

Biology

Advanced GCE A2 H421

Advanced Subsidiary GCE AS H021

Mark Scheme for the Units

June 2009

H021/H421/MS/R/09

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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F211 Cells, Exchange and Transport

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|-------|--|-------|--|
| 1 | (a) | (i) | goblet / mucus (secreting) cell ; ciliated (epithelium) ; | 2 | DO NOT ACCEPT 'globlet' DO NOT ACCEPT 'cilia cell' 'ciliate' |
| 1 | (a) | (ii) | (A / goblet cells) release mucus / AW ; (mucus) traps, dust / particles / named particle ; ciliated cell / B / cilia, wave / waft / move, mucus ; to, top of trachea / back of mouth / AW ; | 3 max | ACCEPT release / creates / produces / secretes DO NOT ACCEPT excrete ACCEPT bacteria / microorganisms / pathogens IGNORE dirt / germs DO NOT ACCEPT 'combines with' ACCEPT 'hair like projections' DO NOT ACCEPT 'hairs' Idea of up and out of lungs |
| 1 | (a) | (iii) | to constrict the bronchus / AW ; | 1 | example of AW e.g. reduce diameter of bronchus DO NOT ACCEPT 'ref to increasing diameter' – (note: if 'increase and decrease diameter' is used do not allow mark as it is contradiction) ACCEPT 'airways' ACCEPT 'control flow of air' |

| Question | | | Expected Answers | Marks | Additional Guidance |
|--------------|-----|------|---|----------|---|
| 1 | (b) | (i) | short, distance / path / AW ; (so that) diffusion / concentration, gradient is, high / steep ; high rate of, (gas) exchange / diffusion ; | 2 max | DO NOT ACCEPT ref to number of cells / cell thickness or short space DO NOT ACCEPT short gradient ACCEPT high rate of movement of named gas in correct direction ACCEPT 'rapid' / fast / quick ACCEPT ref to efficient, gas exchange / diffusion DO NOT ACCEPT gas exchange occurs more 'easily' |
| | (b) | (ii) | recoil / expel air / prevent bursting ; | 1 | ACCEPT exhale more completely / force air out DO NOT ACCEPT 'exhale' (if used alone) DO NOT ACCEPT 'contract' DO NOT ACCEPT 'stretch' on its own DO NOT ACCEPT if response includes any ref to bronchus or smooth muscle |
| Total | | | | 9 | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|------|--|-------|---|
| 2 | (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> |
| 2 | (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> |
| 2 | (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> |
| 2 | (b) | (ii) | <p>(receptor) specific shape / described ;</p> <p><u>complementary</u> 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> |

| Question | | | Expected Answers | Marks | Additional Guidance |
|--------------|-----|------|--|-----------|---|
| 2 | (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> |
| 2 | (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 | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|------|---|-------|--|
| 3 | (a) | | <u>transpiration</u> ; <u>xylem</u> ; <u>osmosis</u> ; stoma(ta) / stomatal pore ; | 4 | DO NOT ACCEPT 'diffusion' alone ACCEPT diffusion with osmosis used as qualification DO NOT ACCEPT 'pore' or 'guard cells' |
| 3 | (b) | (i) | stomata (open to) allow, gaseous exchange / carbon dioxide in / oxygen out / AW ; (gaseous exchange) for photosynthesis ; (photosynthesis) essential for plant to, gain energy / make sugars ; some water lost through cuticle ; | 2 max | look for reverse argument DO NOT ACCEPT ref to air OR to get gases OR let gases in ACCEPT 'gases in <u>and</u> out' |
| | (b) | (ii) | <u>xerophyte</u> ; | 1 | DO NOT ACCEPT cactus |

| Question | Expected Answers | Marks | Additional Guidance |
|-----------|--|-------|---|
| (b) (iii) | <p>Allow the first point once as further explanation for A1 – A4 in addition to the linked explanation: reduce water (vapour) potential gradient / diffusion gradient ;</p> <p>[A 1] hairy leaves ; trap water vapour / moisture ;</p> <p>[A 2] stomata, in pits / sunken ; pits trap, water vapour / moisture ;</p> <p>[A 3] rolled leaves / presence of hinge cells ; reduce surface area OR (rolled leaves) trap water vapour / moisture ;</p> <p>[A 4] high solute concentration in cells ; reduces water potential inside leaf cells ;</p> <p>[A 5] thick(er) cuticle ; (which is) waterproof / (relatively) impermeable ;</p> <p>[A 6] small leaves / needles ; smaller surface area ;</p> <p>[A 7] fewer stomata ; reduces diffusion (of water vapour) ;</p> <p>[A 8] stomata close, during the day ; reduces diffusion (of water vapour) ;</p> <p>[A 9] most stomata on lower surface ; less exposure to sun OR cooler OR reduces diffusion (of water vapour) ;</p> | | <p>MARK FIRST TWO ADAPTATIONS ONLY ALLOW max 2 for adaptation [A] marks</p> <p>Explanation must be linked to an appropriate statement of adaptation. Allow an explanation mark even if adaptation mark not awarded.</p> <p>DO NOT ACCEPT ‘water’ for ‘water vapour’ throughout DO NOT ACCEPT ‘transpiration’ for diffusion of water vapour throughout DO NOT ACCEPT surface area to volume ratio</p> <p>ACCEPT ‘spines’ DO NOT ACCEPT surface area to volume ratio</p> |

| Question | Expected Answers | Marks | Additional Guidance |
|----------|--|---------------------|---|
| | <p>[A 10] more densely packed spongy mesophyll ; smaller surface area for evaporation (from mesophyll cell surface) ; 4 max</p> <p>QWC - technical terms used appropriately and spelt correctly ; 1</p> | <p>5 max</p> | <p>Use three terms from: cuticle, impermeable, water vapour, potential gradient, diffuse / diffusion, stoma(ta), needles, surface area, hinge cells, saturated</p> |
| | <p>Total</p> | <p>12</p> | |

| Question | | Expected Answers | | Marks | Additional Guidance |
|----------|-----|------------------|---|--|---|
| 4 | (a) | | prokaryotic | | <p>DO NOT ACCEPT chromatid</p> <p>Figures must have correct units ACCEPT any figure(s) in range 10 – 100 μm ACCEPT any figure(s) in range 10 – 20 nm ACCEPT 70 S</p> <p>DO NOT ACCEPT sometimes or usually present</p> |
| | | | | as chromosomes / chromatin OR (genetic material) associated with, proteins / histones ; | |
| | | | | (diameter of cell) 20 – 40 μm ; | |
| | | | (ribosomes) 18nm ; | | |
| | | | cell wall (present) ; | | |
| | | | | 4 | |
| | (b) | (i) | flagellum / cilium / microtubule / microfilament / undulipodium ; | 1 | ACCEPT plurals |
| 4 | (b) | (ii) | <p>(<i>movement inside cells of</i>)</p> <p>chromosomes / chromatids (in cell division) ; (cytoplasm in) cytokinesis ; organelles / named organelle ;</p> <p>RNA (in protein synthesis) ; proteins ;</p> | 2 max | <p>DO NOT ACCEPT mitosis / cell division</p> <p>e.g. centriole / vesicle / lysosome / mitochondrion / chloroplast / ribosome</p> <p>ensure that the proteins are being moved in cytoplasm by microtubules rather than by ER or in vesicles (mark given above)</p> |
| | | | Total | 7 | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|------|---|----------|--|
| 5 | (a) | | Q, T, P, R ; ; ; ; | 4 | Allocate marks for the following pairs: S – Q Q – T T – P P – R |
| 5 | (b) | (i) | growth of cell / growth of organelles / increase number of organelles / synthesis of proteins ; | 1 | DO NOT ACCEPT 'growth' unqualified DO NOT ACCEPT refs to DNA replication IGNORE ref. to respiration ACCEPT named steps in protein synthesis |
| 5 | (b) | (ii) | mutation / faulty DNA produced / error in copying ; daughter cells will not receive identical genetic information ; proteins / (daughter) cells, not made / do not function ; | 2 | ACCEPT 'daughter cells will not be clones' ACCEPT 'proteins / daughter cells function differently' |
| 5 | (c) | | haploid / half genetic information / chromosome number is n ; genetic information not identical / produces genetically different cells ; 4 cells produced ; | 2 max | ACCEPT use of comparative chromosome numbers as example DO NOT ACCEPT identical / not identical without 'genetic' DO NOT ACCEPT smaller cells |
| | | | Total | 9 | |

| Question | | | Expected Answers | Marks | Additional Guidance |
|----------|-----|------|---|-----------|---|
| 6 | (a) | (i) | cardiac ; | 1 | ACCEPT myogenic |
| 6 | (a) | (ii) | (muscle) contraction / systole ; | 1 | ACCEPT atrial or ventricular systole DO NOT ACCEPT atrial or systolic pressure |
| 6 | (b) | (i) | <i>correct answer = two marks</i> 75 ; ; <i>if answer incorrect ALLOW one mark for correct working</i> 60 / 0.8 | 2 | |
| 6 | (b) | (ii) | pressure in ventricle is below (pressure in) atrium ; bicuspid / atrioventricular valve, open(s) ; blood flows into (atrium and) ventricle ; max 3 QWC - technical terms used appropriately and spelt correctly ; 1 | 4 | ORA ACCEPT mitral DO NOT ACCEPT pushed or pumped DO NOT ACCEPT arterioventricular Use three terms in correct biological context from: ventricle / ventricular, atrium / atrial, bicuspid, mitral, atrioventricular, diastole |
| | | | Total | 8 | |
| | | | Paper Total | 60 | |