

Movement in and out of Cells

Mark Scheme

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Movement in and out of Cells
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme

Time Allowed: 68 minutes

Score: /56

Percentage: /100

Question		Marks	Guidance Notes
1 (a)	movement/diffusion, of water (molecules) ; from high water <u>potential</u> to low water <u>potential</u> /down water <u>potential</u> gradient ; across a partially permeable membrane ;	[3]	
(b) (i)	<u>1.0</u> (mol dm ⁻³ sodium chloride solution) ;	[1]	
(ii)	(to remove) excess/surface/AW, water/AW, on potato sticks ; to measure the mass of the potato (stick) only ;	[max 1]	I inaccurate unqualified R dry mass
(c)	cells/potato sticks, have lost water (by osmosis) ; from high water <u>potential</u> to low water <u>potential</u> /down water <u>potential</u> gradient ; (cells/tissue/potato) were, plasmolysed/flaccid ; loss of <u>turgor</u> (pressure) ; not enough pressure of water pushing on cell walls ;	[max 3]	I water concentration I incipient (plasmolysis) A reduced turgidity / description
(d)	protein denatured (when cooked) ; cell membrane, damaged/destroyed (when cooked) ; no <u>osmosis</u> will occur ;	[max 2]	R killed proteins I killed/denatured, cells I damaged <u>cell wall</u>
		[Total: 10]	

Question		Mark	Guidance
2 (a) (i)	iodine solution diffused, into the bag/through the (Visking) tubing ; iodine molecules <u>small</u> (enough to pass through the membrane) ; iodine solution stains starch ora ; no starch diffused, out of the bag/through the (Visking) tubing ; starch molecules too <u>large</u> (to pass through the membrane) ; ref to pore / AW, size ;	[max 4]	I osmosis
(ii)	temperature ; (surface) area ; concentration (gradient)/water <u>potential</u> ; size/type, of molecule ; thickness/distance, across membrane/permeability (of membrane) ; pressure ; (number of) protein, channels/pumps / AW ; energy/ number of mitochondria ;	[max 3]	I distance / thickness unqualified
(b) (i)	<i>from muscle cell</i> (produced in) mitochondrion ; diffused ; (diffused) in cytoplasm/tissue fluid/(blood) plasma ; through membrane ; through capillary wall ; <i>from blood:</i> vein/vena cava/pulmonary artery/heart ; travels to lungs ; into alveoli ; exhaled/breathed out/excreted ;	[3]	A red blood cell I exit the body unqualified

Question		Mark	Guidance
2 (ii)	<p>thin, wall/epithelium ; for efficient, diffusion/gas exchange ;</p> <p>small, diameter/lumen ; idea that many capillaries can fit into tissues/capillaries reach (every cell) throughout the body/relative size to red blood cell ;</p> <p>extensive network ; large surface for diffusion ;</p> <p>capillary cells have pores ; to allow substances to pass in and out of the blood easily ;</p>	[max 3]	<p>adaptations must be linked to correct feature max 2 for features only</p> <p>A one cell thick R 'thin cell wall'</p>
(c)	<p>diffusion ; down concentration gradient ;</p> <p>(diffuses) through stoma/stomata ; (through) (intercellular) air space/(between) spongy mesophyll ; into/reached, palisade, mesophyll/cell ; chloroplast ;</p> <p>AVP ; e.g. dissolve/diffuse, through cell wall/cell membrane/cytoplasm</p>	[max 4]	<p>A lower concentration of carbon dioxide inside leaf / ora ;</p> <p>A into guard cell/spongy, mesophyll/cell I chlorophyll</p>
		[Total: 17]	

Question	E	Answers	Marks	Additional Guidance
3 (a) (i)		passive/does not require energy ; substances move down a concentration gradient ; does not have to occur across a membrane ; occurs with gases ; no need for protein, carrier/ channels/ pumps ;	[max 2]	
(ii)		root hair (cells) ; through carrier molecules/ AW ; large/ increased, (surface) area (for absorption) ; roots grow continually (to find new sources of ions) ; AVP ; e.g. extensive root network/ branching roots ;	[max 2]	
(b) (i)		<i>two marks for the correct answer – if no answer, an incorrect answer or an answer without the minus sign award one mark for the correct working</i> 183 – 175 = 8 ; $\frac{8}{183} \times 100 = -4.4$;	[2]	A – 4.37
(ii)		start mass of the onions is, different/ not all the same ; (idea that) allows for (valid/ fair) comparison ; to determine water potential of the onion ;	[max 2]	
(c) (i)		line finished to - 4.4/ A ecf from (b)(i) ;	[1]	R extrapolation past 200 g dm ⁻³
(ii)		44 ± 1 ; g dm ⁻³ ;	[2]	
(d)	1 2 3 4 5	movement of water ; by osmosis ; through partially permeable membrane(s) ; <i>gain</i> – onion has lower water potential/ solution has higher water potential ; <i>loss</i> – onion has higher water potential/ solution has lower water potential ;	[max 4]	A ‘down a water potential gradient’ if direction is correct and clear ignore references to ‘concentrations of water’

4 (a) (i)	<p>award two marks if the answer is correct – 12 if there is no answer or it is incorrect, award one mark for correct working</p> <p>6 s – 1s = 5 seconds for 1 breath ; 60/5 = 12 (breaths per minute) ;</p>	max [2]	Alternative: 4 s – 9 s = 5 s for 1 breath Allow 10 s for 2 breaths for working mark.
(ii)	<p>slower breathing rate before match ; ora deeper breathing during match ; ora during the match breaths are different from each other ; ora pressure (in lungs) increases during the match ;</p>	max [3]	
(b)	<p><u>external</u> intercostal muscles contract ; <u>internal</u> intercostal muscles relax ; lifts ribs, upwards/outwards ; diaphragm contracts ; diaphragm, flattens/drops ; volume of, thorax/lungs/chest, increases ; pressure in, thorax/lungs/chest, decreases ; air flows in down a pressure gradient/description ;</p>	max [4]	Note: internal and external must be stated
(c) (i)	<p>(CO₂) is metabolic/AW, waste ; (CO₂) is toxic ;</p>	max [1]	ignore – from body (in question stem)

Question	Answer	Marks	Additional Guidance
4 (ii)	(blood) plasma ;	[1]	
(iii)	pH decreases/becomes acidic ;	[1]	
(d)	more, (aerobic) respiration ; steeper concentration gradient ;	[2]	A description of gradient.
		[Total: 14]	