New Specification

Rewarding Learning

Centre Number

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Biology

Assessment Unit AS 3
assessing
Practical Skills in AS Biology

[SBY31]

SBY31

FRIDAY 5 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 in black ink only. **Do not write with a gel pen.**
Answer **all eight** 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 are reminded of the need for good English and clear presentation in your answers.
Use accurate scientific terminology in all answers.

1 Benedict's reagent can be used to detect the presence of reducing sugar.

(a) Describe how to carry out the Benedict's test on a prepared sample.

_____

_____

_____ [1]

(b) Describe a positive result for the Benedict's test.

_____

_____ [1]

(c) Identify a second test which would confirm that the reducing sugar present in a sample was glucose.

_____

_____ [1]

2 A colorimeter can be used when investigating the effect of amylase concentration on the rate of breakdown of starch. In order to obtain precise values for the starch remaining in the mixture, a calibration curve is used.

(a) To produce a calibration curve it is necessary to make a serial dilution of a stock starch solution to obtain the range of concentrations required.

(i) Describe how you would make a 0.1% starch solution from a 1% starch solution.

_____

_____

_____ [1]

(ii) State **two** precautions that must be taken to ensure accuracy when preparing serial dilutions.

1. _____

_____

2. _____

_____ [2]

(b) Describe briefly how the serial dilutions can be used to produce a calibration curve, using a colorimeter.

_____

_____

_____

_____

_____

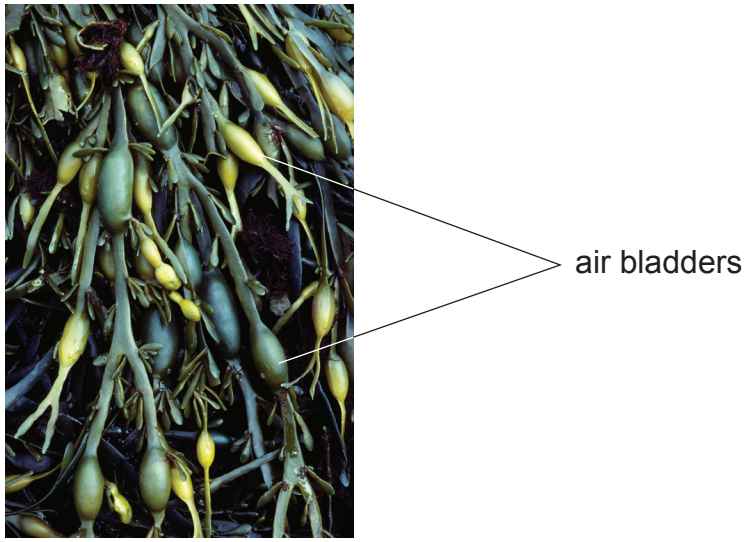
_____

_____ [2]

[Turn over

3 A group of students investigated the distribution of the seaweed, egg wrack *(Ascophyllum nodosum)*, on exposed and sheltered rocky shores.

A. nodosum



Like most seaweeds, *A. nodosum* is firmly attached to underlying rock. The air bladders help the seaweed float when covered by water.

(a) The students placed a transect tape from low tide mark to high tide mark on both an exposed rocky shore and a sheltered rocky shore. They estimated the percentage cover of *A. nodosum* in quadrats placed end to end up the shore in each site.

(i) Explain why systematic sampling was used rather than random sampling.

_____

_____

_____ [1]

When selecting areas to place their transect tape, the students chose positions that avoided their transect tape passing across any rock pools. (Rock pools are large hollows in the rock that contain water, even when the tide is out.)

(ii) Suggest why the students avoided placing their transect tape across rock pools.

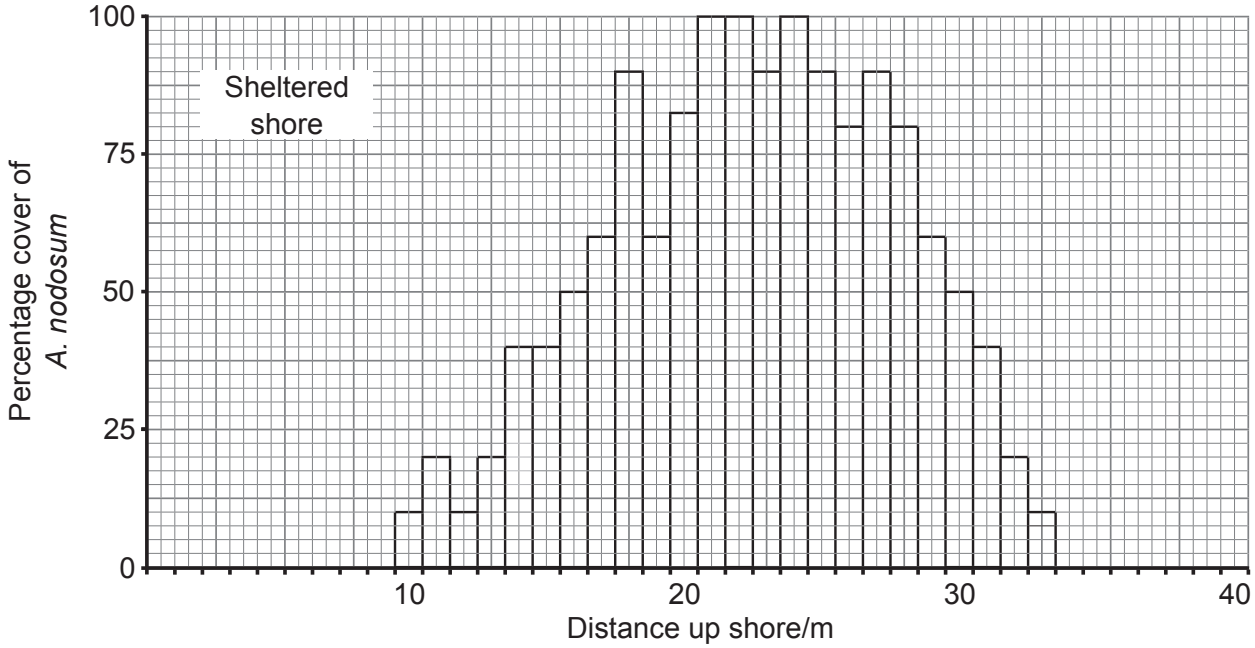
_____

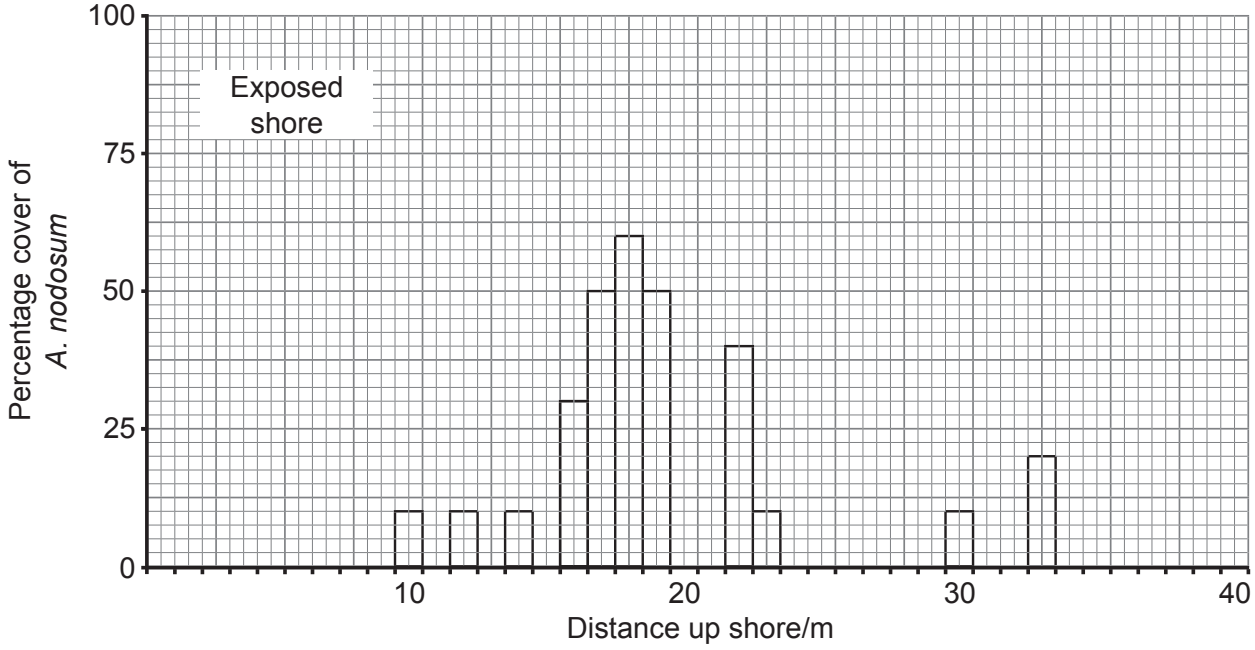
_____

_____ [1]

[Turn over

(b) The graphs below show the distribution of *A. nodosum* on the two rocky shores.





(i) State **one** similarity and **two** differences between the distributions of *A. nodosum* on the two rocky shores.

Similarity_____

_____

_____

Differences

1. _____

_____

_____

2. _____

_____

_____ [3]

(ii) Using the information provided, suggest a possible explanation for **one** of the differences.

_____

_____

_____ [1]

[Turn over

4 In an investigation to determine the average solute potential of onion cells at incipient plasmolysis, the following procedure was carried out:

- sections of onion epidermal tissue were added to different beakers. Each beaker contained either water or one of a range of sucrose solutions
- each section of tissue was left in its beaker for 20 minutes
- after 20 minutes, each section of tissue was removed from its immersing solution and mounted on a microscope slide
- using a microscope, the number of plasmolysed cells in each section of tissue was counted.

A summary of the investigation results is shown in the table below.

Solute potential of immersing sucrose solution/kPa	Percentage of cells plasmolysed
0	0
−500	14
−1000	38
−1500	48
−2000	74
−2500	90
−3000	100
−3500	100

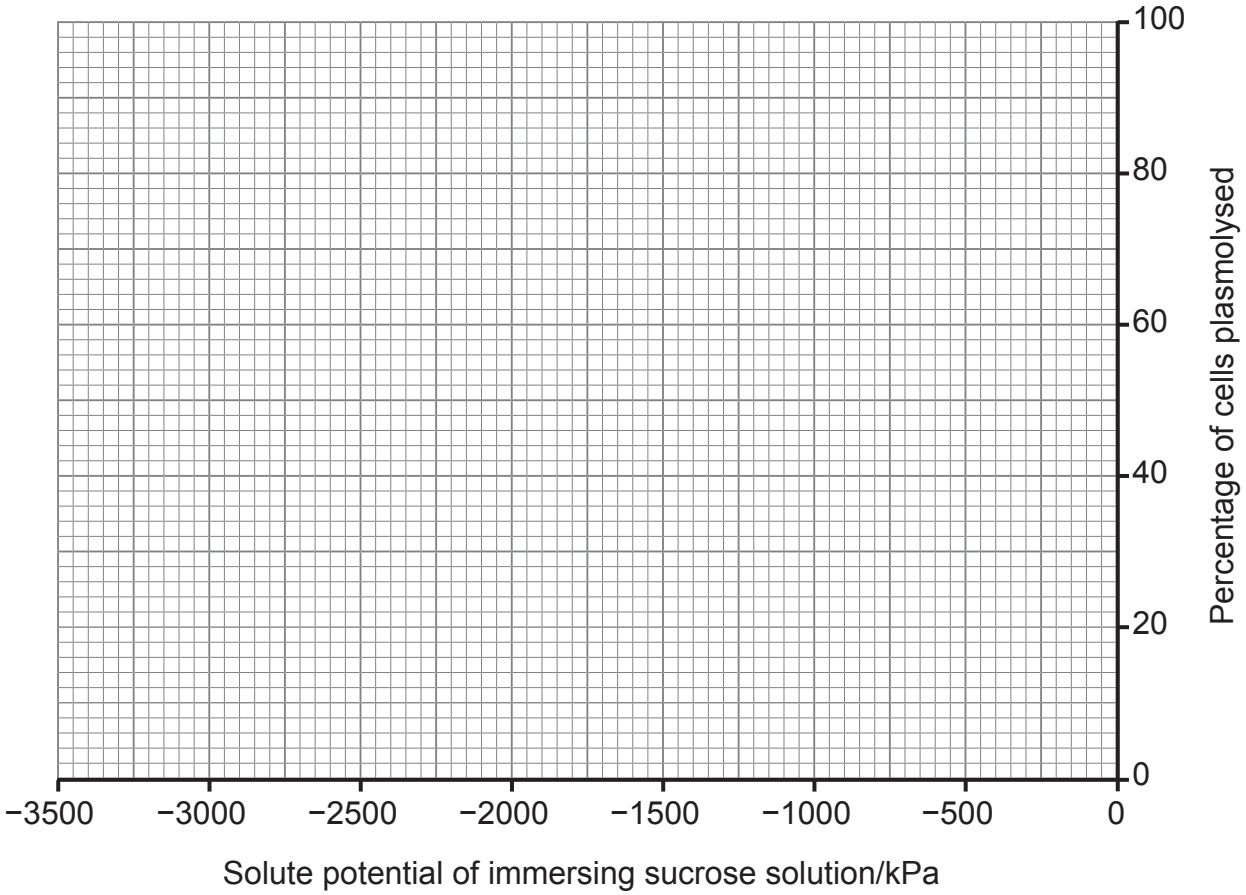
(a) State **one** other observation that needed to be made to obtain the data for the percentage of cells plasmolysed.

_____

_____

_____ [1]

(b) Using the results, draw the most appropriate graph on the grid below.



[3]

(c) Using your graph, estimate the average solute potential of the onion cells at incipient plasmolysis.

_____ kPa [1]

[Turn over

5 Ecological investigations often involve the measurement of abiotic factors. For example, soil moisture content may be calculated when analysing plant distribution. This usually involves collecting soil samples and then bringing them back to the laboratory, where the soil is dried in an oven at 105°C until constant mass is achieved.

The soil moisture data obtained for a particular sample is listed below:

- mass of soil and container before drying = 46.55 g
- mass of soil and container after drying = 36.87 g
- mass of container = 22.04 g

(a) Calculate the percentage soil moisture of this sample.
(Show your working.)

_____ % [3]

(b) Describe how **one** other edaphic factor could be measured.

_____

_____

_____ [1]

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(Questions continue overleaf)

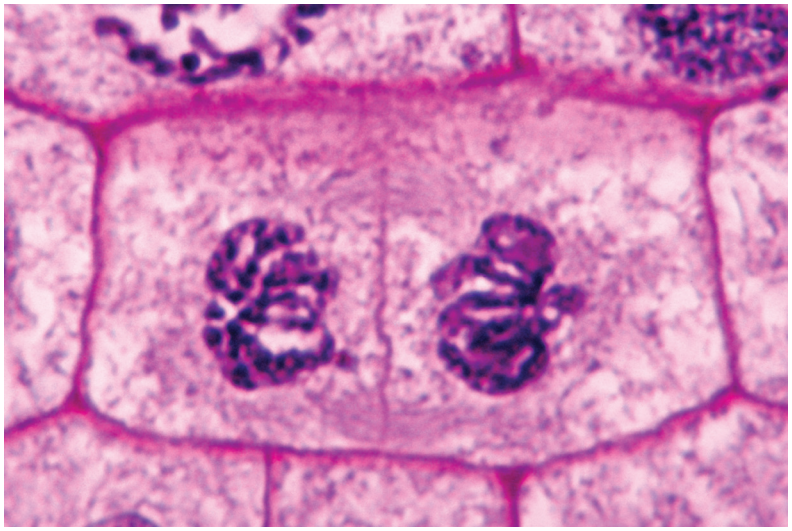
[Turn over

6 Cells at different stages of mitosis can be observed in plant root tips under a microscope. In order to allow chromosomes in individual cells to be seen clearly, the root tips undergo a series of treatments.

(a) Describe how to prepare a microscope slide of a root tip, for the purpose of observing stages of mitosis. Your answer should include how to obtain suitable tissue.

[5]

(b) The photograph below shows a plant cell undergoing mitosis.



© Dr. Robert Calentine / Visuals Unlimited / Science Photo Library

(i) Draw the large central cell undergoing mitosis in the box below. Label three structures visible in this cell. (Your drawing should not include the other surrounding cells.)

[4]

(ii) Identify the stage of mitosis shown.

_____ [1]

[Turn over

7 The enzyme catalase breaks down hydrogen peroxide, a common waste product in plant and animal cells, producing oxygen and water.

If a tissue containing catalase is added to hydrogen peroxide in a boiling tube, oxygen is produced very quickly and a froth develops in the boiling tube. The maximum height of the froth can be measured and used as an indication of catalase activity.

In an investigation, the activity of catalase in three tissues was compared using the following procedure:

- three boiling tubes were set up, each half-filled with hydrogen peroxide
- three 1 cm^3 cubes, one each of liver, muscle (beef) and potato tissue were prepared
- each cube of tissue was added to a separate boiling tube
- the maximum height of froth produced in each boiling tube was measured.

(a) Complete the table below using a tick (✓) to identify variables that should have been controlled to ensure the investigation was valid.

Variable	**Variable controlled?**
Temperature	
Concentration of enzyme	
Concentration of substrate	
Volume of substrate	

[2]

(b) Complete the table below that could be used for recording the results of this investigation.

(You do **not** need to include a caption.)

[3]

(c) Suggest how the investigation could be modified to provide more accurate results.

_____

_____

_____

_____

_____ [2]

(d) In a similar investigation, the cubes of tissue were cut into thin slices. The maximum height of froth produced was greater. Suggest an explanation for this.

_____

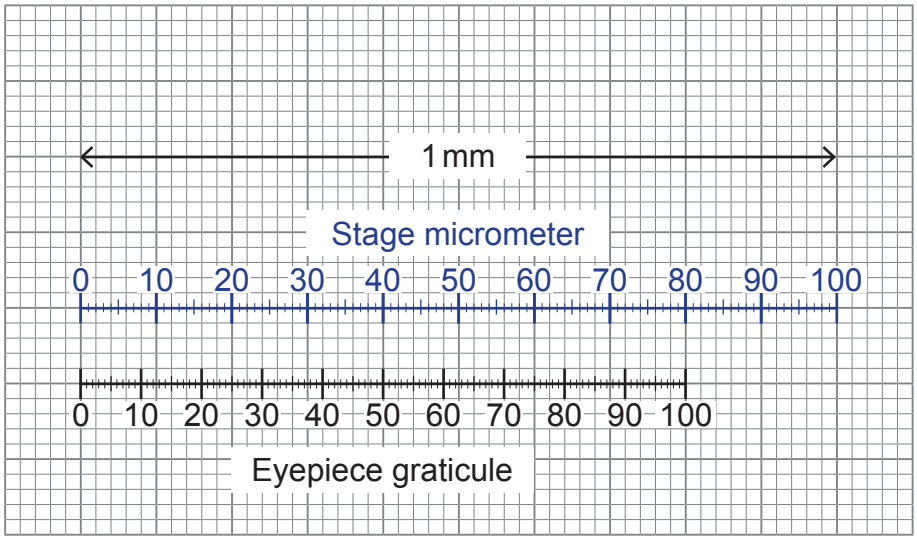
_____

_____ [1]

[Turn over

8 When using a light microscope, an eyepiece graticule can be used to measure cell lengths. Before using an eyepiece graticule, it is important that it is calibrated against a stage micrometer.

(a) The diagram below represents an eyepiece graticule alongside a stage micrometer, as viewed at low power.



(i) Calculate the length (in μm) represented by each small division on the eyepiece graticule at this magnification.

(Show your working.)

_____ μm [3]

(ii) Students may confuse the eyepiece graticule with the stage micrometer when looking down the microscope.

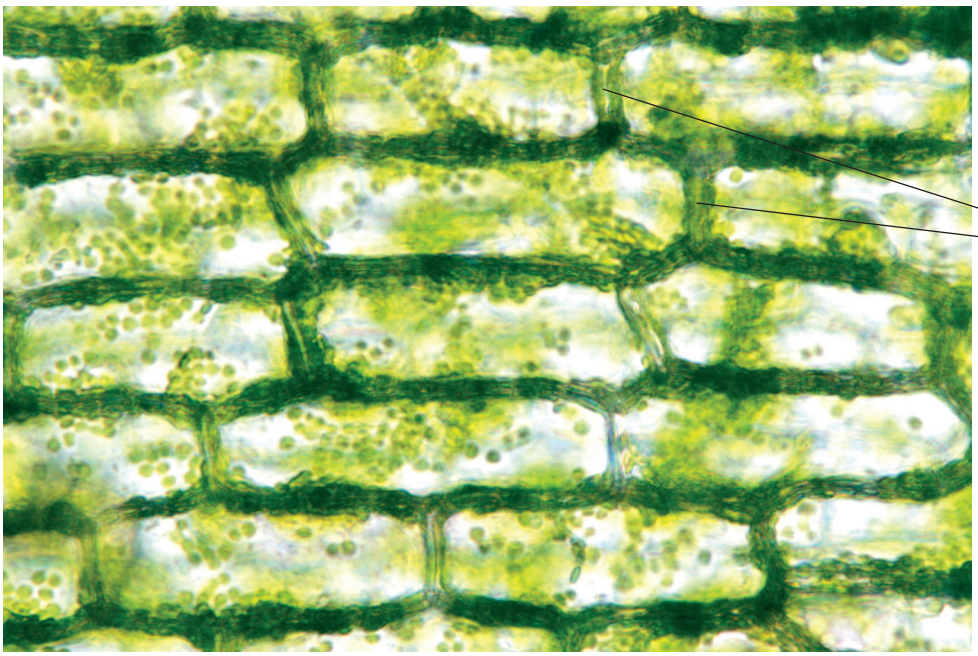
Suggest **one** way that a student could distinguish between the eyepiece graticule and the stage micrometer when looking down the microscope. (Reference to relative lengths or colours of the two scales is not an appropriate answer.)

_____

_____

_____ [1]

(b) The photograph below shows cells from the pondweed *Elodea* as viewed using a light microscope.



(i) Suggest what the lighter zones, labelled **X**, represent.

_____ [1]

[Turn over

(ii) Once the eyepiece graticule has been calibrated, describe how you would use it to determine the mean length of *Elodea* cells, as accurately as possible. (You do not need to describe how to prepare the slide containing the *Elodea*.)

[4]

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
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8	
Total Marks	

Examiner Number