17 Energy for Biological processes Answers to practice questions

Question number	Answer	Marks	Guidance
1 (a)	Limited space due to glasshouse size; idea of temperature control, e.g. too hot in the summer; ventilation due to plants being enclosed;	3	
1 (b) (i)	Rate of, photosynthesis and respiration, increase as temperature increases; rate of photosynthesis higher than rate of respiration at lower temperatures; rate of photosynthesis levels out at higher temperatures; due to, limiting factor / named; figures quote; enzyme controlled reactions in photosynthesis and respiration; enzyme activity effected by temperature;	5 max	
1 (b) (ii)	Assimilates / named, required for, growth / development; idea that rate of photosynthesis must be higher than rate of respiration for net production of assimilates; temperatures need to be lower to increase saleability of tomatoes; tomatoes would be, smaller / less sweet, if grown at higher temperatures;	4	
1 (b) (iii)	Maintenance of optimum, temperature / carbon dioxide concentration; expensive to heat or cool / ventilate; <i>idea that</i> cost of maintaining maximum rate of photosynthesis would reduce profits;	3	
2 (a)	А	1	
2 (b) (i)	Different positions on plant / described;	1	
2 b (ii)	A	1	
2 b (iii)	Cells large number of chloroplasts; leaves large surface area to absorb maximum light; large number of stomata for maximum diffusion of carbon dioxide; adaptations to high temperatures; whole plants taller/broader;	5	
3 (a)	124 (%) / 123.7 (%);;	2	
3 (b)	Benefit allows entry of more CO ₂ ; Explanation (CO ₂) for , light-independent reaction / Calvin cycle or light-dependent reaction is taking place quickly / reduced NADP building up / ATP building up or CO ₂ not as limiting (than when there are fewer stomata) or idea that increases access to air spaces for distribution of CO ₂ ; OR benefit reduces transpiration;		Read through complete answer. Award 2 marks if a benefit and explanation are correctly linked. If benefit and explanation are not correctly linked: Award Max 1 for either a benefit or an explanation.



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idea of stomata sheltered from , air currents / heat			1	
heat (when on lower surface) or idea that diffusion shells maintained; Equal sample size for sun and shade leaves / increase sample size of shade leaves / increase sample size of shade leaves / make cuticle observations quantitative; record range / calculate SD / calculate SE / (named) statistical analysis; record data on leaf, length / width / area / colour / chlorophyll content; record data on and, size of stomata / stomatal count on upper surface; define what is a sun or shade leaf / measure light levels to classify type of leaf; repeat / replicate, the (whole) experiment / using other plants of the same species; 4 (a) Oxygen 1 oxygen only produced in one (named) stage of photosynthesis; 2 oxygen produced might be used for respiration; carbon dioxide 3 CO ₂ only used in one (named) stage of photosynthesis; 4 (CO ₃ produced during respiration might be used for, photosynthesis; (light independent reaction / Calvin cycle; 5 O ₂ / CO ₂ / both , could be an underestimate or represents net production (O ₂) or represents net production (O ₂) or represents net use (CO ₃): 4 (b) (i) Carbon dioxide concentration / partial pressure of CO ₂ / temperature; AVP; DO NOT CREDIT refs to controlling temperature or light or wind or time or light or wind or time or light or wind or time 1 CREDIT for O ₂ only measures the rate of the light dependent stage / photolysis' 3 CREDIT for CO ₂ only measures the rate of the Calvin cycle; 5 ACCEPT a description e.g. "measurement is less than expected because not all the oxygen produced can be measured' (but not if expressed in terms of terms of experimental error – e.g. dissolves in the water) (GNORE refs to reliability / accuracy at the record of the representation or low, as these indicate situations rather than factors eg stomatal density stomatal size chlorophyll concentration number of chloroplasts enzyme turnover rate (GNORE (temporary) changes in stomatal , opening / dosing		explanation		
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4 (b) (iii) (aerobic / anaerobic) respiration;	4 (b) (iii)	(aerobic / anaerobic) respiration;	1	



17 Energy for Biological processes Answers to practice questions

4 (b) (iv)	1 at 0 , respiration only / no photosynthesis; between 0 and X 2 idea that (rate of) respiration is greater than (rate of) photosynthesis; at X 3 idea that (rate of) respiration equals (rate of) photosynthesis / at compensation point; after X 4 idea that (rate of) photosynthesis is greater than (rate of) respiration;	3 max	Assume that candidate is answering in the same order as the bullet points, unless otherwise indicated. IGNORE photorespiration throughout CREDIT 'Calvin cycle' for 'photosynthesis' throughout For mps 2, 3 & 4 must include clear ref. to both respiration and photosynthesis 2 DO NOT CREDIT no photosynthesis
4 (c) (i)	Reduced NADP / NADPH / NADPH ₂ / NADPH ⁺ ; ATP; oxygen;	3	
4 (c) (ii)	1 prevents photophosphorylation; 2 cyclic and non-cyclic; 3 no / less , ATP / reduced NADP , for , light-independent stage / Calvin cycle / GP to TP; 4 no (named) substrate made for respiration;	2 max	3 'no ATP for photosynthesis' is not quite enough DO NOT CREDIT (oxidised) NADP 4 substrate eg glucose / starch / carbohydrate / sucrose / sugars IGNORE triose phosphate / food / nutrients