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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Science: Single Award

Unit 1 (Biology)

Higher Tier

[GSS12]

GSS12

TUESDAY 14 MAY 2013, MORNING

TIME

1 hour 15 minutes.

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 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(a)** and **10(a)**.

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

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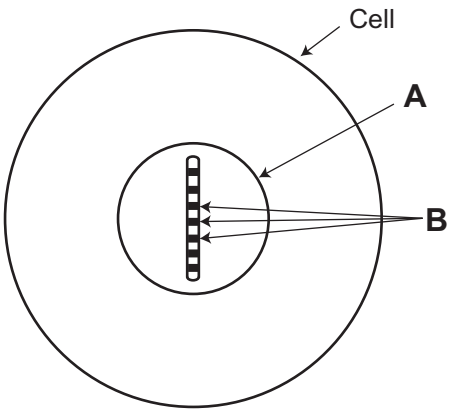
Examiner Only	
Marks	Remark

1 **(a)** The diagram represents an animal cell. Only one chromosome is shown.



(i) Name the structure labelled **A**.

_____ [1]

(ii) Name the structures labelled **B** on the chromosome.

_____ [1]

(b) Tulip flowers can be red or white. The allele for red colour is dominant to the allele for white colour.

(i) Complete the genetic diagram below to show the offspring of a cross between a **heterozygous** red tulip and a white tulip.

Use the symbols; R = red r = white

		Red	
		R	
White		Rr	
	r		rr

[2]

(ii) What percentage of the offspring are white?

_____ % [1]

(iii) Give the genotype of a **homozygous** red tulip.

_____ [1]

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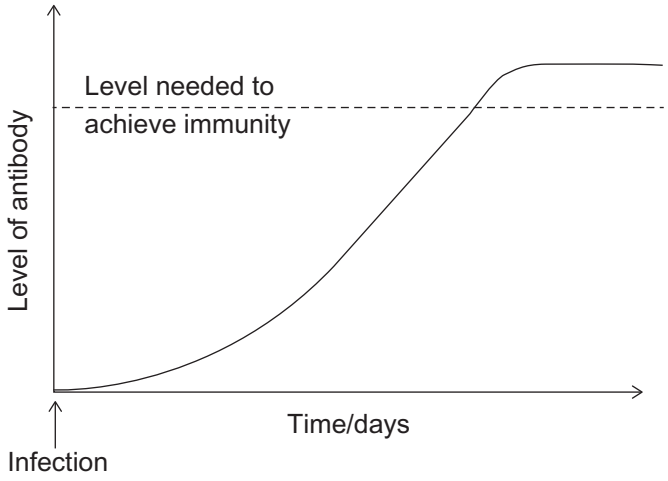
2 **(a)** The following graph shows how our antibody level changes when we have a bacterial infection.



(i) Suggest why there is a delay between infection and achieving immunity.

_____

_____ [1]

(ii) Using the graph above, give **two** pieces of evidence that show the immunity achieved is active immunity.

1. _____

_____

2. _____

_____ [2]

(b) Phagocytosis also helps protect against bacterial infection.

Describe fully the process of phagocytosis.

_____

_____

_____ [2]

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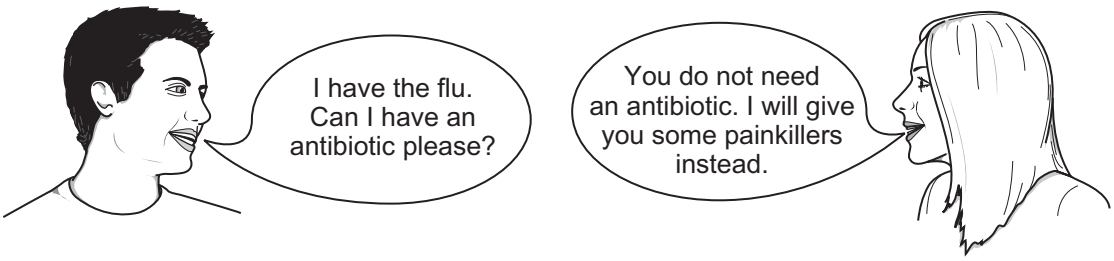
(c) The following diagram shows Mr Wilson talking to his doctor.



Mr Wilson Doctor

(i) Explain fully why the doctor did not prescribe an antibiotic for Mr Wilson's flu.

_____

_____

_____ [2]

(ii) Suggest why new types of antibiotics need to be continually developed.

_____ [1]

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Marks	Remark

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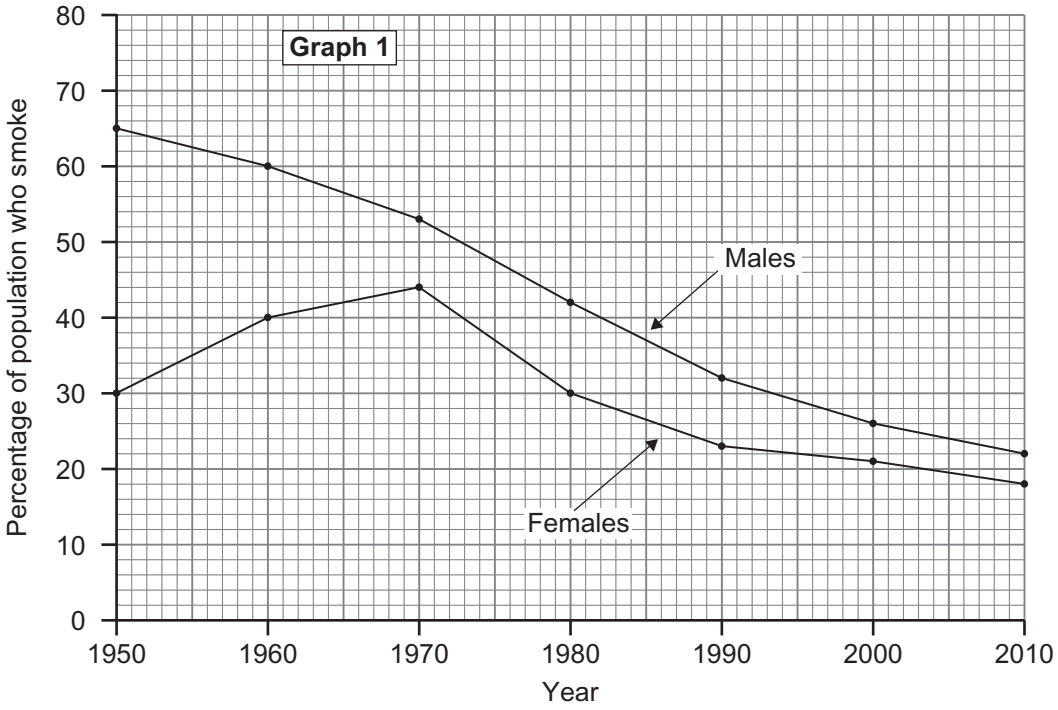
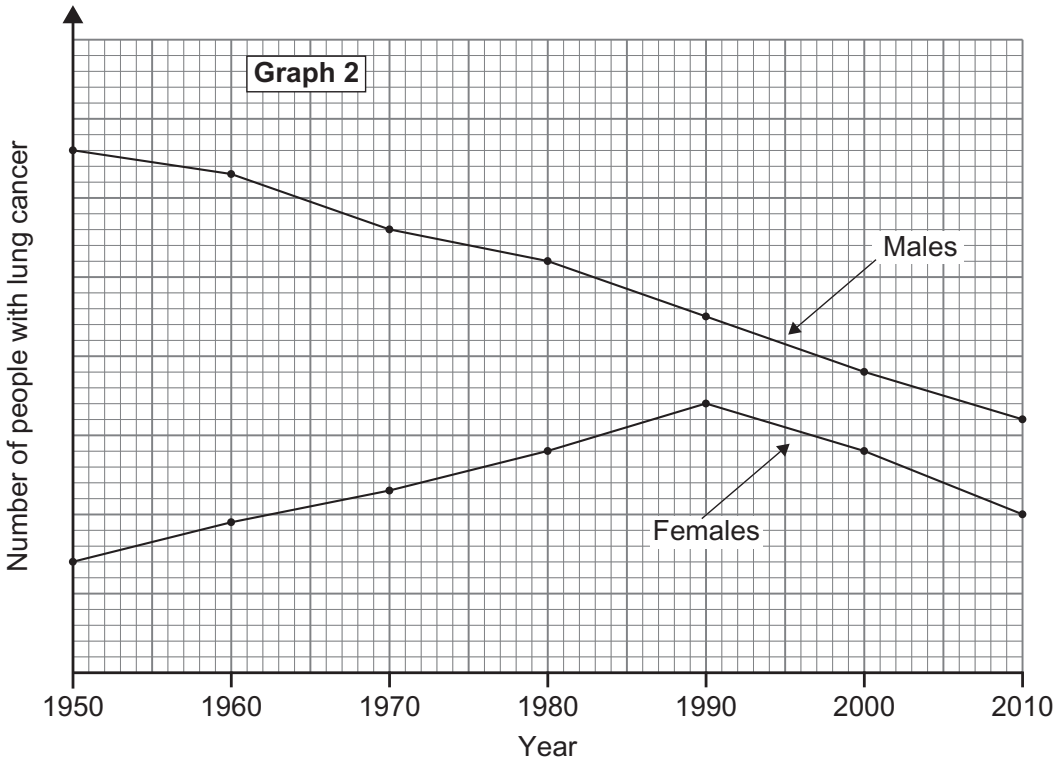
3 **Graph 1** shows the percentage of the population who were smokers between the years 1950–2010.



(a) Which year had the maximum percentage of female smokers?

_____ [1]

Graph 2 shows how the number of people with lung cancer changed between the years 1950–2010.



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(b) Use **Graphs 1** and **2** to describe **and** explain the evidence that links smoking to lung cancer.

_____

_____

_____

_____

_____ [3]

(c) Apart from causing lung cancer, smoking affects smokers in many other ways. For example, many smokers often lack energy.

Explain why.

_____

_____

_____ [2]

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4 **(a)** Global warming is a result of the carbon cycle becoming unbalanced. Give an account of global warming.

Your account should describe **and** explain:

- the causes
- the effects
- what can be done to reduce global warming.

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

[6]

(b) Pollution in the environment can be monitored through the use of biotic indicators such as lichens. Explain why lichens are effective in doing this.

[1]

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(Questions continue overleaf)

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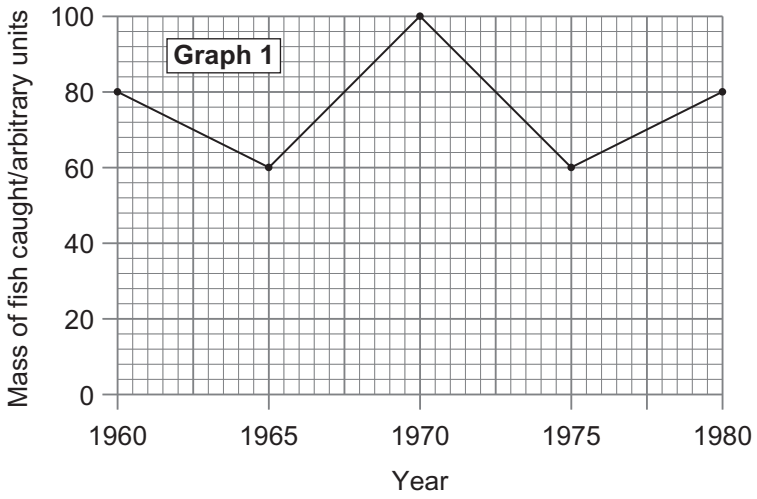
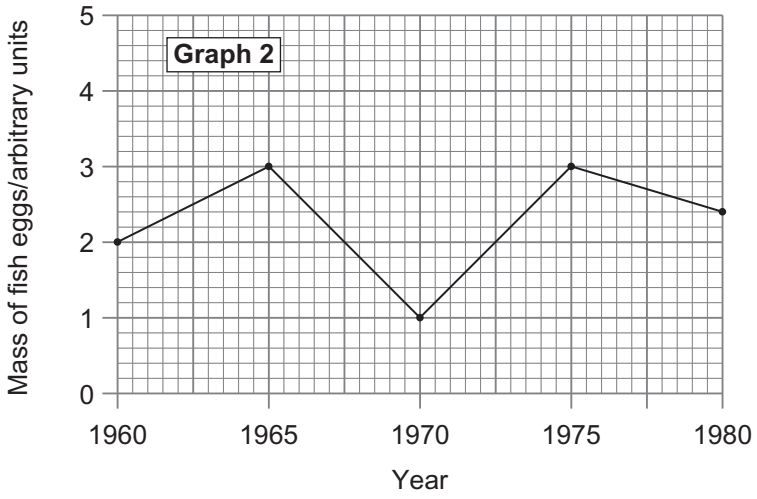
5 **(a)** **Graph 1** shows the mass of fish caught in a part of the Irish Sea between 1960–1980. **Graph 2** shows the mass of fish eggs spawned (produced) in the same period.





(i) Describe **and** explain the relationship between **Graph 1** and **Graph 2**.

_____

_____

_____ [2]

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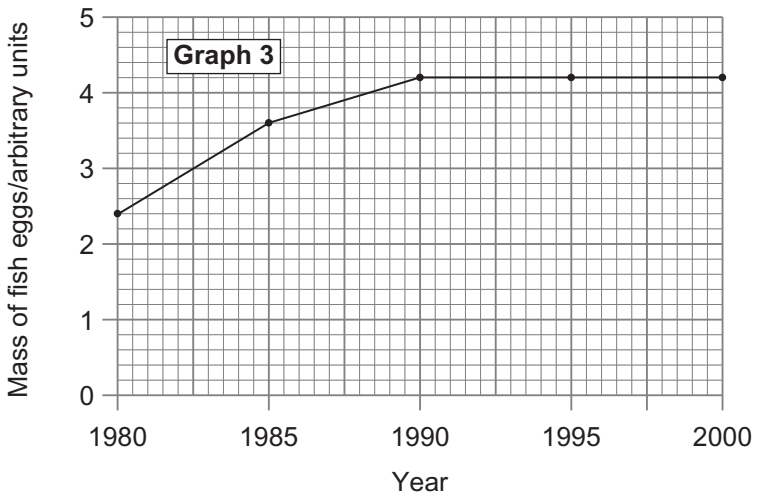
In 1980 the fishing fleets fishing this area of the Irish Sea started using nets with larger mesh sizes. **Graph 3** shows the mass of fish eggs spawned in the sea in the same period.



(ii) Describe **and** explain the change in the mass of fish eggs spawned between **Graph 3** and **Graph 2**.

_____

_____

_____

_____

_____ [3]

(b) Nitrate pollution of waterways is caused by 'run-off' from farming. Explain fully how nitrate pollution could reduce fish stocks in a river.

_____

_____

_____

_____

_____ [3]

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Marks	Remark

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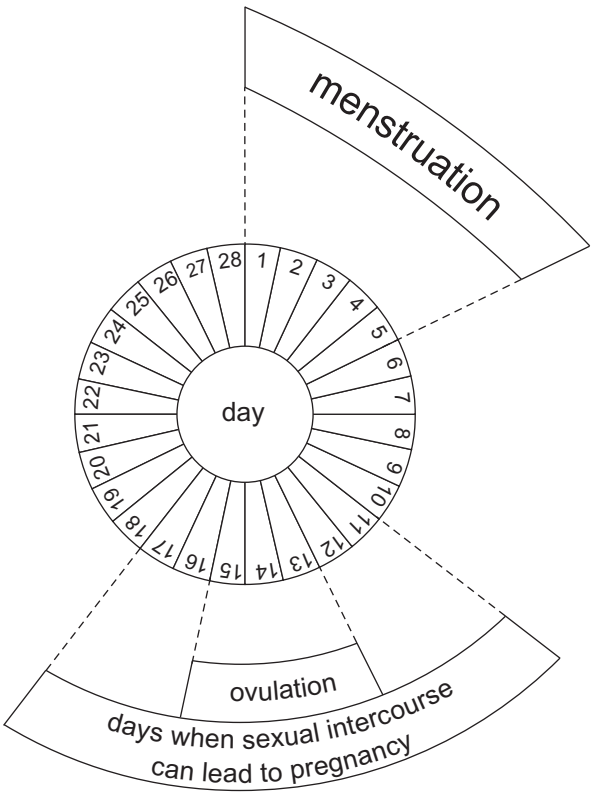
6 The diagram below shows the menstrual cycle.



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(a) Use this information to calculate the percentage of days in the cycle that can lead to pregnancy.

(Show your working out.)

_____ % [2]

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(b) The menstrual cycle is controlled by the hormones oestrogen and progesterone.

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Marks	Remark

(i) Describe fully what a hormone is.

_____

_____ [2]

(ii) The role of oestrogen is to stimulate ovulation. Use the diagram to suggest which day the level of oestrogen is likely to be at its highest.

Day _____ [1]

(iii) Describe fully the function of progesterone in the menstrual cycle.

_____

_____

_____ [2]

(iv) Describe fully how the female contraceptive pill prevents pregnancy.

_____

_____

_____ [2]

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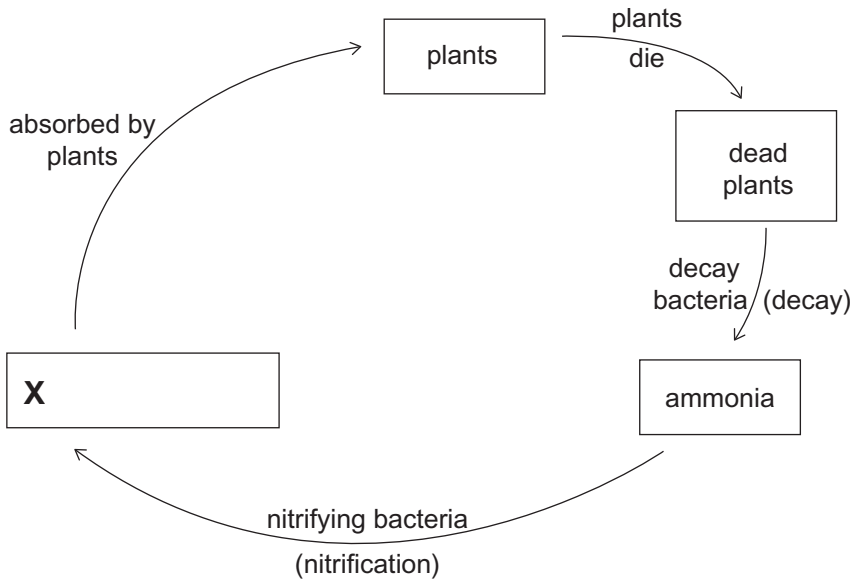
7 **(a)** The following diagram shows part of the nitrogen cycle.



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

(i) On the diagram, complete the label for box **X**. [1]

(ii) Explain why the harvesting of plants for food will cause a decrease in soil nitrogen levels.

_____

_____

_____

_____

_____ [3]

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(b) The following table shows the activity of decay and nitrifying bacteria in a compost bin filled with grass cuttings. It also shows the temperature in the middle of the compost heap.

Note: 10 = maximum bacterial activity; 1 = minimum bacterial activity

Day	Bacterial activity		Temperature/°C
	Decay bacteria	Nitrifying bacteria	
1	1	1	16
2	4	1	18
3	8	2	24
4	10	5	28
5	9	7	31
6	6	10	32
7	4	8	28
8	1	5	21
9	1	3	19
10	1	1	17

(i) What is the evidence from the table that the process of decay comes before nitrification?

_____

_____ [1]

(ii) Suggest on which day the process of **decay** was completed.

Day _____ [1]

(iii) Name the process that produced the heat energy in the bacteria to cause the temperature of the compost heap to rise.

_____ [1]

(iv) Suggest **one** environmental advantage of using garden waste to make compost.

_____ [1]

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8 Attacks by insect pests result in a loss of up to 30% of the world's crops each year leading to food shortages in many developing countries. Chemical pesticides can kill the pests but they will also harm or kill the natural predators of the pests, e.g. birds. Chemical pesticides also pollute the soil.

Genetically modified (GM) maize contains a bacterial gene (the *Bt* gene) that produces a protein that makes the maize poisonous to insect pests.

Some people are concerned about the use of GM crops. They claim that the long term effect of eating genetically modified maize is unknown and that the GM genes will transfer to native species forming 'super-weeds'. However, these claims are not supported by scientific evidence.

(a) Using GM maize as an example, describe what is meant by genetic engineering.

_____

_____

_____ [2]

(b) Name the secondary consumer listed in the passage.

_____ [1]

(c) Using the information provided, give **three** benefits of using genetically modified maize.

1. _____

2. _____

3. _____ [3]

(d) Many scientists claim that opposition to GM crops is based on public misunderstanding rather than being scientific.

What is the evidence in the passage that supports the scientists' claim?

_____

_____ [1]

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9 **(a)** Most British fields of grass have a small number of grass plants (usually <1%) that have a mutation that makes them tolerant to copper-rich soils. However, the mutation that provides copper-tolerance also makes the copper-tolerant plants grow much more slowly.

(i) Using your understanding of natural selection, explain why the proportion of copper-tolerant plants is so low in a typical British field.

[3]

(ii) In some areas of south west England where the soils contain high levels of copper, the proportion of copper-tolerant plants reaches almost 100%.

Explain this observation.

[2]

(b) Cancer in humans is caused by mutation.

Describe how excessive sunbathing can result in the presence of cancer in an individual's skin.

[2]

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10 (a) Describe the structure of DNA and explain the link between the DNA code and the formation of proteins.

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

[6]

(b) The development of the understanding of DNA structure is an example of the collaborative nature of science.

With reference to this example, describe what is meant by the 'collaborative nature of science'.

[3]

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