Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Science: Single Award

Unit 1 (Biology)

Higher Tier

ML

[GSS12]

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.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only.
Answer **all eleven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4** and **9**.

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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]

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.

	Ff	

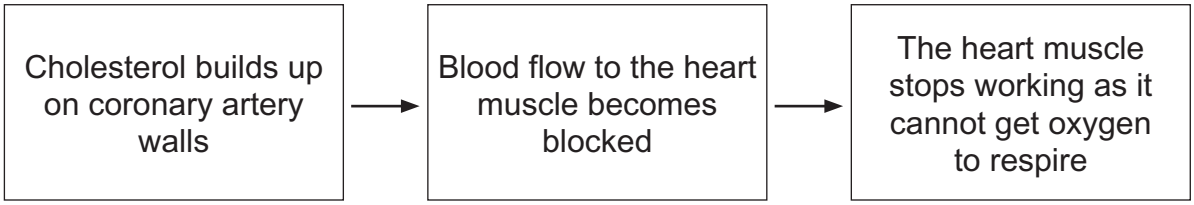
[2]

(c) From the Punnett square, what is the percentage of offspring that:

1. had purple flowers? _____
2. were homozygous? _____ [2]

[Turn over

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]

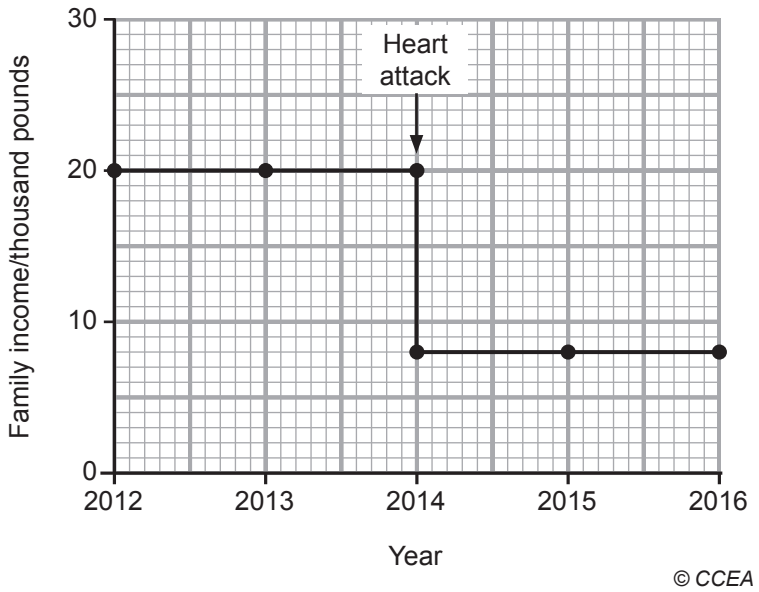
(ii) Give the word equation for respiration.

_____ + _____ → _____ + _____ [2]

(iii) What is the function of respiration?

_____ [1]

(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]

(ii) Suggest **one** reason for this change in income.

_____

_____ [1]

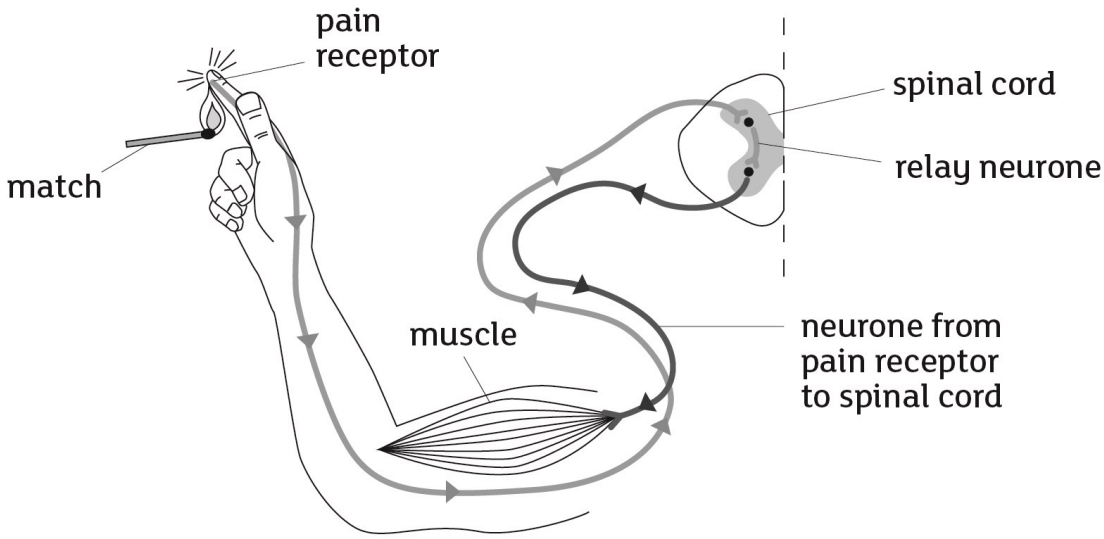
(iii) As well as affecting families directly, the treatment of heart disease costs the health service a lot of money. Suggest **one** reason for the high cost.

_____

_____ [1]

[Turn over

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]

(ii) Name the structure shown in the diagram that is an effector.

_____ [1]

(iii) Complete the following sentences.

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. [2]

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

[3]

[Turn over

4 Tobacco smoke can cause harm to human health.

Describe how tobacco (cigarette) smoke can harm health.

Your answer should include:

- **one** reason why people smoke
- the harmful substances in cigarette smoke and the harm each causes

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

[6]

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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.

© Adrian T Sumner / Science Photo Library

(a) Give **two** features common to all competitive invasive species.

1. _____

_____

2. _____

_____ [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]

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

_____

_____

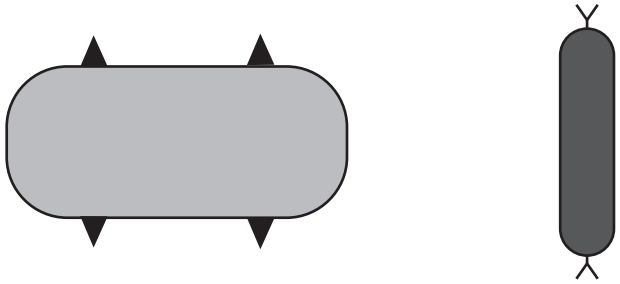
_____

_____

_____ [3]

[Turn over

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



microorganism antibody

(i) Describe fully how this antibody will help defend against this microorganism.

_____

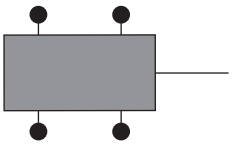
_____

_____

_____

_____ [3]

(ii) Suggest how the body would respond if the microorganism below entered the body.



_____

_____ [1]

(b) Explain fully the difference between active and passive immunity.

_____

_____

_____ [2]

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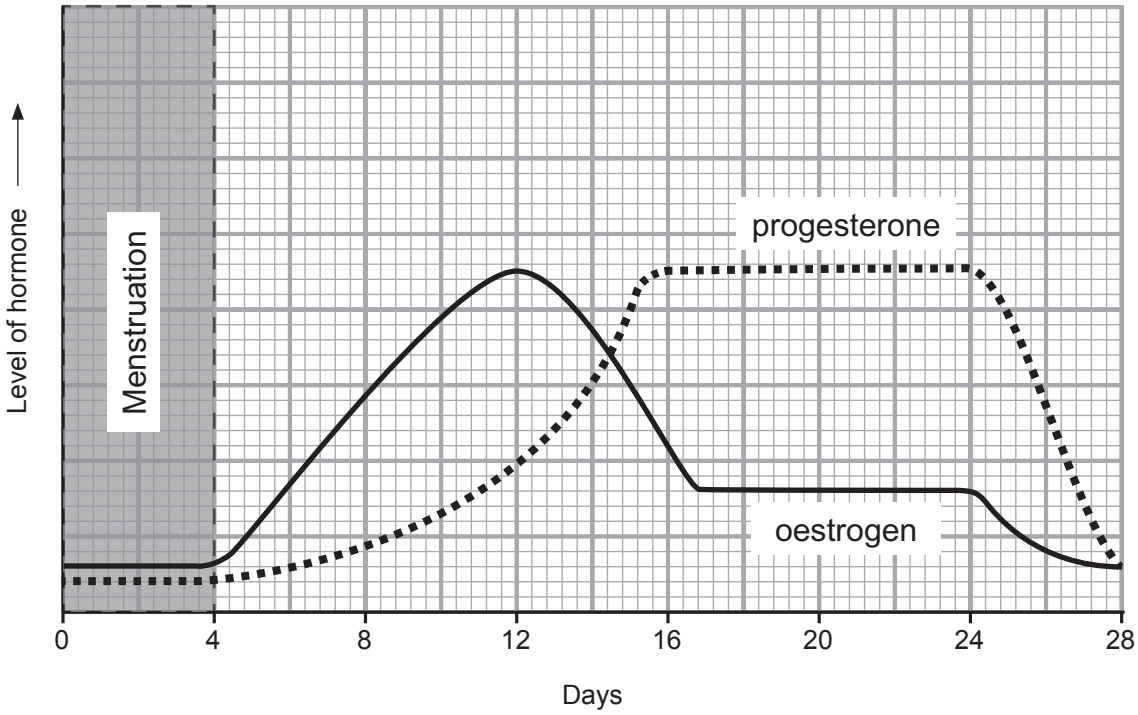
(Questions continue overleaf)

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]

(ii) State **one** other function of oestrogen.

_____

_____ [1]

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

_____

_____ [1]

(ii) State the function of progesterone at this time.

_____

_____ [1]

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

_____

_____

_____ [2]

[Turn over

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

(i) Describe fully the genetic mutation that causes Down syndrome.

_____

_____

_____ [2]

(ii) Name **one** other medical condition caused by a genetic mutation.

_____ [1]

(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.

Show your working out.

_____ % [2]

(ii) In terms of natural selection, explain the results of this investigation.

_____

_____ [1]

(iii) What might happen to the plants without the mutation, over time?

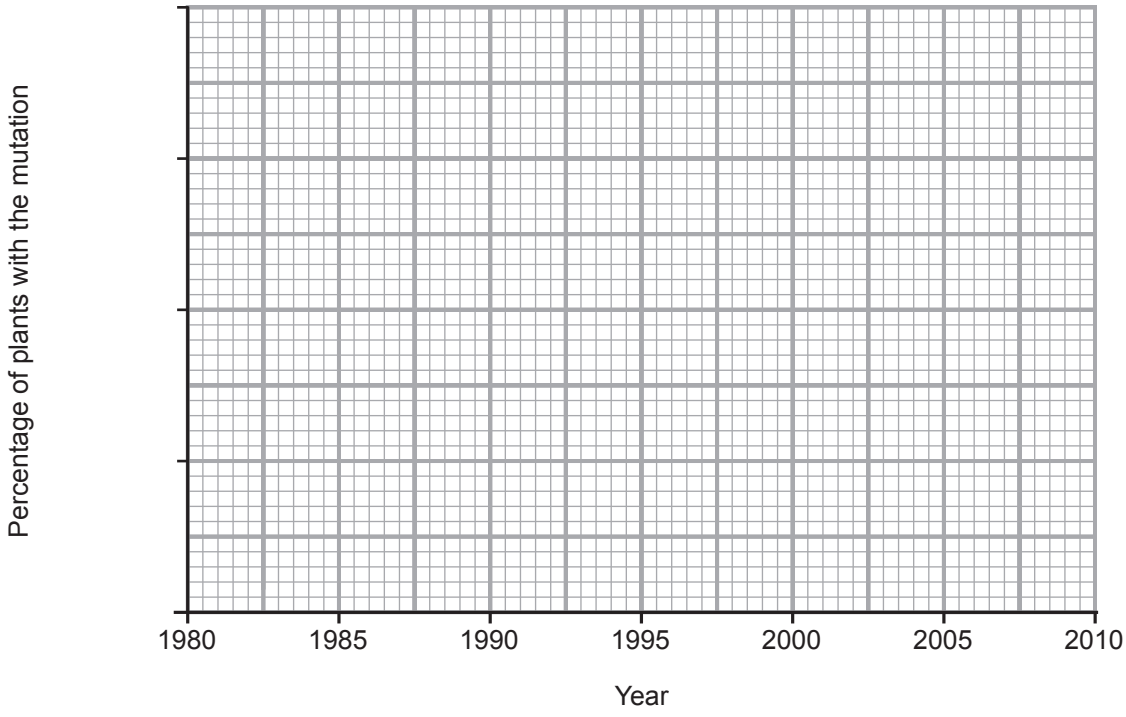
_____ [1]

(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]
- plot the points and draw a line graph of the results. [3]



[Turn over

(ii) Explain how the data shows evolution taking place.

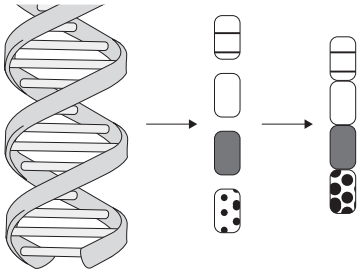
_____

_____ [1]

(d) Name the scientist who developed the theory of evolution.

_____ [1]

9 The diagram below shows how DNA can code for protein.



DNA protein

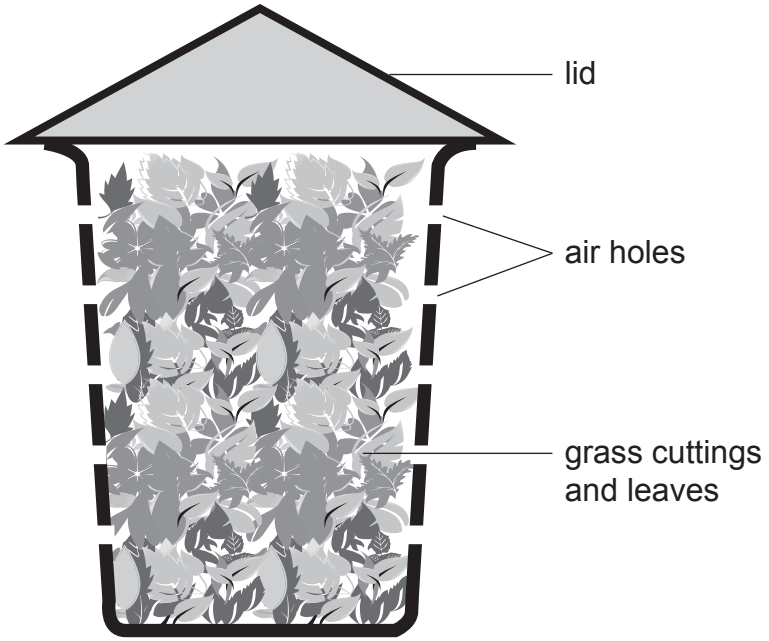
Explain how DNA is able to code for the wide range of different proteins that are found within a cell.

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

[6]

[Turn over

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

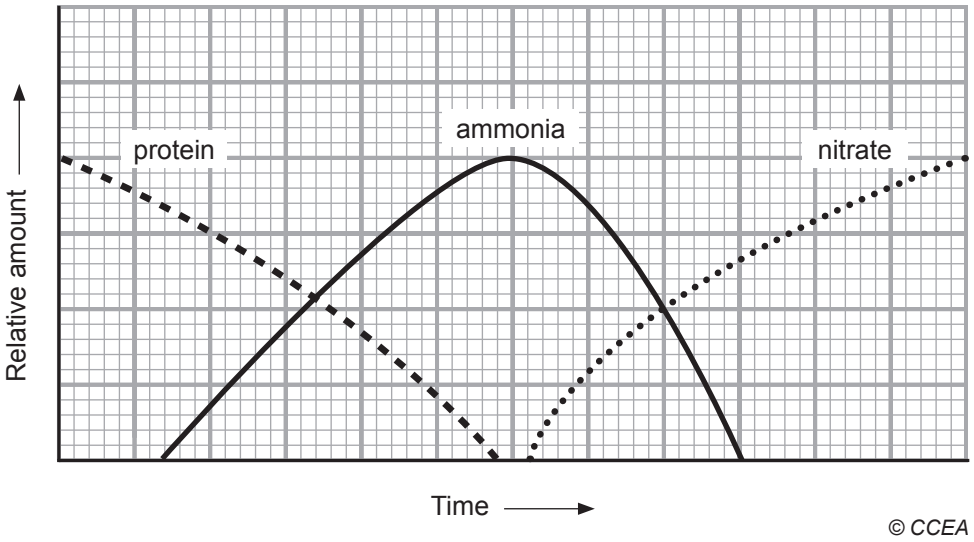


(i) Why were there air holes in the side of the bin?

_____

_____ [1]

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]

(iii) Name the process in which plant protein is converted into ammonia.

_____ [1]

(b) Describe fully the process of nitrification.

_____

_____

_____ [2]

[Turn over

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.

	Number surviving	
Date	**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]

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

_____

_____ [1]

(iii) Why was it important that the tablets looked the same?

_____

_____ [1]

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

_____ [1]

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

_____ [1]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
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5	
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7	
8	
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10	
11	
Total Marks	

Examiner Number