

Question number	Answer	Marks	Guidance
1 (a)	e.g. Protein synthesis; mitosis;	2	
1 (b)	ADP required to synthesis ATP; ADP not supplied from cytoplasm;	2	
1 (c) (i)	Protein;	1	
1 (c) (ii)	Complete set of DNA; of an organism;	2	
1 (c) (iii)	Reduced energy demand; growth / development, no longer occurring;	2	
1 (d)	Electron transport, stopped / reduced; no / fewer, proteins pumped; less ATP synthesised;	2	
1 (e) (i)	Protons are charged; hydrophobic core / described; barrier to ions; channel protein provides hydrophilic channel; carrier protein moves protons across using energy;	4 max	
1 (e) (ii)	Facilitated diffusion of protons; reduces proton gradient; no / less, ATP synthesised; reference to uncoupling;	3 max	
1 (f)	Glycolysis; detail; Link reaction; detail; substrate level phosphorylation;	5	
1 (g)	Rate of basal respiration = rate of overall respiration (initial) – rate of non-mitochondrial respiration; rate of ATP linked respiration = rate of basal respiration – (rate of proton leak respiration + rate of non-mitochondrial respiration); rate of proton leak respiration = rate of overall respiration (after oligomycin) – rate of non-mitochondrial respiration; maximal respiratory capacity = rate of overall respiration (after FCCP) – rate of non-mitochondrial respiration; mitochondrial reserve capacity = maximal respiratory capacity – rate of basal respiration;	5	
1 (h)	ATP-linked respiration; they have the same effect as oligomycin;	2	
2 (a) (i)	Respiration stopped; no more ATP synthesised;	2	
2 (a) (ii)	ATP levels fall; linearly; level of rigor mortis increases; figures quote;	4	
2 (a) (iii)	Residual ATP present; ATP is hydrolysed; energy used for muscle contraction;	3	
2 (a) (iv)	Limited ATP; cross bridges not broken; myosin head not repositioned;	3	
2 (b)	pH decreases due to increase in lactic acid; anaerobic respiration;	2	
2 (c) (i)	Breakdown / hydrolysis, of proteins; due to enzymes; cross bridges broken; no ATP synthesised;	4	
2 (c) (ii)	Temperature; effects activity of enzymes; muscle mass; more muscles leads to greater degree of rigor mortis; gender; effects muscle mass;	4 max	
2 (d) (i)	A myosin; B myosin head; C actin;	3	

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2 (d) (ii)	ATP;	1	
2 (d) (iii)	A moves to the left;	1	
2 (d) (iv)	Cofactor; changes 3D shape of, enzyme / active site; activates enzyme;	3	
2 (d) (v)	Myosin head attaches and rotates; detaches; repeats;	3	
2 (e)	Amino acid sequence / primary structure; different sequence in each; different R group interactions;	3	
2 (f) (i)	Energy (from ATP) changes structure of dyneins / kinesins; Energy (from ATP) used to break cross bridges; dyneins / kinesins, do not form cross bridges, ORA dyneins / kinesins, result in movement within cell; ORA	4	
2 (f) (ii)	Mitosis / meiosis; cell movement;	2	
3 (a)	Lipid structure so hydrophobic; moves across cell membrane by simple diffusion; hydrophobic core is not a barrier; secondary messengers needed for hydrophilic hormones;	4	
3 (b)	Plasma is composed mainly of water; lipid soluble hormones are not soluble in plasma; (some) proteins are soluble in plasma;	2 max	
4 (a)	Consumption of oxygen increases with temperature; in all cases; figure quote;	3	
4 (b)	Germinating corn $1.6/20 = 0.08 \text{ cm}^3/\text{min}$ ; non-germinating $0.2/20 = 0.01 \text{ cm}^3/\text{min}$ ;	2	
4 (c)	Yes oxygen consumption increases; respiration uses oxygen; <i>no</i> seeds not germinating so no respiration; change in oxygen concentration due to experimental error;	4	
5 (a) (i)	(the factor) which is at its, least favourable / nearest its minimum, value; (the factor which) if increased would speed up process; factor which limits the rate of a, reaction / process;	1 max	
5 (a) (ii)	guard cells lose turgidity / AW; closure of stomata; restricts carbon dioxide entry (through stomata); R stops carbon dioxide entry ref. to ABA and stomatal closure;	2 max	
5 (b)	shade plant more photosynthesis at low light intensities / ora; sun plant more photosynthesis at high light intensities / ora; shade plant reaches, compensation point / net rate of photosynthesis, at low light intensity / ora; shade plants , plateau / max photosynthetic rate, at low light intensities / ora;	2 max	
5 (c) (i)	fewer, cells / named cells/ less, biomass / named tissue (present per leaf surface area); fewer mitochondria;	1	

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5 (c) (ii)	(at low light intensity) rate of photosynthesis / primary productivity, low; small amount of sugars formed / AW; R food, nutrients sugars / photosynthetic products used in respiration; idea of low rate of respiration means products used slowly / ora;	3 max	
5 (d) (i)	Group 1 21 mg (CO <sub>2</sub> ) cm <sup>-2</sup> h <sup>-1</sup> ; Group 3 7.5 mg (CO <sub>2</sub> ) cm <sup>-2</sup> h <sup>-1</sup> ; <i>No units max 1</i> <i>If units shown once and figures correct 2 marks</i>	2	
5 (d) (ii)	detect light intensity; ref to PGRs; PGR works via genetic control; different, growth rate / pattern /appearance; example of phenotypic feature	3 max	