Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2025

Centre Number

Candidate Number

Biology

Assessment Unit AS 3
assessing
Practical Skills in AS Biology

[SBY31]

SBY31

WEDNESDAY 28 MAY, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete questions in black ink and use a dark HB pencil for drawings and graphs.
Do not write with a gel pen.
Answer **all seven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You may use a scientific calculator.
You are reminded of the need for good English and clear presentation in your answers.
Use accurate scientific terminology in all answers.

15817

20SBY3101

BLANK PAGE

DO NOT WRITE ON THIS PAGE

1 Carbohydrates and proteins can be detected using biochemical tests.

Name the molecules which can be identified from the following observations.

A Iodine turning blue-black

_____

B Biuret reagent turning purple/lilac

_____

C A brick-red precipitate forming following heating with Benedict's reagent

_____

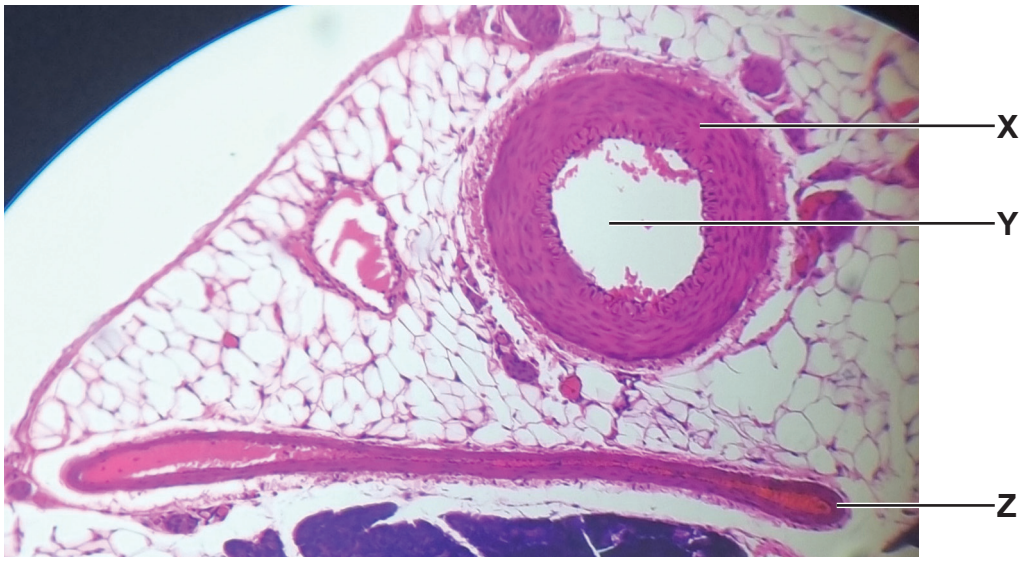
D A brick-red precipitate forming **only** if hydrolysis takes place before heating with Benedict's reagent

_____ [4]

BLANK PAGE

DO NOT WRITE ON THIS PAGE

2 A micrograph of a section through two blood vessels, **X** and **Z**, is shown below.



(a) Identify blood vessels **X** and **Z**, and the part of the blood vessel labelled **Y**.

X _____

Y _____

Z _____ [3]

(b) State **one** piece of evidence which would suggest that this micrograph was produced using a light microscope.

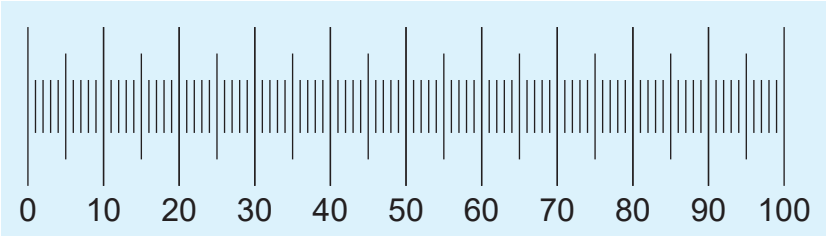
_____ [1]

(c) Suggest why blood vessel **Z** appears flattened, while blood vessel **X** has maintained its rounded shape.

_____

_____ [1]

3 A diagram of a stage micrometer is shown below. The total length of the scale is 1mm.



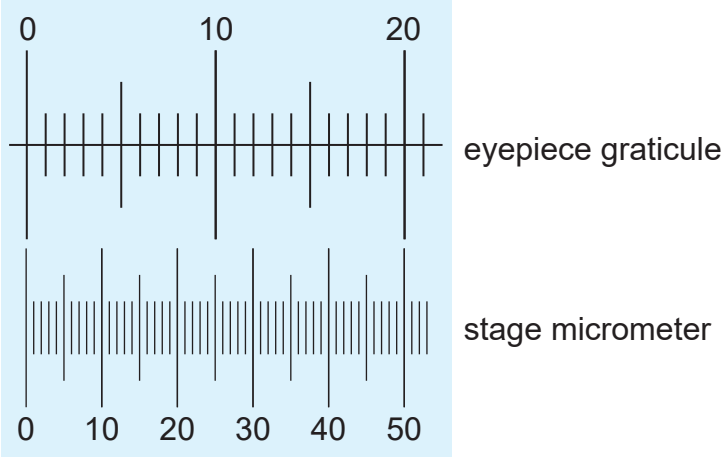
(a) **(i)** Calculate the length of **one** small stage micrometer division in μm.

_____ μm [1]

(ii) The diagram below shows a section of an eyepiece graticule aligned with a stage micrometer, at ×40 magnification.

Using your answer from **(a)(i)**, calibrate the eyepiece graticule shown below by determining the length represented by **one** small eyepiece unit in μm.

Show your working out.



_____ μm [2]

(iii) Other than adjusting the focus, describe **one** way in which you could distinguish between the eyepiece graticule and the stage micrometer when viewed together.

_____

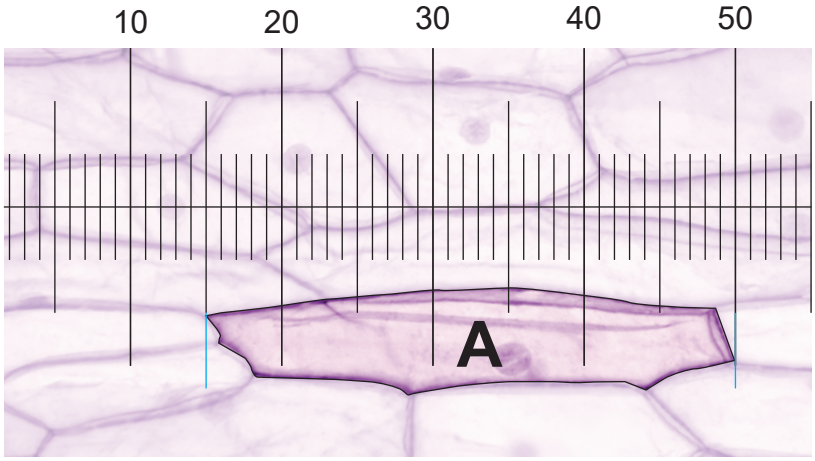
_____

_____ [1]

[Turn over

(b) When viewing onion cells at ×100 magnification, each small eyepiece unit represents 8.7 μm.

Using this information, calculate the length of cell **A**.



Show your working out.

_____ μm [2]

(c) Suggest why it is better to measure cell **A** at ×100 magnification rather than at ×40 magnification.

_____

_____

_____ [1]

4 Butterflies are small insects which use their wings to fly from place to place.

A student wanted to investigate the abundance of butterflies along a transect, from the edge to the centre of a woodland.

(a) Describe an appropriate method which could be used in this investigation. You should name the sampling device which is most appropriate. Your method should describe how the sampling device is used to obtain valid results.

Sampling device _____

Method

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [5]

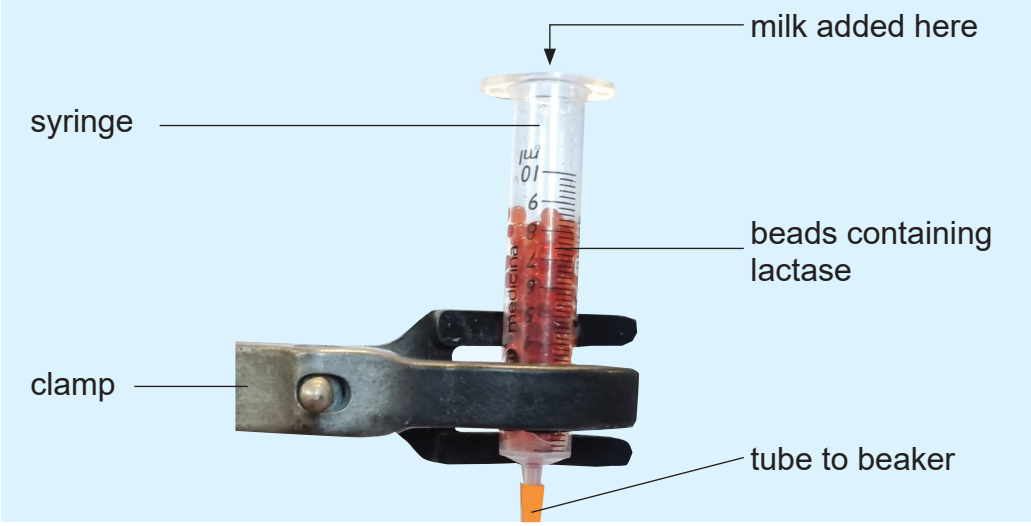
(b) Name **one** abiotic factor that would be expected to change along this transect.

_____ [1]

[Turn over

5 The enzyme lactase breaks down the disaccharide lactose into the monosaccharides glucose and galactose. Lactose sugar can be removed from milk using the apparatus shown in the photograph below.

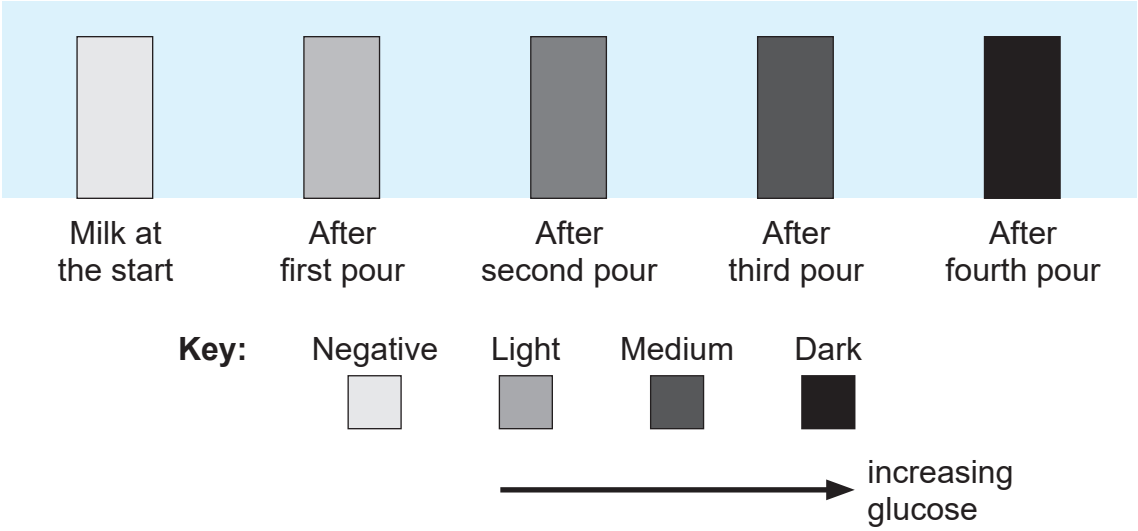
The enzyme lactase is trapped in beads which are placed in a syringe. Milk is poured over the beads and then collected in a beaker below the syringe.



In an investigation, the concentration of glucose in the collected milk was measured. The same milk sample was poured over the beads several times.

After each pour, the glucose concentration was measured using a specific reagent strip. These strips change colour if glucose is present. The darker the colour, the more glucose present.

The results of the investigation are represented in the diagram below.



15817

(a) Describe and explain these results.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [3]

(b) **(i)** State the term used to describe enzymes which are trapped in this way.

_____ [1]

(ii) Suggest a suitable material for producing the beads.

_____ [1]

(c) The experiment was repeated using larger beads.

Suggest and explain how this may affect the concentration of glucose detected.

_____

_____

_____

_____

_____

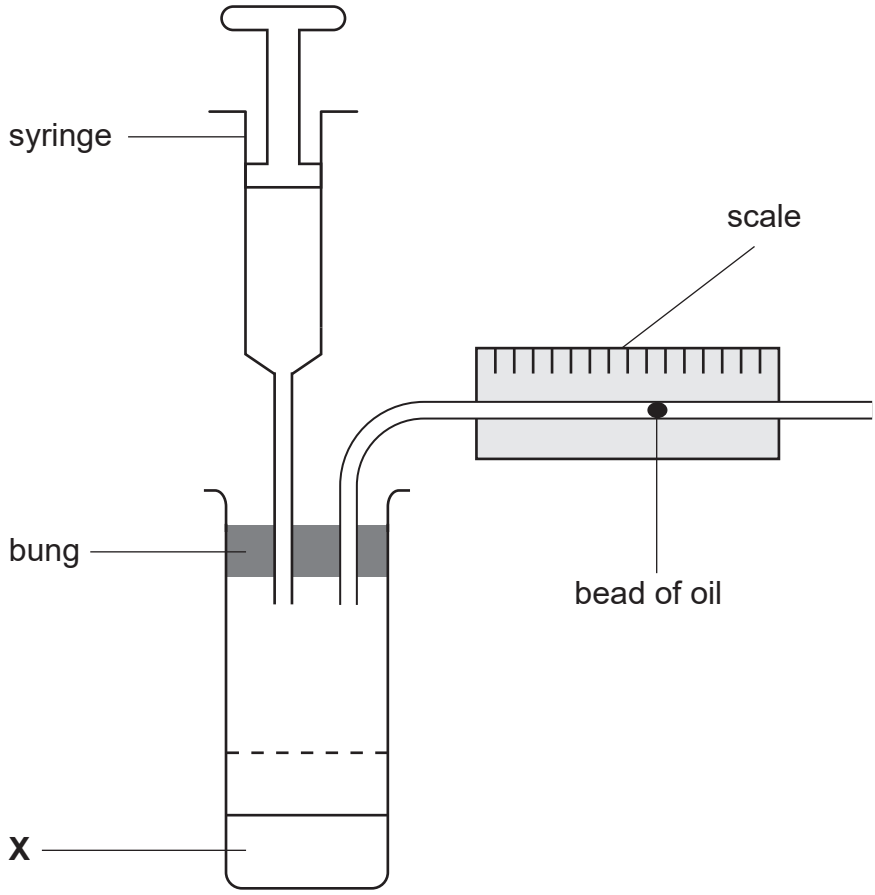
_____ [2]

BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

6 The uptake of oxygen by small living organisms, such as maggots, can be measured using the respirometer shown below.



(a) **(i)** Identify solution **X**.

_____ [1]

(ii) Indicate where the maggots should be placed by adding the letter **M** to the diagram. [1]

(iii) Name the apparatus which could be used to maintain a constant temperature during this investigation.

_____ [1]

5 g of maggots were used in this investigation. The distance moved by the bead of oil was measured over 25 minutes at 30 °C.

The results are shown below.

Time / minutes	Distance moved by the bead of oil / mm
0	0
5	4
10	9
15	13
20	18
25	22

(b) Calculate the rate of oxygen uptake in mm per minute per gram for the maggots, over 25 minutes.

Show your working out.

_____ mm min^{-1} g^{-1} [3]

(c) Predict the change in the rate of oxygen uptake if the investigation was carried out at 20°C. Explain your answer.

Prediction _____

Explanation _____

_____

_____

_____

_____ [3]

[Turn over

7 In an investigation to determine the solute potential of onion epidermal cells, pieces of onion epidermis were placed in salt solutions of different concentrations.

After a period of time, the pieces of onion epidermis were examined under a microscope and 50 cells were observed. The number of plasmolysed cells was counted and recorded for each piece.

(a) **(i)** Identify the dependent variable in this investigation.

_____ [1]

(ii) Describe the appearance of a plasmolysed cell.

_____

_____

_____

_____

_____

_____ [2]

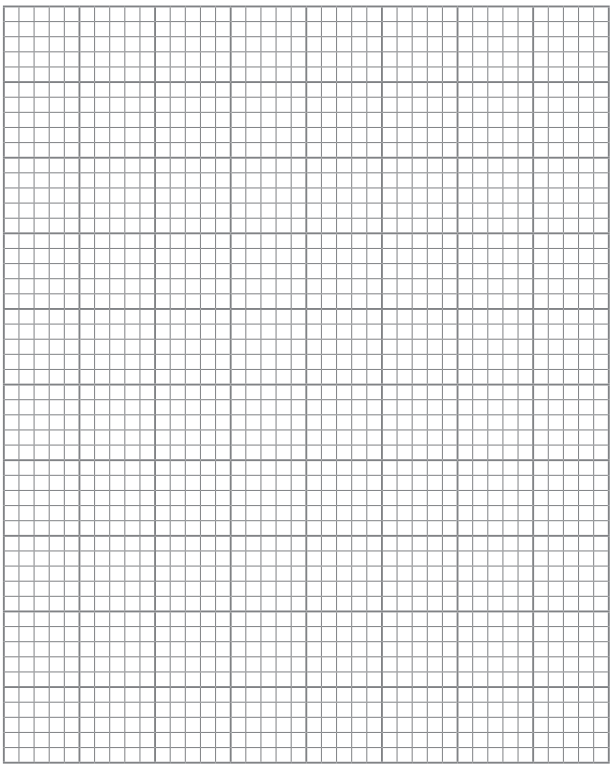
(b) Fifty cells were observed for each piece of onion epidermis.
The results of this investigation are shown in the table below.

Concentration of salt solution / M	Number of cells plasmolysed out of 50	Percentage of cells plasmolysed
0.00	0	0
0.25	10	
0.50	24	
0.75	36	
1.00	50	100

(i) Complete the table by calculating the percentage of cells plasmolysed at 0.25, 0.50 and 0.75 M. [2]

(ii) Plot a graph of the percentage of cells plasmolysed against the concentration of salt solution on the graph paper below.

Percentage of onion cells plasmolysed in different concentrations of salt solution



[4]

(c) Describe how the data from this graph could be used to determine the solute potential of the onion epidermal cells.

_____

_____

_____

_____

_____ [2]

[Turn over

This technique is based upon the pressure potential being equal to zero when the cell membrane is in contact with the cell wall, but not exerting any pressure on it.

(d) State the term used to describe a cell in this state.

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE

SOURCES

Question 2: Principal Examiner
Question 3(b): © Getty Images / Principal Examiner
Question 5: Principal Examiner
Question 6: Principal Examiner

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
Total Marks	

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.