Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Science: Single Award

Unit 1 (Biology)
Higher Tier

MV18

[GSS12]

WEDNESDAY 22 FEBRUARY 2017, 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 ten** 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 **(a)** Type 1 diabetes occurs when an organ in the body stops producing insulin.

(i) Name the organ that produces insulin. [1 mark]

_____

(ii) Describe and explain the effect insulin has on blood glucose levels. [2 marks]

_____

_____

_____

(b) Niamh has Type 1 diabetes. She takes the same amount of carbohydrate for breakfast each morning and injects herself with the same amount of insulin at the same time. Normally, she walks a kilometre to school.

One morning, Niamh slept in and she had to run to school.
Two hours later Niamh started to feel faint and unwell.

(i) Using the information provided, suggest why she felt faint and unwell. [2 marks]

_____

_____

_____

_____

(ii) When Niamh started to feel faint, what would she have needed to eat to make her feel well again? [1 mark]

_____

(c) Give **two** differences between Type 2 diabetes and Type 1 diabetes. [2 marks]

1. _____

2. _____

(d) Insulin is a hormone. Regulation of many body processes involves hormone or nervous control.

Give **two** differences between hormone and nervous control. [2 marks]

1. _____

_____

2. _____

_____

2 **(a)** Polydactyly is an inherited condition where affected individuals have extra fingers or toes.

(i) Explain the term 'inherited condition'. [1 mark]

_____

_____

(ii) Unusually, the allele that causes polydactyly is **dominant** to the normal allele.

Complete the genetic diagram below to show the offspring produced by two parents who are **heterozygous** for polydactyly. [2 marks]

Use the symbols: D = polydactyly allele;
d = normal allele

		d
	DD	
d		

(iii) In the Punnett square, circle any offspring that have polydactyly. [1 mark]

(iv) From the genetic diagram, what is the probability of these parents having a child with polydactyly? [1 mark]

_____

(b) Polydactyly in humans is an example of discontinuous variation.
Define the term 'discontinuous variation'. [1 mark]

_____

_____

3 **(a)** A group of students investigated the effect of planting density on seedling growth. Their results are shown in the table below.

Number of seedlings in pot	Average mass of seedlings/g	Total mass of all seedlings/g
5	2.2	11
10	2.2	22
15	2.2	33
20	1.9	38
25	1.8	45
30		42

(i) Calculate the **average mass** of the seedlings when there are 30 seedlings in the pot. [2 marks]

(Show your working out.)

_____ g

(ii) Suggest why the **average mass** of the seedlings did not change when there were 15 or fewer seedlings in the pot. [1 mark]

(b) Using information from the table, describe fully the relationship between the number of seedlings and the **total mass** of all the seedlings. Suggest reasons for this relationship. [3 marks]

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4 Microorganisms can cause harm if they get into the body.

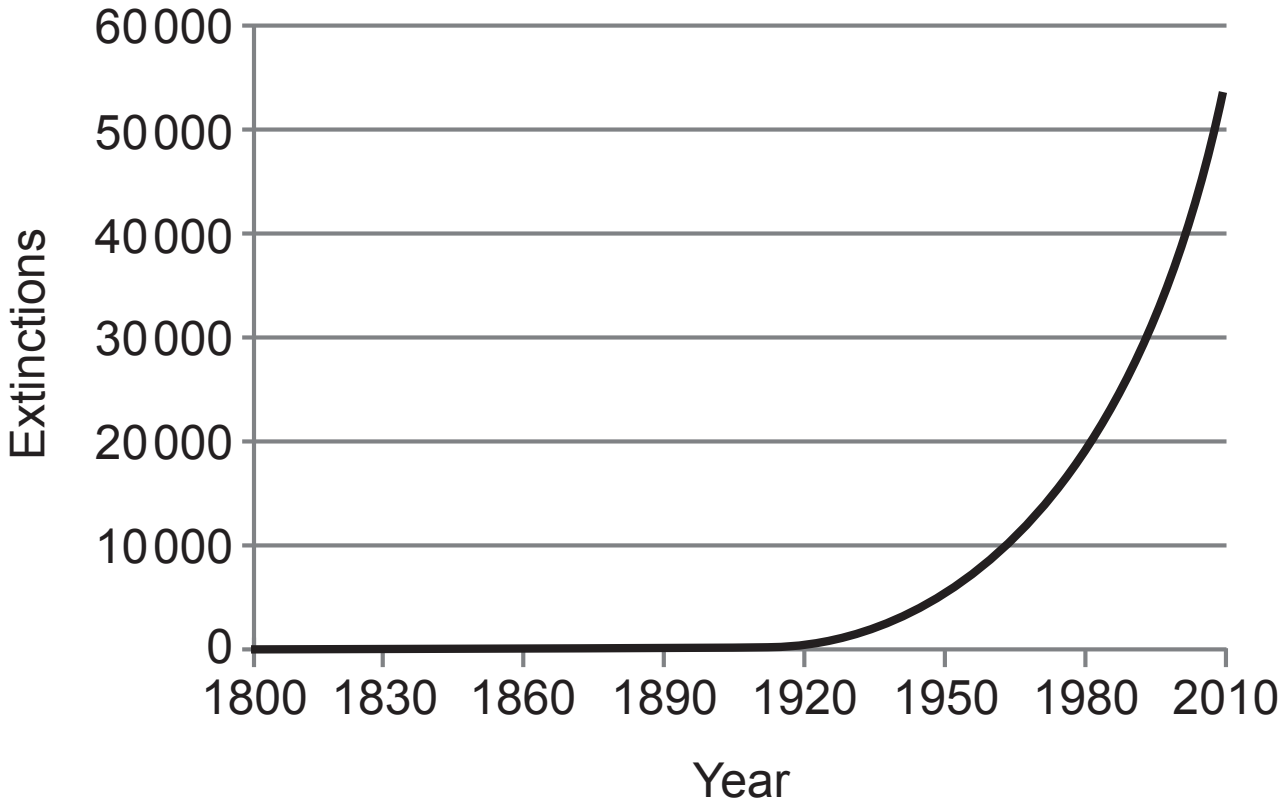
Describe how the body can defend itself against harmful microorganisms **after** they have gained entry to the blood. [6 marks]

Your answer should include:

- the role of antibodies,
- the process of phagocytosis.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

5 **(a)** The graph below shows the number of species extinctions since the year 1800.



(i) Describe fully the trend shown by the graph.
[2 marks]

(ii) Humans have been responsible for the extinction of many species.
State **two** ways in which the actions of humans can cause the extinction of species. [2 marks]

1. _____

_____

2. _____

_____

(b) Species (plants and animals) are also at risk of becoming extinct if they don't evolve by natural selection.

(i) Explain fully the process of natural selection. [2 marks]

_____

_____

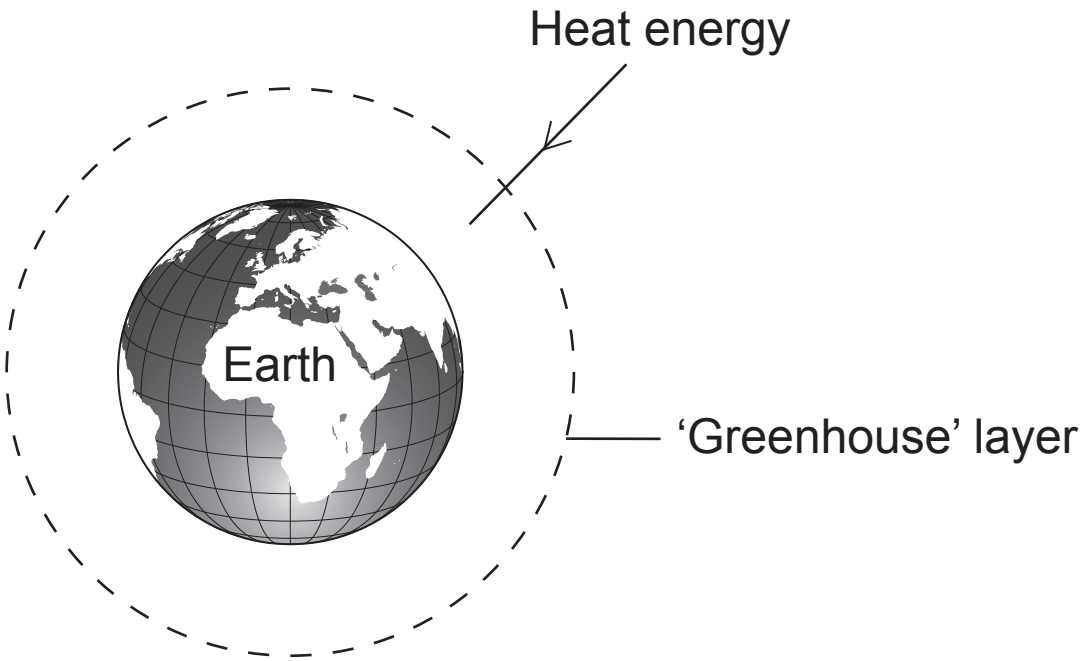
_____

_____

(ii) Name the scientist who proposed the theory of evolution by natural selection. [1 mark]

_____

6 **(a)** The diagram below shows heat energy from the Sun entering the Earth's atmosphere.



(i) Complete the diagram to show how this heat could contribute to global warming. [1 mark]

(ii) Explain fully how global warming may lead to rising sea level. [2 marks]

_____

_____

_____

(iii) Rising sea level is an example of an abiotic factor. What is meant by the term abiotic? [1 mark]

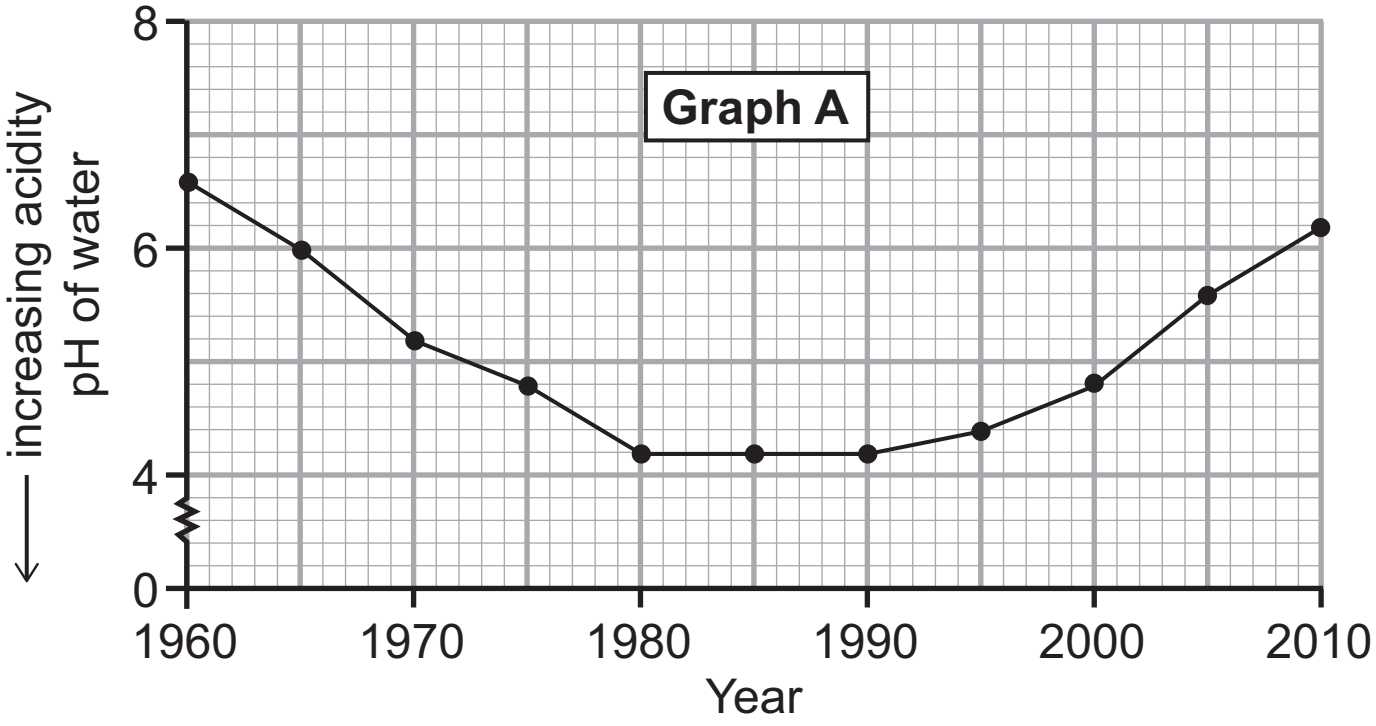
_____

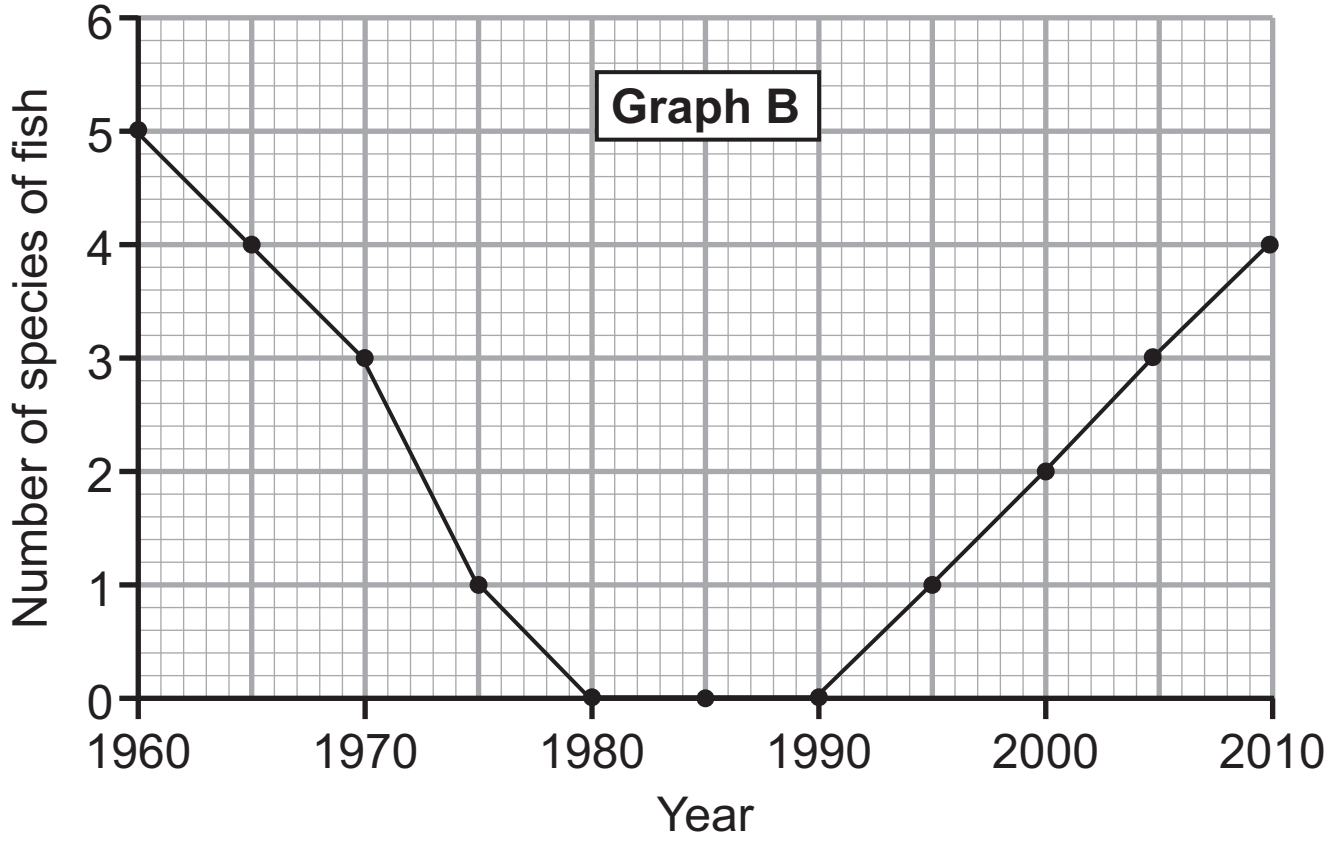
(b) The atmosphere is also polluted by acid rain.

(i) Describe how acid rain is formed. [2 marks]

Many fish are unable to survive when water becomes acidic because of acid rain.

The graphs below show the change in acidity (**A**) and the number of fish species (**B**) in a European lake over a fifty year period.





(ii) What evidence from graphs **A** and **B** suggests that the number of fish species is affected by the acidity of the water? [1 mark]

_____

_____

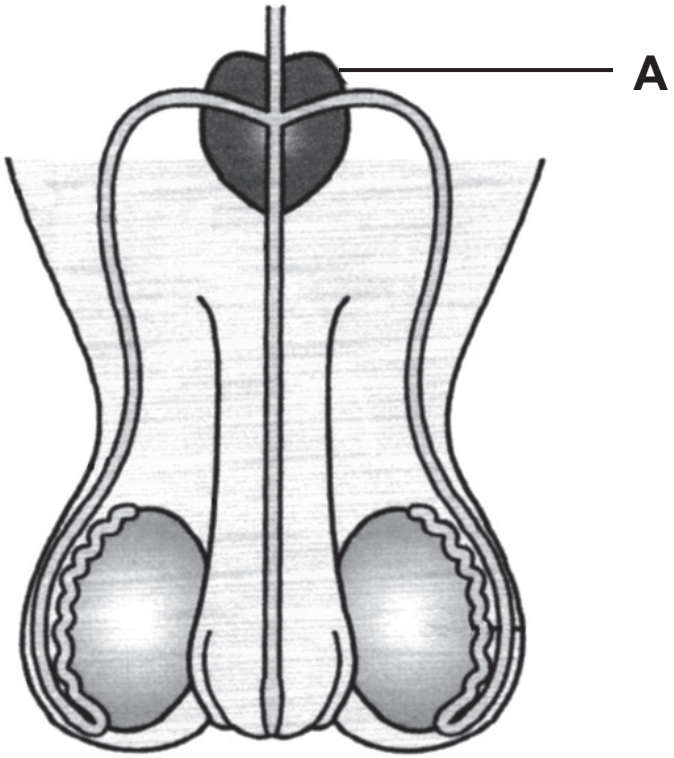
(iii) State the year when actions to reduce the amount of acid rain started to have an effect on the number of fish species. [1 mark]

_____

(c) Give **one** action that can be taken to reduce the amount of acid rain. [1 mark]

_____

7 **(a)** The diagram below shows the male reproductive system.



(i) Name the structure labelled **A** in the diagram above. [1 mark]

_____

(ii) Describe the passage of sperm from where it is produced until it leaves the male body. [3 marks]

_____

_____

_____

_____

_____

(b) The female contraceptive pill is very effective. A pill is taken every day for 21 days then a gap of 7 days before the next cycle begins.

More recently many females are using implants instead of the pill. The implants are semi-permanent and are placed just under the skin. The implants release hormones at a fixed rate and can be effective for a number of years before they need replaced.

(i) State **two** ways in which implants are similar to the contraceptive pill in terms of how they work. [2 marks]

1. _____

2. _____

(ii) Suggest **one** reason why many females prefer the implant to the pill. [1 mark]

_____

8 **(a)** **(i)** In terms of DNA structure, explain fully what is meant by base pairing. [2 marks]

(ii) Explain what is meant by the 'unique nature of an individual's DNA'. [2 marks]

(b) It is now possible to buy genetic testing kits which analyse a person's DNA and give feedback including an individual's 'genetic risk'.

(i) Suggest what is meant by the term 'genetic risk'. [1 mark]

Some people think that information obtained from genetic testing should be made available on a public database.

(ii) Suggest **one** advantage and **one** disadvantage to the individual if other people were made aware of the results from genetic testing. [2 marks]

Advantage _____

_____

Disadvantage _____

_____

(c) Our understanding of DNA and genes has been built up over many years. Research findings by scientists are normally subject to peer review before they are accepted by the scientific community.

Explain what is meant by the term peer review.
[2 marks]

_____

_____

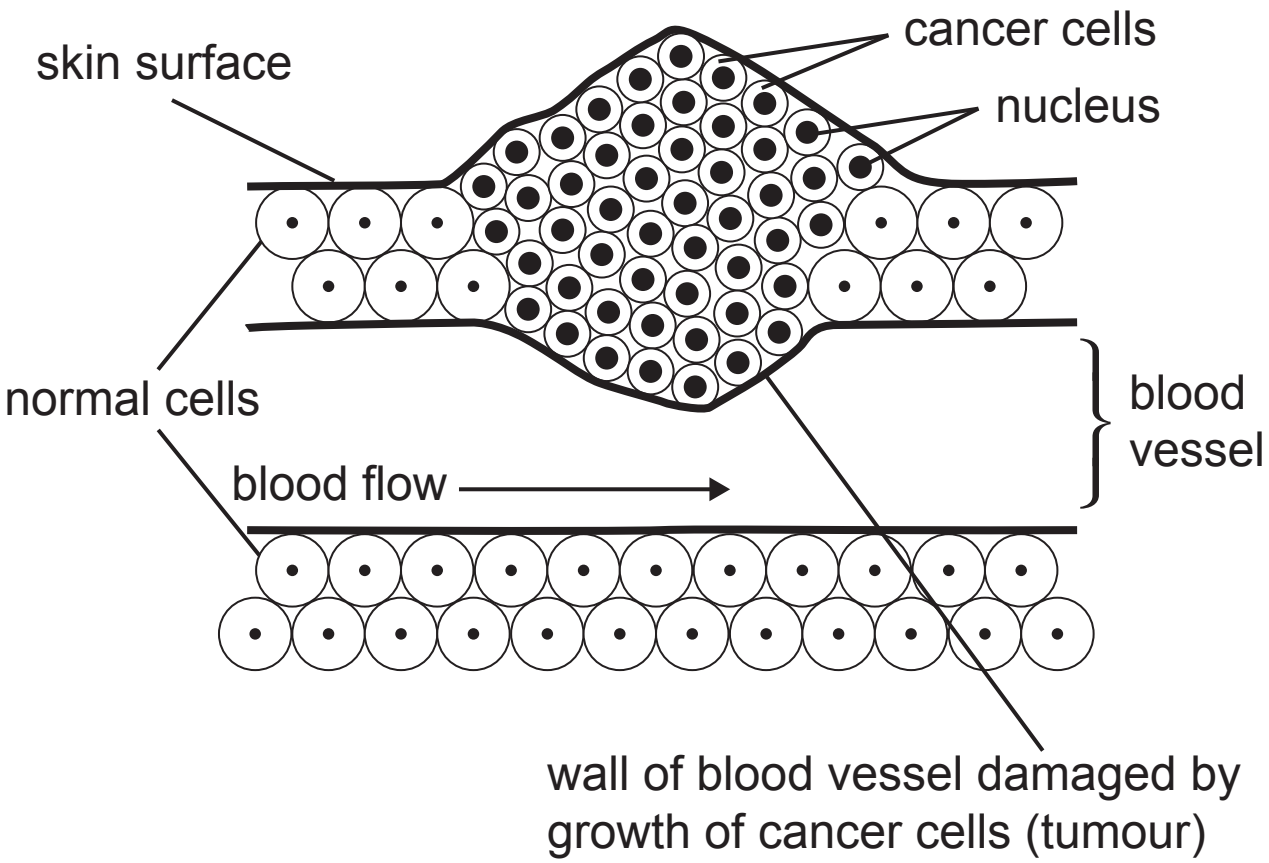
_____

_____

9 Cancers are normally caused by cells mutating and then dividing out of control.

(a) Explain fully the term mutation. [2 marks]

(b) The diagram below represents skin cancer growing at the surface of the skin. The cancer cells form a clump called a tumour.



Use the diagram to answer the questions below.

(i) State **one** way in which the cancer cells are different from non-cancer cells. [1 mark]

_____

(ii) If the tumour (group of cancer cells) continues to grow, there is a possibility that some cancer cells could spread to other parts of the body. Suggest how this could happen. [2 marks]

_____

_____

_____

_____

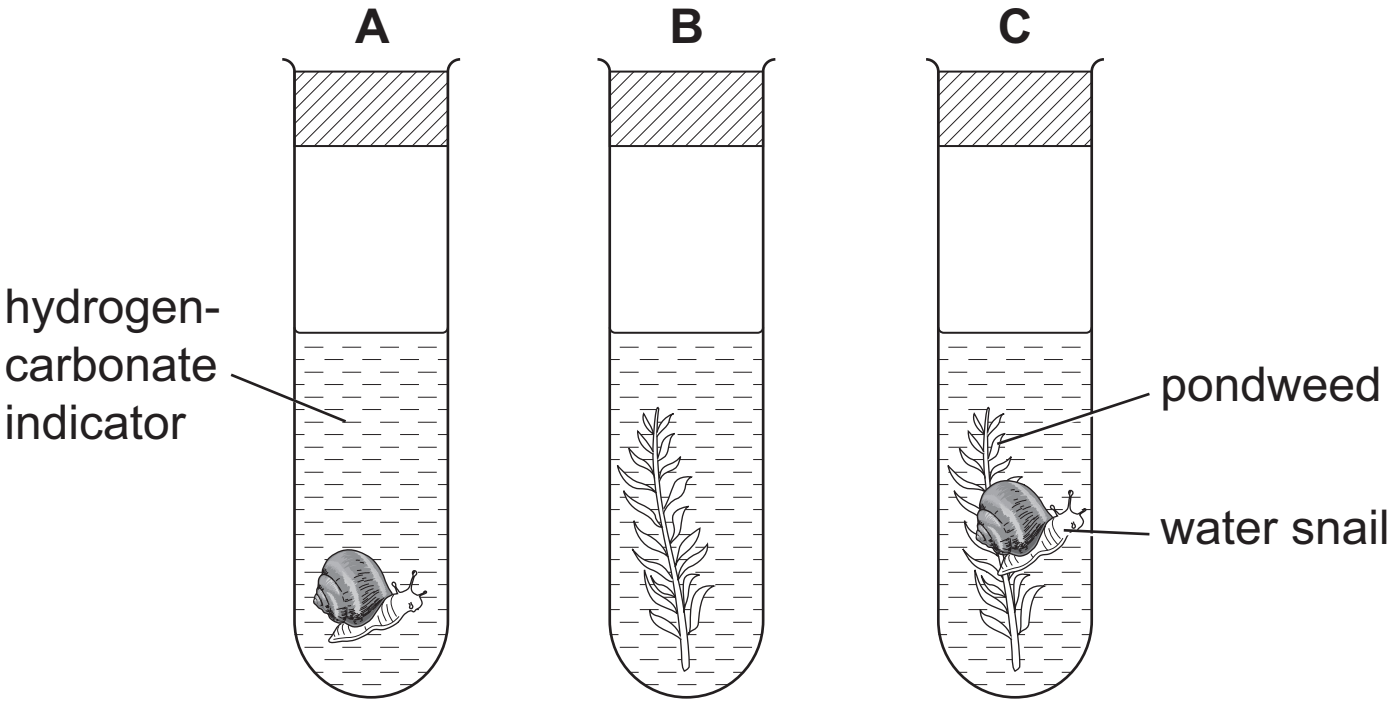
(c) The table below shows data gathered by scientists investigating skin cancer in one region of the UK.

Years	Number of people as % of population in region				
	With skin cancer	Use tanning studios	Work outdoors, e.g. in farming	Take continental holidays in sunny resorts	Wear sunglasses in the sun
1995–1999	0.02	2.0	9.2	15.6	44.4
2000–2004	0.03	3.7	8.8	20.2	50.7
2005–2009	0.06	4.2	8.9	25.7	47.6
2010–2014	0.10	5.5	9.1	33.5	44.5

(i) State the trend shown for skin cancer. [1 mark]

(ii) Using data from the table and your knowledge, give **two** reasons (factors) for the trend. Explain how these factors caused this trend. [3 marks]

10 The diagram below shows apparatus used to investigate gas exchange in animals and plants.



The hydrogencarbonate indicator shows the level of carbon dioxide by changing colour as below:

Reduced carbon dioxide	**Normal** (atmospheric) carbon dioxide	**Increased** carbon dioxide

Tubes **A**, **B** and **C** were set up with normal indicator at the start and left in the light for two hours. The results are shown in the table below.

	Colour of Indicator	
Tube	**At start**	**After two hours**
A	red	yellow
B	red	purple
C	red	red

Use your understanding of gas exchange in plants and animals to describe and explain the result for **Tube C** and compare it to the results for **Tube A** and **Tube B**.
[6 marks]

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

THIS IS THE END OF THE QUESTION PAPER

SOURCES

Q6(a) .....Source: CCEA

Q7(a) .....© GCSE Science Single Award for CCEA Foundation & Higher Tier by James Napier, Alyn G McFarland and Roy White. Published by Hodder Education, 2013. (ISBN: 9781444195729) "Reproduced by permission of Hodder Education".

Q9(b).....© Chief Examiner

Q10.....© Chief Examiner

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	