



F

Tuesday 13 May 2014 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE BIOLOGY A/SCIENCE A

A161/01 Modules B1 B2 B3 (Foundation Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

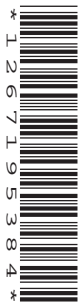
OCR supplied materials:

None

Other materials required:

- Pencil
- Ruler (cm/mm)

Duration: 1 hour



| | | | |
|-----------------------|--|----------------------|--|
| Candidate forename | | Candidate surname | |
|-----------------------|--|----------------------|--|

| | | | | | | | | | | |
|---------------|--|--|--|--|--|------------------|--|--|--|--|
| Centre number | | | | | | Candidate number | | | | |
|---------------|--|--|--|--|--|------------------|--|--|--|--|

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

2

Answer **all** the questions.

- 1 (a) Cystic fibrosis is an inherited disorder.

People with cystic fibrosis show symptoms of the disorder.

Put ticks (✓) in the boxes next to **two** symptoms of cystic fibrosis.

| | |
|------------------------------|--------------------------|
| memory loss | <input type="checkbox"/> |
| clumsiness | <input type="checkbox"/> |
| problems with digesting food | <input type="checkbox"/> |
| production of thick mucus | <input type="checkbox"/> |
| not able to concentrate | <input type="checkbox"/> |

[2]

- (b) Sharon and Eric are both carriers for cystic fibrosis.

Sharon is pregnant. Eric is the father of the baby.

- (i) Complete the diagram to show the possible combinations of alleles for their baby.

Key

T = normal allele

t = cystic fibrosis allele

| | | | |
|-------------|-------|---------------|-------|
| | | Sharon | |
| | | T | |
| Eric | T | | |
| | | | |

[2]

3

(ii) Calculate the probability that the baby will have cystic fibrosis.

probability of baby having cystic fibrosis = [1]

(c) Sharon and Eric discuss whether to have their fetus (unborn baby) tested.

This is what they discuss.

- A The results of the test might not be accurate.
- B The test will enable us to plan treatment if the fetus has cystic fibrosis.
- C Cystic fibrosis is a serious disease.
- D We would rather not know whether our baby has cystic fibrosis.
- E The test is painful for the mother.

Sharon and Eric decide to have their fetus tested.

Use the ideas of benefit and risk to suggest why they made that decision.

.....

.....

.....

..... [2]

(d) Some people do not agree with fetal testing.

Suggest why.

.....

..... [1]

[Total: 8]

4

- 2 (a) Write down the combination of sex chromosomes in the body cells of human males and females.

males females [1]

- (b) (i) In the UK, the expected ratio of male to female births is 1 : 1.
2000 babies are born at one hospital in a year.

How many of these would you expect to be female?

answer = [1]

- (ii) In another country, the ratio of males to females born is 1.2 : 1.
1000 females are born in a day.

Calculate how many males you would expect to be born on the same day.

Show your working.

answer = [2]

- (iii) Suggest why the ratio of males to females born in some countries is 1.2 : 1.

.....

 [2]

[Total: 6]

4 Ian decides to join a running club.

At the first session, the instructor takes Ian's resting pulse rate.

(a) Explain how the instructor would measure Ian's pulse rate.

.....
 [1]

(b) The instructor wants to work out how much blood the heart pumps out in a minute.

This is called cardiac output.

He uses this formula.

$$\text{cardiac output} = \text{pulse rate} \times \text{volume of blood pumped out per heart beat}$$

The results for Ian and three other members of the running club are shown in the table.

| Name | Resting pulse rate in beats per minute | Volume of blood pumped out per heart beat in cm ³ | Cardiac output in cm ³ per minute |
|----------|--|--|--|
| Alistair | 80 | 75 | 6000 |
| Byron | 68 | 80 | 5440 |
| Colin | 71 | 70 | 4970 |
| Ian | 75 | 92 | |

(i) Complete the table by calculating Ian's cardiac output.

[1]

(ii) Write down the range of the cardiac output measurements for these members of the running club.

range = to [1]

7

- (iii) The instructor says that resting pulse rate is a good indicator of the level of fitness. The lower your resting pulse rate the fitter you are.

From the data, put the men in order of fitness from the least fit to the most fit.

least fit

.....

.....

most fit

[1]

- (iv) The instructor thinks that the order of fitness may be incorrect.

Which **two** reasons, when taken together, explain why the order may be incorrect?

Put ticks (✓) in the boxes next to the **two** most likely reasons.

Ian has only just joined the running club.

The measurements were only recorded once.

A person's pulse rate may vary.

Blood pressure measurements were not recorded.

The men had different diets.

[2]

[Total: 6]

8

5 Helen is investigating the effect of antibiotics on the growth of bacteria.

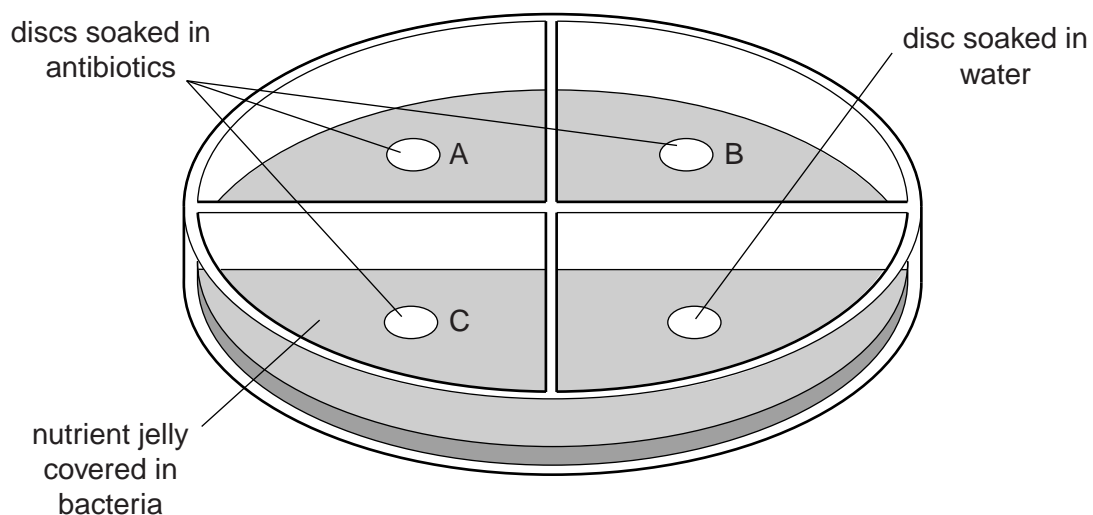
Bacteria are grown on nutrient jelly. This makes the jelly look cloudy.

Helen puts a small paper disc into each of three different antibiotic solutions, **A**, **B** and **C**.

She puts another paper disc into water.

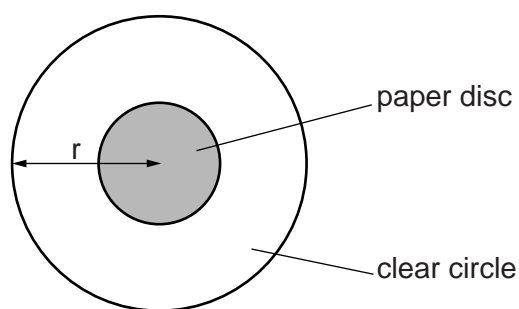
She then places all of the paper discs onto the nutrient jelly.

The diagram shows the apparatus she uses for her investigation.



After two days Helen sees clear circular areas around some of the paper discs.

Helen measures the radius (r) as shown in the diagram.



She then calculates the total area of the clear circle (including the paper disc) using the formula:

$$\text{area} = \pi r^2 \quad (\text{where } \pi = 3.14).$$

Here are her results.

| | Radius in mm | Total area of the clear circle (including the paper disc) in mm ² |
|--------------|--------------|--|
| A | 8 | |
| B | 14 | 615.44 |
| C | 3 | 28.26 |
| water | 3 | 28.26 |

- (a) Complete the table by calculating the total area of the clear circle (including the paper disc) for **A**.

Show your working below.

[2]

- (b) The clear areas on the nutrient jelly are where the bacteria have been killed by the antibiotic.

Helen makes the following conclusions from her results.

Which of these conclusions are correct?

Put ticks (✓) in the boxes next to the **three** correct conclusions.

The greater the clear area, the more bacteria have died.

The bacteria may be resistant to antibiotic C.

Antibiotic A is the least effective.

Water kills more bacteria than any antibiotic.

Antibiotic C must be water.

Antibiotic B is the most effective.

[3]

10

(c) Explain why it is important for all the paper discs to be the same size.

.....
.....
..... [2]

(d) New antibiotics must be tested before they can be made available to the general public.

Write down **one** reason why.

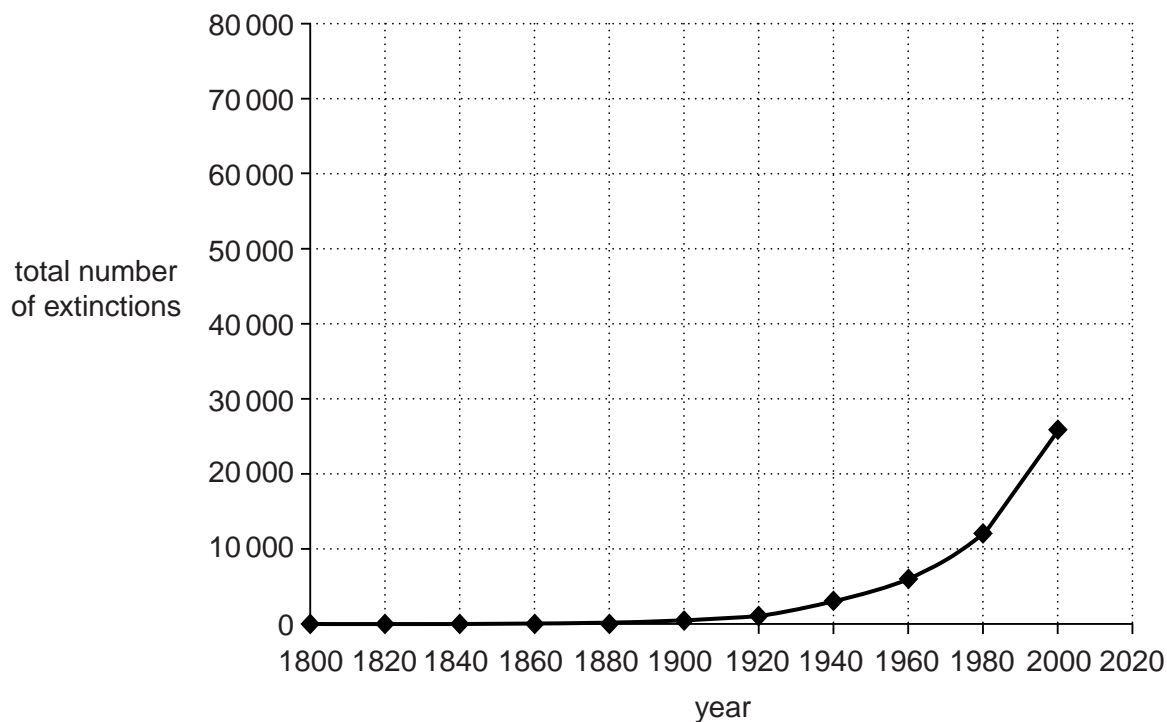
..... [1]

[Total: 8]

12

7 Species that no longer exist are said to be extinct.

The graph shows the estimated total number of extinctions worldwide since 1800.



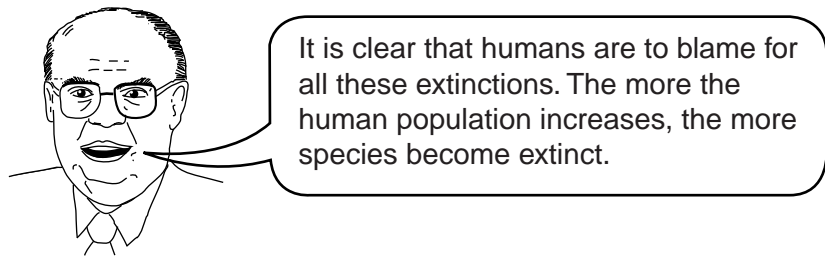
(a) (i) Describe the pattern shown by the graph.

.....
.....
.....
..... [2]

(ii) Continue the line on the graph to predict how many species are likely to have become extinct by 2020.

number of extinct species by 2020 = [1]

(b) Boris says:



(i) Explain one reason why species extinctions increase as the human population increases.

.....

.....

..... [2]

(ii) Suggest and explain which part of Boris' conclusion is likely to be incorrect.

.....

..... [1]

(c) Scientists try to prevent species becoming extinct.

Which of the following are reasons why scientists do this?

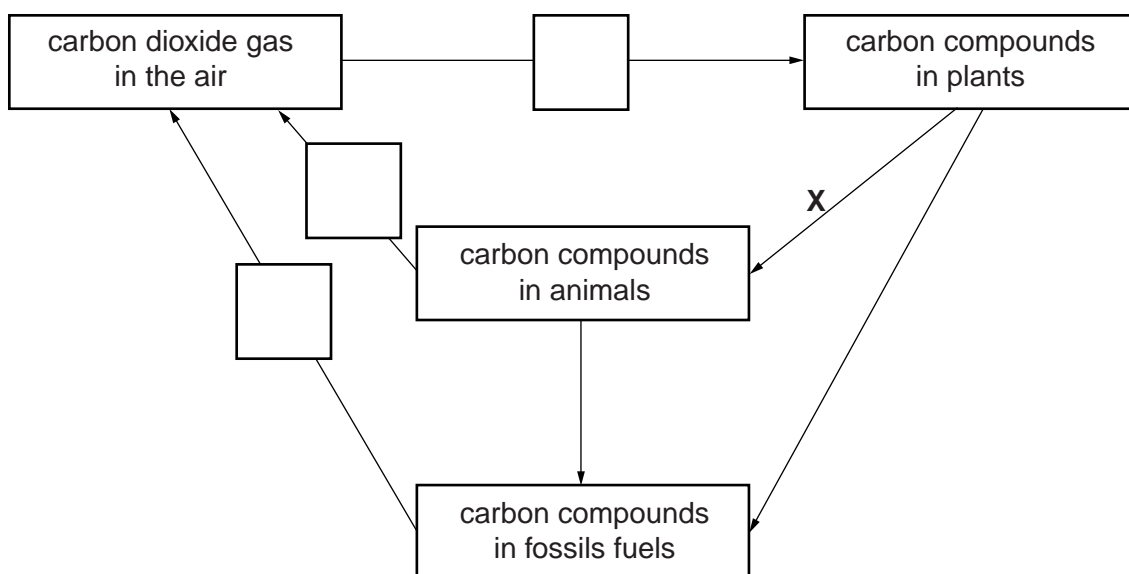
Put ticks (✓) in the boxes next to the **two** best reasons.

- Preventing extinctions is easy to do.
- Many plants and animals are dangerous.
- Biodiversity is important for sustainability.
- Scientists always work together in teams.
- Some plants and animals provide us with vital resources.

[2]

[Total: 8]

9 The diagram shows parts of the carbon cycle.



(a) Three different processes are involved:

- A combustion
- B photosynthesis
- C respiration.

Write the letters **A**, **B** and **C** in the correct boxes to complete the diagram. [2]

(b) Explain what is happening at arrow **X**.

.....

.....

.....

..... [2]

(c) Microorganisms have a very important role in the carbon cycle.

Describe the role of microorganisms in the carbon cycle.

.....

.....

.....

..... [2]

[Total: 6]

END OF QUESTION PAPER

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