PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 4: EXCHANGE AND TRANSPORT

CORE PRACTICALS 5 AND 6

SCORE	PERCENTAGE
/53	%

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Mark Scheme

Q1.

Question Number	Acceptable Answers	Additional Guidance	Mark
(a)(i)	An explanation that makes reference to the following: • red is absorbed (1) • because of the presence of chlorophyll (1)		(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
(a)(ii)	An explanation that makes reference to the following: • {chlorophyll / leaf pigment} was present (1) • because some cells are damaged / discs not washed (1)		(2)

Question Number	Answer	Additional Guidance	Mark
(a)(iii)	An explanation that makes reference to the following: • ethanol {disrupts / damages / dissolves / affects} the phospholipid (1) • therefore the membrane {becomes more permeable / allows pigment out} (1)		(2)

Question Number	Answer	Additional Guidance	Mark
(b)	An answer that makes reference to the following: • starts at 0.05 absorbance value (1) • flat line along 0.05 absorbance value (1)		(2)

Question Number	Answer	Additional Guidance	Mark
(c)	An answer that makes reference to five of the following: • use leaves of {same age / same position on plant} because this affects concentration of pigment (1) • obtain leaf discs from the same part of the leaf because this affects concentration of pigment (1) • use same {cork borer / size of leaf disc / diameter of leaf disc} because this affects concentration of pigment (1) • use same temperature because temperature affects the rate of diffusion (1) • use same volume of ethanol so chlorophyll is diluted the same (1) • replicate each ethanol concentration to {see if results are consistent / identify anomaly / to calculate standard deviation / allow statistical test} (1) • wash discs to remove pigment (1)		(5)

Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to four of the following: • use same light intensity (1) • use red filter (1) • use tube {with clean sides / no scratches / holding opaque side} (1) • use a control tube with water to {calibrate / obtain zero absorbance} (1) • same {concentration / volume} of {chloroplasts / DCPIP} (1)	**DO NOT ACCEPT** same lamp / same bulb / same power / same distance	**(4)**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to four of the following: • with herbicide DCPIP not {decolourised / reduced / stays blue} (1) • no electrons available / reduced electron transport (1) • less {reduced NADP / NADPH} (1) • therefore less ATP (1) • because the {Calvin cycle / light independent stage} are affected (1)	**ACCEPT** converse **DO NOT ACCEPT** absorbance does not change **DO NOT ACCEPT** if from ETC implies respiration	**(4)**

Q3.

Question Number	Answer	Additional Guidance	Mark
	A description that makes reference to five of the following: • equal mass and shape of carrot tissue cut (1) • carrot tissue submerged in (boiling tubes with)known volume of water (1) • placed in water baths at stated range of temperatures for a stated length of time (1) • contents {filtered / decanted} (1) • absorbance measured / colour charts used (1) • graph plotted / statistical analysis of results (1) • appropriate step to ensure validity (1)	Allow use of cork borer and same lengthAllow {same surface area / equal cubes} Allow 5 – 100°C (must be at least 5 temps),for 5 – 30 mins Allow transmission measured Allow all tissue from same {carrot / age ofcarrot} Allow repeats at each temperature and {mean / SD} calculated	**(5)**

Q4.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to the following: • conversion of mg to g (1) • division by 750 and calculation of percentage (1)	1265.25 mg = 1.26525 g (0.1687 g in 100g) = 0.17 (%) Correct answer with no working gains 2marks Otherwise correct answer to wrongpower of 10 gains 1 mark Correct answer with wrong number ofdecimal place gains 1 mark	**(2)**

Mark Scheme

Q1.

Question Number	Indicative content
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. • no evidence of replicates, so data may not be valid • water potential = turgor pressure + osmotic potential and at 50% plasmolysis, there is no turgor pressure so water potential = osmotic potential of cells • data for 1200 s suggest that osmotic potential of cell is equivalent to 0.3 M sucrose and more cells are plasmolysed at 1200 s • graphs are different suggesting that water is still moving in and out of the cells, data for 900 s suggests that the osmotic potential of cells is equivalent to less than 0.3 M • cannot be certain that osmotic potential is equivalent to 0.3 M sucrose unless cells are left in sucrose longer than 1200 s • the estimate is changing as time goes by so the cells would need to be left in solution until there is no further increase in the number of plasmolysed cells

Level	Marks	
Level 0	**0**	No awardable content
Level 1	**1-2**	An explanation may be attempted but with limited interpretation or analysis of the scientific information with a focus on mainly just one piece of scientific information. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.
Level 2	**3-4**	An explanation will be given with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.
Level 3	**5-6**	An explanation is made which is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.

Q2.

Question Number	Answer	Additional Guidance	Mark
	use ratio of 8:2 of sucrose and water	**ACCEPT** other correct ratios	**(1)**

Q3.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to five of the following: • use range of at least five concentrations of (sucrose / salt) solution (1) • use equal {size / length / shape / surface area to volume} of pieces of carrot and potato (1) • control carrot and potato {age / part of tissue / temperature} (1) • pieces of carrot and potato submerged in the solutions for the same time (1) • carrot and potato pieces weighed before and after and dried (1) • plot graph of mass change against (salt / sucrose) concentration and use to compare where line cuts x-axis for carrot and potato (1)	**Accept** locate isotonic point	**(5)**

Q4.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to three of the following: • control temperature because affects {diffusion / osmosis / molecular movement / membrane permeability} (1) • submerge cubes in sucrose solution so all surfaces in contact (1) • use smaller intervals of sucrose concentration (between 0.2 and 0.4) (1) • blot cubes before weighing to remove surface solution / blot cubes dry to remove excess solution (1) • repeat to identify {anomalies / variability / SD} / because result in table could be {anomalous} (1)	**ACCEPT** dry but not if linked to dry mass **DO NOT ACCEPT** to calculate mean	**(3)**

Q5.

Question Number	Answer	Additional guidance	Mark
	An answer that makes reference to five of the following: • cut potato into chips of same size as this {gives equal surface area (to volume ratio) / affects osmosis} (1) • place potato chips in range of {salt / sucrose} solutions to allow {osmosis / water to enter / water to leave} (1) • blot chips to remove surface water (1) • measure (percentage) change in {mass / length} and {determine loss or gain of water / plot graph} (1) • identify where line crosses x axis as this represents {no change in mass / length / the estimate of water potential} (1) • compare these lines for different ages of potato tissue (1) • use same temperature as this affects {osmosis / diffusion} / leave potato for same time in solutions as this affects	Accept use a cork borer to give samples of standard size (linked to SA or osmosis) Accept dry using a paper towel Accept measure initial {length / mass} and final {length / mass} to find change	
	{osmosis / diffusion} / use same {potato / variety of potato} as this affects {water potential / osmosis / diffusion} (1)		

Q6.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • pond water has greater water potential than the cytoplasm therefore water enters by osmosis (1) • *Paramecium* has { only cell membrane / has no cell wall } (1) • so would burst if water not removed (1)		**(3)**

Q7.

Question Number	Answer	Mark
	An answer that makes reference to the following: • x axis labelled 'sucrose concentration / mol dm^{-3}' **and** y axis labelled 'percentage change in mass' / 'change in mass (%)' (1) • trend shows top left to bottom right, crossing x axis / crossing 0% (1)	**(2)**