Published Mark Scheme for GCE AS Biology

January 2009

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NORTHERN IRELAND GENERAL CERTIFICATE OF SECONDARY EDUCATION (GCSE)
AND NORTHERN IRELAND GENERAL CERTIFICATE OF EDUCATION (GCE)

MARK SCHEMES (2009)

Foreword

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 16- and 18-year-old 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 a 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.

The Council hopes that the mark schemes will be viewed and used in a constructive way as a further support to the teaching and learning processes.

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ADVANCED SUBSIDIARY (AS)
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Biology

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assessing

Module 1: Cell Biology

[AB111]

WEDNESDAY 14 JANUARY, AFTERNOON

MARK SCHEME

/ 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 Any three from
- the enzymes are initially synthesised on rough endoplasmic reticulum
- transferred in vesicles from ER to Golgi body
- fuse with Golgi body at the formative (cis-) face
- processed within Golgi body/packaged into vesicles (lysosomes)
- which bud off the mature (trans-) face [3] — 3

2 (a) Sequence of amino acids; [1]

(b) Any four from
- forms disulphide bridges/covalent bonds
- forms bonds within the A chain
- folded chain represents the tertiary structure
- bond chains A and B together
- chains bonded together represent the quaternary structure [4]

(c) The R group of cysteine; [1] — 6

3 (a) (i) Telophase;
metaphase;
prophase;
anaphase; [4]

(ii) C, B, D, A; [1]

(b) (i) Chiasma(ta);
centromere/kinetochore; [2]

(ii) A section of chromatid of one chromosome is exchanged with a chromatid of the other homologue/crossing over of homologous chromosomes;
resulting in genetic recombination/genetic information is exchanged/swapped;
Reward each point only if the event and consequence are clearly distinguished [2] — 9

			AVAILABLE MARKS
4	**(a)**	The water potential of the immersing solution is higher than that in the potato tissue *(the term "water potential" is obligatory)*; so water enters by osmosis (increasing the length of the cylinder); [2]	
	(b)	–900 kPa; there is no change in the length of the potato cylinder/the water potential of the potato tissue is equal to that of the immersing solution/there is no water entering or leaving the tissue; [2]	
	(c)	8% of the initial length = 4 mm; = 50 mm less 4 mm = 46 mm **[final length is reduced by value above]**; [2]	
	(d)	Diagram showing protoplast pulled away from cell wall; [1]	7

AVAILABLE MARKS

5 **(a)** Mitochondria are bounded by an envelope in which the inner membrane is folded/forms cristae;
their function is to generate ATP/aerobic respiration; [2]

(b) **(i)** Caption;
scaling of the graph (using the graph paper to maximal effect);
labels and units of measurement shown;
points accurately plotted **[6/7 points for 2 marks/5 points for 1 mark]**;
scattergram (points not joined, though line of best fit may be drawn); [6]

(ii) Larger cells (up to a certain size) possess a greater number of mitochondria;
over a certain size the number of mitochondria remains steady/ fluctuates; [2]

(iii) **Any two from**
- mitochondria divide (replicate themselves)
- mitochondria produced during the G1 phase (of interphase)
- cells grow during the G phases/interphase
- mitochondria generate energy for cell growth (division)
- an increase in mitochondria (organelles) increases the size of cells
- there is a maximum size to which cells grow
- other appropriate response [2]

(c) **Any two from**
- DNA in prokaryotic cells is naked, i.e. is not associated with protein/DNA in eukaryotic cells is bounded by proteins (histones)
- prokaryotic cells may contain extrachromosomal DNA/plasmids
- prokaryotic cells have smaller (70s) ribosomes/eukaryotic cells have larger (80s) ribosomes
- prokaryotic cells have a cell wall of peptidoglycan/some eukaryotic cells (i.e. animal cells) lack a cell wall/have a cellulose cell wall (plant cells) or chitin cell wall (fungal cells)
- prokaryotic cells are much smaller, rarely exceeding 2 µm in width/eukaryotic cells are generally greater than 5 µm in size
- bacterial cells are prokaryotic while animal, plant and fungal cells are eukaryotic
- other appropriate example [2]

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AVAILABLE MARKS

6 **(a)** **(i)** Both consist of α-glucose/possesses glycosidic bonds; [1]

(ii) Starch is a polymer/polysaccharide/consists of amylose and amylopectin/possesses 1,4 and 1,6 bonds/may be branched; maltose is a disaccharide/1,4 bonds only; [2]

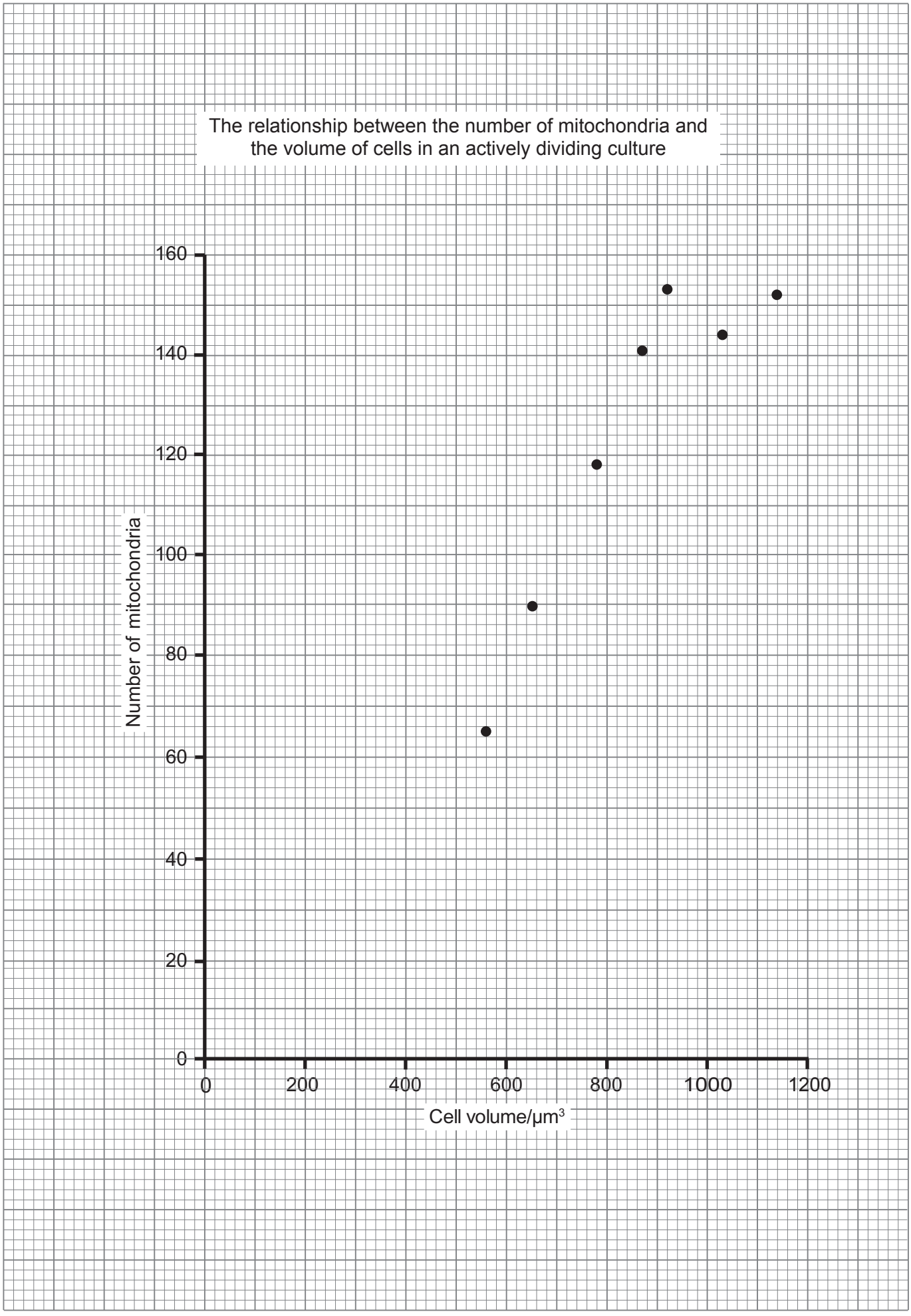
(b) **(i)** **Any three from**

- samples of reaction mixture are taken at intervals of time (e.g. every minute);
- iodine solution is added;
- starch turns iodine blue-black;
- the intensity of colour will diminish over time/colour change is measured using a colorimeter; [3]

(ii) Need to calibrate the colorimeter (from % transmission to % starch)/ (if not using colorimeter) difficulty of measuring colour density/need to control other variables/other appropriate suggestion; [1]

(c) **(i)** The amount of starch decreases; the rate of reaction is initially very high but then slows/rate of reaction decreases/amount of starch is halved approximately every half minute; [2]

(ii) The amount of starch decreases as it is broken down by amylase; as the reaction progresses the concentration of starch decreases and so the reaction slows down (since there are fewer collisions between substrate and enzyme); [2] 11



		AVAILABLE MARKS
7 **(a)**	DNA nucleotide has the sugar deoxyribose, while RNA nucleotide has the sugar ribose; DNA nucleotide may have the base thymine (as well as adenine, guanine, cytosine) while RNA nucleotide has the base uracil (as well as adenine, guanine, cytosine); [2]	
(b) **(i)**	Step 1: heating to separate the DNA strands/H-bonds broken to release the two strands; Step 2: addition of DNA primers; Step 3: use of (heat sensitive) DNA polymerase to add further nucleotides/ nucleotides attach to the exposed strands according to base-pairing rules (A–T, C–G); [3]	
(ii)	32; [1]	
(c)	Cut at a specific base sequence; across the sugar-phosphate backbone/producing fragments of different length/producing fragments with sticky ends; [2]	
(d)	(7), (8), 4, 5; (4), 5, 7, 8; [2]	10
	Section A	**60**

AVAILABLE MARKS

Section B

Thirteen points, at least five in each section

8 Structure of cell surface membrane:

- bilayer of phospholipids
- polar (charged/hydrophilic) phosphate ends outermost
- non-polar (hydrophobic) hydrocarbon chains innermost
- phospholipid layers impregnated with protein
- and glycoprotein/glycolipid
- some proteins are peripheral (or extrinsic) while some are integral (transmembranal or intrinsic)
- proteins have hydrophobic regions in contact with the lipid layer with hydrophilic regions facing out
- carbohydrate (glycocalyx) is found on the outer face only/involved in cell recognition
- movement of the phospholipids with a mix of proteins has given rise to the term “fluid-mosaic” model
- cholesterol may be found (in animal cells) among the hydrocarbon chains/ within the hydrophobic region/influences the “fluidity” of the membrane

Movement of molecules across the membrane:

- lipid-soluble/non-polar molecules can diffuse through the phospholipid layers
- water/O_2/CO_2 move through the phospholipid layers (since they are such small molecules)
- polar molecules (ions, etc.) cannot move through the phospholipid layers
- movement is achieved by special transport proteins/channel proteins
- carrier proteins are specific for a particular type of molecule (or ion)/have specific receptor regions to which the transported molecule/ion attaches
- the number of carriers in the membrane determines the rate of facilitated diffusion/the rate of uptake
- facilitated diffusion is a passive process/takes place along the concentration gradient
- active transport involves movement against the concentration gradient
- active transport involves the expenditure of energy/usage of ATP
- the carrier protein change its three-dimensional shape (transferring the molecule across the membrane in the process)

[13]

		AVAILABLE MARKS
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**