OCR GCSE GATEWAY BIOLOGY A · J247

BIOLOGY



EXAM QUESTION PACK

M2 HANDLING DATA

SCORE	PERCENTAGE
/44	%

STEMUP

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Gateway Biology A (9-1)

Maths 2: Handling data

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 **44**.
- The total number of marks may take into account some 'either/or' question choices.

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1 A light microscope resolution is 0.2 μm. An electron microscope resolution is 0.0001 μm.

How many times closer can two objects be seen as separate objects by using an electron microscope compared to using a light microscope?

A 2x
B 20x
C 200x
D 2000x

Your answer ☐ **[1]**

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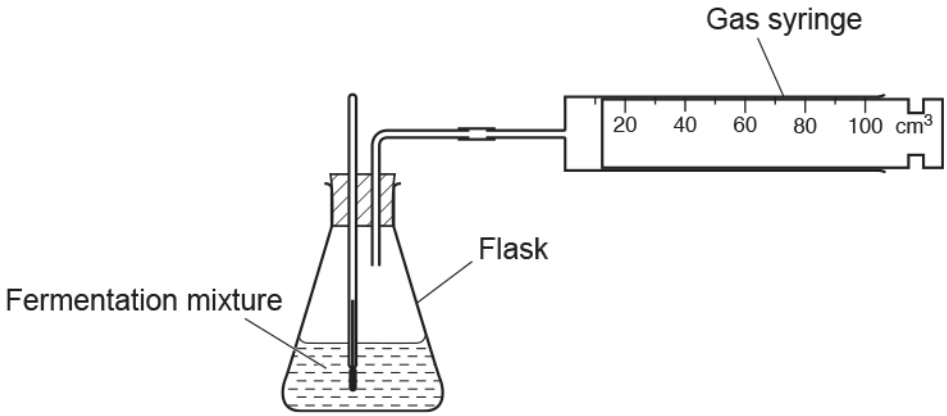
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2 Fermentation involves enzymes breaking down sugar and releasing carbon dioxide gas.

The volume of carbon dioxide released can be used to measure how fast these enzymes are working.

A student investigates if fermentation works faster at 25 °C or 30 °C.
She measures the volume of carbon dioxide released in 10 minutes.
The diagram shows the apparatus she uses.



The table shows the student's results.

Temperature (°C)	Volume of carbon dioxide gas released in 10 minutes (cm^3)				
	Trial 1	Trial 2	Trial 3	Mean	Range
25	23	25	22	23	22–25
30	34	29	33	.....	29–34

(i) Calculate the **mean** for the results at 30 °C and **complete the table**.

[2]

(ii) The student repeated the experiment at two more temperatures, 20 °C and 35 °C, to get enough readings to

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plot a line graph.

Which measurement should the student plot on the **x-axis**?

[1]

(iii) Describe **one** way that the range would improve any conclusions made from the graph.

[1]

(iv) The mean volume at a temperature of 20 °C was 15 cm^3 and for a temperature of 35 °C it was 27 cm^3.

Describe what the student's results show about the effect of temperature on enzyme activity.

[2]

3 **Fig. 22.1** shows the mass of urea in the urine plotted against the BMI (Body Mass Index) for nine boys. BMI is a value often used to see if a person is a healthy mass for their height.

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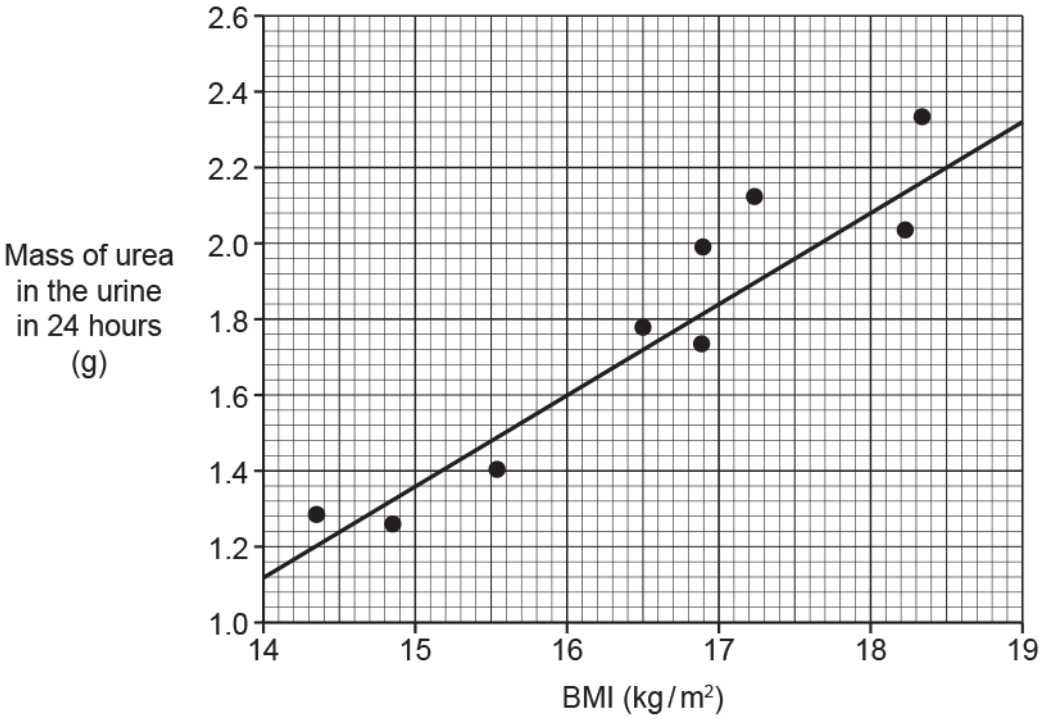


Fig. 22.1

(i) What does the graph show about the relationship between BMI and the mass of urea in the urine?

[1]

(ii) A boy has a BMI of 16. He produces 1000 cm^3 of urine in 24 hours.

Calculate the concentration of urea in the boy's urine.

Concentration = ...g / cm^3

[2]

(iii) **Fig. 22.2** shows the mass of urea in the urine against the BMI for nine **different** boys.

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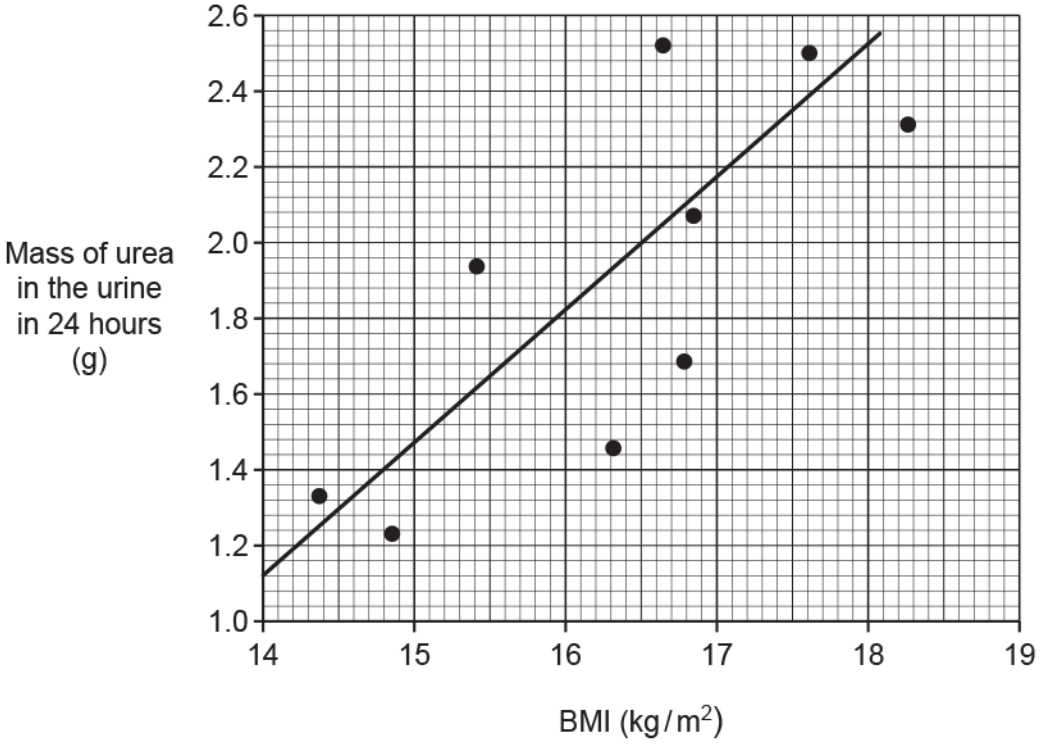


Fig. 22.2

Give **two** differences in the relationship between BMI and the mass of urea in the urine shown in **Fig. 22.1** and **Fig. 22.2**.

1 _____

_____

2 _____

_____

[2]

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

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]

(b) **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

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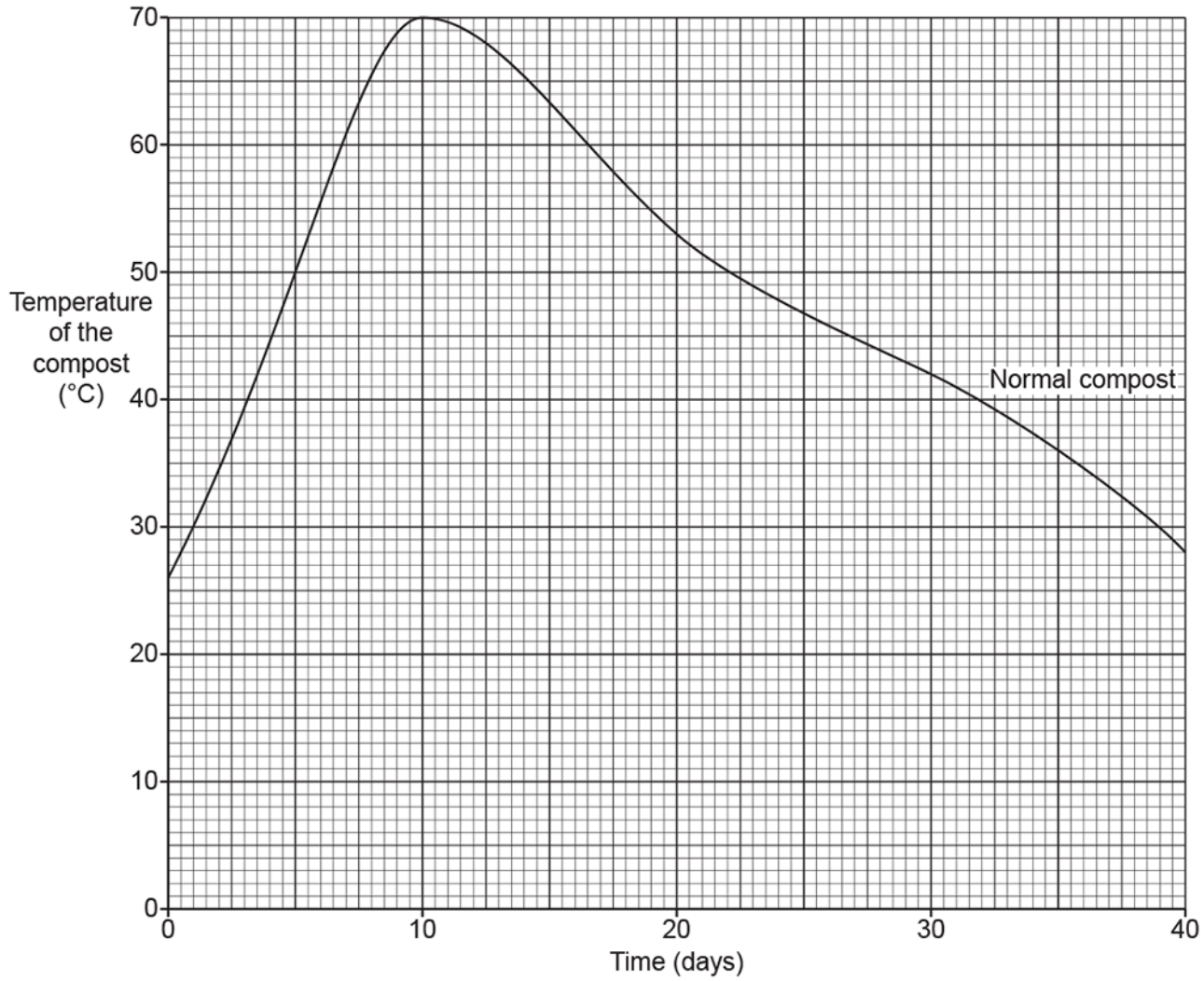
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Table 20.1

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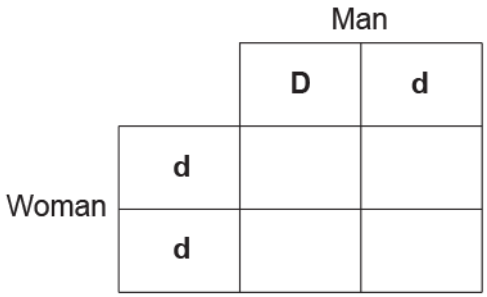
5 Hypercholesterolemia (HC) is caused by a dominant allele on chromosome 19. This allele has mutations which cause a change in the order of DNA nucleotides.

A woman who does **not** have HC and a man who is heterozygous are expecting a baby.

What is the probability of the baby having HC?

Complete the genetic diagram to explain your answer.

D is the dominant HC allele and **d** is the recessive allele.



Probability = ... [2]

6 The resolution of an electron microscope is 0.1 nanometres.

The resolution of the eye is 100 micrometres.

How many times greater is the resolution of the electron microscope than the eye?

(1 micrometre = 1000 nanometres)

A 1000
B 10 000
C 100 000
D 1 000 000

Your answer ☐ [1]

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7 Fig. 17.1 shows the mass of urea in the urine plotted against the BMI (Body Mass Index) for nine boys. BMI is a value often used to see if a person is a healthy mass for their height.

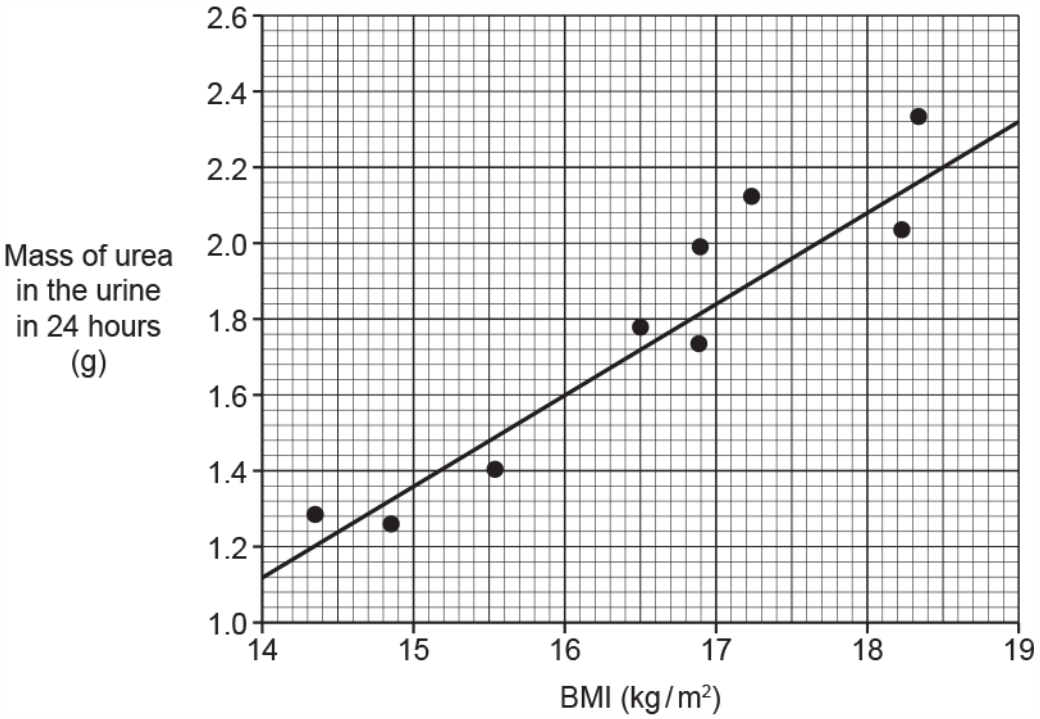


Fig. 17.1

(i) What does the graph show about the relationship between BMI and the mass of urea in the urine?

[1]

(ii) A boy has a BMI of 16. He produces 1000 cm^3 of urine in 24 hours.

Calculate the concentration of urea in the boy's urine.

Concentration = ... g / cm^3 [2]

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(iii) **Fig. 17.2** shows the mass of urea in the urine against the BMI for nine **different** boys.

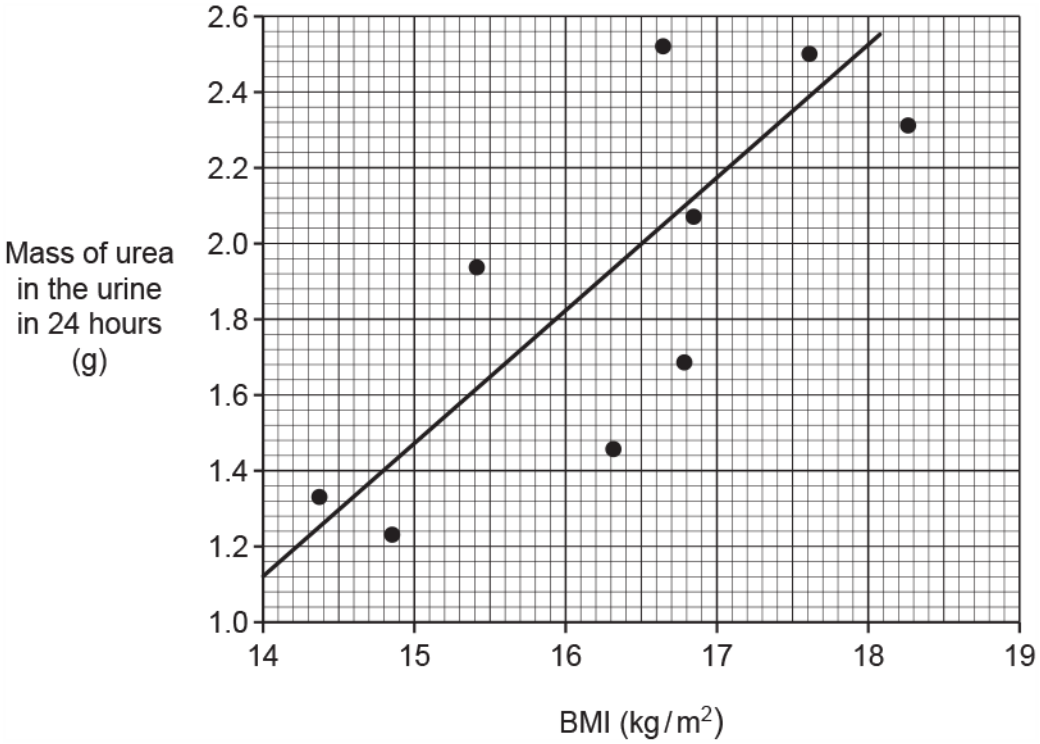


Fig. 17.2

Give **two** differences in the relationship between BMI and the mass of urea in the urine shown in **Fig. 17.1** and **Fig. 17.2.**

1 _____

_____

2 _____

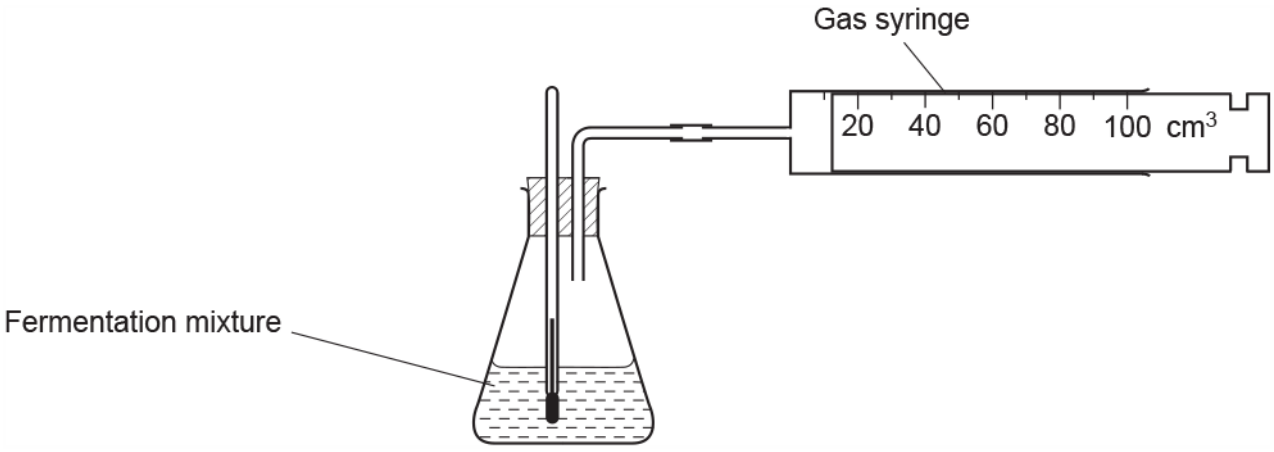
_____

[2]

8 Fermentation involves enzymes that break down sugar releasing carbon dioxide gas.

The volume of carbon dioxide released can be used to measure how fast these enzymes are working.

A student investigates if fermentation works faster at 25 °C or 30 °C.
She measures the volume of carbon dioxide released in 10 minutes.
The diagram shows the apparatus she uses.



The student's results are shown in the table.

Temperature (°C)	Volume of carbon dioxide gas (cm^3) released in 10 minutes		
	Trial 1	Trial 2	Trial 3
25	23	25	22
30	34	27	33

(i) Calculate the **mean** rate of gas produced at **25 °C** in cm^3 / minute.

Give your answer to **1** decimal place.

Mean rate of gas produced at 25 °C = ... cm^3 / minute **[3]**

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(ii) The rate of gas produced at 30 °C is greater than at 25 °C.

Use ideas about enzymes to explain why.

---

[3]

9(a) 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.

Write the words **allele, chromosome, genome** and **nucleotide** in the boxes to show their size from smallest feature to largest feature.

Smallest feature	
Largest feature	

[1]

(b) One in 500 people are heterozygous for HC.

There are 66 000 000 people in the UK.

Calculate how many people in the UK are heterozygous for HC.

Number of people = ... **[1]**

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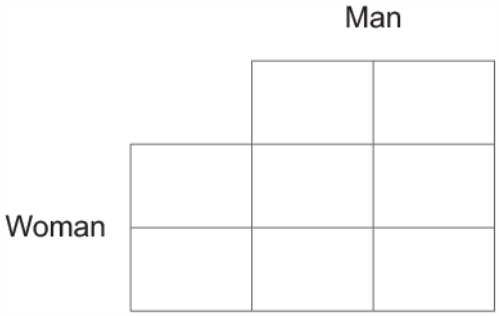
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(c) A woman who does not have HC and a man who is heterozygous are expecting a baby.

What is the probability of the baby having HC?

Complete the genetic diagram to explain your answer.

Use **D** for the dominant HC allele and **d** for the recessive allele.



Probability = ... **[2]**

END OF QUESTION PAPER