

**Biology**

Advanced GCE A2 H421

Advanced Subsidiary GCE AS H021

**Mark Scheme for the Units**

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**June 2009**

**H021/H421/MS/R/09**

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**Advanced Subsidiary GCE Biology (H021)**

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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	<b>DO NOT ACCEPT</b> 'globlet' <b>DO NOT ACCEPT</b> '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	<b>ACCEPT</b> release / creates / produces / secretes <b>DO NOT ACCEPT</b> excrete  <b>ACCEPT</b> bacteria / microorganisms / pathogens <b>IGNORE</b> dirt / germs <b>DO NOT ACCEPT</b> 'combines with' <b>ACCEPT</b> 'hair like projections' <b>DO NOT ACCEPT</b> '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 <b>DO NOT ACCEPT</b> 'ref to increasing diameter' – (note: if 'increase and decrease diameter' is used do not allow mark as it is contradiction) <b>ACCEPT</b> 'airways' <b>ACCEPT</b> '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	<b>DO NOT ACCEPT</b> ref to number of cells / cell thickness or short space <b>DO NOT ACCEPT</b> short gradient <b>ACCEPT</b> high rate of movement of named gas in correct direction <b>ACCEPT</b> 'rapid' / fast / quick <b>ACCEPT</b> ref to efficient, gas exchange / diffusion <b>DO NOT ACCEPT</b> gas exchange occurs more 'easily'
	(b)	(ii)	recoil / expel air / prevent bursting ;	1	<b>ACCEPT</b> exhale more completely / force air out <b>DO NOT ACCEPT</b> 'exhale' (if used alone) <b>DO NOT ACCEPT</b> 'contract' <b>DO NOT ACCEPT</b> 'stretch' on its own <b>DO NOT ACCEPT</b> if response includes any ref to bronchus or smooth muscle
<b>Total</b>				<b>9</b>	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	<p><b>D</b> cholesterol ;</p> <p><b>E</b> protein / glycoprotein / intrinsic protein / protein channel / protein pump / transport protein / carrier protein ;</p> <p><b>F</b> phospholipid (bilayer) / phospholipid head ;</p>	3	<p><b>ACCEPT</b> polypeptide chain</p> <p><b>DO NOT ACCEPT</b> amino acid chain</p> <p><b>DO NOT ACCEPT</b> extrinsic protein</p> <p><b>DO NOT ACCEPT</b> lipids / bilayer</p>
2	(a)	(ii)	<p><b>D</b> stabilise the membrane OR maintain / affect / control / AW, fluidity OR reduces permeability to, polar / charged, particles ;</p> <p><b>E</b> allow communication across membrane OR allow, polar / charged, particles to pass through membrane ;</p> <p><b>F</b> 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><b>DO NOT ACCEPT</b> refs to rigidity / support / strength</p> <p><b>ACCEPT</b> reduces / affects, lateral movement of phospholipids</p> <p><b>ACCEPT</b> cell recognition / receptor site / cell signalling / cell attachment</p> <p><b>ACCEPT</b> (acts as) selectively permeable or partially permeable membrane</p> <p><b>ACCEPT</b> allows small / fat soluble molecules to pass through</p> <p><b>DO NOT ACCEPT</b> 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><b>ACCEPT</b> 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><b>ACCEPT</b> tertiary structure</p> <p><b>DO NOT ACCEPT</b> ref to active site</p> <p><b>ACCEPT</b> fits / idea of lock &amp; key in correct context</p> <p><b>DO NOT ACCEPT</b> 'matches'</p> <p><b>DO NOT ALLOW</b> 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><b>ACCEPT</b> description of damage e.g. proteins denatured / phospholipids separate / bilayer melts <b>DO NOT ACCEPT</b> bilayer becomes 'more fluid' <b>DO NOT ACCEPT</b> 'cell membrane' unqualified <b>ACCEPT</b> 'cell contents' for pigment <b>DO NOT ACCEPT</b> '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><b>ACCEPT</b> repeats <b>ACCEPT</b> collect average / mean results</p> <p><b>DO NOT ACCEPT</b> mass <b>ACCEPT</b> any method of cutting to provide larger surface area</p> <p><b>ACCEPT</b> list of figures of additional temps between 0-100 <b>DO NOT ACCEPT</b> wider range of temperatures / more evenly spaced temperatures</p> <p><b>DO NOT ACCEPT</b> leave for longer <b>DO NOT ACCEPT</b> idea of control</p>
<b>Total</b>				<b>15</b>	

Question			Expected Answers	Marks	Additional Guidance
3	(a)		<u>transpiration</u> ; <u>xylem</u> ; <u>osmosis</u> ; stoma(ta) / stomatal pore ;	<b>4</b>	<b>DO NOT ACCEPT</b> 'diffusion' alone <b>ACCEPT</b> diffusion with osmosis used as qualification <b>DO NOT ACCEPT</b> '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 ;	<b>2 max</b>	look for reverse argument <b>DO NOT ACCEPT</b> ref to air OR to get gases OR let gases in <b>ACCEPT</b> 'gases in <u>and</u> out'
	(b)	(ii)	<u>xerophyte</u> ;	<b>1</b>	<b>DO NOT ACCEPT</b> cactus



Question	Expected Answers	Marks	Additional Guidance
(b) (iii)	<p>Allow the first point <b>once</b> as further explanation for A1 – A4 in addition to the linked explanation:  reduce water (vapour) <b>potential gradient</b> / <b>diffusion</b> gradient ;</p> <p><b>[A 1]</b> hairy leaves ;  trap <b>water vapour</b> / moisture ;</p> <p><b>[A 2]</b> <b>stomata</b>, in pits / sunken ;  pits trap, <b>water vapour</b> / moisture ;</p> <p><b>[A 3]</b> rolled leaves / presence of <b>hinge cells</b> ;  reduce <b>surface area</b> OR (rolled leaves) trap <b>water vapour</b> / moisture ;</p> <p><b>[A 4]</b> high solute concentration in cells ;  reduces water potential inside leaf cells ;</p> <p><b>[A 5]</b> thick(er) <b>cuticle</b> ;  (which is) waterproof / (relatively) <b>impermeable</b> ;</p> <p><b>[A 6]</b> small leaves / <b>needles</b> ;  smaller <b>surface area</b> ;</p> <p><b>[A 7]</b> fewer <b>stomata</b> ;  reduces <b>diffusion</b> (of water vapour) ;</p> <p><b>[A 8]</b> <b>stomata</b> close, during the day ;  reduces <b>diffusion</b> (of water vapour) ;</p> <p><b>[A 9]</b> most <b>stomata</b> on lower surface ;  less exposure to sun OR cooler OR reduces diffusion (of water vapour) ;</p>		<p><b>MARK FIRST TWO ADAPTATIONS ONLY</b>  <b>ALLOW</b> 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><b>DO NOT ACCEPT</b> ‘water’ for ‘water vapour’ throughout  <b>DO NOT ACCEPT</b> ‘transpiration’ for diffusion of water vapour throughout  <b>DO NOT ACCEPT</b> surface area to volume ratio</p> <p><b>ACCEPT</b> ‘spines’  <b>DO NOT ACCEPT</b> 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><b>5 max</b></p>	<p>Use three terms from:  cuticle, impermeable, water vapour, potential gradient,  diffuse / diffusion, stoma(ta), needles, surface area,  hinge cells, saturated</p>
	<p><b>Total</b></p>	<p><b>12</b></p>	

Question		Expected Answers		Marks	Additional Guidance
4	(a)		prokaryotic		<p><b>DO NOT ACCEPT</b> chromatid</p> <p>Figures must have correct units  <b>ACCEPT</b> any figure(s) in range 10 – 100 <math>\mu\text{m}</math></p> <p><b>ACCEPT</b> any figure(s) in range 10 – 20 nm  <b>ACCEPT</b> 70 S</p> <p><b>DO NOT ACCEPT</b> sometimes or usually present</p>
				as chromosomes / chromatin OR (genetic material) associated with, proteins / histones ;	
				(diameter of cell) 20 – 40 $\mu\text{m}$ ;	
			(ribosomes) 18nm ;		
			cell wall (present) ;		
				4	
	(b)	(i)	flagellum / cilium / microtubule / microfilament / undulipodium ;	1	<b>ACCEPT</b> 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><b>DO NOT ACCEPT</b> 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>
			<b>Total</b>	<b>7</b>	

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	<b>DO NOT ACCEPT</b> 'growth' unqualified <b>DO NOT ACCEPT</b> refs to DNA replication <b>IGNORE</b> ref. to respiration <b>ACCEPT</b> 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	<b>ACCEPT</b> 'daughter cells will not be clones' <b>ACCEPT</b> '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	<b>ACCEPT</b> use of comparative chromosome numbers as example <b>DO NOT ACCEPT</b> identical / not identical without 'genetic' <b>DO NOT ACCEPT</b> smaller cells
			<b>Total</b>	<b>9</b>	

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