Rewarding Learning

ADVANCED
General Certificate of Education
2024

Biology

Assessment Unit A2 3

assessing

Practical Skills in Biology

[ABY31]

WEDNESDAY 19 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.

/ 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)**	With an inoculating loop, spread several lines of bacteria across the agar; repeat the process at 90° (twice) from the ends of the initial 'streaks'; make a final single streak (at 90°); [3]	
	(b)	Can produce pure colonies/OAR; [1]	4
2	**(a)**	**(i)** **X** – Schwann cell; **Y** – myelin sheath; [2]	
		(ii) Axon correctly labelled; [1]	
	(b)	Impulses travel faster; (myelin acts as an insulation layer) leading to saltatory conduction/ depolarisation only taking place at nodes of Ranvier; [2]	
	(c)	There would be no myelin sheath/Schwann cell visible; [1]	
	(d)	Image is not in 3-D/image is at a very high magnification/internal structure (rather than surface) visible; [1]	7
3	**(a)**		

Term	Description
Origin/baseline	.....
Solvent front	.....

[2]

	(b)	**(i)** Grind leaves with a pestle and mortar; with a solvent; filter; [3]	
		(ii) Measure the distance from the **origin** to the **solvent front** or **centre**/**leading edge** of the spot; Divide by the distance moved by spot by distance moved by solvent; [2]	
	(c)	**(i)** Difficult to accurately identify the centre/leading edge of a spot/OAR; [1]	
		(ii) By colour; [1]	9

				AVAILABLE MARKS
4	**(a)**	**(i)**	Nucleus; [1]	
		(ii)	Length of time (for centrifugation); [1]	
		(iii)	Golgi/ribosomes/mitochondria/OAR; [1]	
	(b)	**(i)**	In tube A there (was no colour change as there) were **no chloroplasts** to reduce DCPIP/release hydrogen/electrons; in tube B **no light for photosynthesis** to reduce DCPIP/release hydrogen/electrons; in tube C hydrogen/electrons released from photosynthesis reduced DCPIP; [3]	
		(ii)	(If there was mitochondrial contamination) DCPIP would be reduced/ change colour from blue-green to green in tube B; as mitochondria would release hydrogen ions/electrons in respiration; [2]	8
5	**(a)**	**(i)**	Spreader; [1]	
		(ii)	A **and** C produced clear zones from concentrations **7** and above; B produced **clear zones** from a concentration of **2** and above; A produced the **largest** clear zone/**most** effective overall/C produced the **smallest** clear zone/**least** effective overall/B produced clear zones/ effective over a wider range of concentrations; [3]	
		(iii)	Is effective at preventing bacterial growth at low concentrations; cost less/reduced side effects/OAR; [2]	
		(iv)	Incubation was at 37° C (which would be inappropriate in a school laboratory)/the bacteria was a cause of infections (pathogenic); [1]	
	(b)		Any **three** from: • flame a metal loop (either before of after transfer) glass pipette/use a disposable sterile loop • remove lid of culture bottle without setting on the bench • flame neck of culture bottle (either before or after removing culture) • open Petri dish at an angle/just enough to add (and spread) bacteria over the agar • work by a (lit) Bunsen burner [3]	
	(c)		Informs reader about the research carried out/knowledge level in advance of new research/OAR; [1]	11

					AVAILABLE MARKS
6	**(a)**	**(i)**	Line drawn from **X** to the gel;	[1]	
		(ii)	Prevents the buffer solution evaporating/OAR;	[1]	
	(b)	**(i)**	Band 1 has smaller fragments; and fewer fragments; (or converse)	[2]	
		(ii)	The restriction enzyme used in lane B has more recognition sites (compared to the enzyme used in lane A); (or converse)	[1]	5
7	**(a)**		High metabolic rate/many can be placed in a small space;	[1]	
	(b)	**(i)**	16 cm^3;	[1]	
		(ii)	16 – 3 = 13; 13 ÷ 16 = 0.81;	[2]	
	(c)		Can use the same maggots; different maggots would have different metabolic rates/respiration rates/ OAR;	[2]	6
8	**(a)**		Counting grid accurately labelled;	[1]	
	(b)	**(i)**	Volume of type-C square = 0.0025 × 0.1 = 0.00025 mm^3; 7.4 ÷ 0.00 025 = 29 600/(2.96 × 10^4);	[2]	
		(ii)	Type-A or B squares would have very high numbers of yeast cells; more likely to be errors in counting/much more time-consuming;	[2]	
	(c)	**(i)**	Students 1, 2, and 3 all had similar/slightly different mean values (for type-C squares); with no significant difference between them; student 4 had a much lower mean value and was significantly different from the other three students;	[3]	
		(ii)	Failure to stir flask when taking sample/OAR;	[1]	
	(d)		Log scale caters for a very large range of numbers/exponential growth;	[1]	10
				Total	**60**