Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2022

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[SBY11]

FRIDAY 20 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.

COVID-19 Context

Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

/ 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			Calcium; magnesium; iron; hydrogencarbonate;	[4]	4
2	**(a)**		Variable R group/chain;	[1]	
	(b)	**(i)**	The amino acid sequence of a (polypeptide/protein); peptide bonds;	[2]	
		(ii)	Hydrogen (bonds);	[1]	
		(iii)	Secondary and tertiary structures involve (both peptide and) hydrogen bonds; tertiary structures also contain other *named* bonds (e.g. disulfide/ionic) or hydrophobic/hydrophilic interactions;	[2]	
		(iv)	Support; due to the presence of many cross links/hydrogen bonds/'rope like' structure (as in collagen)/folded chains which wind around each other/many polypeptides linked together;	[2]	
	(c)		Ionic bonds become disrupted/break; causing the specific shape of the active site to be lost;	[2]	10
3	**(a)**	**(i)**	A – upper epidermis; B – spongy mesophyll;	[2]	
		(ii)	Double layer of palisade cells; palisade mesophyll cells are tightly packed/horizontal orientation of epidermal cells;	[2]	
	(b)	**(i)**	Thylakoids/grana;	[1]	
		(ii)	(Mean) rate of photosynthesis;	[1]	
		(iii)	It does not/data contradicts the hypothesis; since variety A (with smaller chloroplasts) has a higher rate of photosynthesis (or converse);	[2]	
		(iv)	Variety A has smaller chloroplasts which can orientate to greatest light intensity; resulting in more/faster photosynthesis (or converse);	[2]	10

					AVAILABLE MARKS
4	**(a)**		A non-protein component that enzymes require in order to function;	[1]	
	(b)	**(i)**	Mucosa;	[1]	
		(ii)	Microvilli are extensions of the membrane of a single cell/villi; villi are extensions of the ileum wall (containing many cells);	[2]	
		(iii)	Enzymes less likely to be lost (therefore a reduced metabolic cost)/ other appropriate response;	[1]	
	(c)	**(i)**	3.25 − 1.65; (= 1.6) ÷ 1.65; × 100 = 96.97/97%;	[3]	
		(ii)	As maltose concentration increases, the rate of maltose breakdown increases up to a maximum before levelling off; as maltose concentration increases, more enzymes are utilised/ more substrates available for enzyme action (converting maltose to glucose); at the maximum, all the enzymes are utilised/no more active sites available;	[3]	11

			AVAILABLE MARKS
5	**(a)**	Any **two** from: • in RNA the base thymine is replaced by uracil • RNA has the sugar ribose rather than deoxyribose • DNA is longer/has more bases than RNA [2]	
	(b)	X – phosphate; [1]	
	(c) **(i)**	So that the full/normal DNA complement is in each daughter cell (following cell division); [1]	
	(ii)	(DNA) helicase breaks the hydrogen bonds between bases (to give two template strands); free nucleotides bind to complementary bases/or by example on each template strand; (DNA) polymerase joins the nucleotides of each new strand; [3]	
	(iii)	Adenine and thymine bases are joined by only two hydrogen bonds; easier/less energy required to break two bonds (than required to break the three bonds between G and C bases); [2]	
	(iv)	S-phase; [1]	
	(d) **(i)**	Y – metaphase; Z – anaphase; [2]	
	(ii)	Any **two** from: • chromosomes decondense/becoming longer and thinner and less visible • nuclear membrane reforms • spindle fibres break down • cell plate starts to form/vesicles along middle of the cell • nucleolus reforms [2]	14

				AVAILABLE MARKS
6	(a)	(i)	Movement of water through a selectively permeable membrane from a solution of higher (less negative) water potential to a solution of lower (more negative) water potential; [1]	
		(ii)	The salt solution has a lower/more negative water potential than the swollen cells; excess water leaves the cells by (osmosis) (thus reducing the swelling); [2]	
	(b)	(i)	Cell/plasma membrane invaginates around fluid; to form a vesicle which pinches off and enters the cell; [2]	
		(ii)	4; [1]	
		(iii)	At 4 ºC most/a high number of cells had no macropinosomes; and a maximum number of 2; at 37 ºC there can be 0–10 macropinosomes per cell/wider range of macropinosomes per cell; at 37 ºC the majority of cells had between 2–6 macropinosmes; [4]	
		(iv)	More fluid can be taken into a cell/more pinocytosis; [1]	11
			Section A	**60**

7 Indicative content

AVAILABLE MARKS

- cell membrane consists of phospholipid bilayer and protein
- hydrophilic ‘heads’ on outside/hydrophobic ‘tails’ on inside
- protein molecules are scattered throughout the membrane
- glycocalyx on outer surface of cell membrane
- contains glycoproteins/glycolipids/extrinsic proteins
- animal cells have cholesterol scattered throughout the membrane/ cholesterol provides stability/fluidity
- (cell membrane) cell boundary that regulates movement of substances into and out of the cell
- proteins can act as channels/carriers/enzymes/receptors/antigens (any two)
- nuclear membrane is double membrane with pores surrounding the nucleus
- (outer membrane) is encrusted with ribosomes and site of origin of RER
- pores allow mRNA/ribosomes to pass into cytoplasm
- rough endoplasmic reticulum (RER) contains ribosomes and also provides the ‘scaffolding’ for protein synthesis
- smooth endoplasmic reticulum (SER) involved in synthesis of lipids
- Golgi apparatus is organelle with membrane-enclosing cisternae/sacs and vesicles involved in modifying proteins
- vesicles are membrane-surrounded sacs involved in transporting materials
- lysosome (membrane) prevents cytolytic enzymes being released into the cytoplasm
- mitochondria have a double membrane and involved in aerobic respiration
- inner membrane has infolding to increase surface area for enzymes/ respiration
- chloroplasts have a double membrane and are the organelles where photosynthesis takes place
- membranes/thylakoids/grana contain the chlorophyll
- vacuole is surrounded by the tonoplast/tonoplast separates the vacuole from the cytoplasm

Band	Response	Mark
3	Candidates use the most appropriate specialist terms to fully outline the structure of the cell membrane and describe and explain the occurrence and function of membranes within plant and animal cells using a minimum of **eleven points** of indicative content. Spelling, punctuation and grammar are excellent and the form and style are of a high standard.	[11]–[15]
2	Candidates use appropriate specialist terms to outline the structure of the cell membrane and describe and explain the occurrence and function of membranes within plant and animal cells using a minimum of **six points** of indicative content. Spelling, punctuation and grammar are good and the form and style are of a good standard.	[6]–[10]
1	Candidates partially outline the structure of the cell membrane and partially describe and explain the occurrence and function of membranes within plant and animal cells using a minimum of **one point** of indicative content. Spelling, punctuation, grammar, form and style are of a basic standard.	[1]–[5]
0	Response not worthy of credit.	[0]

[15] 15

Section B **15**

Total **75**

AVAILABLE MARKS