OCR GCSE GATEWAY BIOLOGY A · J247

BIOLOGY



EXAM QUESTION PACK

B1.3 RESPIRATION

SCORE	PERCENTAGE
/137	%

STEMUP

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Gateway Biology A (9-1)

Respiration

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **137**.
- The total number of marks may take into account some 'either/or' question choices.

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1 What are proteins made of?

A amino acids
B fatty acids
C nucleotides
D sugars

Your answer

[1]

2 What is the word equation for aerobic respiration?

A carbon dioxide + water → glucose + oxygen
B glucose + carbon dioxide → oxygen + water
C glucose + oxygen → carbon dioxide + water
D oxygen + water → glucose + carbon dioxide

Your answer

[1]

3 What type of reactions are photosynthesis and respiration?

	photosynthesis	respiration
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

Your answer

[1]

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4 What substance does Benedict's reagent test for?

A lipid
B protein
C starch
D sugar

Your answer ☐

[1]

5 Which molecule is **not** a polymer?

A DNA
B lipid
C protein
D starch

Your answer ☐

[1]

6(a) What is the gas given off in photosynthesis?

---

[1]

(b) Explain why the amount of this gas given off is **not** a true measure of the rate of photosynthesis.

---

[2]

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7 A group of students investigate the effect of temperature on the breakdown of the fat in milk by the enzyme lipase.

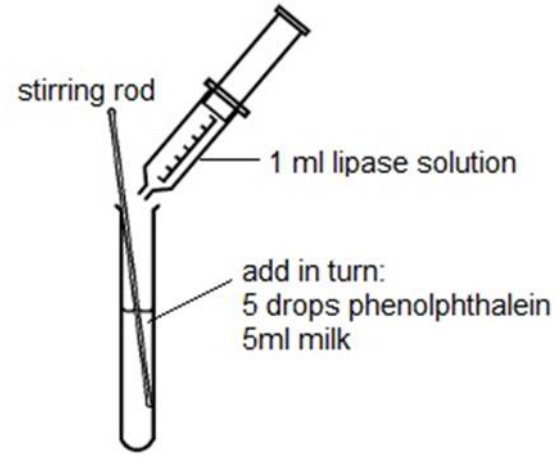
In their investigation they use an indicator called phenolphthalein.

Phenolphthalein is pink in alkali conditions but becomes colourless when the pH falls below pH8.

A student puts 5 drops of phenolphthalein and 5 ml of full fat milk into a test tube.

She adds 1 ml of lipase, stirs the mixture and times how long it takes to lose the pink colour.

Other students repeat this but at different temperatures.



The table shows the group's results.

Temperature (°C)	Time for pink colour to disappear (s)
20	480
40	240
60	270
80	960

Explain why the pH falls when lipase breaks down the fat in milk.

---

[2]

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8 Compost decomposes more slowly above 60 °C or below 30 °C.

Use ideas about enzymes and decomposition to explain why this is.

---

[2]

9 A group of students investigate the effect of temperature on the breakdown of the fat in milk by the enzyme lipase.

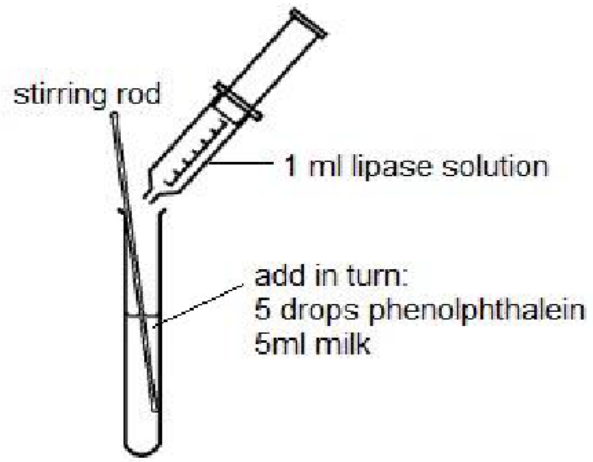
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---

[2]

10 Compost decomposes more slowly above 60°C or below 30°C.

Use ideas about enzymes and decomposition to explain why this is.

---

[2]

11 Two athletes run in a long race.

During the race both athletes made more carbon dioxide than normal.

Why is more carbon dioxide made and why must it be removed from the body?

---

[2]

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12(a) The table shows some information about three types of mammal.

Mammal	Metabolic rate	Surface area of one red blood cell in arbitrary units	Volume of one red blood cell in arbitrary units	Surface area to volume ratio of red blood cells
Mouse	1.0	91	52	1.75
Rabbit	1.5	114	70	1.63
Shrew	7.5	60	24	

The units for the metabolic rate are cm^3 of oxygen consumed in one hour per gram of animal.

(i) Suggest why the oxygen consumed is given as **per gram of animal**?

---

[1]

(ii) Explain why oxygen consumption can be used as a measure of metabolic rate.

---

[2]

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(b)

(i) Calculate the surface area to volume ratio of red blood cells for the shrew.

answer = _____

[1]

(ii) Explain how the shrew manages to maintain its metabolic rate.

Use your calculation in part **(b)(i)** and information from the table in your answer.

---

[3]

13 Sam investigates the rate of alcohol production by fermentation.

She mixes yeast with sugar and water and leaves the mixture to ferment for 4 days.

She does this for two different strains of yeast, **A** and **B**.

Sam monitors the fermentation process by recording the specific gravity of the mixture.

The lower the specific gravity the more alcohol the mixture contains.

Look at Sam's results.

Time in hours	Specific gravity in g/cm^3	
	Yeast strain A	Yeast strain B
0	1.090	1.090
24	1.065	1.057
48	1.054	1.038
72	1.044	1.023
96	1.037	1.010
120	1.037	1.001

Explain the patterns seen in the two sets of data.

--- [2]

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14 Which two substances are products of **anaerobic** respiration in **yeast**?

A Carbon dioxide and ethanol

B Carbon dioxide and water

C Oxygen and ethano

D Oxygen and water

Your answer [ ] **[1]**

15 A student wants to test for **protein.**

What would they use to test for protein?

A Benedict's reagent

B Biuret reagent

C Iodine solution

D Ethanol

Your answer [ ] **[1]**

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16 Yeast cells are used in the production of alcohol.

During this process conditions are controlled so that the yeast grows at an optimum rate.

One condition that is controlled is temperature.

Write down two **other** ways to optimise the growth rate of yeast.

1

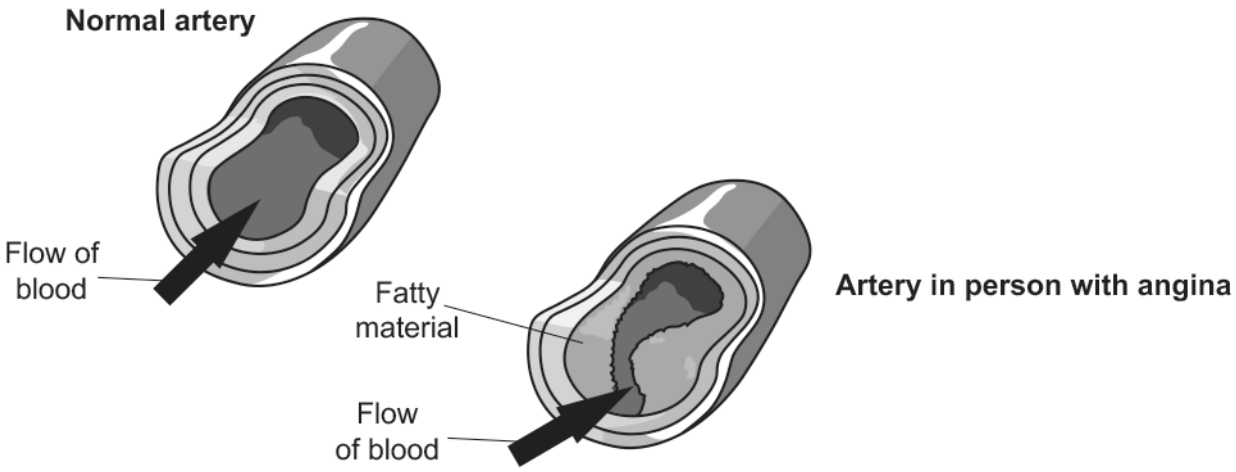
2

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[2]

17 Angina is caused by a problem in the arteries that supply the heart muscle.

Fatty material (cholesterol) builds up in these arteries.



In angina the heart muscle starts to carry out anaerobic respiration.

Explain why this happens.

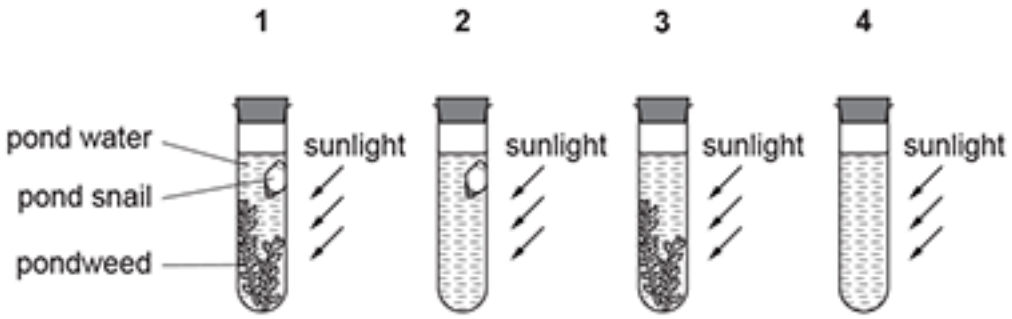
Use the information in the diagram and your biological knowledge.

---

[3]

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18 Pond snails and pondweed are living in water in sealed test tubes.



Carbon dioxide dissolves in water and forms an acid.

In which test tube would the water become most acidic?

A 1
B 2
C 3
D 4

Your answer ☐ [1]

19(a) Yeast cells can respire anaerobically.

Complete the word equation for **anaerobic** respiration in yeast.

glucose → ..... + ... [1]

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(b) Write down **two** ways in which anaerobic respiration in yeast cells is different from anaerobic respiration in human muscle cells.

1 _____

_____

2 _____

_____

[2]

(c) Date fruits contain three different sugars, fructose, glucose and sucrose.

Different strains of yeast can ferment different sugars to produce a fermented product.

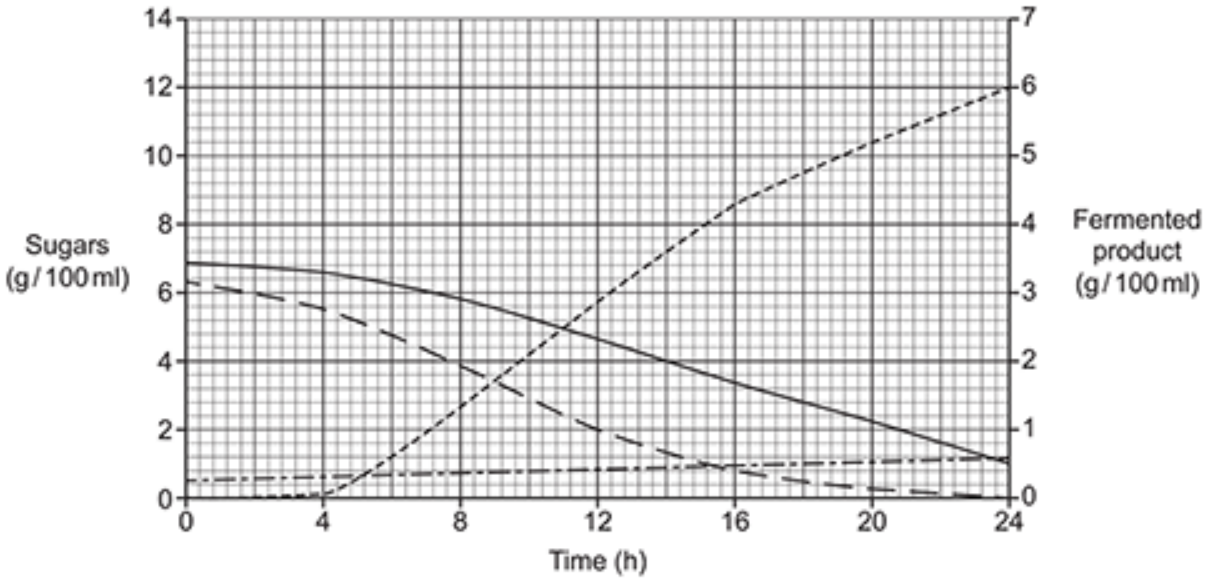
Scientists investigate how two different strains of yeast, **A** and **B**, ferment sugars inside date fruits.

Look at their results.

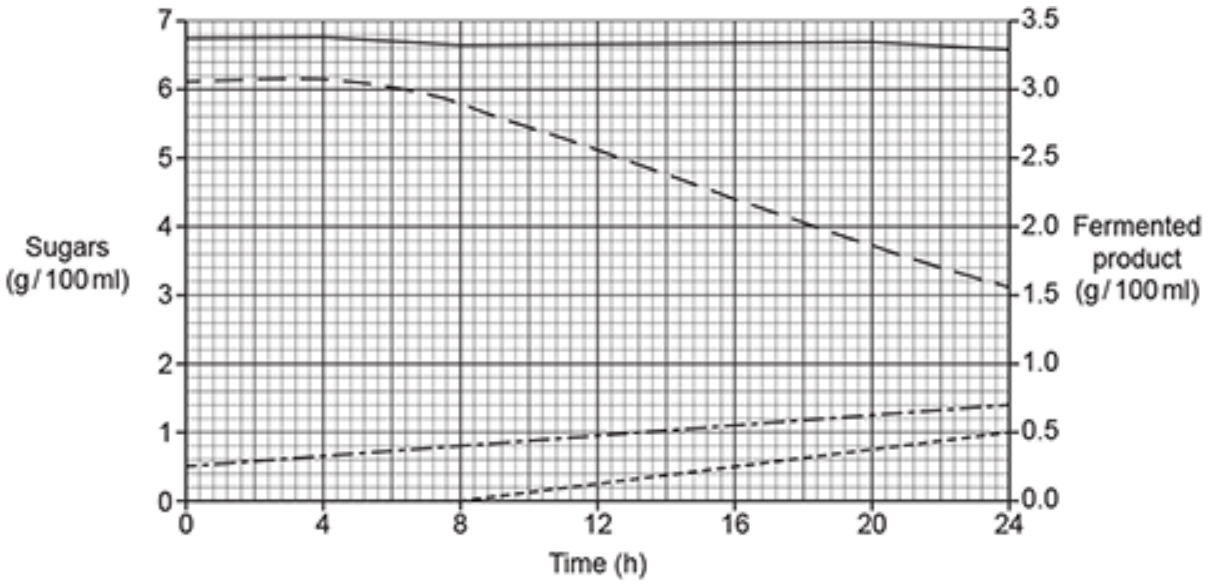
Key

———— fructose —— —— glucose – - — - – sucrose ----- fermented product

Yeast A



Yeast B



(i) Which sugar is **not** fermented by either strain of yeast?

Tick (✓) **one** box.

Fructose ☐

Glucose ☐

Sucrose ☐

[1]

(ii) After 24 hours, how many times higher is the fermented product yield of yeast **A** compared to yeast **B**?

Number of times higher = ... [2]

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(iii) Which sugar would increase fermentation the **most** if added to either yeast **A** or yeast **B**?

Tick (✓) **one** box.

Fructose ☐

Glucose ☐

Sucrose ☐

[1]

(iv) Fermented dates are used to supply both fructose and fermented product.

Explain why it would be best to use yeast **B** to ferment dates to supply both fructose and fermented product.

---

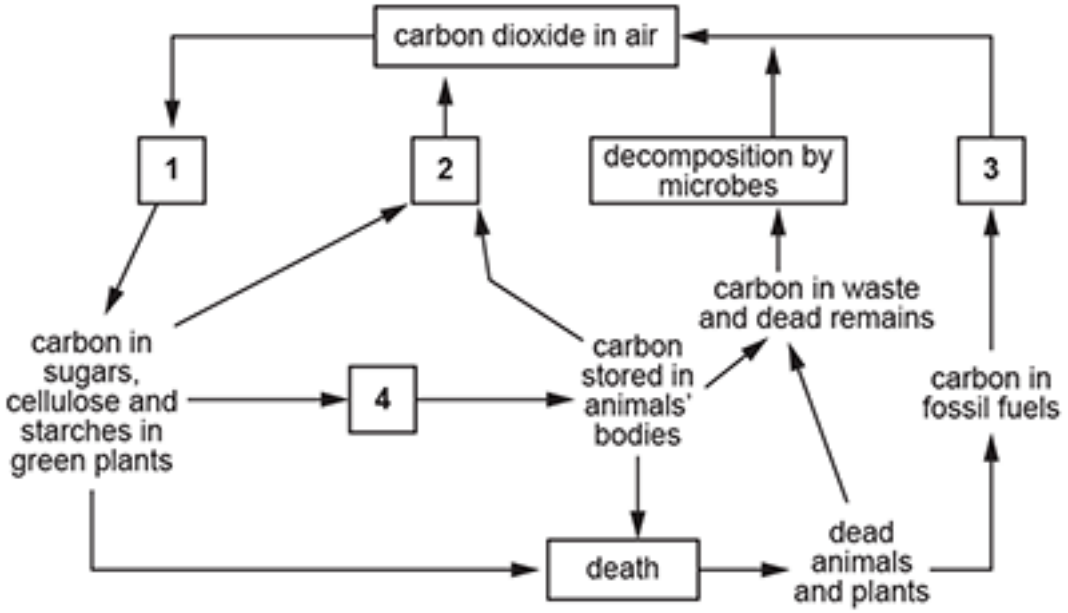
[2]

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20 The diagram shows the carbon cycle.



Scientists investigated if crops can be grown on the planet Mars.

They used a soil that was similar to the soil found on Mars. The soil contained some minerals but no living organisms.

(i) The scientists managed to grow crops in the soil. However on Mars, the minerals in the soil would soon run out.

Explain why.

---

[2]

(ii) Living organisms could be added to the soil but there is no air on Mars. The plants would need to be grown in an enclosed structure.

At first, air would need to be added, but after a while the organisms in the soil and the plants would supply each other with the gases they need.

Explain how this would happen.

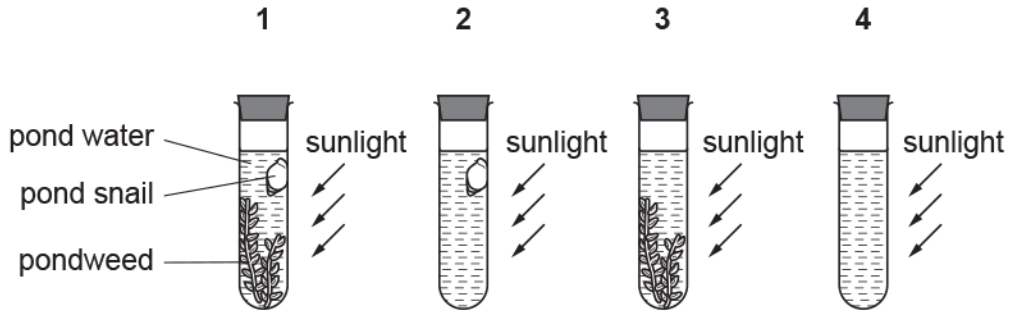
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[2]

21 Pond snails and pondweed are living in water in sealed test tubes.



Carbon dioxide dissolves in water and forms an acid.

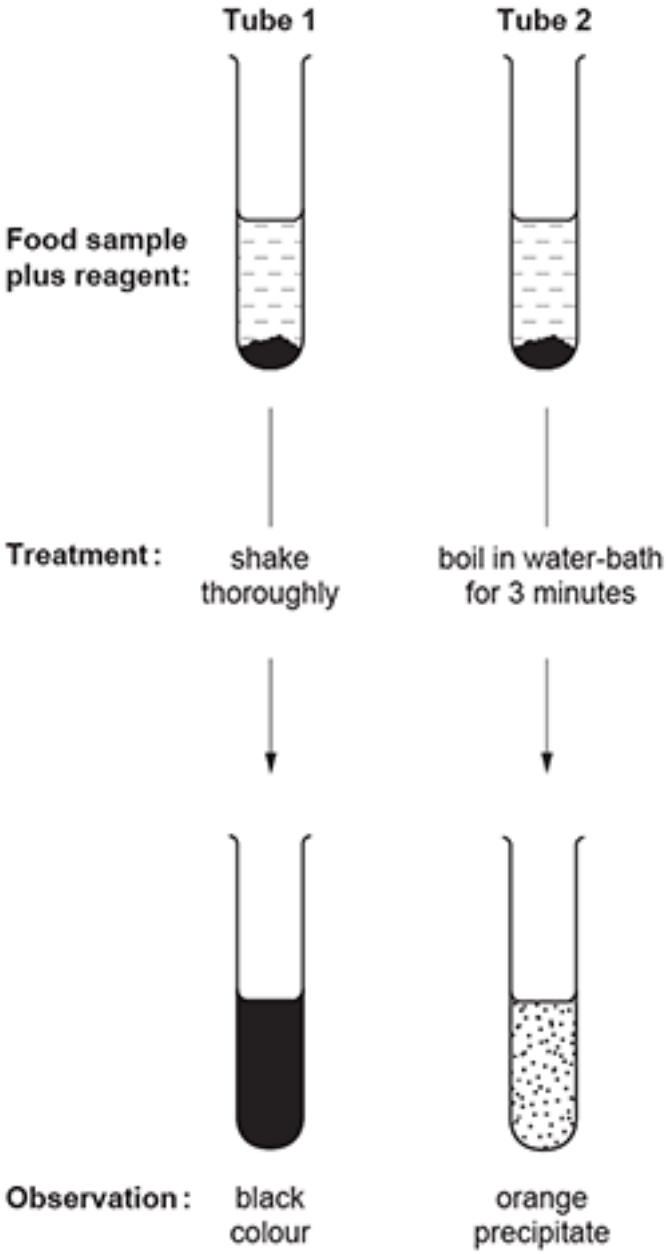
In which test tube would the water become most acidic?

A 1
B 2
C 3
D 4

Your answer [1]

22 The diagram shows positive results in two different food tests.

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What do the results show in each tube?

	Tube 1	Tube 2
A	sugar	lipid
B	starch	sugar
C	protein	sugar
D	starch	protein

Your answer [ ] [1]

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23 Aerobic respiration occurs all the time in plant cells but photosynthesis only occurs in daylight.

Why is more energy released by a plant cell during the night?

A Photosynthesis is endothermic taking in energy and aerobic respiration is exothermic.
B Photosynthesis is exothermic taking in energy and aerobic respiration is endothermic.
C Aerobic respiration is exothermic taking in energy and photosynthesis is endothermic.
D Aerobic respiration is endothermic taking in energy and photosynthesis is exothermic.

Your answer ☐ [1]

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

glucose → ---------- + ---------- [1]

(b) Write down **two** ways in which anaerobic respiration in yeast cells is different from anaerobic respiration in human muscle cells.

1 ----------

---

2 ----------

[2]

(c) Date fruits contain three different sugars, fructose, glucose and sucrose.

Different strains of yeast can ferment different sugars to produce a fermented product.

Scientists investigate how two different strains of yeast, **A** and **B**, ferment sugars inside date fruits.

Look at their results.

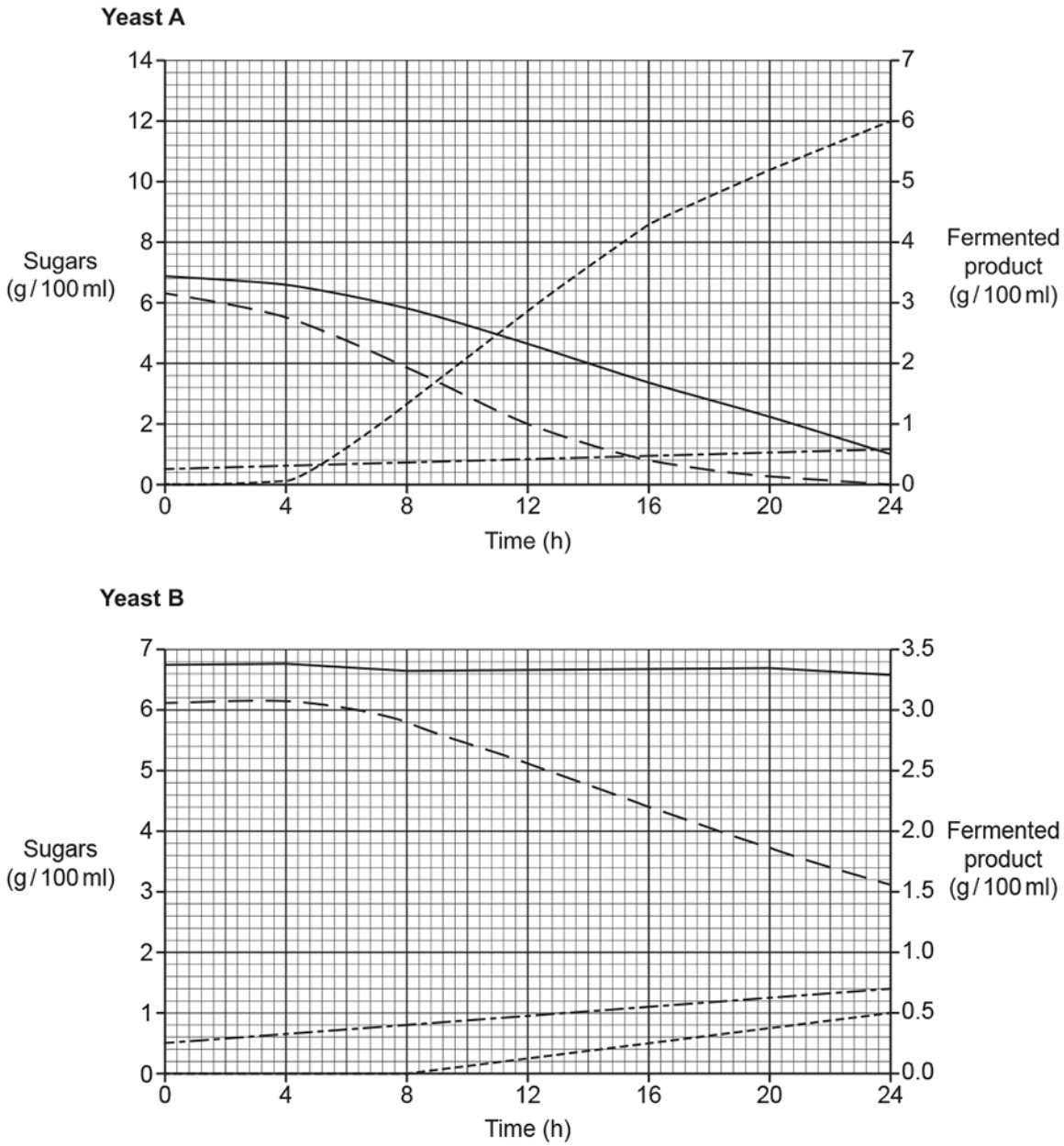
Key

——— fructose — — glucose --—-- sucrose ------ fermented product

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(i) Which sugar is **not** fermented by either strain of yeast?

Tick (✓) **one** box.

Fructose ☐

Glucose ☐

☐

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Sucrose

[1]

(ii) After 24 hours, how many times higher is the fermented product yield of yeast **A** compared to yeast **B**?

Number of times higher = ... [2]

(iii) Which sugar would increase fermentation the **most** if added to either yeast **A** or yeast **B**?

Tick (✓) **one** box.

Fructose ☐

Glucose ☐

Sucrose ☐

[1]

(iv) Fermented dates are used to supply both fructose and fermented product.

Explain why it would be best to use yeast **B** to ferment dates to supply both fructose and fermented product.

---

[2]

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25(a) Rats are a major pest in many areas of the world. They can reduce food security and spread diseases.



Warfarin is a chemical that is used as a rat poison. It stops platelets working in the blood.

Describe the function of platelets in the blood.

---

[2]

(b) Some rats are resistant to warfarin. When fed with large amounts of warfarin the rats do not die.

Scientists found that the resistance is due to the dominant allele **R**.

Two resistant rats (**Rr**) mate.

Complete this genetic diagram to find the ratio of resistant rats to non-resistant rats that would be expected to be produced.

		Rr	
		.....	.....
Rr	R	.....	.....
	r	.....	.....

Ratio = ... [3]

(c) After several years, the percentage of resistant rats in the population had increased.

Use Darwin's theory of natural selection to explain this observation.

[3]

(d) Scientists are now trying to find another poison to use on rats.

They have introduced a chemical called phosphine. This blocks the action of mitochondria in rat cells.

Explain why this might kill rats.

[3]

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26 Respiration is a reaction that happens in all cells.

(i) Why do cells need respiration?

[1]

(ii) Cells use aerobic respiration when oxygen is available.

What are the **two** products of aerobic respiration?

1 _____

2 _____

[2]

(iii) Aerobic respiration releases heat energy.

What term describes a reaction that releases heat energy?

[1]

27 Which monomer is used to make proteins?

A Amino acid
B Fatty acid
C Glucose
D Glycerol

Your answer ☐ [1]

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28 Modern hair shampoos contain cleaning agents. One cleaning agent is made from fatty acids.

Explain how a **polymer** found in plants and animals can be treated to obtain these fatty acids.

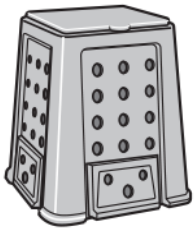
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[2]

29(a) Gardeners use dead plant material to make compost. They add this compost to soil where they are growing plants.

Compost can be made in a composting bin. In the bin **aerobic** bacteria turn dead plant material into compost.

The drawing shows a composting bin.



Explain why the composting bin needs holes in it.

---

[2]

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(b) A new way of making compost is called bokashi. In this process the compost is made **anaerobically** in a different type of composter.

Scientists compare the normal methods of making compost with bokashi.

This is their method:

- Take one large pile of dead plant material
- Divide the material into two samples of equal mass
- Place one sample into the normal composter and place one sample into the bokashi composter
- Measure the temperature in each composter every 10 days
- After 40 days, measure the mass of the compost.

Why did the scientists put the same mass of compost in each composter?

Tick (✓) **one** box.

To allow valid comparisons of the results. ☐

To decrease the temperature. ☐

To make the measurements more accurate. ☐

To make the results repeatable. ☐

[1]

(c) **Table 20.1** shows the scientists' temperature measurements.

	Temperature of the compost (°C)	
Time (days)	Normal compost	Bokashi compost
0	26	26
10	70	27
20	53	29
30	42	31
40	28	28

Table 20.1

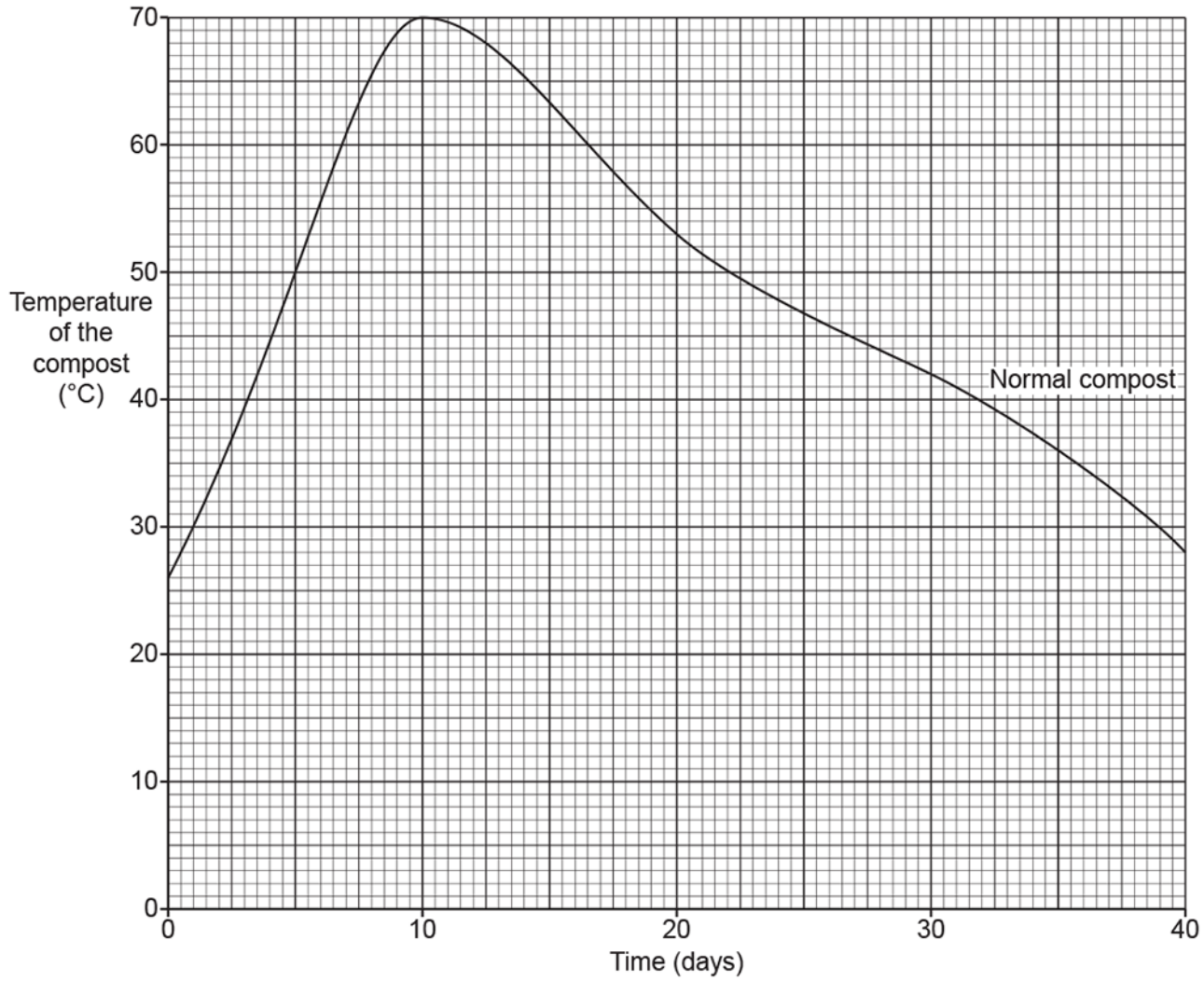
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(i) The scientists' results for the normal compost are plotted on the grid.

Complete the graph by plotting the results for the **bokashi** compost and draw a curve of best fit.



[3]

(ii) Describe the change in the temperature of the **normal** compost during the investigation.

---

[2]

(iii) Use data from **Table 20.1** to calculate the difference between the maximum temperature of the normal compost and the maximum temperature of the bokashi compost.

Difference = ... °C **[2]**

(iv) Which **two** statements explain this difference in temperature between the two types of compost?

Tick (✓) **two** boxes.

Both types of compost are made by aerobic respiration.	☐
Normal compost is made by aerobic respiration.	☐
Normal compost is made by anaerobic respiration.	☐
Aerobic respiration and anaerobic respiration release the same amount of energy.	☐
Aerobic respiration releases more energy than anaerobic respiration.	☐
Aerobic respiration releases less energy than anaerobic respiration.	☐

[2]

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(d) **Table 20.2** shows the scientists' results for the mass of the compost.

	Normal compost	Bokashi compost
Mass at start (kg)	1500	1500
Mass after 40 days (kg)	760	1200

Table 20.2

(i) The mass of the normal compost has decreased by 19 kg per day.

Calculate the decrease in mass of the bokashi compost per day.

Give your answer to the nearest **whole** number.

Decrease = ...kg per day **[3]**

(ii) Carbon dioxide is given off in the making of the compost. This causes most of the decrease in mass.

Scientists think that the bokashi method of composting might be better for the environment.

Use your answer from part **(i)** to justify the scientists' conclusion.

---

[1]

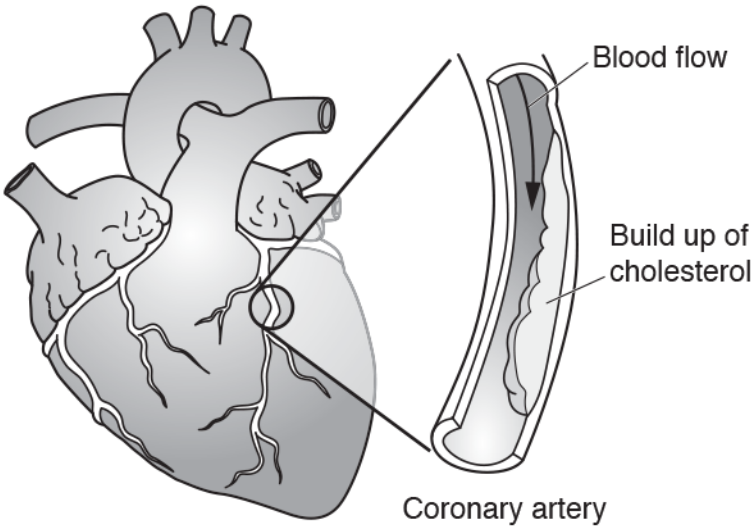
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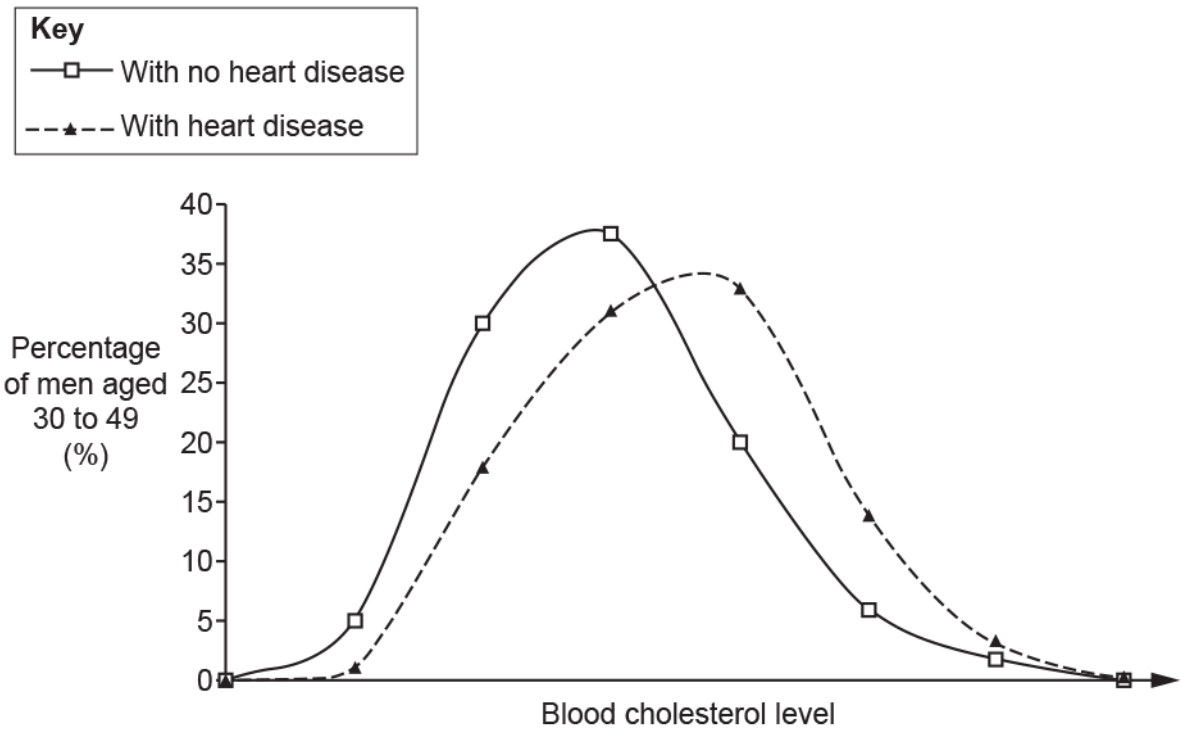
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30 Hypercholesterolemia (HC) is caused by a dominant allele on chromosome 19. This allele has mutations which cause a change in the order of DNA nucleotides.

* People with HC are more likely to get heart disease. The diagram shows the heart of a person who has heart disease.



The graph shows the results of a study of men aged 30 to 49. The study measured the cholesterol levels in the blood of the men. It also recorded if the men developed signs of heart disease.



Explain the possible link between cholesterol and heart disease and if this link is supported by the graph.

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Use evidence from the diagram and the graph in your answer.

[6]

31 In a sample of DNA, 23% of the bases are cytosine.

What percentage of the bases are adenine?

A 23%
B 27%
C 46%
D 54%

Your answer [1]

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32 A process in cells is involved in producing a chemical that causes ripening of fruit.
Look at **Fig. 20.2**.

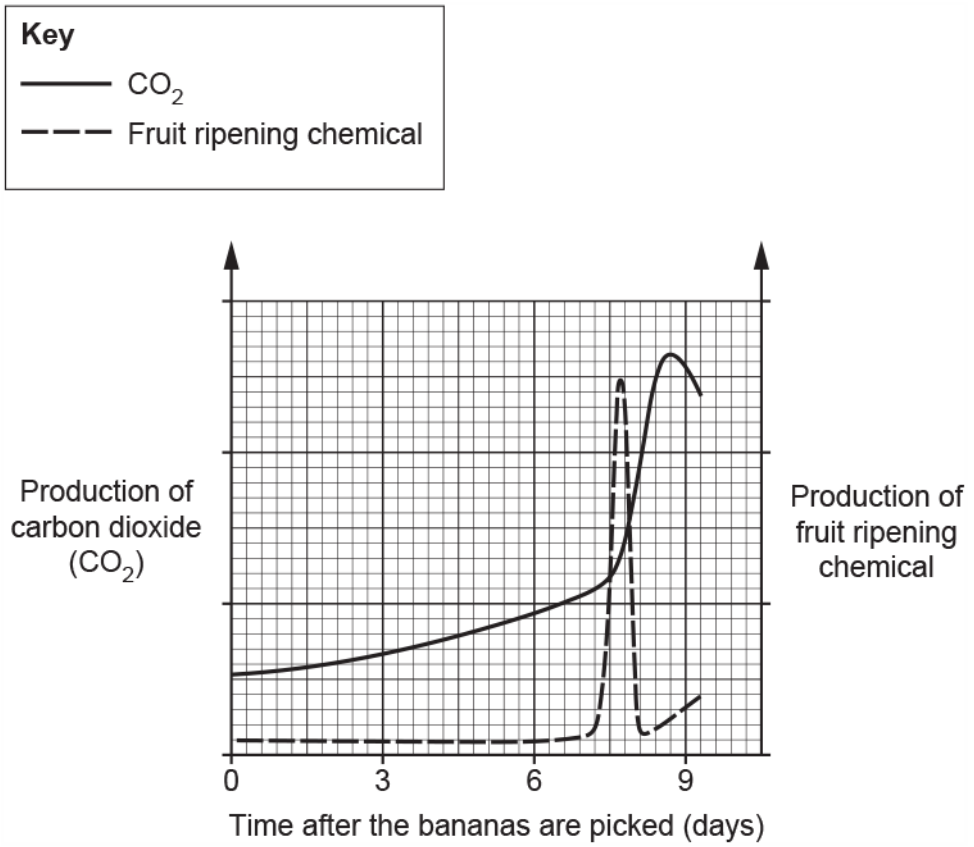


Fig. 20.2

Use evidence from **Fig. 20.2** to suggest what this process might be.

---

[2]

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33 Protein synthesis takes place inside cells.

ADH is a protein hormone made up of amino acids.

(i) Complete the sentences to explain the link between amino acids and proteins.

Large molecules, like proteins, made of smaller molecules are called .....

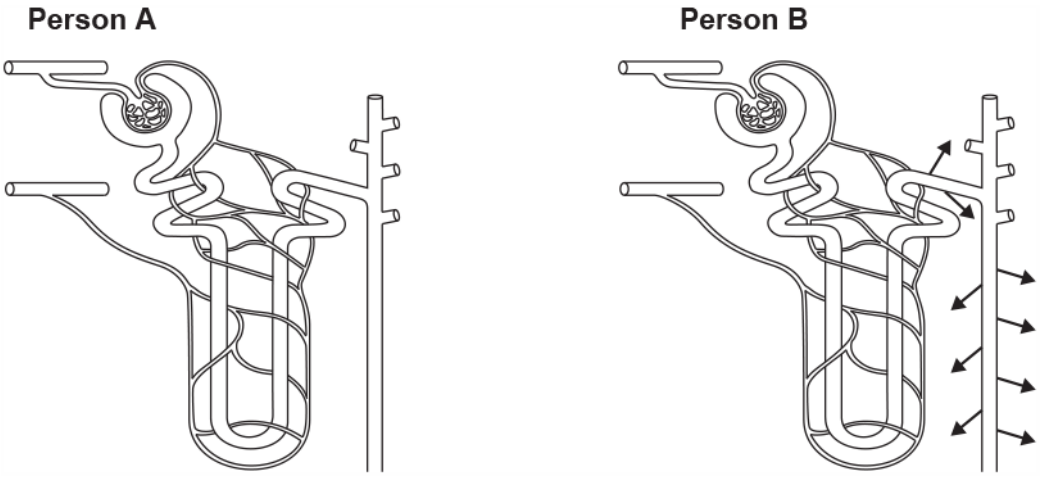
The smaller molecules, or amino acids, are called ..... .

[2]

(ii) Alcohol inhibits ADH production.

Person **A** and **B** both drank one small 100 ml drink.
Only one of the drinks was high in alcohol.

Look at the diagram of a kidney tubule in person **A** and **B** after the drink.



→ Movement of water

Explain how you can tell from the diagram that person **A**'s drink contained alcohol.

---

[2]

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(iii) After the alcohol has been removed from person **A**'s body, control mechanisms will correct the excess loss of water caused by the alcohol.
Describe these control mechanisms.

---

[2]

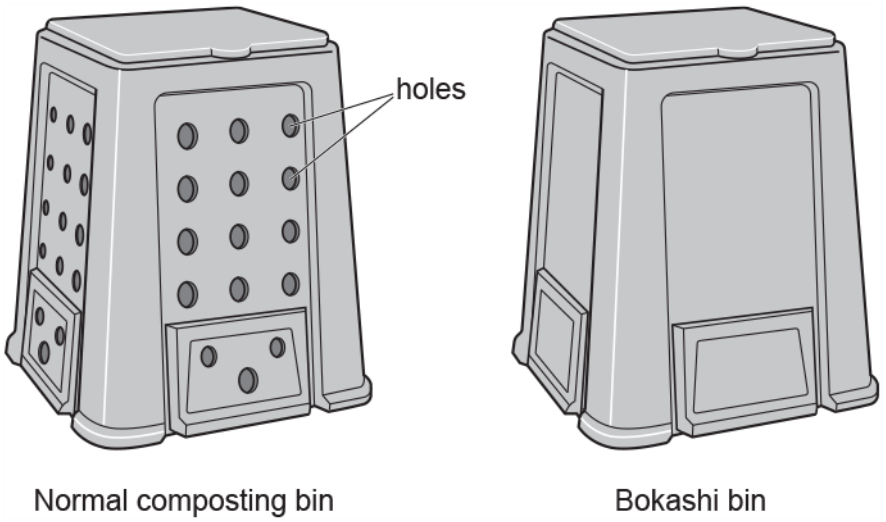
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34(a) Gardeners often turn dead plant material from their garden into compost. They then add this compost to the soil where they are growing plants.

Compost can be made in a composting bin. In the bin **aerobic bacteria** turn dead plant material into compost.

Some people use a different way of making compost, called bokashi. In this process the compost is made **anaerobically.**

The drawings show a normal composting bin and a bokashi bin.



Explain the difference in the design of the two composting bins.

---

[2]

(b) Scientists investigate the two methods of making compost.

This is their method:

- Take one large pile of dead plant material
- Divide the material into two samples of equal mass
- Place one sample into the normal composter and place one sample into the bokashi composter
- Measure the temperature in each composter every 10 days
- After 40 days, measure the mass of the compost.

Write down **one** way that the scientists make sure that they can draw valid conclusions.

---

[1]

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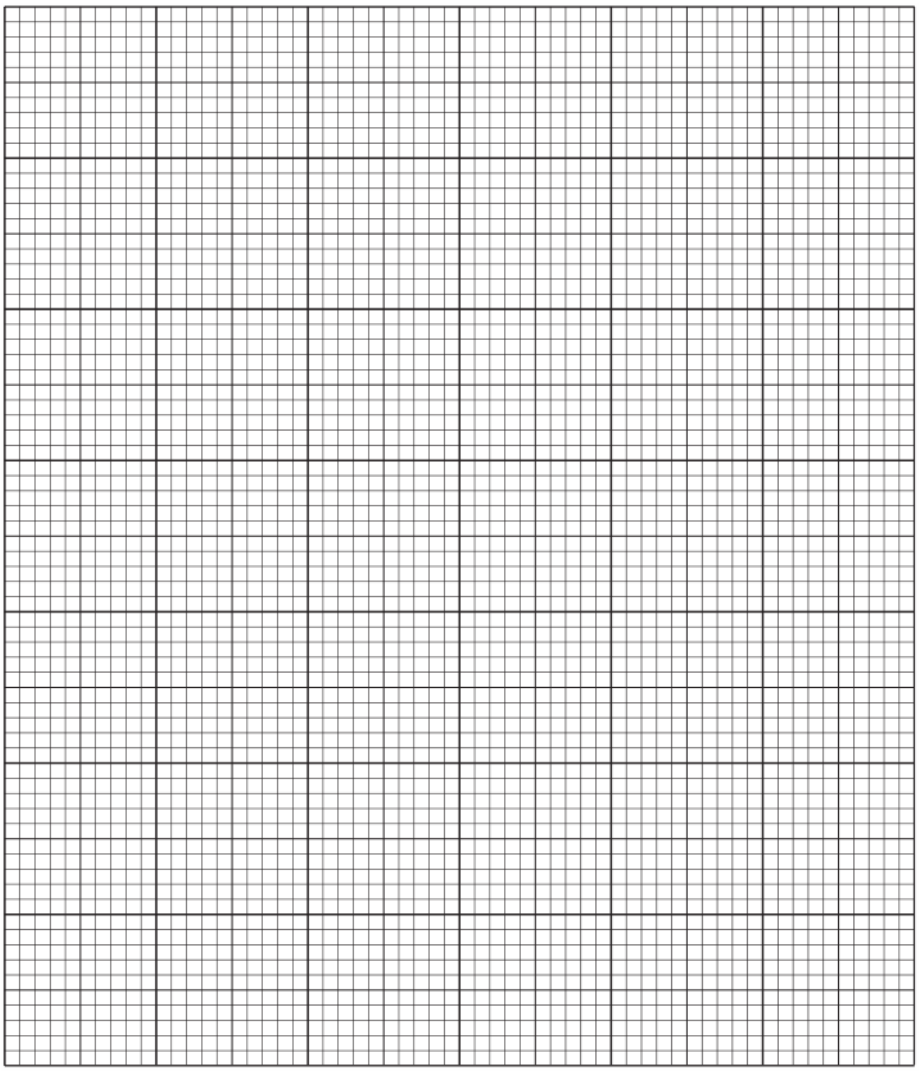
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(c) **Table 18.1** shows the scientists' temperature readings.

	Temperature of the compost (°C)	
Time (days)	normal compost	bokashi compost
0	26	26
10	70	27
20	53	29
30	42	31
40	28	28

Table 18.1

(i) Plot the scientists' results on the grid for normal and bokashi compost, and draw **two** curves of best fit.



[5]

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(ii) Explain why the temperature of the compost in the **normal** bin changed as shown in the graph.

[2]

(iii) Explain the difference in the temperature changes between the aerobic normal compost and the anaerobic bokashi compost.

[2]

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(d) **Table 18.2** shows the scientists' results for the mass of the compost.

	Normal compost	Bokashi compost
Mass at start (kg)	1500	1500
Mass after 40 days (kg)	750	1100

Table 18.2

A gas is given off in the formation of the compost. This causes most of the decrease in mass.

(i) The percentage decrease in the mass of the normal compost is 50%.

Calculate the percentage decrease in the mass of the bokashi compost.

Give your answer to **2** significant figures.

Percentage decrease = ... % **[3]**

(ii) The scientists concluded that the bokashi method of composting might be better for the environment.

Use your answer from part **(i)** to justify the scientists' conclusion.

---

[2]

35 Hypercholesterolemia (HC) is the result of a mutation in the genome. It is caused by a dominant allele on chromosome 19. The mutation involved causes a change in the DNA nucleotides.

People with HC are more likely to develop heart disease. **Fig. 21.1** shows the heart of a person who has heart disease.

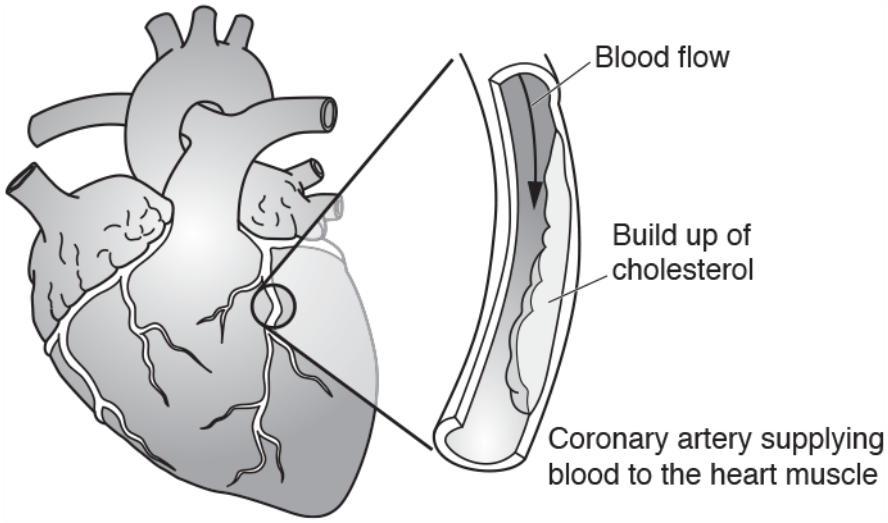


Fig. 21.1

The LDL receptor protein is found on the cell membrane of liver cells. The receptor picks up cholesterol from the blood and transports it into the liver cell. Inside the liver cell the cholesterol is broken down or used.

Explain why people who have the mutation in the allele for the LDL receptor are much more likely to develop heart disease.

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[6]

36 A chemical in stevia leaves makes them taste sweet. This chemical is **not** a sugar.
People with diabetes need to know if the food they eat contains sugar.

(i) Describe how you could test some stevia leaves to prove that they do **not** contain sugar.

Reagent used

Method

Expected result

[3]

(ii) Will using stevia in foods help people with type 2 diabetes?

Explain your answer.

[2]

END OF QUESTION PAPER

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