AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
BIOLOGY

Higher Tier Paper 1H

H

Tuesday 12 May 2020 Afternoon Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

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Answer all questions in the spaces provided.

0 1 This question is about photosynthesis.

0 1 . 1 Complete the word equation for photosynthesis.

[2 marks]

_____ + _____ → _____ + oxygen

0 1 . 2 Describe how energy for the photosynthesis reaction is gained by plants.

[2 marks]

Students investigated the effect of temperature on the rate of photosynthesis.

The students shone light from a lamp onto pondweed and measured the volume of oxygen produced per hour.
shows the results.

Table 1

Table 1

Temperature in °C	Rate of photosynthesis in cm3/hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	X
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

0 1 . 3 Calculate mean value X.

[2 marks]

X = _____ cm3/hour

The students identified one anomalous result in Table 1.

0 1 . 4 Draw a ring around the anomalous result in Table 1.

[1 mark]

0 1 . 5 Suggest one possible cause of the anomalous result.

[1 mark]

0 1 . 6 How did the students deal with the anomalous result?

[1 mark]

0 1 . 7 Give one factor the students should have kept constant in this investigation.

[1 mark]

Table 1 is repeated below.

Table 1

Temperature in °C	Rate of photosynthesis in cm3/hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	X
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

0 1 . 8 Why did the rate of photosynthesis decrease from 35 °C to 45 °C?

[1 mark]

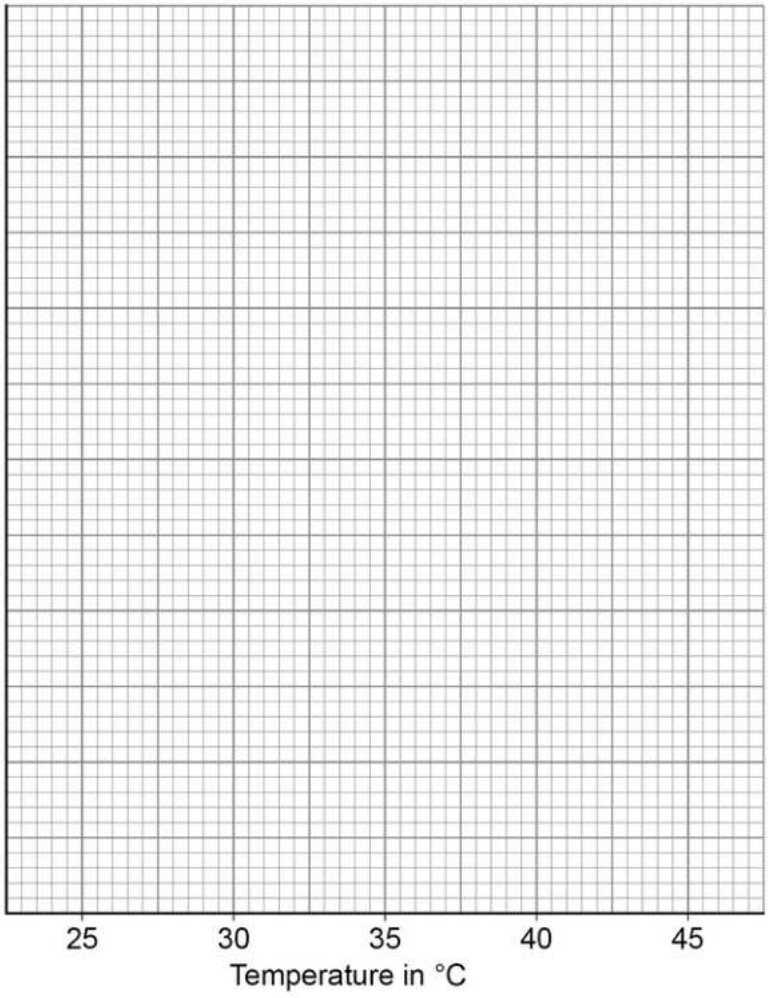
0 1 . 9 Complete Figure 1 using data from Table 1.

You should:

- label the y-axis
- use a suitable scale for the y-axis
- plot the mean data from Table 1 for temperatures from 25 °C to 45 °C
- draw a line of best fit.

[5 marks]

Figure 1



16

Turn over for the next question

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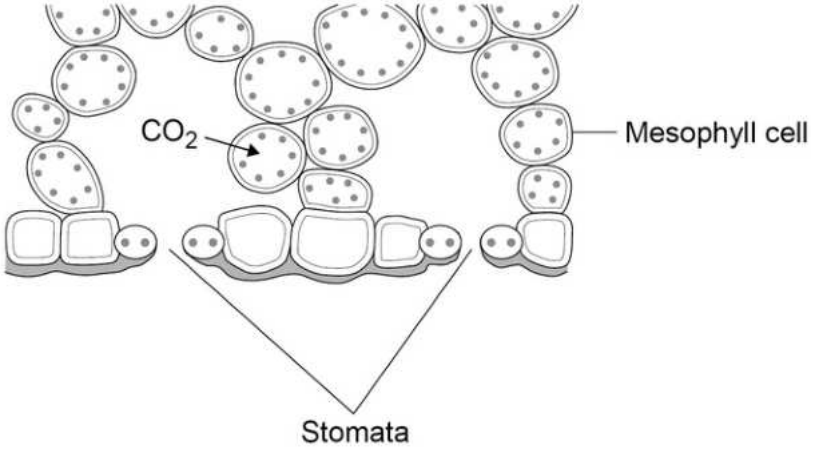
0 2 Diffusion is an important process in animals and plants.

0 2 . 1 What is meant by the term diffusion?

[2 marks]

0 2 . 2 Figure 2 shows part of a leaf.

Figure 2



Molecules of carbon dioxide diffuse from the air into the mesophyll cells.

Which two changes will increase the rate at which carbon dioxide diffuses into the mesophyll cells?

[2 marks]

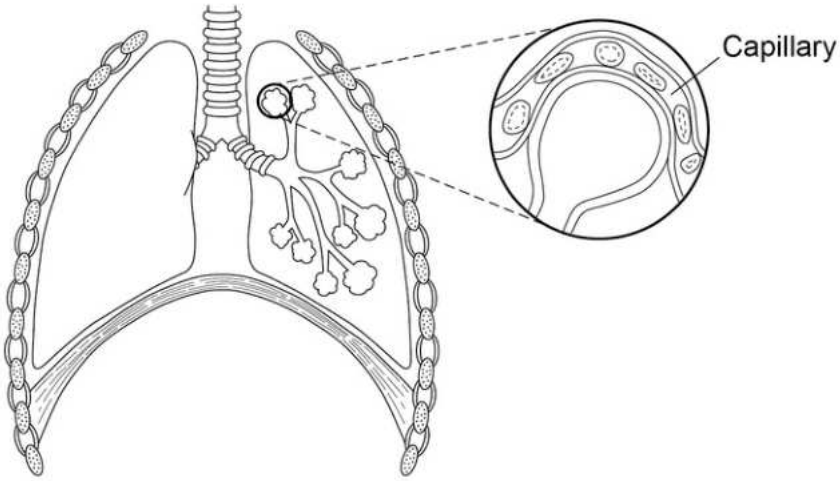
Tick (✓) two boxes.

- Decreased number of chloroplasts in the cells ☐
- Decreased surface area of cells in contact with the air ☐
- Increased carbon dioxide concentration in the air ☐
- Increased number of stomata that are open ☐
- Increased oxygen concentration in the air ☐

0 2 . 3 Diffusion also happens in the human lungs.

Figure 3 shows the human breathing system.

Figure 3

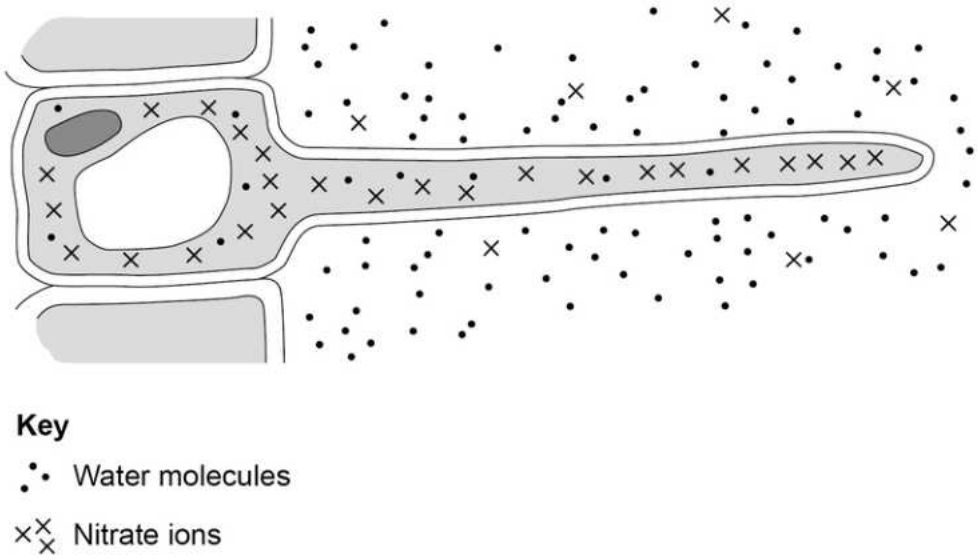


Explain how the human lungs are adapted for efficient exchange of gases by diffusion.

[6 marks]

Figure 4 shows a root hair cell.

Figure 4



0 2 . 4 Name the process by which water molecules enter the root hair cell.

[1 mark]

0 2 . 5 Nitrate ions need a different method of transport into the root hair cell.

Explain how the nitrate ions in Figure 4 are transported into the root hair cell.

Use information from Figure 4 in your answer.

[3 marks]

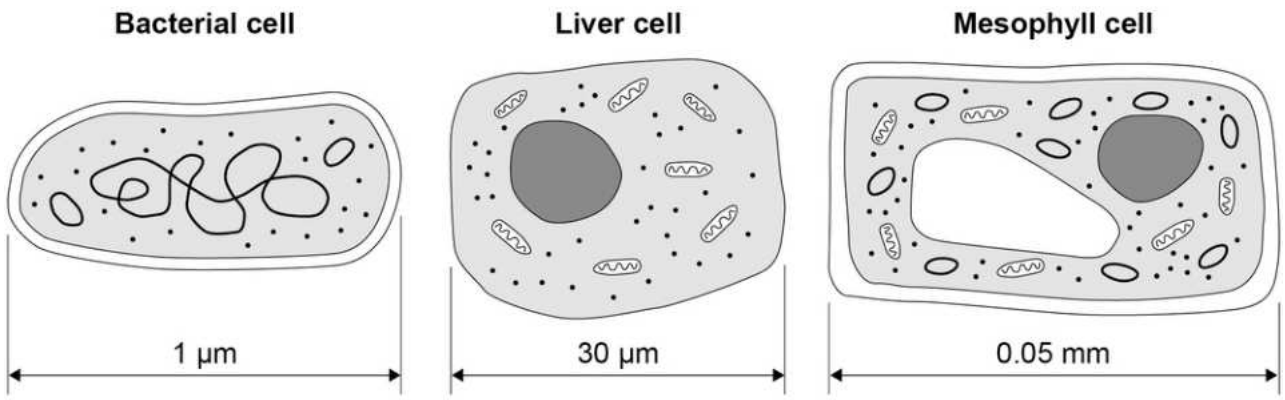
Name of process

Explanation

14

0 3 Figure 5 shows three types of cell.

Figure 5



0 3 . 1 Give two similarities between the prokaryotic cell and the eukaryotic cells in Figure.5

[2 marks]

1

2 _____

0 3 . 2 Give three differences between the prokaryotic cell and the eukaryotic cells in Figure 5.

[3 marks]

1

_____

2 _____

_____

3 _____

_____

Do not write outside the box

0 3 . 3 Calculate the ratio of the size of the bacterial cell to the size of the mesophyll cell.

[2 marks]

Ratio = 1 : _____

0 3 . 4 Name the type of cell division that produces genetically identical body cells for growth and repair.

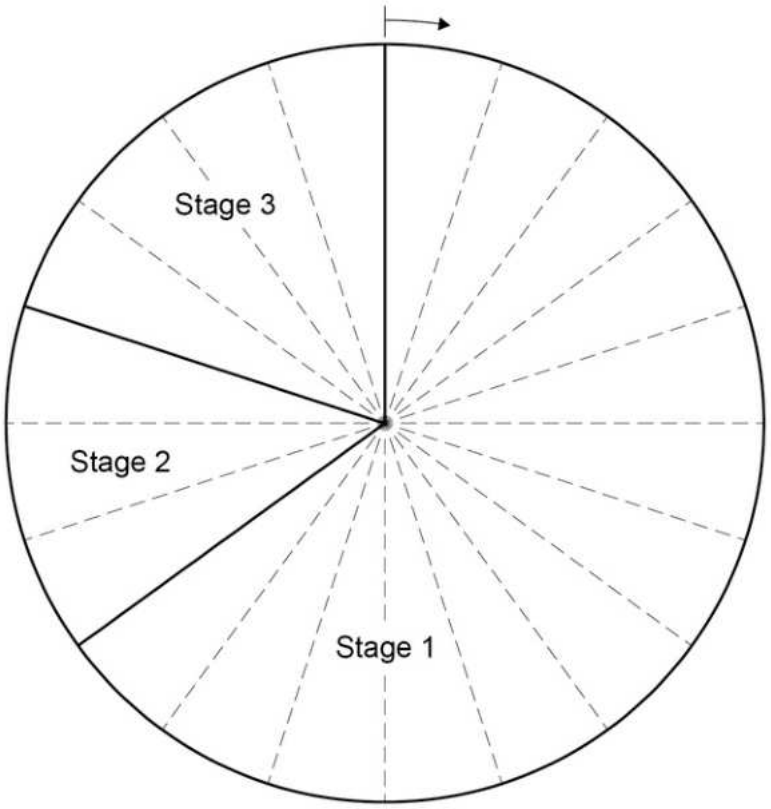
[1 mark]

_____

Question 3 continues on the next page

Figure 6 shows a cell cycle.

Figure 6



0 3 . 5 What percentage of the time for one cell cycle is represented by stage 2 and stage 3 together?

[1 mark]

Tick (✓) one box.

7% ☐ 35% ☐ 40% ☐ 65% ☐

Do not write outside the box

0 3 . 6 Describe what happens during each stage of the cell cycle.

[4 marks]

Stage 1 _____

_____

Stage 2 _____

_____

Stage 3 _____

_____

_____

13

Turn over for the next question

0 4 . 1

Lipases break down lipids.

Which two products are formed when lipids are broken down?

[2 marks]

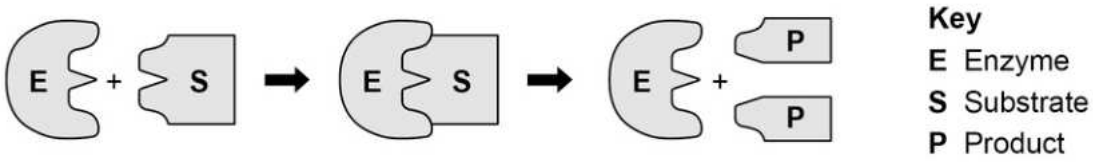
Tick (✓) two boxes.

- Amino acids ☐
- Fatty acids ☐
- Glucose ☐
- Glycerol ☐
- Glycogen ☐

One model used to explain enzyme action is the 'lock and key theory'.

Figure 7 shows a model of the theory.

Figure 7



0 4 . 2 Explain the 'lock and key theory' of enzyme action.

Use information from Figure 7 in your answer.

[3 marks]

0 4 . 3 There are many different types of lipase in the human body.

Why does each different type of lipase act on only one specific type of lipid molecule?

[1 mark]

Students investigated the presence of starch and glucose in the leaves of geranium plants.

This is the method used.

1. Place two identical geranium plants on a bench near a sunny window for two days.

2. After two days:
- leave one plant near the window for two more days.
- place one plant in a cupboard with no light for two more days.

3. Remove one leaf from each plant.

4. Crush each leaf to extract the liquid from the cells.

5. Test the liquid from each leaf for glucose and for starch.

0 4 . 4 Describe how the students would find out if the liquid from the leaf contained glucose.

[3 marks]

0 4 . 5 Describe how the students would find out if the liquid from the leaf contained starch.

[2 marks]

Table 2 shows the students' results.

Table 2

Test	Leaf from plant kept in light for four days	Leaf from plant kept in light for two days and then no light for two days
Glucose	Strong positive	Weak positive
Starch	Positive	Negative

0 4 . 6 Explain why the leaf in the light for four days contained both glucose and starch.

[2 marks]

0 4 . 7 Explain why the leaf left in a cupboard with no light for two days did contain glucose but did not contain starch.

[3 marks]

0 4 . 8 Suggest one way the students could develop the investigation to find out more about glucose and starch production in plants.

[1 mark]

17

0 5 Many plants have evolved defence mechanisms.

Figure 8 shows part of a gorse plant and part of a deadly nightshade plant.

Figure 8

Gorse plant

Deadly nightshade plant

0 5 . 1 The gorse plant has evolved to have sharp thorns.

What type of defence response are thorns?

[1 mark]

0 5 . 2 How do thorns defend the gorse plant?

[1 mark]

0 5 . 3 The deadly nightshade plant has poisonous berries.

What type of defence response are poisonous berries?

[1 mark]

0 5 . 4 A scientist noticed that in one area the gorse plants had yellow leaves and had stunted growth.

One reason for yellow leaves and stunted growth is a deficiency of nitrate ions in the soil.

Explain two other possible reasons for the yellow leaves and stunted growth.

Do not refer to nitrate ions in your answer.

[5 marks]

Reason 1 _____

_____

Explanation _____

_____

_____

_____

Reason 2 _____

_____

Explanation _____

_____

_____

_____

Question 5 continues on the next page

The gorse plant has nodules on its roots.

The nodules are part of the living root tissue.

Bacteria which convert nitrogen gas into soluble nitrate ions live in the nodule tissue.

Figure 9 shows the nodules on the roots.

Figure 9

0 5 . 5 Suggest how the nodules benefit the bacteria.

[2 marks]

0 5 . 6 Explain how the nodules benefit the gorse plant.

[2 marks]

Do not write outside the box

0 5 . 7 For many years drugs have been extracted from plants.

Which plant material was chewed as a painkiller?

[1 mark]

Tick (☒) one box.

Blackcurrant berries ☐

Foxglove leaves ☐

Rose petals ☐

Willow bark ☐

13

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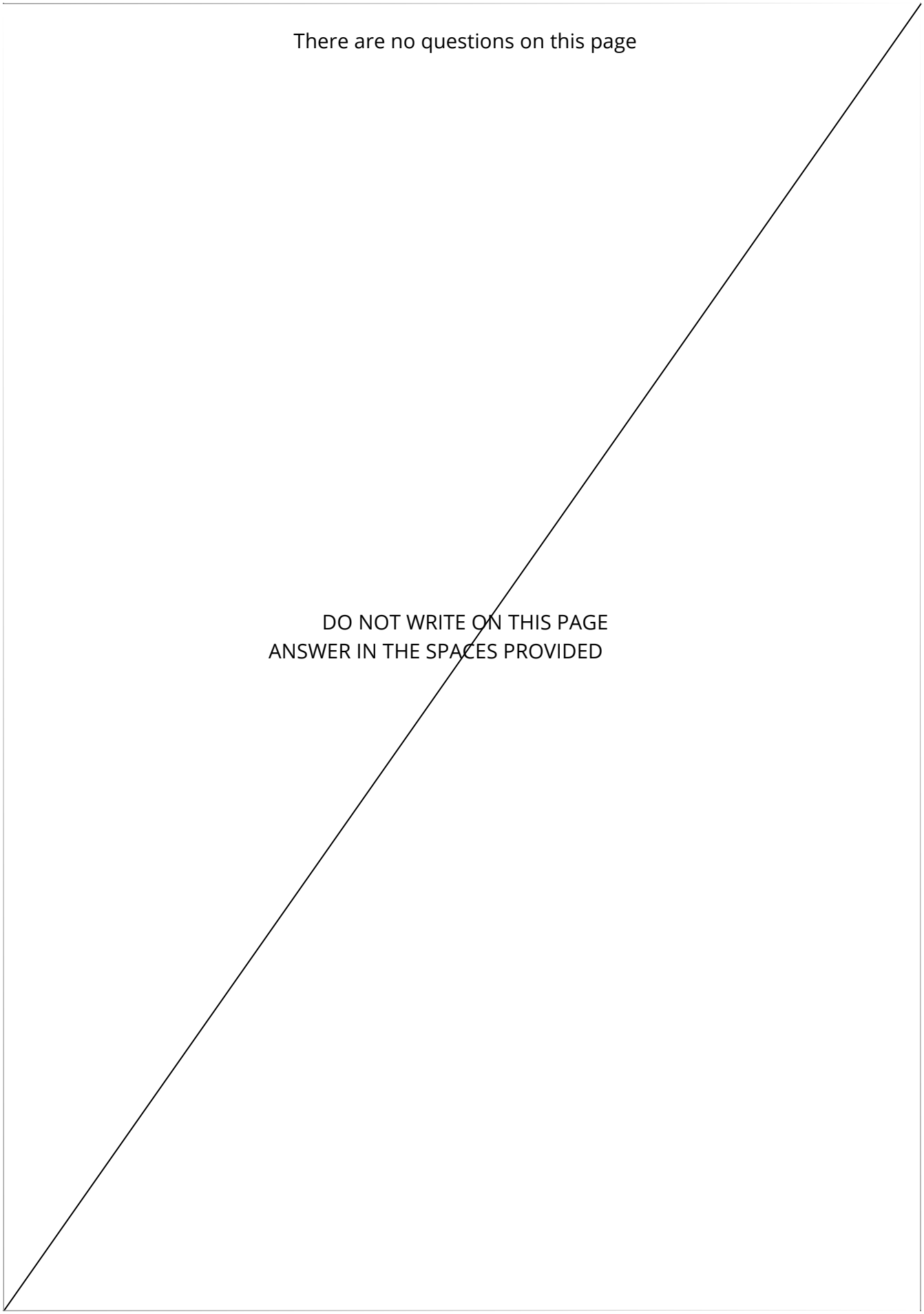


0 6 Data from 'The Million Women' survey in the UK was collected for over 15 years.

Scientists analysed the data to study the effect of consuming alcohol on liver disease.

The scientists:

- included 400 000 women who regularly consumed alcohol
- included 400 000 women who did not consume alcohol
- excluded women who already had a liver disease.

0 6 . 1 Age and gender were two factors controlled in this analysis.

Many other factors were also controlled.

Suggest two other factors which the scientists would have controlled.

[2 marks]

1 _____

_____

2 _____

_____

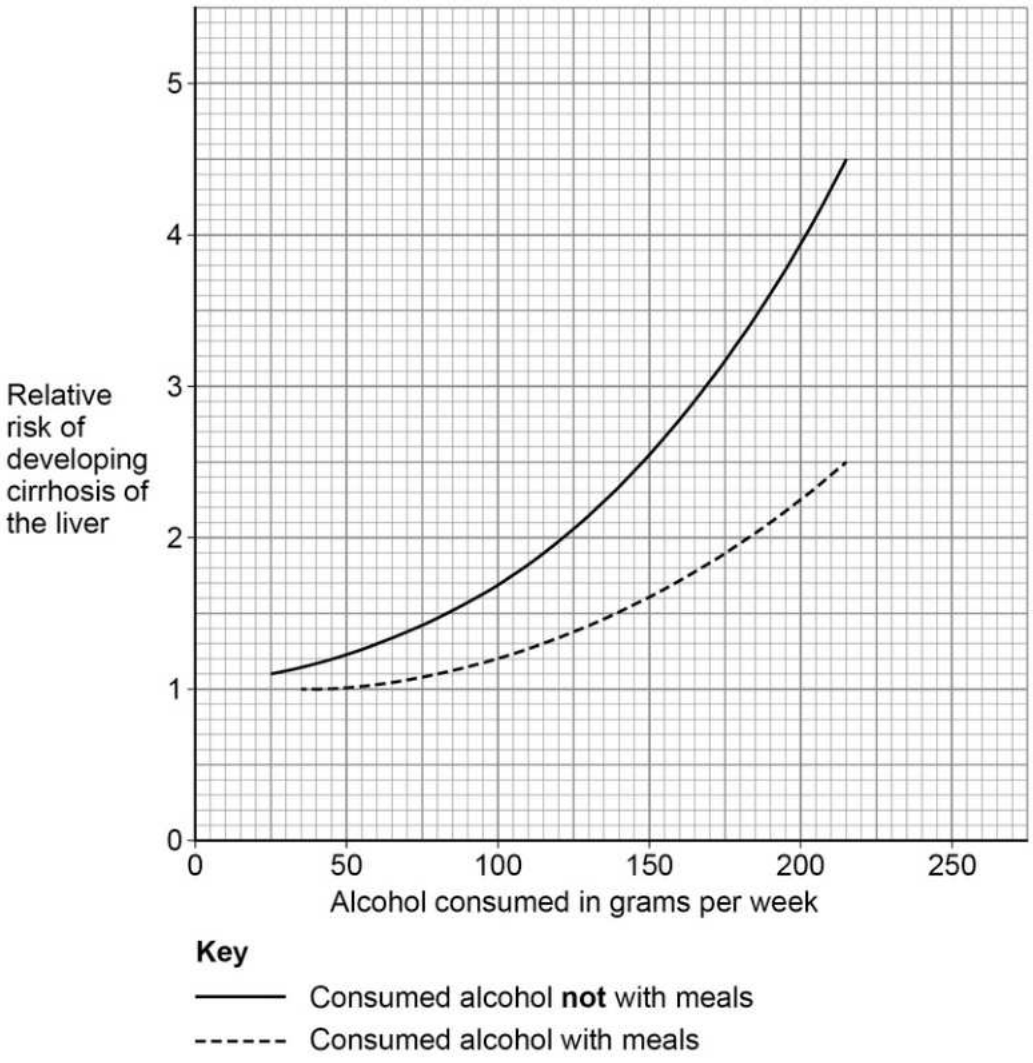
Question 6 continues on the next page

The data was analysed for:

- women who drank alcohol with meals
- women who drank alcohol not with meals
- women who did not drink alcohol.

During the survey approximately 1500 women developed a liver disease called cirrhosis of the liver.
Scientists calculated the relative risk of developing cirrhosis of the liver for each group who consumed alcohol.
A relative risk of 1.0 means there was no statistical difference between the groups who did consume alcohol and the group who did not consume alcohol.
Figure 10 shows a summary of the results.

Figure 10



0 6 . 2 A woman drinks 150 g of alcohol per week not with meals.

The woman decides to change to drinking 150 g of alcohol per week with meals.

Calculate the percentage decrease in relative risk of developing cirrhosis of the liver for this woman.

[2 marks]

Percentage decrease = _____ %

0 6 . 3 One glass of wine contains 12 g of alcohol.

A different woman drinks two glasses of wine each day with her meals.

Calculate the relative risk of developing cirrhosis of the liver for this woman.

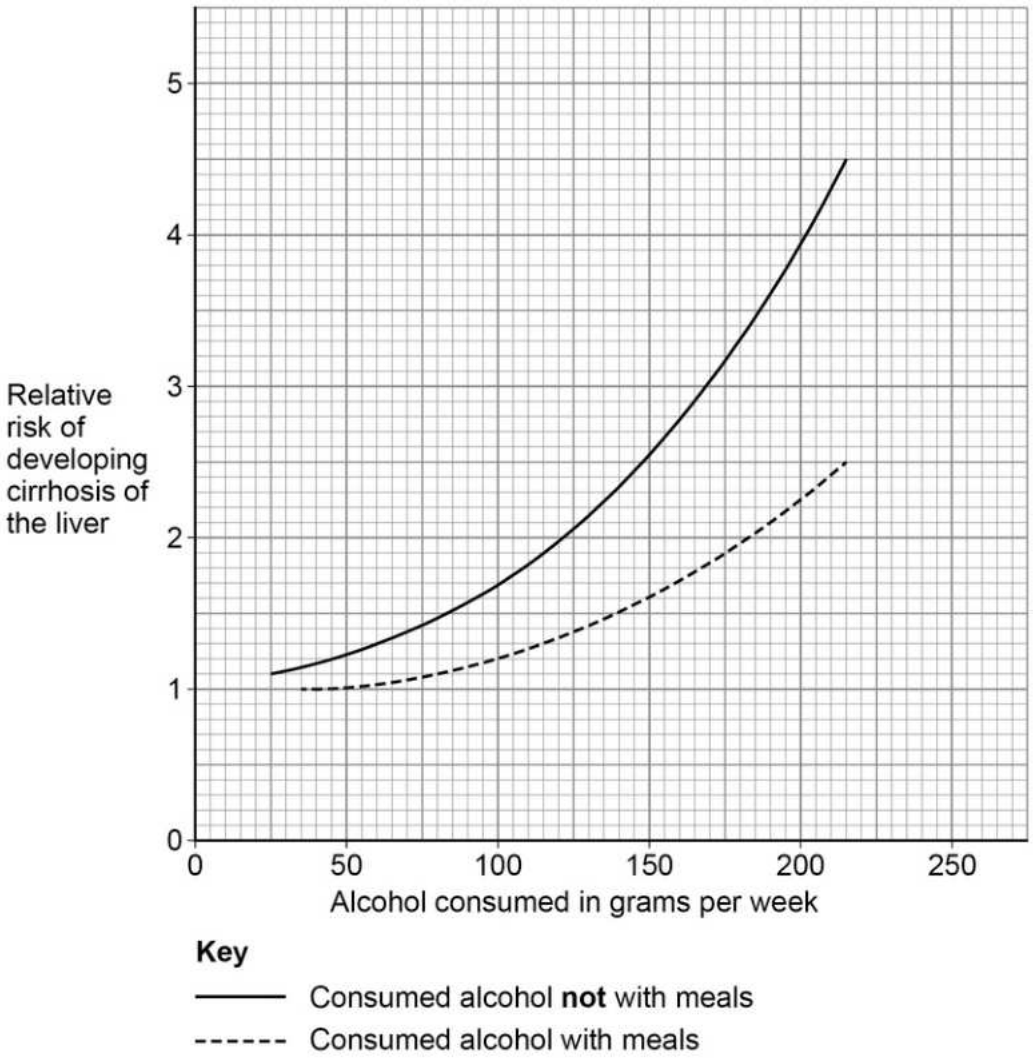
[2 marks]

Relative risk = _____

Question 6 continues on the next page

Figure 10 is repeated below.

Figure 10



0 6 . 4 Consuming alcohol with meals instead of not with meals decreases the relative risk of developing cirrhosis of the liver.

Give two other conclusions about the relative risk of developing cirrhosis of the liver related to alcohol consumption.

Use data from Figure 10 in your answer.

[2 marks]

1

2

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0 6 . 5 Suggest two reasons why the data is considered to be valid.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 6 Suggest one aspect of the survey which might reduce validity.

[1 mark]

_____

_____

0 6 . 7 Cirrhosis of the liver leads to liver failure.

Describe the effects of liver failure on the human body.

[4 marks]

_____

_____

_____

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_____

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_____

_____

_____

_____

15

Turn over for the next question

0 7 Monoclonal antibodies (mAbs) are usually made using mouse lymphocytes.

Candida albicans infection produces serious symptoms in patients with a poor immune system.
Recently scientists have produced mAbs to *Candida albicans* using human lymphocytes produced naturally after an infection.

0 7 . 1 *Candida albicans* lives in the throat of infected patients.

A sample is taken from the throat of a patient with a suspected *Candida albicans* infection.
The sample is transferred onto a microscope slide.

Describe how the mAbs and a fluorescent dye could be used to see any *Candida albicans* pathogens on the slide.

[3 marks]

In a laboratory the human lymphocyte mAbs were injected into animals infected with *Candida albicans*.

The mAbs caused increased phagocytosis of the *Candida albicans* pathogens.

Doctors intend to start a trial to give the mAbs to patients severely ill with *Candida albicans.*

0 7 . 2 Explain how increased phagocytosis of the *Candida albicans* pathogen will help the patient.

[2 marks]

Question 7 continues on the next page

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0 7 . 3 It has been shown that this mAbs treatment is effective in the laboratory using both:

- infected tissue culture cells
- infected live animals.

The mAbs treatment for *Candida albicans* is now ready for clinical trials on people.

Describe how the clinical trials should be carried out.

[6 marks]

Do not write outside the box

0 7 . 4 Scientists have also used human lymphocytes to make mAbs to other pathogens and to some types of cancer cells.

Suggest one reason why these new mAbs have been more successful in treating diseases in humans than mAbs made using mice.

[1 mark]

12

END OF QUESTIONS

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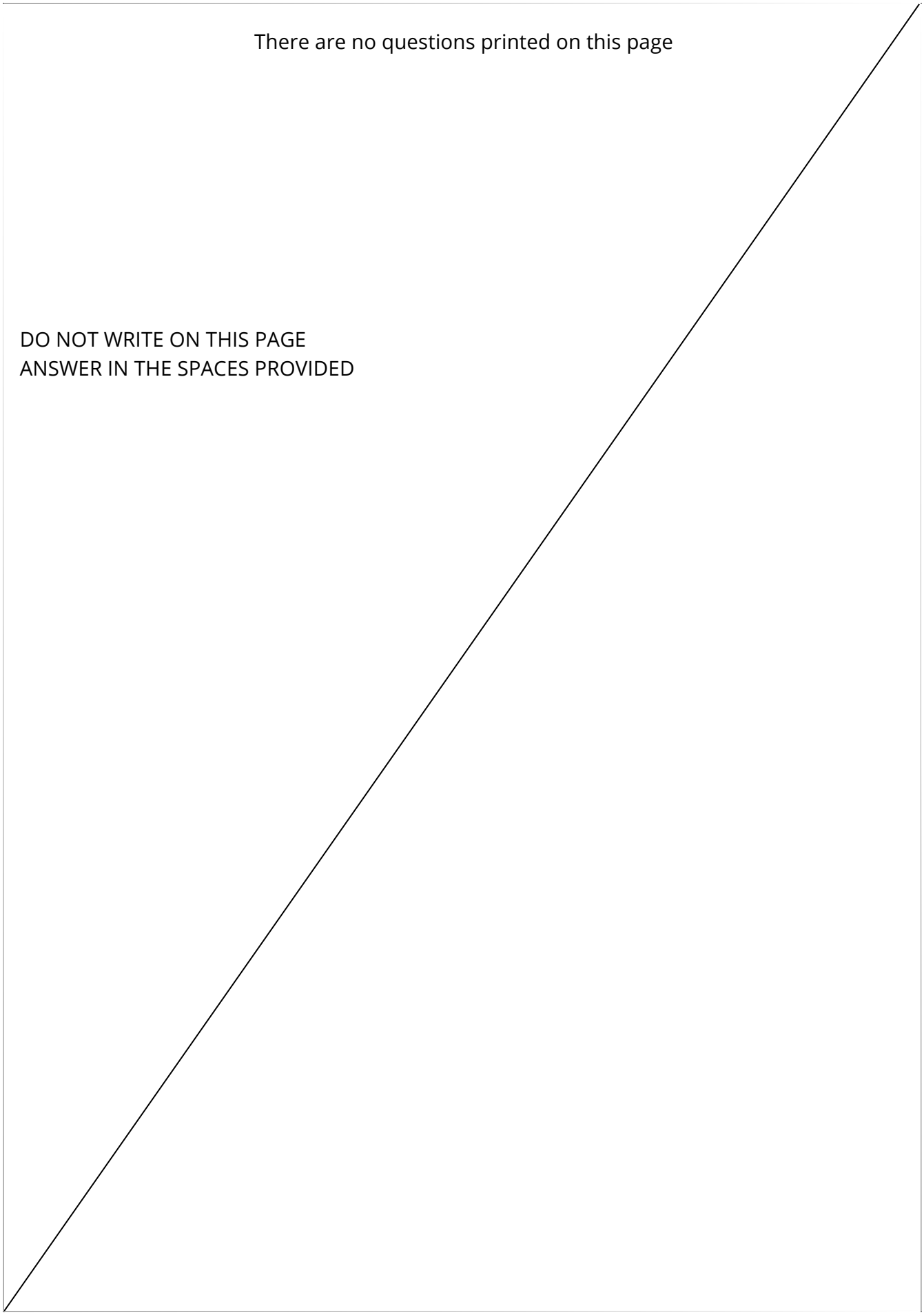

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