OCR
Oxford Cambridge and RSA

Friday 7 June 2024 – Afternoon

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

J250/02 Biology (Foundation Tier)

Time allowed: 1 hour 10 minutes

F

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

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

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.

Section A

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

Write your answer to each question in the box provided.

1 What traps harmful microorganisms in human lungs?

A Acid

B Hairs

C Mucus

D Plasma

Your answer ☐ **[1]**

2 A student investigates the number of plant species growing in one area.

Which piece of scientific equipment will they use?

A Balance

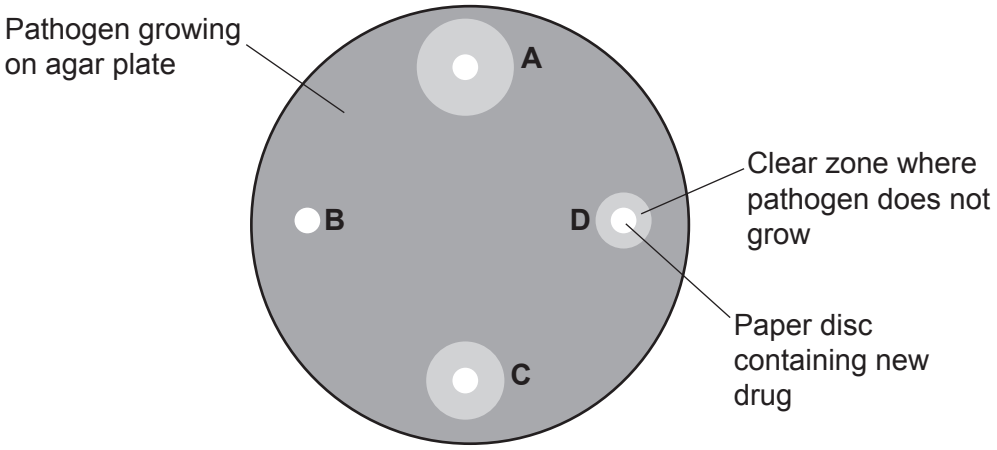
B pH probe

C Pooter

D Quadrat

Your answer ☐ **[1]**

3 Scientists test the effect of new drugs on the growth of a pathogen.



Which new drug has **no** effect on the growth of the pathogen?

Your answer ☐ **[1]**

4 Which word describes all the physical features and living organisms in an area?

A Community

B Ecosystem

C Habitat

D Interdependence

Your answer ☐ **[1]**

5 Eye colour, height and weight in humans all show variation.

Which of these are examples of **continuous** variation?

A Eye colour and height

B Eye colour, height and weight

C Height and weight

D Height only

Your answer ☐ **[1]**

6 Which process is required to recycle both carbon and nitrogen?

A Condensation

B Decomposition

C Photosynthesis

D Precipitation

Your answer ☐ **[1]**

7 Which risk is decreased by using adult stem cells instead of embryonic stem cells in skin transplants?

A Fatty deposits forming below the skin

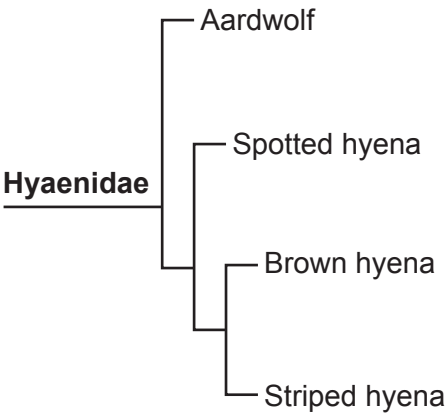
B Rejection of transplanted skin

C Skin becomes less waterproof

D Skin cancer developing

Your answer ☐ **[1]**

8 The diagram shows a phylogenetic tree for a group of related animals.



Which two animals are most closely related?

A Aardwolf and spotted hyena

B Aardwolf and striped hyena

C Brown hyena and spotted hyena

D Brown hyena and striped hyena

Your answer ☐ **[1]**

9 Gardeners are changing the way they care for their gardens.

Which change would **increase** biodiversity?

A Adding chemical fertilisers to a grass lawn

B Cutting a grass lawn more often than usual

C Removing a grass lawn area and putting down paving stones

D Replacing a grass lawn area with a wild flower meadow

Your answer ☐ **[1]**

10 Which row is a correct comparison of meiosis and mitosis?

	Involves cell division	**Halves the number of chromosomes**	**Requires DNA replication**
A	both	meiosis only	both
B	both	both	both
C	meiosis only	both	mitosis only
D	mitosis only	meiosis only	mitosis only

Your answer ☐ **[1]**

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Section B

11 Inheritance is passing genetic material from one generation to the next.

(a) Draw lines to connect each **term** used in inheritance with its correct **definition**.

Term	Definition
	a change in the structure of DNA
Chromosomes	different versions of the same gene
Mutation	nucleus containing two different genes
	strands of DNA containing genes

[2]

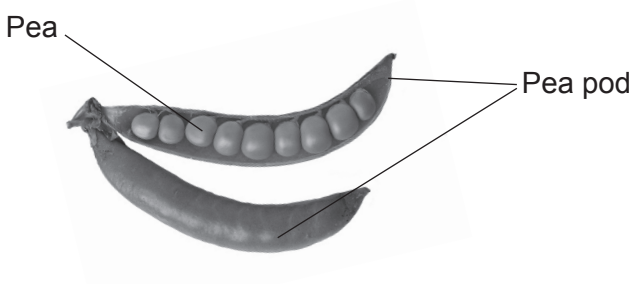
(b) Which terms describe sex cells in humans?

Tick (✓) **two** boxes.

- Diploid ☐
- Double helix ☐
- Gamete ☐
- Genome ☐
- Specialised ☐
- Undifferentiated ☐

[2]

(c) Peas develop inside pods.



Pea pods can be green or yellow.

(i) A pea plant with green pods is crossed with a pea plant with yellow pods.
All the pods on the new plant are green.

Complete the sentences about the pea pods.

Use words from the list.

dominant	**haploid**	**heterozygous**
homozygous	**recessive**	

The results of this cross show that the allele for green is ..... and the allele for yellow is ..... .

The genotype of the new plant is **Gg**. This means it is ..... for pod colour.

[3]

(ii) The new plants with green pods are then crossed.

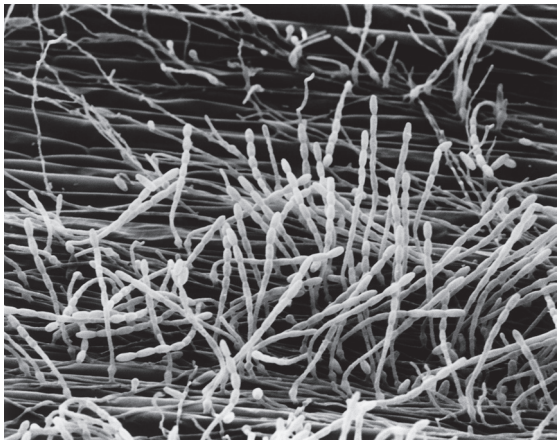
What is the probability that a plant from this cross will have **yellow** pods?

Complete the genetic diagram to explain your answer.

		green pods	
		G	**g**
green pods	**G**		
	g		

Probability = ... **[2]**

12 The picture shows the plant pathogen that causes powdery mildew.



(a) Complete the sentences about powdery mildew.
Use words from the list.

bacterium	**chlorophyll**	**decrease**	**fungus**
increase	**threat**	**virus**	**wind**

Powdery mildew is caused by a pathogen that is a ..... .

The disease is spread by spores which travel to new plants by ..... .

The powdery mildew covers the leaves which could result in less light being absorbed by ..... .

Visual identification of disease is one way to ..... the spread of the disease.

[4]

(b) Why is powdery mildew called a **communicable disease**?

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

(c) Describe how selective breeding is used to make plants resistant to powdery mildew.

.....

.....

.....

.....

..... **[3]**

13 New medicines are developed all the time.

(a) Insulin is a protein used to treat diabetes. The human stomach contains an enzyme that is specific to proteins like insulin.

Suggest why it is difficult to develop an insulin medicine that is swallowed.

.....

.....

.....

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

(b) Which type of medicine has been developed to treat HIV?

Put a (ring) around the correct option.

antibiotic **antigen** **antiseptic** **antiviral**

[1]

(c) Some diseases are treated by changes to lifestyle.

Complete these sentences about cardiovascular disease.

The risk of cardiovascular disease is reduced by a ..... low in saturated fat.

This reduces the risk of blocked arteries therefore allowing more oxygen to be transported to the

..... muscle in the ventricle wall.

[2]

14 The moisture content in soil affects the growth of plants.

A student investigates the moisture content of different soils.

This is the method they use:

- Measure the mass of each soil sample.
- Place the soil samples in a warm oven to dry for 4 hours.
- Measure the mass of each soil sample again.

The table shows their results.

Soil sample	Mass of soil sample at start (g)	Mass of soil sample after drying (g)	Change in mass of soil sample (g)
A	120.1	97.3	.....
B	154.2	125.5	.....
C	126.3	121.3	.....

(a)

(i) Calculate the change in mass for each soil sample.

Write your answers in the table.
Give **all** answers to the **same** number of decimal places.

[2]

(ii) The student uses the changes in mass to conclude that soil sample **B** had the highest percentage moisture content.

Suggest why the student **cannot** make a fair comparison between the samples.

.....

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

(iii) Describe **two** ways the student could improve their investigation to get a valid conclusion.

1 .....

.....

2 .....

.....

[2]

(b) Explain how **low** moisture content in soil affects transpiration in plants.

.....

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.....

..... **[3]**

(c) Moisture content is one abiotic factor that affects plants.

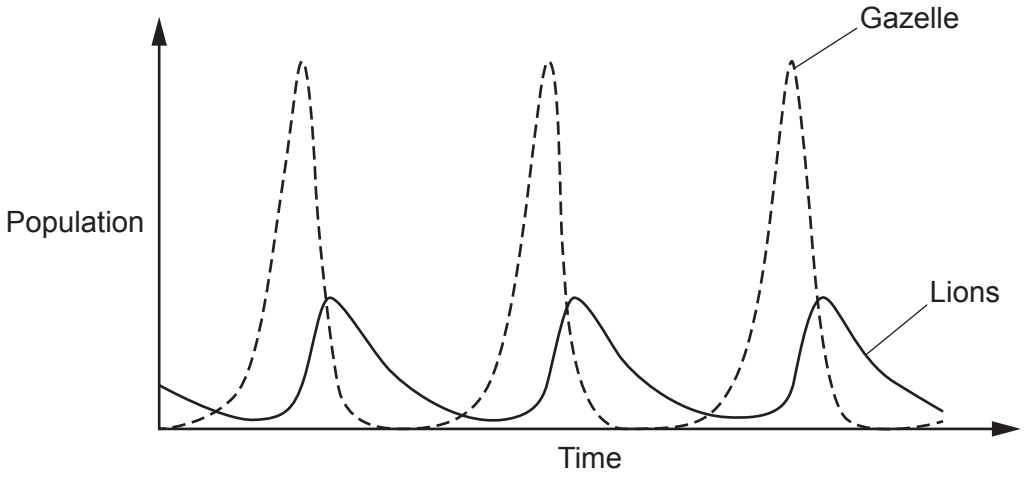
State **two** other abiotic factors that affect plant growth.

1 .....

2 .....

[2]

15* The graph shows the changes in population of a predator and its prey.



Describe **and** explain the trends in the graph.
Identify the predator and the prey using evidence from the graph to support your choice.

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

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16 Scientists are concerned that increased pollution in a forest is affecting the population of insects living in the forest.

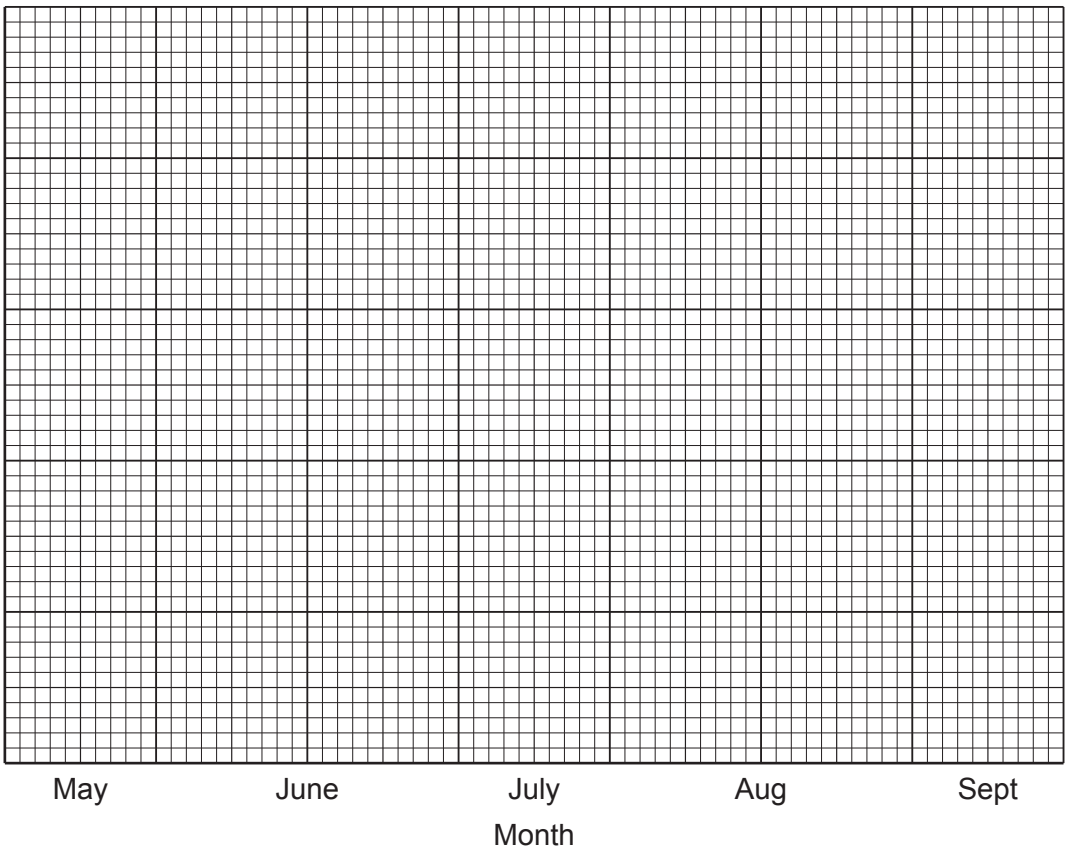
(a) In an investigation, scientists estimated the population of **flying** insects in a forest.

- They trap the insects using nets.
- The mass of insects collected each month is then recorded. The data is collected in two different years, 1995 and 2015.

The table shows their results.

Month	Mass of insects trapped (g)	
	1995	**2015**
May	450	50
June	520	120
July	920	160
August	420	110
September	100	20

(i) Complete the bar chart to show the mass of insects collected each year.
Both years should be included on the same grid.
Include a Key to identify which year the bars represent.



[4]

(ii) What **two** conclusions can be made about the mass of flying insects in 1995 compared to 2015?

1 .....

.....

2 .....

.....

[2]

(iii) How can the scientists' method be developed to investigate biodiversity in the forest?

Tick (✓) **one** box.

Place traps in different parts of the forest.	
Record the number of different species found in the nets.	
Repeat their method again in 2025 to see if mass changes.	
Use their data to calculate mean mass for each year.	

[1]

(b) In a separate investigation, scientists estimated the population of insects that live on the forest **ground**.

The scientists trap insects using a pitfall trap.
This is a hole in the ground that the insects fall into when they crawl along the ground.

For each estimate they use this method:

- Place pitfall traps in different areas of the forest.
- Count the total number of insects caught in the pitfall traps.
- Mark the insects.
- Release the insects where they are collected from.

A week later they trap a second sample of insects.

(i) The scientists used an ink that is not easily washed off to mark the insects for identification.

State **one** other precaution that they should take when deciding how to mark the insects.

.....

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

(ii) They complete their investigation during July 1995 and July 2015. This table shows the results of this investigation.

Year	Number of insects in first sample	Total number of insects in second sample	Number of marked insects in second sample
1995	114	60	8
2015	146	63	6

The scientists use this formula to estimate the population of insects living on the forest ground:

$$\text{Estimated population size} = \frac{\text{number in first sample} \times \text{total number in second sample}}{\text{number of marked insects in second sample}}$$

The population of insects in 1995 is estimated to be 855.

Use the formula to estimate the population size of insects in **2015**.
Give your answer to **3 significant figures**.

Estimated population of insects = ... **[2]**

(c) The aim of each investigation is to see if increased pollution has affected the insect population.

The population of insects living on the forest ground increased between 1995 and 2015.

Which statements about the two investigations are **true**, and which are **false**?

Tick (✓) **one** box in each row.

	True	False
Both investigations came to the same conclusion about changes in insect population.		
All insects living in the forest have been negatively affected by the increased pollution.		
Only one investigation shows how the insect population changes with each month.		
The two methods used to trap the insects will result in different types of insects being trapped.		

[2]

END OF QUESTION PAPER

EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.