OXFORD AQA

INTERNATIONAL QUALIFICATIONS

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

INTERNATIONAL AS

BIOLOGY (9610)

Unit 1 The Diversity of Living Organisms

Wednesday 14 May 2025 07:00 GMT Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a ruler with millimetre measurements
- a scientific calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

Answer **all** questions in the spaces provided.

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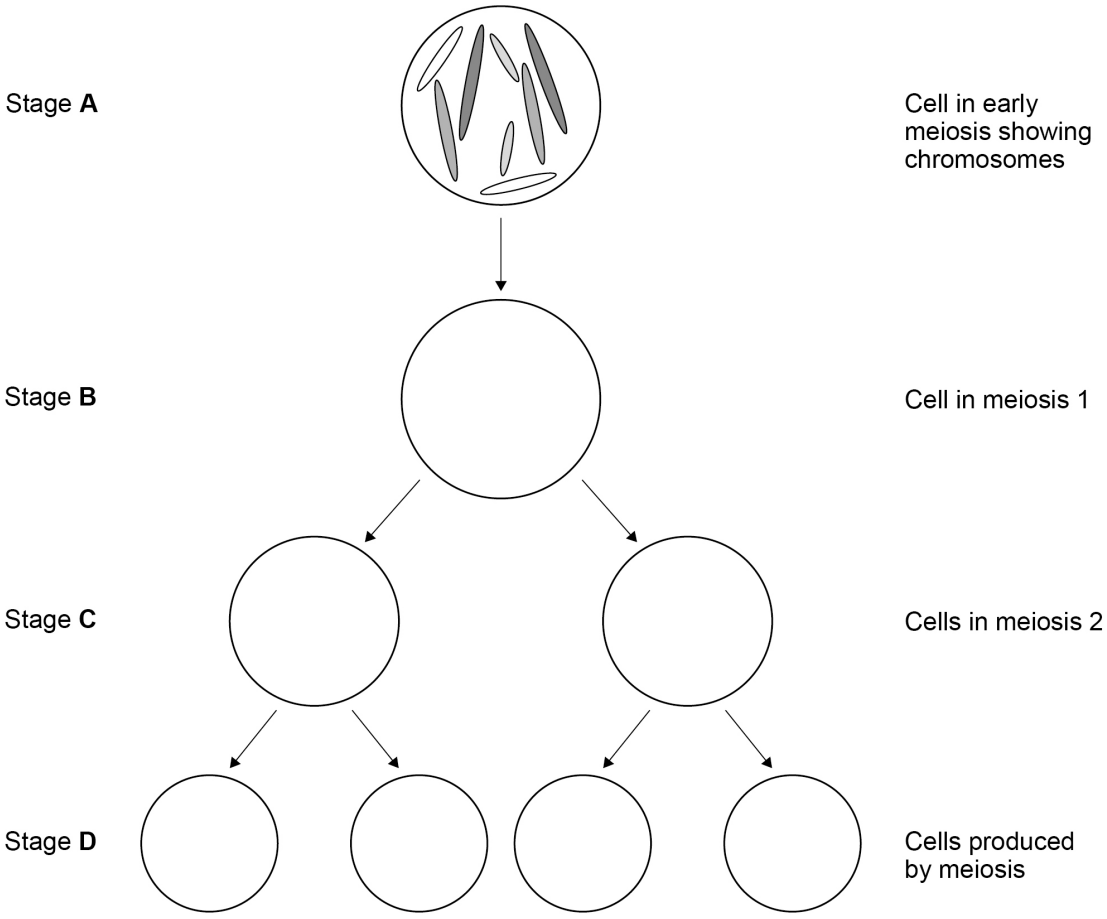
0 1 Haploid cells are produced by meiosis.

0 1 . 1 Define **haploid**.

[1 mark]

Figure 1 shows an outline of the stages of meiosis.

Figure 1



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0 1 . 2 Describe the appearance of **one** chromosome in the cell at stage **B**.

[2 marks]

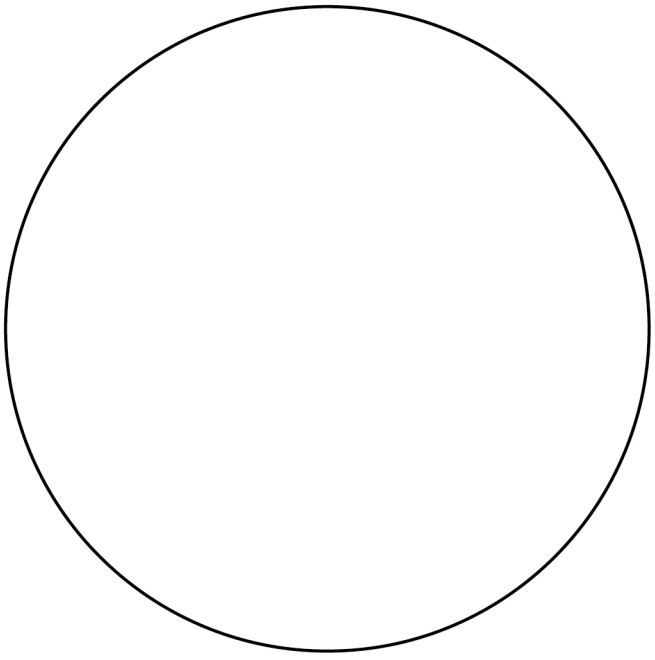
0 1 . 3 Describe **one** process that occurs in the cells at stage **C** that does **not** occur in the cell at stage **B**.

[1 mark]

0 1 . 4 **Stage A** in **Figure 1** shows the appearance of the chromosomes in early meiosis.

Cells in stage **D** are all haploid.

In the circle below, draw the chromosomes as they would appear in **one** of the cells at stage **D**.



[2 marks]

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Crossing over increases the genetic diversity of a species.

0 1 . 5 Describe how the process of crossing over occurs.

[2 marks]

0 1 . 6 Explain how crossing over increases genetic diversity.

[2 marks]

0 1 . 7 State **one** way that genetic diversity in a species can increase **after** meiosis is complete.

[1 mark]

11

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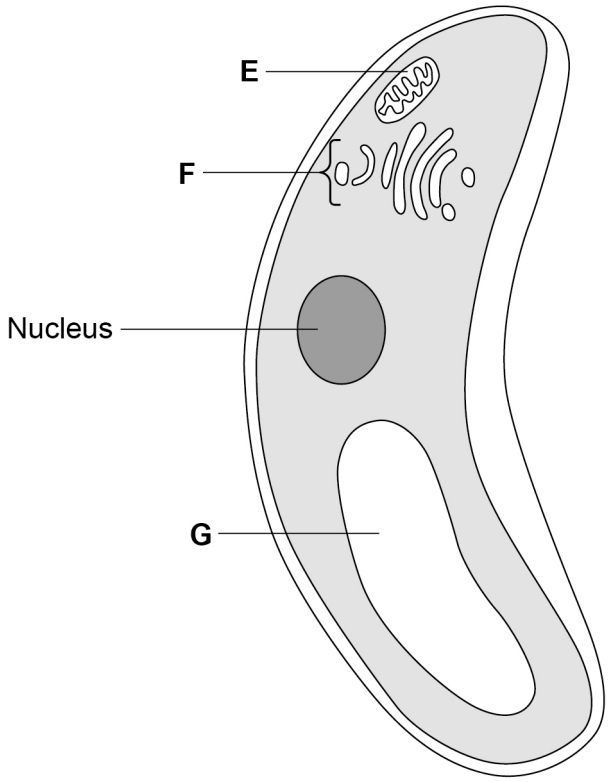
0 2 The surface layer of cells on a plant leaf is called the epidermis.

Guard cells can be found in the lower epidermis of a plant leaf.

Figure 2 shows some of the internal structures of a single guard cell.

Figure 2



0 2 . 1 State the functions of organelles **E**, **F** and **G** in **Figure 2**.

[3 marks]

E _____

_____

F _____

_____

G _____

_____

Question 2 continues on the next page

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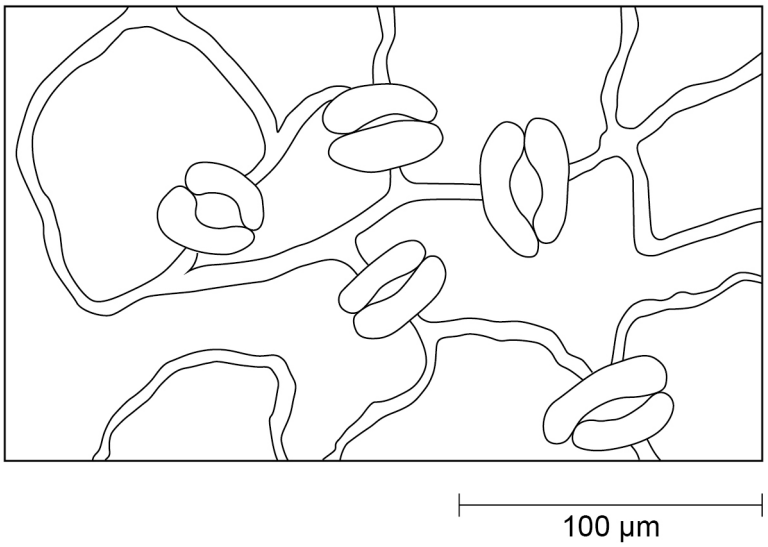
Figure 3 shows the arrangement of stomata on part of the lower epidermis of the leaf.

Figure 3



0 2 . 2 Calculate the stomatal density per mm^2 of the leaf epidermis shown in **Figure 3**.

[2 marks]

Number of stomata _____ per mm^2

Do not write outside the box

0 2 . 3 A student investigates the number of stomata on the leaves of two different plant species.

The student compares the stomatal density of a large number of pieces of the leaf epidermis from each species.

Explain why the student uses a large number of pieces of leaf.

[2 marks]

Question 2 continues on the next page

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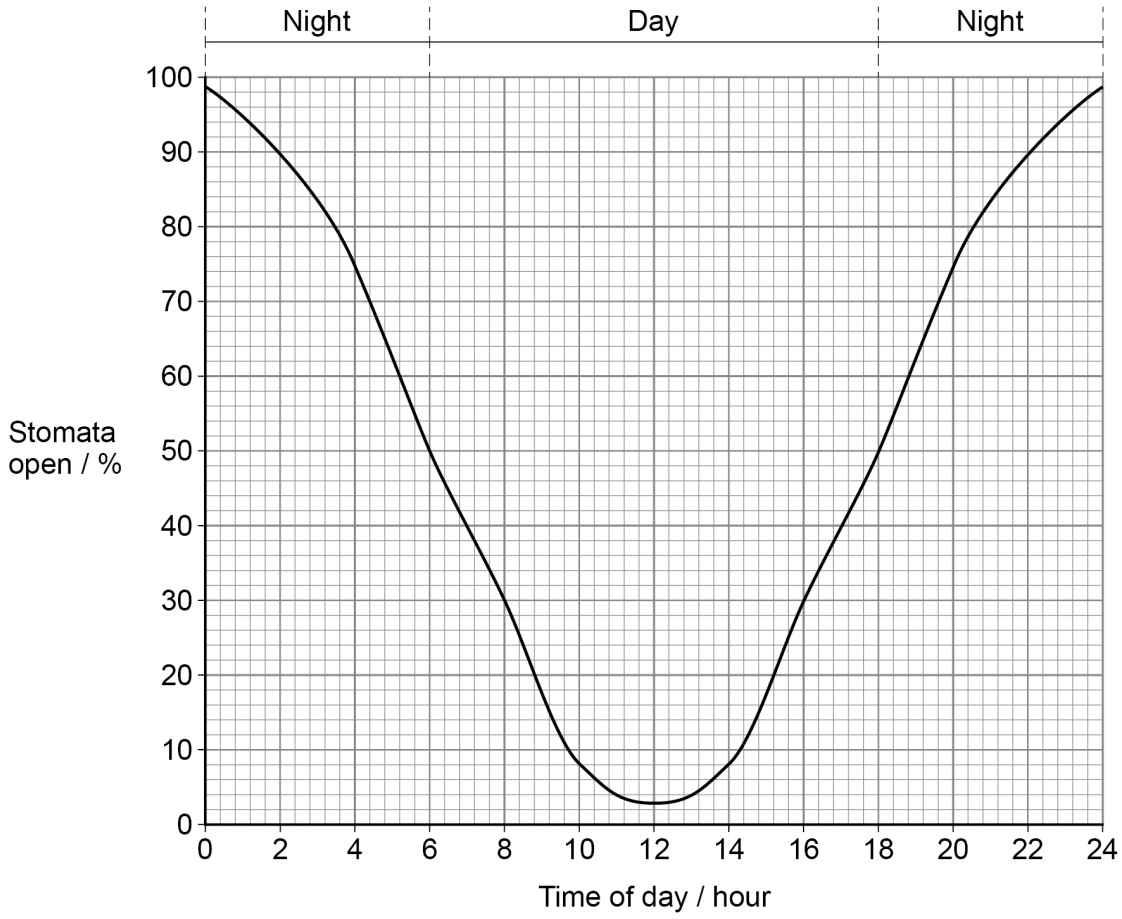
Xerophytic plants have adaptations to living in dry conditions.

Figure 4 shows the percentage of stomata open on a xerophytic plant for 24 hours.

Figure 4



0 2 . 4 Explain how the pattern of stomata opening helps xerophytic plants survive in dry environments.

Use **Figure 4**.

[2 marks]

Do not write outside the box

0 2 . 5 State **three** adaptations of the **leaves** of xerophytic plants to help the plants survive in a dry environment.

Do **not** include the opening and closing of stomata.

[3 marks]

Feature 1 _____

_____

Feature 2 _____

_____

Feature 3 _____

_____

12

Turn over for the next question

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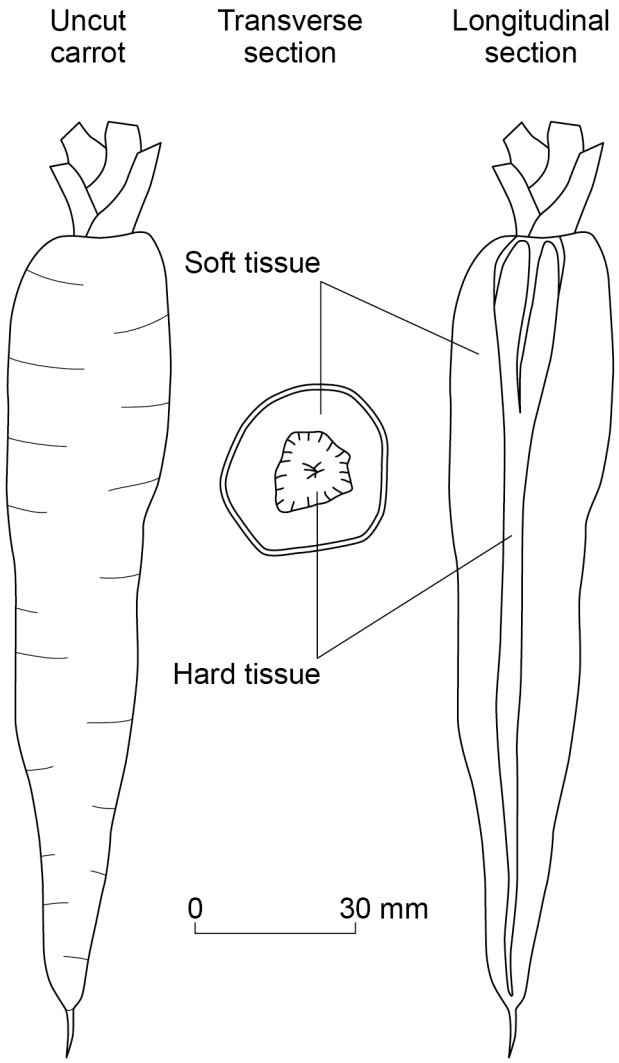
0 3 A student investigates the effect of salt solution concentration on the length of pieces of carrot tissue.

This is the method the student uses.

1. Cut the carrot into cylinders exactly 30 mm long.
2. Put one carrot cylinder into a test tube containing 10 cm^3 of 0.2 mol dm^{-3} salt solution.
3. Seal the test tube with a rubber bung.
4. Leave the carrot cylinder in the solution for 24 hours.
5. Measure the final length of the carrot cylinder.
6. Calculate the percentage change in length of the carrot cylinder.
7. Repeat steps 1–6 at concentrations of 0.4, 0.6, 0.8 and 1.0 mol dm^{-3} salt solution.

Figure 5 shows a carrot cut at different angles.

Figure 5



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0 3 . 1 Describe how the student should cut the carrot cylinders to make sure valid results can be collected.

[2 marks]

0 3 . 2 Explain why the student puts a rubber bung in the top of the test tube.

[2 marks]

0 3 . 3 Suggest why the carrot cylinders are left in the salt solution for 24 hours instead of 1 hour.

[1 mark]

Question 3 continues on the next page

Do not write outside the box

0 3 . 4 The final length of the carrot cylinder after 24 hours in 0.2 mol dm^{-3} salt solution is 35 mm

Calculate the percentage increase in length of this carrot cylinder.

Give your answer to **one** decimal place.

[2 marks]

Percentage increase _____ %

0 3 . 5 Explain why the length of the carrot cylinder increases in 0.2 mol dm^{-3} salt solution.

[3 marks]

Do not write outside the box

0 3 . 6 Describe how the student could use the data from this investigation to find the concentration of salt solution that gives no change in length of a carrot cylinder.

[2 marks]

12

Turn over for the next question

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0 4 Cysteine is an amino acid. It has functional groups made from different elements.

Figure 6 shows the structure of cysteine.

Figure 6

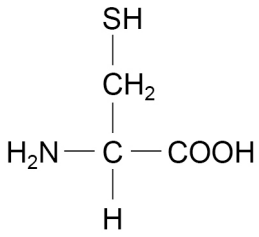

Table 1 shows five elements that may be found in each functional group of cysteine.

0 4 . 1 Put a tick (✓) in **Table 1** if the element is found in each functional group of cysteine.

One of the ticks has been added already.

[2 marks]

Table 1

Group	Nitrogen	Carbon	Oxygen	Hydrogen	Sulfur
R					
Amine	✓				
Carboxyl					

0 4 . 2 The secondary structure of a polypeptide is produced by bonds between amino acids.

Describe how.

[2 marks]

Do not write outside the box

0 4 . 3 Two different proteins can have the **same** number and types of amino acid, but **different** tertiary structures.

Explain how.

[2 marks]

0 4 . 4 Insulin is a hormone that helps to control blood glucose levels.

An insulin molecule contains 51 amino acids.

Calculate how many DNA base pairs are on the coding regions of the insulin gene.

[1 mark]

Number of base pairs = _____

Question 4 continues on the next page

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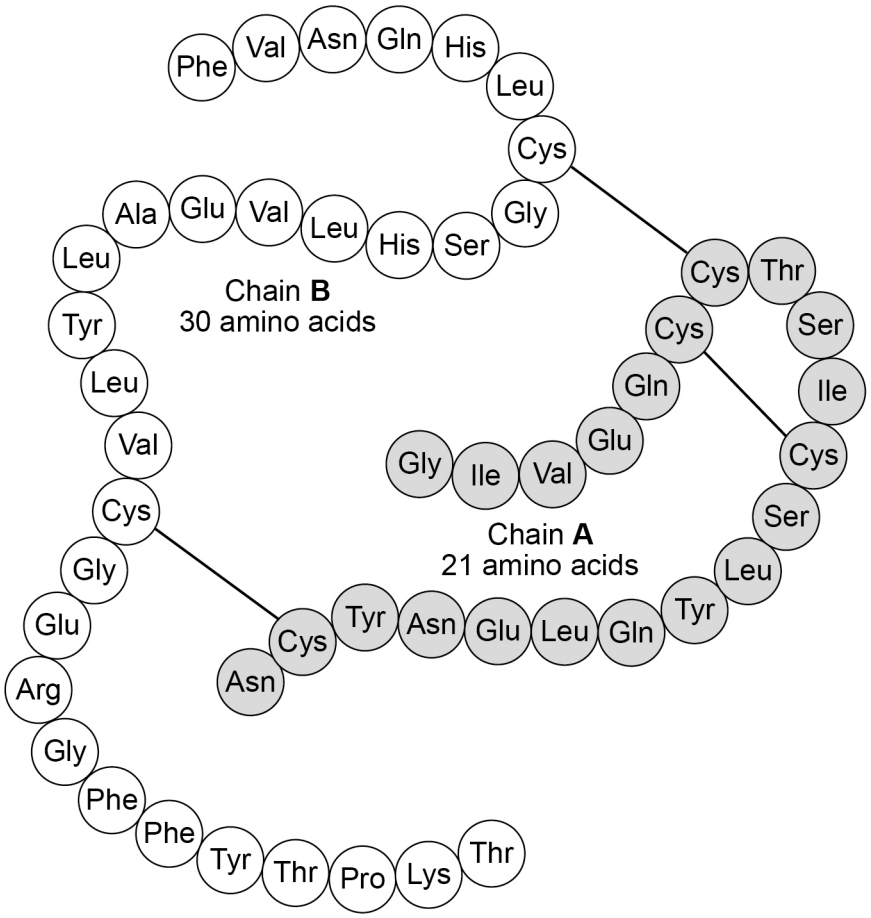
Figure 7 shows the amino acid sequence of an insulin molecule.

Figure 7



0 4 . 5 On **Figure 7**, the amino acids labelled 'Cys' are cysteines.

There are bonds between the R groups of the cysteines on chain **A** and the R groups of the cysteines on chain **B**.

Name this type of bond.

[1 mark]

Do not write outside the box

0 4 . 6 Name the highest level of protein structure shown in **Figure 7**.

Give a reason for your answer.

[2 marks]

Level of structure _____

Reason _____

_____

_____

0 4 . 7 Insulin molecules need to be folded correctly.

Describe the process of protein folding.

[2 marks]

_____

_____

_____

_____

_____

_____

0 4 . 8 Research has found that zinc ions are needed for the correct folding of insulin.

Scientists put insulin molecules that were not folded into test tubes with different concentrations of zinc ions. Insulin only folded correctly in the test tubes with a high concentration of zinc ions.

List **three** factors that should be controlled in the test tubes.

[3 marks]

Factor 1 _____

_____

Factor 2 _____

_____

Factor 3 _____

_____

Question 4 continues on the next page

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0 4 . 9 Some proteins form channels in cell surface membranes.

Suggest why incorrect folding might result in a non-functional protein channel.

[1 mark]

16

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Turn over for the next question

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0 5 A student uses Benedict's reagent to test for the presence of glucose in a food sample.

The test gives a positive result.

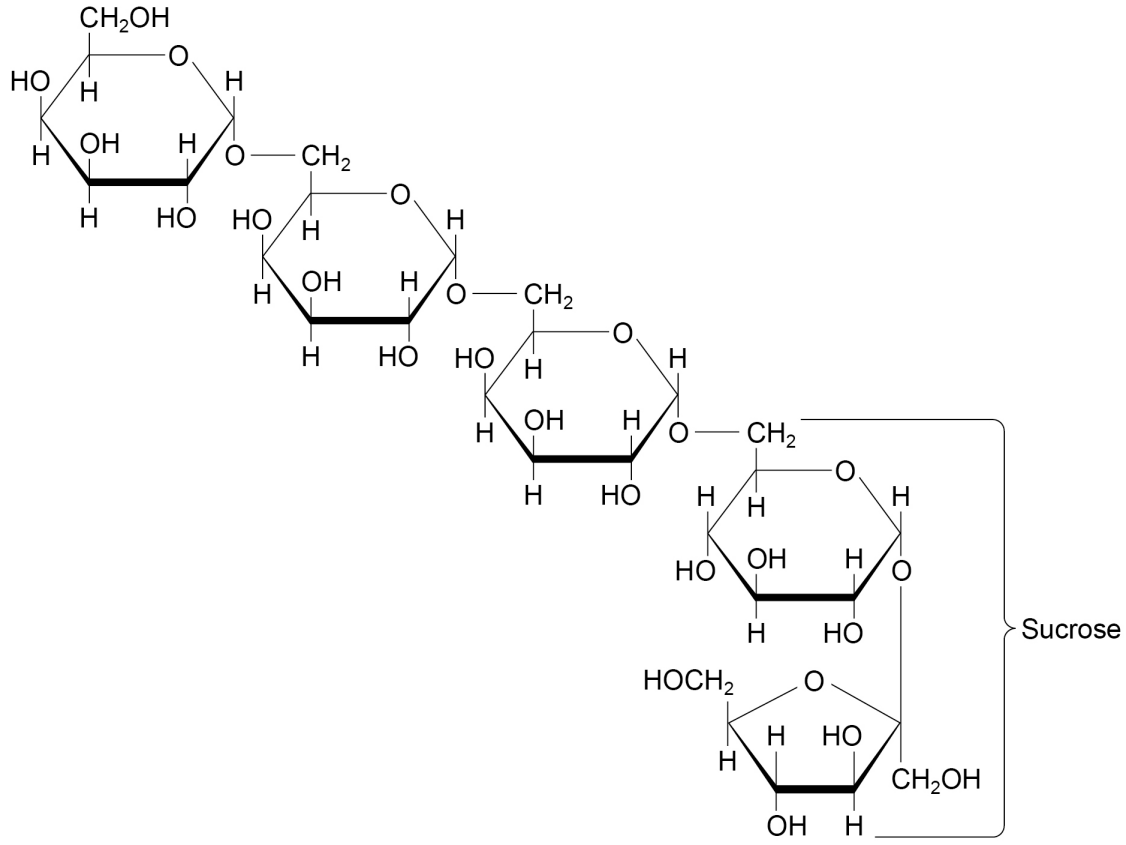
0 5 . 1 Why can the student **not** conclude that there is glucose in the food sample?

[1 mark]

Verbascose is a carbohydrate found in some foods. It contains a sucrose molecule joined to a chain of three galactose molecules. The molecules are joined by condensation reactions.

Figure 8 shows a molecule of verbascose.

Figure 8



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0 5 . 2 Describe the structure of sucrose.

[1 mark]

0 5 . 3 Describe a condensation reaction.

[2 marks]

0 5 . 4 Draw a ring around **one** glycosidic bond on the verbascose molecule shown in **Figure 8**.

[1 mark]

0 5 . 5 Name the isomer of glucose found in verbascose.

Use **Figure 8**.

[1 mark]

Question 5 continues on the next page

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0 5 . 6 Two different enzymes are needed to hydrolyse verbascose into monosaccharides.

Explain why.

Use **Figure 8**.

[2 marks]

0 5 . 7 Verbascose can be called a polymer.

Suggest why.

[1 mark]

Do not write outside the box

0 5 . 8 Verbascose solution gives a negative result when tested with Benedict's reagent.

Describe how Benedict's reagent can be used to show that verbascose solution contains reducing sugars.

[3 marks]

0 5 . 9 Another carbohydrate called ajugose is formed by adding one more galactose molecule to verbascose.

Determine the molecular formula of ajugose.

[2 marks]

Molecular formula of ajugose _____

14

Turn over for the next question

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0 6 Read the following passage:

Protists are a taxonomic group made up of any eukaryotic organisms that are not animals, plants or fungi.

Organisms in the class *Oligohymenophorea* are simple, single-celled protists found almost anywhere there is water. They contain many structures including cytoplasm, cilia, lysosomes, ribosomes, a cell-surface membrane, a nucleus and mitochondria.

However, when researchers studied the genomes of the *Oligohymenophorea* they found a difference in how their DNA is translated into proteins compared with other organisms.

In most organisms, the first codon to be read during translation is AUG. This is the start codon. Translation finishes when the codons UAA, UAG or UGA are read. These are stop codons. There are no anticodons complementary to the stop codons. Instead, a protein release factor binds to the ribosome, stopping translation.

The difference in the *Oligohymenophorea* is that **only** UGA functions as a stop codon. UAA codes for the amino acid lysine and UAG codes for the amino acid glutamic acid. This is extremely unusual and there are no other cases where these two stop codons are linked to two different amino acids. This goes against one of the known features of the genetic code.

Use the information from the passage and your own knowledge to answer the questions.

0 6 . 1 Protists are eukaryotic organisms (line 1).

Name **two** organelles listed in the passage that are **only** found in eukaryotic cells.

[1 mark]

Do not write outside the box

0 6 . 2 Scientists have **not** put the *Oligohymenophorea* into the plant kingdom.

Use the information in lines 4–6 to suggest why.

[2 marks]

0 6 . 3 Define **genome** (line 7).

[1 mark]

0 6 . 4 'Translation finishes when the codons UAA, UAG or UGA are read. These are stop codons' (lines 11–12).

These stop codons are found on RNA, **not** DNA.

Give evidence from lines 11–12 that shows that these stop codons are **only** found on RNA.

[1 mark]

Question 6 continues on the next page

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0 6 . 5 Describe an anticodon (lines 12–13).

[2 marks]

0 6 . 6 'There are no anticodons complementary to the stop codons' (lines 12–13).

List the **three** missing anticodons.

[1 mark]

1 _____

2 _____

3 _____

0 6 . 7 The codon UGA is found only once in an mRNA molecule.

Give the reason why.

[1 mark]

0 6 . 8 'This goes against one of the known features of the genetic code' (lines 18–19).

Identify this feature of the genetic code.

[1 mark]

10

END OF QUESTIONS

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