Rewarding Learning

ADVANCED
General Certificate of Education
2022

Biology

Assessment Unit A2 3

assessing

Practical Skills in Biology

[ABY31]

FRIDAY 24 JUNE, MORNING

MARK SCHEME

General Marking Instructions

Introduction

The main purpose of the mark scheme is to ensure that examinations are marked accurately, consistently and fairly. The mark scheme provides examiners with an indication of the nature and range of candidates' responses likely to be worthy of credit. It also sets out the criteria which they should apply in allocating marks to candidates' responses.

Assessment objectives

Below are the assessment objectives for Biology.

Candidates should be able to demonstrate:

AO1 Knowledge and understanding of scientific ideas, processes, techniques and procedures.

AO2 Apply knowledge and understanding of scientific ideas, processes, techniques and procedures:

- in a theoretical context
- in a practical context
- when handling qualitative data
- when handling quantitative data.

AO3 Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to:

- make judgements and reach conclusions
- develop and refine practical design and procedures.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 17 or 18-year-old which is the age at which the majority of candidates sit their GCE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 17 or 18-year-old GCE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Marking Calculations

In marking answers involving calculations, examiners should apply the 'own figure rule' so that candidates are not penalised more than once for a computational error. To avoid a candidate being penalised, marks can be awarded where correct conclusions or inferences are made from their incorrect calculations.

COVID-19 Context

Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

/ denotes alternative points

; denotes separate points

comments on mark values are given in bold

comments on marking points are given in italics

					AVAILABLE MARKS
1	**(a)**	**(i)**	Number of cells: 11; sample volume: $0.2 \times 0.2 \times 0.1 = 0.004\ mm^3$; number of cells mm^{-3}: $11 \div 0.004 = 2750$;	[3]	
		(ii)	Allow time for the cells to settle/adjust the fine focus of the microscope;	[1]	
	(b)		Any **two** from: • concentration of sugar/glucose/oxygen • type of sugar • initial population size • time • concentration of alcohol • pH	[2]	6
2	**(a)**		• Step 3: to prevent the origin line from being dissolved by the solvent/ prevent contamination by ink; • Step 5: to form a small/concentrated spot; • Step 6: to prevent the pigments dissolving directly into the solvent; • Step 8: so that the solvent front was still clearly visible/since solvent evaporates in air;	[4]	
	(b)		To prevent harmful vapours escaping into the lab/reduce likelihood of spilling the solvent/prevent evaporation of solvent from the container;	[1]	
	(c)	**(i)**	Distance from the origin to the leading edge/centre of spot;	[1]	
		(ii)	Yellow;	[1]	
		(iii)	This is the least soluble pigment;	[1]	8
3	**(a)**	**(i)**	Myelin sheath/Schwann cell;	[1]	
		(ii)	Transmission electron microscope;	[1]	
	(b)	**(i)**	12;	[1]	
		(ii)	There are outliers in the data set (for both neurones);	[1]	
		(iii)	Higher at 30 °C; (at higher temperatures particles would have) more kinetic energy/ increased membrane permeability; faster depolarisation/generation of action potential;	[3]	7

					AVAILABLE MARKS
4	**(a)**	**Any five from:** • hold lid in little finger/do not set lid on desk • flame the neck of the culture bottle • use sterile dropper/syringe to remove some of the culture • transfer to agar, lifting Petri dish lid at an angle • use sterile spreader to spread the culture • place spreader/dropper/syringe in disinfectant		[5]	
	(b)	Sterile water;		[1]	
	(c)	**(i)**	At this temperature there is an increased chance of (contaminating) human pathogens being cultured;	[1]	
		(ii)	Incubation temperature to match the conditions in which the antiseptic creams would be used;	[1]	
		(iii)	Seal/tape the lids on the Petri dishes; autoclave Petri dishes for disposal/dispose of safely;	[2]	
	(d)	**(i)**	The effect of (different types of) antimicrobial substances on the (mean) area of clear zone; of *S. aureus* growth;	[2]	
		(ii)	Plot confidence limits/carry out paired t-tests;	[1]	13
5	**(a)**	**(i)**	Guard cell;	[1]	
		(ii)	Stomata are sunken (or by description); reducing water diffusion gradient; reduce transpiration/conserve water	[3]	
	(b)	Leaf;		[1]	5
6	**(a)**	To absorb the carbon dioxide (produced during respiration);		[1]	
	(b)	**(i)**	To allow mealworms time to acclimatise/adjust to environmental conditions;	[1]	
		(ii)	Remove soda lime;	[1]	
	(c)	0.875 × 8 mm = 7 mm; 8 mm – 7 mm = 1 mm; to the right;		[3]	
	(d)	Any **two** from: • temperature • mealworms used • volume/air pressure (of chamber B) • duration of measuring period		[2]	8

			AVAILABLE MARKS
7	(a)	Place/pin (small) animal on wax tray/dissecting board; use of scalpel/forceps/other appropriate apparatus; under magnifying lens/binocular microscope; **or** Place organ on wax tray/dissecting board; use of scalpel/forceps/other appropriate apparatus; appropriate cutting procedure to expose key structures; **or** Place leaf on microscope slide; irrigate and scrape with blade/razor; observe under a light microscope; [3]	
	(b)	Any **two** from: • fewer ethical concerns • less expensive • no need to dispose of waste material/less mess/no risk of disease • process can be repeated • other appropriate response, e.g. certain procedures can be magnified/ viewed in slow motion [2]	5
8	(a)	Increase the shade on the water; reduces photosynthesis of algae; **or** Reduce nutrient levels in the water; reduces growth of algae; [2]	
	(b)	Oxygen levels; algal bloom reduces oxygen levels at night/when decomposing; **or** Light levels; algal bloom reduces light levels by blocking/absorbing sunlight; **or** OAR; [2]	
	(c) (i)	Increases sensitivity of the colorimeter/the sample will be reflecting green (blue-green) light/absorbing red light; [1]	
	(ii)	Algae abundance rises and then falls; 11th September; [2]	
	(iii)	Samples all taken from the same depth in the lake/OAR; [1]	8
		Total	**60**