Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[SBY11]

TUESDAY 21 MAY, AFTERNOON

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

AVAILABLE MARKS

Section A

1 (a)

Description	Stage of meiosis	Division	
Microtubules of spindle contract, pulling chromosomes to opposite poles of the cell	Anaphase	I	;;
Chromosomes align along the cell equator	Metaphase	II	;;
Chiasmata occur between bivalents	Prophase	I	;;

[6]

(b) Any **two** from:
- in meiosis two divisions/four daughter cells produced/crossing over occurs in meiosis
- daughter cells are genetically different to parent cells/each other
- half the amount of DNA present in daughter cells/diploid cells divide into haploid cells
(or converse) [2]

8

2 (a) (Nucleus **A**) contains the genetic code/DNA/makes ribosomes/produces mRNA;
(RER **B**) synthesises the protein/provides scaffolding for the ribosomes to make the protein;
(Golgi apparatus **C**) modifies/packages the protein; [3]

(b) (i) Pancreas (cell);
contains more (RER) secretory vesicles/Golgi apparatus;
vesicles (bud off the Golgi apparatus and) transport proteins to the cell (surface) membrane for release; [3]

(ii) (There is) a relatively high percentage of SER (which is involved in the synthesis of lipids); [1]

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				AVAILABLE MARKS
3	(a)		Cell B = −875 + 150 = −725 kPa; arrows going from cell C to A and from cell B to A and C; [2]	
	(b)		Water enters the red blood cells, if sufficient water enters, the cells may lyse/burst/expand; moving from a higher to lower water potential/to a more negative water potential; [2]	
	(c)	(i)	Urea; [1]	
		(ii)	Any **two** from: • so there is no concentration gradient/to prevent diffusion • to avoid losing glucose from the blood/glucose entering the blood • as glucose is required for respiration/ATP synthesis [2]	
		(iii)	Red colouration indicates red blood cell damaged/haemoglobin entered the fluid/red cells have entered the fluid; may result from an increase of water potential of the dialysis fluid/semi-permeable membrane damaged/high blood pressure; [2]	9
4	(a)	(i)	Channel (protein); provides a hydrophilic channel for polar molecules; allowing them to pass through the hydrophobic bilayer; [3]	
		(ii)	Increases membrane stability/maintains fluidity of the membrane; [1]	
	(b)		Saturated fatty acid chains have no carbon-carbon double bonds/maximum number of hydrogens (or converse); [1]	
	(c)	(i)	0.96 – 0.90 = 0.06; 0.06 ÷ 0.90 × 100 = 6.67%/6.7%; [2]	
		(ii)	At low concentrations increasing alcohol concentration has little effect on absorbance but above 40%, increasing alcohol dramatically increases absorbance; more pigment is released/greater permeability at higher alcohol concentrations; the alcohol disrupts/destroys the membrane/proteins within the membrane; [3]	
		(iii)	70% is high enough to destroy many bacteria (by membrane disruption); while not having the associated drying effect of higher concentrations/is more economical; [2]	12

			AVAILABLE MARKS
5	**(a)**	Attached by weak forces/bonds to an inert substance; trapped inside a selectively permeable membrane; covalently bonded (to a matrix); [3]	
	(b)	Any **one** matching pair some active sites blocked/inaccessible; reaction may be slowed/substrate cannot enter some active sites; **or** substrate must move through a material to get to enzyme; reduced speed of diffusion (between substrate and material so reduced activity)/reduced rate of reaction; **or** enzymes can be washed off material; as weak forces holding them in place break; **or** immobilisation process may alter shape of active site; reducing binding of substrate/reduced rate of reaction; [2]	
	(c) **(i)**	Enzymes can be retained/no contamination of the end product/ continuous process/thermostable/pH resistant; [1]	
	(ii)	Advantage: prevents spoiling of milk/growth of bacteria; Disadvantage: reduces the rate of reaction; [2]	
	(iii)	Not all lactose will be broken down on first passing through the reactor/ allows more time for all the lactose to be removed; reduced kinetic energy/or consequence, e.g. fewer collisions/fewer ES complexes (in context of lower temperature); [2]	
	(iv)	More sugar molecules present/lactose broken down into glucose and galactose which are sweeter/glucose (or galactose) is sweeter; [1]	
	(d)	The digestive system may not be producing (lactase) enzyme yet/may not be producing enough (lactase) enzyme; [1]	12

				AVAILABLE MARKS
6	**(a)**	Any **two** from: • (CPV-2) contains DNA rather than RNA • does not contain reverse transcriptase • only contains a single layer of protein in coat rather than double layer • does not contain (phospholipid) bilayer/glycoprotein (or converse)	[2]	
	(b)	**(i)** Cell surface membrane invaginates/surrounds the virus; vesicle which forms pinches off inside the cell;	[2]	
		(ii) Free nucleotides attach (to the viral DNA) using base pairing rules/ A=T, C=G; nucleotides are joined together using (DNA) polymerase;	[2]	
	(c)	Stem cells/in crypts of Lieberkuhn; fewer new epithelial cells produced/mucosa lining becomes vulnerable to damage;	[2]	
	(d)	Throughout October and November all three years have similar numbers of consultations; for all years there is a peak in number of consultations in January/all increase December/January; in 2017–2018 there is a much greater number of consultations from mid-December onwards/higher peak in January/has most dramatic increase/ most dramatic decrease in January; in 2015–2016 numbers level off after a peak in January/smallest decrease/2016–2017 has smoothest peak/flatter peak;	[4]	12

7 Indicative content

- primary structure consists of a sequence of amino acids/polypeptide joined with peptide bonds
- the type of protein formed depends on the order of the amino acids
- secondary structure involves hydrogen bonds
- α-helix and β-pleated sheets are formed
- bonds twist the amino acid chains into a helical/spiral shape/amino acid chains are (anti) parallel to each other
- tertiary structure gives the protein its 3D shape/is more compact
- hydrogen bonds, ionic bonds, disulfide bridges and hydrophobic interactions are all involved (must mention at least 3)
- quaternary structure occurs if two or more polypeptides are involved
- some proteins also contain prosthetic groups/are conjugated proteins
- collagen is a fibrous protein
- collagen consists of 3 polypeptide chains
- parallel chains are cross-linked/rope-like structures/high tensile strength
- enzymes/haemoglobin are globular proteins (which have polypeptide chains folded into roughly spherical shape)
- the variety of ways the polypeptide chain can fold give rise to a variety of shapes
- shape of active site confers specificity/changes shape for induced fit
- this allows a particular substrate to fit into the active site
- haemoglobin consists of 4 polypeptide chains
- (each one) contains an (iron-containing) haem group
- (iron in) haem allows haemoglobin to transport oxygen

Band	Response	Mark
3	Candidates use appropriate specialist terms to fully describe the structure of the proteins formed by a variety of bonds to allow them to carry out a range of functions using a minimum of **twelve** points of indicative content. They must use good spelling, punctuation and grammar and the form and style are of a very good or better standard.	[11]–[15]
2	Candidates sometimes use appropriate specialist terms to describe the structure of the proteins formed by a variety of bonds to allow them to carry out a range of functions using a minimum of **six** points of indicative content. They must use satisfactory spelling, punctuation and grammar and the form and style are of a good standard.	[6]–[10]
1	Candidates partially describe the structure of the proteins formed by a variety of bonds to allow them to carry out a range of functions using a minimum of **one** point of indicative content. They must use limited correct spelling, punctuation and grammar and the form and style is of a basic standard.	[1]–[5]
0	Response not worthy of credit.	[0]

[15]

Total

AVAILABLE MARKS

15

75