Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2013

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[AB111]

TUESDAY 11 JUNE, MORNING

MARK SCHEME

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

/ denotes alternative points
; denotes separate points
Comments on mark values are given in bold
Comments on marking points are given in italics

Section A

1 Centrioles (centrosomes);
centromere (kinetochore);
metaphase;
telophase;
prophase 1; [5] 5

2 **(a)** Hydrophobic tails on inside and hydrophilic heads on outside; [1]

(b) **(i)** Tertiary structure allows the protein to have a specific/complementary shape for the attachment of a (particular) molecule; [1]

(ii) Changes in pH may result in breaking of some of the ionic bonds/some of the binding sites may be altered;
so that the molecule does not attach/fit/bind as effectively to the receptor site;
[Terminology of 'active site' not acceptable] [2]

(iii) Hydrophobic R-groups are in contact with the phospholipid tails;
hydrophilic R-groups inside the carrier/channel will allow passage of water soluble ions; [2] 6

3 A: polysaccharides/starch/glycogen/cellulose/amylose/amylopectin;
B: triglycerides/lipids/fats/oils;
C: proteins/polypeptides;
D: phospholipid;
E: nucleic acids/DNA/RNA; [5] 5

4 **(a)** **Essential point**: creation/use of specific primers that will attach to the start of the relevant sections of DNA (specific primers allow polymerase to commence replication of the relevant DNA section);
[Insist on use of term 'specific' or a description of primers that will attach to appropriate base sequences]

Any two from
- heat DNA to break hydrogen bonds/separate the two strands of DNA
- cool to allow primers to anneal (complementary base pairing)
- use of (Taq) polymerase to extend primers/allow more nucleotides to bind [3]

(b) **Any three from**
- use gel electrophoresis
- to separate the sections according to size
- some detail of procedure (e.g. treat DNA to make single stranded or transfer from gel to membrane)
- label sections with (radioactive/fluorescent) probes
- transfer to X-ray film/UV light to produce the banded (lined) pattern [3]

(c) Related species: some bands (lines) should be common to all three fingerprints (profiles);
Different species: each species will have some unique bands (lines)/some bands (lines) will only be found in one of the species (not found in any of the other species);
[Insist on use of term 'bands' (or equivalent). Do not allow simple references to 'the profiles/DNA have similarities'] [2] 8

5 **(a)** A: crista;
B: mitochondrial envelope; [2]

(b) Length of scale bar = 40 mm;
= 40 000 µm;
40 000 ÷ 2.5 = ×16 000; [3]

(c) G1 (gap 1) phase;
(at cytokinesis) existing organelles were shared between the two new cells/ as cell grows during G1 new organelles are required; [2]
or
G2 (gap 2) phase;
more mitochondria to build up ATP (energy) for mitosis/cytokinesis;

(d) Aerobic respiration/ATP synthesis; [1] 8

6 **(a)** **(i)** B;
C (accept D);
E; [3]

(ii) To reduce/minimise water loss by evaporation/transpiration; [1]

(b) **(i)**

Potential/kPa	Cells of upper mesophyll	Cells of lower mesophyll
Ψ_{cell}		–150;
Ψ_s		
Ψ_p	250;	

[2]

(ii) Water will flow from upper mesophyll cells to lower mesophyll cells;
since osmosis takes place from higher to lower water potential;
[Must make reference to water potential, not concentration] [2]

(iii) The cells of the lower mesophyll become more turgid;
lower mesophyll increases in size (and becomes more convex); [2] 10

7 **(a)** **(i)** The energy needed to make a reaction occur; [1]

(ii) Similarity: both involve shape complementarity between substrate and active site of the enzyme/complementary binding sites on enzyme and substrate/both involve formation of ES complex/both involve an active site on the enzyme/other appropriate similarity;

Difference: in the induced fit model, full complementarity only occurs once binding has occurred between enzyme and substrate, whereas lock and key hypothesis states that they are complementary from the outset; [2]

(b) **(i)** **Any two from**
- vacuole membrane/tonoplast is ruptured (as a result of mechanical damage)
- allowing enzyme and substrate to come together/ enzyme–substrate complex forms
- the production of melanin results in brown/black colour/ bruised areas [2]

(ii) Cutting results in destruction of cells, so that more enzyme is released; whereas tearing leaves cells intact/breaks the tissue along cell walls; [2]

(c) Cofactor; [1]

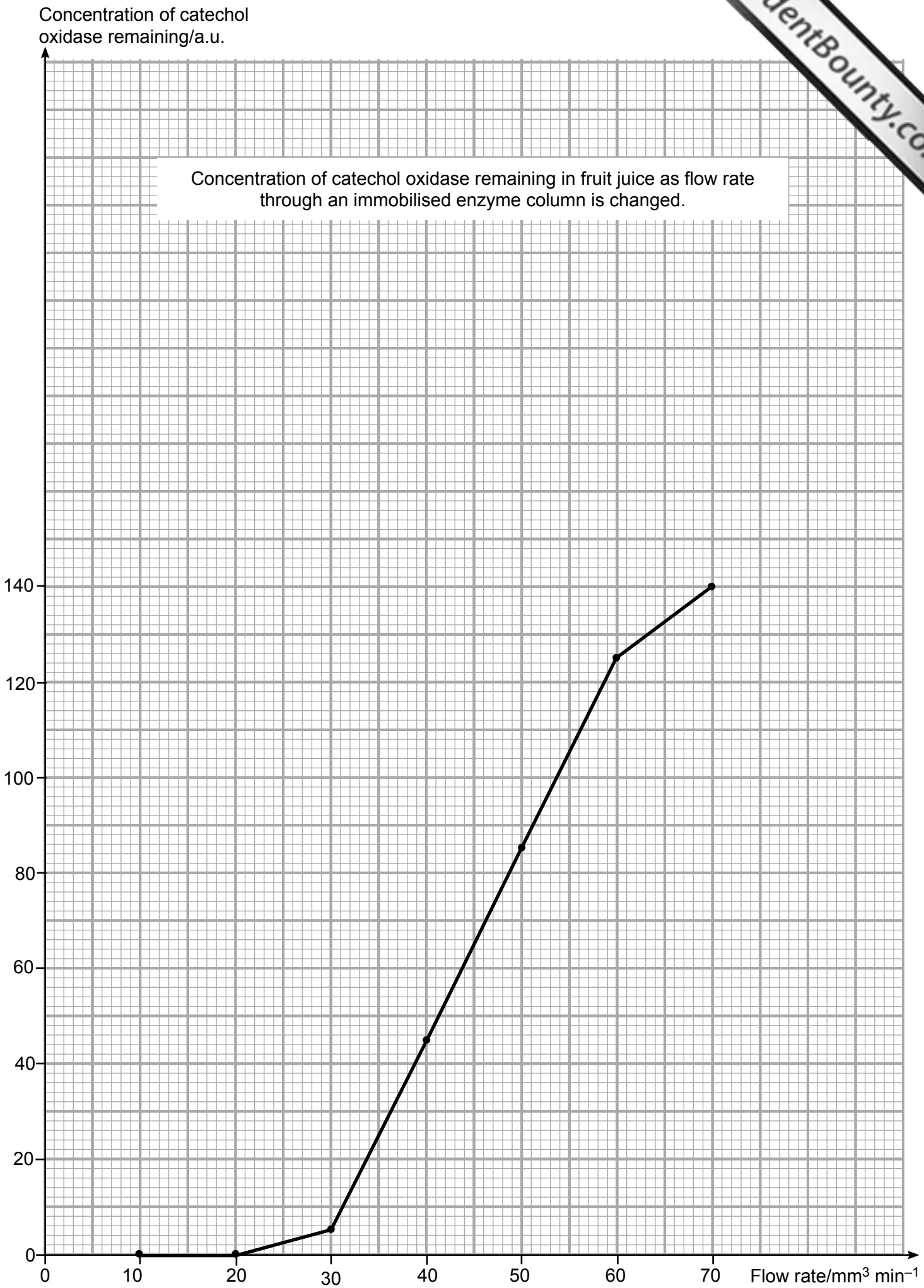
(d) 3;
2; [2]

(e) **(i)** Appropriate caption, including concentration of catechol oxidase and flow rate;
axes the correct way round (flow rate on *x*-axis);
selection of appropriate scale and axes labelled including units;
points plotted accurately, and joined by short straight lines; [4]

(ii) At flow rate of 20 mm^3 min^{-1}, no catechol oxidase remains in the fruit juice;
20 mm^3 min^{-1} represents a more efficient/more cost effective process than at 10 mm^3 min^{-1} [2]

(iii) As flow rate increases, the amount of enzyme remaining in the juice increases/the amount of enzyme (catechol oxidase) removed decreases; at higher flow rates, there is insufficient time for substrate molecules to be catalysed by the enzyme/for substrates to bind to the active sites of the protease molecules; *[QWC: must be clear which enzyme is being referred to. Protease is the catalytic enzyme, catechol oxidase is the (protein) substrate broken down.]* [2] 18

Section A **60**



Section B

8 Any thirteen points from

Nucleus and rough ER
- the nucleolus produces ribosomal RNA/ribosomes
- chromosomes within the nucleus contain the genetic code/DNA has a nucleotide sequence
- that determines the sequence of amino acids in a polypeptide chain
- mRNA carries a copy of this code out of the nucleus/through the nuclear pores
- onto the rough ER/ribosomes
- ribosomes (on RER) are the site of protein/polypeptide synthesis

Golgi body
- ER vesicles containing the newly synthesised (primary) protein bud off RER
- and carry it to the forming face of the Golgi apparatus
- within Golgi the primary protein is modified into the final enzyme
- carbohydrate/lipid may be added to make glycoprotein/lipoprotein
- polypeptides brought together to form quaternary proteins
- prosthetic group may be added

Vesicles and lysosomes
- vesicles then bud off the mature face of Golgi
- secretory vesicles will carry enzymes to the cell-surface membrane
- where they fuse with it/release their enzymes
- other vesicles may carry glyco/lipoproteins to the surface membrane
- where they can become incorporated into the membrane as receptors/ recognition sites
- lysosomes are also budded off Golgi
- they fuse with worn-out organelles that have been enclosed in a membrane/phagocytosed material
- the hydrolytic enzymes (in the lysosome) then digest the old organelle/ phagocytosed material/carry out autolysis [13]

Quality of written communication

2 marks:
The candidate expresses ideas clearly and fluently through well-linked sentences, which present relationships and not merely list features. Points are generally relevant and well-structured. There are few errors of grammar, punctuation and spelling.

1 mark:
The candidate expresses ideas clearly, if not always fluently. The account may stray from the point or may not indicate relationships. There are some errors of grammar, punctuation and spelling.

0 marks:
The candidate produces an account that is of doubtful relevance or obscurely presented with little evidence of linking ideas. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the account. [2] 15

Section B **15**

Total **75**