

New
Specification



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017**

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[SBY11]

THURSDAY 25 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)
- | | Prokaryotic cell | Eukaryotic cell |
|-----------------------|------------------|-----------------|
| Endoplasmic reticulum | <i>X</i> | ✓ |
| DNA | ✓ | ✓ |
| Histone protein | <i>X</i> | ✓ |
| Ribosome | ✓ | ✓ |
| Golgi apparatus | <i>X</i> | ✓ |
| Plasmid | ✓ | <i>X</i> |
- ... [3]
- (b) Spindle fibres/cilia/flagella/cell cytoskeleton; [1]
- 2 (a) Has one or more carbon-carbon double bonds/contains double bonds between carbon atoms; [1]
- (b) (i) Glycerol; [1]
- (ii) One fatty acid chain replaced with a phosphate group; [1]
- (c) (i) Synthesis: condensation;
breakdown: hydrolysis; [2]
- (ii) Any **two** from:
 • energy store/respiratory substrate
 • insulation
 • buoyancy
 • organ protection
 • waterproofing [2]

4

7

3 (a) 150 000 – 10 320;

$$\frac{139 - 80}{150\,000} \times 100 = 93.12; \quad [2]$$

(b) (i) Initially AZT caused a dramatic reduction in viral load;
viral load begins to increase after month 2;
AZT alone is not an effective treatment/the dose used is not effective
as viral load never falls as low as 50 cm^{-3} ; [3]

(ii) AZT may be used in combination with/used with other HIV drugs/
replaced with other HIV **drugs**/use increased dose; [1]

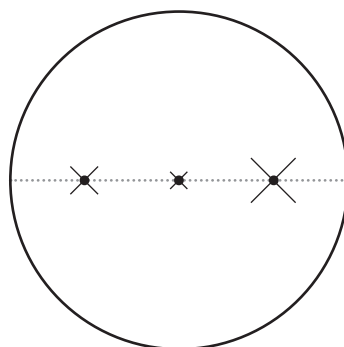
(c) Reliability: take repeat counts from the same sample;
Validity: use the same method to count the viral particles/keep blood in the
same conditions before counting/avoid sample contamination; [2]

(d) Target reverse transcriptase action/ prevents conversion of RNA to DNA
(so incorporation into host DNA is prevented); [1]

9

4 (a) Metaphase; [1]

(b) One chromosome of each pair (any order);
aligned with centromere on equator line;



[2]

(c) Independent assortment/random alignment of homologous chromosomes;
resulting in new chromosome combinations in gametes;
chiasmata;
exchange of genetic information/recombination of genes between two
chromatids/non sister chromatids/homologous chromosomes/new allelic
combination; [4]

(d) DNA synthesis/S-phase [1]

8

	AVAILABLE MARKS
5 (a) Calcium pectate; chlorophyll; [2] (b) It consists of β-glucose monomers which join together to make straight chains/β1-4 bonds form; hydrogen bonds form cross-links between adjacent chains; [2] (c) (i) Plasmodesmata/other appropriate response; [1] (ii) The thylakoids/grana may be destroyed/pushed to one side; less light can be absorbed (for photosynthesis); [2] (d) Any two from: both have double membrane; large internal surface area/many internal membranes; both contain DNA; both contain ribosomes; [2]	9
6 (a) (i) Has a carbohydrate/sugar chain attached; [1] (ii) The net movement of water molecules from an area of higher water potential to an area of lower water potential, through a semi permeable membrane; [1] (b) (i) Excessive; chloride ions are pumped out of cells/into lumen (due to action of the toxin); results in more negative/lower water potential in the lumen of the intestine; water follows by osmosis; [4] (ii) The water potential of the cell is decreased/becomes more negative; so water is drawn in/less water leaves the cells; [2] (c) Fewer chloride ions move out of the cell/more remain in the cells of the lung epithelium; so less water moves out of the cell/into the mucus layer; [2]	10

- 7 (a) (i) A non-protein substance that an enzyme may require to function; [1]
- (ii) Any **three** from:
- individual collagen chains show α -helix polypeptide chains/secondary structure helix present in chains/functional collagen comprised of three polypeptide chains;
 - held by hydrogen bonds;
 - three chains twisted around each other;
 - very strong/does not stretch with tension/insoluble; [3]
- (b) (i) Independent variable (time) on x-axis;
axes correctly labelled with units and scale;
accurate plotting;
points joined with short, straight lines including a legend; [4]
- (ii) Average fibril diameter decreases much faster when zinc is present/
fibril digestion is much slower when zinc is absent;
zinc makes active site more complimentary to the substrate;
hence in the absence of zinc, few enzyme substrate complexes form; [3]
- (c) Targeted active site inhibitor specific to collagenase/block zinc binding site on collagenase;
so collagen is not broken down; [2]

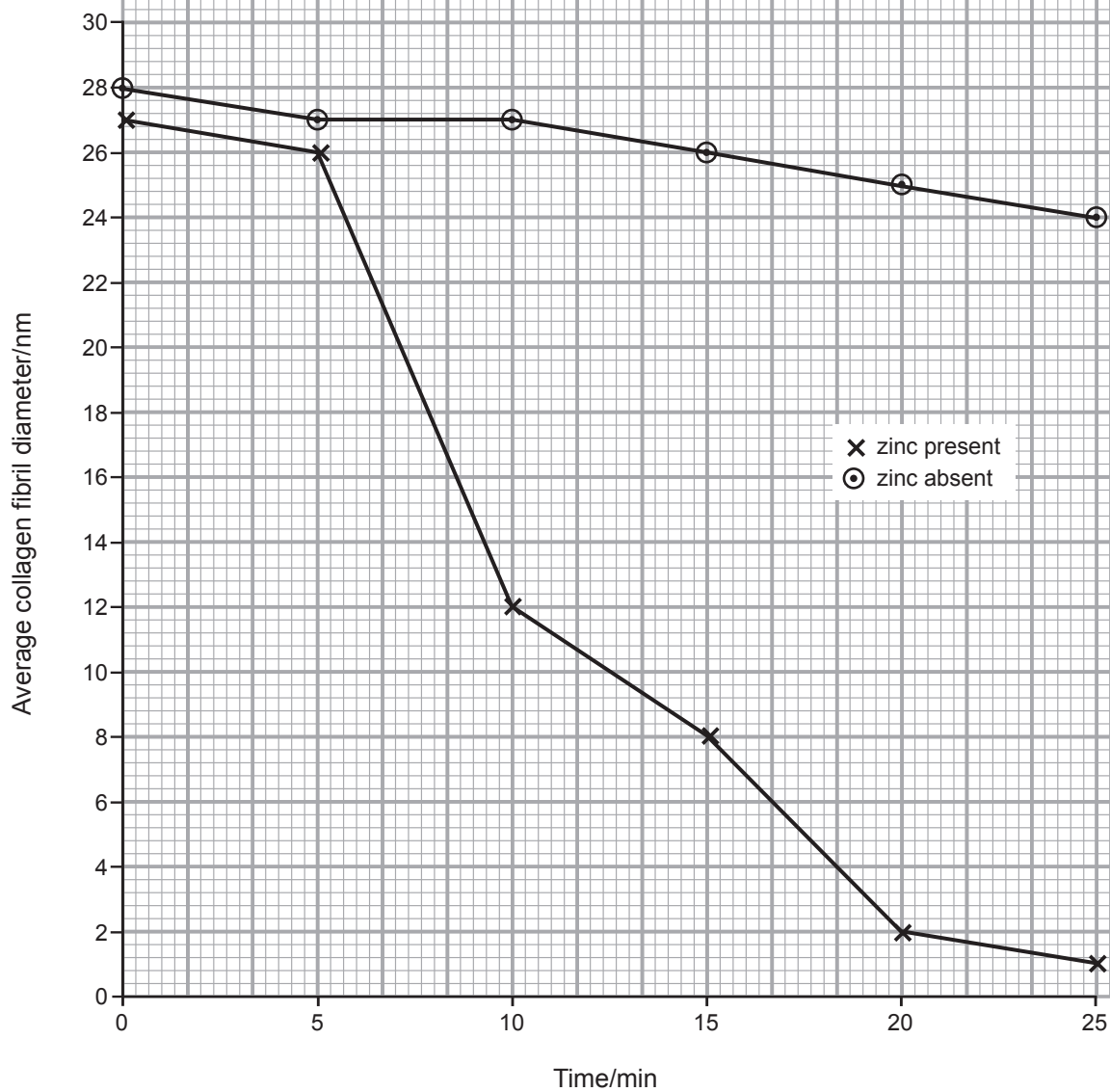
Section A

**AVAILABLE
MARKS**

13

60

The effect of zinc availability on average collagen fibril diameter due to collagenase activity over time



Section B

AVAILABLE
MARKS

8 (a) Indicative content

- LM allows live/whole specimens to be viewed/EM allows only dead/thin sections to be viewed
- LM has lower resolving power/TEM has much greater resolving power
- hence LM allows only macrostructure/TEM allows ultrastructure to be viewed (smallest organelles can be seen)
- LM is much cheaper/EM is expensive
- LM more portable/preparation of specimens much easier than for EM
- SEM allows surface of structures to be viewed (at high resolution)
- Resolution is not as high in SEM image
- LM allows colour to be seen/TEM image is black and white
- preparation of specimen for EM may introduce artefacts
- other appropriate response

Band	Response	Mark
3	Candidates use appropriate specialist terms to fully describe the advantages and disadvantages of light microscopy and electron microscopy using a minimum of seven 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.	[5]–[6]
2	Candidates sometimes use appropriate specialist terms to fully describe the advantages and disadvantages of light microscopy and electron microscopy using a minimum of four points of indicative content. They must use satisfactory spelling, punctuation and grammar and the form and style are of a good standard.	[3]–[4]
1	Candidates partially describe the advantages and disadvantages of light microscopy and electron microscopy, using a minimum of one point of indicative content. They must use limited correct spelling, punctuation and grammar and the form and style are of a basic standard.	[1]–[2]
0	Response not worthy of credit.	[0]

[6]

(b) Indicative content

- mucosa layer is where absorption occurs
- villi are present which increase surface area
- microvilli increase surface area for diffusion
- epithelial cells have many mitochondria for active transport
- goblet cells produce mucus to protect mucosa/provide lubrication
- muscularis mucosa is a thin layer of muscle that controls movement of the villi which increases contact with digested food in the gut lumen
- villi have a rich network of capillaries which maintains diffusion gradient between lumen and blood
- submucosa contains blood and lymphatic vessels for transport
- muscularis externa consists of both longitudinal and circular muscles causing pendular movements/peristalsis
- serosa is a thin outer layer of connective tissue – this provides protection and support of the ileum
- lacteal for absorption of fatty acids and glycerol
- crypts of Lieberkühn/Paneth cells for antimicrobial action

Band	Response	Mark
3	Candidates use appropriate specialist terms to fully describe how the specialised structure of the ileum helps it carry out its function using a minimum of nine 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.	[7]–[9]
2	Candidates sometimes use appropriate specialist terms to fully describe how the specialised structure of the ileum helps it carry out its function using a minimum of five points of indicative content. They must use satisfactory spelling, punctuation and grammar and the form and style are of a good standard.	[4]–[6]
1	Candidates partially describe how the specialised structure of the ileum helps it carry out its function, using a minimum of one point of indicative content. They must use limited correct spelling, punctuation and grammar and the form and style are of a basic standard.	[1]–[3]
0	Response not worthy of credit.	[0]

[9]

15

Section B**15****Total****75****AVAILABLE
MARKS**