Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2023

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[SBY11]

FRIDAY 12 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.

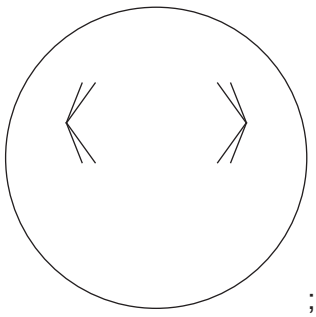
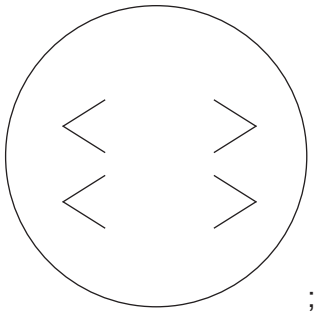
The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends 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)**	X – phospholipid/fatty acid; Y – (intrinsic) protein;	[2]	
	(b)	Membrane stability;	[1]	
	(c)	Through channel proteins; as they create a hydrophilic channel (through the hydrophobic bilayer); **or** carrier proteins; which change shape;	[2]	5
2	**(a)**	An amalgamation/group of cells that perform the same/a similar/specific function;	[1]	
	(b)	**(i)** Secretion of mucus;	[1]	
		(ii) Mucosa;	[1]	
		(iii) Increase surface area; for increased absorption of digested food;	[2]	
		(iv) Lacteal; for the transport/absorption of lipids; **and/or** single layer of (columnar epithelium) cells; short diffusion distance for absorption of digested food; **and/or** capillary network; for the transport/absorption of amino acids/glucose;	[4]	9
3	**(a)**	A – Cisterna; B – vesicle/lysosome;	[2]	
	(b)	Any **two** from: • carbohydrate added to form a glycoprotein • lipid added to form a lipoprotein • prosthetic groups/co-factors added • two or more polypeptides joined together to form a protein with quaternary structure	[2]	
	(c)	Any **two** from: • rough e.r. forms a more extensive network • rough e.r. is encrusted with/contains ribosomes • rough e.r. is continuous with nuclear envelope	[2]	6

			AVAILABLE MARKS
4	**(a)**	Red king crab have 104 pairs of chromosomes compared to 8 in the koala; more opportunities for unique combinations of alleles to form due to chiasmata formation/crossing over; a greater number of possible chromosome combinations; due to independent assortment; [4]	
	(b)	Nucleus must contain homologous/paired chromosomes to be able to undergo meiosis; [1]	
	(c)	**(i)** Spindle fibre/microtubules; [1]	
		(ii) Nuclear envelope breaks down (during prophase I); [1]	
		(iii)  ; [1]	
		(iv)  ; [1]	9
5	**(a)**	The protoplast/cell membrane has pulled away from the cell wall/cells plasmolysed; water has moved out of the vacuole/cell; to an area of more negative/lower water potential; [3]	
	(b)	**(i)** The % of seeds germinating increases up to 15 au concentration of fertiliser and then decreases for all vegetables; aubergine has the greatest decrease in/lowest % germination/is affected the most at higher fertiliser concentrations; chilli plants have the highest % of germination at all fertiliser concentrations; [3]	
		(ii) Fertiliser gives a more negative/lower solute potential; water cannot enter/not enough water enters the seeds preventing germination/water leaves the seeds; [2]	
	(c)	**(i)** The pressure exerted on a solution by a cell wall/pressure exerted on the cell wall by the cell membrane; [1]	
		(ii) It has no cell wall; [1]	10

				AVAILABLE MARKS
6	**(a)**		Quaternary structure – two or more polypeptide chains make up the protein; collagen consists of three polypeptides wound around each other/intertwined (held by hydrogen bonds); [2]	
	(b)	**(i)**	Biomarker is a molecules/enzyme present in blood (body fluids) which may indicate health or disease/can be used in monitoring/diagnosing disease; [1]	
		(ii)	Breakdown the collagen in cartilage; [1]	
		(iii)	Rheumatoid arthritis more severe/increasing pain or stiffness in joints/ more collagen broken down; [1]	
	(c)	**(i)**	Attaches to a part of the enzyme which is not the active site; active site no longer complementary so fewer enzyme-substrate complexes form/substrate can no longer bind; [2]	
		(ii)	Less collagen broken down and therefore slowing down progression of disease; but already damaged cartilage cannot be repaired; [2]	9
7	**(a)**	**(i)**	RNA; [1]	
		(ii)	Reverse transcriptase; catalyses synthesis of DNA from RNA (which allows for new viruses to be produced); [2]	
	(b)	**(i)**	The cell/plasma membrane invaginates/infolds/forms around the virus; a vesicle/(membrane bound) sac containing the viruses pinches off/is released on inside of cell; [2]	
		(ii)	Stage 1 – stopping binding will prevent all subsequent stages of infection; stage 7 – (the virus would not be able to leave the cell) to infect other cells; [2]	
	(c)	**(i)**	Between days 0–15 there is no increase in viral load; there is a steady/large increase between day 15 and day 30; after day 30 there is a steady/slower decrease; [3]	
		(ii)	day 5 – 2, day 25 – 5.4 or 3.4; 3.4/2 × 100 = 170%; [2]	12
			Section A	**60**

Section B

AVAILABLE MARKS

8 (a) Indicative content

- nucleic acid is a polymer of nucleotides
- nucleotide consists of a pentose sugar, a phosphate group and a nitrogenous base
- the pentose sugar is ribose in RNA, deoxyribose in DNA
- phosphodiester bonds link pentose sugar to phosphate/join adjacent nucleotides together
- nucleic acids are formed by a condensation reaction
- DNA is double stranded/RNA is single stranded
- in DNA the strands are anti-parallel
- DNA has four different bases, Adenine, Thymine, Cytosine and Guanine
- RNA has Uracil instead of Thymine
- DNA provides the genetic code of living organisms
- DNA controls protein synthesis/codes for sequence of amino acids
- one of the DNA strands is the template strand/the bases are read as triplets
- messenger RNA carries the code (from the DNA in the nucleus) to a ribosome
- transfer RNA carries amino acids to the ribosome/rough endoplasmic reticulum/mRNA
- ribosomal RNA forms ribosomes/ribosomes are the site of protein synthesis

Band	Response	Mark
3	Candidates use the most appropriate specialist terms to describe the structure of a nucleic acid and explain the functions of DNA and RNA. At least **eight** points must be made. Spelling, punctuation and grammar and the form and style are of a high standard.	[7]–[9]
2	Candidates sometimes use appropriate specialist terms to describe the structure of a nucleic acid and explain the functions of DNA and RNA. At least **five** points must be made. Spelling, punctuation and grammar and the form and style are of a good standard.	[4]–[6]
1	Candidates may only briefly describe the structure of a nucleic acid and explain the functions of DNA and RNA. At least **two** points should be made. Spelling, punctuation and grammar and the form and style are of a basic standard.	[1]–[3]
0	Response not worthy of credit.	[0]

[9]

(b)
- DNA helicase breaks the hydrogen bonds between bases
- this separates the two strands
- each original strand becomes a template
- free nucleotides link to the template strands following base pairing rules
- adjacent nucleotides are joined together by DNA polymerase
- phosphodiester bonds are formed
- each new DNA molecule has one original and one new DNA strand

Band	Response	Mark
3	Candidates use the most appropriate specialist terms to describe the process of DNA replication and discuss how the results of this experiment allowed them to accept the semi conservative model of replication. At least **five** points must be made. Spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
2	Candidates sometimes use appropriate specialist terms to describe the process of DNA replication and discuss how the results of this experiment allowed them to accept the semi conservative model of replication. At least **three** points must be made. Spelling, punctuation and grammar and the form and style are of a good standard.	[3]–[4]
1	Candidates may only briefly describe the process of DNA replication and discuss how the results of this experiment allowed them to accept the semi conservative model of replication. At least **one** point should be made. Spelling, punctuation and grammar and the form and style are of a basic standard.	[1]–[2]
0	Response not worthy of credit.	[0]

[6] 15

Section B **15**

Total **75**

AVAILABLE MARKS