



**ADVANCED SUBSIDIARY (AS)
General Certificate of Education**

Biology

Assessment Unit AS 2

assessing

Organisms and Biodiversity

[SBY21]

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) (i)	Bohr (shift/effect);		[1]
(ii)	Increased respiration; extra oxygen delivered to (muscle) tissue/delays onset of anaerobic respiration;	First marking point (MP)1 need <i>increased</i> respiration. Allow saturation of haemoglobin with oxygen is reduced so more available for respiration (MP2).	[2]
(b) (i)	Curve drawn to the left of the normal pCO ₂ line;	Curve needs to extend from 0 – 16 kPa (if curve coalesces with 'normal' curve at high partial pressures assume extends to 16). Ignore a small section of curve being below the other curves (but only at high partial pressures O ₂).	[1]
(ii)	Increases;		[1] [5]

2 (a)	A – trachea B – bronchus C – bronchiole D – diaphragm (4 correct 2 marks, 3 correct 1 mark, 2 or fewer correct 0 mark)	A – not windpipe.	[2]
(b)	External intercostal muscles and diaphragm relax; volume of thorax/chest cavity reduced and pressure in the thorax/chest cavity increases; thorax has a higher pressure than the atmosphere, so air is forced out;	(MP1) need both intercostal and diaphragm but do not penalise if 'external' missing. (MP2) reference to volume and pressure both needed. (MP3) Credit idea that pressure in lungs exceeds that outside the body so air is expelled.	[3]
(c) (i)	Diffusion rate proportional to surface area x difference in concentration divided by thickness of membrane;; [one mark for terms and one mark for arrangement]	MP1 for answer that contains reference to each of surface area, difference in concentration, and membrane thickness (right side of equation). MP2 awarded for correct equation.	[2]
(ii)	Branching/folding provides a large surface area;	Not just they have a large surface area – need why.	[1]
(iii)	Protected from damage inside the organism/other appropriate response;	Example of other appropriate response (OAR) – better opportunity for ventilation to maintain concentration gradient.	[1] [9]

Question	Answer	Additional Guidance	Mark
3 (a) (i)	A – Apoplast; B – symplast;	One mark if both correct terms used but in wrong order.	[2]
(ii)	A/apoplast is through cell walls and B/ symplast is through the cytoplasm; limited resistance to water movement through A; movement of water is under metabolic control through B;	Use error carried forward (ECF) – if apoplast and symplast in incorrect order in (i) – do not penalise again as long as description correct in terms of where the water is moving. Allow MPs 2 and 3 by example, e.g. apoplast allows large amounts of water to travel freely (MP2) and symplast prevents harmful substances getting beyond the root (MP3).	[3]
(b)	Stomata; cuticle;	(MP1) term stomata required. MP2 – cuticular transpiration = cuticle.	[2]
(c) (i)	$4.10 \div 400$; 0.0103;	Correct answer without working out = 2.	[2]
(ii)	The greater the leaf surface area, the larger the total water loss;	Positive correlation not enough on own without stating what the variables are.	[1]
(iii)	Older leaves may have a thicker cuticle/younger leaves require more water for biochemical processes/other appropriate response;	OAR example - xylem vessels become clogged/broken in older leaves. Not younger leaves need more water without qualification.	[1] [11]
4 (a)	The use of pesticides increased greatly after 2009 and started to decrease (in 2016); the percentage of bee colonies lost increased dramatically after 2011 and fluctuated until 2015 after which the percentage lost decreased; the increased use of pesticides in 2010–2011 caused the loss of colonies in 2012 due to many of the bees in the colonies dying/ as pesticide usage decreased the percentage of colonies being lost decreased as fewer bees were being killed;	(MP1) increase from 2010 and decreasing from 2015 fine. (MP2) same principle applies as in MP1. Reference to fluctuation of data not required. (MP3) needs to be clear link between increase in pesticide use and increased loss of colonies (or converse) and that colony loss is linked to increase in number of bees being killed.	[3]

Question	Answer	Additional Guidance	Mark
(b)	Any two from: <ul style="list-style-type: none"> reduced pollination (reduces plant biodiversity) reduced food sources for animal species reduced habitats affects predators of honeybees other appropriate response 	(bp5) OAR – killing non-target species not sufficient without elaboration as is in the question stem.	[2]
(c) (i)	Combines the use of biological and chemical pest control;		[1]
(ii)	Creates habitats for more insect species/increased plant species; greater variety of food sources; fewer chemical pesticides required;	(MP1) allow greater range of habitats. (MPs1/2/3) allow as an alternative, predator strips act as a 'wildlife corridor' linking different areas together.	[3] [9]

5 (a) (i)	X – Atrioventricular (AV) node; Y – Purkinje fibres;		[2]
(ii)	Any four from: <ul style="list-style-type: none"> passes across the atria and reaches AVN(X) atria contract to fully empty of blood non-conducting tissue around AV-valves prevents the impulse from passing directly to ventricles, delaying ventricular systole (or by description) (wave of excitation) passes from AVN down the Bundle of His and up through the Purkinje fibres this ensures the ventricles contract from the bottom up so that blood enters the arteries 	<p>(bp1) need reference to across/over atria to AVN/X.</p> <p>(bp2) atria contracting is key point.</p> <p>(bp3) ideas that can only cross to ventricular tissue via the AVN and the delay in ventricular contraction are the important points.</p> <p>(bp4) reference to both Bundle of His and Purkinje/Y needed.</p> <p>(bp5) ventricles contracting from bottom up is key point.</p> <p>Note – some students may write answer in excitation sequence (bps 1,3, 4) then consequences (bps 2 and 5).</p> <p>As long as each part of the sequence is correctly linked to the cardiac cycle, should still gain credit.</p>	[4]
(b) (i)	QRS;		[1]
(ii)	Ventricular systole;	Allow ventricles contracting.	[1]

Question	Answer	Additional Guidance	Mark
(iii)	Any two from: <ul style="list-style-type: none"> the QRS complexes are much closer together/by description the height of the P wave is much higher/by description no T wave/by description 	(bp1) by description – e.g. peaks/spikes are closer together in ECG2. Same principle for bps 2 and 3 (i.e. not necessary to name the stages P, QRS, T). If no reference in answer to whether referring to ECG1 or ECG2, assume ECG2 unless evidence to suggest otherwise (based on how question is worded).	[2]
(c) (i)	X on correct part of heart;	Label for X should be on the extension of Purkinje fibres in the left wall of the heart.	[1]
(ii)	The wave of excitation returns back to the atria; the atria contract more quickly/strongly due to extra electrical impulse/rhythm of heart is interrupted/ventricles don't contract as strongly;	MP1 – needs reference to atrium/atria – not just to upper part of heart.	[2] [13]

6 (a) (i)	Special Area of Conservation;		[1]
(ii)	To protect and conserve rare habitats/species;	'Rare' must be stated or implied. Allow protect or conserve.	[1]
(b) (i)	$2\,675\,686 \div 3382 \times 3381$; 0.23;	Allow 0.2. Two marks for correct answer without showing working.	[2]
(ii)	Uncut bog has the greater biodiversity because it has a lower Simpson's index; uncut bog is undisturbed; plants are able to grow to maturity;	If value for Simpson's index incorrect in (i), leading to conclusion that the cut bog has a higher biodiversity could still get MP1 by ECF. (MP3) allow as an alternative, delicate plants can survive.	[3]
(c)	Diversity of genes present within a species;	Allow genetic variability/genomic range or equivalent within a species. Within a species must be included or implied.	[1]
(d)	Any two from: <ul style="list-style-type: none"> shape of flowers position of flowers positioning of leaves shape of leaves 	Allow size of flowers as an alternative for bp1 or 2.	[2]

Question	Answer	Additional Guidance	Mark
(e) (i)	<ul style="list-style-type: none"> Nutrients which aren't available in soil can be obtained by digesting insects; including a source of nitrogen/nitrates/amino acids/proteins; 	(MP1) credit bogs have poor/nutrient deficient soils.	[2]
(ii)	Outcompeted in woodland/other appropriate response;	Allow outcompeted by description, e.g. other species are better adapted to woodland habitats. OAR – allow sundew needs high light levels.	[1] [13]
		Section A total	[60]

Question	Answer	Additional Guidance	Mark
7	<p>Indicative content</p> <p>Xerophytes</p> <ol style="list-style-type: none"> xerophytes are adapted to habitats with reduced water availability leaf curvature/rolled leaves stomata are within the enclosed area sunken stomata in pits layer of leaf hairs (on lower epidermis) a layer of humid air trapped diffusion gradient decreases reduces rate of transpiration thick cuticle increased waterproofing so reduced cuticular transpiration spines/needles replace typical leaves small leaves reduced surface area for transpiration/fewer stomata succulent tissue large stores of water within the tissue which can be used in drought deep roots/shallow widespread roots deep roots reach water deep into the soil/any rain is quickly absorbed before it evaporates other appropriate response <p>Hydrophytes</p> <ol style="list-style-type: none"> hydrophytes are found in wet habitats stomata found mainly on upper surface of the leaf allows gas exchange to take place between leaf and air prevents water entering air spaces and submerging leaf aerenchyma/large air spaces allow plants to float so obtaining maximum light for photosynthesis other appropriate response <p>[At least three points must come from the hydrophyte section to achieve full marks]</p>	<p>Xerophytes found in sand dunes/ deserts not enough for bp1 – need ref to water availability.</p> <p>6,7 and 8 can be in context of leaf curvature/rolled leaves (2), sunken stomata (4), or leaf hairs (5) but no bp can be awarded more than once.</p> <p>10 – need idea that <i>increased</i> waterproofing or <i>reduced</i> transpiration (through leaf surface).</p> <p>‘Leaves are small, needle-shaped with reduced numbers of sunken stomata’ = 12, 11, 13 and 4.</p> <p>Succulent stems store water = 14 and 15.</p> <p>(bp17) alternative must match correct alternative in 16 (for both 16 and 17 to be awarded).</p> <p>(bp5) not just air spaces – needs aerenchyma or large/many.</p> <p>Large air spaces allow plant to float so diffusion between stomata on upper surface and air can take place = 5, 2, 3 but not enough for 4 and 6. Bp7 could be awarded as aerenchyma (bp5) allows plant to float so that gas exchange can take place with atmosphere.</p>	

Question	Answer		Additional Guidance	Mark
7 (contd.)	Indicative points	Marks		
	18+	15		
	16–17	14		
	14–15	13		
	13	12		
	12	11		
	11	10		
	10	9		
	9	8		
	8	7		
	7	6		
	6	5		
	5	4		
	4	3		
	3	2		
	1-2	1		
	0	0		
			Section B total	[15]
			Total	[75]