Rewarding Learning

ADVANCED
General Certificate of Education
2018

Biology

Assessment Unit A2 3

assessing

Practical Skills in Biology

[ABY31]

FRIDAY 4 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.

1 (a) Allows the current to flow/allows the DNA to migrate through the agarose gel; [1]

(b) Series of bands in each lane;
bands in different positions across the four lanes; [2]   3

2 (a) X – myelin sheath/Schwann cell;
Y – axon; [2]

(b) Myelin sheath present;
larger axon diameter; [2]

(c) Transmission electron microscope/TEM; [1]   5

3 (a) (i) Type-A squares would have too many cells to count;
Type-C squares are very variable/many squares empty; [2]

(ii) Volume of type-B square = $0.004 \, mm^3$;
$16 \div 0.004 = 4000 \, mm^{-3}$; [2]

(b) (i) Sample from the same depth/stir before sampling each time; [1]

(ii) Avoid the sample entering haemocytometer grooves/on top of coverslip/
ensure no air in sample; [1]

(c) Very dramatic/significant increase in numbers over time/population growth
may be exponential;
log scale caters for very large range/across several orders of magnitude; [2]

(d) (i) Bacteria are very small/normally too small to see/count using a light
microscope; [1]

(ii) Degree of 'opaqueness'/cloudiness/other appropriate
description; [1]   10

4 Reference to supporting apparatus, e.g. dissecting board, microscope slide (for
leaf scrape);
appropriate description of opening organism/process of dissecting;
correct reference to apparatus used, e.g. scalpel;
further detail (e.g. pinning skin to dissecting board/removing mesophyll (in leaf
scrape)); [4]   4

	AVAILABLE MARKS

5 **(a)** Using a micro-pipette/capillary tube/point of pin add extract from plant macerate;
allow to dry before adding additional 'spots'; [2]

(b) Distance travelled by leading edge/centre of pigment on chromatogram;
divided by distance between origin/base line and solvent front; [2]

(c) **(i)** Difficulty in determining exact position of leading edge/centre of pigment on chromatogram/difficulty in determining exact position of solvent front/ (slight) variation in saturation of tank/other appropriate response; [1]

(ii) All the R_f values are lower;
but pigments in the same sequence; [2]

(iii) Measurement from base of spot (rather than leading edge or centre)/ incorrect positioning of solvent front line (e.g. solvent front taken as top edge of chromatogram)/other appropriate response; [1]

8

6 **(a)** To prevent the germinating peas photosynthesising;
so that only gas exchange resulting from respiration measured; [2]

(b) **(i)** 12; [1]

(ii) CO_2 produced = 12 + 8 = 20;
20 ÷ 12 = 1.67/1.7; [2]

(c) **(i)** Avoids difference in enzyme activity in two respirometers/prevents differential expansion/contraction of gases in the two respirometers; [1]

(ii) Age/strain of peas/same stage of germination; [1]

7

7 **(a)** Any **five** from:
- method of capture described, e.g. sweep net
- suitable method of marking described, e.g. permanent marker
- description of how to avoid marking affecting survival, e.g. non-toxic marker
- allow time to redistribute so that marked animals are evenly spread
- population resampled using same method as before
- explanation of use of (correct) formula to estimate population [5]

(b) **(i)** Number of marked birds decrease with time;
particularly large fall between 2007–2008; [2]

(ii) Any **two** from:
- births not marked/counted/over five years will have been (many) deaths
- immigration/emigration (no evidence that population is static)
- only marked birds are counted each year [2]

9

8 (a) (i) Any **five** from:
- flame a metal inoculating loop/use a sterile plastic disposable loop/ sterile glass pipette
- (if metal) allow to cool in air/glass pipette should not be heated excessively
- remove lid of culture bottle without setting on the bench
- flame neck of culture bottle
- inoculate the loop with bacteria by gently scraping over the agar/ draw up one or two drops of liquid culture
- flame neck of culture bottle before replacing the lid (allow once)
- only open Petri dish enough to add bacteria
- plate the bacteria over the surface of the Petri dish with the loop/ use glass spreader (sterilised in ethanol)
- other appropriate response, e.g. work beside a lit Bunsen on bench to ensure 'updraft' [5]

(ii) Avoid condensation on lid – liquid that would subsequently fall and destroy the culture on the agar; [1]

(iii) (Measuring diameter or radius) – uneven edge so diameter or radius will change depending where measured;
(measuring the area of clear zone) – clear zone affected by edge of Petri dish; [2]

(iv) Use one disc in centre of Petri dish/move discs further away from edge (and measure area)/multiple measurements of diameter/radius in several directions/other appropriate response (e.g. use electronic device to measure area) [1]

(b) (i) Root in the soil is more likely to be in contact with microorganisms/ infected leaves can be dropped (to prevent infection spreading)/other appropriate response; [1]

(ii)
$$\frac{22 - 13}{\sqrt{(3.4)^2 + (2.6)^2}}$$

t = 2.10; [2]

(iii) 0.05 > p > 0.02;
difference between effect of stem and root extract is significant; [2]

AVAILABLE MARKS	
	14
Total	**60**