

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|-----|---|-------|---|
| 1 | (a) | (i) | <p>1 at low temperatures, all stain is in cells OR no stain in surrounding solution ;</p> <p>2 (taken up / held) against, diffusion / concentration, gradient ;</p> <p>3 at high temperature stain not held in cells ;</p> <p>4 at high temperature enzymes denatured so no ATP for active transport (of stain) ;</p> <p>5 use of correct comparative figs to illustrate a point ;</p> <p>AVP ; ;</p> | max 2 | <p><i>MP 1 awarded for observation that the stain was no longer in the surrounding solution and not for the % of cells containing the stain.</i></p> <p>ACCEPT the stain is not evenly distributed between cells and solution</p> <p>ACCEPT stain doesn't move out of cells</p> <p>ACCEPT <i>up</i> the diffusion gradient</p> <p>ACCEPT solution now contains stain</p> <p>ACCEPT 0% = none / no cells (stained)</p> <p><i>MP 1 and 3 - must be stated rather than inferred from quoted figs</i></p> <p>IGNORE 'enzymes denatured' alone</p> <p>CREDIT active transport / carrier, proteins denatured</p> <p>ACCEPT mitochondria stopped working so no ATP produced</p> <p>e.g. 97% at 30°C but 0% at 80°C</p> <p>IGNORE figs without units</p> |

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| 1 | (a) | (ii) | <p>cells, dead / not respiring ;</p> <p>no, (metabolic) energy / ATP, to take up stain ;</p> <p>AVP ;</p> | max1 | <p>DO NOT CREDIT 'burst' as these cannot be seen</p> <p>ACCEPT inhibitor present / membrane impermeable</p> <p>ACCEPT no functioning mitochondria</p> |
| 1 | (b) | (i) | <p>(membrane) structure disrupted ;</p> <p>(phospho)lipid bilayer, melts / more fluid ;</p> <p>(membrane) proteins / carrier molecules, denatured / unable to function ;</p> <p>(membrane) becomes more permeable ;</p> | max 1 | <p><i>Mark first suggestion and if correct award mark – if further answers contradict first answer do not award mark.</i></p> <p>ACCEPT damaged, destroyed, break down</p> <p>IGNORE <i>membrane</i>, denatured / more fluid</p> <p>IGNORE lipid <i>molecules</i> melt</p> <p>ACCEPT lose shape for denatured</p> <p>ACCEPT leaky</p> <p>IGNORE refs to bonds breaking</p> |

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| 1 | (d) | | <p>nucleus divides / mitosis ;</p> <p><i>idea of :</i> cell, swells on one side / bulges ;</p> <p>nucleus / cytoplasm / organelles, move into, bud / bulge ;</p> <p>pinches off / cell wall forms, (so bud becomes a separate cell) ;</p> | max 2 | <p>ACCEPT asexual reproduction / cloning IGNORE cell splits, ref to genetically identical cells</p> <p>IGNORE <i>bud</i> forms on side</p> <p>IGNORE replicated DNA enters bud</p> <p>ACCEPT cytokinesis IGNORE two cells are formed / bud separates unqualified</p> |
| Total | | | | 10 | |

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|----------|-----|--|-------|--|
| 2 | (a) | partially / selectively ; (facilitated) diffusion OR osmosis ; plasma ; phospholipids ; cholesterol ; | 5 | DO NOT ACCEPT semi ACCEPT differentially ACCEPT plasma cell |
| | | | | |

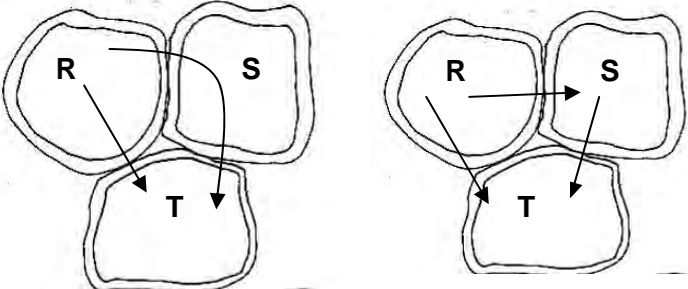
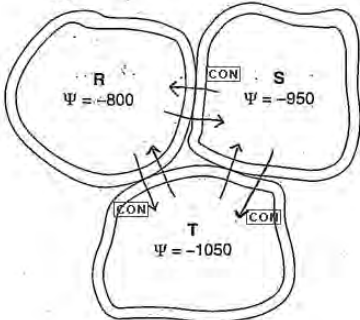
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| 2 | (b) | <p>1 (acting as) antigens ;</p> <p>2 identification / recognition, (of cells) as, self / non-self / AW ;</p> <p>3 cell signalling / described ;</p> <p>4 receptor / binding site, for, hormone / (chemical) signal / (medicinal / named) drugs ;</p> <p>5 ref. to receptor / binding site / trigger, on transport proteins / AW ;</p> <p>6 cell adhesion / to hold cells together (in a tissue) ;</p> <p>7 attach to water molecules (to stabilise membrane / cell) ;</p> <p>4 max for description</p> | | <p>Look for <u>description</u> not list of functions</p> <p><i>Do not credit repetition of same point</i></p> <p>ACCEPT foreign for non-self</p> <p>ACCEPT description e.g. communication <i>between</i> cells / cell responds to, chemical / signal, <i>from another cell</i></p> <p>ACCEPT description of <i>attachment process</i> for receptor / binding site</p> <p>DO NOT ACCEPT molecule unqualified</p> <p>ACCEPT binding site for foreign antigen</p> <p>ACCEPT ref to receptors on ion channels</p> <p>ACCEPT bind to other cells for cell adhesion</p> |
| | | <p>QWC:</p> <p>three technical terms used and spelt correctly ;</p> | 5 max | <p>Any three from:</p> <p>receptor, antigen, hormone, <u>cell</u> signal(ing), adhesion, recognition, <u>facilitated</u> diffusion, <u>active</u> transport</p> |
| | | Total | 10 | |

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| 3 | (a) | (i) | <p>D cholesterol ;</p> <p>E protein / glycoprotein / intrinsic protein / protein channel / protein pump / transport protein / carrier protein ;</p> <p>F phospholipid (bilayer) / phospholipid head ;</p> | 3 | <p>ACCEPT polypeptide chain</p> <p>DO NOT ACCEPT amino acid chain</p> <p>DO NOT ACCEPT extrinsic protein</p> <p>DO NOT ACCEPT lipids / bilayer</p> |
| 3 | (a) | (ii) | <p>D stabilise the membrane OR maintain / affect / control / AW, fluidity OR reduces permeability to, polar / charged, particles ;</p> <p>E allow communication across membrane OR allow, polar / charged, particles to pass through membrane ;</p> <p>F to act as a barrier (to, polar / charged, particles) / select what enters or leaves cell ;</p> | 3 | <p><i>mark independently of (a)(i) i.e. NO ecf</i></p> <p>DO NOT ACCEPT refs to rigidity / support / strength</p> <p>ACCEPT reduces / affects, lateral movement of phospholipids</p> <p>ACCEPT cell recognition / receptor site / cell signalling / cell attachment</p> <p>ACCEPT (acts as) selectively permeable or partially permeable membrane</p> <p>ACCEPT allows small / fat soluble molecules to pass through</p> <p>DO NOT ACCEPT separates inside from outside</p> |
| 3 | (b) | (i) | <p>communication between cells / AW ;</p> <p>cell, recognition / identification ;</p> <p>cells work together / coordination between action of different cells ;</p> <p>to trigger, response / reaction (inside the cell) ;</p> | 2 max | <p>ACCEPT example to illustrate the point, e.g. action of hormone / cytokines</p> |
| 3 | (b) | (ii) | <p>(receptor) specific shape / described ;</p> <p>complementary to (shape of), trigger / named trigger / communicating ;</p> <p>molecule ;</p> <p>(trigger / AW) binds / attaches to receptor ;</p> | 2 max | <p>ACCEPT tertiary structure</p> <p>DO NOT ACCEPT ref to active site</p> <p>ACCEPT fits / idea of lock & key in correct context</p> <p>DO NOT ACCEPT 'matches'</p> <p>DO NOT ALLOW joins / bonds / links / combines / fits</p> |

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| 3 | (c) | (i) | <p>cell surface / plasma, membrane damaged ;</p> <p>pigment, released / leaks out ; pigment, absorbs / takes up, the light ;</p> | 2 max | <p>ACCEPT description of damage e.g. proteins denatured / phospholipids separate / bilayer melts DO NOT ACCEPT bilayer becomes 'more fluid' DO NOT ACCEPT 'cell membrane' unqualified ACCEPT 'cell contents' for pigment DO NOT ACCEPT 'no light transmitted' 'solution is opaque'</p> |
| 3 | (c) | (ii) | <p><i>Mark first response on each numbered line. Only return to extra points on first or second line if no response in line two or three</i></p> <p>more samples at each temperature ;</p> <p>same / fixed, volume of water ; all samples same, size / surface area ; ref to further cutting to increase surface area ;</p> <p>pieces, rinsed / blotted, after cutting ; more (intermediate) temperatures ;</p> <p>same beetroot used / same part of beetroot used ;</p> | 3 max | <p>ACCEPT repeats ACCEPT collect average / mean results</p> <p>DO NOT ACCEPT mass ACCEPT any method of cutting to provide larger surface area</p> <p>ACCEPT list of figures of additional temps between 0-100 DO NOT ACCEPT wider range of temperatures / more evenly spaced temperatures</p> <p>DO NOT ACCEPT leave for longer DO NOT ACCEPT idea of control</p> |
| Total | | | | 15 | |

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|---|------------|--|-------------|--|--|------------|--|------------|--|------------|---|--|---|--|
| 4 | (a) | <table border="1"> <thead> <tr> <th>description</th> <th>letter</th> </tr> </thead> <tbody> <tr> <td>an animal cell that has been placed in water</td> <td>N ;</td> </tr> <tr> <td>an animal cell that has been placed in a strong sugar solution</td> <td>K ;</td> </tr> <tr> <td>a plant cell that has been placed in water</td> <td>L ;</td> </tr> <tr> <td><i>a plant cell that has been placed in a strong sugar solution</i></td> <td></td> </tr> </tbody> </table> | description | letter | an animal cell that has been placed in water | N ; | an animal cell that has been placed in a strong sugar solution | K ; | a plant cell that has been placed in water | L ; | <i>a plant cell that has been placed in a strong sugar solution</i> | | 3 | |
| description | letter | | | | | | | | | | | | | |
| an animal cell that has been placed in water | N ; | | | | | | | | | | | | | |
| an animal cell that has been placed in a strong sugar solution | K ; | | | | | | | | | | | | | |
| a plant cell that has been placed in water | L ; | | | | | | | | | | | | | |
| <i>a plant cell that has been placed in a strong sugar solution</i> | | | | | | | | | | | | | | |
| 4 | (b) | <p>water moves out of cell ; by osmosis ;</p> <p>cell has, <u>higher</u> / <u>greater</u> / <u>less</u> negative, <u>water potential</u> (than surrounding solution) / ORA ;</p> <p>(water moves) <u>down water potential</u> gradient/from high to low <u>water potential</u> ;</p> | 3 max | <p><i>note: this is explain not describe</i></p> <p>ACCEPT Ψ for water potential must be comparative – DO NOT ACCEPT high alone</p> <p>DO NOT ACCEPT across or along water potential gradient DO NOT ACCEPT ref to water concentration anywhere IGNORE ref to solute potentials</p> | | | | | | | | | | |

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| 4 (c) | <p><i>small, non-polar substances</i> diffuse (through membrane / phospholipid bilayer) ;</p> <p><i>large substances</i> (using), transport / carrier, proteins ;</p> <p>endocytosis / phagocytosis / described ;</p> <p><i>polar substances</i> through, pore / channel, proteins ; (using), transport / carrier, proteins ;</p> <p><i>general – must be used in correct context, each once only</i> ref to facilitated diffusion ;</p> <p>ref to active transport / use of ATP ;</p> <p style="text-align: right;">4 max</p> <p>QWC – technical terms spelled AND used in correct context ;</p> <p style="text-align: right;">1</p> | <p style="text-align: center;">5 max</p> | <p>ACCEPT diffusion / diffuses</p> <p>ACCEPT protein pump DO NOT ACCEPT channel proteins here ACCEPT pinocytosis</p> <p>apply only to large / polar substances</p> <p>apply only to large / polar substances DO NOT ACCEPT ref to active transport with channel proteins</p> <p>(three from: phospholipid / bilayer / diffusion / facilitated diffusion / active transport / transport protein / carrier protein / channel protein / pinocytosis / endocytosis / phagocytosis)</p> <p>if protein spelled incorrectly throughout, only penalise once</p> |
| | | <p style="text-align: center;">[Total : 11]</p> | |

| | | | |
|-----|---|--------------|---|
| | <p>(iii) arrow from R to T ;</p> <p>arrow from R to S AND arrow from S to T OR arrow from R to S to T ;</p> | | <p>e.g.</p>  <p>If contradictory arrows to the above are drawn, apply CON for each arrow going from low Ψ to high Ψ.</p> <p>e.g.</p>  <p>2 gets 0</p> |
| (b) | <p>this is where cambium / meristem / xylem / phloem / vascular bundle, is found ;</p> <p>mitosis/cell division, occurs in cambium (to produce new cells for growth) ;</p> <p>new cells, differentiate / specialise, (into xylem and phloem) ;</p> <p>xylem supplies water for, (cell) elongation / (cell) growth ;</p> <p>phloem supplies, sugars / assimilates, for, energy / growth /respiration ;</p> | <p>max 2</p> | <p>CREDIT from a labelled diagram</p> <p>CREDIT description of position being close to the edge of trunk</p> <p>DO NOT CREDIT responses that suggest that cambium etc. are in or outside bark OR under cut surface</p> <p>ACCEPT cambium differentiates</p> <p>IGNORE nutrients</p> |

| | | | | |
|--|------------|--|------------------|---|
| | (c) | <p>tip / apex, of, shoot / root ;</p> <p>meristem ;</p> <p>bud ;</p> | <p>max 1</p> | <p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>IGNORE root or shoot unqualified</p> <p>ACCEPT behind root tip</p> |
| | (d) | <p>allow <u>oxygen</u> to reach, cells / tissues (under bark) ;</p> <p>for (aerobic) respiration ;</p> <p>animals transport oxygen in, blood / circulation / transport system ;</p> <p>plants do not transport (much) oxygen in transport system ;</p> <p><i>idea that</i> (oxygen not supplied from leaves as) stomata only open in day / no leaves in winter ;</p> | <p>max 2</p> | <p>IGNORE refs to need for CO₂/ photosynthesis throughout</p> <p>ACCEPT correct formula O₂</p> <p>DO NOT CREDIT oxygen for photosynthesis</p> <p>ACCEPT gas(es) for oxygen</p> <p>ACCEPT gas(es) for oxygen</p> |
| | | <p>Total</p> | <p>10</p> | |