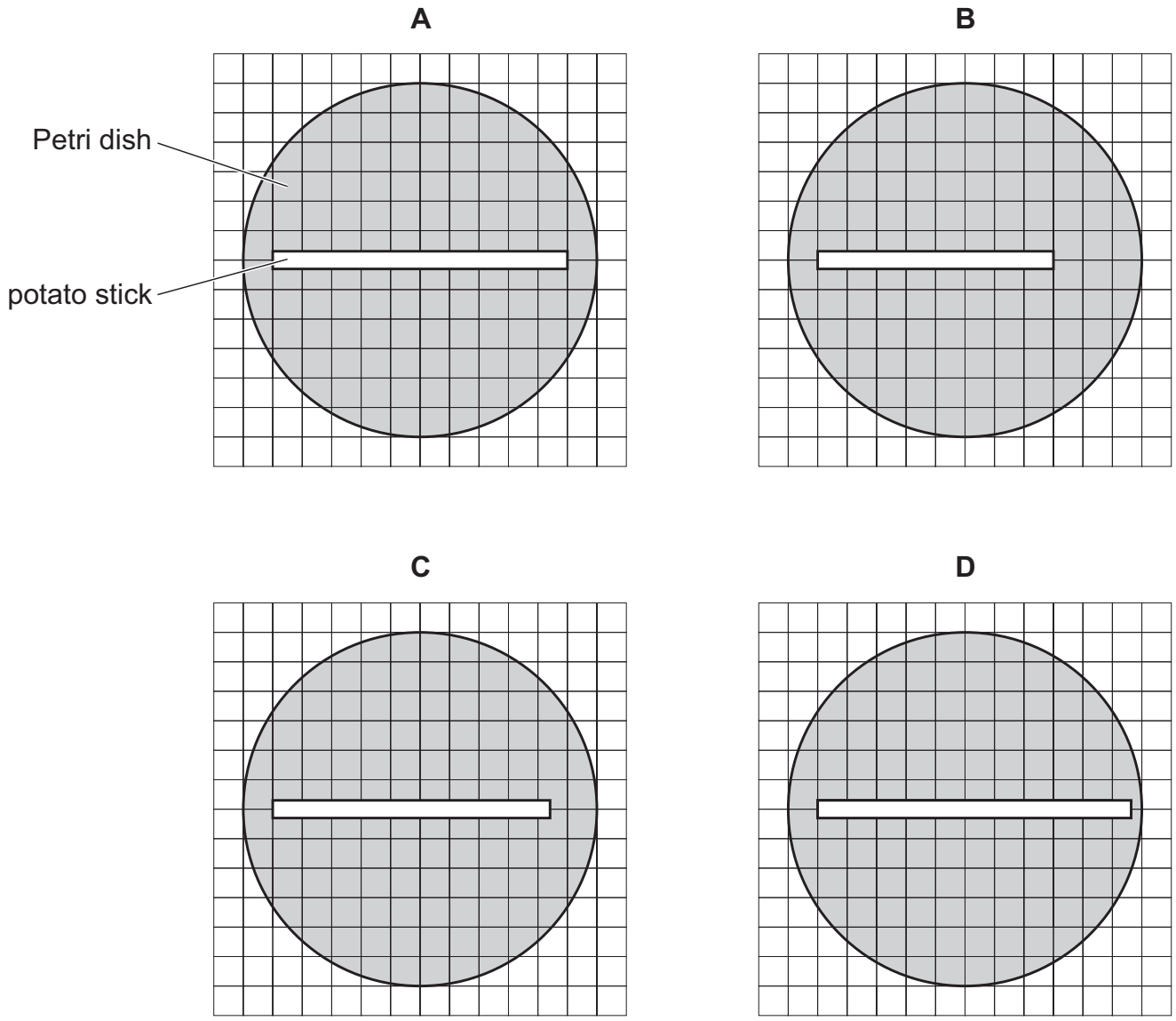
Which features does *Spirogyra* share with plant cells?

	cell wall	chloroplast	cytoplasm	nucleus	vacuole
A	yes	yes	yes	yes	yes
B	yes	yes	no	no	yes
C	yes	no	yes	yes	no
D	no	yes	yes	no	yes

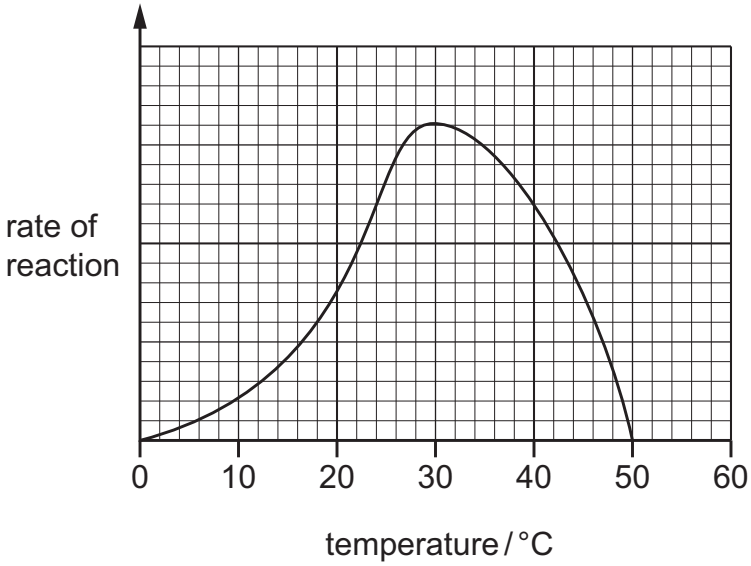
5 A potato was used as a source of plant tissue. Four potato sticks of identical size were cut from the same potato. At the start of the investigation, each potato stick was 10 squares long. The potato sticks were put into four separate Petri dishes. Each Petri dish contained a different concentration of sugar solution.

The diagram shows the four Petri dishes after 24 hours.

Which dish contains a sugar solution that has a higher water potential than the potato tissue?



7 The graph shows the effect of temperature on an enzyme-controlled reaction.



Which statement describes the effect of temperature on this reaction?

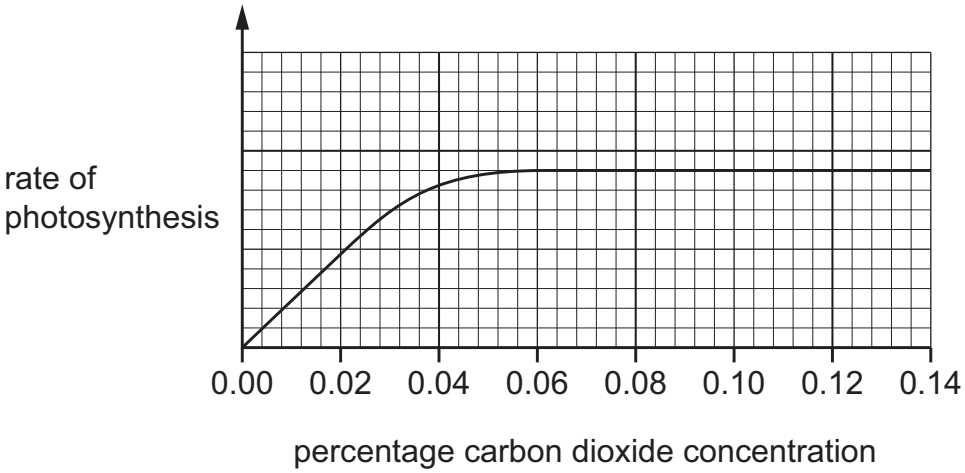
A As the temperature increases to 25 °C, the reaction speeds up.

B Between 10 °C and 20 °C, the enzyme denatures.

C Between 35 °C and 45 °C, frequency of effective collisions increases.

D The optimum temperature for this reaction is 40 °C.

8 The graph shows the rate of photosynthesis of a plant in full sunlight in different concentrations of carbon dioxide. All other factors were kept constant.



What limits the rate of photosynthesis at 0.02% carbon dioxide concentration?

A carbon dioxide concentration

B humidity

C light intensity

D temperature

10 What is a role of bile?

A It contains enzymes that digest starch.

B It emulsifies fats, increasing their surface area.

C It kills bacteria in food.

D It provides the optimum pH for pepsin activity.

12 What is a structural feature of xylem vessels?

A contain many mitochondria

B made up of cells joined end to end

C presence of cross walls

D thin walls

14 Which statements are correct descriptions of methods of preventing pathogens from entering the body?

1 Fibrin is converted to fibrinogen to form a mesh.

2 Phagocytes produce antibodies.

3 Platelets clot blood.

4 Lymphocytes engulf pathogens.

A 1, 3 and 4 **B** 1 and 3 only **C** 2 and 4 **D** 3 only

15 Which statement describes a double circulatory system?

A Blood goes through the lungs twice every time it goes round the body.

B Blood goes through the kidneys twice every time it goes round the body.

C Blood goes through the heart twice every time it goes round the body.

D Blood goes through the brain twice every time it goes round the body.

17 Which muscles in the breathing system contract during inspiration?

A external intercostal and diaphragm only

B external intercostal and internal intercostal only

C external intercostal, internal intercostal and diaphragm

D internal intercostal and diaphragm only

5 The diagram shows the order of bases along part of one strand of DNA.

A—C—T—T—A—G—A—T

What is the order of bases on the complementary part of the other strand?

A A—C—T—T—A—G—A—T

B C—A—G—G—C—T—C—G

C T—A—G—A—T—T—C—A

D T—G—A—A—T—C—T—A

2 **(a)** Fig. 2.1 is a diagram of part of the human circulatory system.

The arrows show the direction of blood flow.

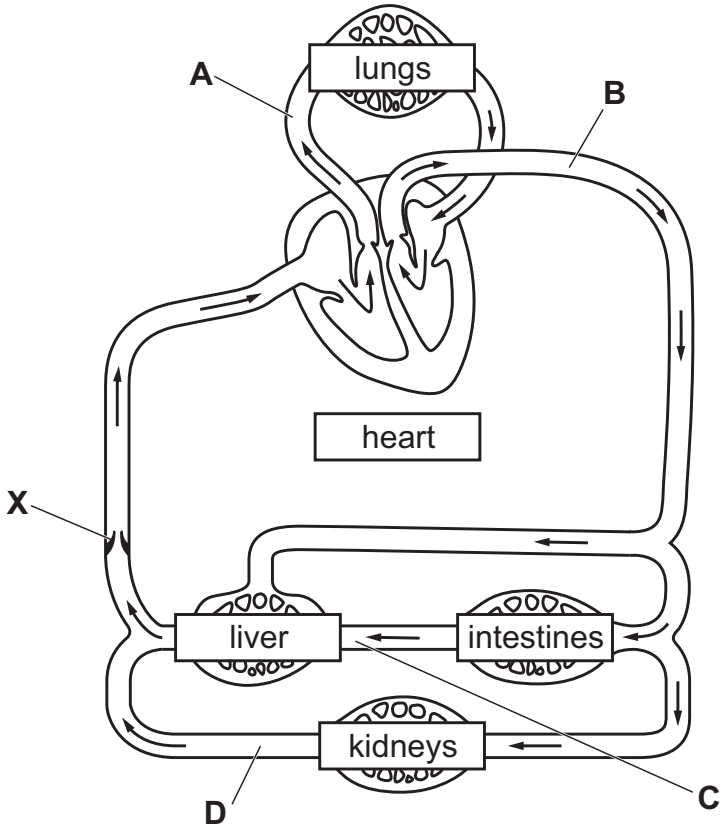


Fig. 2.1

(i) Complete Table 2.1 by naming the blood vessels in Fig. 2.1 and stating whether the blood in each vessel is oxygenated.

Table 2.1

letter in Fig. 2.1	name of the blood vessel	carries oxygenated blood (yes / no)
A		
B		
C		
D		

[4]

(ii) State the name of structure **X** in Fig. 2.1 and outline its function.

name .....

function .....

.....

[2]

(b) Fig. 2.2 is a diagram of part of a fish circulatory system.

The arrows show the direction of blood flow.

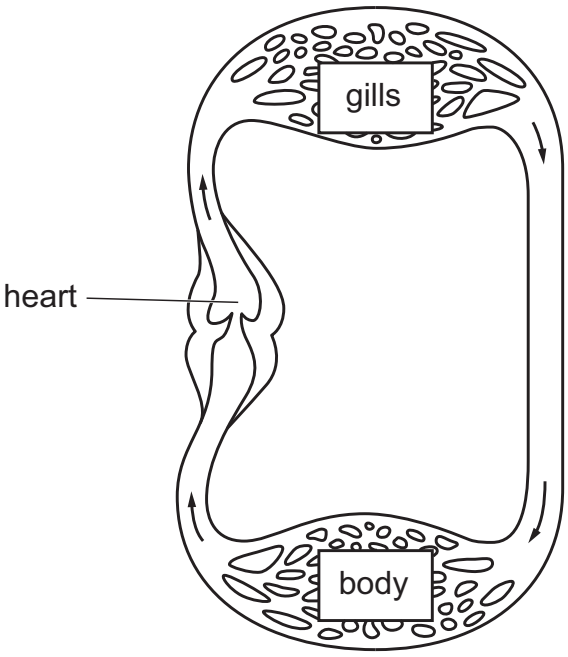


Fig. 2.2

(i) Describe how the structure of the fish heart in Fig. 2.2 differs from a human heart.

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.....

.....

..... [2]

(ii) Explain the advantages of the type of circulatory system found in humans, compared with the circulatory system shown in Fig. 2.2.

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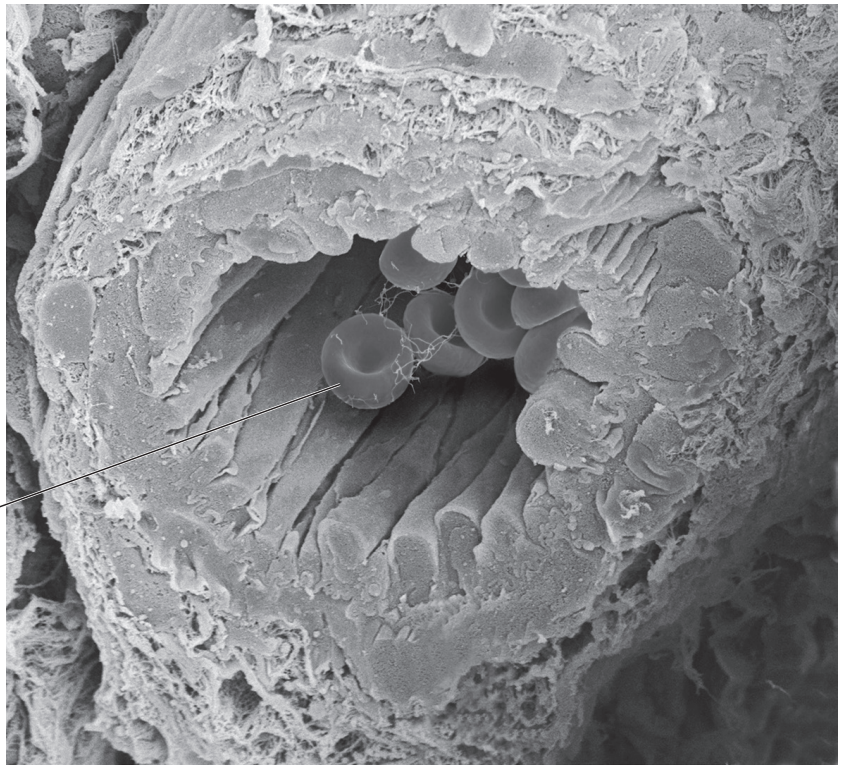
..... [4]

(c) Fig. 2.3 is a photomicrograph of an arteriole.



magnification ×1430

Fig. 2.3

(i) Identify the structure labelled **P** in Fig. 2.3.

..... [1]

(ii) The magnification of the image is provided. Write the formula that would be used to calculate the actual diameter of the lumen of the arteriole in Fig. 2.3.

..... [1]

(iii) The actual diameter of the lumen of the arteriole shown in Fig. 2.3 is 0.0315 mm.

Convert 0.0315 mm to micrometres (μm).

..... μm [1]

[Total:15]

3 Enzymes are biological catalysts.

(a) Describe what is meant by the term catalyst.

.....

.....

.....

.....

..... [2]

(b) A student investigated the effect of temperature on enzyme activity.

A starch suspension was kept at 0 °C.

Amylase solution was added to the starch suspension.

Samples of the starch and amylase mixture were tested with iodine solution at 1-minute intervals for 15 minutes.

The student recorded the time at which the starch and amylase mixture stopped turning a blue-black colour.

The student repeated this investigation at different temperatures.

Table 3.1 shows the results.

Table 3.1

temperature / °C	time at which the starch and amylase mixture stopped turning a blue-black colour / minutes
0	stayed blue-black
10	12
20	8
30	5
40	3
50	10
60	stayed blue-black

(i) Explain the results between 0 °C and **40 °C** in Table 3.1.

.....

.....

.....

.....

.....

.....

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.....

.....

.....

.....

..... [6]

(ii) This investigation was repeated with protease instead of amylase.

Explain why the samples from the mixture produced a blue-black colour at every temperature.

.....

.....

.....

.....

..... [2]

(c) State **one** factor, other than temperature, that affects enzyme action.

..... [1]

[Total: 11]

3 **(a)** Scientists investigated the relationship between height and the vital capacity of the lungs in people.

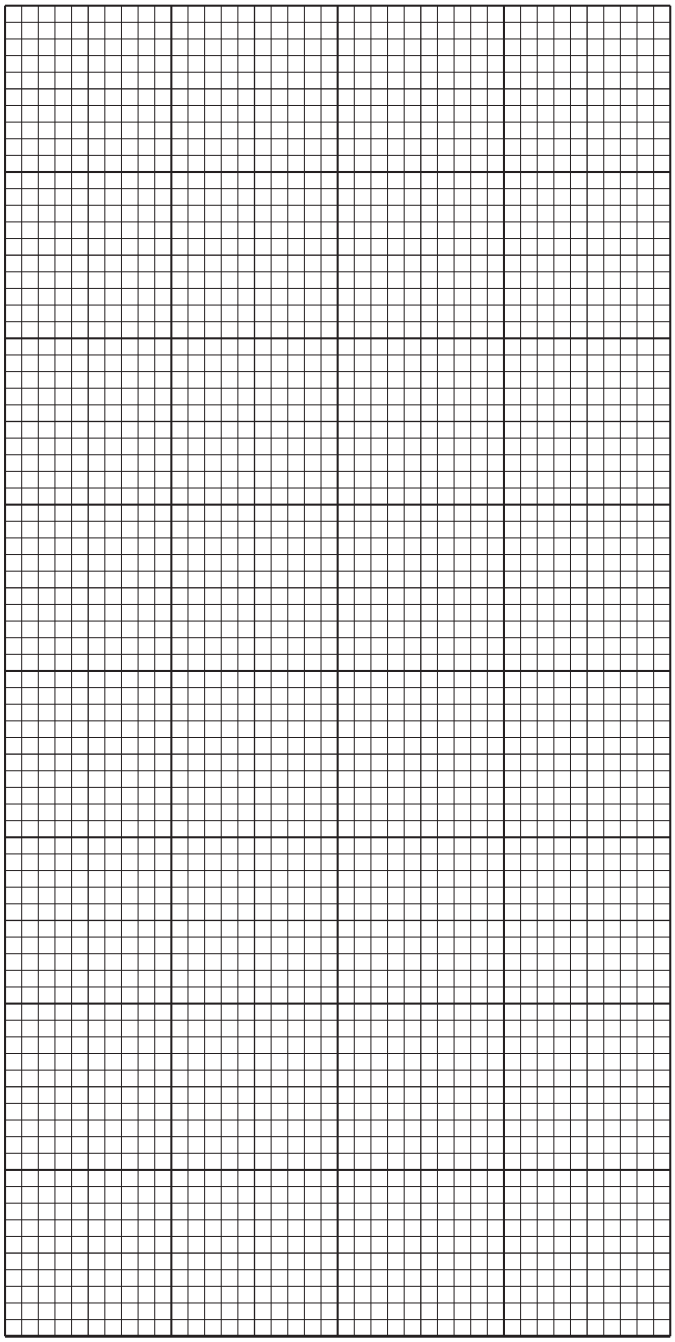
The vital capacity is the maximum volume of air that can be expelled from the lungs after taking the deepest possible breath.

Table 3.1 shows the results of the investigation.

Table 3.1

height of the person / cm	vital capacity / dm^3
130	1.9
140	2.2
150	2.9
160	3.4
170	4.1
180	5.1
190	6.2
200	7.2

(i) Plot a line graph on the grid of the data in Table 3.1.



[4]

(ii) Describe the relationship shown in your graph between height and vital capacity.

.....

.....

..... [1]

(iii) Use your graph to estimate the vital capacity of a person with a height of 175 cm.

Indicate **on your graph** how you obtained your estimate.

..... dm^3

[2]

(b) In people with certain lung diseases, the enzyme elastase is more active. Elastase is a protein.

State the name of the reagent that is used to test for protein.

..... [1]

[Total: 8]

1 A student investigated the rate of respiration in yeast using different concentrations of glucose.

They used a 5% glucose solution to make a 1% glucose solution and a 4% glucose solution.

The student used this method:

Step 1 Label two small test-tubes **1%** and **4%**.

Step 2 Use a syringe to put 1 cm^3 of 5% glucose solution into the small test-tube labelled **1%**.

Put 4 cm^3 of 5% glucose solution into the small test-tube labelled **4%**.

Step 3 Use a clean syringe to put 4 cm^3 of distilled water into the small test-tube labelled **1%**.

Put 1 cm^3 of distilled water into the small test-tube labelled **4%**.

Step 4 Pour yeast suspension into the small test-tube labelled **1%** until it is completely full.

Step 5 Keep the small test-tube upright and carefully place a large test-tube over the top of the small test-tube labelled **1%**. Push the small test-tube up to the top of the large test-tube, as shown in Fig. 1.1**A**. Quickly invert the test-tubes, as shown in Fig. 1.1**B**.

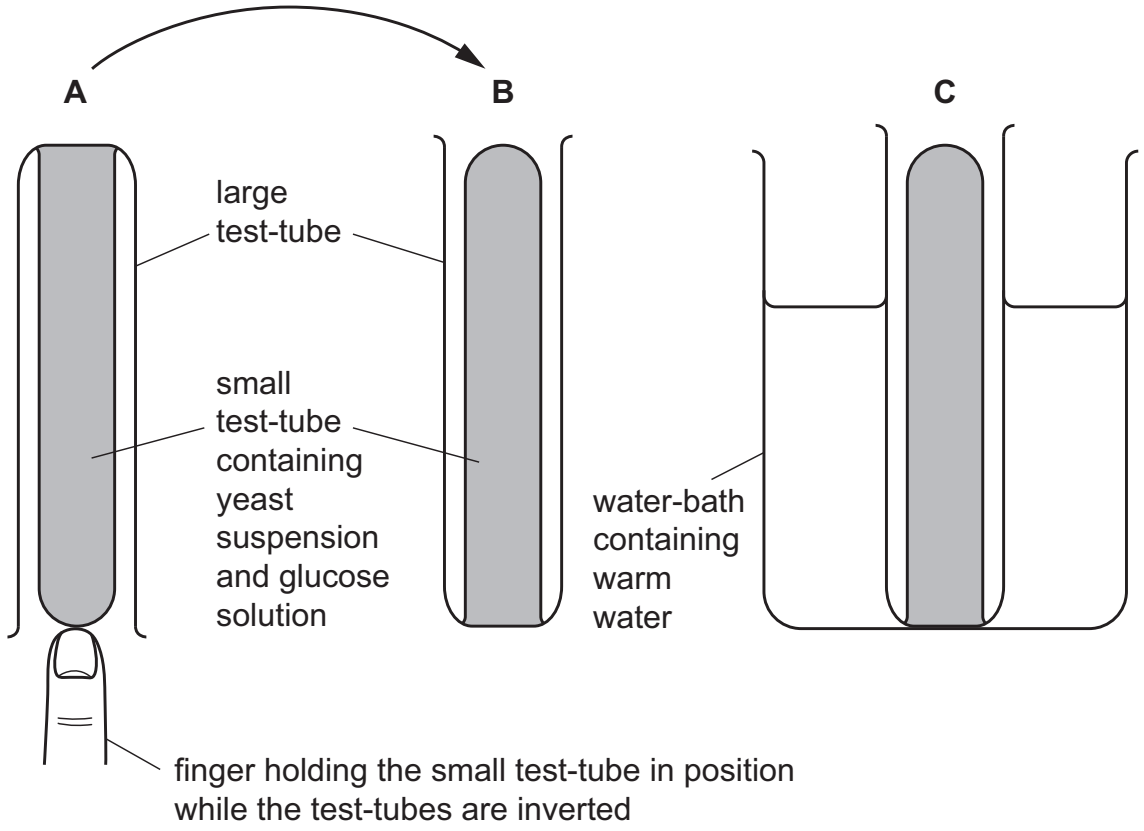


Fig. 1.1

Step 6 Put the large test-tube and the small test-tube labelled **1%** into a warm water-bath, as shown in Fig. 1.1**C**.

Step 7 Start the stop-clock and wait for five minutes.

Step 8 After five minutes, stop the stop-clock and use a ruler to measure the height of the yeast suspension in the **large** test-tube, as shown in Fig. 1.2.

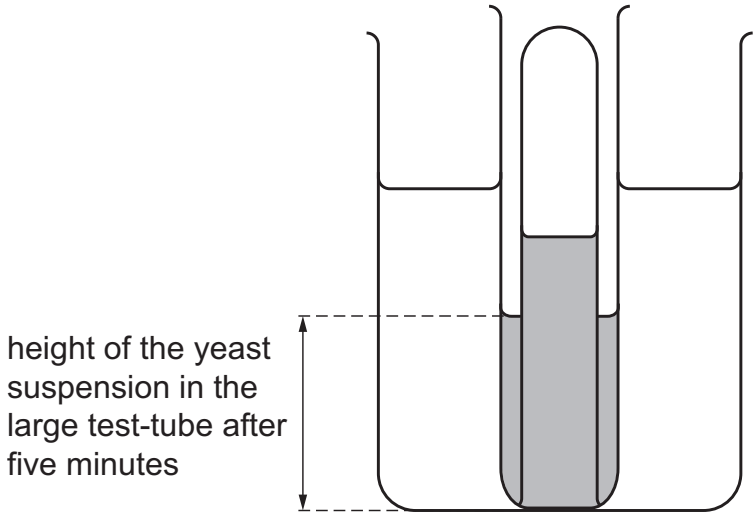


Fig. 1.2

Step 9 Remove the test-tubes from the warm water-bath and discard them.

Step 10 Pour yeast suspension into the small test-tube labelled **4%** until it is completely full.

Step 11 Repeat steps 5 to 8 with the small test-tube labelled **4%**.

(a) Fig. 1.3 is a diagram of the water-baths in steps 8 and 11.

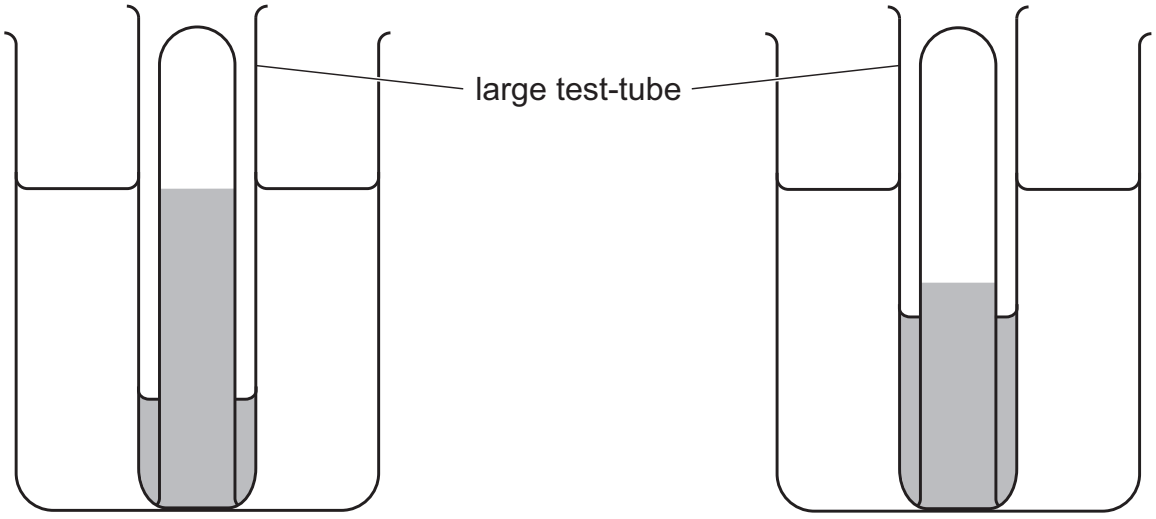


Fig. 1.3

(i) Measure the height of the yeast suspension in each of the **large** test-tubes shown in Fig. 1.3.

Prepare a table for the results and record your measurements from Fig. 1.3.

[4]

(ii) State a conclusion for the results of this investigation.

.....

.....

..... [1]

(iii) State the independent and dependent variables in this investigation.

independent variable .....

.....

dependent variable .....

.....

[2]

(iv) Describe how the temperature of the water-bath could be maintained.

.....

.....

..... [1]

(v) Explain why a clean syringe was used in step 3.

.....

.....

..... [1]

(b) A student extended the investigation by using more concentrations of glucose solution.

Calculate the volumes of 5% glucose solution and distilled water that are needed to make 5 cm^3 of a 3% glucose solution.

volume of 5% glucose solution ..... cm^3

volume of distilled water ..... cm^3

[1]

(c) Sports drinks often contain glucose, which is a reducing sugar.

State how you could test a sample of a sports drink for reducing sugar.

.....

.....

.....

.....

..... [2]

(d) **(i)** The ethanol emulsion test can be used to show that a sample of food contains fat.

State the result of a positive test.

..... [1]

(ii) Suggest **one** safety precaution that should be followed when using ethanol.

.....

.....

..... [1]

[Total: 14]

1 Yeast cells produce an enzyme called invertase. Invertase catalyses the breakdown of sucrose into reducing sugars. Sucrose is **not** a reducing sugar.

A student investigated the effect of two different concentrations of invertase extract on a sucrose solution.

The student used this method:

Step 1 Label three test-tubes **A**, **B** and **W**.

Step 2 Use a syringe to put 2 cm^3 of sucrose solution into all three test-tubes.

Step 3 Use a clean syringe to put 2 cm^3 of 100% invertase extract into test-tube **A**.

Step 4 Use a clean syringe to put 2 cm^3 of 10% invertase extract into test-tube **B**.

Step 5 Use a clean syringe to put 2 cm^3 of distilled water into test-tube **W**.

Step 6 Put all three test-tubes in a warm water-bath at 40 °C for 15 minutes.

Step 7 Measure the temperature of the liquid in the test-tubes.

(a) State the name of the piece of equipment that is used to measure temperature.

..... [1]

Step 8 Use a clean syringe to add 4 cm^3 of Benedict's solution to all three test-tubes.

Step 9 Place all three test-tubes into a hot water-bath for five minutes.

Step 10 After five minutes, record the colour of the liquid in each test-tube.

Fig. 1.1 shows the notes the student made about their observations in step 10.

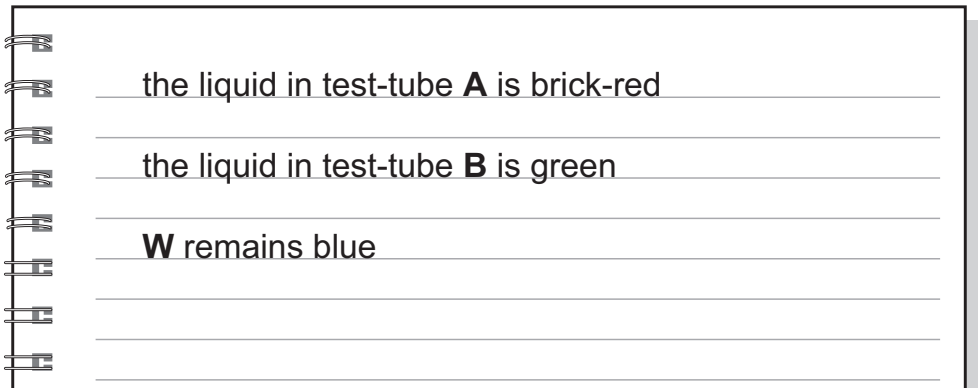


Fig. 1.1

(b) Prepare a table and record the results of this investigation using the information in Fig. 1.1.

[3]

(c) State a conclusion for the results shown in test-tube **A** and test-tube **B**.

.....

.....

..... [1]

(d) Explain the purpose of test-tube **W**.

.....

.....

.....

..... [2]

(e) State the independent variable in this investigation.

..... [1]

(f) Explain why the test-tubes were placed in the warm water-bath in step 6.

.....

.....

..... [1]

(g) Explain why a clean syringe was used in steps 3, 4 and 5.

.....

.....

..... [1]

(h) Invertase is a protein.

State the reagent used to test for the presence of protein.

..... [1]

[Total: 11]