

N5

National Qualifications

2026

Biology

Section 2

Tuesday, 28 April

Instructions to Candidates

Candidates should enter their surname, forename(s), date of birth, Scottish candidate number and the name and level of the subject at the top of their first answer sheet.

Section 2 — 75 marks

Attempt ALL questions

You must clearly identify the question number you are attempting on your answer sheet. Any rough work must be written on your answer sheet.

Tactile diagrams are produced in a separately bound booklet.

Marks are shown in square brackets at the end of each question or part question.

Questions marked with an asterisk differ in some respect from those in the printed paper.

An ow in the margin indicates a new question.

[Braille page 2] SECTION 2 — 75 marks

Attempt ALL questions

ow * 1. Refer to the diagrams for question 1. The diagram shows a typical plant cell and a typical fungal cell and some of their structures.

(a) Name structure X and give its function. [2 marks]

Structure X: _

Function: _

(b) Apart from the difference in size and shape, describe one other structural difference between typical plant and fungal cells. (2 print lines) [1 mark]

(c) Select one structure from the list of 4 structures below that is found in all typical plant, fungal, animal and bacterial cells and give its function. [2 marks]

- Nucleus
- Cytoplasm
- Ribosome
- Mitochondrion

Name the structure and give its function.

Structure: _

Function: _

[Braille page 3] ow * 2. A model cell was set up to investigate the movement of molecules across a selectively permeable membrane. To make the model cell, a length of selectively permeable visking tubing was filled with starch solution and tied closed at each end. This model cell filled with starch solution was then placed in a boiling tube filled with iodine and water.

(a) Iodine is a small soluble molecule that changes from yellow to black in the presence of starch. Starch is a large insoluble molecule.

(i) From the information given, state the colour of the solution outside the model cell at the start of the investigation. (1 print line) [1 mark]

(ii) After one hour, the following results were observed:

1. The contents of the model cell turned black.

2. There was no change in colour outside the model cell.

Explain these results. [2 marks]

1 (2 print lines)

2 (2 print lines)

(b) Name the process that would allow water to move across the membrane of the model cell. (1 print line) [1 mark]

[Braille page 4] (c) Name one component of a cell membrane. (1 print line) [1 mark]

ow * 3. Refer to the diagram for question 3. The diagram represents a section of DNA.

(a) Give the term used to describe the structure of a DNA molecule. (1 print line) [1 mark]

(b) Name base 1. (1 print line) [1 mark]

(c) Refer to the diagram for question 3 (c). The base sequence shown represents 1.4% of the total number of bases in a single strand of DNA.

Calculate the total number of bases in this strand. Give your answer as: _ bases [1 mark]

(d) (i) Give the term used to describe a section of DNA that codes for a protein. (1 print line) [1 mark]

(ii) A mutation occurred in this section of DNA.

Explain why this mutation would result in a change to the protein's shape and function. (2 print lines) [1 mark]

[Braille page 5] ow *4. Refer to the diagram for question 4. An experiment was carried out into the effect of increasing pH on the activity of the enzyme amylase. Starch is broken down by amylase to produce maltose.

Three petri dishes of starch agar were set up. Each had four wells filled with amylase solution at the pH values shown.

The dishes were left at 30°C for 24 hours.

(a) (i) State two other variables, not already mentioned, that should be controlled to ensure the validity of this experiment. [2 marks]

1: _

2: _

(ii) Explain why three petri dishes of starch agar were set up. (2 print lines) [1 mark]

(b) After 24 hours, iodine solution was poured over the surface of each dish. When iodine is added to starch, it turns black in colour.

Clear areas, where the iodine did not turn black, were found around each well and their diameters were measured.

The results are shown in the table.

[Braille page 6] In the table below, pH is followed by Diameter of clear area (mm) for Dish 1; Diameter of clear area (mm) for Dish 2; Diameter of clear area (mm) for Dish 3; Average diameter of clear area (mm).

3: 6; 6; 6; 6.

5: 18; 22; 23; _.

7: 27; 31; 29; 29.

10: 23; 27; 22; 24.

(i) The average diameter of the clear area for pH 5 is missing in the table. Calculate and write down the average diameter of the clear area for pH 5, as needed to complete the table. Give your answer as: _ mm. [1 mark]

(ii) Explain why there was a clear area around each well to measure. (2 print lines) [1 mark]

(iii) Give a suitable conclusion for this experiment. (2 print lines) [1 mark]

[Braille page 7] ow * 5. An investigation was carried out to compare the breakdown of glucose by different respiratory pathways in cells.

The results are shown in the table.

In the table Y = yes and N = no. — In the table below, Product is followed by: Respiratory pathway A; Respiratory pathway B; Respiratory pathway C.

Carbon dioxide: Y; Y; N.

Water: Y; N; N.

Ethanol: N; Y; N.

Lactate: N; N; Y.

(a) (i) Use these results to identify the type of respiration in pathway A. (1 print line) [1 mark]

(ii) Name a type of cell in which respiratory pathway B would occur. (1 print line) [1 mark]

(iii) State the location in the cell where respiratory pathway C would be completed. (1 print line) [1 mark]

(b) Further investigation into the energy released by these respiratory pathways produced the following results.

[Braille page 8] In the table below, Respiratory pathway is followed by: Energy released (kJ).

A:16.8.

B:0.8

C:0.8

Calculate the simple whole number ratio for these results. [1 mark]

Give your answer as A _ : B _ : C: _

ow * 6. Refer to the diagram for question 6. The diagram shows some stages in the development of a variety of cells in the body.

(a) (i) State the feature of stem cells that gives them the potential to become many different body cells. (1 print line) [1 mark]

(ii) Give a function of stem cells. (1 print line) [1 mark]

(b) (i) Process X allows the number of stem cells to increase.

Name this process. _ [1 mark]

(ii) Stem cells can be grown in the laboratory. They double in number every 48 hours.

Calculate the time taken for 16 stem cells to be produced from one stem cell.

[Braille page 9] [1 mark]

Give your answer in: _ hours.

(c) Name the system in the human body of which white blood cells are part of. (1 print line) [1 mark]

ow * 7. When the knee is bent, a knee jerk reflex occurs in response to tapping the tendon that is located below the knee. This causes the thigh muscle to contract, jerking the lower leg forward. For this knee jerk reflex, the messages travel along a neural pathway involving several neurons. A message is first sent along a neuron from the knee to the spinal cord. In the spinal cord, this message is passed to another type of neuron. This neuron then passes a message to another type of neuron, neuron A, which transfers the message to the leg.

(a) Identify neuron A. (1 print line) [1 mark]

(b) Describe how a message:

(i) travels along a neuron (1 print line) [1 mark]

(ii) is transferred between neurons. (1 print line) [1 mark]

(c) A typical knee jerk response takes 15 milliseconds.

Calculate the speed of the response if the distance covered is 1.2 metres. **[Braille page 10]** [1 mark]

(1 second = 1000 milliseconds)

Give your answer as: _ metres per second.

(d) State the function of a reflex. (2 print lines) [1 mark]

ow * 8. Refer to the diagram for question 8. The diagram shows the human female reproductive system.

(a) Which letter in the diagram shows the site of female gamete production? _ [1 mark]

(b) (i) A hormone produced in the brain triggers the release of this gamete.

Describe how this hormone travels from the brain to the female reproductive system. (1 print line) [1 mark]

Refer to the graph for question 8 (b). The graph shows the changes in concentration of this hormone during one month.

(ii) Use the data to describe the changes in the hormone concentration from day 0 to day 14. (5 print lines) [2 marks]

(iii) Calculate how many times greater the hormone concentration is at day 14 compared to day 16. Give your answer as: _ times greater. [1 mark]

[Braille page 11] ow * 9. Hair length in cats is an inherited characteristic controlled by different alleles of a gene. H represents the allele for short hair, and h represents the allele for long hair.

The diagram shows the inheritance of hair length in cats.

P Phenotype	short hair×long hair
P Genotype	HH×hh
F ₁ Phenotype	all short hair
F ₂ Genotypes	HH and Hh and hh

(a) (i) Give the genotype of cats in the F₁ generation. _ [1 mark]

(ii) Explain why the F₁ generation all have short hair. (2 print lines) [1 mark]

(b) In addition to the phenotypes shown above, some cats can be hairless. This is caused by a genetic mutation.

(i) Give the definition of the term mutation. (2 print lines) [1 mark]

(ii) To be hairless, a cat must inherit the mutated allele from both parents. State the term used to describe this genotype. (1 print line) [1 mark]

[Braille page 12] ow * 10. Scientists carried out a study to investigate if claims that protein supplements increase lean mass and strength were true.

24 volunteers followed the same training programme where they trained three times a week for eight weeks. After each session, one group were given a protein supplement, and the other group were not. Both groups were asked to keep a food diary to allow their daily intake of protein to be recorded.

At the beginning and end of the training programme, lean mass and strength were measured. The average percentage increase in each of these measurements was calculated.

The results are shown in the table.

In the table below, Measurement is followed by: Average percentage increase in measurement with protein supplement; Average percentage increase in measurement without protein supplement.

Lean mass	1.2	1.0
Thigh muscle thickness	5.9	2.7
Knee strength	28.0	35.0

(a) The group taking the protein supplement were compared to the group who did not take a protein supplement.

[Braille page 13] Give the term used to describe the group who did not take the protein supplement. (1 print line) [1 mark]

(b) Suggest one reason why the volunteers recording their own daily intake of protein could be described as a limitation. (1 print line) [1 mark]

(c) An individual with an initial knee strength of 50 kg took part in a similar training programme.

Predict their knee strength after 8 weeks if they took no protein supplements after each session. [1 mark]

Give your answer as: _ kg.

(d) Suggest why it may not be necessary to take this protein supplement. (2 print lines) [1 mark]

ow * 11. Refer to the diagram for question 11. Describe the pathway of blood through the heart and associated blood vessels starting at point A and finishing at point B. (10 print lines) [5 marks]

ow * 12. Refer to the diagram for question 12. The diagram shows the flow of energy through some organisms found in part of a food web in a pine forest ecosystem.

(a) (i) Give the term used to describe all of the organisms in this **[Braille page 14]** ecosystem. (1 print line) [1 mark]

(ii) 1. Give a named example of a carnivore. [1 mark]

2. Give a named example of an omnivore. [1 mark]

(iii) Name the process in which the capercaillie uses energy, which will then be available to the pine marten. (1 print line) [1 mark]

(iv) Explain why the red fox population has the least energy. (2 print lines) [1 mark]

(b) Refer to the diagram for question 12 (b). The diagram shows a pyramid of numbers for a food chain from a pine forest.

Calculate the percentage of organisms in this food chain that are consumers. Give your answer as: _%. [1 mark]

ow 13. Fertilisers can be added to soil to increase crop yield.

(a) Explain why crop yields need to be increased. (1 print line) [1 mark]

(b) Excess fertilisers can leach into freshwater ecosystems causing algal blooms.

[Braille page 15] Describe the effect an algal bloom will have on the number of bacteria and give the reason why. [2 marks]

Effect on number (1 print line)

Reason (2 print lines)

(c) Explain why an algal bloom would cause a decrease in the concentration of oxygen in the water. (1 print line) [1 mark]

(d) Suggest an alternative that could be used to reduce the use of fertilisers. (1 print line) [1 mark]

ow * 14. Refer to the diagram for question 14. An experiment was set up to investigate the effect of changing temperature on the rate of photosynthesis in a plant by measuring the volume of oxygen produced per minute.

(a) Name the stage of photosynthesis that produces oxygen. (1 print line) [1 mark]

(b) Produce a table to show the data used to plot the line graph for the five temperatures used in this experiment. [2 marks]

You can write your table in linear braille format as follows.

[Braille page 16] In the table below, _ is followed by: _

_ : _

_ : _

_ : _

_ : _

_ : _

(c) Describe the relationship between temperature and the rate of photosynthesis.
(4 print lines) [2 marks]

(d) Explain why no oxygen is produced at 70°C. (4 print lines) [2 marks]

ow * 15. Venus flytrap plants grow in wetlands where the soil nitrate content is low.

The leaves of these plants have evolved to form two hinged sides with sharp spines around the edge. The two sides can quickly snap-close, trapping insects and other invertebrates that land on them. This allows the plants to capture and digest invertebrates, which provides a source of nitrates.

Two varieties are the Sharks Tooth Venus Flytrap and the South West Giant Venus Flytrap.

The Sharks Tooth Venus Flytrap **[Braille page 17]** has short jagged spines around the edge of their traps.

The South West Giant Venus Flytrap has long thin spines around the edge of their traps.

(a) The plants' traps are an inherited characteristic that makes each plant well suited to survive in its environment.

Give the term used to describe this characteristic. (1 print line) [1 mark]

(b) Shark's Tooth and South West Giant varieties can interbreed to produce fertile offspring.

Give a conclusion that can be made from this information. (2 print lines) [1 mark]

(c) During the evolution of these Venus flytrap plants, low soil nitrate content has acted as a selection pressure.

Name the process by which the plants best adapted to this environment survive and pass on favourable alleles to their offspring. (1 print line) [1 mark]

(d) In an average trap, each side travels a distance of 12 mm when snap-closing together.

Calculate the time taken for a trap to close if each side closes at a speed **[Braille page 18]** of 40 mm per second. [1 mark]

Give your answer as: _ seconds.

[END OF QUESTION PAPER]