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F

Wednesday 15 June 2022 – Morning

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/02 Paper 2 (Foundation Tier)

Time allowed: 1 hour 10 minutes

8994136684

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

J25002

Please write clearly in black ink. **Do not write in the barcodes.**

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

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **20** pages.

ADVICE
- Read each question carefully before you start your answer.

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SECTION A

Answer **all** the questions.

You should spend a maximum of 20 minutes on this section.

Write your answer to each question in the box provided.

1 What is the function of platelets in blood?

A They destroy pathogens.

B They help clot the blood.

C They produce antibodies.

D They transport oxygen around the body.

Your answer ☐ **[1]**

2 Which **abiotic** factor affects the growth of plants?

A Food

B Nitrogen gas

C Predators

D Soil pH

Your answer ☐ **[1]**

3 Plasmodium is a microbe that causes the disease malaria in humans.
Humans act as a host for plasmodium.

Which term describes the relationship between plasmodium and humans?

A Consumer

B Mutualism

C Parasitism

D Predation

Your answer ☐ **[1]**

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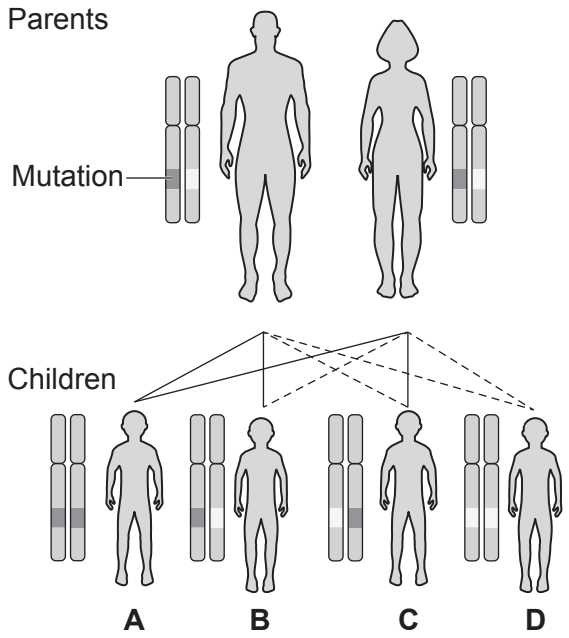
4 The diagram shows how a condition caused by a **recessive** gene mutation is inherited.

Which child, **A**, **B**, **C** or **D**, will inherit and develop the condition?



Your answer ☐ **[1]**

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5 Which row shows the size of each group from smallest to largest?

A class → family → order → phylum

B family → order → class → phylum

C order → phylum → family → class

D phylum → class → order → family

Your answer ☐ **[1]**

6 Which term is used to describe a pair of alleles that control a characteristic?

A Gamete

B Genome

C Genotype

D Phenotype

Your answer ☐ **[1]**

7 The kangaroo **diploid** chromosome number is 16.

Which row shows the number of chromosomes found in each type of cell?

	Kangaroo cells		
	Skin	**Sperm**	**Egg**
A	8	8	16
B	8	16	16
C	16	8	8
D	16	16	8

Your answer ☐ **[1]**

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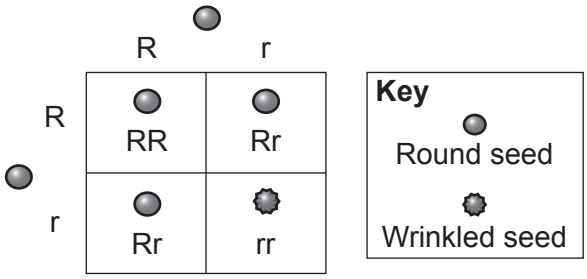
8 The microorganism that causes Cowpea mosaic disease can pass through a filter that blocks anything larger than 100 nm.

Which type of microorganism causes Cowpea mosaic disease?

	Microorganisms	Smallest size of microorganism
A	bacteria	120 nm
B	fungi	2 μm
C	protist	8 μm
D	virus	15 nm

Your answer ☐ **[1]**

9 The diagram shows a genetic cross for seed shape in peas.



Which prediction about the offspring is **most** likely?

A All the offspring will be heterozygous for seed shape.

B All the offspring will be homozygous for seed shape.

C The ratio of heterozygous to homozygous offspring will be 1 : 1.

D The ratio of heterozygous to homozygous offspring will be 3 : 1.

Your answer ☐ **[1]**

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10 The diameter of a human ovum is 100 000 nm. The diameter of the HIV pathogen is 100 nm.

How many orders of magnitude larger is the diameter of a human ovum compared to an HIV pathogen?

A 3

B 10

C 99

D 1000

Your answer ☐ **[1]**

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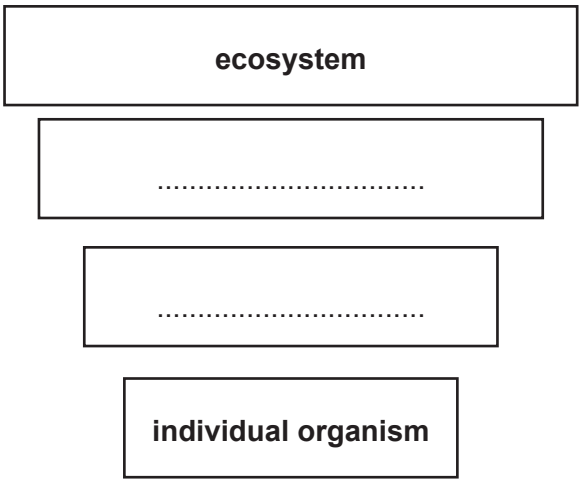
SECTION B

Answer **all** the questions.

11 **(a)** The diagram shows some of the levels of organisation within the ecosystem.

Complete the diagram using words in the list.

biomass	**community**	**population**	**predator**	**prey**



[2]

(b) Explain why the carbon cycle is important to plants.

.....

.....

.....

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

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

Complete these sentences about microorganisms.

Microorganisms break down dead organisms releasing nutrients such as nitrogen. This process is called ..... .

Microorganisms will also convert the carbon in their food to carbon dioxide in a process called ..... .

The reaction to produce carbon dioxide releases energy. This makes it an ..... reaction.

[3]

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12 **(a)** HIV and TB (tuberculosis) are infectious diseases.

HIV is spread between humans during sexual intercourse when body fluids come into contact.

TB is a disease caused by bacteria. It affects the lungs.

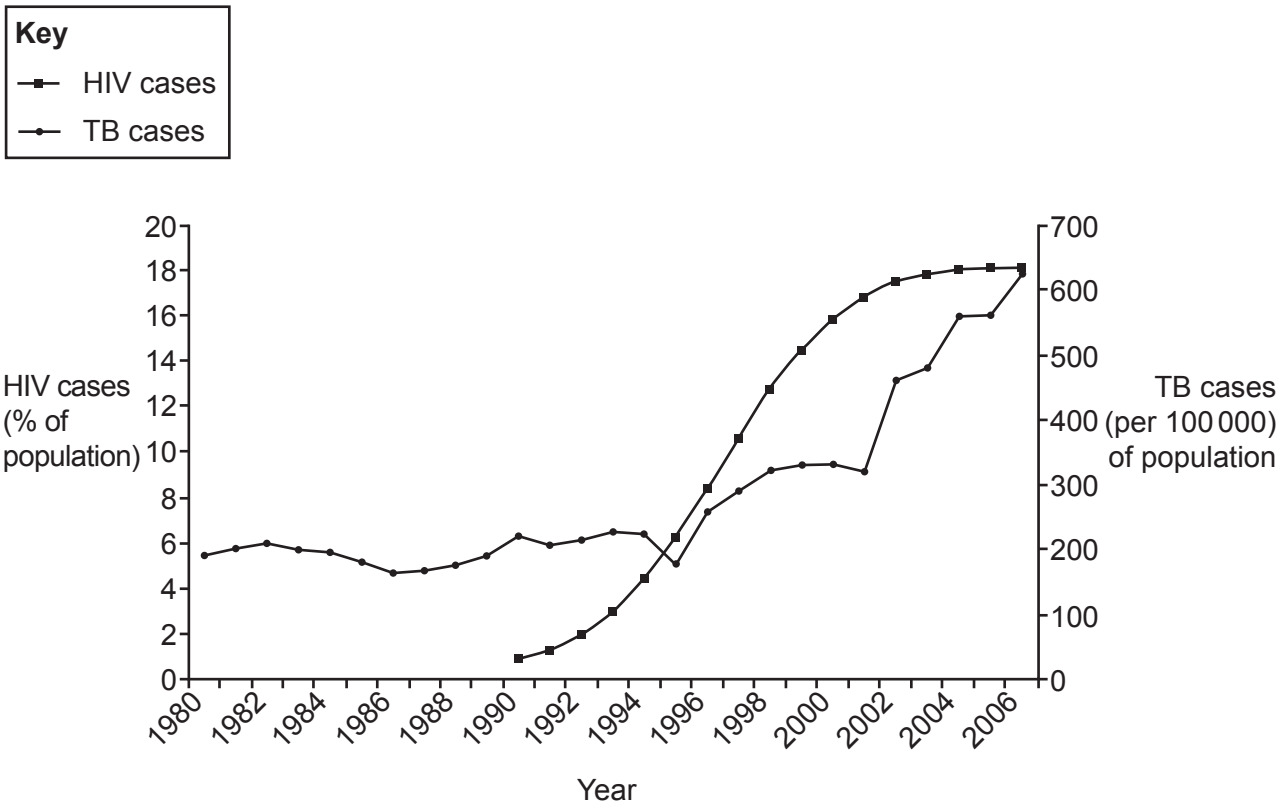
(i) Explain how TB is spread between humans.

.....

.....

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

(ii) The graph shows how the number of cases for HIV and TB have changed between 1980 and 2006 for one country.



Describe how the graph shows a link between HIV and TB.

.....

.....

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

(iii) Describe how the **lungs** defend the body against infection from TB bacteria.

.....

.....

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

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(b) The lungs can also be affected by cancer.

Complete these sentences to describe what cancer is.

Use the words in the list.

differentiated	**meiosis**	**mitosis**	**multiple**	**undifferentiated**

Cancer is the result of uncontrolled growth when cells divide by ..... .

This may lead to millions of ..... cells that are unable to become specialised.

[2]

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13 (a) A student models the inheritance of sex using two coins.

- The student puts a **red** sticker on **both** sides of one coin to represent a **female**.
- They then put a **red** sticker on one side and a **white** sticker on the other side of a second coin to represent a **male**.

Which of the two sex chromosomes is represented by each colour?

Red = ... chromosome

White = ... chromosome

[1]

(b) The student tosses the two coins 10 times and records the colour of the sticker showing on each coin.

The table shows their results.

Male coin	Female coin	Offspring Boy (B) or Girl (G)?
red	red	G
red	red	
white	red	
white	red	
white	red	
red	red	
white	red	
white	red	
red	red	
white	red	

The offspring is determined by the colour recorded for each coin.

(i) Complete the column for the offspring. One has been done for you. **[1]**

(ii) Calculate the ratio of boys to girls in the 10 offspring.

Ratio of boys : girls = ... **[1]**

(iii) The results do **not** match the expected ratio.

What is the expected ratio of offspring for boys : girls?

..... **[1]**

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(c) Explain why the results do **not** match the expected ratio.
Suggest how the student could develop the experiment to get closer to the expected result.

.....

.....

.....

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

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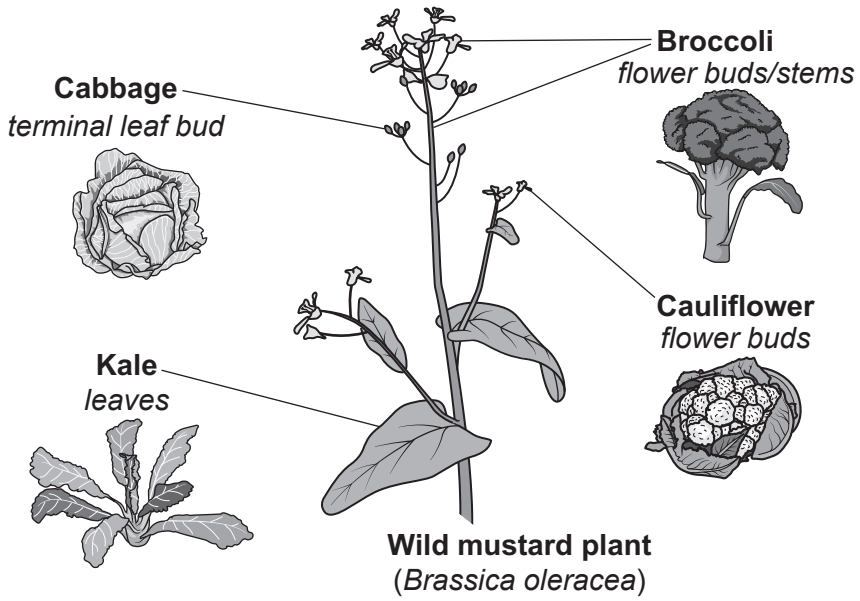
14 The diagram shows some crops that have been developed from a wild mustard plant.



(a) The cauliflower crops grown today have taken many years to develop.

Name the process used by humans to develop cauliflower plants from wild mustard plants.

Put a tick (✓) next to the correct answer.

Artificial engineering	
Evolution	
Natural selection	
Selective breeding	

[1]

(b) Some bacteria have genes which mean that they can produce a natural insecticide. Scientists have produced cauliflowers that contain these genes. This means the cauliflowers can now make their own natural insecticide.

(i) What is modified inside the cauliflower so that it has the genes?

..... **[1]**

(ii) Suggest **one** reason for and **one** reason against producing cauliflowers with these genes.

For: .....

.....

Against: .....

.....

[2]

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(c) Scientists can now treat blood disorders using gene therapy. To do this they need to obtain blood stem cells.

(i) Scientists can obtain blood stem cells from different sources.

Name the different types of stem cell that could be obtained from these two sources:

Bone marrow .....

Fertilised egg after 3 to 5 days ..... **[2]**

(ii) The blood stem cells are then modified before being placed into the patient.

Complete these sentences to explain the benefits of using modified stem cells.

The stem cells can be modified to stop the ..... blood cells of the immune system detecting the stem cells.

This will reduce the chance of ..... .

[2]

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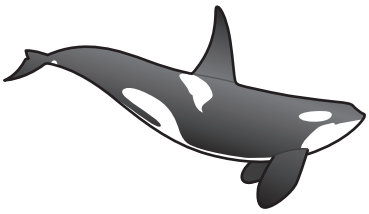
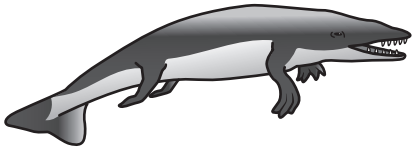
15 (a) The diagram shows a killer whale and three species thought to be ancestors of the killer whale.



Killer whale

Species A

Species B



Species C

(i) Killer whales evolved from ancestors that walked on land and then went back into the sea.

Complete the table to show the time when each species **A**, **B** and **C** existed on this planet.

Species	Time the species existed on this planet
killer whale	present day
.....	41 million years ago
.....	43 million years ago
.....	48 million years ago

[2]

(ii) Species **A**, **B** and **C** have **not** existed on this planet for millions of years.

What have scientists used to provide evidence for the evolution of the killer whale?

..... **[1]**

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***(b)** Many tour companies offer whale watching sight-seeing trips when visiting Monterey in California. Read the article about whale watching trips.

> One of the best things to do in Monterey is to join one of the whale watching trips offered year-round in Monterey Bay.
>
> These trips allow the thousands of tourists that visit our area to see the spectacular diversity and large numbers of whales, dolphins and other wildlife.
>
> Marine biologist guides will accompany the trips. They provide information for the tourists and collect valuable data on the marine mammals that are sighted.
>
> The boats used are old whaling boats driven by diesel engines. Their original purpose was to hunt the whales for food but the hunting is now banned in Monterey Bay.

Explain how whale watching activities impact on biodiversity in Monterey Bay.

Your answer should include:

- benefits and challenges to maintaining biodiversity
- a judgement about the effect whale watching has on marine life.

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..... **[6]**

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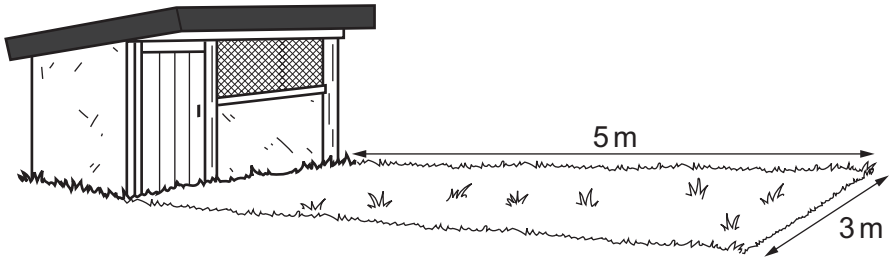
16 Two students investigate the population of daisies in a lawn. The diagram shows the lawn in front of a shed.



(a) (i) Complete these sentences about the method the students use to find the population of daisies.

Use the words in the list.

pooter	**quadrat**	**random**	**square**

The lawn is sampled using a square frame called a ..... .

Drop the square frame over one shoulder to provide a ..... sample.

Count and record the number of daisy plants present in the square grid.

Repeat this process in 10 different areas of the lawn.

[2]

(ii) **Table 16.1** shows their results.

Table 16.1

Square frame	1	2	3	4	5	6	7	8	9	10	**Total**
Number of daisies counted	14	3	8	10	16	15	11	10	11	12	110

Estimate the population of daisies in the lawn.

- The students used a 0.5 m × 0.5 m frame to sample the lawn.
- The lawn size is 5 m × 3 m.

Estimate of population of daisies in the lawn = ... **[3]**

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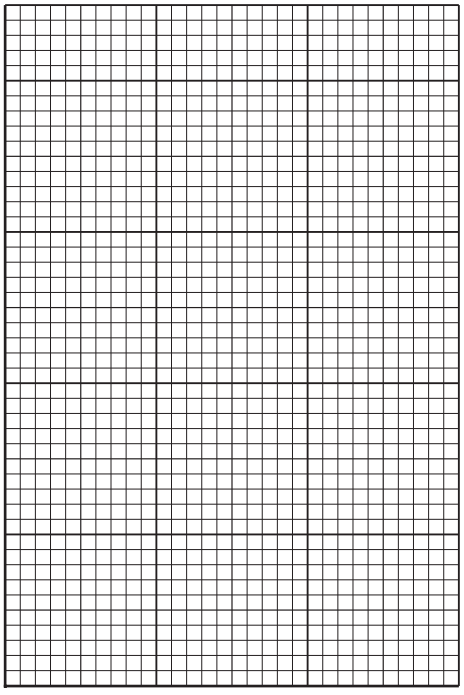
(b) The students develop their investigation to show how the shed affects where daisies grow in the lawn.

Table 16.2 shows the results.

Table 16.2

Distance from shed (m)	Number of daisies
1.0	0
1.5	2
2.0	4
2.5	6
3.0	8
3.5	10
4.0	12
4.5	14
5.0	16

(i) Plot a line graph of the results from **Table 16.2**. Draw a straight line of best fit.



[4]

(ii) Use the graph to determine the slope of the line.

Slope = ... **[1]**

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(iii) Daisy plants require lots of light.

Explain the effect of the shed on the growth of daisies in the lawn.

.....

.....

.....

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

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

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