

Friday 9 June 2023 – Afternoon

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

J250/02 Paper 2 (Foundation Tier)

Time allowed: 1 hour 10 minutes



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

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Candidate number

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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.

2
Section A

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

Write your answer to each question in the box provided.

1 Which word describes the entire genetic material of an organism?

- A** Chromosome
- B** Genome
- C** Nucleus
- D** Phenotype

Your answer

[1]

2 Which is a **positive** impact of humans on the environment?

- A** Building roads and houses on protected land.
- B** Cutting down forests to plant crops.
- C** Hunting endangered species.
- D** Stopping the use of plastic drinking straws.

Your answer

[1]

3 Which is an example of an antiseptic?

- A** A chemical injected into the blood to prevent infection.
- B** A drug taken as a tablet to reduce an infection.
- C** Cream put on the skin to kill harmful microorganisms.
- D** Part of a pathogen that triggers an immune response.

Your answer

[1]

4 Which type of pathogens cause crown gall disease in plants?

- A Bacteria
- B Fungi
- C Protists
- D Viruses

Your answer

[1]

5 Tuberculosis is a disease of the lungs. The number of cases of tuberculosis in the UK between 1914 and 1987 decreased from 99497 to 5086.

Which could be a reason for this decrease?

- A Development of a vaccine for tuberculosis
- B Development of industrial processes that produce pollution
- C Increase in population between 1914 and 1987
- D Increase in the number of people who smoke

Your answer

[1]

6 Which row shows the correct levels of organisation in an ecosystem?

Smallest \longrightarrow Largest

A	community	population	species	ecosystem
B	community	species	population	ecosystem
C	species	population	community	ecosystem
D	species	community	population	ecosystem

Your answer

[1]

7 Which is an example of selective breeding?

- A Bacteria developing antibiotic resistance.
- B Farmers developing food plants resistant to disease.
- C Gardeners adding nitrogen to the soil to help plants grow.
- D Scientists changing the genes of an organism.

Your answer

[1]

8 There are interactions between some types of disease.

Which is an example of two diseases that interact?

- A Cervical cancer and HPV
- B Cervical cancer and tuberculosis
- C HIV and HPV
- D HPV and tuberculosis

Your answer

[1]

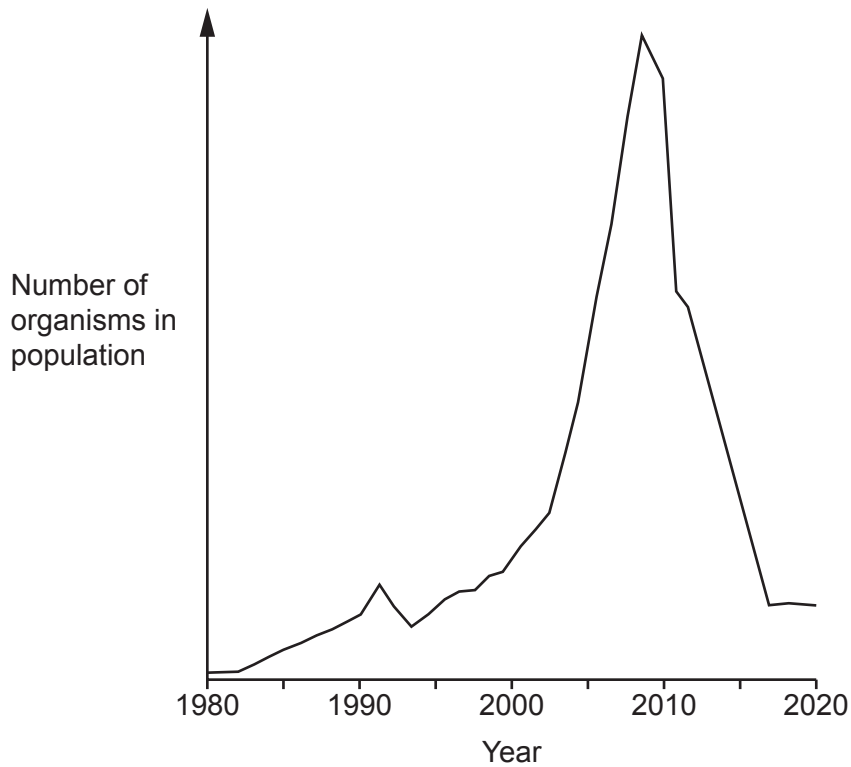
9 Which is a **true** statement about artificial classification?

- A It is based on the observation of only one or a few characteristics.
- B It involves the use of DNA sequencing.
- C It relies on the use of phylogenetics.
- D It uses the fossil record to link common ancestors.

Your answer

[1]

10 The graph shows the changing population of one species in a habitat.



Predict the years when this species had the **highest** availability of their food source.

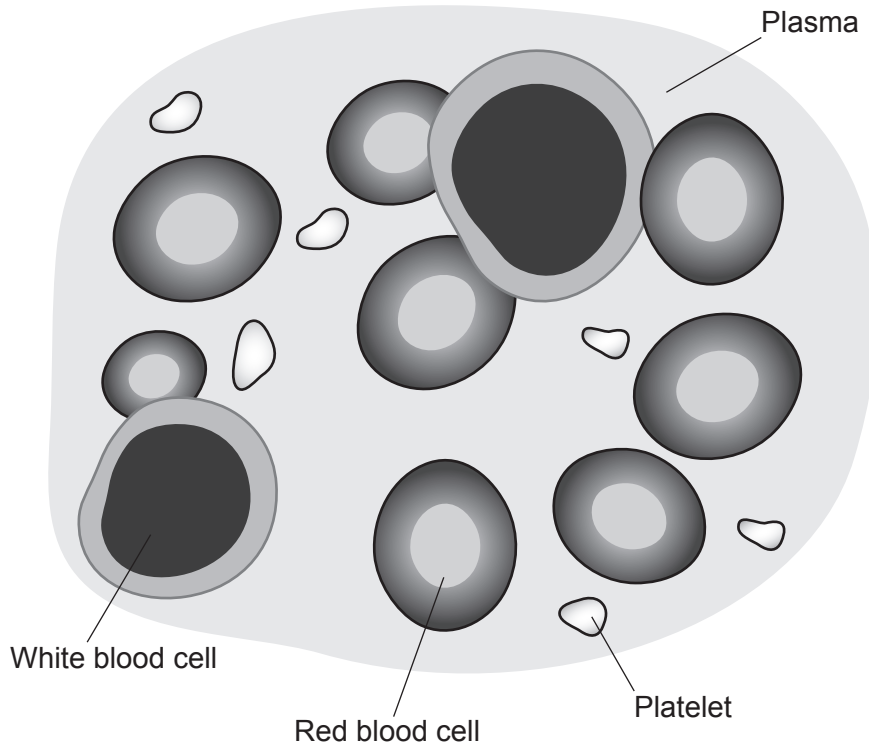
- A Between 1980 and 1990
- B Between 1990 and 2000
- C Between 2000 and 2010
- D Between 2010 and 2020

Your answer

[1]

Section B

11 (a) The diagram shows the main components of the blood.



(i) Complete the table to show which part of the blood is liquid and which helps blood to clot.

Put **one** tick (✓) in each row.

	Part of blood			
	Platelet	Plasma	Red blood cell	White blood cell
Liquid				
Helps blood to clot				

[2]

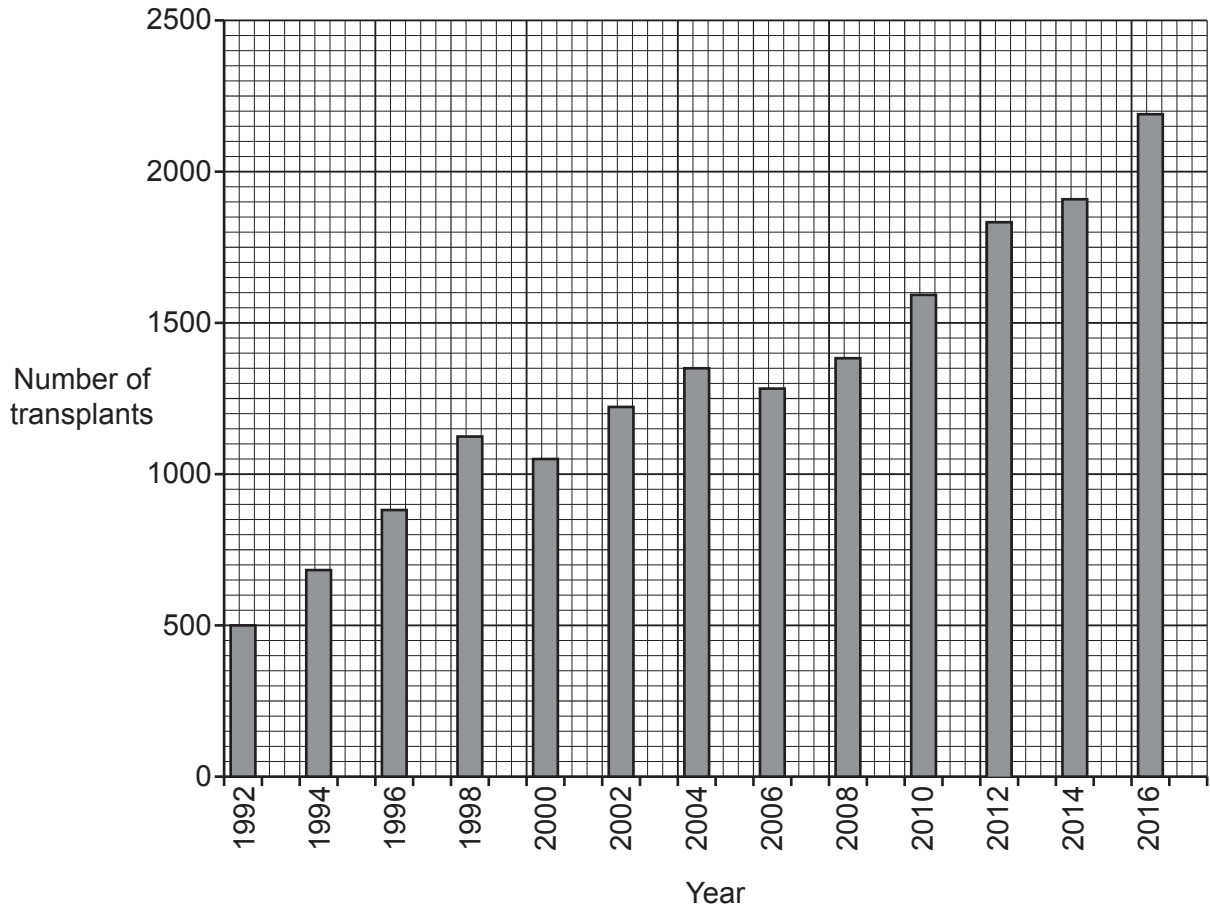
(ii) Describe **two** differences in the **structure** of red blood cells and white blood cells.

- 1
-
- 2
-

[2]

- (b) Some blood diseases are treated using blood stem cell transplants. Healthy blood stem cells from another person (donor) are injected into the bones of the patients so that the blood stem cells can differentiate into healthy blood cells.

The graph shows the number of blood stem cell transplants for one country.



(i) In which year were there the most number of transplants?
 [1]

(ii) Describe the overall trend in the number of transplants shown in the graph.
 [1]

(iii) The blood stem cells used in these transplants are adult stem cells from a donor.

Stem cells can also be taken from embryos.

Write down **one** benefit and **one** risk of using adult stem cells from a donor.

Benefit

.....

Risk

.....

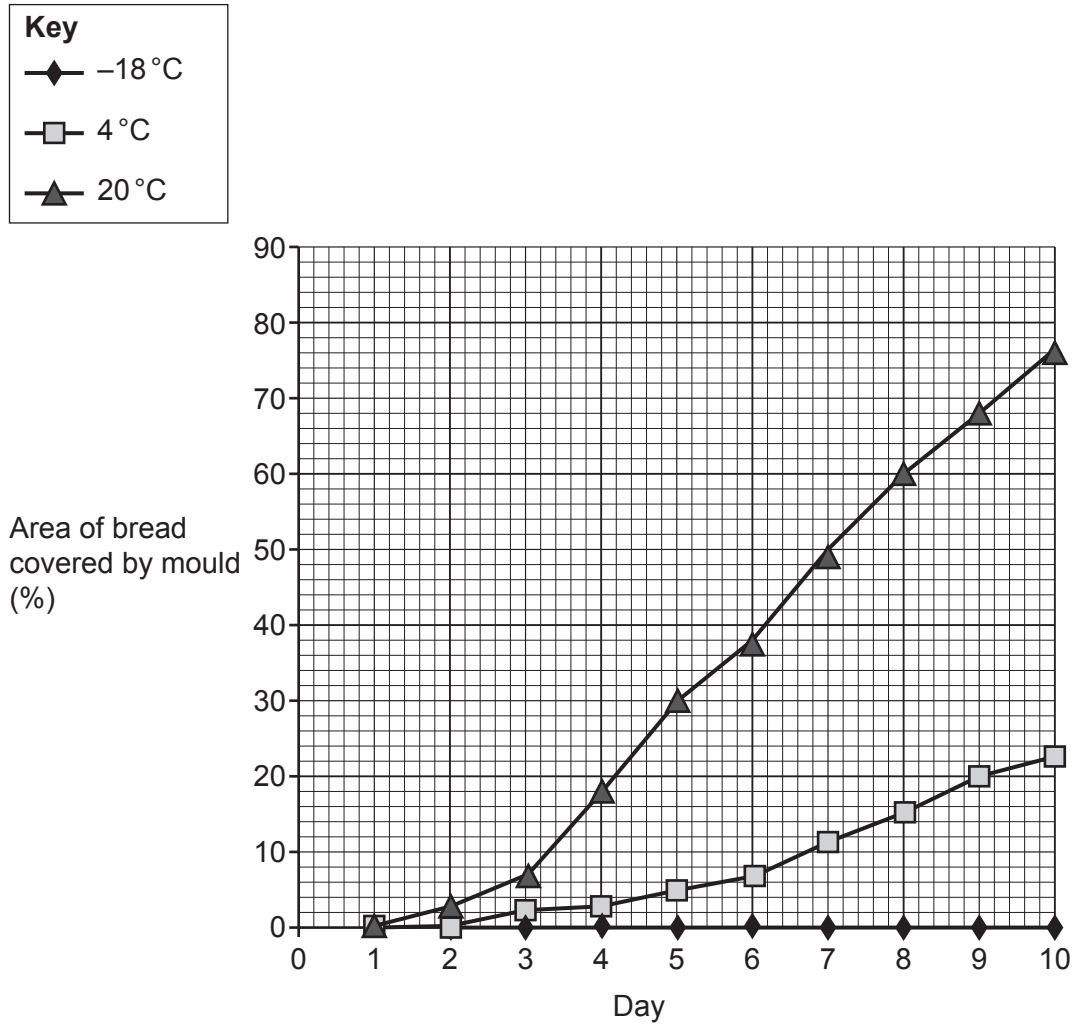
[2]

12 Bread mould is a type of fungus that decomposes plant material.

A student investigates the effect of temperature on decomposition.

- They leave slices of bread at three different temperatures.
- Each day the student records the area of each slice of bread covered by mould.

(a) The graph shows their results.



(i) Which is a correct statement about these results?

Tick (✓) **one** box.

Temperatures $> 4^{\circ}\text{C}$ stop mould decomposing the bread.

Temperatures = to -18°C stop mould decomposing the bread.

Temperatures $> -18^{\circ}\text{C}$ stop mould decomposing the bread.

Temperatures = to 4°C stop mould decomposing the bread.

[1]

(ii) Look at the results for 20 °C.

Calculate the increase in area covered by mould between **day 5** and **day 10**.

Increase in percentage area covered = % [2]

(b) Suggest how the student could change their method to investigate the effect of **moisture** on decomposition.

.....

.....

.....

..... [2]

(c) Decomposers release carbon from decaying plant material as part of the carbon cycle.

Complete the table to describe **two** different processes in the carbon cycle.

Process	Description	Takes in carbon from the atmosphere	Releases carbon into the atmosphere
.....	occurs in chloroplasts	✓	✗
combustion	burning of fossil fuels

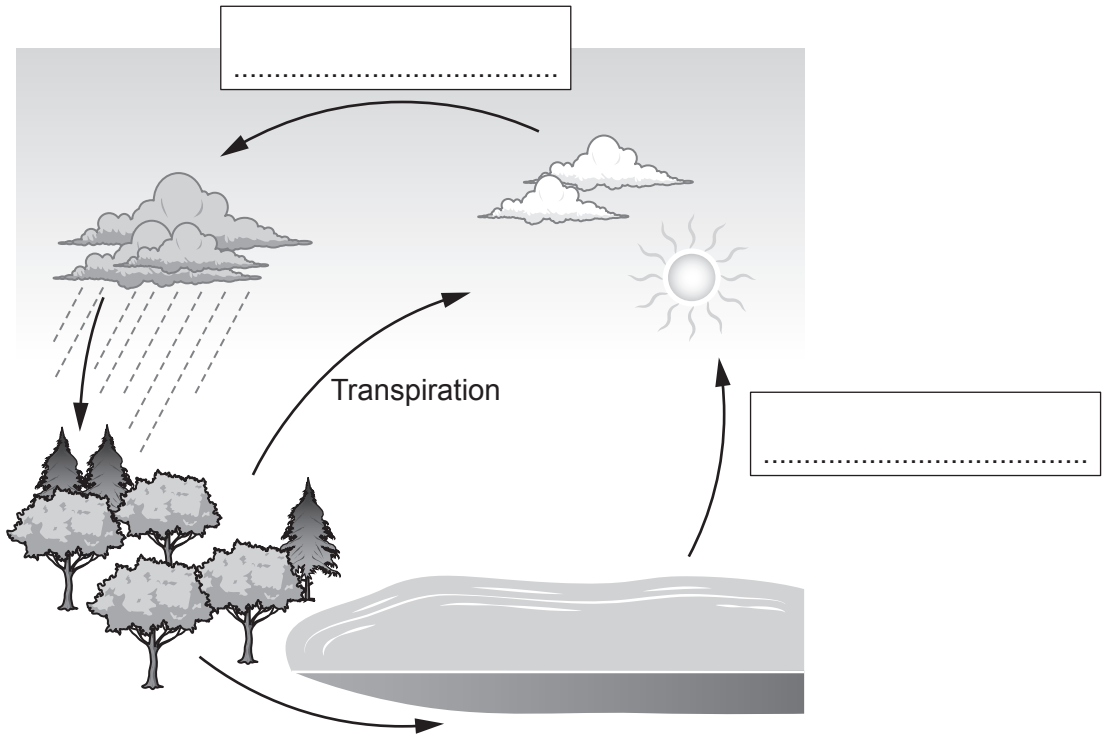
[2]

(d) The diagram shows the water cycle.

(i) Complete the diagram.

Use the words from the list.

- | | | | | |
|------------|--------------|-------------|---------------|-------------|
| Collection | Condensation | Evaporation | Precipitation | Respiration |
|------------|--------------|-------------|---------------|-------------|



[2]

(ii) Explain why transpiration is important to the plant communities in an ecosystem.

.....

.....

.....

..... [2]

- 13 The picture is of a sword-billed hummingbird feeding on a flower.



- The hummingbird feeds on nectar from the flower.
- The flower benefits because the hummingbird transfers pollen from one flower to the next.
- This helps the flower to reproduce and develop seeds.

- (a) Which word describes the interdependence between the hummingbird and the flower?

Put a ring around the correct answer.

competition

mutualism

parasitism

predation

[1]

- (b) The long beak of the hummingbird is an adaptation that helps the bird to feed. The bird's ancestors had shorter beaks.

Complete the sentences about the long beak of the sword-billed hummingbird.

The ancestors of the sword-billed hummingbird showed in beak length.

Members of the species with longer beaks fed on more nectar.

This meant they were more likely to

The allele for longer beaks was passed on to the next





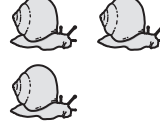
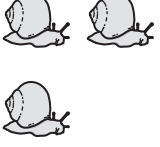

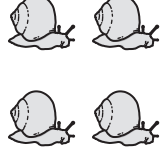




Over time, all the hummingbirds evolved to have longer beaks.

This process is called natural

[4]

14 (a) A student draws a grid containing some snails to model a habitat with snails living in it.

They then take a random sample from their grid.

1 	2 	3 	4 	5 
6 	7 	8 	9 	10
11 	12 	13 	14	15

This is the method they follow:

- Write numbers 1 to 15 on pieces of paper.
- Put the pieces of paper in a bag.
- Take one piece of paper out of the bag to select the number of the square.
- Record the number of snails in that square.
- Choose three more squares in the same way.

The table shows their results.

Attempt	Number of square	Number of snails
1	8	4
2	13	2
3	5	3
4	6	3

(i) Calculate the **mean** number of snails in the four squares listed in the table.

Mean = snails [2]

(ii) The student estimates the total population by multiplying the mean by the number of squares, which is 15.
The actual total population in the 15 squares is 22.

Suggest **two** reasons why the student's estimate is different to the actual total population.

1

.....

2

.....

[2]

(iii) Suggest **one** way the student could change their method to improve their estimate, without counting all of the snails.

.....

..... [1]

(b) The method of capture–recapture can be used to estimate the population of snails in their actual habitat.

Describe how the student could use the method of capture–recapture to estimate the snail population.

Include the name of any apparatus the student should use.

.....

.....

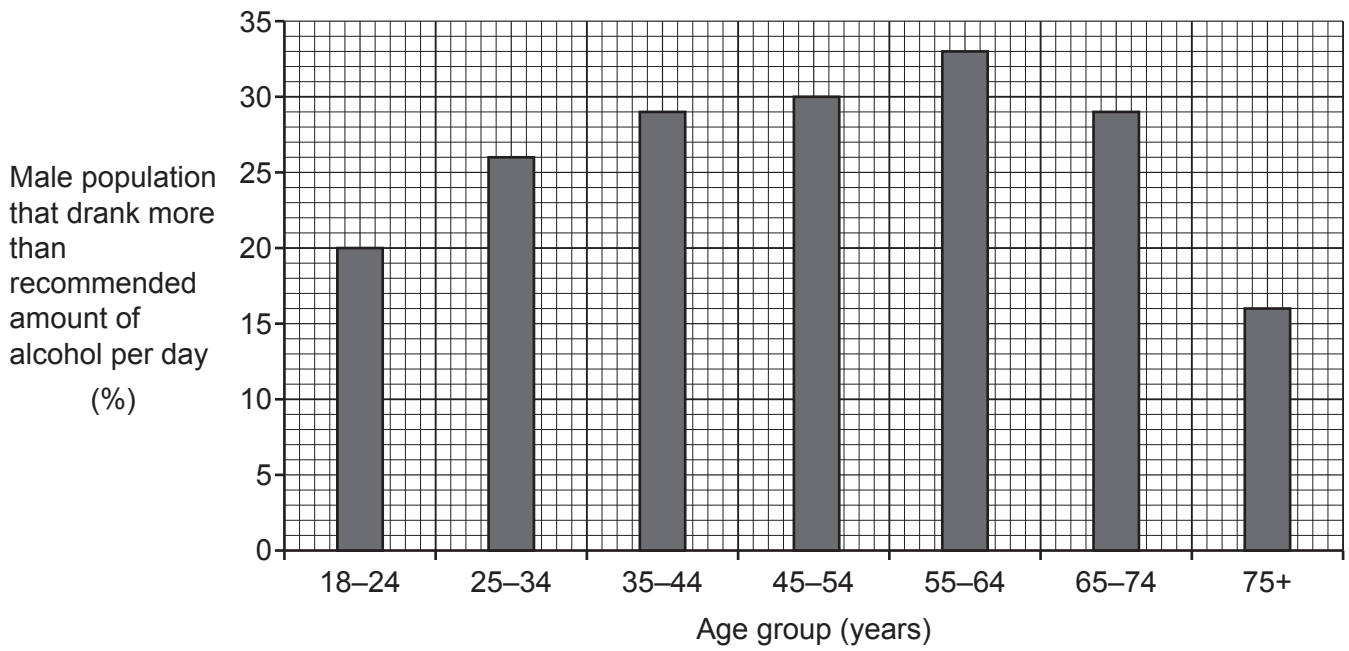
.....

.....

..... [3]

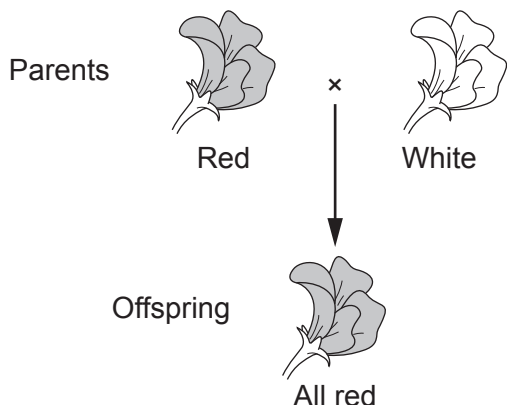
15* A survey recorded the percentage of the male population that drank more than the recommended amount of alcohol per day.

The bar chart shows the results.



- 16 A gardener grows a species of plant that has either red or white flowers. The colour of the flowers is controlled by a single pair of alleles, R and r.

The gardener crosses a plant that is homozygous for red flowers with a plant that is homozygous for white flowers.
The diagram shows the results.



- (a) (i) Explain why the offspring in the diagram are **all** red.

.....

 [2]

- (ii) The offspring are all heterozygous for flower colour.

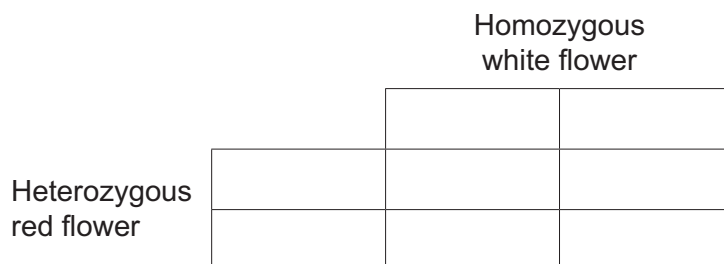
What is meant by the term **heterozygous**?

..... [1]

- (b) The gardener crosses one of these offspring plants with a plant that is homozygous for white flowers.

Predict the probability that the next generation of plants will have white flowers.

Complete the genetic diagram to explain your answer.

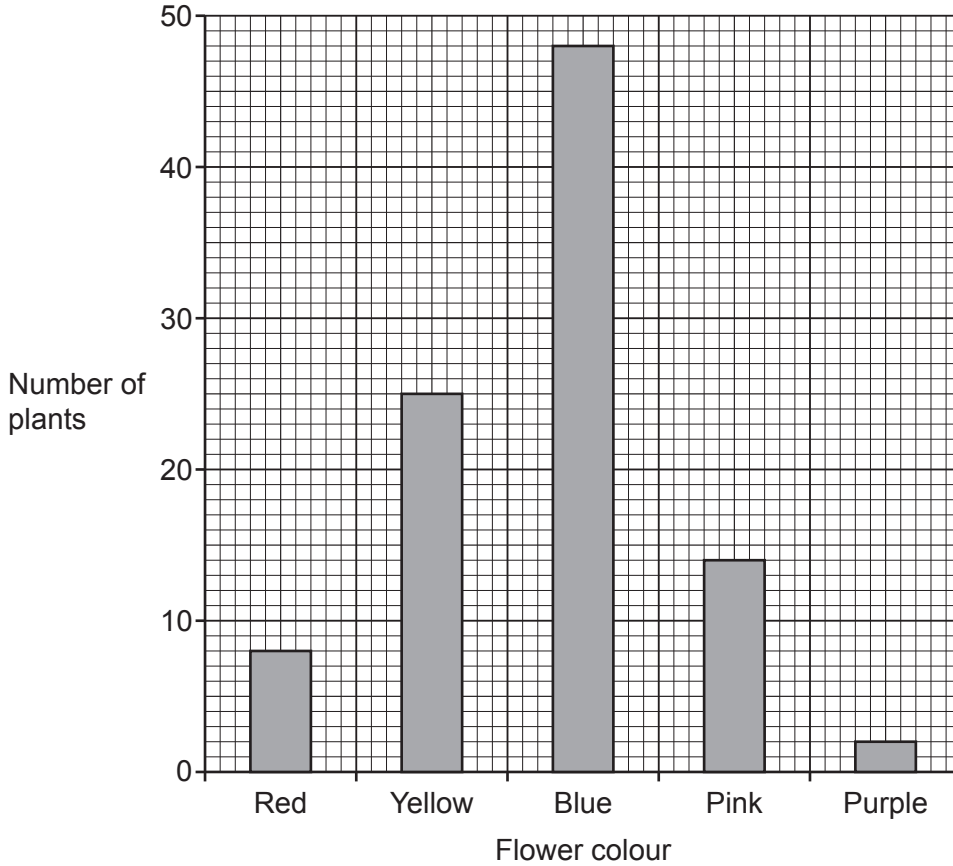


Probability = [3]

- (c) The gardener grows another species of plant that can produce flowers of five different colours.

The gardener counts the number of plants for each flower colour.

The graph shows their results.



- (i) The gardener counted 97 plants.

Calculate the percentage of these plants that have blue flowers.

Give your answer to the nearest whole number.

Percentage of plants with blue flowers = % [3]

- (ii) What evidence is there in the graph that flower colour is an example of discontinuous variation in this species?

.....
 [1]

(d) The male gametes of a plant are called pollen.

The sentences in the text box are about pollen.

There are two words in the sentences that are **not** correct.

Put **circles** around the **two** words that are **not** correct.

Pollen cells are haploid. This means that the pollen cells of a plant have twice the number of chromosomes as the leaf cells of the plant.

Pollen cells are formed by a type of cell division called mitosis.

[2]

END OF QUESTION PAPER

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).

A large area of lined paper for writing, consisting of 25 horizontal dotted lines. A solid vertical line runs down the left side of the page, creating a margin. The rest of the page is open for writing.

A large area of the page is reserved for writing, featuring a vertical solid line on the left side and horizontal dotted lines extending across the page.

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