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WELSH JOINT EDUCATION COMMITTEE
CYD-BWYLLGOR ADDYSG CYMRU

General Certificate of Education
Advanced Subsidiary/Advanced

Tystysgrif Addysg Gyffredinol
Uwch Gyfrannol/Uwch

MARKING SCHEMES

SUMMER 2007

BIOLOGY

WJEC
CBAC

INTRODUCTION

The marking schemes which follow were those used by the WJEC for the Summer 2007 examination in GCE 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.

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

AS MODULE B11

Question	Answers/Explanatory Notes	Marks Available
1.	amylose; alpha/ α ; glycosidic; water/H ₂ O; beta/ β ; hydrogen/H; microfibrils;	[7]
2.	(a) D; F; C; G; H;	[5]
	(b) 60 30; (1) 2 4; (1)	[2]
	(c) production of haploid gametes; (not: half DNA/ half number of chromosomes) so diploid number regained (in zygote); allows variation; (not: genetically different) by crossing over/chiasmata formation; random assortment;	Max [3]
	Total	[10]

Question	Answers/Explanatory Notes	Marks Available
3.	(a)	
	(i) protein;	[1]
	(ii) correct part labelled/circled;	[1]
	(iii) <u>complementary</u> shape to glucose/ similar shape to substrate and active site; substrate/glucose will fit into/binds with (active site)/ enzyme; (not: competes) can form enzyme substrate complex; glucose can't fit anywhere else;	Max [2]
	(b)	
	<u>complementary/similar</u> shape to active site; (not: ref. to substrate) enters active site/ occupies active site; blocks active site; (not: competes/ joins active site) no glucose can enter; less/ no enzyme substrate complex formed/ fewer products formed; glucose not metabolised/no products formed/ metabolised more slowly; competitive inhibitor;	Max [4]
	(c)	
	ethanol acts as inhibitor; competitive; meths can't be converted to formaldehyde/converted more slowly; no/reduced toxic effects	Max [3]
Total		[11]

Question		Answers/Explanatory Notes			Marks Available		
4.	(a)	cell wall	✓	✓	X;	[6]	
		vacuole	X	✓	X;		
		nuc mem	X	✓	✓;		
		chloroplasts	X	✓	X;		
		mesosomes	✓	X	X;		
		mitochondria	X	✓	✓;		
	(b)	(i)	collection/number/many <u>similar</u> cells; working together/carrying out a function;			[2]	
		(ii)	yes because many cells; identical in structure; working together to move/raise forearm; no because other tissues/blood vessels/nerves/ connective tissue present; therefore is an organ;			Max [2]	
					Total	[10]	
5.	(a)	(i)	cytoplasm/rough endoplasmic reticulum;			[1]	
		(ii)	ribosome; protein; (not: amino acid) ribosomal/rRNA;			[3]	
		(iii)	transfer/tRNA; messenger/mRNA;			[2]	
		(b)	(i)	peptide bond formed; amine group linked to carboxyl group; molecule of water eliminated; condensation reaction; (points two and three can be shown on <u>labelled</u> diagram)			Max [3]
			(ii)	ATP/enzyme;			[1]
		(c)	(i)	mutation;			[1]
			(ii)	different base sequence/codon changes sequence of mRNA; incorrect/wrong/different amino acid presented; (changed amino acid sequence) leads to changed protein; changed function;			Max [2]
		(iii)	cystic fibrosis/sickle cell anaemia/haemophilia/hunting- tons; (not: cancer)			[1]	
					Total	[14]	

Question	Answers/Explanatory Notes	Marks Available
6.	<p>(a) DNA/ plasmid cut open; at certain base sequences; generating blunt/sticky ends; use of restriction (endonuclease)/ enzyme; which must be the same;</p> <p>(b) only those bacteria that take up the plasmid are resistant; those grow; others die;</p> <p>(c) produced in larger quantities/ faster rate; no allergic reactions; identical to human insulin; ethical reasons e.g. animal welfare/ religious reasons/ transfer of prions; (not: disease)</p>	<p>Max [4]</p> <p>Max [2]</p> <p>Max [2]</p>
Total		[8]
7.	<p>(a) A primary, secondary, tertiary and quaternary; B primary is number/ sequence of amino acids; C linked by peptide bonds; D secondary is alpha helix; E beta pleated sheet; F linked by hydrogen bonds; G fibrous protein; H tertiary is folding of chains; I-J disulphide bridges ionic bonds hydrophobic bonds; K between R groups; L forming specific/3D shape/globular; M named example/enzyme; N quaternary is linking of two or more polypeptide chains; O e.g. haemoglobin/chlorophyll;</p>	[10]

Question	Answers/Explanatory Notes	Marks Available
7. (b)	<p>A diffusion;</p> <p>B high to low concentration/<u>down</u> a conc. gradient;</p> <p>C passive process/no energy/ATP involved;</p> <p>D facilitated diffusion;</p> <p>E requires use of carrier/channel protein/molecule; (not: intrinsic)</p> <p>F osmosis</p> <p>G movement of water from high to low water potential; (not: water concentration)</p> <p>H active transport;</p> <p>I ATP dependent;</p> <p>J against/up a concentration gradient;</p> <p>K protein carriers in membrane required;</p> <p>L endo/exocytosis/bulk transport;</p> <p>M active/energy ATP dependent process;</p> <p>N pinocytosis liquid/phagocytosis solid;</p> <p>O involves breakage of membrane/invagination; (not: pinching off)</p>	[10]

AS MODULE B12

Question	Answers/Explanatory Notes	Marks Available	
1.	(a) Xylem		
	(b) Mass flow hypothesis		
	(c) Nitrates (not: nitrogen/formula)		
	(d) Counterflow/countercurrent		
	(e) Tissue fluid	Total 5	
2.	(a) (i) Potometer	1	
	(ii) (rate of) water uptake by the shoot/volume of water taken up	1	
	(iii) movement of bubble indicates volume of water (taken up by the shoot)	1	
	(b) (i)	cut shoot under water;	1
		keep leaves dry;	1
		set up apparatus under water/full of water	1
		make sure joints are airtight	Max. 2
	(ii)	to return bubble to zero/starting point	1
	(c)	use a fan at different air speeds for air currents;	
		allow plant to acclimatise;	
measure distance bubble moves;			
in a specific time;			
	Repeat and calculate means	Max 3	
		Total 9	

Question	Answers/Explanatory Notes	Marks Available
3.	(a)	
	A Nitrogen fixation	1
	B Decay/putrefaction/decomposition	1
	C Nitrification (Penalty if bacteria mentioned)	1
	(b)	
	<p>Stimulates plant growth/algal bloom;</p> <p>Which then die plus the reason (lack of light/nutrient depletion);</p> <p>Decomposition by bacteria;</p> <p>Which increase in number;</p> <p>O₂ level decreases because O₂ used by bacteria/higher BOD/respiration;</p> <p>Death of fish/invertebrates (in context of previous point)</p>	
		Max. 4
		Total 7

Question	Answers/Explanatory Notes	Marks Available
4.	(a)	
	(i)	
	Symmetrical and correct way up	1
	Labels correct using names in table	1
	Correct proportions	1
	(ii)	
	not all of organism eaten;	
	dead organisms not eaten;	
	loss of undigested material;	
	loss of CO ₂ /respiration/loss of heat;	
	Loss as urine/urea/excretion	Max. 2
	(b)	
	Dead organisms may not be collected/only living organisms collected;	
	Roots/part of organisms not collected;	
	Not representative areas samples;	
	Time of collection/seasonal variation;	
	Variable water content unless dried/dry biomass;	
	Animals may be at more than one trophic level.	Max. 2
	(c)	
	Reflected;	
	Light passes through leaf/does not get absorbed by a chloroplast;	
	Converted to heat energy;	
	Some <u>wavelengths</u> not absorbed by plant pigments/eq. (not: ref. to short wavelengths; not all hits the plant)	Max. 2
		Total 9

Question

Answers/Explanatory Notes

Marks Available

5.

	<i>Inspiration</i>	<i>Expiration</i>
<i>External intercostal Muscles</i>	Contracted	Relaxed
<i>Movement of ribcage</i>	Up and outwards	Down and inwards
<i>diaphragm</i>	Contracts (flattens)	Relaxes (dome shaped)
<i>Volume of thorax</i>	Increases/high	Decreases/less
<i>Pressure in thorax</i>	Decreases/less	Increases/high
<i>Direction of movement of air</i>	In (to lungs)	Out (of lungs)

One mark per row.

6

(b) (i) A – B

1

$$((400 \times 4) \times 3 =) 4,800 \text{ cm}^3$$

(ii) C – D

1

$$((1000 \times 10) \times 3 =) 30,000 \text{ cm}^3$$

No units = 1 mark only if both answers correct.

(c) Increases number of breaths per minute/unit time in Y.

1

Increased volume of each breath in Y

1

Any use of figures

1

e.g. Increase in breaths from 4 to 10 (in 20 secs)/eq in Y

Increase in volume from 400 to 1000cm³ in Y

5 secs per breath in X, 2 secs per breath in Y
(comparison required)

(d) Vol breathed in/out per breath would be less

Time taken for each breath would be longer

Max. 1

Total 12

Question	Answers/Explanatory Notes	Marks Available
6.	(a) (i) Days 25 – 30	1
	(a) (ii) Increase in/high predator numbers; Increased predation (by higher predator population) (not: ref. to carrying capacity)	1
	(b) (i) (Decrease due to lack of prey (not: food)	1
	(b) (ii) (Increase) due to lack of predators	1
	(c) (i) Add more predatory mites (at intervals)	1
	(c) (ii) Maintain Predator numbers or description (linked marks)	1
	(d) Specific (to one pest); Long term; Does not develop resistance; No environmental damage/ref. to insecticide damage/no bioaccumulation. (not: not using harmful chemicals)	Max. 1
		Total 7

Question	Answers/Explanatory Notes	Marks Available
7.	(a)	
	A Agranulocyte/lymphocyte/monocyte	1
	B Granulocyte/phagocyte/neutrophil	1
	For A and B if WBC's/Leucocytes ONE MARK ONLY	
	C Erythrocytes/Red corpuscles/red blood cells	1
	(b)	
	Bi concave disc increases SA: (Vol) for O ₂ uptake; (not: flattened)	
	No nucleus leaves more space for Hb;	
	Contains Hb which has an affinity for/combines with O ₂ ;	
	Flexible shape/elastic membrane allows cells to squeeze through capillaries.	Max. 2
	(c)	
	(i) As O ₂ pp decreases going into tissues more O ₂ is released/dissociated.	1
	(ii) HB fully saturated at relatively low pp	1
	(d)	
	(i) Curved line drawn to the RHS of human Hb	1
	(ii) Bohr (effect) (correct spelling)	1
	(e)	
	(i) Greater affinity for O ₂ (at lower pp)/more readily combines (not: ref to time/picks up)	1
	(ii) Low O ₂ conditions/pp O ₂	1
		Total 11

Question	Answers/Explanatory Notes	Marks Available
8. (a)	<p>A. Heart muscle is myogenic/contraction is initiated from within the muscle itself (not: heart)</p> <p>B. Initiated at the SAN/pacemaker.</p> <p>C. Wave of (<u>depolarisation/impulses/excitation</u>) pass over atria walls causing contraction of atria.</p> <p>D. Cannot pass to ventricles because of layer of (<u>non-conductive/insulative</u>) tissue/collagen fibres.</p> <p>E. (Right left) both atria contract simultaneously/eq.</p> <p>F. <u>Depolarisation/impulses</u> converges on/arrives at the AVN.</p> <p>G. Mention of delay.</p> <p>H. So that atria contract before ventricles.</p> <p>I. Depolarisation passes down septum walls.</p> <p>J. Through <u>Purkyne/Purkinje tissues/Bundles of His</u>.</p> <p>K. To apex of heart.</p> <p>L. Depolarisation passes upwards through ventricle walls/muscle.</p> <p>M. So heart contracts from apex upwards.</p> <p>N. So pushing blood into the <u>arteries/PA/Aorta</u>.</p> <p>O. Some mention of nervous supply to heart/mention of effect of adrenaline.</p>	

10 marks from the available 15


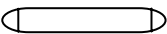
Question	Answers/Explanatory Notes	Marks Available
(b)	<ul style="list-style-type: none"> A. Pores in the leaf epidermis, bordered by guard cells B. Inner wall thicker than outer C. Presence of chloroplasts D. (Fully labelled) reasonable diagram E. GC change shape to allow opening and closing/labelled diagrams F. Allow gas exchange G. Control loss of water vapour from leaf H. Opening = K^+ pump actively transports K^+ ions into GC (not: ref. stomata) I. PS causes CO_2 levels to fall/pH rises J. and (enzyme catalyses) the conversion of starch to malate K. K^+ and malate ions/solutes accumulate in GC L. Ψ cell is lowered (i.e. ref water potential) M. Water flows (into GC) by osmosis/down WP gradient N. GC becomes turgid O. Inner walls move apart/pore opens (because outer walls are thinner than inner) 	<u>10 marks</u> from the available 15
(Max. 9 if no diagram)		

AS MODULE BI4

Question	Answers/Explanatory Notes	Marks Available
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1. (a) suitable temp; suitable pH; nutrient source; water; oxygen (not: warmth/air)
Any **three** of above [1]

(b)

Shape of Cells - drawn	Name of Group
round 	Coccus/cocci
rod 	Bacillus/bacilli

1 mark per column but must match horizontally.

(c) (i) Gram (stain) [1]

(ii)

Cell	Colour after staining	Positive or negative
A	violet	positive
B	pink	negative

Correct colours [1]
Correct groups [1]

(iii) Protein [1]
Lipopolysaccharide [1]

Total marks [8]

Question	Answers/Explanatory Notes	Marks Available
-----------------	----------------------------------	------------------------

- | | | | | |
|----|-----|------|---|-----|
| 2. | (a) | (i) | 1. ingestion 2. digestion
3. absorption 4. egestion
4 correct
3 correct - 1 mark | [2] |
| | | (ii) | The breakdown of large, insoluble molecules into small soluble ones | [1] |

(b)

Enzyme	Substrate	Products	Site of secretion
pepsin	<u>protein/ polypeptide</u>	peptides	<u>stomach/ gastric pits</u>
peptidases	peptides	<u>amino acids</u>	<u>Pancreas/ small intestine</u>
<u>lipase</u>	lipids	fatty acids and glycerol	<u>pancreas</u>
(salivary) <u>amylase</u>	<u>starch/amylose</u>	maltose	salivary gland

1 mark for each correct row [4]

- | | | | |
|-----|-------|--|-----|
| (c) | (i) | Drawing showing brush border labelled | [1] |
| | | Drawing showing goblet labelled | [1] |
| | (ii) | Correct function of brush border cell | [1] |
| | | Correct function of goblet cell | [1] |
| | (iii) | Microvilli/brush border-large surface area/mitochondria-for active transport/'goblet' to store mucus/any feature of secretion, e.g. vesicles | [1] |

Total marks [12]

Question	Answers/Explanatory Notes	Marks Available	
3.	(a) (i) Chlorophyll a; chlorophyll b; xanthophyll, carotene, carotenoid Any three of above	[1]	
	(ii) Allows light of different wavelengths to be absorbed	[1]	
	(b) (i) Rate of photosynthesis; at different wavelengths	[1] [1]	
	(ii) Axis correctly labelled, - rate of photosynthesis Line drawn to show peaks that coincide	[1] [1]	
	(iii) The wavelengths of light most absorbed are the wavelengths used in the biochemical reactions owtte.	[1]	
	(c) (i) photosystems	[1]	
	(ii) photolysis	[1]	
	(iii) X - NADP Y - water Z - oxygen	[1] [1] [1]	
	(iv) p - electrons q - protons	[1] [1]	
	(v) Accepting or donating electrons	[1]	
	(vi) $XH_2/NADPH_2$	[1]	
	(vii) Source of reducing power/to reduce CO_2 /adding hydrogen to PGA (to form GALP).	[1]	
	Total marks		[17]

Question	Answers/Explanatory Notes	Marks Available	
4.	(a) (i) ATP/adenosine triphosphate	[1]	
	(ii) Purine base correctly circled on diagram	[1]	
	(iii) ADP/adenosine diphosphate AND phosphate	[1]	
	(iv) It occurs in all cells/ all organisms/ all metabolic reactions	[1]	
	(b) (i) A - intermembrane space B - matrix		[1]
			[1]
		(ii) Glycolysis/Link reaction/Kreb's cycle Any two - 1 mark each	[1] [1]
		(iii) P - pump protons from matrix into intermembrane space/ref. active transport C - carry electrons (from pump to pump)/ electron transport	[1] [1]
		(iv) Provide energy for pumps	[1]
		(v) ATP synthetase/synthase (accept ATP ase) (not: stalked particles)	[1]
	(vi) converts ADP(+Pi) to ATP; Using energy from protons moving down (electrochemical) gradient chemiosmosis qualified	[1] [1]	
	Total Marks		[14]
	5.	(a) (i) I - humoral II - cell mediated	[1] [1]
		(ii) X - B lymphocyte/cell Y - T lymphocyte/cell	[1] [1]
(iii) Bone marrow		[1]	
(iv) Memory cell Proliferate/produce antibodies (immediately) on next contact with the specific antigen/ pathogen		[1] [1]	
(v) Helper (cell), killer (cell), suppressor (cell), memory (cell) Any 3 of above for 2 marks (2 for 1 mark) (not: abbreviations)		[2]	
(vi) Stimulate production of B cells/cytotoxicity/Switch off cell mediated response at end of immune response/proliferate on next contact/ destroy pathogens by lysis		[1]	

Question	Answers/Explanatory Notes	Marks Available
(b)	(i) T cells/lymphocytes multiply in response to presence of virus/ antigen/ part of primary response (not: primary response unequal)	[1]
	(ii) Virus particles are inside T cells/T cells destroy virus particles (not: ref. to antibodies)	[1]
	(iii) They do not have enough T cells to defend against pathogens. owtte (not: immune system weakened)	[1]
(c)	The antibodies raised in the immunisation will also attack human cells/ cell membranes.	[1]
Total marks		[14]

Question	Answers/Explanatory Notes	Marks Available
6. (a)	A. All materials are added at start/not during the process;	[1]
	B. Sterile apparatus;	[1]
	C. Pure (culture) of <i>Penicillium (notatum)</i> ;	[1]
	D. Sterile nutrient medium;	[1]
	E. Aeration method/oxygen for respiration;	[1]
	F. pH adjustment/buffer;	[1]
	G. Filters for introduction of sterile air/oxygen;	[1]
	H. Method of mixing qualified;	[1]
	I. Water jacket to control temperature/qualified;	[1]
	J. Allow growth phase to take place/Glucose is depleted during growth phase;	[1]
	K. Penicillin is secondary metabolite;	[1]
	L. Penicillin is produced/harvest after growth phase/ during stationary phase/ after nutrient depletion;	[1]
	M. Filter culture fluid/ separate fungus;	[1]
	N. Purify filtrate/chemically modify antibiotic;	[1]
	O. AVP e.g. penicillin production in nature possibly to reduce competition/ comparison with continuous culture.	[1]

Maximum 10 from 15 available.

(b)	A. Parasite in salivary gland of mosquito/ ref. to saliva;	[1]
	B. Passes into blood stream when mosquito bites;	[1]
	C. Invades liver cells;	[1]
	D. Invades red blood cells;	[1]
	E. Taken in when mosquito feeds;	[1]
	F. Passes to salivary gland of mosquito;	[1]
	G. Prevent adult biting;	[1]
	H. Nets/clothing/repellants;	[1]
	I. Control mosquito population;	[1]
	J. Insecticide qualified/DDT to kill adults or larvae;	[1]
	K. Drain/cover standing water to prevent egg laying/larvae developing;	[1]
	L. Spray oil/detergent on water to drown larvae;	[1]
	M. Fish to eat/bacteria to infect larvae/biological control;	[1]
	N. Sterilisation/infertile males to prevent reproduction;	[1]
	O. Correct reference to difficulty of treating/vaccinating in order to reduce pool of infected humans/ ref. to prophylaxis	[1]

Maximum 10 from 15 available.

Total marks [10]

AS MODULE B15

Question	Answers/Explanatory Notes	Marks Available														
1.	<p>(a)</p> <p>(i) A = Petals accept Corolla</p> <p style="padding-left: 20px;">B = Stigma</p> <p style="padding-left: 20px;">C = Anther (not : pollen/stamen)</p> <p style="padding-left: 20px;">D = Sepals accept calyx (not : bract)</p> <p style="padding-left: 20px;">E = Ovary (not : carpel/ovule)</p> <p>(ii) <u>Large</u> petals; Stamens/anther/stigma inside flower; (not : high stigma) carpel inside flower; nectary;</p>	<p>[5]</p> <p>[Max 2]</p>														
(b)	<p>(i) (Growth) organised/controlled by tube nucleus; Enzymes released; Digest path/tissue; Nutrients/products absorbed and used for growth; Positively chemotropic/negatively aerotropic</p> <p>(ii) Micropyle</p> <p>(iii) 1 mark for each. Acc. Letter or name pre or post fertilisation.</p>	<p>[Max 3]</p> <p>[1]</p> <p>[4]</p>														
Total 15																
2.	<p>(a)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="padding: 2px;">Kingdom</td> <td style="padding: 2px;">Animalia</td> </tr> <tr> <td style="padding: 2px;">Phylum</td> <td style="padding: 2px;"><i>Chordata</i></td> </tr> <tr> <td style="padding: 2px;">Class</td> <td style="padding: 2px;"><i>Mammalia</i></td> </tr> <tr> <td style="padding: 2px;"><i>order</i></td> <td style="padding: 2px;">Carnivora</td> </tr> <tr> <td style="padding: 2px;"><i>family</i></td> <td style="padding: 2px;">Felidae</td> </tr> <tr> <td style="padding: 2px;">Genus</td> <td style="padding: 2px;"><i>Panthera</i></td> </tr> <tr> <td style="padding: 2px;">Species</td> <td style="padding: 2px;"><i>tigris</i></td> </tr> </tbody> </table>	Kingdom	Animalia	Phylum	<i>Chordata</i>	Class	<i>Mammalia</i>	<i>order</i>	Carnivora	<i>family</i>	Felidae	Genus	<i>Panthera</i>	Species	<i>tigris</i>	
Kingdom	Animalia															
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<i>order</i>	Carnivora															
<i>family</i>	Felidae															
Genus	<i>Panthera</i>															
Species	<i>tigris</i>															
(b)	<p>More closely related, fewer number of differences / high number of shared genes. ora (comparison needed)</p>	<p>[1]</p> <p>(Total 7)</p>														

Question	Answers/Explanatory Notes	Marks Available
3. (a)	<p><i>Long haired brown</i> <i>short haired black</i></p> <p>hhbb HHBB [2]</p> <p>(not : if gap or colon etc between letter pairs) [1]</p> <p>hb HB [1]</p> <p>F1 HhBb [1]</p> <p>F1 Short hair Black</p> <p>(no error carried forward)</p>	
(b)	<p>HB. Hb. hB. hb [1]</p> <p>Short haired Black HHBB; HHBb; HhBB; HhBb</p> <p>Short haired Brown bbHH; bbHh;</p> <p>Long haired Black. BBhh; Bbhh</p> <p>Long haired Brown bbhh [8]</p>	
(Total 14)		
4. (a)	<p>1 mark each correct label and position of cell body [3]</p> <p>Sensory: into dorsal root with ganglion in grey matter. Relay: in grey matter with cell body in grey matter Motor: cell body in grey matter, out of ventral root on same side as sensory.</p>	
(b)	<p>White matter (axons and dendrons) myelin sheath/no cell bodies [1]</p> <p>Accept ora grey matter, cell bodies no myelin sheath</p>	
(c)	<p>Synaptic vesicles/receptor sites only on presynaptic/one side of synapse; [2]</p> <p>Explanation of refractory period qualified;</p>	
(d)	<p>(a) Slow it down;</p> <p>(b) Depolarisation / action potential at the node (not : impulse);</p> <p>(c) from one node (of Ranvier) to next (called Saltatory conduction);</p> <p>(d) Because sodium and potassium ions cannot pass across myelin sheath;</p> <p>(e) No myelin sheath local circuit conduction;</p>	[Max 4]
(Total 10)		

Question	Answers/Explanatory Notes	Marks Available
5. (a)	<p>A Definition of species;</p> <p>B Preventing allele / gene flow / interbreeding;</p> <p>C (Differences arise because) mutation (random);</p> <p>D Selection pressures are different or described;</p> <p>E Geographical/allopatric qual;</p> <p>F Behavioural qual;</p> <p>G morphological/mechanical qual;</p> <p>H sympatric qual/seasonal isolation;</p> <p>I Hybrid sterility;</p> <p>J Fittest survive; (term needed)</p> <p>K Pass on favourable alleles; (not : genes)</p> <p>L Natural selection; (term needed)</p> <p>M e.g. Galapagos finches;</p> <p>N No competition for available niches;</p> <p>O Adaptive radiation (term needed in context)</p> <p>P AVP. e.g. ref Genetic drift, founder principle explained</p>	Max 10

Question	Answers/Explanatory Notes	Marks Available
(b)	A Ref. points B - G in proximal convoluted tubule. If two of following used in context;	
	B Water absorbed by Osmosis;	
	C Glucose absorbed by cotransport accept ATP required / active transport;	
	D Some substances absorbed by diffusion, e.g. Vit A D K E chloride ions; (example needed)	
	E Selective reabsorption / selective absorption;	
	F Water potential of filtrate decreases (not : ref. to surrounding tissue);	
	G Pressure drops;	
	H Ref. to points I - M in (Descending) loop of Henle if two used in context;	
	I Na^+ levels up/water moves out (by osmosis if not above); (not : salt)	
	J Water potential down;	
	K Ascending loop Na^+ out / chloride out/walls impermeable to water;	
	L Water potential up;	
	M Ref counter current;	
	N ADH acts on collecting duct/distal convoluted tubule;	
	O so water absorbed explained/because of increased permeability;	
	P AVP e.g. ref urea out from PCT or from collecting duct to lower WP/Ref. secretion creatinine, penicillin into PCT/aquaporins.	

Question	Answers/Explanatory Notes	Marks Available
6.	(a) (i) RNA / nucleotides; (not : tRNA/rRNA)	[1]
	(ii) Active site	[1]
	(iii) Secondary/alpha Helix (not : coil/spiral)	[1]
	Tertiary 3 dimensional folding accept globular	[1]
	(not : ref. S-S bridges etc/more than one 3D structure i.e. quaternary)	
	(b) (i) Reverse transcriptase uses RNA as a template (1) to make DNA (1)	[2]
	(ii) Different amino acid (sequence) made; Different (viral) protein will be made; (Viral) Protein is an antigen Antigen changes; Antibodies are specific/do not recognise new antigen;	[3]
	(c) (i) Attaches to enzyme; Not at active site / at allosteric site; Changes shape of active site; (not : damages/ref. to enzyme) substrate can no longer fit/no enzyme substrate complex formed;	[3]
	(d) (i) By removal of water; Condensation (reaction);	[2]
	(ii) Modified nucleotide does not have an OH group/has N ₃ group instead; Phosphate group of another nucleotide cannot join to it/cannot undergo condensation reaction.	[2]
(e) (i) Protease / peptidase. (not : hydrolase/specific name e.g. pepsin)	[1]	
(ii) Ligase	[1]	
(f) Guanine 10% Cytosine 40% Adenine 30% Thymine 20%		
1 mark correct % column		
1 mark correct base pairing column	[2]	

Question	Answers/Explanatory Notes	Marks Available
7. (a)	(i) Converted into a form which is useable by living organisms.	[1]
	(ii) Nitrogen fixing bacteria or example Industrial fixation / Haber process / Electrical storms; Any two for 1 mark. (not : root nodules)	[2]
	(iii) Denitrifying bacteria convert nitrates into atmospheric nitrogen/less nitrates in water logged soils/plants don't rely on soil nitrates; Insectivorous plants digest protein and absorb amino acids use nitrogen from these accept ref DNA;	[1]
(b)	(i) Carry out chemical reaction / named;	[1]
	(ii) Electron transfer chain / cytochromes/electron carriers; (not : ETC/photosystems)	[1]
	(iii) Used to pump protons; Into (bacterial cell) wall; Creates proton gradient / proton motive force/ electrochemical gradient / pH Gradient / high concentration protons in wall	[2 Max]
	(iv) Protons move down gradient (into cytoplasm); Through stalked particles, proteins/protein channels; Causes ATP synthetase / synthase; To produce ATP from ADP and iP/phosphorylation of ADP;	[Max 3]
(c)	Hydrogen from reduced NAD; is used to reduce carbon dioxide/donate to glycerate 3 phosphate; using energy from ATP; to make glucose/triose phosphate; (not : sugar)	[Max 3]

Welsh Joint Education Committee
245 Western Avenue
Cardiff. CF5 2YX
Tel. No. 029 2026 5000
Fax. 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk/exams.html

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