

Biology

Advanced Subsidiary GCE

Unit **F211**: Cells, Exchange and Transport

Mark Scheme for January 2013

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

| Annotation | Meaning |
|---|---------------------------------|
|  | Benefit of Doubt |
|  | Contradiction |
|  | Cross |
|  | Error carried forward |
|  | Given Mark |
|  | Extendable horizontal wavy line |
|  | Ignore |
|  | QWC Point |
|  | Benefit of Doubt not given |
|  | additional QWC credit given |
|  | Tick |
|  | Tick 1 |
|  | Tick 2 |
|  | Omission Mark |

| Question | | Answer | Marks | Guidance |
|----------|---------|---|-------|--|
| 1 | (a) | <p>low / small, surface area to volume ratio ;</p> <p>diffusion, too slow / distance too great ;</p> <p>to supply enough, oxygen / (named) nutrients ;</p> <p>to prevent, CO₂ / (named) waste product, building up ;</p> <p>active ;</p> | 3 max | <p>Mark the first 3 suggestions</p> <p>CREDIT SA/Vol, SA:Vol</p> <p>ACCEPT surface area to volume (ie if 'ratio' missed)</p> <p>IGNORE lower SA / Vol</p> <p>ACCEPT diffusion pathway too long</p> <p>ACCEPT diffusion insufficient because, body too large / tissues too deep</p> <p>ACCEPT 'transport enough' for 'supply enough' idea of 'enough' is important</p> <p>ACCEPT to remove waste products</p> <p>ACCEPT to prevent waste reaching toxic levels</p> <p>ACCEPT high demand for oxygen / energy</p> <p>OR high metabolic rate</p> <p>OR endotherm / maintaining temperature / exercising</p> |
| | (b) (i) | <p><u>electrocardiogram</u> ;</p> | 1 | <p>Mark the first answer. 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 ECG</p> <p>DO NOT CREDIT electrocardiograph</p> |
| | (ii) | <p>A sinoatrial node / SAN ;</p> <p>B atrioventricular node / AVN ;</p> | 2 | <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>sinalatrial node / sanatrial node = NBOD</p> <p>atroventricular / atrialventricular, node= BOD</p> <p>artrialventricular / avioventricular node = NBOD</p> |

| Question | | Answer | Marks | Guidance |
|----------|---------|--|-----------|--|
| | (c) (i) | (to allow time) for the atria to (fully) contract ; to allow (time for), atria to empty / blood to move / ventricles to fill ; so that ventricle(s) do not contract, too early ; | 2 max | ACCEPT systole for contraction IGNORE pumping ACCEPT so atria and ventricles do not contract at the same time ACCEPT (atria contract) before ventricular systole occurs Note: so ventricles do not contract before they are full = 2 so ventricles do not contract before atria are empty = 2 so atria have time to empty before the ventricles start to contract = 2 |
| | (ii) | so that (ventricular) contraction starts at, apex / base / bottom ; to push blood upwards OR into/ towards, (named) arteries ; complete / efficient, emptying of ventricles ; | 2 max | IGNORE ref to gravity / ref to blood pressure ACCEPT systole for contraction ACCEPT contract from the apex IGNORE pumping ACCEPT force all blood out of heart |
| | | Total | 10 | |

| Question | | | Answer | Marks | Guidance |
|----------|-----|------|---|-------|---|
| 2 | (a) | (i) | budding ; | 1 | <p>Mark the first answer. 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 mitosis / asexual</p> |
| | | (ii) | <p><u>mitosis</u> ;</p> <p>swelling / bulge, in (surface of) the cell ;</p> <p>nucleus moves into, swelling / bulge / bud ;</p> <p>idea that, bulge / bud, nips / pinches / breaks off / cleaves ;</p> <p>ref to uneven distribution of cytoplasm ;</p> | 2 max | <p>Ensure this is in context of before nucleus moves into bud</p> <p>IGNORE bud / growth</p> <p>IGNORE DNA / genetic material</p> <p>IGNORE 'separates' / 'detaches'</p> |
| | (b) | (i) | 35 / 36 ; ; | 2 | <p>Correct answer = 2 marks</p> <p>If not whole number e.g. 35.79 or 35.8 = 1 mark</p> <p>If answer incorrect allow one mark for seeing: $4 \times 3.14 \times 1.5^2 \div 3.14 \times 0.5^2$</p> <p>OR $4 \times 1.5^2 \div 0.5^2$</p> <p>OR $4 \times 2.25 \div 0.25$</p> <p>OR</p> $\frac{4 \times 3.14 \times 2.25}{3.14 \times 0.25}$ |

| Question | Answer | Marks | Guidance |
|----------|---|-----------------------|---|
| | <p>(ii) new bud cannot occur, on / close to, old scar ;</p> <p>not enough space between scars for another bud ;</p> <p>yeast cell not a true sphere ;</p> <p>(gene) mutation / DNA damage ;</p> | 1 max | <p>CREDIT idea that some of surface between scars is not used / ref to unable to tessellate / scars not closely packed</p> <p>IGNORE 'covered in scars' OR ref to scar size</p> <p>IGNORE ref to chromosome numbers</p> |
| | <p>(c)</p> <p>(cells) differentiate(d) / specialise(d) ;</p> <p>(groups of) cells form tissue(s) ;</p> <p>(groups of) tissues form organ(s) ;</p> <p>(groups of organs) form organ system(s) ;</p> <p>(group of) cells / tissues / organs / organ systems, work together / interact ;</p> <p>named example of a tissue / an organ /an organ system ;</p> <p>QWC ;</p> | <p>4 max</p> <p>1</p> | <p>IGNORE 'system' alone</p> <p>ACCEPT same job / same task / same function</p> <p>It should be clear whether they are naming a tissue, an organ or a system</p> <p>NOTE e.g. cells work together to form tissues = 2 marks (mp2 and 5)</p> <p>two terms used appropriately and spelled correctly</p> <p>ACCEPT correct derivations of these terms: differentiate, specialise / specialize, tissue, organ, organ system</p> |
| | Total | 11 | |

| Question | | Answer | Marks | Guidance |
|----------|-----|---|-------|--|
| 3 | (a) | partially permeable ; | 1 | ACCEPT selectively permeable / differentially permeable DO NOT CREDIT semi permeable IGNORE fluid mosaic |
| | (b) | fluid mosaic ; active ; fats / lipids / oils / cholesterol / oxygen / carbon dioxide / (named) steroid hormones / fat soluble vitamins ; carrier / (co)transport(er) ; | 4 | ACCEPT phonetic spelling IGNORE 'mosaic structure' ACCEPT O ₂ and CO ₂ ACCEPT Vitamin A / D / E / K DO NOT CREDIT water DO NOT CREDIT channel |
| | (c) | (i) communication between cells ; <i>idea that:</i> molecule released by one cell, attaches to / causes change in, another cell ; | 1 max | ACCEPT cell communication IGNORE ref to cell recognition and cell binding |

| Question | | Answer | Marks | Guidance |
|--------------|------|---|-----------------------|---|
| | (ii) | <p>release of signal molecule by, exocytosis / secretion OR described ;</p> <p><i>idea that:</i> proteins / glycoproteins / glycolipids, act as / have, receptors OR described ;</p> <p><i>idea that:</i> receptor / signal, is specific ;</p> <p><i>idea that:</i> shape of receptor and signal are complementary ;</p> <p><i>idea that:</i> attachment of signal molecule causes change (inside cell / on cell surface) ;</p> <p>cell surface membrane allows entry of some signal molecules ;</p> <p>QWC ;</p> | <p>3 max</p> <p>1</p> | <p>ACCEPT hormone / messenger (molecule) / named hormone for signal throughout IGNORE 'molecule' / 'proteins' alone unless qualified</p> <p>ACCEPT eg 'place for signal molecules to bind' or 'binding site' for 'receptor'</p> <p>IGNORE ref to recognition as meaning specific specific can be described</p> <p>this can be described</p> <p>e.g. cause release of cAMP e.g. hormones trigger a reaction in the cell</p> <p>ACCEPT diffusion (in context of steroid hormones)</p> <p>Award for two terms used appropriately and spelled correctly exocytosis, secretion / secretes / secreted, glycoprotein, glycolipid, receptor, specific, complementary</p> |
| Total | | | 10 | |

| Question | | | Answer | Marks | Guidance |
|----------|-----|-----|---|-------|---|
| 4 | (a) | (i) | <u>units</u> ; mm s ⁻¹ ; raw data ; leaf area ; | 2 max | ACCEPT mm min ⁻¹ / cm min ⁻¹ / cm s ⁻¹ / written in words ACCEPT mm ³ min ⁻¹ / cm ³ min ⁻¹ / cm ³ s ⁻¹ / written in words e.g. individual trial results / the repeat readings / data used to calculate the mean IGNORE only the mean is shown IGNORE 'how many repeats were done' |

| Question | Answer | Marks | Guidance |
|----------|--|-------|---|
| | <p>(ii)</p> <p><i>description</i> as number of leaves increases the (rate of) bubble movement increases ; (pair of) figs to illustrate the change ;</p> <p><i>explanation</i> larger (surface) area ; more stomata ; more / fast(er), evaporation / transpiration / loss of water vapour ; more / fast(er), uptake of water (by shoot) ;</p> <p><i>idea that:</i> (some) bubble movement with no leaves as not all uptake due to transpiration from leaves ;</p> | 3 max | <p>ACCEPT ORA throughout IGNORE refs to more bubbles / photosynthesis</p> <p>must be pair of figures illustrating change eg 7 bubble movement with 0 leaves and 92 bubble movement with 8 leaves</p> <p>ACCEPT calculated difference e.g. increase of 21 between 2 & 4</p> <p>ACCEPT 'surface area increases'</p> <p>IGNORE 'many stomata' OR 'more stomata open'</p> <p>NOTE e.g. more, stomata / surface area for transpiration = 2 marks (as more transpiration implied)</p> <p>e.g some loss from other parts of stem / uptake into cells</p> |

| Question | Answer | Marks | Guidance |
|----------|--|-----------|---|
| (b) | <p><i>statement 1</i> <u>surface area / SA</u>, of leaves is different</p> <p>OR</p> <p>different number of stomata ;</p> <p>(choose shoot(s) with), similar sized leaves / similar surface area</p> <p>OR</p> <p>repeats to calculate mean ;</p> <p><i>statement 2</i> reduces water (vapour) potential gradient (between inside and outside of leaf) ;</p> <p>assemble without wetting leaves / dry the leaves / wait until leaves dry ;</p> <p><i>statement 3</i> (increased temperature) will increase, evaporation / transpiration / loss of water vapour ;</p> <p>control the temperature / carry out in room with controlled temperature ;</p> | 6 | <p>IGNORE 'surface area to volume ratio' (as a phrase)</p> <p>ACCEPT measure surface area of each leaf and calculate rate of movement per unit area ACCEPT measure leaves to check they are same size DO NOT CREDIT cut or trim leaves to size</p> <p>ACCEPT water potential outside leaf is too high OR WP outside higher than inside</p> <p>IGNORE ref to light</p> <p>ACCEPT do it in constant temperature CREDIT suitable practical method of achieving this IGNORE 'pull blinds down' / 'open the window' / 'general ref to environment or conditions', without mentioning temperature or heat</p> |
| | Total | 11 | |

| Question | | Answer | Marks | Guidance | | | |
|--------------|-----|---------------------|----------|---|------------|-------------|----------------|
| 5 | (a) | | 4 | <p>Allow one mark for each correct row. DO NOT CREDIT 'hybrid' ticks or crosses</p> <p>NB each row must have 3 correctly completed boxes</p> | | | |
| | | | | | cell type | | |
| | | feature | | | plant cell | animal cell | bacterial cell |
| | | mitochondria | | | ✓ | ✓ | x |
| | | chloroplasts | | | ✓ | x | x |
| | | cellulose cell wall | | | ✓ | x | x |
| | | centrioles | x | ✓ | x | | |
| | | ribosomes | ✓ | ✓ | ✓ | | |
| | (b) | (i) | 4 | <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> | | | |
| | | (ii) | 1 | IGNORE 'tube number' | | | |
| Total | | | 9 | | | | |

| Question | | | Answer | Marks | Guidance |
|----------|-----|------|---|-------|--|
| 6 | (a) | (i) | <p>provides, strength / support ;</p> <p>to keep, it / the vessel / the tube, open OR prevent collapse of, vessel / tube ;</p> <p>(because) transpiration produces, tension / negative pressure ;</p> <p>to waterproof the, cell / vessel / tube / wall ;</p> <p>(so) <u>cell</u>, dies / content decays ;</p> <p>to create a hollow, tube / vessel OR to create a continuous column / allow unimpeded flow ;</p> <p>to limit lateral flow of water ;</p> <p>ref to adhesion (between water molecules and wall) ;</p> | 3 max | <p>IGNORE ref to flexibility</p> <p>IGNORE xylem unqualified</p> <p>IGNORE 'collapse of wall'</p> <p>IGNORE 'xylem'</p> <p>IGNORE xylem vessels die</p> <p>CREDIT reduce / prevent lateral movement</p> <p>ACCEPT lignin helps water move by adhesion</p> |
| | | (ii) | <p>(provides) strength / support, to keep, it / trachea / airway, open OR (provides) strength / support, to prevent collapse ;</p> <p>during, inspiration / inhaling / breathing in ;</p> <p>volume of, chest cavity / thorax / lungs, increases ;</p> <p>low(er) / negative, pressure in, trachea / thorax / lungs ;</p> | 3 max | <p>IGNORE ref to alveoli / C-shape of cartilage</p> <p>ACCEPT in context of bending the neck</p> |

| Question | | Answer | Marks | Guidance |
|----------|-----|---|----------|--|
| | (b) | <p>body has small <u>surface area to volume ratio</u> OR lungs, provide / have, large <u>surface area to volume ratio</u> ;</p> <p>correct calculation of (one) surface area to volume ratio ;</p> <p><i>idea of:</i> body SA / SA:Vol is not big enough to meet body's needs OR lung SA / SA:Vol is big enough to meet body's needs ;</p> <p>oxygen into (blood / body) and carbon dioxide out (of blood / body) ;</p> | 3 max | <p>ensure that 'surface area to volume ratio' is used correctly</p> <p>CREDIT SA/Vol, SA:Vol ACCEPT person for body</p> <p>25.7 /26 (:1) for body OR 1000(:1) for lungs DO NOT CREDIT 1 : 1000 OR 1 : 26</p> <p>e.g. allows gaseous exchange at a high enough rate IGNORE ref to efficiency</p> <p>CREDIT O₂ and CO₂</p> |
| | | Total | 9 | |

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