1 Potato cells contain the enzyme catalase. Catalase catalyses the breakdown of hydrogen peroxide into water and oxygen gas. The oxygen gas forms a foam. The height of the foam indicates how active the enzyme is.

A student investigated the effect of temperature on the activity of the enzyme catalase.

The student used this method:

Step 1 Label three test-tubes **C**, **R** and **H**.

Step 2 Use a syringe to add 4 cm^3 of hydrogen peroxide solution to each of the test-tubes labelled **C**, **R** and **H**.

Step 3 Place test-tube **C** into a cold water-bath.

Step 4 Place test-tube **R** in a test-tube rack to keep it at room temperature.

Step 5 Place test-tube **H** into a hot water-bath.

Step 6 Leave the test-tubes for five minutes.

Step 7 After five minutes, use a clean syringe to add 1 cm^3 of potato extract to test-tube **C**. Start the stop-clock.

Step 8 Repeat step 7 for test-tube **R** and test-tube **H**.

Fig. 1.1 shows the test-tubes 30 seconds after adding the potato extract.

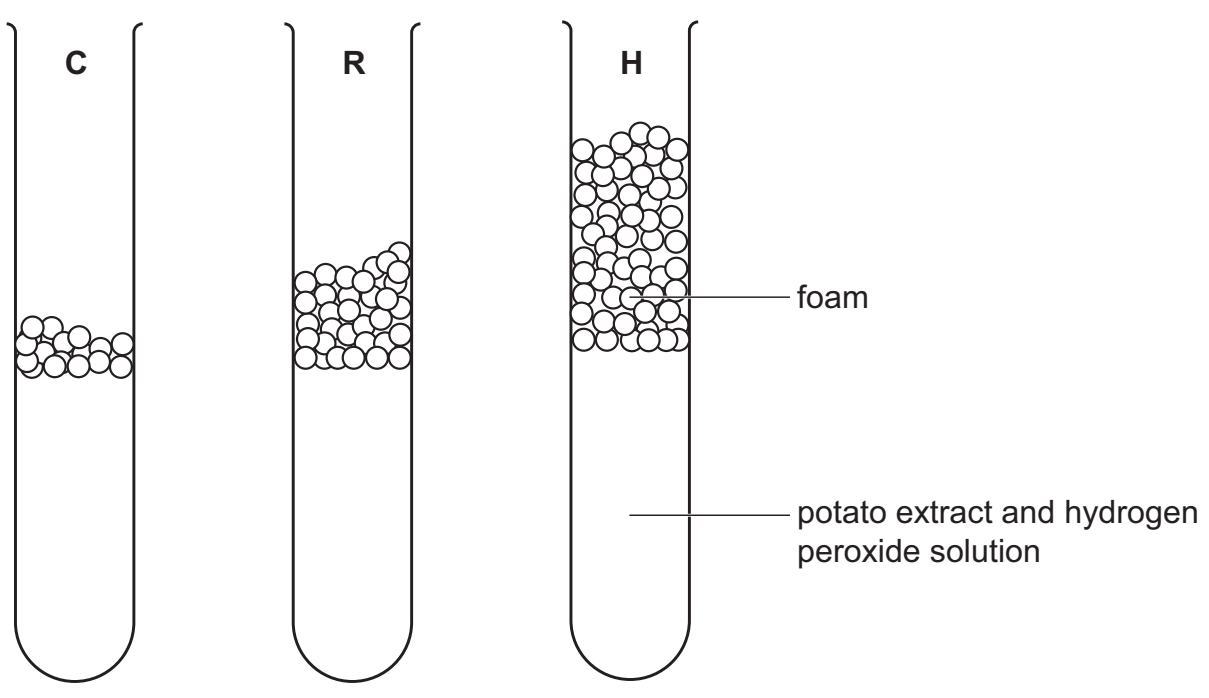

Fig. 1.1

(a) (i) Prepare a table for the results of the investigation.

Measure the maximum height of the foam, in mm, in each of test-tubes **C**, **R** and **H** shown in Fig. 1.1.

Record these measurements in your table.

[4]

(ii) State a conclusion for these results.

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..... [1]

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

independent variable .....

.....

dependent variable .....

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[2]

(iv) Explain why test-tube **C** and test-tube **H** were kept in the water-baths for five minutes in step 6.

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..... [1]

(v) The student suggests repeating the investigation twice more.

Explain how this would give you more confidence in these results.

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..... [1]

(vi) Potato extract can be prepared by cutting a potato into pieces and then grinding it with a mortar and pestle and some water.

Describe a safety precaution that would reduce the hazards in producing potato extract using this method.

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..... [1]

(b) (i) Another student did the same experiment and measured the height of the foam in one of the test-tubes as 29 mm. The diameter of the test-tube was 25 mm.

Calculate the volume of foam produced, and give your answer in cm^3 to **one** decimal place.

Use 3.14 as the value for π.

..... cm^3 [3]

(ii) Suggest a more accurate method of measuring the volume of oxygen gas produced.

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..... [1]

(c) Potatoes are a source of starch and vitamin C.

(i) Iodine solution was used to test a sample of potato for starch.

State the result of a positive test for starch.

..... [1]

(ii) State the name of a reagent that can be used to test for vitamin C.

..... [1]

(d) Photosynthesis also produces oxygen gas.

Plan an investigation to determine the effect of light intensity on the rate of photosynthesis in aquatic plants.

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..... [6]

[Total: 22]