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GENERAL CERTIFICATE OF EDUCATION
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MARKING SCHEME

**BIOLOGY/HUMAN BIOLOGY (NEW)
AS/Advanced**

JANUARY 2009

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2009 examination in GCE BIOLOGY/HUMAN BIOLOGY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

AS MODULE BY1

Question	Answers/Explanatory Notes	Marks Available
1.	(a) F / calcium or G / phosphate (b) I / sucrose (c) A / magnesium (d) D / cellulose (e) G / phosphate (f) H / water (mark first answer)	[1 mark each] [Total 6 marks]

2. (a)

Level of protein structure	Types of bonds			
	peptide	hydrogen	disulphide	ionic
Primary	/			
Secondary	/	/		
Tertiary	/	/	/	/

[1 mark per row across]

[3]

- (b) (i) More than one polypeptide chain present /
two or more polypeptide chains present.
(not: ref. to protein/tertiary) [1]
- (ii) haemoglobin / collagen / insulin/antibodies [1]

[Total 5 marks]

3. (a) β glucose [1]
- (b) glycosidic [1]
- (c) starch has α glucose molecules cellulose has β glucose;
starch two polysaccharides (or named), cellulose one;
starch has (two polysaccharides) one of which is branched whereas
cellulose is unbranched;
starch has 1-4 and 1-6 linkages, cellulose 1-4 only;
amylose / starch coiled, cellulose (cross linked) in straight chains;
starch consists of single chains cellulose has many parallel chains
linked with hydrogen bonds.
Starch, glucose all same way 'up', rotated (90°) in cellulose.
(must be a comparison) [Any 2] [2]

Question	Answers/Explanatory Notes	Marks Available
3.	(d) long chains cross linked by hydrogen bonds; adjacent glucose molecules are rotated by 180° ; hydrogen bonds form between hydroxyl groups of adjacent parallel chains; microfibrils. (not: fibres/fibrils) [Any 2]	[2]

[Total 6 marks]

4. (a)

Structure	Name	Function
A	Mitochondrion	(Cell) respiration / ATP production
B	Chloroplast	Photosynthesis / light trapping
C	Ribosome	Protein synthesis

Independent marks

[6]

(b) they have been cut in different planes [1]

(c) animal cells do not have chloroplast; cell wall; (large) (central) permanent vacuole; centrioles; plasmodesmata

(not: chlorophyll) No need for comparative statements. [Any 2] [2]

[Total 9 marks]

5.	(a)	(i)	X high Y low Z high	(all three correct)	[1]
		(ii)	There are folds in the membrane / microvilli (which increases the surface area).		[1]
	(b)	(i)	C		[1]
		(ii)	Moving sodium ions out of the cell will reduce their concentration and create a greater difference in concentration between the inside of the cell and the outside so ensuring a rapid rate of diffusion into the cell.		[1]
		(iii)	as the temperature is increased kinetic energy/the movement of molecules increases; this results in an increase in rate of diffusion. (allow: diffuse faster)		[2]

Question	Answers/Explanatory Notes	Marks Available
5.	<p>(c) (i) P = diffusion Q = facilitated diffusion (must have both) [1]</p> <p>(ii) facilitated diffusion causes more rapid movement of molecules through a membrane than simple diffusion; it relies on protein carriers / channel proteins; and the rate is limited by the number of proteins in the membrane i.e. protein carriers 'full'; therefore the curve flattens out; or converse</p> <p>Diffusion – no carriers involved then just limited by concentration gradient = 2 [2] Q flattens out as channel proteins are fully occupied=2</p>	[1]
(d)	water potential is the capacity of water to leave or enter a system/cell Concentration free water molecules in a solution/ ref. kinetic energy	[1]
(e)	<p>(i) K cell wall [1] J cell/plasma membrane [1]</p>	[1]
	<p>(ii) cell is plasmolysed / cell membrane has pulled away from the cell wall. Allow incipient plasmolysis, not: cytoplasm has shrunk [1]</p> <p>(iii) cell wall is (fully) permeable; sucrose diffused/moved through to T; there must be the same (concentration) solution on both sides of the wall; [2]</p>	[1]
[Total 15 marks]		

Question	Answers/Explanatory Notes	Marks Available
6.	(a)	
	(i)	A competitive [1]
		B non competitive [1]
	(ii)	A [1]
	(b)	(i) 5°C kinetic energy is low / few collisions between the (active site) of the enzyme and the substrate; [1]
		Allow: ref. to increasing temp and kinetic energy i.e. assume 0 to 5° 70°C the hydrogen bonds are broken (as vibrations are strong) / <u>active</u> site of the enzyme is denatured/ fewer ES complexes formed due to denaturation. [1]
	(ii)	A. activity of immobilised enzyme is greater between 0°C and 40°C or at lower temperatures/ rate of reaction greater
		B. optimum temperature of IE covers a wider range / 40°C - 50°C
		C. above 40°C the free enzyme begins to denature whereas the IE starts to denature at 50°C
		D. IE is more active at all temperatures except 40°C
	E. free enzyme is (completely) denatured at 70°C IE is completely denatured at 80°C [3]	
	(any three)	
(iii)	The shape of the enzyme / 3-D structure is maintained or it is stabilised – molecular movement is 'reduced' (not: shielded/protected enzyme) [1]	
(iv)	Detection of blood sugar / testing blood sugar (in diabetics) Allow : lactose free milk/Clinistix qual (not: diabetics/ biosensor) [1]	
		[Total 10 marks]

Question	Answers/Explanatory Notes	Marks Available
7.	(a) (i) metaphase	[1]
	(ii) centromere	[1]
	(iii) pulls chromatids/chromosomes to opposite poles	[1]

(b)

Statement	Stage in cell cycle
Chromosomes shorten and thicken and spindle forms	Prophase
A period of intense activity which includes the replication of DNA	interphase
Formation of two nuclei	Telophase (not: cytokinesis)

[3]

(c)

Meiosis	Mitosis
1 two divisions	One division
2 four daughter cells	Two daughter cells
3 number of chromosomes is halved	Number of chromosomes remains the same
Daughter cells <u>genetically</u> different/variation	Daughter cells genetically identical/no variation
Crossing over	No crossing over
(Homologous chromosomes pair)	(Homologous chromosomes do not associate in pairs)

(any three, last 2 points not expected on new spec.) Matched statements required [3]

Question	Answers/Explanatory Notes	Marks Available
8. (a)	(i) A DNA is a polymer of many nucleotides / nucleotide chains / polynucleotide;	[1]
	B The nucleotide contain the (5-carbon sugar / pentose sugar) deoxyribose;	[1]
	C Attached to which is a base, either thymine, cytosine, adenine or guanine;	[1]
	D The base is either a purine or a pyrimidine;	[1]
	E T and C are pyrimidines, A and G are purines;	[1]
	F The nucleotides are linked in a chain by alternate phosphate / sugar links/sugar phosphate backbone;	[1]
	G One nucleotide can join to another by a condensation reaction;	[1]
	H DNA consists of two of these chains twisted helically / double helix	[1]
	I (Diagram showing) strands linked through correct A-T, G-C base pairings;	[1]
	J Complimentary bases linked by hydrogen bonds.	[1]
(Any 7 from A-J)		
(ii)	K DNA contains deoxyribose sugar and RNA contains ribose;	[1]
	L DNA contains thymine (base) and RNA contains uracil;	[1]
	M DNA the bases are paired, in RNA they are unpaired;	[1]
	N DNA is a double helix/stranded and RNA is single stranded;	[1]
	O DNA is longer than RNA;	[1]
(Any 3 comparative points from K-O)		
		[Total 10 marks]

Question	Answers/Explanatory Notes	Marks Available
8. (b)	A water is a polar molecule / dipolar / allows chemical reactions to take place in solution;	[1]
	B explanation of dipolar H +ve, O -ve (allows diagram);	[1]
	C explanation of hydrogen bonding;	[1]
	D water is an universal solvent / dissolves polar and ionic substances or examples (not: many substances dissolve in water);	[1]
	E since chemicals <u>dissolve</u> in water it acts as a transport medium in blood or phloem / xylem;	[1]
	F water molecules show cohesion qual. / tall columns of water can be drawn up xylem vessels in tall trees / reference to cohesion tension theory and transpiration/ surface tension-importance to living organisms e.g. walk on surface	[1]
	G gases such as O ₂ and CO ₂ dissolve in water, available for respiration / photosynthesis;	[1]
	H high latent heat of vaporisation;	[1]
	I explanation of importance, cooling body when sweating;	[1]
	J water has a high specific heat / large amount of heat energy is needed to raise the temperature of water / high thermal capacity;	[1]
	K explanation – heats up slowly and cools down slowly;	[1]
	L importance of this ability to maintain constant temperature / this prevents large fluctuations in the temperature of water / important in keeping the temperature of aquatic habitats stable / that organisms do not have to endure extremes of temperature;	[1]
	M water is transparent allowing light to pass through enabling aquatic plants to photosynthesise effectively;	[1]
	O Water in its solid form (ice) is less dense than water and so floats on the surface;	[1]
P Ice forms an insulating layer and allows organisms to survive beneath it / preventing further heat loss / hibernation in ponds	[1]	
Q Water is a reactant in photosynthesis / hydrolysis		

[Total 10 marks]



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