Rewarding Learning

ADVANCED
General Certificate of Education
2019

Biology

Assessment Unit A2 3

assessing

Practical Skills in Biology

[ABY31]

TUESDAY 7 MAY, 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.

			AVAILABLE MARKS
1	**(a)**	Sclera; [1]	
	(b)	Vascular layer/reduces internal reflection; supplying blood to other layers/ensures a sharp image produced; [2]	
	(c)	Nuclei of bipolar neurones; [1]	
	(d)	Label Z in correct position; [1]	
	(e)	Light microscope; [1]	6
2	**(a)**	X – gel; Y – anode; [2]	
	(b)	Causes the transport of DNA across the gel/causes separation of different fragments of DNA; [1]	
	(c)	**(i)** Fragments of DNA are transported across the gel, according to size; [1]	
		(ii) Different amounts of DNA fragments (of the same size) at the different positions; [1]	5
3	**(a)**	Measure distance liquid travels over time; (using apparatus as set up in diagram) to calculate the oxygen uptake (per unit time); remove the cotton wool soaked with potassium hydroxide (and replace with cotton wool soaked with water) and measure distance liquid travels over same time; carbon dioxide produced is calculated by adding or subtracting the original distance moved using potassium hydroxide to/from distance liquid moves without potassium hydroxide; RQ value is carbon dioxide produced divided by the oxygen consumed (over the same time); [5]	
	(b)	Volumes involved may be too small to measure with one maggot/ to increase reliability/variation in individual living organisms/ other appropriate response; [1]	6
4	**(a)**	Minimum concentration that is effective is 12; more bacteria killed/prevented from growing at higher concentrations between 12 and 15; at higher concentration antibiotic diffuses further across agar (in concentrations that prevent bacterial growth); [3]	
	(b)	Easier to compare effectiveness of different antibiotic strengths/minimum concentration that has effect easier to distinguish/a greater range of concentrations can be on one plate/other appropriate response; [1]	4

				AVAILABLE MARKS
5	**(a)**	Running the chromatogram/2;	[1]	
	(b)	Any **five** from: • chromatogram suspended in boiling tube/gas jar/tank/other appropriate apparatus • with bottom of paper in solvent but base line (origin) above solvent • once solvent well up chromatogram/near top, remove from solvent • mark solvent front on chromatogram • measure distance between solvent front and base line (origin), and between leading edge/centre of each spot and base line (origin) • calculate R_f values as distance to spot divided by distance to solvent front	[5]	
	(c) **(i)**	Leaves from same tree/same solvent/same size of tank/same type of chromatography paper/same method used to macerate leaves/same number of spots applied/other appropriate response;	[1]	
	(ii)	Reduced concentration of pigment/reduced colour (or increase qualified)/fewer pigments; pigments broken down/other appropriate response;	[2]	9
6	**(a)** **(i)**	Counting grid correctly labelled;	[1]	
	(ii)	Apply north-west rule (or by description);	[1]	
	(b) **(i)**	Numbers too high to count; even using a Type-C square;	[2]	
	(ii)	To prevent osmotic damage;	[1]	
	(iii)	Add 99 cm^3 of saline to 1 cm^3 of the sample;	[1]	
	(c) **(i)**	$6.3 \div (0.0025 \times 0.1)/0.00025$ or 6.3×4000; 25 200;	[2]	
	(ii)	There is no significant difference between the mean number of phytoplankton per type-C square at temperatures 25 °C and 30 °C;	[1]	
	(d)	$t = \frac{9.1 - 8.1}{\sqrt{0.26^2 + 0.32^2}}$; $t = \frac{1.0}{0.41} = 2.425$;	[2]	
	(e)	$0.02 > p > 0.01$;	[1]	
	(f)	The null hypothesis is rejected/there is a significant difference between the mean numbers of phytoplankton at 25 °C and 30 °C; at a temperature of 30 °C there is a faster increase in phytoplankton numbers;	[2]	14

				AVAILABLE MARKS
7	**(a)**	**(i)**	Record time taken; for complete loss of the blue colour; [2]	
		(ii)	Any **two** from: • peas were soaked • peas were ground-up • dilute methylene blue [2]	
		(iii)	The blue colour would disappear in the boiling tube at 40°C before the tube at 20°C; as the enzymes involved (in dehydrogenation) would have more kinetic energy/form more complexes with substrate; the colour wouldn't change/only a small change/slower change in colour at 60°C; as the enzymes would be denatured and the active site would be unable to combine with substrate molecules; [4]	
	(b)	**(i)**	Ground up in mortar with a pestle/other appropriate response (e.g. use a blender); [1]	
		(ii)	Mitochondria would otherwise be present in the homogenised material; also have dehydrogenase enzymes/involved in redox reactions; [2]	11
8	**(a)**		On the leaf surface/around stomata/on roots/root hairs/other appropriate response; since a potential pathway into the plant/as if entry gained, microbes will reproduce rapidly (as in favourable conditions)/many microbes found in soil; [2]	
	(b)		Any appropriate format/style that is consistent in all three references [3] one mistake [2] two mistakes [1] [3]	5
			Total	**60**