

# 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 <sup>-3</sup> 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 <b>ora</b> ; 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><b>A</b> one cell thick <b>R</b> '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><b>A</b> lower concentration of carbon dioxide inside leaf / <b>ora</b> ;</p> <p><b>A</b> into guard cell/spongy, mesophyll/cell <b>I</b> chlorophyll</p>
		<b>[Total: 17]</b>	

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]	<b>A</b> – 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/ <b>A</b> ecf from (b)(i) ;	[1]	<b>R</b> extrapolation past $200 \text{ g dm}^{-3}$
(ii)		$44 \pm 1 ; \text{ g dm}^{-3} ;$	[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]	<b>A</b> ‘down a water potential gradient’ if direction is correct and clear <b>ignore</b> 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 – 1 s = 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 ; <b>ora</b> deeper breathing during match ; <b>ora</b> during the match breaths are different from each other ; <b>ora</b> 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>(CO<sub>2</sub>) is metabolic / AW, waste ; (CO<sub>2</sub>) is toxic ;</p>	max [1]	<b>ignore</b> – 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]	

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