

Question	Marking Guidelines	Mark	Comments																
1(a)	<table border="1"> <thead> <tr> <th></th><th>Glycolysis</th><th>Link reaction</th><th>Krebs Cycle</th></tr> </thead> <tbody> <tr> <td>Occurs in mitochondria</td><td></td><td>✓</td><td>✓</td></tr> <tr> <td>Carbon dioxide produced</td><td></td><td>✓</td><td>✓</td></tr> <tr> <td>NAD is reduced</td><td>✓</td><td>✓</td><td>✓</td></tr> </tbody> </table> <p>Mark horizontally</p>		Glycolysis	Link reaction	Krebs Cycle	Occurs in mitochondria		✓	✓	Carbon dioxide produced		✓	✓	NAD is reduced	✓	✓	✓	3	
	Glycolysis	Link reaction	Krebs Cycle																
Occurs in mitochondria		✓	✓																
Carbon dioxide produced		✓	✓																
NAD is reduced	✓	✓	✓																
(b)(i)	<ol style="list-style-type: none"> Glucose is used/broken down during glycolysis/in cytoplasm; Glucose cannot cross mitochondrial <u>membrane(s)</u> / pyruvate can cross mitochondrial <u>membrane(s)</u>; 	2	1 Accept: glucose to pyruvate or glucose not converted to pyruvate for one mark																
(b)(ii)	<ol style="list-style-type: none"> Is a competitive inhibitor / attaches to active site; Reduces/prevents enzyme-substrate/E-S complex forming; 	2	<ol style="list-style-type: none"> Accept: inhibitor/malonate attaches to active site to form an enzyme-substrate complex Accept: substrate/succinate cannot bind to enzyme Accept mark point 2, but not mp1 in context of non-competitive inhibition 																
(b)(iii)	<ol style="list-style-type: none"> Krebs cycle inhibited; NAD/Coenzyme/FAD not/less reduced; Hydrogens not passed to ETC; Oxygen used as final/terminal (electron) acceptor; 	2 max	<p>4 Accept: oxygen combines with electrons <u>and</u> protons/hydrogen ions without reference to final acceptor</p> <p>Neutral: oxygen is used in the Krebs cycle</p>																

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2(a)(i)	So it/CO ₂ is not a <u>limiting</u> factor (on growth/photosynthesis);	1	Accept: CO ₂ is a <u>limiting</u> factor
(a)(ii)	So any difference is due to <u>iron</u> (deficiency);	1	Accept: <u>iron</u> is the variable
(a)(iii)	Amount of triose phosphate/TP will be similar/same/low (at start);	1	Accept: to allow triose phosphate to stabilise / become constant Reject: so all triose phosphate is used up Reject: so no triose phosphate
(b)	<ol style="list-style-type: none"> (Less) ATP produced; (Less) reduced NADP produced; ATP/reduced NADP produced during light-dependent reaction; (Less) GP to triose phosphate/TP; 	4	Accept: alternatives for reduced NADP ie NADP with hydrogen/s attached
(c)	<ol style="list-style-type: none"> Less triose phosphate converted to RuBP; CO₂ combines with RuBP; 	2	Accept: less triose phosphate so less RuBP

Question	Marking Guidance	Mark	Comments
3(a)	Complementary to / fits / binds to <u>active site</u> ; Competitive / competes / 'prevents' enzyme-substrate complexes / 'prevents' urea attaching;	2	Max one mark if candidate suggests that active site/enzyme is damaged destroyed or useless. Allow inhibitor 'prevents' or 'stops' urea/substrate attaching unless candidate clearly indicates this is permanent. Ignore reference to inhibitor forming an enzyme/substrate complex.
3(b)(i)	Reduces loss of ammonia up to <u>day8/9</u> ;	1	
3(b)(ii)	Increase in urease / temperature; More enzyme-substrate complexes; More bacteria;	2max	
3(c)	Less urea/ammonia lost (from soil) / less urea broken down; Urea/ammonia converted to nitrite/nitrate; Used to produce protein / amino acids / DNA / bases / nucleotides;	3	Reference to incorrect bacteria (e.g. denitrifying) producing nitrite/nitrate negates second marking point.

Question	Marking Guidance	Mark	Comments
4(a)(i)	Decrease in spadefoot toad; Decrease in southern toad up to 4 newts per pond, then increase (at 8 newts per pond);	2	Allow one mark for answers stating decrease in both toad species;
4(a)(ii)	Predators/newts eat/feed/prey on toad (tadpoles); Less competition more food/resources / fewer toads feeding on frogs;	2	Allow first mark if reference is made to either toad species being eaten. For first mark candidate must clearly indicate that the newts are feeding on the toads. Answers simply stating that newts are increasing and toads are decreasing are not sufficient.
4(b)	Fewer toads/tadpoles (as number of predators increases in Figure 1); More food, so are larger / grow more / increase in mass;	2	If candidate clearly indicates fewer frog tadpoles survive, negate the first marking point. However, accept decrease in overall number of tadpoles which may include frog tadpoles.

Question	Marking Guidance	Mark	Comments
5(a)(i)	Temperature and light;	1	
5(a)(ii)	Increase in temperature causes increase in rate of photosynthesis / uptake of carbon dioxide; Increase in light/ more/medium/high light (intensity) causes increase in rate of photosynthesis / uptake of carbon dioxide;	2	
5(b)	2.75 - 2.81 (mg g ⁻¹ hr ⁻¹)	1	Accept answers in range 2.75 - 2.81;
5(c)	1. Growth will decrease (at higher temperature); 2. Rate of respiration will increase at higher temperature; 3. Photosynthesis decreases as limited by light/ as there is less light;	3	Ignore references to effect of temperature on rate of photosynthesis;

Question	Marking Guidance	Mark	Comments
6(a)(i)	1. Oxygen taken up/used (by woodlouse); 2. Carbon dioxide (given out) is absorbed by solution/potassium hydroxide; 3. Decrease/change in pressure;	3	Reference to vacuum negates last marking point; Reject reference to pressure increasing inside tube.
6(a)(ii)	1. Distance (drop moves) and time; 2. Mass of woodlouse; 3. Diameter/radius/bore of tubing/lumen / cross-sectional area;	3	If answer refers to measuring volume using the syringe allow 2 max – one mark for measuring volume; one mark for mass of woodlouse;
6(b)	1. Less/no proton/ H^+ movement so less/no ATP produced; 2. Heat released from electron transport/redox reactions / / energy not used to produce ATP is released as heat; 3. Oxygen used as final electron acceptor/combines with electrons (and protons);	3	

Question	Marking Guidelines	Mark	Comments
7(a)	<p>(Biological Agents)</p> <ol style="list-style-type: none"> Only needs one application/ reproduces; Specific; Keeps/maintains low population; Pests do not develop resistance; Can use less chemicals / reduces chemical residues / no bioaccumulation; <p>(Chemical pesticides)</p> <ol style="list-style-type: none"> Acts quickly; Can apply to specific area; Kills all/most/greater variety of pests; 	6 max	<p>Assume advantages are in context of correct type of control (chemical or biological) unless stated otherwise</p> <p>4. Reject reference to immunity</p>
(b)	<ol style="list-style-type: none"> Growth of algae/surface plants/algal bloom blocks light; Reduced/no photosynthesis so (submerged) plants die; <u>Saprobiotic</u> (microorganisms/bacteria); Aerobically respire / use oxygen in respiration; Less oxygen for fish to respire / aerobic organisms die; 	5	<p>3. Accept: Saprobiont/saprophyte/ saprotroph</p> <p>3. Neutral: decomposer</p>

(c)	<ol style="list-style-type: none"> 1. Slaughtered when still growing/before maturity/while young so more energy transferred to biomass/tissue; 2. Fed on concentrate /controlled diet / so higher proportion of food absorbed/digested/assimilated / used for biomass/tissue / lower proportion lost in faeces; 3. Movement restricted so less heat/energy/respiratory loss; 4. Heating/Kept warm/ inside so less heat/energy/respiratory loss/maintain body temperature; 5. Genetically selected / selective breeding (for high productivity); 	4 max	<p>Q 1-4 The principle here is one mark for identifying a relevant point <u>and</u> offering an explanation</p> <ol style="list-style-type: none"> 2. Accept: named diets for controlled diet, eg high protein diet 2. Neutral: loss in excretion 2. Neutral: for growth <p>Neutral: reference to predators</p>
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