AQA GCSE Science Combined Higher

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	light intensity / distance from light source		1	AO2 4.4.1.2
01.2	provide carbon dioxide / to ensure carbon dioxide is not a limiting factor		1	AO2 4.4.1.2
01.3	collect gas in a syringe / upturned test tube add a glowing splint – it will relight / add a burning splint – it will burn more brightly		1 1	AO2 4.4.1.2
01.4	data points plotted accurately correct line of best fit drawn	allow a tolerance of ±1 small square	1 1	AO3 4.4.1.2
01.5	as light intensity decreases / distance from source increases the rate of photosynthesis decreases		1	AO3 4.4.1.2
01.6	accept value between 5 and 6 bubbles per minute		1	AO2 4.4.1.2
01.7	bubbles were different sizes / easy to miss		1	AO2 4.4.1.2
01.8	collect gas given off and measure volume collected per unit time		1	AO3 4.4.1.2
02.1	$6H_20$ $C_6H_{12}0_6$	answers must be in the correct order	1 1	AO1 4.4.1.1

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02.2	more energy needs to be taken in from the environment to break bonds between the atoms in carbon dioxide and water together than is released when new bonds form in glucose and oxygen		1 1 1	AO1 4.4.1.1
02.3	any **six** from: • carbon atom in carbon dioxide • diffuses through stomata • into air spaces in leaf • into plant cells / cell in the spongy mesophyll • into chloroplasts • joins / bonds with water / hydrogen and oxygen • to make glucose • glucose is converted to starch (for storage)		6	AO2 4.2.3.1 4.2.3.2 4.4.1.1 4.4.1.3
03.1	A – cuticle B – stoma		2	AO2 4.2.3.1
03.2	leaves are broad large surface area for light to fall on palisade cells contain many chloroplasts / chloroplasts contain chlorophyll to maximise light absorption	to gain full marks, students must state two features with two linked explanations	1 1 1 1	AO1 4.4.1.2 4.7.1.4

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03.3	guard cells open and close stomata to allow carbon dioxide to diffuse into the leaf air spaces in leaf allow carbon dioxide to diffuse into leaf cells leaves are thin diffusion distance for carbon dioxide is short	to gain full marks, students must state two features with two linked explanations	4	AO1 4.4.1.2 4.7.1.14
04.1	light intensity		1	AO2 4.4.1.2
04.2	plateau forming between greenhouses 1 and 3 maximum rate of photosynthesis reached after experiment 1 but before experiment3		1 1	AO3 4.4.1.2
04.3	(valid because) all data from the experiment support the conclusions formed by the grower (invalid because) any **two** from: • conclusions can only be formed based on the range of data used • grower incorrect to draw conclusions about trends in temperature or CO_2 concentrations based on only two pieces of data • grower incorrect to draw conclusions about how the plants might behave outside the range of data investigated		1 2	AO3 4.4.1.2

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04.4	enzymes will become denatured photosynthesis reaction will stop		1 1	AO2 4.4.1.2
05.1	light intensity / chlorophyll levels		1	AO1 4.4.1.2
05.2	(initially) increasing carbon dioxide levels increases the rate of photosynthesis as increasing availability of reactant increases the rate of reaction after a certain point the graph plateaus / further increase in carbon dioxide concentration does not increase the rate of photosynthesis another factor is now limiting the rate of photosynthesis / another limiting factor named		1 1 1 1	AO1 AO2 4.4.1.2
05.3	as temperature increases rate of photosynthesis increases as molecules have more kinetic energy collisions occur more frequently between particles photosynthesis is an enzyme controlled reaction enzymes are denatured at high temperatures / above temperature named in 40–50 °C (so reaction slows / stops)		1 1 1 1	AO1 4.4.1.2
06	**Level 3:** All key steps are identified and logically sequenced, and control variables are given.		5–6	AO2 4.4.1.2
	Level 2: Most steps are identified, but the method is not fully logically sequenced.		3–4	
	Level 1: Some relevant steps are identified, but links are not made clear.		1–2	

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	No relevant content.		0	
	Indicative content: **Control variables** • temperature / time taken for measurement / volume of water / carbon dioxide concentration **Method** • place pond weed in a test tube of water • place test tube in a beaker of water (to control temperature) • place beaker a set distance from light source / set lamp to initial brightness and measure light intensity • leave for 5 / several minutes for the pondweed to acclimatise to the new light intensity • count the number of bubbles given off in unit time, e.g. one minute / measure the volume of gas given off in unit time • repeat the measurement at this distance to enable identification of anomalies • repeat the investigation at (four or more) additional distances from the light / brightnesses of lamp			
07.1	any **three** from: • starch provides a store of energy • glucose is soluble and would affect movement of water • into and out of plant cells by osmosis • starch is insoluble and does not disturb plant's water balance		3	AO1 4.4.1.3
07.2	(take a thin slice of onion and) add iodine it will turn blue/black if starch is present		1 1	AO3 4.4.1.3

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07.3	glucose combines with nitrate ions (and other mineral ions) which were absorbed from the soil to produce amino acids amino acids are joined together to produce proteins		1 1 1 1	AO1 4.4.1.3
08.1	volume of water in the test tube / length of pondweed / piece of pondweed / time of measurement / dissolved CO_2 concentration / light intensity		1	AO2 4.4.1.2
08.2	to allow pondweed to acclimatise to new temperature		1	AO2 4.4.1.2
08.3	count number of bubbles given off in a fixed period of time	accept measure time taken to collect a fixed volume of gas award 2 marks for collect gas and measure the volume of gas given off in a fixed period of time	1 1	AO2 4.4.1.2
08.4	enzymes in the pondweed had been denatured so photosynthesis reaction could no longer occur (therefore no oxygen produced)		1 1	AO2 4.4.1.2
09.1	25		1	AO2 4.4.1.2 MS1c, 3a

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09.2	*y*-axis – Rate of photosynthesis (bubbles per minute) lines plotted correctly straight line of best fit	 allow a tolerance of ±1 mm 	1 1 1	AO2 4.4.1.2 Ms 4a, 4c
09.3	rate of photosynthesis is directly proportional to the light intensity	award 1 mark for rate of photosynthesis increases as light intensity increases / rate of photosynthesis is proportional to light intensity	2	AO3 4.4.1.2
09.4	(constant / uniform gradient) changing light intensity changes rate of photosynthesis		1	AO3 4.4.1.2
09.5	recognition that 0.10 m corresponds to light intensity 100 au line decreasing in gradient above light intensity 25 au reaching a plateau by light intensity 100 au	 accept any rate value above 60 and less than 250 bubbles per minute	1 1 1	AO3 4.4.1.2
10.1	carbon dioxide + water + light → glucose + oxygen	award 1 mark for reactants, one mark for products	2	AO1 4.4.1.1
10.2	22–27 °C		1	AO2 4.4.1.2 Ms 4a
10.3	another factor is limiting the rate of photosynthesis light intensity / carbon dioxide concentration		1 1	AO2 4.4.1.2

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10.4	22 heating it to a higher temperature will cost more money but will not increase the rate of photosynthesis / plant growth		1 1 1	AO3 4.4.1.2