



National  
Qualifications  
2024

**X807/76/12**

**Biology  
Paper 1 — Multiple choice**

WEDNESDAY, 15 MAY

9:00 AM – 9:40 AM

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**Total marks — 25**

Attempt ALL questions.

**You may use a calculator.**

Instructions for the completion of Paper 1 are given on *page 02* of your answer booklet X807/76/02.

Record your answers on the answer grid on *page 03* of your answer booklet.

Space for rough work is provided at the end of this booklet.

Before leaving the examination room you must give your answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



\* X 8 0 7 7 6 1 2 \*

Total marks — 25 marks

Attempt ALL questions

1. In a DNA molecule, phosphate groups are found at
- A 3' ends and are joined to bases
  - B 3' ends and are joined to deoxyribose sugar
  - C 5' ends and are joined to bases
  - D 5' ends and are joined to deoxyribose sugar.
2. The DNA in prokaryotes is organised as
- A linear chromosomes and plasmids in the cytoplasm
  - B circular chromosomes and plasmids in the cytoplasm
  - C linear chromosomes in the nucleus and plasmids in the cytoplasm
  - D circular chromosomes in the nucleus and plasmids in the cytoplasm.
3. During PCR, repeated cycles of heating and cooling are used to amplify a region of DNA. Which row in the table identifies the events taking place at 72 °C and 55 °C?

	72 °C	55 °C
A	DNA strands separate	primers bind to target sequences
B	primers bind to target sequences	DNA polymerase replicates the region of DNA
C	DNA polymerase replicates the region of DNA	DNA strands separate
D	DNA polymerase replicates the region of DNA	primers bind to target sequences

4. Which statement about introns is correct?
- A They are coding and retained in the mature transcript.
  - B They are coding and removed from the primary transcript.
  - C They are non-coding and retained in the mature transcript.
  - D They are non-coding and removed from the primary transcript.

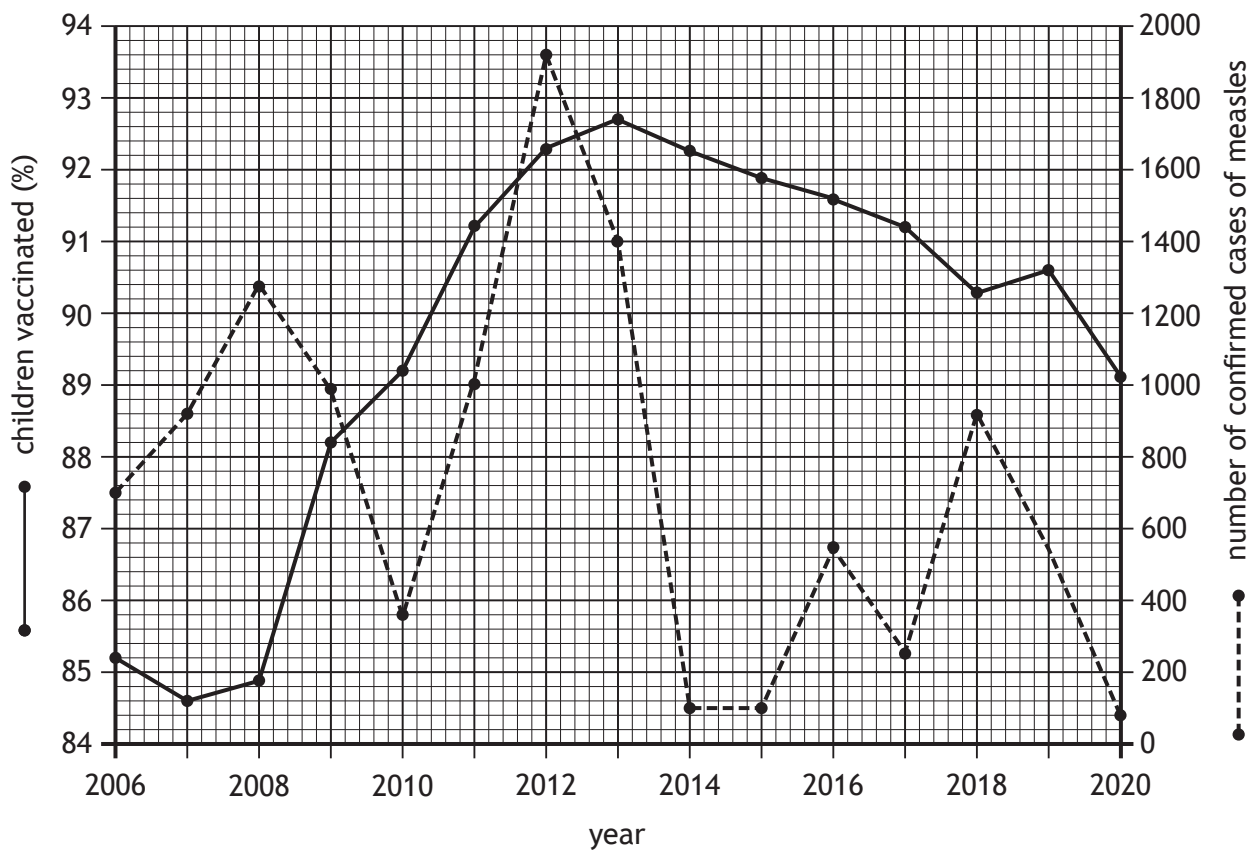
5. The list describes features of stem cells.

1. Involved in growth and repair.
2. All their genes can be switched on.
3. Can divide or differentiate.

Which of these features apply to tissue stem cells?

- A 1 only
- B 1 and 3 only
- C 2 and 3 only
- D 1, 2 and 3

6. The graph shows the percentage of children vaccinated against measles and the number of confirmed cases of measles in children in a region of the UK between 2006 and 2020.



Identify the number of confirmed cases of measles one year after the highest percentage of children were vaccinated.

- A 84.5
- B 92.7
- C 100.0
- D 1720.0

7. Two different colours of peppered moths occur: light and dark.

The moths rest on surfaces during the day and rely on camouflage to avoid predation by birds.

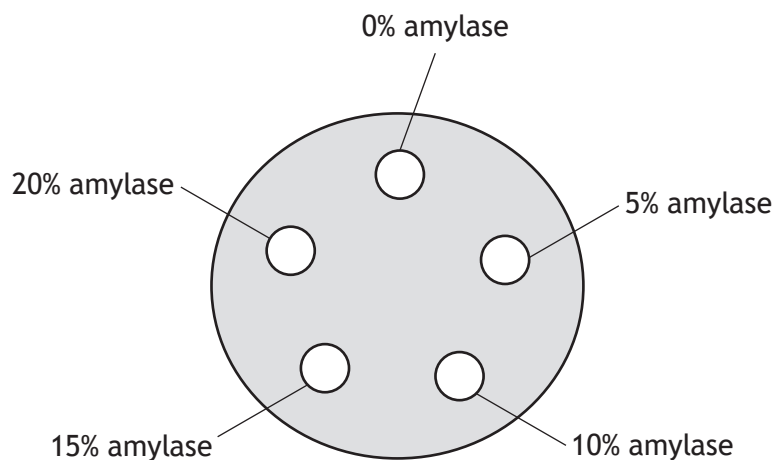
In unpolluted habitats, surfaces are light in colour giving the light moths a selective advantage. The dark moths are predated more by birds in these habitats.

Which row in the table describes the selection and identifies the type of selection involved?

	Description of selection	Type of selection
A	random	disruptive
B	non-random	directional
C	random	directional
D	non-random	disruptive

8. An experiment was set up to investigate the effect of the concentration of amylase on the rate of starch breakdown.

Three starch agar plates, each with five wells containing 100  $\mu\text{L}$  of different amylase concentrations were set up as shown in the diagram.



As the amylase diffuses out of the well it breaks down starch in the agar, turning the agar clear. The plates were incubated at 37 °C for 3 hours and the diameter of the clear zone around each well was measured using a ruler.

Which feature of the design of this experiment would ensure the results were valid?

- A Three plates were set up for each amylase concentration.
- B The same volumes of amylase were used in each well.
- C Different concentrations of amylase were used in each well.
- D The diameter of each clear zone was measured using a ruler.

9. Protease enzymes break down proteins into amino acids.

Which statement about the reaction catalysed by protease enzymes is correct?

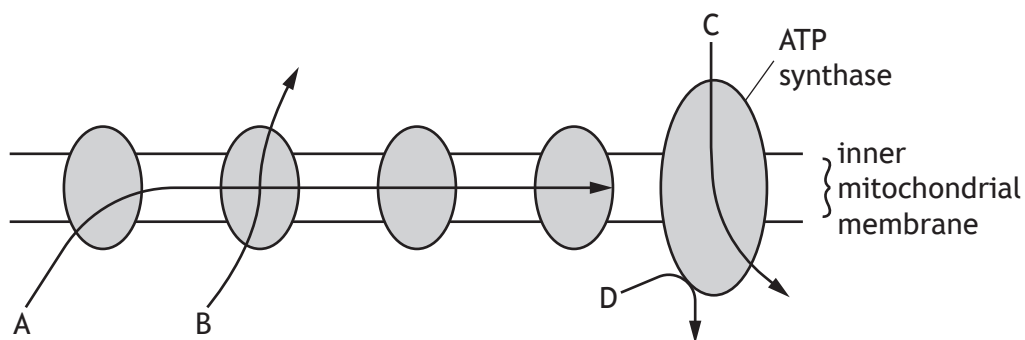
- A Peptide bonds break and energy is released.
- B Peptide bonds break and energy is required.
- C Hydrogen bonds break and energy is released.
- D Hydrogen bonds break and energy is required.

10. Dehydrogenase enzymes catalyse some of the reactions in glycolysis.

Which statement describes the role of these enzymes in glycolysis?

- A They remove hydrogen ions and electrons from NADH.
- B They remove hydrogen ions and electrons from citrate.
- C They transfer hydrogen ions and electrons to glucose.
- D They transfer hydrogen ions and electrons to NAD.

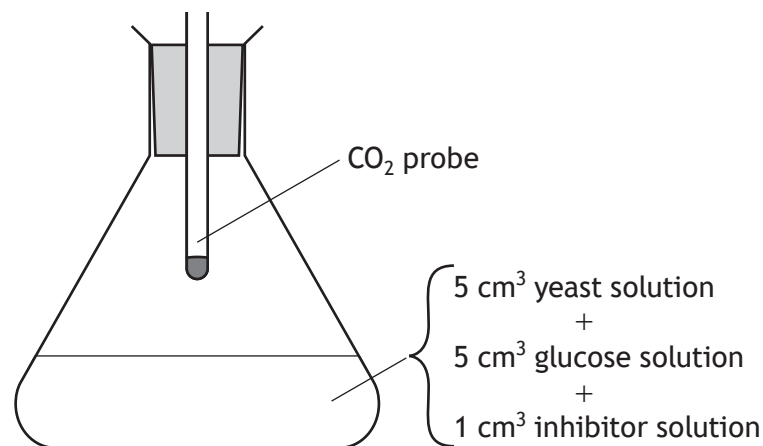
11. The diagram represents some stages of the electron transport chain in aerobic respiration.



Which arrow shows the pumping of hydrogen ions across the inner mitochondrial membrane?

[Turn over

12. An investigation was carried out into the effect of an enzyme inhibitor's concentration on the rate of respiration in yeast. Five different flasks were set up as shown.

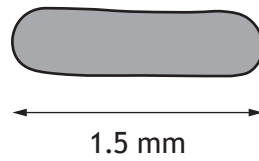


Each flask contained a different concentration of inhibitor. The CO<sub>2</sub> concentration was measured by the probe.

In a suitable control experiment for this investigation the flask should contain

- A 5 cm<sup>3</sup> yeast solution and 5 cm<sup>3</sup> glucose solution
  - B 5 cm<sup>3</sup> yeast solution, 5 cm<sup>3</sup> glucose solution and 1 cm<sup>3</sup> water
  - C 5 cm<sup>3</sup> water, 5 cm<sup>3</sup> glucose solution and 1 cm<sup>3</sup> inhibitor solution
  - D 5 cm<sup>3</sup> yeast solution, 5 cm<sup>3</sup> water and 1 cm<sup>3</sup> inhibitor solution.
13. Adders are snakes whose body temperature is dependent on the external temperature. Which of these statements about adders are correct?
- 1. They have a wide range of ecological niches.
  - 2. They use behavioural responses to help maintain optimum metabolic rate.
  - 3. They have high energy costs to achieve homeostasis.
- A 2 only
  - B 3 only
  - C 1 and 2 only
  - D 1 and 3 only

14. The diagram represents a species of archaea as viewed under a microscope.



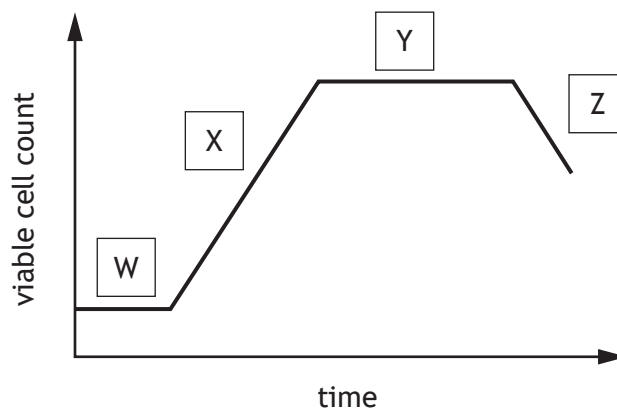
(1 mm = 1000  $\mu\text{m}$ )

The actual length of this cell was 3 micrometres ( $\mu\text{m}$ ).

The microscope had a total magnification of

- A  $\times 5$
- B  $\times 50$
- C  $\times 500$
- D  $\times 5000$

15. The graph shows the phases of growth in a bacterial culture.



Which statement is correct?

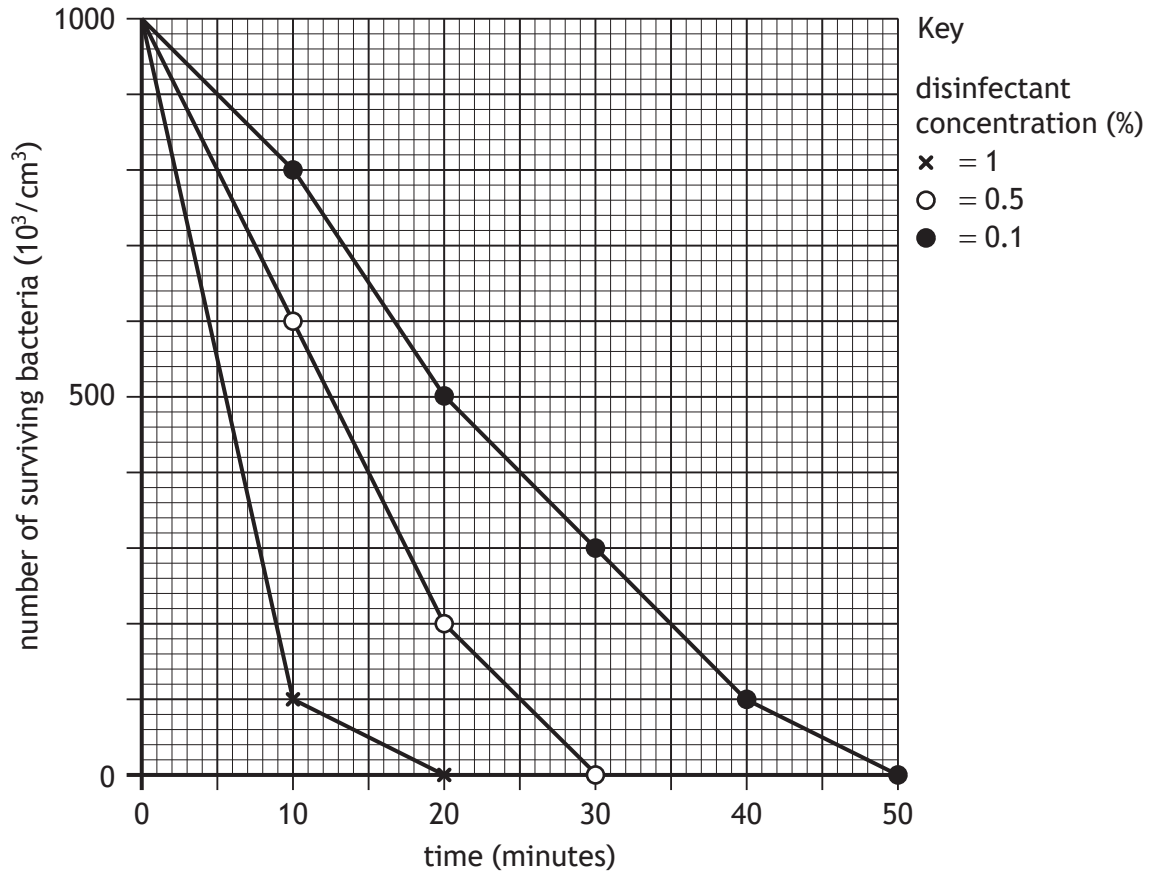
- A X is the log phase and enzymes are being induced.
- B Z is the death phase where total cell count is decreasing.
- C Y is the stationary phase and nutrients are starting to run out.
- D W is the lag phase and secondary metabolites are being produced.

16. Which statement about culturing micro-organisms is **not** correct?

- A Some micro-organisms can use light as an energy source.
- B All micro-organisms require a chemical substrate as an energy source.
- C Sterility, pH, temperature, and oxygen levels can be monitored.
- D Some micro-organisms can synthesise their own amino acids and vitamins.

17. The effect of concentration of disinfectant on survival of bacteria was investigated. Cultures of bacteria were grown in media containing different concentrations of disinfectant and the number of bacteria surviving in each culture was recorded every 10 minutes for 50 minutes.

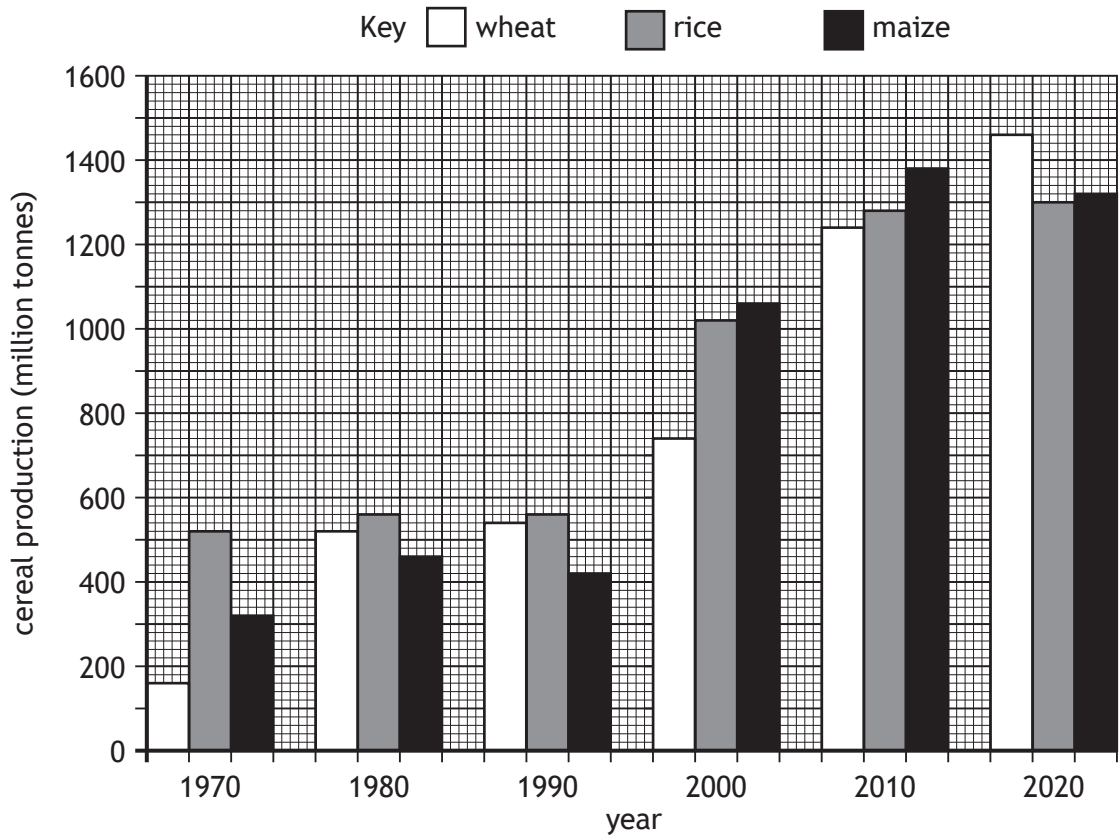
The results are shown in the graph.



Which statement is supported by the data?

- A 1% disinfectant kills all bacteria twice as fast as 0.5%.
- B At 20 minutes 0.1% disinfectant kills more bacteria than 0.5% disinfectant.
- C As concentration of disinfectant increases the length of time taken to kill all bacteria increases.
- D As concentration of disinfectant increases the length of time taken to kill all bacteria decreases.

18. The bar graph shows the world production of three cereals from 1970 to 2020.



Which statement is supported by the data?

- A The total production of the three cereals combined was greatest in 2020.
  - B The greatest increase in maize production was between 2000 and 2010.
  - C The production of rice increased every 10 years.
  - D The production of maize was four times higher in 2020 than in 1990.
19. The role of NADPH in the carbon fixation stage (Calvin cycle) of photosynthesis is to
- A add hydrogen to glyceraldehyde-3-phosphate (G3P)
  - B phosphorylate glyceraldehyde-3-phosphate (G3P)
  - C add hydrogen to 3-phosphoglycerate (3PG)
  - D phosphorylate 3-phosphoglycerate (3PG).

[Turn over

20. The Bt toxin gene can be inserted into maize plants using recombinant DNA technology. As a result of inserting the Bt toxin gene into maize
- A herbicides will kill weeds but not the maize
  - B systemic herbicides will be more effective
  - C the maize will be resistant to insect pests
  - D fungicides will be more effective.
21. The results of a field trial showed a lot of variability within each treatment. The design of this field trial could be improved by
- A dividing the field into plots and randomising the treatments
  - B carefully selecting the treatments
  - C increasing the number of replicates for each treatment
  - D including a control plot with no treatment applied.
22. Adult tapeworms live in the intestine of foxes. Their eggs are passed out in the foxes' waste and survive on the grass for months. The eggs infect rabbits eating the grass and the tapeworms complete their lifecycle inside the rabbits' bodies. Foxes, which prey on the rabbits, are then infected.

Which row in the table identifies the roles of the fox, tapeworm egg and rabbit?

	<b>Fox</b>	<b>Tapeworm egg</b>	<b>Rabbit</b>
A	host	resistant stage	intermediate host
B	host	vector	intermediate host
C	intermediate host	vector	host
D	intermediate host	resistant stage	vector

23. The statements describe symbiotic relationships.

1. Ants feed on sugar-rich liquid produced by aphids and protect aphids from predators.
2. Coral provides nutrients for zooxanthellae, while zooxanthellae produce sugars for coral to feed on.
3. Small fish, called cleaner wrasse, feed on parasites from the skin of sharks.

Which of these statements describes a mutualistic relationship?

- A 1 and 2 only
- B 1 and 3 only
- C 2 and 3 only
- D 1, 2 and 3

24. The list shows behaviours carried out by honey bees.

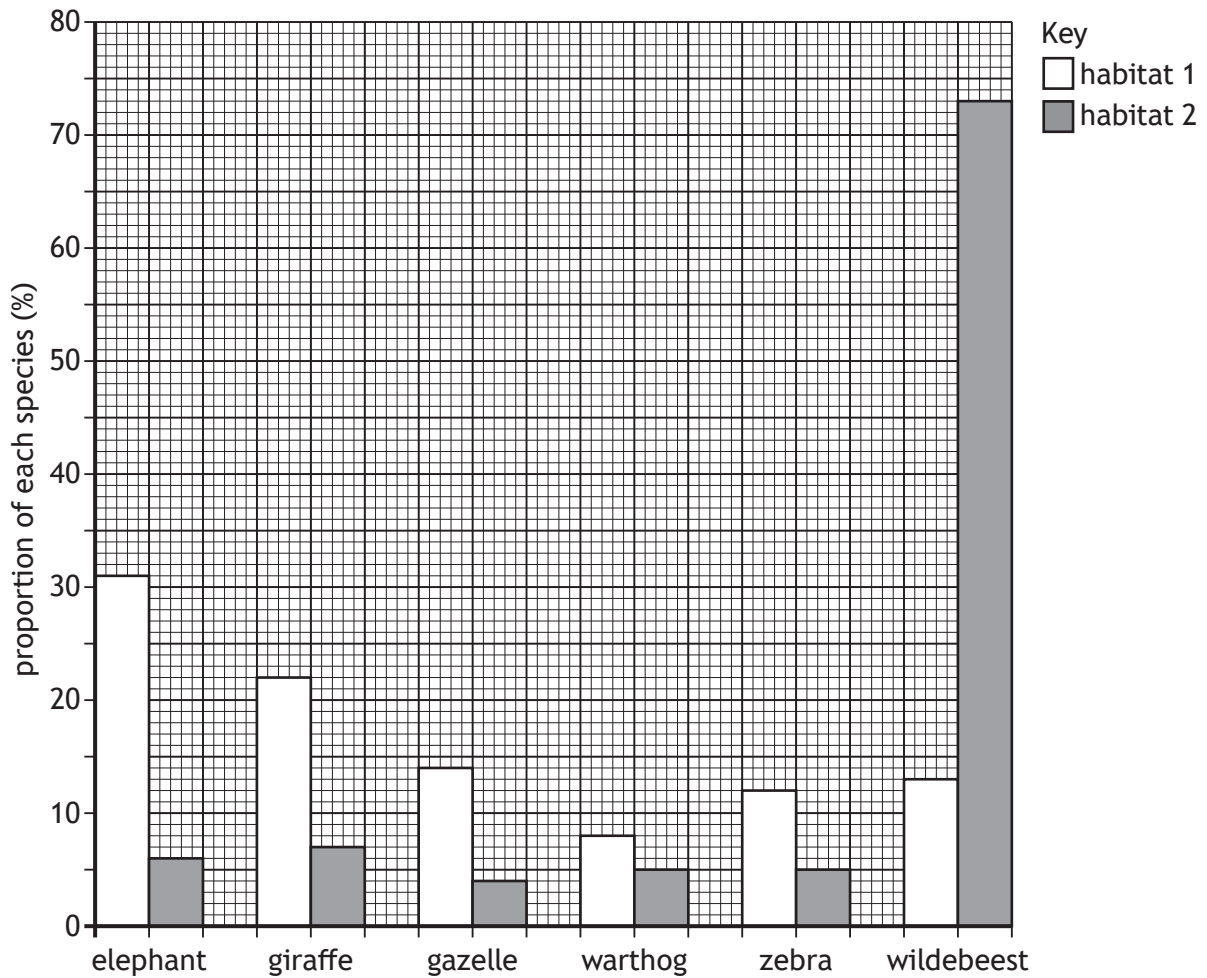
1. Fertilising eggs
2. Collecting pollen
3. Carrying out waggle dances to show the location of food

Which of these behaviours are carried out by drones?

- A 1 only
- B 3 only
- C 1 and 2 only
- D 2 and 3 only

[Turn over

25. The bar chart shows the proportions of different mammal species in two habitats in Africa.



Compared to habitat 2, habitat 1 has

- A a higher species richness and a lower species diversity
- B a lower species richness and a higher species diversity
- C the same species richness and a higher species diversity
- D the same species richness and a lower species diversity.

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