Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2011

Biology

Assessment Unit AS 1

assessing

Module 1: Cell Biology

[AB111]

TUESDAY 11 JANUARY, MORNING

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 Plasmid ✓ ✗;
Ribosomes ✓ ✓;
Golgi apparatus ✗ ✓; [3] 3

2 **(a)** Water potential (ψ_{cell}) of the cell $= -1400 + 500 = -900$kPa; [1]

(b) Water moves out of the cell/into the solution/external medium
water moves from a region of higher water potential to a region of lower water potential/as the cell has a higher (less negative) water potential (allow converse)
Insist on the term water potential. [2]

(c) Diagram showing:
vacuole shrunk;
cytoplasm and cell membrane pulled away from the cell wall;
Diagram consequential to answer in (b). [2] 5

3 **(a)** Amino acids;
condensation;
peptide;
genes/DNA/mRNA; [4]

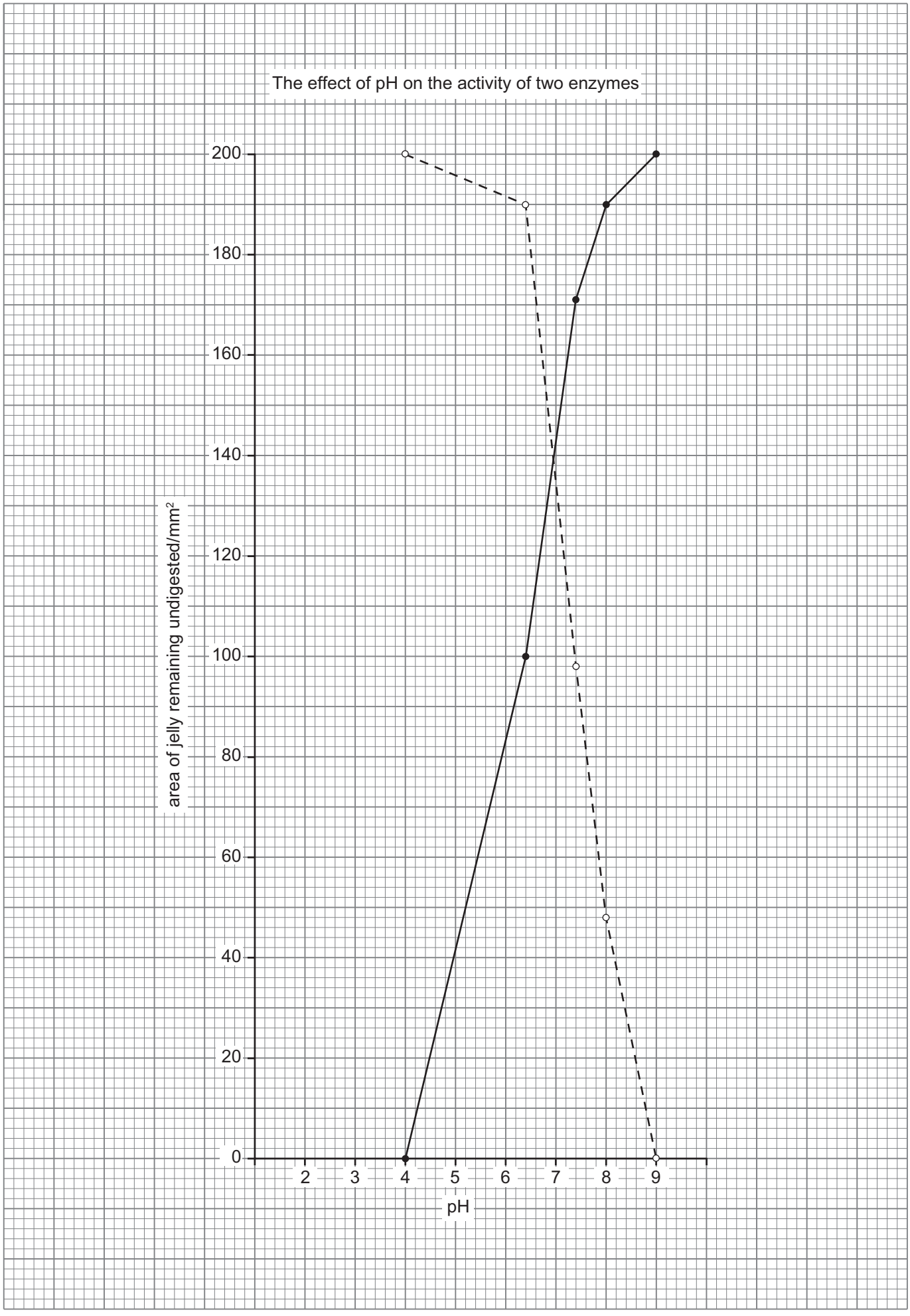
(b) **Any four from**
- hydrogen bonds (between the amino acids) leads to twisting/folding of the chain/secondary structure
- and can take the form of an α-helix or a β-pleated sheet
- a protein will then fold further onto itself to form a tertiary structure/ tertiary structure represented by a globular shape
- this involves H bonds, ionic bonds, disulphide bonds and hydrophobic interactions (between the R groups of the individual amino acids) **[any two]**
- in some proteins, a quaternary structure forms between two or more polypeptide chains
- this involves mainly disulphide bonds between the individual chains [4]

(c) Blue to purple; [1] 9

				AVAILABLE MARKS
4	(a)	(i)	**A** Granum/thylakoids/lamellae; **B** cell wall; **C** nucleolus; **D** nuclear envelope; [4]	
		(ii)	Nuclei are against the cell wall as these cells have a large central vacuole/pushed against the cell wall/cell is turgid; [1]	
	(b)		Scale bar measured as 30mm; equal to 30 000µm; magnification = 30 000 ÷ 0.5 = 60 000; [3]	8
5	(a)	(i)	A: carbohydrate/glycoprotein/glycocalyx; B: polar/hydrophilic head/glycerol-phosphate (*not just head*); C: non-polar/hydrophobic tails/fatty acid tails/hydrocarbon chains (*not just tails*); D: protein; [4]	
		(ii)	X placed on top of diagram since the glycocalyx (structure A) is on the outer surface; [1]	
	(b)	(i)	Active transport; increased oxygen increases ATP production/addition of cyanide decreases ATP production; [2]	
		(ii)	Facilitated diffusion; involves carrier proteins without ATP requirement; [2] *The reason must distinguish this from the other two mechanisms.*	
		(iii)	(Simple) diffusion; no use of carrier proteins; [2]	11

				AVAILABLE MARKS
6	(a)	(i)	4 fragments; [1]	
		(ii)	GATA/ATAG/TAGA/AGAT; 7 repeats (if GATA)/6 repeats (if ATAG or TAGA or AGAT); **Number of repeats is consequential on MRS.** [2]	
		(iii)	Highest amounts of DNA polymorphism is shown by these repeat sequences/number of repeat sequences differs between individuals; [1]	
	(b)	(i)	Each inherits a different marker from each parent/different DNA (chromosomes/gamete) from each parent; [1] *Answer must reference both parents.*	
		(ii)	Grandparents are the husband's parents; one RFLP band has been obtained from each of his parents/ wife has a unique band not found in the grandparents' RFLPs; [2]	
		(iii)	Individual 4 (has an RFLP band in common with family members); [1]	
		(iv)	Much of our DNA is identical to the DNA of other people/ sequences of DNA coding for a protein are common to all humans/other appropriate answer; [1]	9

		AVAILABLE MARKS
7 **(a)** Hydrolysis; [1]		
(b) **(i)** Caption; pH as the independent variable along the shared *x*-axis; labels and units of measurement shown, with a key to identify enzymes A and B; points accurately plotted in a well-scaled graph (using the graph paper to maximal effect); points joined with short straight lines; [5]		
(ii) **Any three from** ● for enzyme A, as pH increases the area of jelly remaining increases/enzyme A is more effective in acidic conditions (pH4/low pH) ● for enzyme B, as pH increases the area of jelly remaining decreases/enzyme B is more effective in alkaline conditions (pH7.4, 8 and 9/high pH) ● the more jelly remaining, the less digestion has taken place (allow converse)/the lower the activity of the enzyme (allow converse) ● enzymes A and B have different optimum pHs ● enzymes A and B have the same activity/amount of jelly remaining at pH7 (approximately) [3]		
(c) Ionic bonds in the tertiary structure may be disrupted (and result in coagulation of the protein); disrupting the shape of the active site/therefore fewer enzyme-substrate complexes are formed; *Insist on reference to terms such as tertiary/globular structure, active site.* [2]		
(d) **Any four from** ● the strips of gelatine were not of uniform thickness ● there was no control experiment (to check that the jelly did not dissolve in water or the different buffer solutions) ● temperature was not controlled ● the range of the pH buffers was not sufficient ● a shorter time period or measurements at intervals should be used as all the jelly was digested at 90 minutes ● the procedure was not replicated/two or more strips of jelly could have been included in each Petri dish ● the enzyme should be mixed with the buffer before adding to the jelly ● mass remaining would be a better measure of enzyme activity (dependent variable) ● area digested should have been determined as initial area minus the area remaining ● other appropriate suggestion [4]		15
Section A		**60**



Section B

AVAILABLE MARKS

8 (a) Any eight points

Nucleic acids (common features):
- nucleic acids are chains of nucleotides
- (a nucleotide) consists of a pentose sugar, a phosphate and a nitrogenous (organic) base/purine and pyrimidine [*or by diagram*]
- the sugars and phosphates are joined to form the spine [*or by diagram*]
- by phosphodiester/condensation/covalent bonds

DNA and RNA (comparisons):
- in DNA the pentose sugar is deoxyribose, while in RNA it is ribose
- DNA is a double chain/double helix, while RNA is single stranded
- hydrogen bonds between the bases form the double chain (in DNA)
- in DNA the bases are adenine, thymine, cytosine and guanine
- in DNA adenine (A) always pairs with thymine (T), while cytosine (C) pairs with guanine (G)/a purine binds to a pyrimidine
- in DNA the two strands run anti-parallel to each other
- a DNA molecule is much longer than an RNA molecule (allow converse)
- in RNA thymine is replaced by uracil
- there are three forms of RNA – ribosomal, messenger and transfer

[8]

(b) Any five points
- DNA replication is said to be semi-conservative, because each new molecule contains one old strand and one new strand
- the two sides of the DNA molecule are “unzipped” from one end
- by DNA helicase
- each strand acts as a template for the formation of new strands
- free nucleotides enter opposite their complementary bases (A opposite T and C opposite G)
- DNA polymerase catalyses the joining up of the nucleotides
- by condensation reactions [5]

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]

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