



General Certificate of Secondary Education
2016–2017

Centre Number

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Candidate Number

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Science: Single Award

Unit 1 (Biology)

Higher Tier

[GSS12]

MV18

TUESDAY 16 MAY 2017, AFTERNOON

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.

You must answer the questions in the spaces provided.

Complete in black ink only.

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 **9**.

- 1 The flower colour in a type of pea plant can be purple or white.

The allele for purple colour is dominant to the allele for white colour.

Let F = purple; f = white

- (a) Give the genotype of a plant with white flowers.
[1 mark]

When a plant that was heterozygous for purple flowers was crossed with a plant with white flowers the following results were produced.

		Flower colour	
		Purple	White
Number of plants	60	60	

- (b) Complete the Punnett square to explain the cross above. [2 marks]

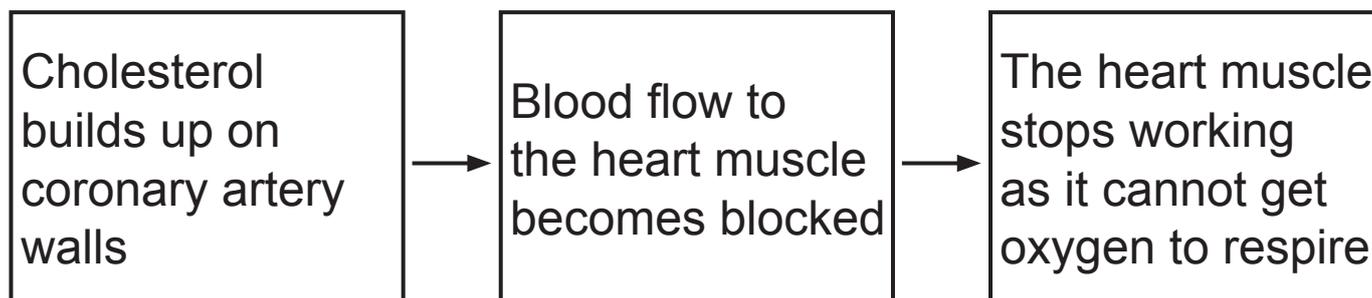
	Ff	

(c) From the Punnett square, what is the percentage of offspring that: [2 marks]

1. had purple flowers? _____

2. were homozygous? _____

- 2 (a) The flow diagram below shows how a heart attack can occur.



The coronary arteries are the very narrow arteries that supply the heart with blood.

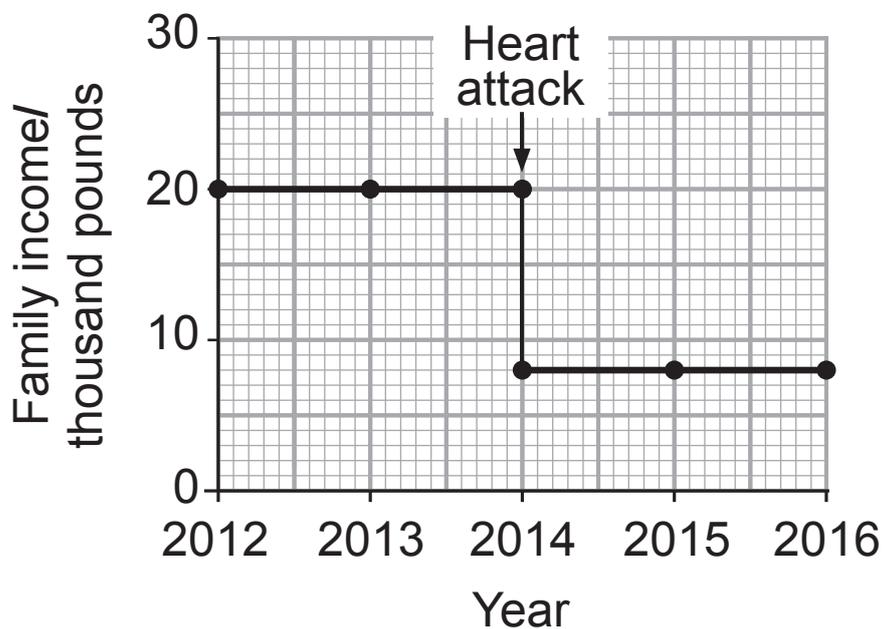
- (i) Suggest why the coronary arteries are at more risk of becoming blocked. [2 marks]

- (ii) Give the word equation for respiration. [2 marks]

_____ + _____ → _____ + _____

- (iii) What is the function of respiration? [1 mark]

- (b) The graph below shows how the total income (money earned) for a family changed after one of the parents had a heart attack in 2014.



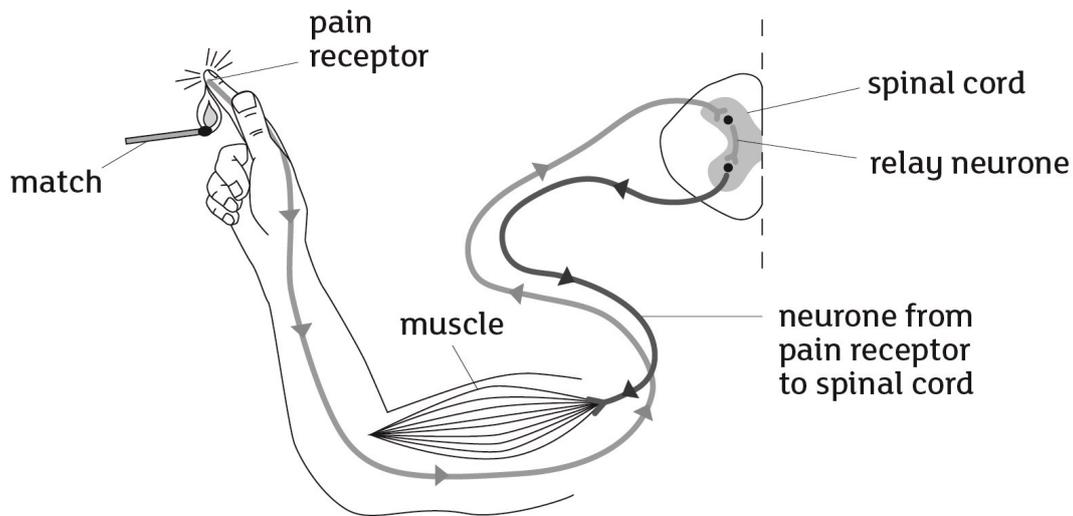
- (i) Calculate the change in family income in 2014.
[1 mark]

£ _____

- (ii) Suggest **one** reason for this change in income.
[1 mark]

- (iii) As well as affecting families directly, the treatment of heart disease costs the health service a lot of money. Suggest **one** reason for the high cost. [1 mark]

- 3 (a) The diagram shows part of the Central Nervous System. It represents the nerve pathway for a reflex action.



Use the diagram and your knowledge to answer the questions below.

- (i) Name the part of the Central Nervous System **not** shown in the diagram. [1 mark]

- (ii) Name the structure shown in the diagram that is an effector. [1 mark]

- (iii) Complete the following sentences. [2 marks]

The length of the nerve pathway for a reflex action is _____ than for a voluntary action.

This gives the reflex action the advantage of being _____ than a voluntary action.

(b) Phototropism is a plant response to change in the environment. Describe the process of phototropism.
[3 marks]

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(Questions continue overleaf)

- 5 Giant hogweed is a plant that is common along river edges in many parts of Northern Ireland. It is a competitive invasive species.



(a) Give **two** features common to all competitive invasive species. [2 marks]

1. _____

2. _____

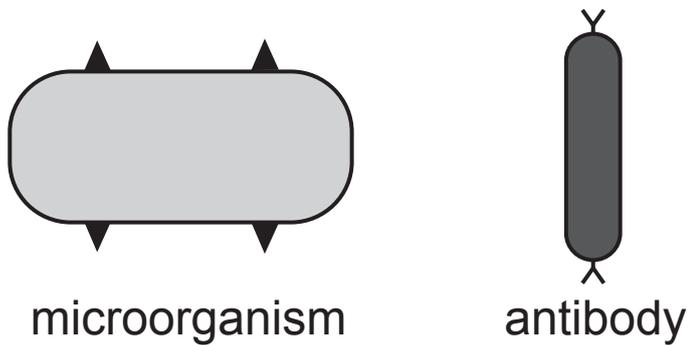
(b) Giant hogweed is harmful to humans. A combination of UV light and sap from the plant on the skin can cause very severe burns and blisters.

As with many invasive plants, it is proving very difficult to get rid of giant hogweed by cutting or using chemical sprays.

(i) In a food chain, the giant hogweed is described as a producer. What term is used to describe animals that feed on producers? [1 mark]

(ii) Explain fully why it would be beneficial to increase the number of animals that feed on giant hogweed. [3 marks]

6 (a) The diagram below represents a microorganism and an antibody.



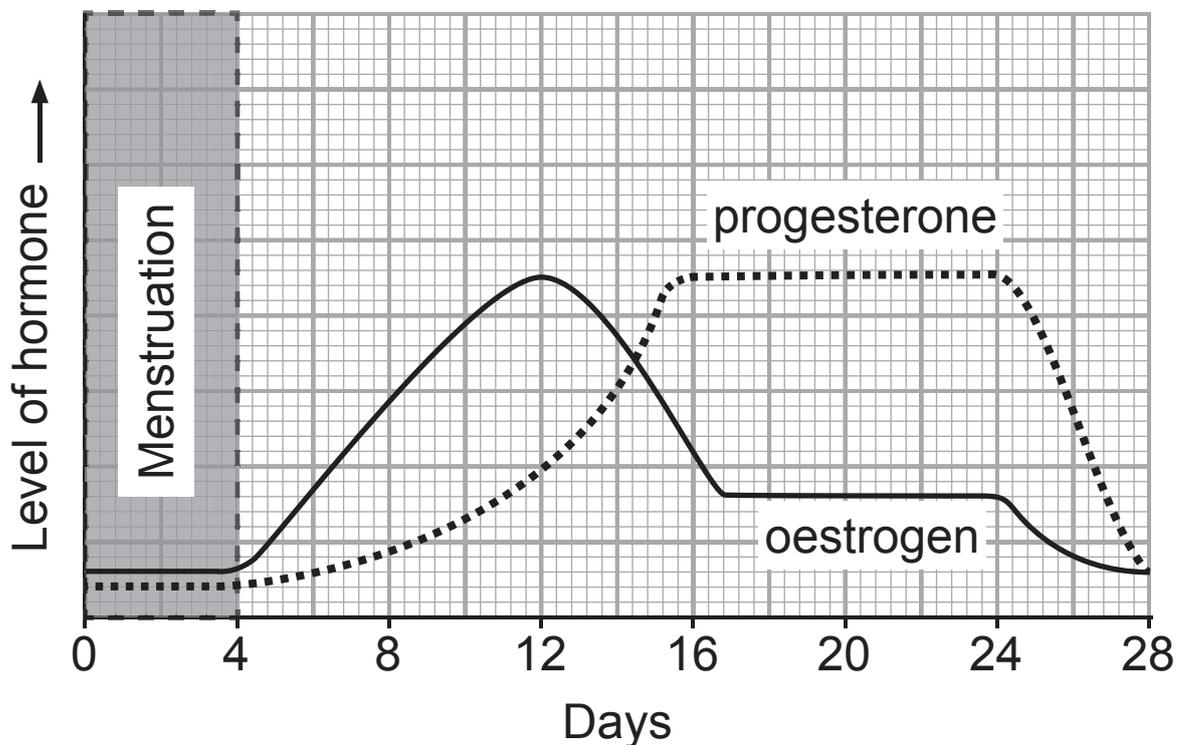
(i) Describe fully how this antibody will help defend against this microorganism. [3 marks]

(ii) Suggest how the body would respond if the microorganism below entered the body. [1 mark]



(b) Explain fully the difference between active and passive immunity. [2 marks]

- 7 (a) The graph below shows how the levels of oestrogen and progesterone change through the menstrual cycle. Ovulation takes place around day 14.



- (i) What is the evidence that oestrogen is the hormone that stimulates ovulation? [1 mark]

- (ii) State **one** other function of oestrogen. [1 mark]

(b) (i) Describe the level of progesterone between days **16** and **24**. [1 mark]

(ii) State the function of progesterone at this time. [1 mark]

(c) In terms of hormone levels, suggest why menstruation occurs in the first four days. [2 marks]

8 (a) Many medical conditions are caused by mutations.

(i) Describe fully the mutation that causes Down syndrome. [2 marks]

(ii) Name **one** other medical condition caused by a mutation. [1 mark]

(b) In some circumstances mutations can be beneficial to an organism. A mutation in a type of garden plant makes it produce a toxic compound that prevents slugs from eating it.

In an investigation, 50 plants without the mutation and 50 plants with the mutation were planted in a section of garden. The number of plants surviving after two months was recorded. The results are shown in the table below.

Time	Number of plants	
	Without mutation	With mutation
At start	50	50
Two months later	26	48

- (i) Calculate the difference between the percentage of plants without the mutation and those with the mutation surviving after two months. [2 marks]
(Show your working out.)

_____ %

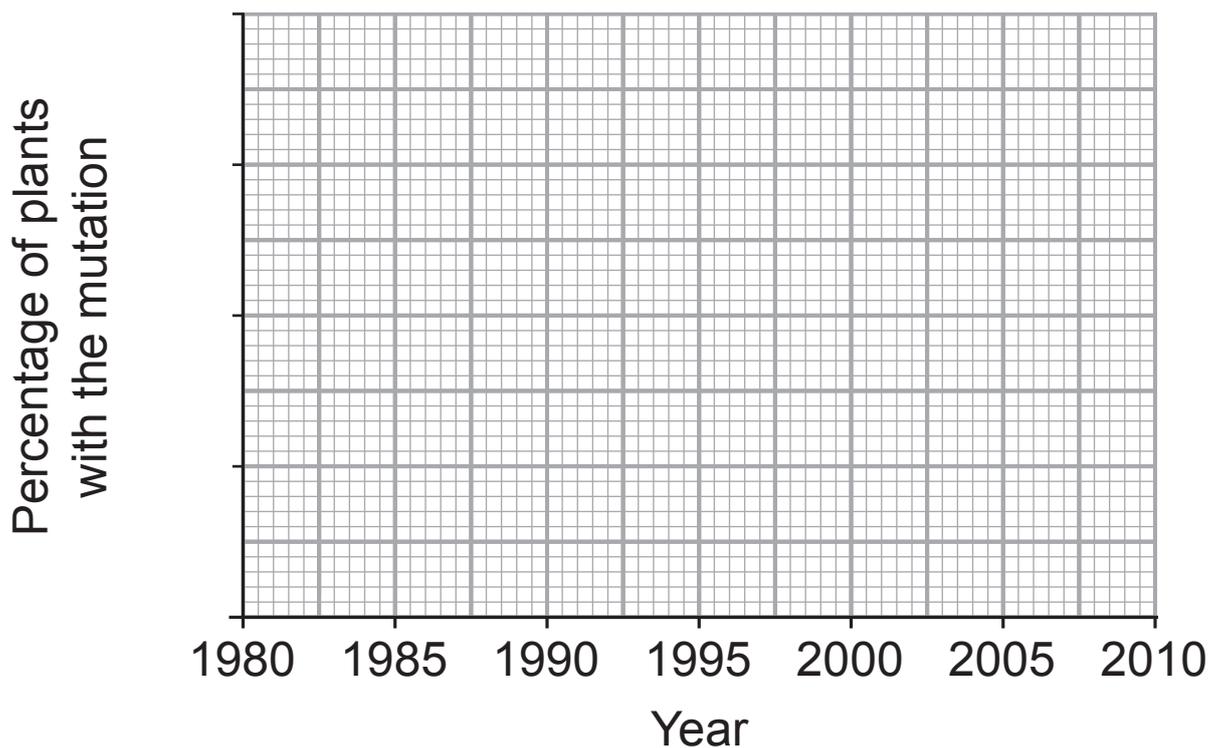
- (ii) In terms of natural selection, explain the results of this investigation. [1 mark]

- (iii) Suggest what might happen to the plants without the mutation over time. [1 mark]

(c) A UK wide survey showed that the percentage of plants with the mutation changed over time as shown in the table below.

Year	1980	1985	1990	1995	2000	2005	2010
Percentage of plants with the mutation/%	2	5	12	20	34	61	78

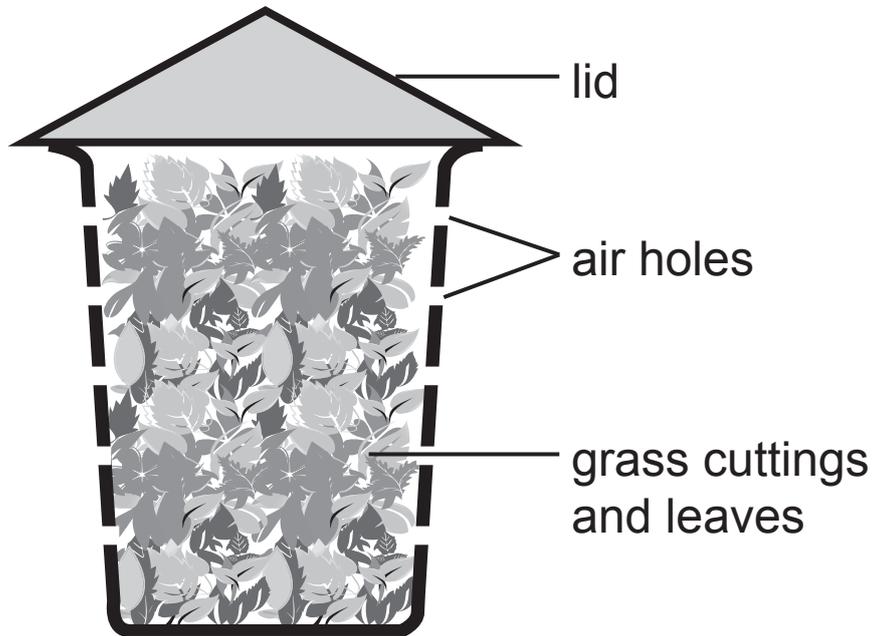
- (i) On the grid below:
- add a suitable scale to the Y-axis. [1 mark]
 - plot the points and draw a line graph of the results. [3 marks]



(ii) Explain how the data shows evolution taking place.
[1 mark]

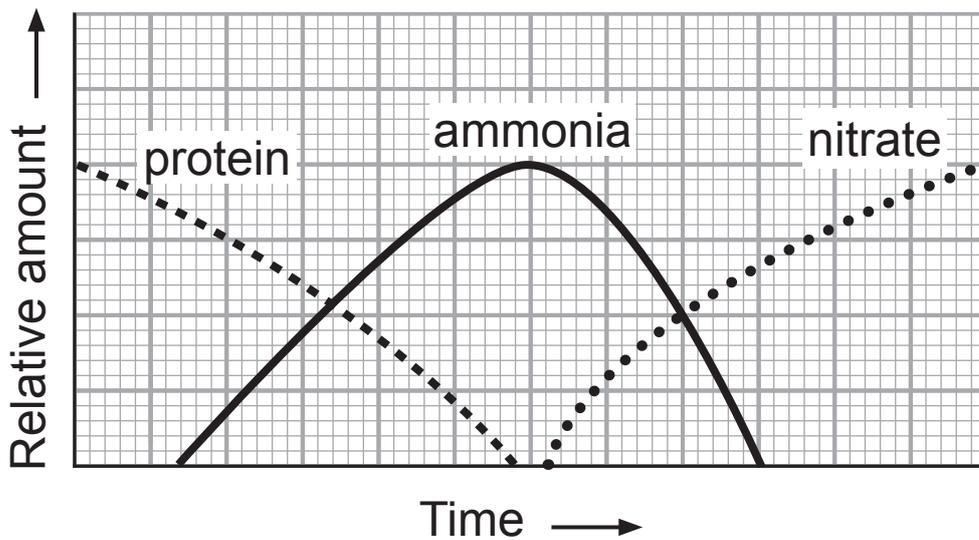
(d) Name the scientist who developed the theory of evolution. [1 mark]

10 (a) Grass cuttings and leaves from a garden were used to fill a compost bin as shown below. Once filled, the bin was left for a number of months.



(i) Suggest why there were air holes in the side of the bin. [1 mark]

The relative change over time of plant protein, ammonia and nitrate is shown in the graph below.



- (ii) From the graph, describe the evidence that suggests that plant protein is converted to ammonia before nitrate. [1 mark]

- (iii) Name the process in which plant protein is converted into ammonia. [1 mark]

- (b) Describe fully the process of nitrification. [2 marks]

- 11 (a)** A clinical trial on a new drug to treat AIDS used 600 men with the disease.

Half of the men were given a tablet containing the drug and the other half were given a tablet which looked exactly the same but did not contain the drug.

The trial started in January 2012 and finished in July 2015. The number of patients surviving in each group is shown below.

Date	Number surviving	
	Taking the trial drug	Not taking the trial drug
January 2012	300	300
July 2012	288	260
January 2013	280	225
July 2013	268	195
January 2014	258	158
July 2014	128	128
January 2015	89	90
July 2015	66	65

- (i) Using data from the table, state the conclusions that can be drawn from this clinical trial. [3 marks]

(ii) Why was it important to have a group of patients who were not given the drug? [1 mark]

(iii) Suggest why it was important that the tablets looked the same. [1 mark]

(iv) Apart from patients, give **one** other group who test drugs and medicines during the clinical stages. [1 mark]

(b) If the clinical trials prove successful, what is the next (and final) stage in drug development? [1 mark]

THIS IS THE END OF THE QUESTION PAPER

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Question Number	Marks
1	
2	
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11	
Total Marks	

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