



Centre Number

71	
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Candidate Number

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General Certificate of Secondary Education
2013–2014

Science: Single Award

Unit 1 (Biology)

Higher Tier

[GSS12]

MV18

TUESDAY 13 MAY 2014, MORNING

TIME

1 hour 15 minutes, plus your additional time allowance.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all eleven** questions.

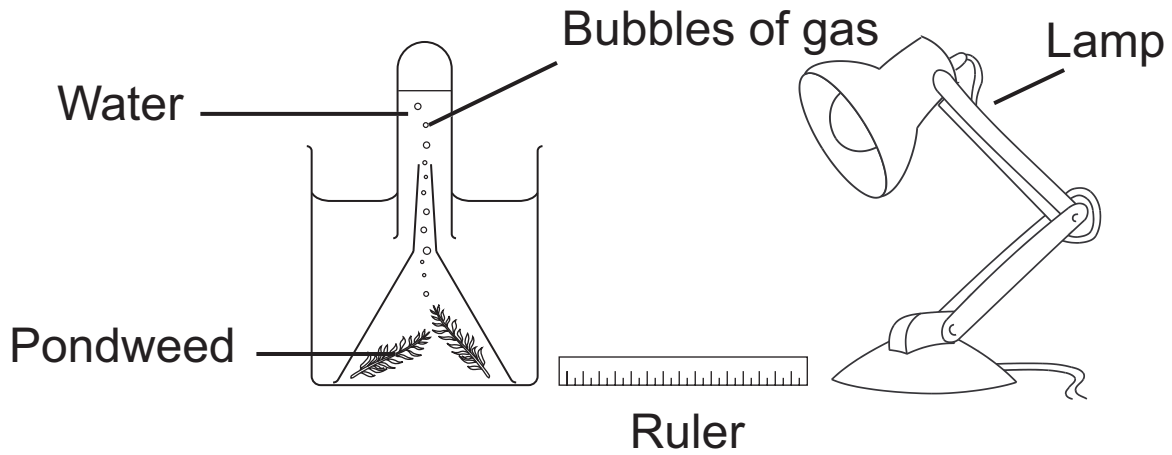
INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Questions **4** and **10**.

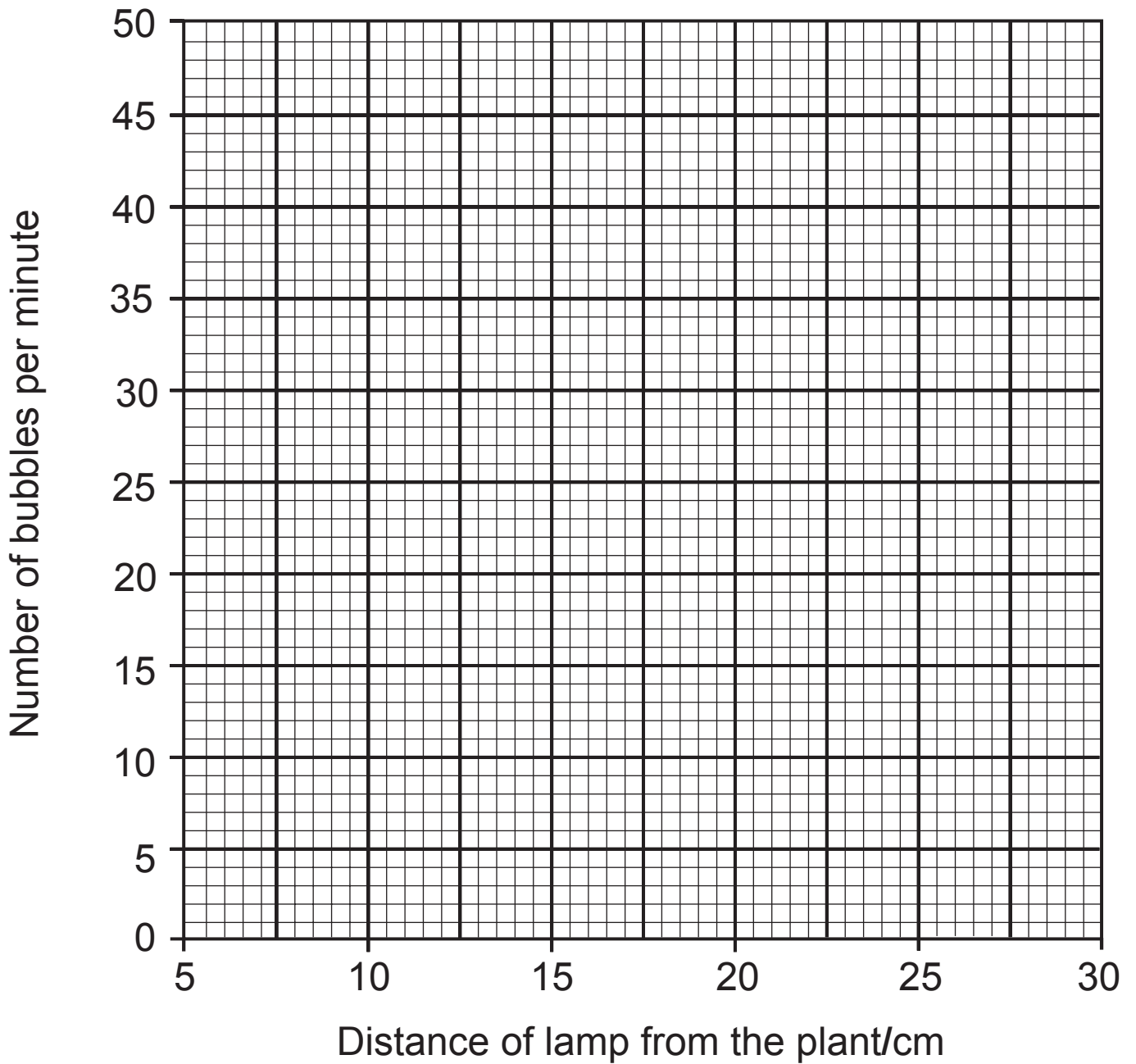
- 1 The following experiment was set up to investigate the effect of light intensity on photosynthesis. The lamp was set at different distances from the plant and the number of bubbles of gas per minute was counted.



The results of the experiment are shown below.

Distance of lamp from the plant/cm	Number of bubbles per minute
5	50
10	45
15	36
20	20
25	8
30	8

(a) Use these results to plot a line graph on the grid below. [3 marks]



(b) (i) Name the gas produced during this experiment.
[1 mark]

(ii) Describe and explain the results of this investigation.
[3 marks]

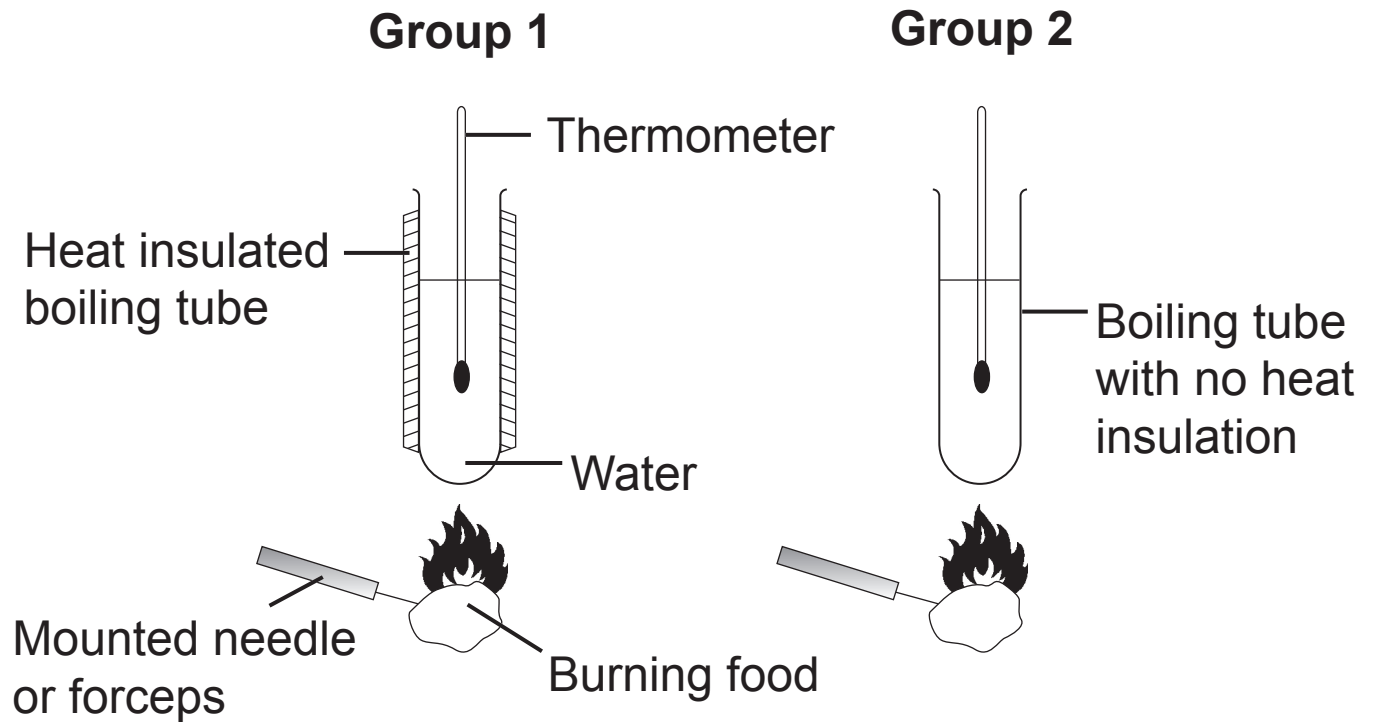
(c) In order to get the most light a plant will often grow in the direction of the sunlight.

What is this response to light called? [1 mark]

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(Questions continue overleaf)

2 The energy content of food was investigated by two groups each using a different method as shown below. The methods were identical except Group 1 used a heat insulation material.



The results are shown below but two values are missing.

(a) Complete the **two** missing values in the tables. [2 marks]

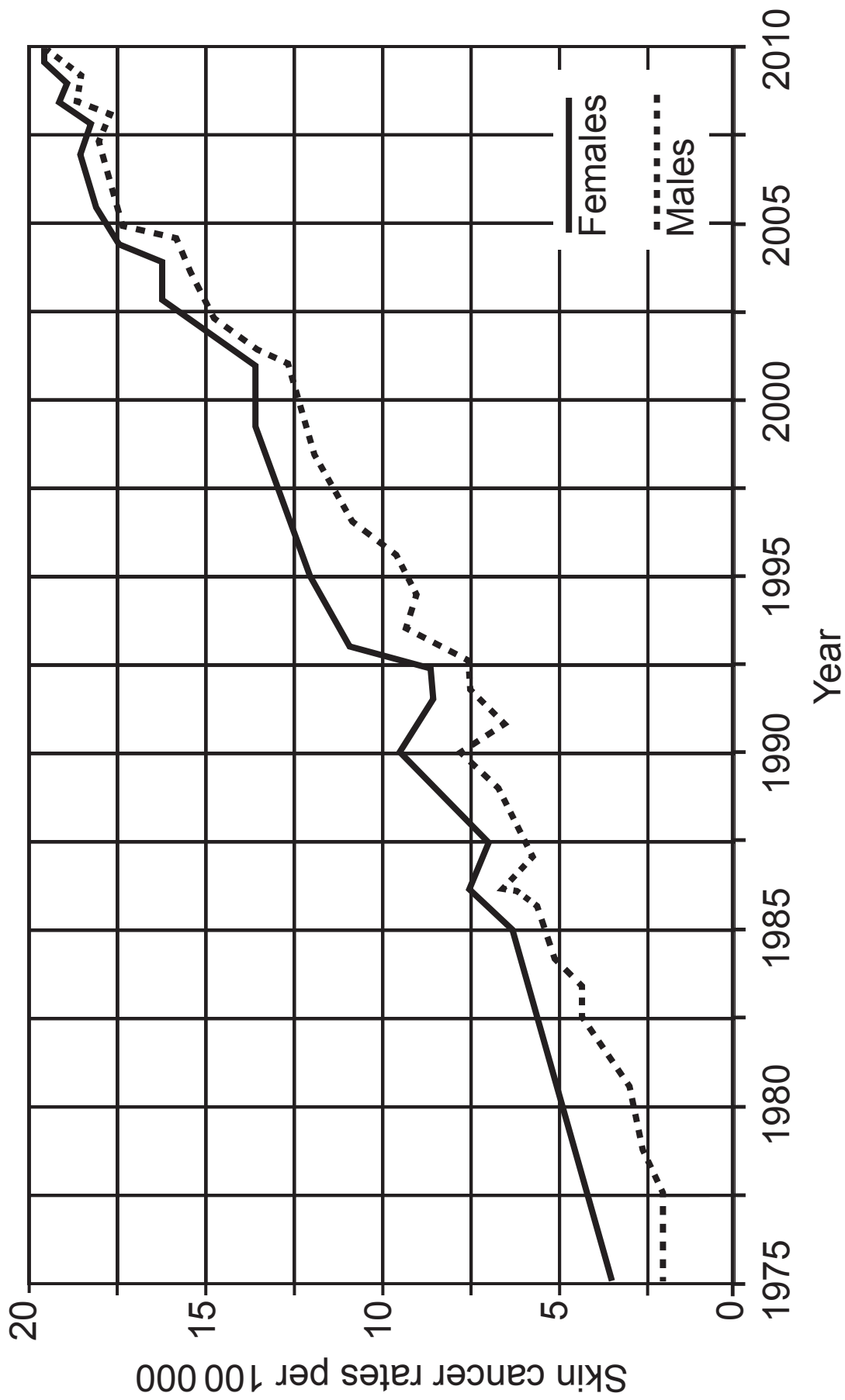
Group 1

Food	Temperature at the start/°C	Temperature at the end/°C	Temperature rise/°C
bacon	18	64	46
crisps	18	52	34
biscuit	18	42	

Group 2

Food	Temperature at the start/°C	Temperature at the end/°C	Temperature rise/°C
bacon	18	54	36
crisps	18		26
biscuit	18	36	18

(b) Using the information provided, explain fully why the temperature rises obtained by Group 2 were lower than that obtained by Group 1. [2 marks]



3 (a) The graph on page 8 shows the skin cancer rates (number per 100 000) in the UK between 1975 and 2010.

(i) State **two** conclusions that can be made from the information provided. [2 marks]

1. _____

2. _____

A new law in England and Wales bans people under 18 from using sunbeds.



(ii) Describe and explain the effect this new law may have on the rates of skin cancer over the next ten years. [2 marks]

(b) The table below shows how the age of a mother affects the risk of having a Down syndrome child.

Age of mother/years	Risk of having a child with Down syndrome
25	1 in 1350
30	1 in 940
35	1 in 350
40	1 in 85
45	1 in 35
50	1 in 10

A test can be carried out to see if a child has Down syndrome before it is born. However, there is a 1% (1 in 100) risk of a miscarriage (loss of baby) with this test.

(i) Using the information provided, explain fully why this test is normally only offered to mothers over the age of 35 and not offered to mothers aged under 35 years. [2 marks]

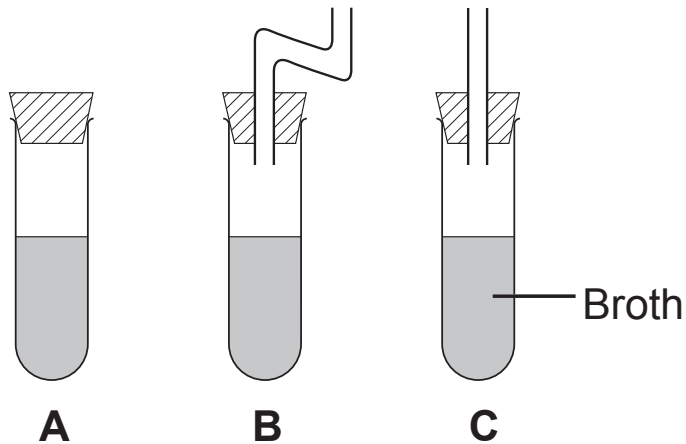
(ii) Apart from the risk involved, suggest **one** other factor that may influence a mother's decision whether to take the test or not. [1 mark]

(c) Skin cancer and Down syndrome are both caused by a change to genetic material in body cells. Give the general name that describes a change to genetic material. [1 mark]

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(Questions continue overleaf)

- 5 (a) The following experiment was set up to investigate the role of microorganisms in contamination. The apparatus, including the broth, was sterilised and left for a period of time.



- (i) Which tube(s) (**A**, **B** or **C**) will contain contaminated broth after a period of time? [1 mark]

- (ii) State **two** things that must be done to ensure that the results are valid (fair test). [2 marks]

1. _____

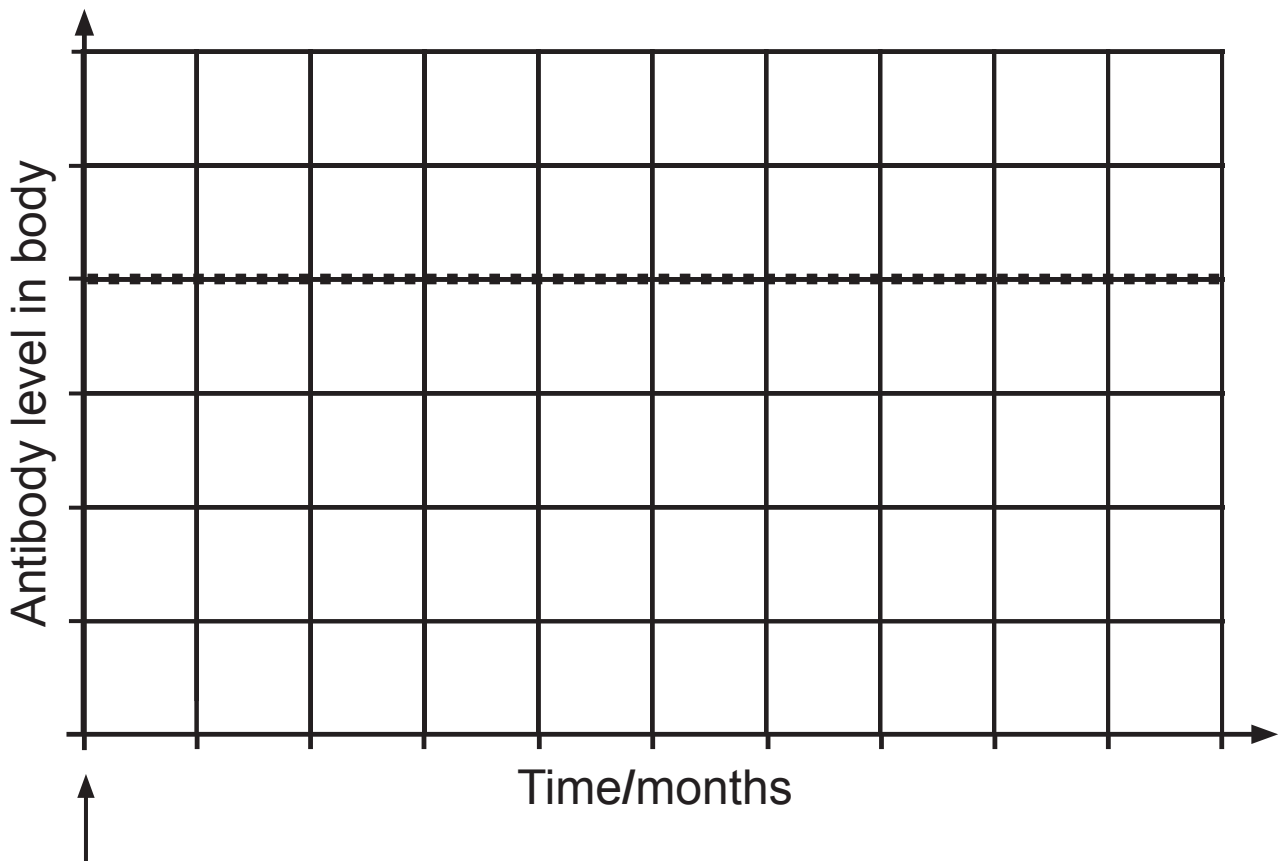
2. _____

- (iii) Name the scientist who used similar apparatus to investigate contamination by microorganisms. [1 mark]

(b) Microorganisms can also cause disease in humans. We can avoid some types of disease by having a vaccination.

(i) What do vaccinations contain? [1 mark]

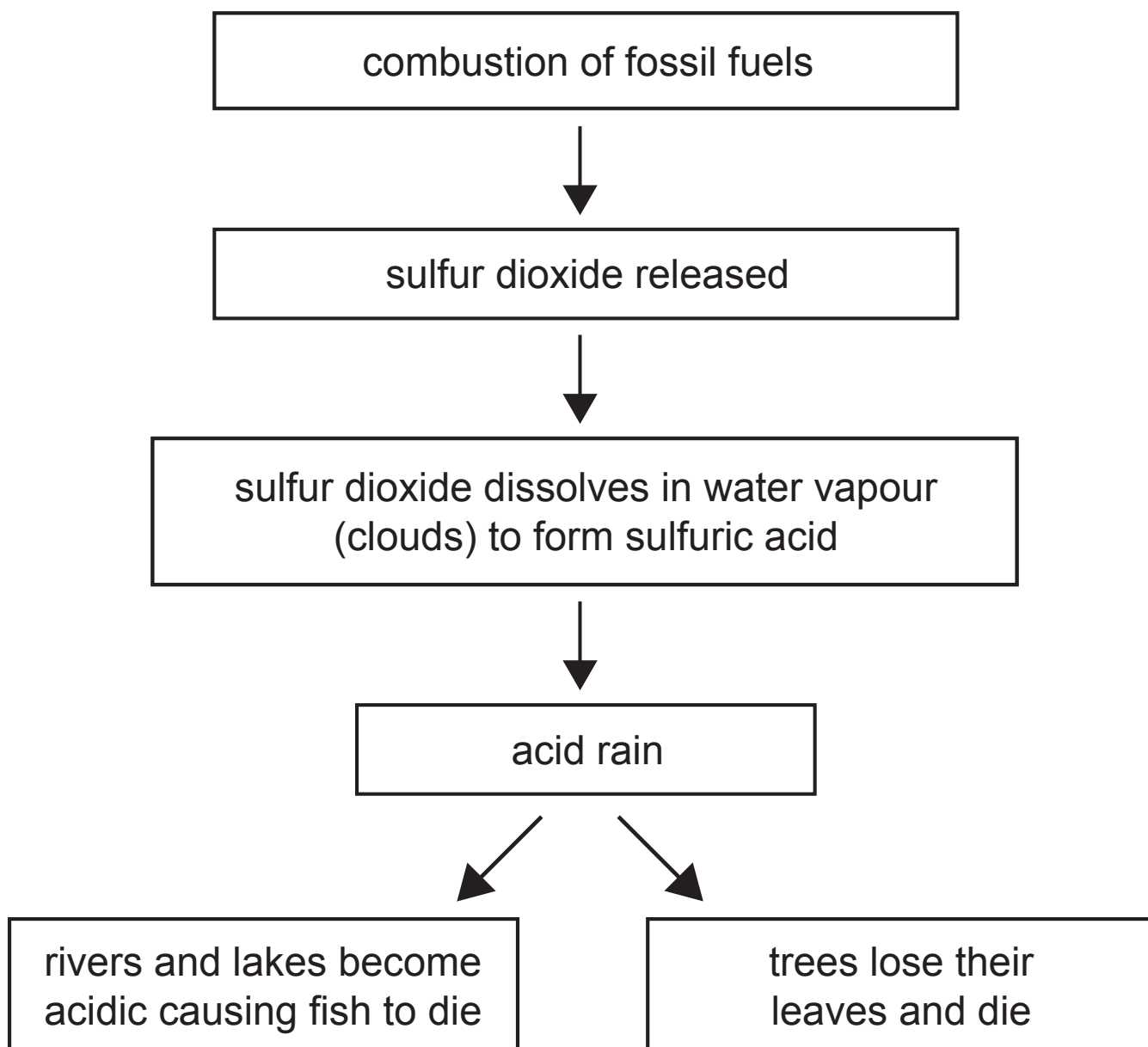
(ii) On the grid below, complete the diagram by drawing a line to show how antibody levels change after a vaccination. [2 marks]



Vaccination

Key
.....
immunity achieved

- 6 (a) The flow chart below shows how acid rain is produced and some of its effects.



Using the information provided and your knowledge, answer the following questions.

- (i) Suggest why the effects of acid rain can occur a long distance away from the source of sulfur dioxide pollution. [1 mark]

(ii) Describe one way in which the **effects** of acid rain can be monitored over a period of time. [2 marks]

(iii) Acid rain is causing less pollution now than it did twenty years ago. Suggest **one** reason why. [1 mark]

(b) Milford Nature Reserve in Co. Armagh runs along an old railway cutting. There are many different habitats over a small area including woodland, shrubs, marsh and grassland.

Each type of habitat supports a range of species of flowering plants, providing food for insects including rare butterflies. The insects support a large number of bird species.

Using the information provided, explain why this nature reserve has a high biodiversity. [2 marks]

7 Explain the difference between the following genetic terms.

(a) Gene and allele [2 marks]

(b) Dominant and recessive [2 marks]

(c) Homozygous and heterozygous [2 marks]

8 Regular exercise benefits the circulatory system.

(a) Describe how exercise benefits the heart and heart muscle. [3 marks]

(b) Give **one** reason why treating circulatory diseases is very expensive.

Explain your answer. [2 marks]

- 9 (a) The table below shows the percentage of DNA bases that are adenine and cytosine in an organism.

bases/%			
adenine	guanine	cytosine	thymine
20		30	

- (i) Complete the table to show the percentage of bases that are guanine and thymine. [1 mark]
- (ii) Explain what is meant by the unique nature of an individual's DNA. [1 mark]

- (iii) Describe fully how DNA codes for protein. [3 marks]

- (b) DNA sequencing is a technique that works out the sequence of DNA bases in an organism, i.e. the order of bases along each chromosome in a cell.

The Human Genome Project was a massive multinational project, started in 1990 and completed by 2003; a project that took over a decade and billions of pounds to work out the sequence of bases in humans.

Sequencing techniques have improved so much that the complete base sequence in a human can be worked out in a few hours.

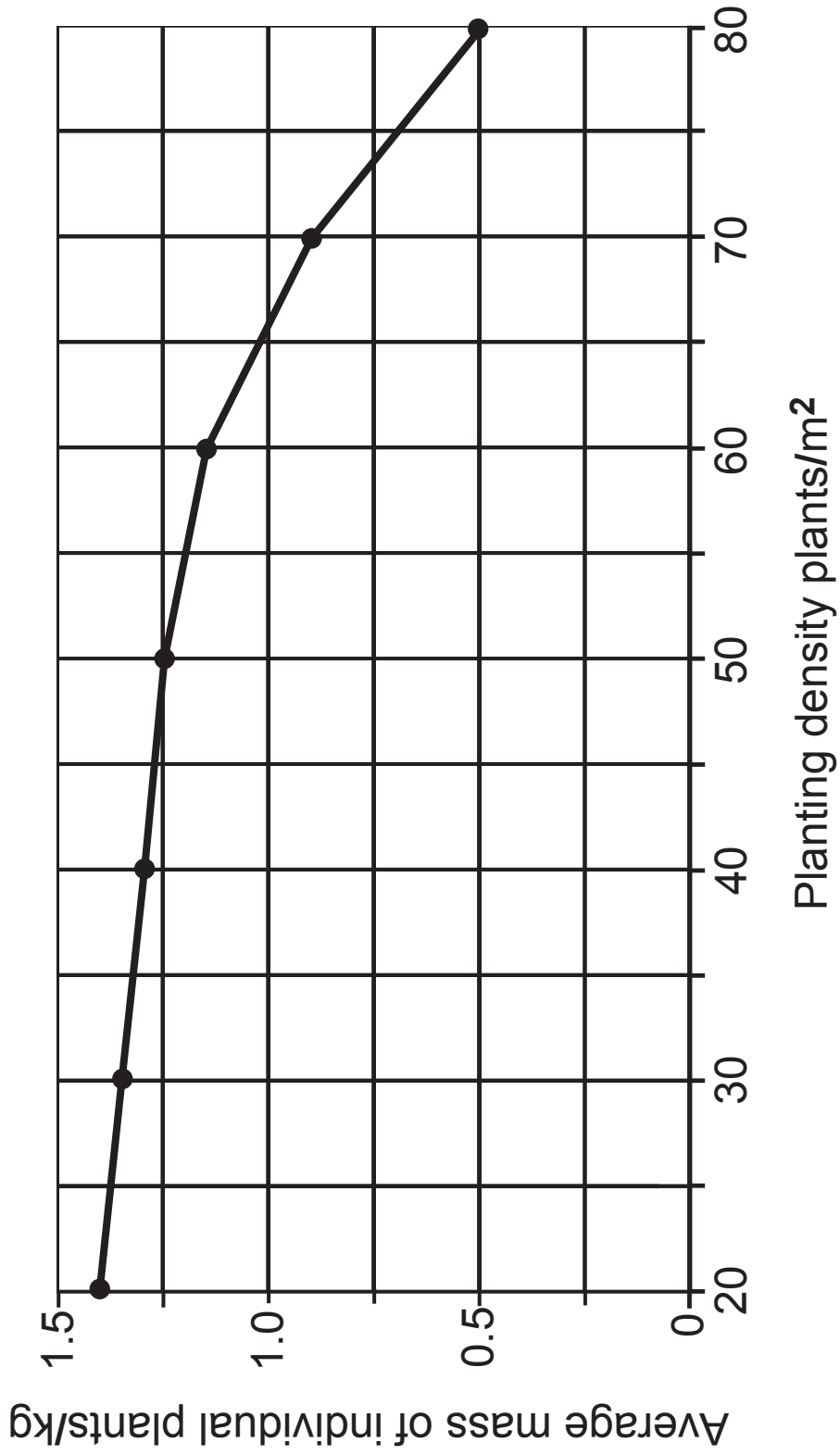
- (i) Give **one** piece of evidence that suggests that the Human Genome Project involved scientific collaboration. [1 mark]
-

- (ii) Results from base sequencing provide information on how closely related different species are to each other. Suggest how the results for closely related species are different to those obtained for more distantly related species. [1 mark]
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Graph A



11 (a) The photograph below shows part of a maize crop. The maize plants are regularly spaced to maximise growth.

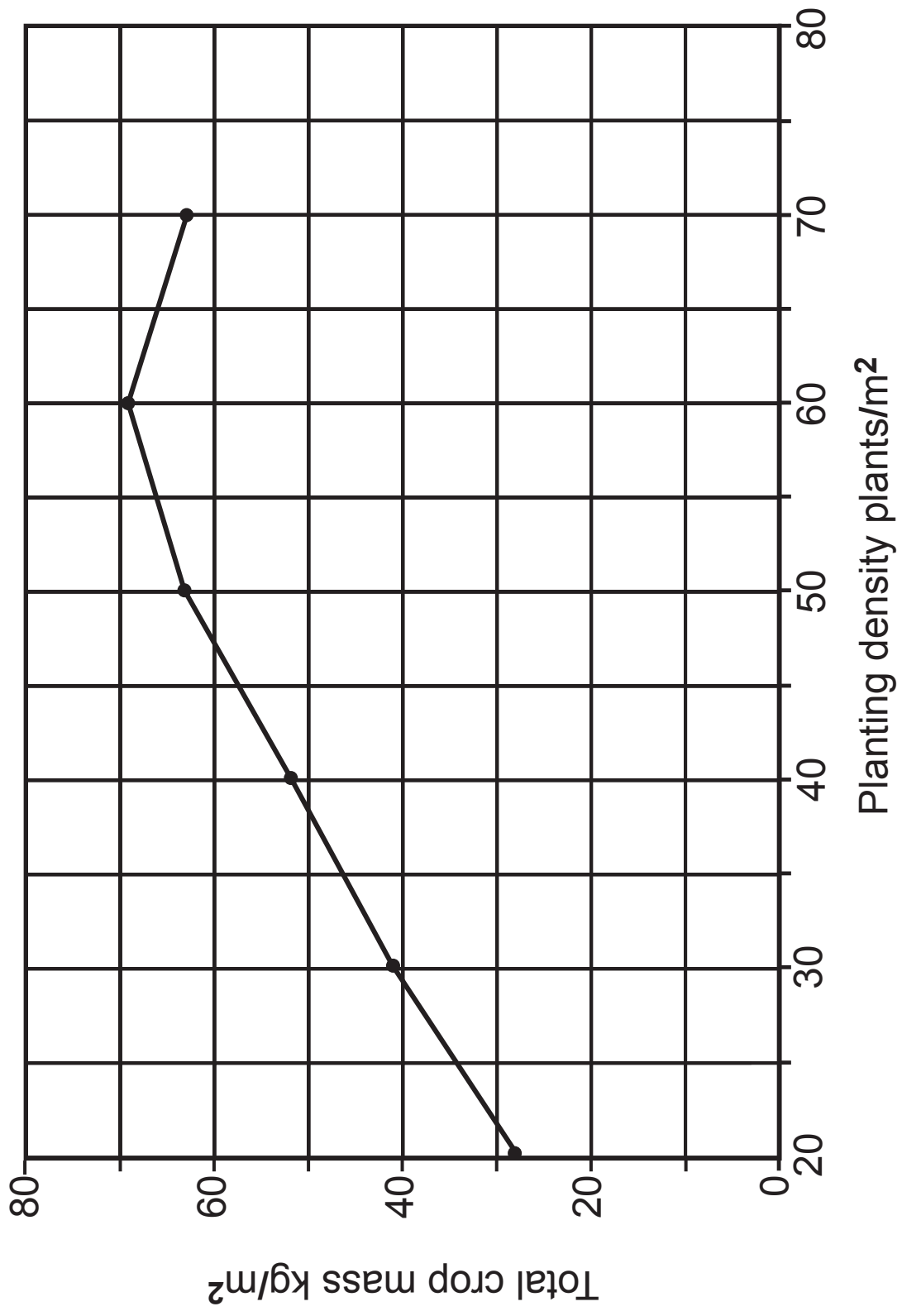


Graph A on page 24 shows the effect of planting density (number of plants per square metre) on the average mass of individual plants.

(i) In terms of competition between plants, describe and explain the results for **Graph A**. [3 marks]

Graph B

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Graph B on page 26 shows the total crop (maize) mass per square metre.

(ii) Calculate the value for the total crop mass at a planting density of 80 plants/m².

You will need to refer to **Graph A**. [2 marks]

(Show your working out.)

_____ kg/m²

(iii) Describe and explain the results for **Graph B**.

[3 marks]

(b) Some varieties of maize are genetically modified (GM). One variety of GM maize produces a chemical that is toxic (poisonous) to leaf-eating insects.

(i) Explain the advantages of using this variety of GM maize. [3 marks]

(ii) Give **one** reason why so many people are opposed to GM crops. [1 mark]

THIS IS THE END OF THE QUESTION PAPER

SOURCES

Page 8, Question 3a(i), Graph showing skin cancer rates in the UK between 1975 and 2010 Adapted from:

Page 9, Question 3a(ii), © Cancer Research UK <http://www.cancerresearchuk.org/cancer-info/cancerstats/types/skin/incidence/uk-skin-cancer-incidence-statistics-2013>

Photograph of a sun bed, © Boris Kaulin/iStock/Thinkstock

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Question Number	Marks
1	
2	
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11	
Total Marks	

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