



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Centre Number

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Candidate Number

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Biology

StemUp Model Solution

Assessment Unit AS 3

assessing

Practical Skills in AS Biology



[SBY31]

SBY31

THURSDAY 2 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.

12158

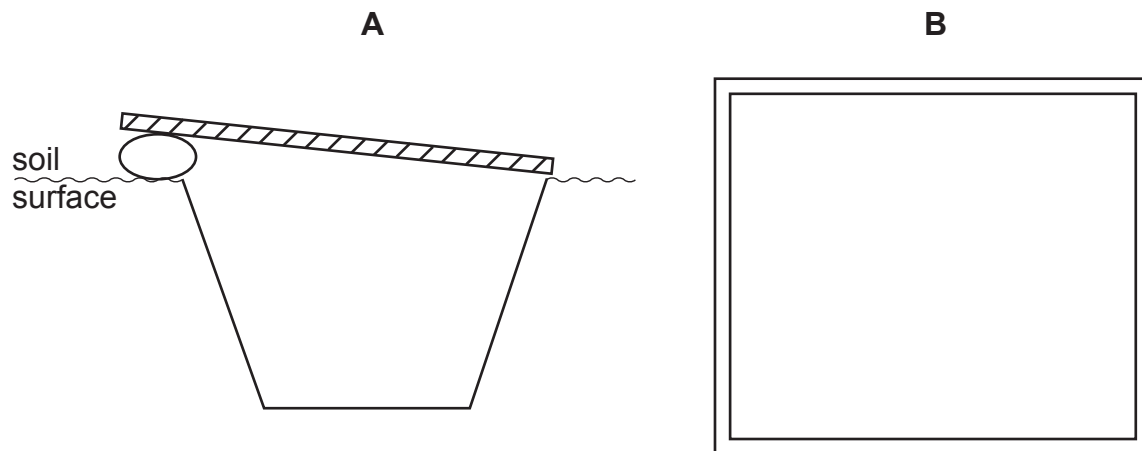


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- 1 The diagram below represents two ways of sampling animal populations, labelled **A** and **B**. (The diagrams are not drawn to scale.)



- (a) Complete the table below by naming each sampling device shown and suggesting the type of animal each could be used to sample.

	Sampling device	Type of animal sampled
A	<i>Pitfall trap</i>	<i>Insects (e.g. beetles) that crawl in leaf litter / on the ground</i>
B	<i>Quadrat</i>	<i>Sedentary or slow-moving animals, e.g. snails, limpets, barnacles</i>

[4]

- (b) Suggest **one** precaution necessary when using apparatus **A** to ensure successful sampling of the population.

Sink the trap so that its rim is exactly level with the soil surface, so crawling animals fall in.

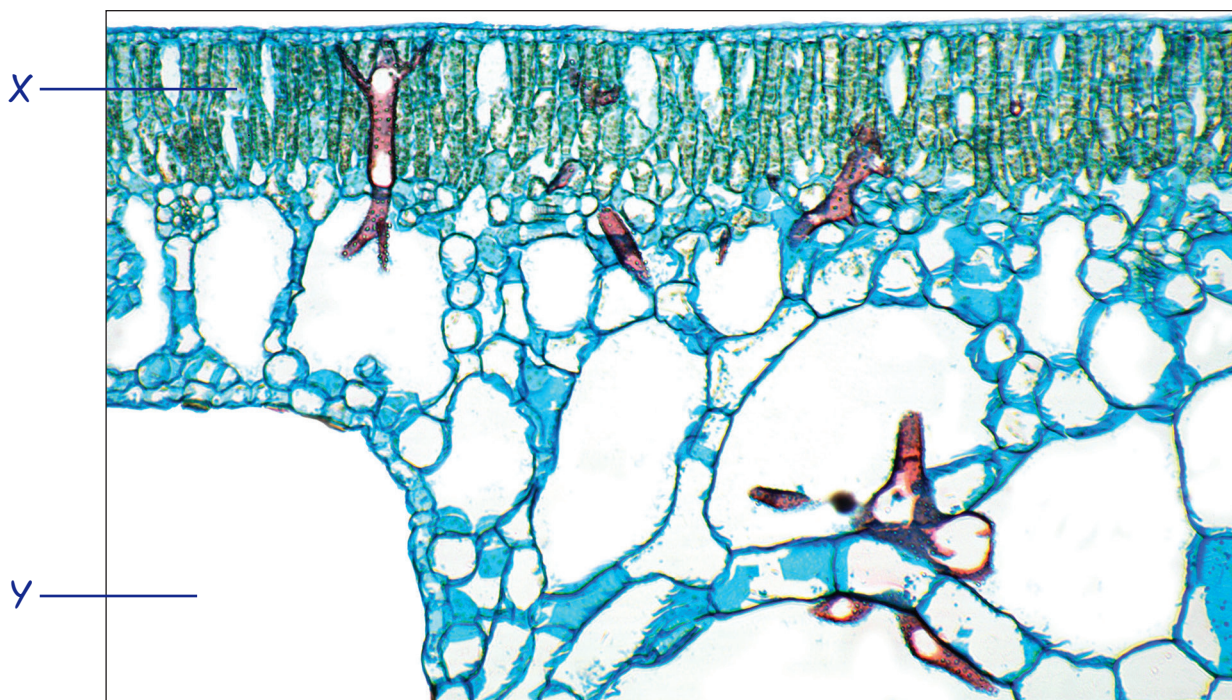
[1]

[Turn over]



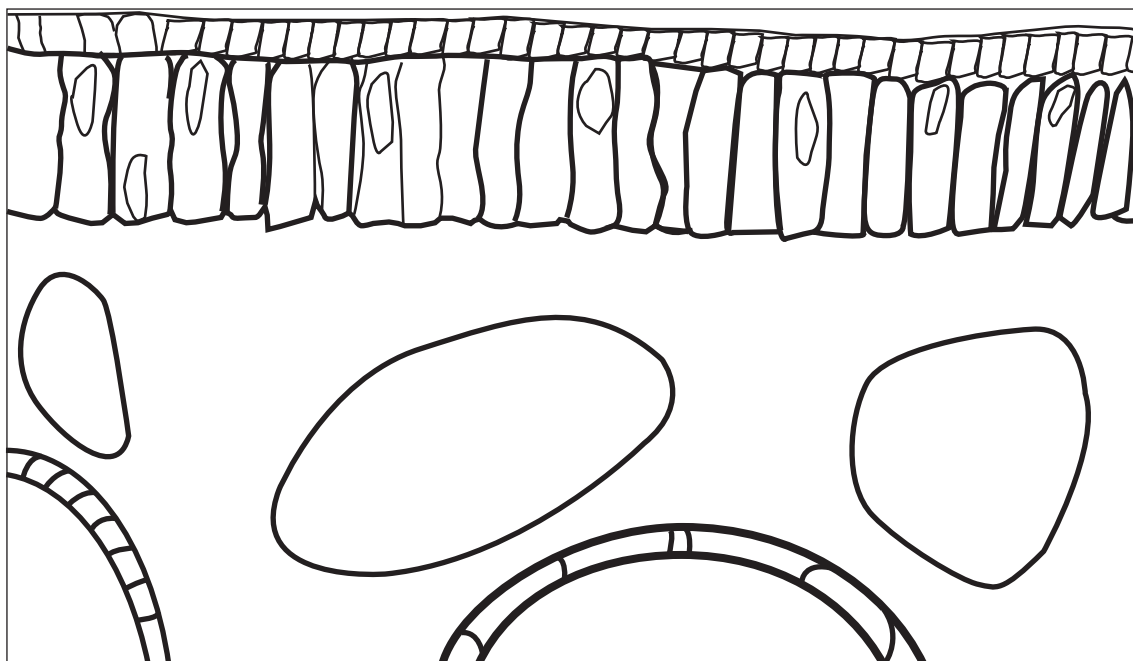
- 2 The photograph below shows a section through a water lily (*Nymphaea alba*) leaf. A student drew a block diagram of this section and this is also shown. The block diagram includes some errors.

Photograph



© Dr Keith Wheeler / Science Photo Library

Block diagram



(a) On the **photograph** label

- the main photosynthetic layer with an **X**
- a feature that adapts the water lily to survive in water with a **Y**. [2]

(b) Describe **three** errors that can be seen in the block diagram.

1. *The drawing is not representative of the specimen: the air spaces and lower tissues do not match the photograph.*

2. *The layers are not drawn in proportion, e.g. the upper epidermis is drawn too thick.*

3. *Individual cells have been drawn, so it is not a block diagram (only tissue boundaries should be shown).*

[3]

[Turn over



- 3 An investigation was carried out into the effect of temperature on the hydrolysis of starch by amylase.

Three water baths were set up at 20°C, 40°C and 60°C. Equal volumes of starch and amylase solutions were placed in separate test tubes in each water bath for 5 minutes, before being mixed. At this point a stopclock was started.

The mixtures were sampled initially and then every 2 minutes for 12 minutes and tested with iodine for the presence of starch. Measurements of transmission of light were taken using a colorimeter.

- (a) State the appropriate colour of filter to be used in the colorimeter.

Red

[1]

The results of this investigation are shown in the table below. The temperatures shown represent the temperature of each water bath.

Time/minutes	Transmission of light/%		
	20°C	40°C	60°C
0	7	8	6
2	15	24	11
4	23	48	12
6	42	66	11
8	58	52	13
10	75	92	11
12	86	97	11



- (b) (i) Identify the anomalous result at 40°C and suggest **two** possible ways in which this anomaly could have arisen.

Anomalous result 52 % at 8 minutes

1. The cuvette was dirty or scratched, or was not inserted the correct way round (it was not optically identical).
2. A different volume of iodine was added to this sample, or the sample was not shaken (mixed) equally.

[3]

- (ii) At 60°C, the percentage transmission of light remains low throughout. However, there is a small increase from 0 – 2 minutes. Suggest a reason for this small increase.

Not all of the enzyme molecules have been denatured yet, so a small amount of starch is broken down at first.

[1]

- (c) Describe briefly how the colorimeter measurements could be converted from % transmission to starch concentrations.

Make up standard starch solutions of known concentration by serial dilution, test each with iodine and measure its % transmission.

Plot a calibration curve of % transmission against starch concentration and read the starch concentration of each sample off the curve.

[2]

[Turn over]



- 4 A student was asked to test a solution for the presence of protein and non-reducing sugar.

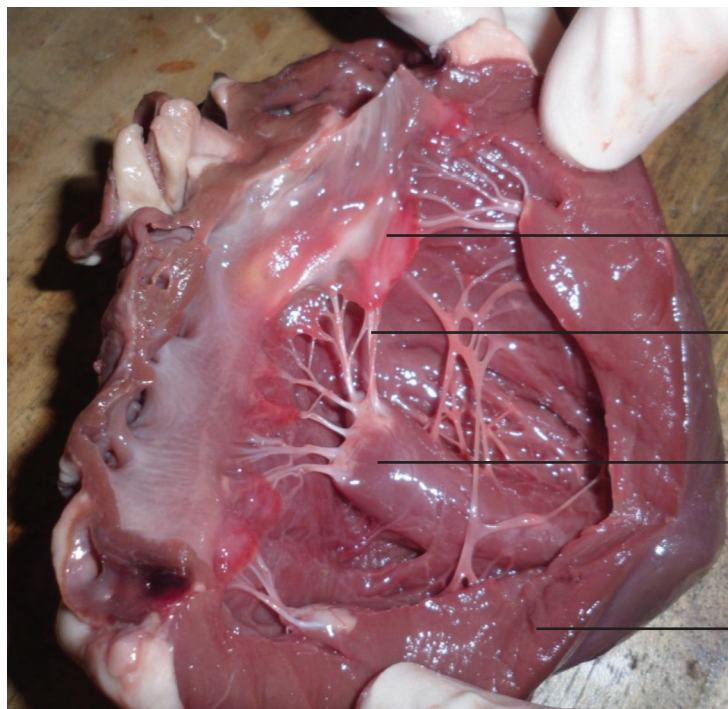
Complete the table below with the names of the reagent(s) and/or chemical(s) required for each test and a description of the colour **change** which would indicate a positive result.

Test	Reagent(s) and/or chemical(s) required	Positive colour change
Protein	<i>Biuret reagent (sodium hydroxide solution and copper(II) sulfate solution)</i>	<i>Blue to purple (lilac / violet)</i>
Non-reducing sugar	<i>Benedict's test is negative first. Boil with dilute hydrochloric acid (acid), neutralise with sodium hydrogencarbonate (alkali), then heat with Benedict's reagent in a water bath</i>	<i>Blue to brick red / orange (precipitate) after the acid and alkali treatment</i>

[5]



- 5 A photograph of the dissected left side of a sheep's heart is shown below.



© CCEA

- (a) Name the structures labelled A – D.

A Atrioventricular (bicuspid / mitral) valve
B Chordae tendineae (valve tendons)
C Papillary muscle
D Wall of the left ventricle (cardiac muscle)

[4]

- (b) Describe and explain how **one** of these structures (A – D) would differ on the right side of the heart.

D, the ventricle wall, would be thinner on the right side.

This is because the right ventricle only needs to create a lower pressure,
to pump blood the short distance to the lungs.

[2]

[Turn over]



- 6 Paper chromatography can be used to identify unknown amino acids in a solution.

Describe how to **set up** and **develop** a chromatogram to identify unknown amino acids in a solution.

Include **one** safety precaution necessary in this experiment.

Setting up

Wearing gloves and handling the paper by its edges (to avoid contamination), draw a pencil origin line about 2 cm from the bottom of the chromatography paper.

Use a capillary tube to spot the unknown solution on the origin; let it dry and re-apply several times to concentrate the spot.

Spot standard solutions of known amino acids alongside it on the origin line.

In a fume cupboard (solvent is toxic and flammable), add solvent to the tank, put the lid on and leave it so the air is saturated with solvent vapour.

Hang the paper in the tank so the origin line is above the solvent level and replace the lid.

Development

Let the solvent rise until near the top, remove the paper, mark the solvent front in pencil and dry it.

In a fume cupboard, spray with ninhydrin, then dry/heat it to develop purple spots; compare with the standards (R_f values).

[6]





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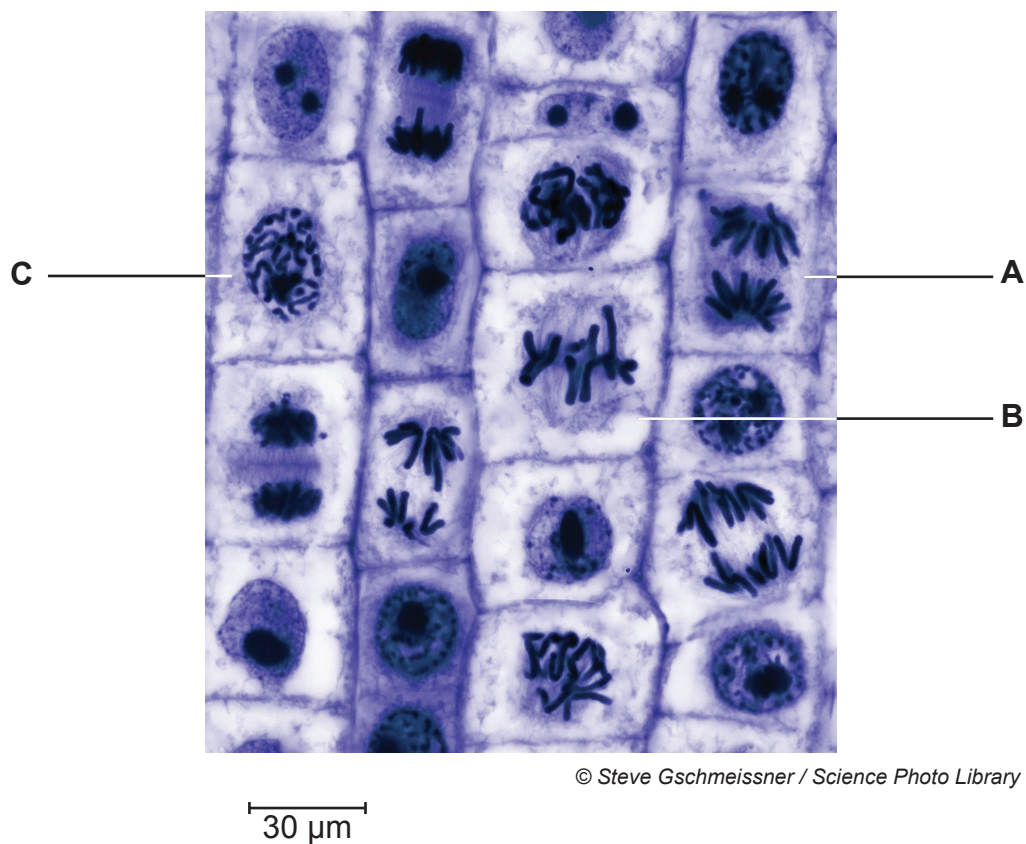
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[Turn over



7 The photograph below shows onion cells in a root tip.



(a) Name the stage of mitosis occurring in each of the cells labelled **A – C**.

A Anaphase

B Metaphase

C Prophase

[3]



(b) Using the scale bar, calculate the magnification of the photograph.

(Show your working.)

Length of scale bar = 15 mm

15 mm $\times$ 1000 = 15 000 μ m

magnification = image size $\div$ actual size

= 15 000 μ m $\div$ 30 μ m = 500

$\times$ 500

[3]

(c) Name a stain that can be used when investigating mitosis in root tips and explain why a stain is necessary.

Stain *Acetic orcein*

Explanation *Chromosomes are colourless, so the stain binds to the DNA to make the chromosomes (chromatids) more visible, so stages can be identified.*

[2]

[Turn over]



- 8 An investigation was carried out into the distribution of the woodland plant bluebell (*Hyacinthoides non-scripta*).

A student set up a transect from the edge of an area of woodland towards its centre. At 10 metre intervals along the transect, percentage cover of *H. non-scripta* was recorded. At each transect position, light intensity was measured and recorded.

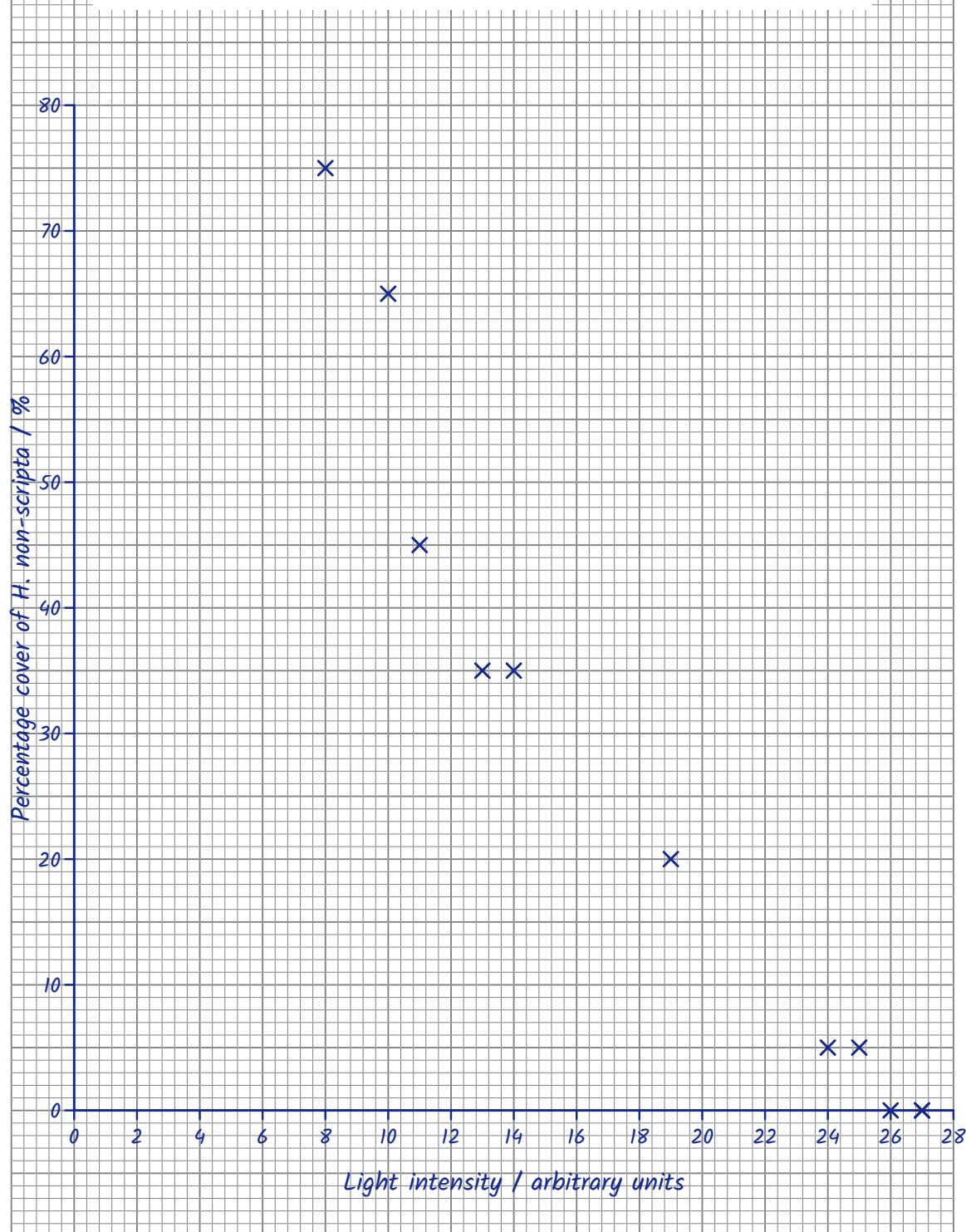
The results are shown in the table below.

Transect position/m	Light intensity/ arbitrary units	Percentage cover of <i>H. non-scripta</i>
0	27	0
10	27	0
20	25	5
30	26	0
40	19	20
50	14	35
60	24	5
70	13	35
80	11	45
90	10	65
100	8	75

- (a) Use the data to plot a scatter graph to investigate if a correlation exists between **percentage cover** of *H. non-scripta* and **light intensity**. [3]



Percentage cover of *H. non-scripta* against light intensity in an area of woodland



[Turn over]



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(b) Describe the trend shown in the graph.

*There is a negative correlation: as light intensity increases, the percentage cover of *H. non-scripta* decreases.*

[1]

(c) (i) Name the apparatus used to measure light intensity.

A light meter

[1]

(ii) Suggest a reason for the increase in light intensity shown in the table at 60 m.

There is a clearing (gap in the canopy) at 60 m, e.g. a fallen tree, so more light reaches the ground.

[1]

(iii) Suggest how the student would have ensured that the data for light intensity at each sampling point was valid.

Hold the light meter at the same height above the ground and in the same orientation at each point, under the same cloud cover.

[1]

(d) State **one** other abiotic factor which would be expected to change along the transect used by the student.

Soil moisture

[1]

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Question Number	Marks
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Examiner Number

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