12. Respiration

12.3 Anaerobic respiration

Paper 3 and 4

Question Paper

Paper 3

Questions are applicable for both core and extended candidates

1 **(a)** Fig. 1.1 is a photograph showing different stages of bread-making.

Bread dough is made by mixing flour, water and yeast together.

Bread dough **A** has just been mixed.

Bread dough **B** was mixed a few hours before the photograph was taken and has increased in volume.

Fig. 1.1

(i) State the name of the gas that caused bread dough **B** to increase in volume.

..... [1]

(ii) State the name of the process in yeast that produces the gas during bread-making.

..... [1]

(b) State **one other** product that is made using yeast, apart from food or drink.

..... [1]

2 **(a)** Yeast can respire anaerobically.

The box on the left shows the beginning of a sentence.

The boxes on the right show some sentence endings.

Draw **three** straight lines from the box on the left to the boxes on the right to make three correct sentences.

Anaerobic respiration in yeast	breaks down nutrient molecules.
	is a chemical reaction.
	only takes place in ribosomes.
	produces lactic acid.
	releases less energy than aerobic respiration.
	requires oxygen.

[3]

(b) State **two** ways anaerobic respiration in yeast is used in biotechnology.

1 .....

2 .....

[2]

(c) A student investigated the effect of different glucose solution concentrations on the volume of gas produced by yeast.

The results are shown in Table 8.1.

Table 8.1

glucose solution concentration / mol per dm^3	time to produce 1 cm^3 of gas / s
0.1	121
0.2	100
0.3	85
0.4	60
0.5	45

The rate of gas production can be calculated using the formula:

$$\text{rate} = \frac{1}{\text{time}}$$

Calculate the rate of gas production for the glucose solution concentration of 0.4 mol per dm^3.

Give your answer to **two** decimal places.

..... cm^3 per s [2]

[Total: 7]

3 **(a)** Complete the sentences about anaerobic respiration in **humans**, using words or phrases from the list.

You may use the words or phrases once, more than once or not at all.

alcohol **breaks down** **builds up** **carbon dioxide**

element **lactic acid** **less** **molecule** **more**

muscles **particle** **oxygen** **releases**

Anaerobic respiration is the chemical reaction in cells that ..... nutrient molecules to release energy without using ..... .

Anaerobic respiration releases much ..... energy per glucose ..... than aerobic respiration.

..... is produced by anaerobic respiration during vigorous exercise.

[5]

(b) Complete the word equation for anaerobic respiration in **yeast**.

glucose ⟶ ..... + ...

[2]

4 Respiration occurs in all living organisms.

(a) State the name of the product of **anaerobic** respiration in humans.

..... [1]

(b) **(i)** Table 6.1 shows the energy released during the aerobic and anaerobic respiration of one molecule of glucose in humans.

Table 6.1

type of respiration	energy released / kJ
aerobic	2872
anaerobic	118

Calculate the difference in energy released between aerobic and anaerobic respiration.

..... kJ [1]

(ii) State the word equation for **aerobic** respiration.

..... [2]

(c) Biofuels can be made from ethanol which is a type of alcohol.

Ethanol is produced during anaerobic respiration in yeast.

The volume of biofuels produced by seven countries was measured.

Fig. 6.1 shows the percentage of biofuels produced by each country.

The countries are labelled **A** to **G**.

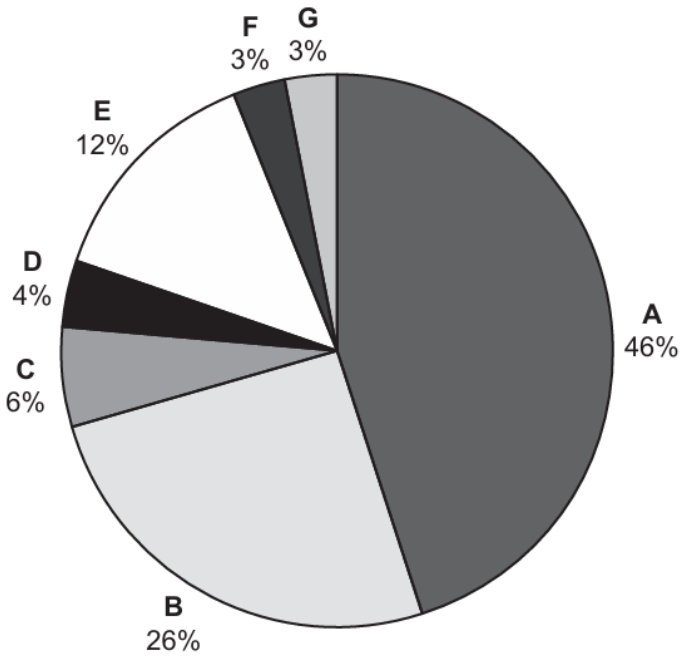

Fig. 6.1

(i) Complete the sentences to describe the results shown in Fig. 6.1.

Country ..... produces the largest percentage of biofuels.

Countries ..... and ..... produce the smallest percentages of biofuels.

Country **E** produces twice as much biofuel as country ..... .

[4]

(ii) State the name of **one** product of anaerobic respiration in yeast, other than alcohol.

..... [1]

(iii) State **one** use by humans of anaerobic respiration in yeast, other than to produce biofuels.

..... [1]

[Total: 10]

5 **(a)** A scientist measured the mass of carbon dioxide produced by anaerobic respiration in yeast cells for 1200 minutes.

Fig. 7.1 shows the results.

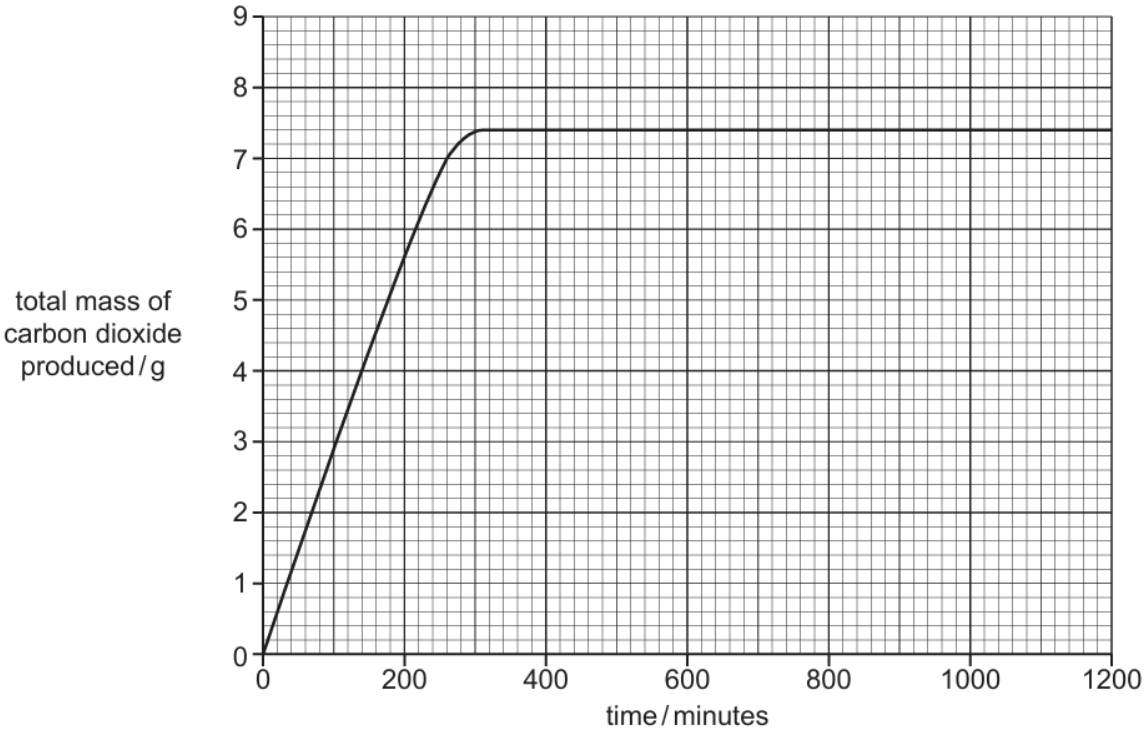

Fig. 7.1

(i) Complete the sentences to describe the results shown in Fig. 7.1.

The yeast cells produced a total of ..... g of carbon dioxide during 1200 minutes.

The yeast cells stopped producing carbon dioxide at ..... minutes.

[2]

(ii) The investigation was repeated with boiled yeast cells.

Predict the effect on the mass of carbon dioxide produced **and** explain your prediction.

.....

.....

.....

.....

..... [2]

(iii) State the name of **one other** product of anaerobic respiration in yeast cells.

..... [1]

6 **(a)** Place ticks (✓) in the boxes that describe anaerobic respiration.

a chemical reaction in a cell	
breaks down nutrient molecules	
coordinates and regulates body functions	
does **not** use oxygen	
affects reaction times and self-control	
produces alcohol and carbon dioxide in yeast	
uses carbon dioxide	
uses oxygen	

[4]

(b) State the product of anaerobic respiration in muscles during vigorous exercise.

..... [1]

7 **(a)** A student investigated respiration in yeast. An equal mass of yeast was added to different types of sugar solution.

The student measured the volume of carbon dioxide released by the yeast using four different sugar solutions with the same concentrations.

The four different sugar solutions used were:

- dextrose
- lactose
- maltose
- sucrose.

Fig. 3.1 is a graph of the results.

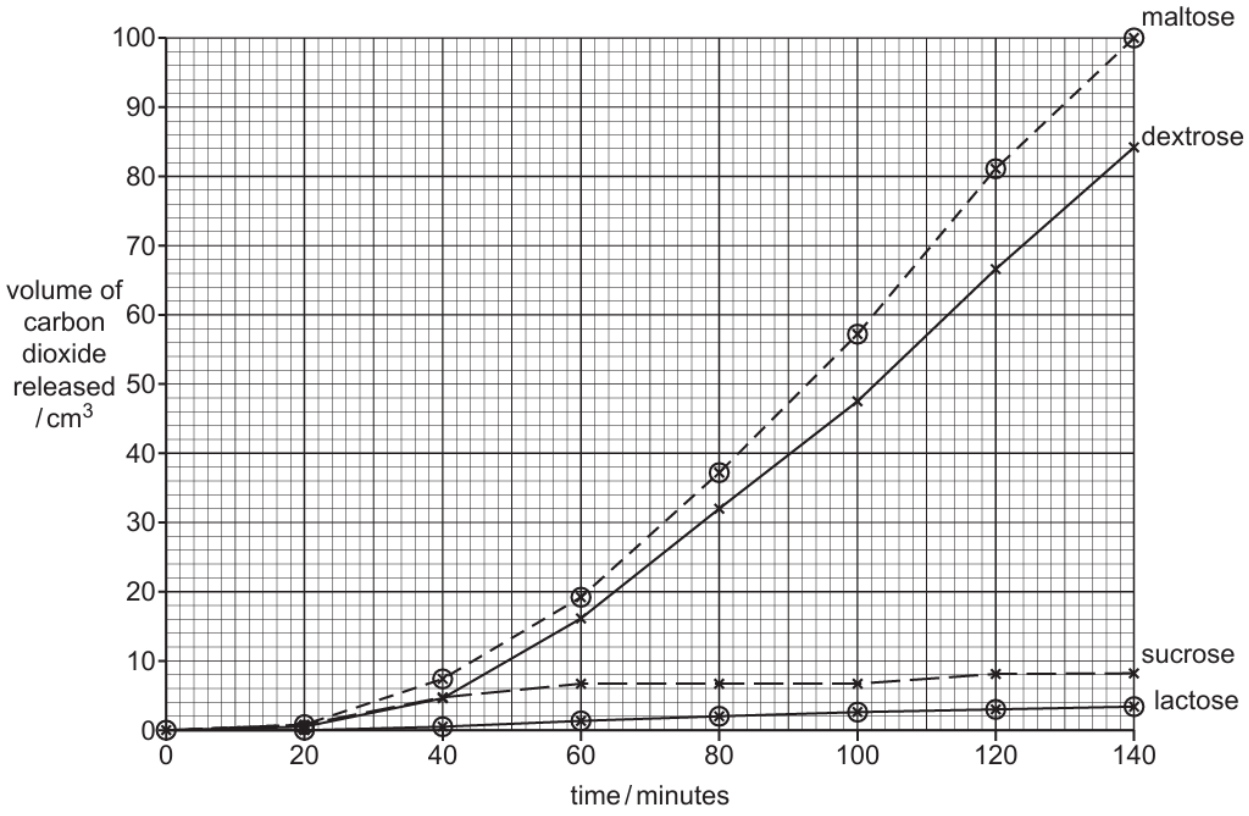

Fig. 3.1

(i) State the name of the sugar solution that produced the most carbon dioxide.

..... [1]

(ii) State the volume of carbon dioxide produced by yeast with the dextrose solution at 80 minutes.

..... cm^3 [1]

(b) The temperature during the investigation was maintained at 20 °C.

Predict the effect on the volume of carbon dioxide produced if the investigation was repeated at 30 °C.

.....

.....

..... [1]

(c) State **two** ways humans use anaerobic respiration in yeast to make useful products.

1 .....

2 .....

[2]

(d) Describe the similarities **and** differences between **anaerobic** respiration in yeast and **aerobic** respiration in humans.

similarities .....

.....

.....

.....

.....

differences .....

.....

.....

.....

.....

[4]

(e) State the word equation for **anaerobic** respiration in humans.

..... [2]

[Total: 11]

8 **(a)** Aerobic and anaerobic respiration both release energy.

Describe the **other** similarities **and** differences between aerobic and anaerobic respiration in muscles.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) Anaerobic respiration in yeast produces alcohol.

The boxes on the right show some sentence endings.

Draw lines from the word alcohol to make **three** correct sentences.

Alcohol	abuse decreases instances of crime.
	can be addictive.
	causes lung cancer.
	increases levels of self-control.
	increases reaction times.
	is a depressant.

[3]

(d) State the name of an organ damaged by long-term alcohol abuse.

..... [1]

9 **(e)** Anaerobic respiration occurs when exercising vigorously.

(i) State the word equation for anaerobic respiration in muscle cells.

.....[1]

(ii) State **one** advantage of using aerobic rather than anaerobic respiration in humans.

.....

.....[1]

10 **(d)** Yeast cells can respire anaerobically.

Biotechnology makes use of this.

State **two** ways that the products of anaerobic respiration in yeast are used by humans.

1 .....

.....

2 .....

.....

[2]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

11 **(a)** Fig. 6.1 is a diagram showing how glucose is used by different organisms.

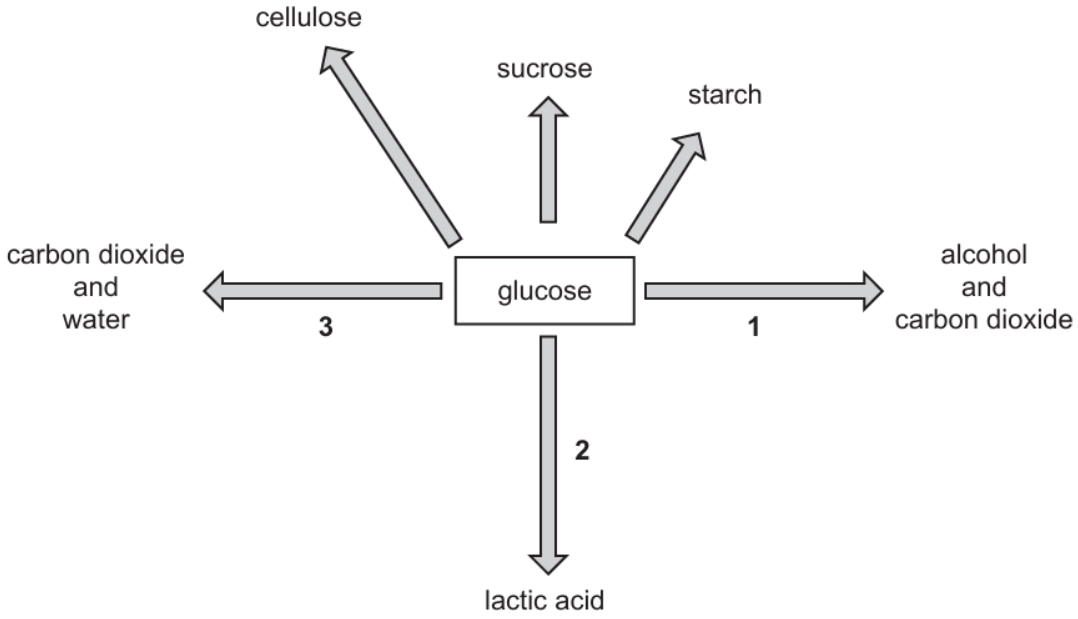

Fig. 6.1

(i) State the number or numbers from Fig. 6.1 that identify the processes that:

- release the most energy per glucose molecule .....
- take place in yeast cells. .....

[2]

(ii) State the balanced chemical equation for anaerobic respiration in a yeast cell. **(extended only)**

..... [2]

(iii) State the names of **two** enzymes that are needed to break down starch into glucose in humans.

1 .....

2 .....

[2]

(b) In humans, the build-up of lactic acid creates an oxygen debt. **(extended only)**

(i) State the body tissue that produces the most lactic acid during vigorous exercise.

..... [1]

(ii) The oxygen debt needs to be removed after exercise.

State how the breathing **and** circulatory systems act to remove the oxygen debt.

.....

.....

.....

.....

..... [2]

(iii) State the name of the organ which breaks down lactic acid.

..... [1]

12 **(a)** A scientist monitored the changes in the pH in muscles before, during and after two minutes of vigorous exercise.

The changes in pH are caused by the production of lactic acid. **(extended only)**

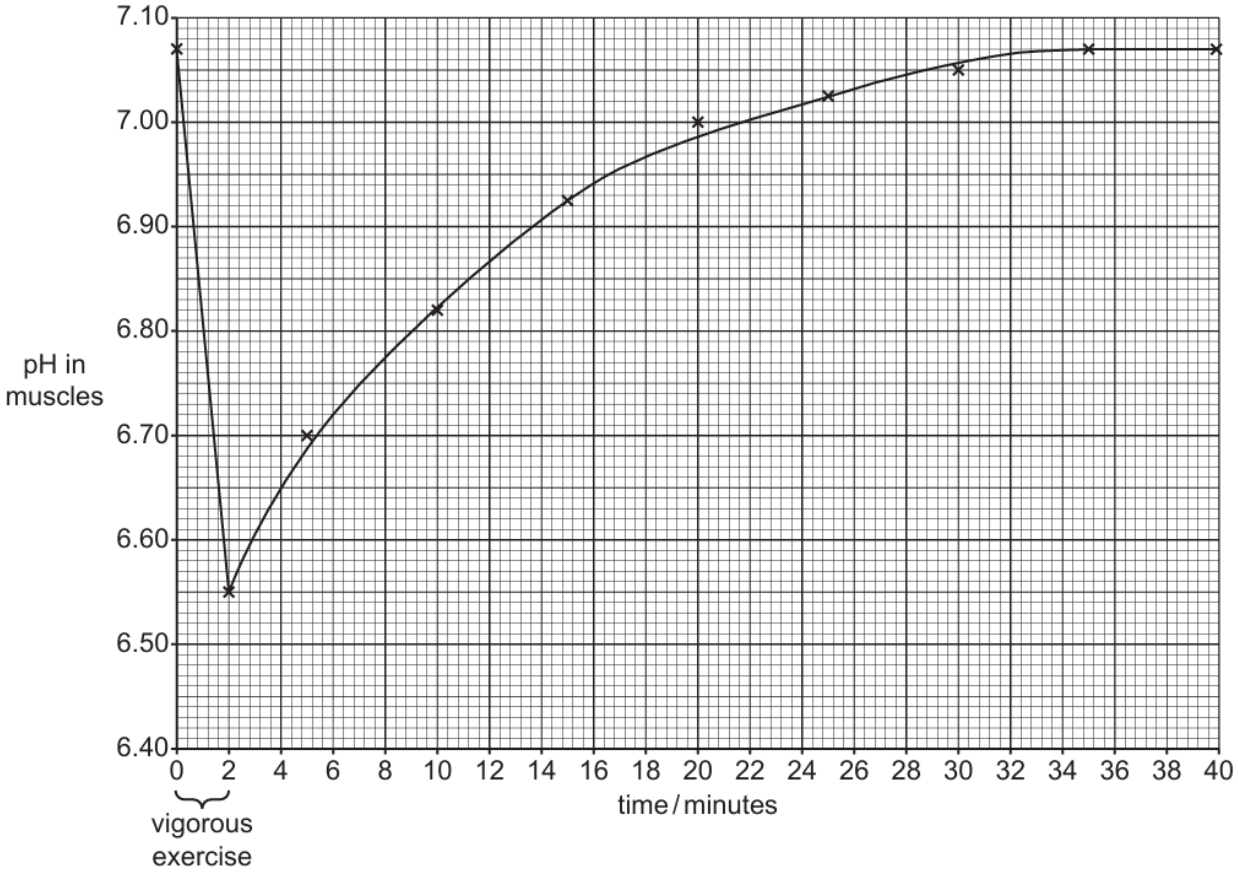

Fig. 6.1

Complete the sentences to describe **and** explain the results in Fig. 6.1.

The pH decreases from ..... to ..... during vigorous exercise.

There is not enough ..... supplied to the muscles.

The body respires anaerobically. The lactic acid produced builds up in the muscles causing

an ..... debt.

It takes ..... minutes for the muscle pH to return to its initial level after exercise.

The pH value increases after vigorous exercise has ended, as lactic acid is transported in the

..... to the ..... .

During this time the breathing rate and ..... rate remain high.

[6]

(b) Yeast can respire anaerobically.

(i) Complete the balanced chemical equation for anaerobic respiration in yeast. **(extended only)**

$C_6H_{12}O_6$ ..... [2]

(ii) Yeast belongs to the kingdom fungus.

State **one** cell component that is present in yeast cells but is absent in animal cells. **(extended only)**

..... [1]

13 **(a)** Fig. 4.1 is a flow chart showing some of the processes that occur in a biofuels power plant.

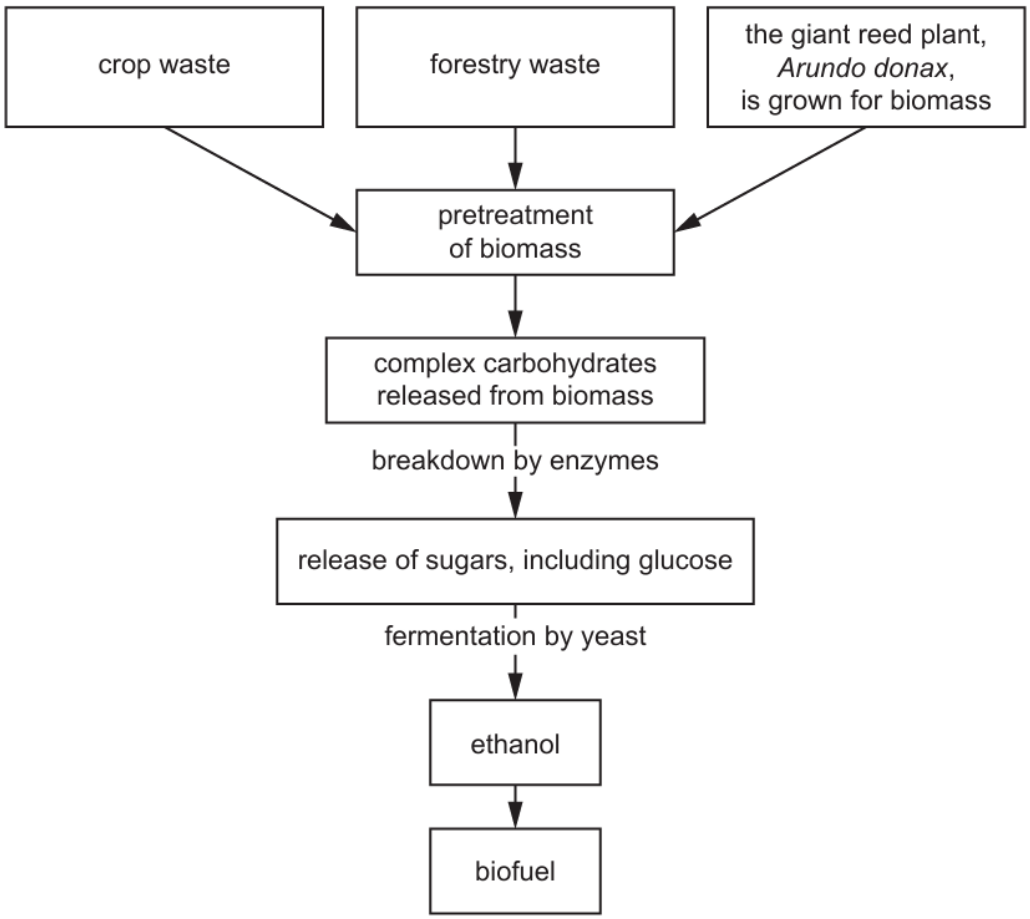

Fig. 4.1

(i) The fermentation stage shown in Fig. 4.1 requires yeast.

Complete the balanced chemical equation to show how ethanol is produced by yeast respiration. **(extended only)**

..... ⟶ ..... + ...

[2]

14 Biotechnology is used in the process of bread-making.

Fig. 1.1 shows some of the steps in making bread.

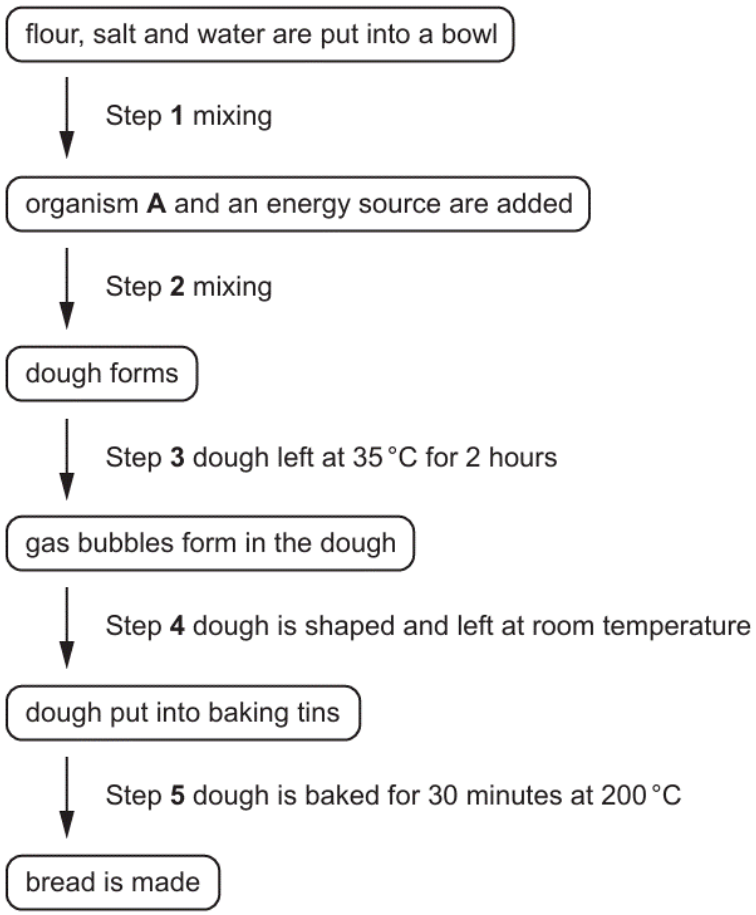

Fig. 1.1

(b) (i) State the name of the source of energy used by organism **A**.

..... [1]

(ii) State the name of the process that occurs at step **3** that causes gas bubbles to form in the dough.

..... [1]

(iii) State the name of the gas that forms to create the gas bubbles in the dough.

..... [1]

15 **(c)** The researchers also calculated the oxygen debt for each type of exercise.

They found that the horses developed a larger oxygen debt when they exercised by galloping and cantering rather than when they walked.

Explain why the horses developed an oxygen debt when they exercised. **(extended only)**

.....

.....

.....

.....

.....

.....

.....

.....[3]

(d) Describe how the horses would recover from an oxygen debt when they stop exercising. **(extended only)**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]