

GCE BIOLOGY - BY4

Question		Marking details	Marks Available
1	(a)	effectors /{carry out/ bring about} the response/ react to a stimulus;	1
	(b)	only have a nerve net /no CNS / (nerve fibres) non-myelinated/ branching neurons/ narrower axons; NOT shorter neurons/ no reflex arc	1
	(c)	phytochrome;	1
		Question 1 total	[3]

Question		Marking details	Marks Available
2	(a)	axes correctly assigned with correct labels; appropriate linear scales; all points correctly plotted and joined with a curve or ruled straight lines; (tolerance ½ small square)	3
	(b)	birth rate must be greater because {population rose/ sensible explanation};	1
	(c)	(i) Any two from nesting / roosting sites (in oakwoods)/ space in habitat; NOT habitat destruction/ shelter source of food/ number of prey; mates; parasites / disease ;	2
	(ii)	Extreme climate/ severe weather / harsh winter /drought/ wind farms/fires/shooting/poisoning/pesticides/egg collecting/ habitat destruction/ deforestation/ flooding/ new top predator;	1
		Question 2 total	[7]

Question			Marking details	Marks Available
3	(a)	(i)	A;	1
		(ii)	A <u>and</u> D;	1
		(iii)	C;	1
	(b)	(i)	{RuBP/ 5C compound} and carbon dioxide linked together / carbon dioxide is fixed with RuBP; RuBP carboxylase / RUBISCO {is the enzyme / catalyses the reaction}; unstable 6C {substance/compound} {initially formed/ splits into two 3C};	2 max
		(ii)	Glycerate 3 phosphate reduced; using reduced NADP; ATP also required (to supply energy) / Glycerate 3 phosphate is phosphorylated; {reduced NADP / ATP} from the light dependent reactions;	3 max
	(c)	(i)	some (triose phosphate) needed to {regenerate/ make more} RuBP;	1
		(ii)	six times;	1
Question 3 Total			[10]	

Question		Marking details	Marks Available
4	(a)	(improves) aeration / ensures all parts of the culture receive oxygen; helps to mix the contents / prevent {sedimentation/ clumping}; improves contact with nutrients;	2
	(b)	(i) Monitor pH; used to determine whether acid or alkali must be added; to maintain optimal pH/ pH required for growth;	2
		(ii) carbon dioxide;	1
		(iii) heat needed at the start to speed up {enzyme reactions/ growth/ metabolic rate}; removal of heat produced by respiration/ more microbes at the end so more respiration/heat ;	2
	(c)	competition for nutrients/ oxygen; NOT food lower yield; toxic products; contamination of <u>product</u> ;	2
		Question 4 Total	[9]

Question		Marking details	Marks Available
5	(a)	(i) phosphate / Pi / inorganic phosphate/ iP/ PO_4^{3-} ;	1
		(ii) W is outer (mitochondrial) membrane; Z is the (mitochondrial) matrix;	2
		(iii) most concentrated in part X;	1
	(b)	(reduced NAD) supplies protons; and brings (high energy) electrons; electrons {supply energy for proton pumping/ fuels proton pumps};	2
	(c)	(i) P = ADP/ ADP + Pi } Q = ATP }	1
		(ii) cytoplasm/ cytosol;	1
		(iii) glucose is phosphorylated by ATP; two phosphorylations / production of hexose/fructose (bi)phosphate; hexose (bi)phosphate is <u>split</u> (from 6C to two 3C);	3
	(d)	(i) allows reduced NAD to be converted back to NAD/ regenerate reduced NAD/ without oxygen reduced NAD not converted to NAD by {electron transport chain/ krebs/ link reaction}; allowing ATP production/ without oxygen no ATP production by oxidative phosphorylation; allows {glycolysis/ substrate level phosphorylation} to continue/ ORA; No O_2 to act as the final {hydrogen/ electron} acceptor/ NADH {must find an alternative hydrogen acceptor/ must use pyruvate};	3
(ii) Only glycolysis required/ shorter metabolic pathways; oxygen supply too slow/ no need for oxygen {supply/diffusion}; no need to carry out Krebs cycle/ electron transport / oxidative phosphorylation; no need to build up a proton gradient; no need to transport pyruvate into the mitochondrion;		Max 1	
Question 5 Total			[15]

Question		Marking details	Marks Available	
6	(a)	X is the node of <u>Ranvier</u> ; Y is axon /axoplasm;	2	
	(b)	Schwann (cell);	1	
	(c)	-60 <u>mV</u> ;	1	
	(d)	(i)	(voltage-gated) sodium channels open/ increase in sodium ion permeability; {sodium ions / Na ⁺ } {diffuse/ flood/ rush/ sudden influx} <u>in</u> ;	2
		(ii)	repolarisation;	1
	(e)	resting potential is lower / more negative in {B/ the cardiac muscle fibre}/ ORA; slower repolarisation / time taken to get back to resting potential is longer in {B/ the cardiac muscle fibre}/ ORA; higher peak of depolarisation /more positive potential reached in {A/ neurone}/ ORA; {no hyperpolarisation/ refractory period/ undershoot} in Trace B;	2 max	
	(f)	contraction; NOT contract faster	1	
	(g)	Frog has right to life / {suffering/ pain/ distress/ harm} of frog / frogs scarce in the wild; NOT cruel benefits to <u>medicine/ health of heart</u> research;	2	
		Question 6 Total	[12]	

Question		Marking details	Marks Available
7	(a)	renal artery;	1
	(b)	many {pores/ gaps} in the {capillary wall/endothelium / fenestrated wall}; basement membrane with {pores / molecular sieve} (through which large molecules cannot pass); efferent arteriole has {smaller <u>diameter</u> / narrower <u>lumen</u> } than afferent;	2 max
	(c)	(all) glucose (selectively) reabsorbed; (reabsorption) in the proximal convoluted tubule; (reabsorption) by active transport;	2 max
	(d)	(i) <ul style="list-style-type: none"> A. water {reabsorbed from filtrate/removed from filtrate}; B. less urea reabsorbed / urea not reabsorbed; C. {sodium / mineral ions} reabsorbed in proximal convoluted tubule; D. therefore water reabsorbed by osmosis in proximal convoluted tubule; E. {active transport/ pumping} of Na⁺ ions in the ascending limb of the loop of Henle; F. water reabsorbed from filtrate in the descending limb of loop of Henle/ descending limb is permeable to water/ ascending limb impermeable; G. hypertonic conditions /high solute concentrations in the medulla/ lowering water potential of medulla/ correct description of concentration gradient towards apex of loop; H. therefore water reabsorbed in the collecting duct/distal convoluted tubule; 	5 max
		(ii) less water lost (in urine)/ conserves water; reduces risk of dehydration; useful in dry habitats/ adaptation to terrestrial life;	2 max
(e)	ADH /anti diuretic hormone; {increases reabsorption of water/ increases permeability of collecting duct to water / opens more aquaporins} <u>so increases ion concentration</u> ;	2	
Question 7 Total			[14]

Question		Marking details	Marks Available
8	(a)	<p>A absorption of light {in photosystems/by pigments};</p> <p>B energy transferred to reaction centre of photosystem /antenna complex;</p> <p>C (a molecule of) chlorophyll a is the reaction centre;</p> <p>D electrons excited / electrons {raised to higher energy level / emitted}/ high energy electrons produced;</p> <p>E {high energy / excited} electrons passed to electron acceptor/ first carrier in chain};</p> <p>F electrons (from Photosystem II) pass along {a chain of electron carriers/ electron transport chain};</p> <p>G energy from electrons used to pump protons;</p> <p>H higher concentration of protons <u>inside thylakoid</u> (than in the stroma)/ concentration gradient of protons from thylakoid to stroma;</p> <p>I used to produce ATP;</p> <p>J Photosystem I receives electrons from{ the chain of carriers / from Photosystem II};</p> <p>K Electrons {used to reduce NADP /to produce reduced NADP};</p> <p>L photolysis of water provides electrons to replace those lost by Photosystem II;</p> <p>M oxygen produced {by photolysis /by splitting of water};</p> <p>N cyclic photophosphorylation only involves Photosystem I/ non cyclic involves both photosystems;</p> <p>O light dependent reactions take place {in thylakoid (membranes)/ in (membranes of) grana};</p> <p>[Marks can be awarded for points made using an annotated diagram]</p>	

Question	Marking details	Marks Available
	<p>(b) <i>Nitrogen cycle</i></p> <p>A death of plant / shedding of {leaf/other part of plant};</p> <p>B consumers feed on plant material then {die / excrete /defecate/ egest};</p> <p>C putrefaction due to bacteria/ decomposition due to{ fungi/ bacteria};</p> <p>D digestion of protein to amino acids;</p> <p>E deamination of amino acids/ ammonification;</p> <p>F nitrification is conversion of {ammonia/ ammonium} to nitrate;</p> <p>G <i>Nitrosomonas</i> convert {ammonia/ ammonium} to nitrite;</p> <p>H <i>Nitrobacter</i> convert nitrite to nitrate;</p> <p>I plants absorb nitrate from the soil;</p> <p><i>Roles of nitrogen in metabolism</i></p> <p>J in amine/ amino group;</p> <p>K needed to make amino acids / proteins;</p> <p>L part of (organic) bases ;</p> <p>M needed to make DNA / RNA / nucleic acids/ nucleotides;</p> <p>N part of chlorophyll;</p> <p>O part of NADP/ ATP;</p> <p>Question 8 Total</p>	<p>[10]</p>