

Question 16 (Answer: B)

- Distilled water has a higher (less negative) water potential than the cell contents.
- So water moves in, down the water potential gradient, by osmosis.
- Osmosis is passive – no active transport and no movement of solutes is needed.

Question 17 (Answer: B)

- Halving every dimension divides the volume by 8 but the surface area by only 4.
- So the surface area to volume ratio *doubles*.
- A larger ratio means the dye diffuses to the centre faster.

Question 18 (Answer: D)

- Cells shrink in a solution of lower water potential and swell in one of higher water potential.
- Compare each cell type's response in each solution to rank the water potentials.
- Whichever solution changes both cell types the same way is the one furthest from their internal water potential.

Question 19 (Answer: D)

- A larger cube has a smaller surface area to volume ratio.
- The dye has further to diffuse and relatively less surface to enter through.
- So the slowest cube is the one with the lowest surface area to volume ratio.

Question 19 (Answer: A)

- Channel proteins let water-soluble ions through, and carrier proteins move glucose – 1 and 2 are right.
- Oxygen is non-polar and small, so it passes straight through the phospholipid bilayer – 3 is right.
- Glycoproteins act in recognition and attachment, so that statement holds too.

Question 20 (Answer: C)

- Compare the surface area to volume ratio of the two cylinders.
- The dye must diffuse from the outside to the centre, so what matters is the *distance* to the centre.
- The cylinder with the smaller radius has the shorter diffusion path, so its centre colours first.

Question 17 (Answer: C)

- Distilled water has a *higher* water potential than the cell contents, so statement 1 is the wrong way round.
- Water enters the red blood cell by osmosis and the cell swells.
- A red blood cell has no cell wall to resist the pressure, so it bursts.

Question 18 (Answer: C)

- Work out the missing quantity for each cell from the figures given.
- Then form the surface area to volume ratio for both.
- The cell with the larger ratio exchanges materials more efficiently for its size.

1(a)	letter A: example of substance = carbon dioxide / oxygen ; letter D: type of movement = active transport ; letter D: part of membrane involved = carrier / pump, protein <u>and</u> example of a substance = sodium ions ; R sodium-potassium pump A potassium ions / chloride / amino acids A sodium pump (if sodium is example) A glucose if not given for letter C letter C: example of a substance = glucose ; A amino acids / chloride (ions) / potassium ions / sodium ions part of membrane involved: for B = channel protein <u>and</u> for C = carrier protein ;
1(b)	any two from viruses travel through symplast pathway ; I apoplast pathway if described correctly R symplast <u>and</u> apoplast pathways if no further detail of apoplast given plasmodesmata / cytoplasmic connections between cells ; A strands of cytoplasm because viruses are small enough (to pass through plasmodesmata) ; AVP ; A any ref. to actual size (width of plasmodesmata ~ 50 nm, width of Tobacco Mosaic Virus 18 nm)

1(a)	any sensible concentrations ; corresponding volumes of distilled water <u>and</u> sucrose;									
1(b)	<i>any seven from:</i> 1 same / stated, variety / age / AW, of beetroots ; 2 remove the outer skin (of the beetroot) / AW ; 3 same / stated, dimensions / AW, of (beetroot) block / AW ; 4 <i>ref. to</i> apparatus for obtaining same size of (beetroot) blocks ; 5 for each sucrose concentration, place (beetroot) block in a suitable container <u>and</u> submerge / AW (in sucrose solution); 6 (for each sucrose concentration) measure the initial mass <u>and</u> the final mass ; 7 (measure final mass) after a (suitable) stated time ; 8 method to remove excess liquid from beetroot (before measuring final mass) ; 9 use at least three different (beetroot) blocks <u>and</u> calculate a mean, for each sucrose concentration ; 10 safety comment with named hazard <u>and</u> risk <u>and</u> precaution ; <table><tr><td>hazard</td><td>risk</td><td>precaution</td></tr><tr><td>beetroot</td><td>allergy / irritant</td><td>gloves / mask / PPE</td></tr><tr><td>knife / scalpel / cork borer / AW</td><td>cut</td><td>cut away from the hand / cut onto a, board / tile / AW</td></tr></table>	hazard	risk	precaution	beetroot	allergy / irritant	gloves / mask / PPE	knife / scalpel / cork borer / AW	cut	cut away from the hand / cut onto a, board / tile / AW
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1(c)(i)	1 appropriate axis labels <u>and</u> units ; 2 sketch shows decreasing line crossing x-axis ;									
1(c)(ii)	(identify the) x-axis intercept point or (identify the point on the x-axis where the mean) percentage change in mass is zero ;									
1(c)(iii)	rinse (beetroot) blocks (after cutting / before adding to sucrose solution) ;									