



**ADVANCED**  
**General Certificate of Education**

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## **Biology**

**Assessment Unit A2 3**

*assessing*

**Practical Skills in Biology**

**[ABY31]**

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## **Assessment**

**MARK  
SCHEME**

## General Marking Instructions

The main purpose of the mark scheme is to ensure that each question is marked accurately, consistently and fairly.

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which students may produce. In the event of unanticipated answers, teachers and lecturers are expected to use their professional judgement to assess the validity of answers.

### Mark Scheme Notation

The use of a solidus (/) denotes alternative answers which can be awarded within the same question (or marking point in a question worth more than one mark).

The use of a semi-colon (;) denotes separate marking points. These are particularly relevant when separating the different marking points in a question worth more than one mark.

Part of an answer within brackets indicates that this part is not essential to gain credit – the bracketed section is usually to set context or for the purpose of completeness.

Some answers are shown as 'Any **two** from' (or any number between two and six). This means that any two (or other specified number) answers from the bullet-pointed list can be credited in this question or question part.

Some answers have 'Other appropriate response' (OAR) as an alternative answer which may be credited. OAR is most likely to appear in an answer where there are a wide range of possible answers worthy of credit and it is unlikely that the mark scheme contains all the possible answers.

### Marking Calculations

Full marks are normally awarded for the correct answer – irrespective of whether working out has been shown (even when asked to show working out.) The principle of 'error carried forward' (ECF) usually applies in that if a student makes a mistake in the first part of a three-mark, three-stage calculation then the final two marks can be awarded if the second and third stage processes are carried out correctly. The same principle applies to a mistake at any stage in a calculation.

### Essays

The mark scheme includes indicative points for essays. Each indicative point is numbered to aid marking. Following the indicative points in the mark scheme, a table is included which shows how many marks should be awarded for an answer that is credited with having a particular number of indicative points.

### Additional Guidance

The Additional Guidance column in the mark scheme provides extra information to aid the marking process. This column includes clarification concerning some marking points: this may include naming key words which may be required in an answer or may provide a range of alternative answers which would be considered creditworthy under OAR, or examples of the ECF principle. It may also include examples of answers which would not be considered creditworthy.

Question	Answer	Additional Guidance	Mark
1 (a)	To absorb carbon dioxide;		[1]
(b)	The bead would not move; since volume of oxygen used and volume of carbon dioxide produced are equal;	No change implies no bead movement (marking point (MP)1). No change in gas pressure <b>not</b> enough for second mark.	[2]
(c)	Place the test tube in a water bath;	Credit 'use a water bath'.	[1] [4]
2 (a)	Avoid disruption of proteins/organelles/ enables photosynthetic enzymes to function properly;	Maintains pH <b>not</b> enough (as in the question).	[1]
(b)	DCPIP would remain blue/not be decolourised;	Not just <b>no</b> change.	[1]
(c)	<b>Test tube 1</b> DCPIP would be decolourised; due to hydrogen/electrons/NADPH/ reducing agent produced by light- dependent stage of photosynthesis;  <b>Test tube 3</b> DCPIP would remain blue/not be decolourised; no chloroplasts to carry out photosynthesis so no hydrogens/ electrons/NADPH/reducing agent produced;	<b>Test tube 1</b> – DCPIP reduced by photolysis = 1 mark (second marking point awarded as splitting of water implies light-dependent stage of photosynthesis but no reference to colour change in DCPIP so not first mark). <b>Test tube 3</b> – allow no change to DCPIP and no photosynthesis as no chloroplasts or no photosynthesis so no reduction can take place.	[4]
(d)	There are a small number of chloroplasts in the supernatant;	Allow some chloroplasts did not spin down into the pellet.	[1] [7]
3 (a) (i)	Platyhelminthes;	Allow phonetically equivalent spelling variations.	[1]
(ii)	Platyhelminthes lack a through gut/ the gut does not extend throughout the body;	<b>Not</b> just some sections taken where there is no gut.	[1]
(iii)	Dorso-ventral flattening/non-specialised skeletal system/supported by body tissue;		[1]
(b) (i)	t-value (at 7 degrees of freedom) = 2.365; $13 \pm 2.365 \times \sqrt{\frac{5.38^2}{8}}$ ;  <b>Upper limit</b> 17.5 <b>Lower limit</b> 8.5 (apply ECF on t-value);	In general, one mark awarded for each correct step, so if mistake in reading of t-value second and third mark can still be awarded by 'Error Carried Forward' (ECF) if carried out accurately. Third mark only awarded if two values are equidistant from 13.	[3]
(ii)	Upper and lower limits correctly plotted (apply ECF from (b)(i));	Only ECF if accurately plotted and equidistant from 13.	[1]

Question	Answer	Additional Guidance	Mark
(iii)	Rivers <b>B</b> and <b>D</b> have a higher number of planarians; there is no overlap in confidence limits with <b>A</b> , <b>C</b> and <b>E</b> ;	'They' in answer implies rivers B and D. (MP2) allow the confidence limits between the two groups do not overlap. <b>Not</b> just the confidence limits do not overlap.	[2] [9]

<b>4 (a)</b>	Any <b>three</b> from: <ul style="list-style-type: none"> <li>• add some solvent</li> <li>• add (small amount of) sand</li> <li>• grind with a pestle and mortar/ blender</li> <li>• filter</li> </ul>	(bp3) allow macerate leaves in a mortar/blender. (bp4) pour through muslin implies filtering.	[3]
<b>(b) (i)</b>	Distance moved by pigment 10 mm, distance moved by solvent 50 mm; $10 \div 50 = 0.2$ ;	Accurate calculation for the most soluble pigment (in the bright habitat) or least soluble pigment in the shaded habitat = 1 mark.	[2]
<b>(ii)</b>	Chromatogram supports hypothesis; since there are four pigments in the extract from the plant in the shaded habitat but only three from the bright habitat;	<b>Not</b> just there are fewer pigments in the leaf from the bright habitat.	[2]
<b>(c)</b>	<b>Extraction of pigments</b> – mass or area of leaf material/solvent used/ extent of grinding leaves;  <b>Preparing the chromatogram</b> – concentration of spot;  <b>Determining <math>R_f</math> values</b> – measured to same place on each spot;	<b>[EP]</b> Allow same volume/amount or type of solvent. Time in blender implies extent of grinding. <b>[PC]</b> Allow same number or concentration of spots or spots applied by same method. <b>[R<sub>f</sub>]</b> Or by description, e.g. measure all spots to leading edge.	[3] [10]

<b>5 (a) (i)</b>	To break down cell membranes;		[1]
<b>(ii)</b>	Use of a pestle and mortar/blender;		[1]
<b>(iii)</b>	White/cloudy; strands/string;		[2]
<b>(b)</b>	Any <b>three</b> from: <ul style="list-style-type: none"> <li>• cellulase breaks down cell walls</li> <li>• allows DNA to exit the cell more easily</li> <li>• lots of DNA in strawberry cells</li> <li>• easier to isolate/see DNA</li> </ul>	'cellulase breaks down cellulose in cell walls allowing the removal of DNA' = bps 1 and 2. (bp3) <b>not</b> just strawberries have many chromosomes.	[3] [7]

Question	Answer	Additional Guidance	Mark
<b>6 (a)</b>	Any <b>five</b> from: <ul style="list-style-type: none"> <li>• open Petri dish lid at an angle</li> <li>• swipe the loop backwards and forwards across one edge of the agar</li> <li>• close the lid and rotate 90°</li> <li>• flame the loop</li> <li>• allow the loop to cool</li> <li>• make 3 or 4 parallel streaks away from the original inoculum</li> <li>• repeat the rotate/flame/cool and streak cycle twice more</li> </ul>	(bp1) allow just open enough to add bacteria. (bp2) allow add bacteria to one edge/side of agar/dish.  (bp6) allow streak at an angle from the original inoculum.  (bp7) allow repeat the process twice/at least twice more.	[5]
<b>(b)</b>	Different colour/shape/texture/size;	<b>Not</b> just has a different appearance.	[1] <b>[6]</b>

<b>7 (a)</b>	Too difficult to count due to numbers involved/movement/hiding;	<b>Not</b> just too time consuming without qualification.	[1]
<b>(b)</b>	Pitfall trap; haemocytometer; (sweep) net;	(MP2) <b>not</b> just microscope slide with grid.	[3]
<b>(c) (i)</b>	Number in second sample = $85 + 31 = 116$ ; $(135 \times 116) \div 31$ ; 505;	If 85 is taken as number in second sample an answer of 370 = 2 marks by ECF provided working shown (as stages 2 and 3 in calculation correct). Correct answer without showing working out = 3 marks (applies throughout).	[3]
<b>(ii)</b>	Estimate will be too high; since number of recaptured bears will be lower than it ought to be;	<b>Not</b> just estimate will not be accurate.	[2]
<b>(iii)</b>	Influence of deaths/births/migration;		[1] <b>[10]</b>

<b>8 (a)</b>	Any <b>two</b> from: <ul style="list-style-type: none"> <li>• author</li> <li>• publisher</li> <li>• title</li> <li>• date of publication</li> </ul>	Allow page numbers.	[2]
<b>(b) (i)</b>	<b>B</b> – sarcomere; <b>C</b> – A-band;		[2]
<b>(ii)</b>	Intercalated discs/branching;		[1]
<b>(iii)</b>	Mitochondria; (very) high demand for ATP/energy in cardiac muscle since it never rests;	(MP2) allow skeletal muscle only used intermittently so lower energy needs (or some explanation for why energy demand of skeletal muscle is less). Need reference to both energy demand and activity.	[2] <b>[7]</b>
		<b>Total</b>	<b>[60]</b>