



National
Qualifications
2018

X707/76/02

Biology
Section 1 — Questions

TUESDAY, 15 MAY
9:00 AM – 11:30 AM

Instructions for the completion of Section 1 are given on *page 02* of your question and answer booklet X707/76/01.

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

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



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SECTION 1 — 20 marks

Attempt ALL questions

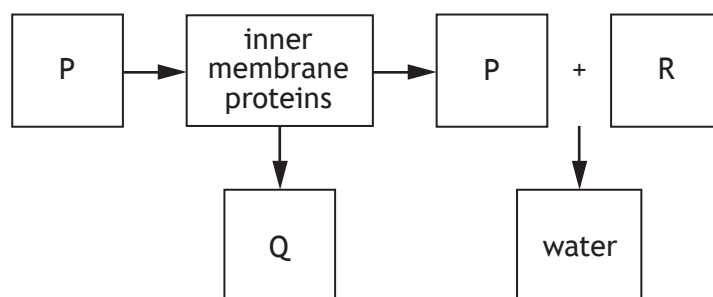
1. The following substances are products of fermentation.

- 1 ATP
- 2 Lactate
- 3 Carbon dioxide

Which of these are products of fermentation in human muscle cells?

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

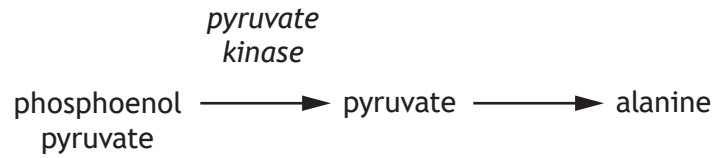
2. The diagram represents a stage of cellular respiration that occurs in a mitochondrion.



Which row in the table identifies substances P, Q and R?

				<i>Substances</i>		
				P	Q	R
A	ATP	hydrogen ions and electrons	oxygen			
B	hydrogen ions and electrons	oxygen	ATP			
C	oxygen	ATP	hydrogen ions and electrons			
D	hydrogen ions and electrons	ATP	oxygen			

3. Part of a metabolic pathway used by cells to produce the amino acid alanine is shown.



Alanine is a non-competitive, feedback inhibitor of the enzyme pyruvate kinase.

The following statements refer to the metabolic pathway.

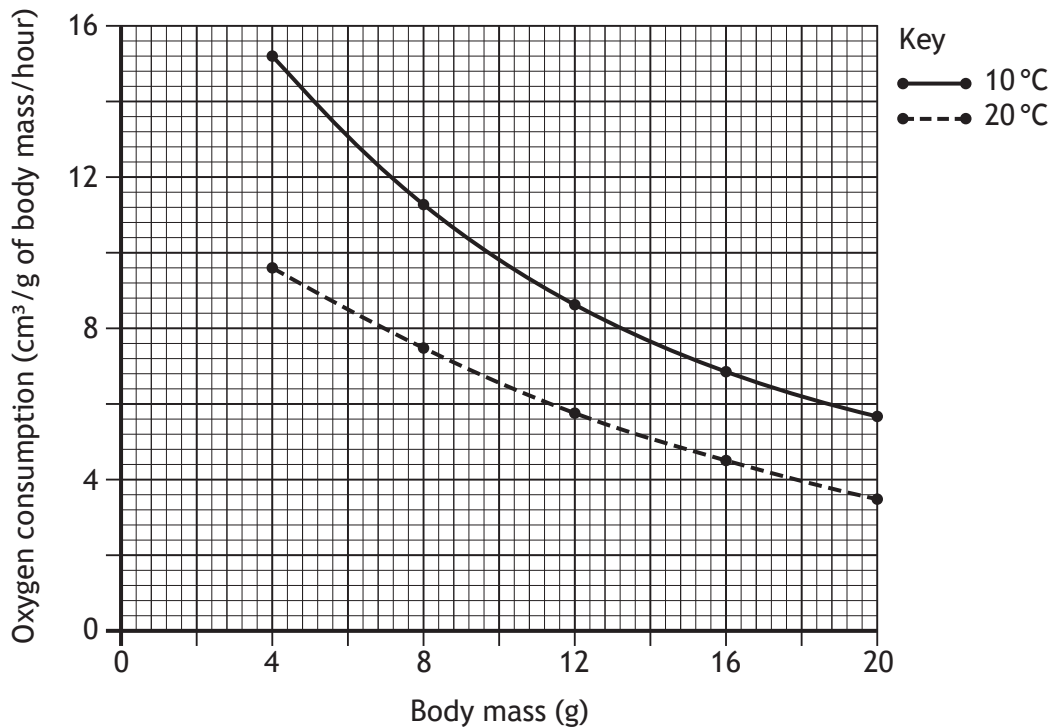
- 1 Pyruvate kinase reduces the activation energy needed to convert phosphoenol pyruvate into pyruvate.
- 2 Phosphoenol pyruvate is the substrate for pyruvate kinase.
- 3 Alanine can bind to the active site of pyruvate kinase.

Which of these statements are correct?

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

[Turn over

4. Shrews are small mammals. The graph shows the relationship between body mass and oxygen consumption of shrews at two environmental temperatures.



Which of the following statements about this graph is correct?

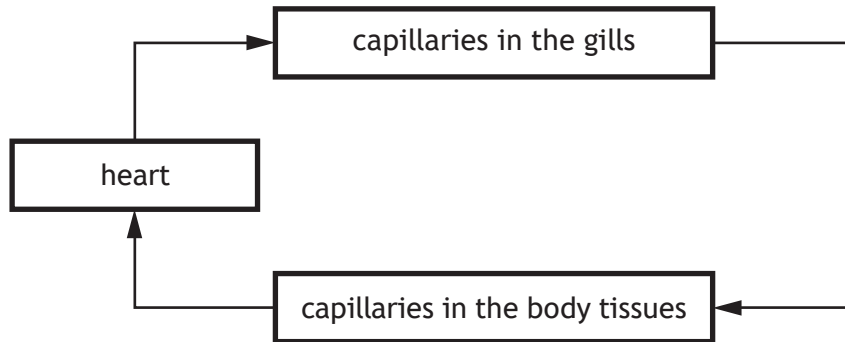
- A Shrews of greater mass consumed less oxygen.
 - B The optimum temperature for oxygen consumption was 10 °C.
 - C As environmental temperature increased oxygen consumption decreased.
 - D At 10 °C a 16 g shrew consumed 6.2 cm³ of oxygen/g of body mass/hour.
5. Yeast cells contain the enzyme catalase which breaks down hydrogen peroxide to produce oxygen. An experiment was carried out into the effect of lead nitrate concentration on the activity of catalase.

Six flasks were set up. Each contained 25 cm³ of hydrogen peroxide and 10 cm³ of yeast suspension. 10 cm³ of a different concentration of lead nitrate was then added to each flask. The volume of oxygen produced after 15 minutes was measured.

Identify the independent variable in this experiment.

- A Volume of lead nitrate
- B Volume of oxygen produced
- C Activity of catalase
- D Concentration of lead nitrate

6. The diagram illustrates the circulatory system of a fish. The arrows indicate the direction of blood flow.



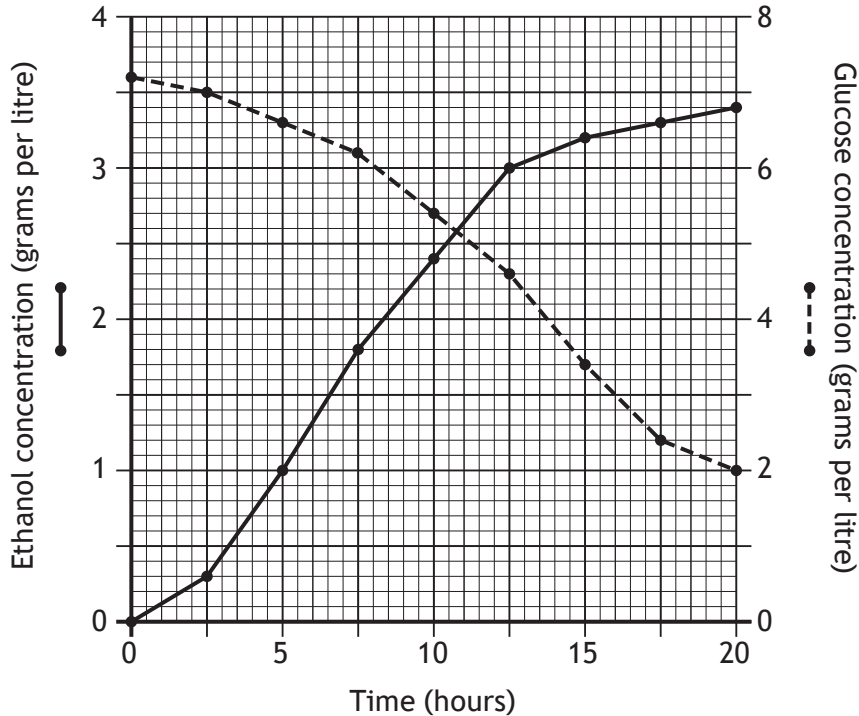
Which row in the table describes the type of circulatory system of a fish and the blood pressure in the capillaries in the gills and body tissues?

	<i>Type of circulatory system</i>	<i>Blood pressure in the capillaries in the gills</i>	<i>Blood pressure in the capillaries in the body tissues</i>
A	single	lower	higher
B	double	higher	lower
C	single	higher	lower
D	double	lower	higher

[Turn over

7. In an investigation into fermentation, yeast was grown in a flask of glucose solution for 20 hours at 20°C.

The graph shows the concentrations of ethanol and glucose in the flask over the period of the investigation.



What was the glucose concentration when the ethanol concentration was 3.3 grams per litre?

- A 1.2 grams per litre
- B 2.2 grams per litre
- C 2.4 grams per litre
- D 6.6 grams per litre

8. The following statements describe stages in the Calvin Cycle (carbon fixation).

- 1 Carbon dioxide attaches to ribulose bisphosphate (RuBP) producing 3-phosphoglycerate (3PG).
- 2 3-phosphoglycerate (3PG) forms glyceraldehyde-3-phosphate (G3P).
- 3 Glyceraldehyde-3-phosphate (G3P) regenerates ribulose bisphosphate (RuBP).

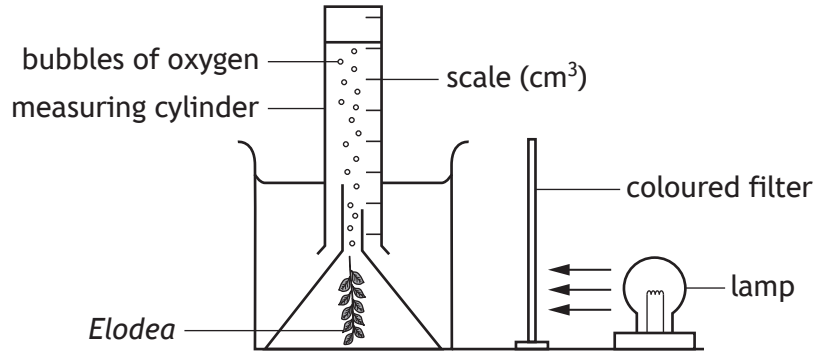
Which row in the table identifies the stage which is catalysed by RuBisCO and the stage which requires hydrogen?

	<i>Catalysed by RuBisCO</i>	<i>Requires hydrogen</i>
A	1	2
B	1	3
C	3	1
D	3	2

[Turn over

9. The diagram shows apparatus used in an investigation to measure the rate of photosynthesis in *Elodea* (pondweed) at different wavelengths of light.

Coloured filters were used to change the wavelength of the light. The volume of oxygen collected after 30 minutes was used to measure the rate of photosynthesis.



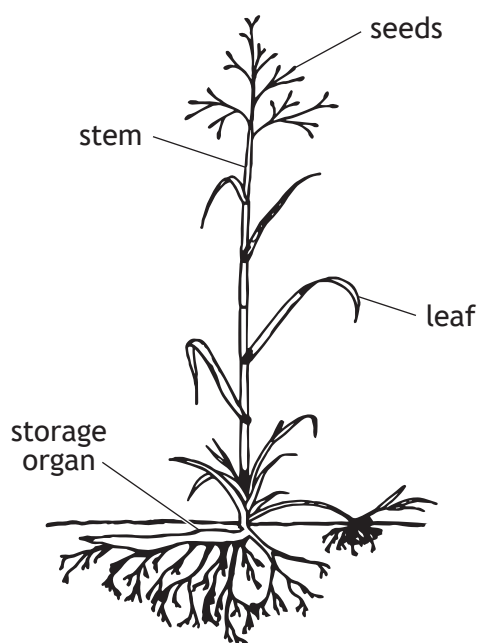
Suggested improvements to the investigation are shown.

- 1 Use a measuring cylinder with a narrower diameter.
- 2 Repeat the experiment several times and take averages.
- 3 Use a scale with more divisions.

Which of these suggestions would improve the accuracy of the results?

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

10. The diagram shows a perennial weed found in agricultural land in Scotland.

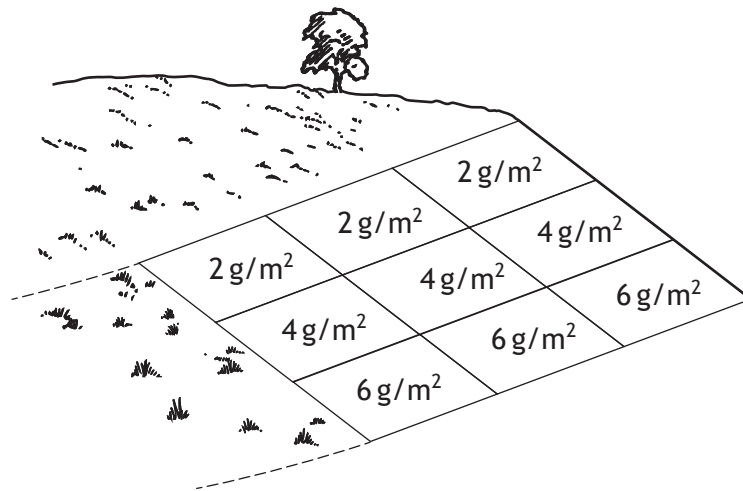


Which feature of this weed indicates that it should be controlled by a systemic herbicide?

- A Seeds
- B Stem
- C Storage organ
- D Leaf

[Turn over

11. A field trial was carried out to investigate the effect of mass of phosphate fertiliser applied on the growth of barley. The barley was planted in plots of equal area on a hillside and fertiliser applied as shown in the diagram.



Which of the following procedures would improve the field trial design to take into account higher soil moisture levels at the bottom of the hill?

- A Increase the range of phosphate fertiliser masses applied.
B Randomise the treatment plots.
C Increase the number of plots.
D Select another hillside.
12. Which of the following is an example of kin selection?
- A Worker leafcutter ants raising young ants in their colony.
B A vampire bat regurgitating blood to feed an unrelated bat.
C A dominant lion feeding on a zebra kill before its offspring.
D A young orangutan spending a long period in parental care to learn complex social behaviours.
13. An experiment was carried out to investigate the growth rate of pigs. They were put into five groups of eight pigs, each with the same average initial body mass. Each group was fed a diet which contained either 0, 10%, 20%, 30% or 40% faba beans. The pigs were re-weighed each day for 40 days.

Which aspect of the experimental design increased reliability of the results?

- A Five groups of pigs were used.
B The pigs were re-weighed each day for 40 days.
C Each group had the same average initial body mass.
D Each group contained eight pigs.

14. An investigation was carried out into the social hierarchy in a group of five hens, V, W, X, Y and Z. Hens establish dominance by pecking each other aggressively. The number of pecks given and received was recorded.

The results are shown in the table.

		<i>Number of pecks given by each hen</i>				
		V	W	X	Y	Z
<i>Number of pecks received by each hen</i>	V	-	-	-	10	-
	W	2	-	-	13	-
	X	6	8	-	7	-
	Y	-	-	-	-	-
	Z	11	10	5	4	-

The order of hierarchy from most dominant to least dominant hen is

- A Z, V, X, W, Y
 - B Y, V, W, X, Z
 - C Z, X, W, V, Y
 - D Y, W, V, X, Z.
15. Each type of human cell has a different structure and function because
- A only some of their genes are expressed
 - B they contain different genes
 - C some genes are lost during differentiation
 - D some genes are gained during differentiation.

[Turn over

16. The list describes some uses of stem cells.

- 1 Studying how cells differentiate
- 2 Researching the development of Parkinson's disease
- 3 Producing skin for skin grafts
- 4 Bone marrow transplants

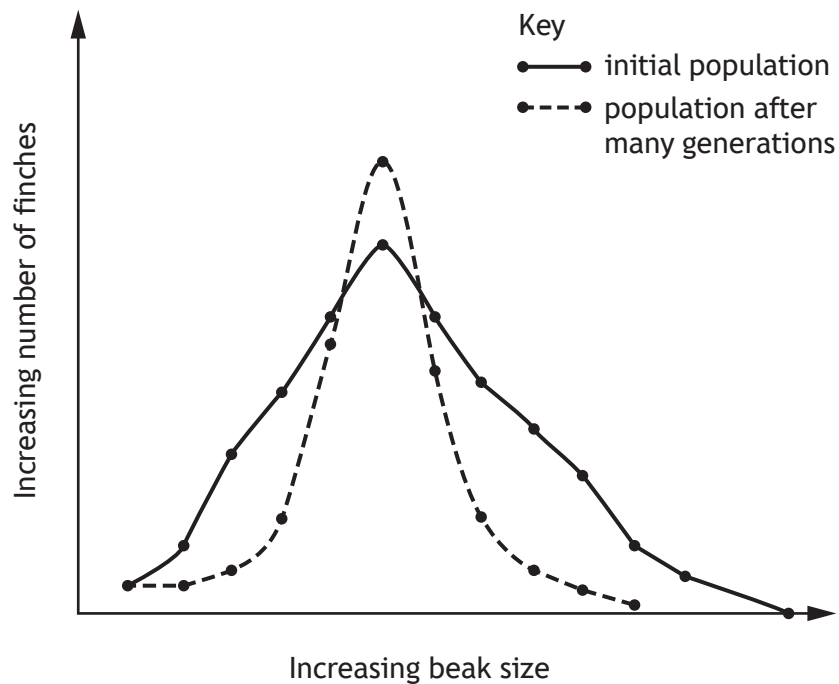
Which of these uses are **not** therapeutic?

- A 1 only
- B 1 and 2 only
- C 2 and 4 only
- D 3 and 4 only

17. Which of the following is an example of sexual selection?

- A Koalas with resistance to disease surviving to reproduce.
- B Peppered moths with the most effective camouflage avoiding predation.
- C Plant breeders selecting barley cultivars to cross to improve grain yield.
- D Female black grouse mating with the male with the best display.

18. A population of finches became isolated on an island. The graph shows the range of beak sizes within the initial population at the time of isolation and in the population after many generations.



Which row in the table shows the type of selection pressure and the type of speciation which might be expected to occur in this example?

	<i>Selection pressure</i>	<i>Speciation</i>
A	directional	allopatric
B	directional	sympatric
C	stabilising	allopatric
D	stabilising	sympatric

[Turn over

19. Some processes involved in evolution are shown.

- 1 sexual selection
- 2 disruptive selection
- 3 genetic drift

Which of these processes involve non-random changes in the frequency of DNA sequences?

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

20. The analysis of DNA sequences from different organisms is used in the production of molecular clocks.

This analysis is based on the assumption that over time DNA sequences undergo mutations

- A randomly
- B spontaneously
- C at a varying rate
- D at a constant rate.

[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2 OF YOUR QUESTION AND ANSWER BOOKLET.]

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