



# GCE

## Biology

Advanced GCE A2 H421

Advanced Subsidiary GCE AS H021

# Mark Scheme for the Units

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## January 2010

**HX21/MS/R/10J**

# F211 Cells, Exchange and Transport

Question			Expected Answers	Marks	Additional Guidance
1	(a)		<u>1500</u> ;	2	ACCEPT 1400 and 300,000 for 1 max only
			<u>500 000</u> ;		
1	(b)		ability to see (two) objects (that are close together) as separate objects / AW ; see detail ;	2	ACCEPT ability to distinguish two objects IGNORE clarity / clear
1	(c)	(i)	transports water (up plant) ;	1 max	ACCEPT alternative wording for transport e.g. movement DO NOT ACCEPT up and down DO NOT ACCEPT water and sugars
			transports, minerals / ions, (up plant) ;		ACCEPT alternative wording for transport IGNORE ref nutrients / solutes DO NOT ACCEPT sugars
			support (plant / stem / shoot) ;		ACCEPT keeps plant upright

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Question			Expected Answers	Marks	Additional Guidance
1	(c)	(ii)	<p><i>Functions:</i></p> <p><b>F1</b> (lignin), strengthens / thickens, the (xylem) <u>wall</u> ;</p> <p><b>F2</b> waterproofing (wall) / AW ;</p> <p><b>F3</b> (improving) adhesion of water (molecules) ;</p> <p><b>F4</b> (spiral) pattern allows flexibility / stretching / movement;</p> <p style="text-align: right;"><b>2 max</b></p>		<p><b>ACCEPT</b> support only if in specific context of supporting the xylem <u>wall</u></p> <p><b>ACCEPT</b> waterproofs cell</p> <p><b>DO NOT ACCEPT</b> adhesion <b>and</b> cohesion when used together</p> <p>Flexibility / stretching must ref, <i>pattern</i> of lignin laid down i.e. spirals</p>
			<p><i>Explanation:</i></p> <p><b>E1</b> prevents collapse of xylem ;</p> <p><b>E2</b> (water) under tension / at low pressure / negative pressure;</p> <p><b>E3</b> reduces (lateral) loss of water, through wall ;</p> <p><b>E4</b> increases capillarity / AW ;</p> <p><b>E5</b> prevents stem breaking / AW ;</p> <p style="text-align: right;"><b>2 max</b></p>	<b>3 max</b>	<p><i>Award mark(s) for function and explanation independently</i></p> <p><b>DO NOT CREDIT</b> loss of water unqualified</p>

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Question			Expected Answers	Marks	Additional Guidance
1	(c)	(iii)	(pits) allow water to move, in / out / between, <u>vessel(s)</u> ; to bypass blockage ; supply water to other, tissues / (other types) cells / parts of plant ;	2 max	<b>ACCEPT</b> lateral movement for 'out' <b>ACCEPT</b> bypass air lock <b>ACCEPT</b> any named, tissue / cells e.g. to allow water to other tissues 1 mark to allow water out to other tissues 1 mark to allow water out of vessel to other tissues 2 marks
			<b>Total</b>	<b>10</b>	

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Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	collection / group, of cells (of one or more types) ;	2 max	<b>IGNORE</b> ref similar cells
			(cells), working together <b>OR</b> with, common / same, function ;		<b>ACCEPT</b> a group of cells with a function = 2 marks
			specialised (cells) ;		<b>DO NOT CREDIT</b> differentiated
2	(a)	(ii)	squamous / ciliated ;	1	<b>ACCEPT</b> endothelium / columnar <b>DO NOT ACCEPT</b> cilia, goblet cell, ciliated <i>cells</i>
2	(b)		(organ is) a collection of tissues / named tissues ;	2	Look for idea of more than one tissue <b>ACCEPT</b> two or more correctly named tissues from: epithelium, elastic, glandular, smooth muscle, blood, nervous, cartilage, connective
			(working together) to enable gas exchange / AW ;		<b>DO NOT ACCEPT</b> perform a function unqualified – we want to know <i>what</i> function (can be named or described) <b>DO NOT ACCEPT</b> respiration <b>IGNORE</b> breathing

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Question			Expected Answers	Marks	Additional Guidance
2	(c)	(i)	<i>(release of energy)</i> mitochondria ;	1	
		(ii)	<i>(movement of cilia)</i> cytoskeleton ;	1	<b>ACCEPT</b> mitochondria if not used in <b>(i)</b>
		(iii)	<i>(secretion of mucus)</i> Golgi (vesicle) ;	1	<b>ACCEPT</b> cytoskeleton if not used in <b>(ii)</b> <b>ACCEPT</b> Golgi body / apparatus <b>DO NOT ACCEPT</b> Golgi vessel
			<b>Total</b>	<b>8</b>	

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Question		Expected Answers	Marks	Additional Guidance
3	(a)	partially / selectively ;  (facilitated) diffusion <b>OR</b> osmosis ; plasma ; phospholipids ; cholesterol ;	5	<b>DO NOT ACCEPT</b> semi <b>ACCEPT</b> differentially  <b>ACCEPT</b> plasma cell

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



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Question		Expected Answers	Mark	Additional Guidance
4	(a)	timer <b>OR</b> scale / ruler ;	1	
4	(b)		3 max	<i>Mark the first three suggestions irrespective of numbered points</i> <i>IGNORE reasons – just mark <b>steps</b> in the process</i>
		shoot is healthy ;		<b>ACCEPT</b> shoot not wilted
		assemble apparatus / cut shoot, under water ;		
		cut last 2-3 cm off cut end / cut at an angle ;		<b>ACCEPT</b> cut end off shoot
		check there are no air bubbles in apparatus ;		<b>ACCEPT</b> make sure cut end of shoot is in contact with water once apparatus assembled
		apparatus, water tight / air tight / has no leaks ;		<b>ACCEPT</b> screw clip tight <b>DO NOT ACCEPT</b> use Vaseline unqualified
		leaves dry ;		
				<b>DO NOT CREDIT</b> allow time for acclimatisation, equilibration

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Question			Expected Answers	Mark	Additional Guidance
4	(c)	(i)	<u>25.3</u> ;	1	<b>IGNORE</b> any units
4	(c)	(ii)	to make results (more) <u>reliable</u> ;	2	<p><b>DO NOT ACCEPT</b> accurate <b>and</b> reliable (use of <b>both</b> terms) anywhere in the answer</p> <p>Look for idea of spotting the anomaly e.g. spot, notice, recognise, show, detect.</p> <p><b>DO NOT CREDIT</b> prevents / take out / remove / accounts for, anomalies</p> <p><b>DO NOT CREDIT</b> 'ensure there is no anomaly' unless qualified</p> <p><b>ACCEPT</b> outliers for anomalies</p> <p><b>ACCEPT</b> to identify other factors / (uncontrolled) variables that may be having an effect</p>
			to help identify anomalies ;		
4	(c)	(iii)	<p><i>in afternoon:</i></p> <p>plant dying / less healthy / wilting ;</p> <p>ref to stomatal closure ;</p> <p>more humid / <u>higher</u> water (vapour) potential in air ;</p> <p>less air movement / wind / draughts ;</p>	2 max	<p><i>Mark first response in each numbered section (1-2). If not all sections are used, return to the first section and mark further suggestions</i></p> <p>Assume answer is for different conditions in the afternoon</p> <p><b>ACCEPT</b> ORA if stated 'in morning...'</p> <p><b>IGNORE</b> ref to light / dark</p> <p>Look for <b>comparative</b> statements – <u>higher</u>, <u>greater</u> etc</p> <p><b>DO NOT CREDIT</b> more <b>moisture</b> in air</p>

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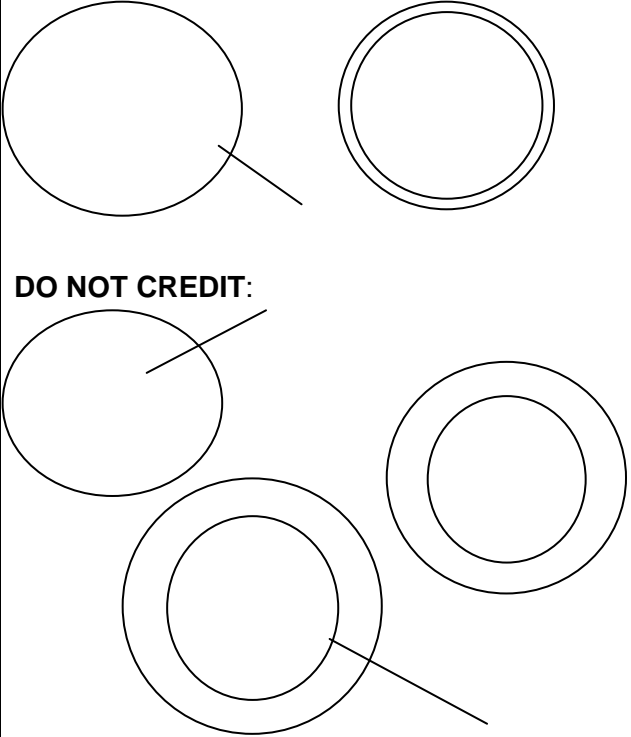
January 2010

Question			Expected Answers	Mark	Additional Guidance
4	(c)	(iv)	(potometer) measures (water) uptake ;	2 max	
			not all water (taken up) is lost ;		ACCEPT ref to figs e.g. 99% water <i>taken up</i> is lost ACCEPT the assumption that water loss is equal to water uptake is incorrect
			some water used (in photosynthesis / making cells turgid) ;		
			<b>Total</b>	<b>11</b>	

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Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	vein with thinner wall than artery ;	1	<p><b>CREDIT:</b> Correct position of endothelium as indicated by circle or label line Must be clearly <b>thinner</b> than shown on artery</p>  <p><b>DO NOT CREDIT:</b></p>

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Question			Expected Answers	Mark	Additional Guidance
5	(a)	(ii)	<p><i>Arteries have:</i></p> <p>no valves ;</p> <p>endothelium / tunica intima, folded / AW ;</p> <p>more / thicker, muscle / elastic tissue / tunica media ;</p> <p>more / thicker, collagen / tunica externa ;</p>	2 max	<p><i>Assume answer refers to wall of artery.</i></p> <p><b>IGNORE</b> any ref to artery wall being thicker, unqualified, as this has already been stated in the question</p> <p><b>IGNORE</b> reasons for differences</p> <p><b>ACCEPT</b> ORA if stated - 'vein is.....'</p> <p>Look for <b>comparative</b> statements</p> <p><b>ACCEPT</b> tunica adventitia for tunica externa</p>
5	(b)	(i)	contraction of <u>ventricle</u> , wall / muscle ;	1	<p><b>ACCEPT</b> ventricular systole</p> <p><b>DO NOT CREDIT</b> heart muscle unqualified</p> <p><b>DO NOT CREDIT</b> contraction of atria <b>and</b> ventricles</p> <p><b>DO NOT CREDIT</b> pump / squeeze / push / beat without ref to contraction</p>

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Marks			Expected Answers	Mark	Additional Guidance
5	(b)	(ii)	more, (smaller) vessels / named vessels ; (vessels) have larger, total lumen / cross sectional area ; reduced resistance to blood flow ; arteries, stretch / expand ; loss of, fluid / plasma, from capillaries ;	2 max	<b>ACCEPT</b> <i>divides</i> into smaller vessels (implies more of them) <b>ACCEPT</b> larger total surface area <b>DO NOT CREDIT</b> further from the heart <b>DO NOT CREDIT</b> loss of, blood / water <b>DO NOT CREDIT</b> loss of fluid / plasma, unqualified or from other vessels
5	(b)	(iii)	plasma / fluid, moves out of, capillary / blood ; enters / forms, tissue fluid ; (plasma) proteins, remain in capillary / too large to pass through capillary wall / AW ; (fluid moves) down pressure gradient ; hydrostatic pressure greater than, water potential / $\Psi$ ;	3 max	Assume 'it' refers to plasma: <b>DO NOT CREDIT</b> water / diffuses out <b>ACCEPT</b> filters out <b>DO NOT CREDIT</b> ref to osmosis

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Marks		Expected Answers	Marks	Additional Guidance
5	(c)	X = carbonic anhydrase ;	3	<b>ACCEPT</b> correct phonetic spelling <b>DO NOT ACCEPT</b> anhydrase
		Y = carbonic acid / H <sub>2</sub> CO <sub>3</sub> ;		If formula <u>only</u> given, it must be correct. Incorrect formula can be ignored if correct name given.
		Z = hydrogen (ion) / H <sup>+</sup> ;		<b>DO NOT CREDIT</b> H alone
		<b>Total</b>	<b>12</b>	

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Question			Expected Answers	Marks	Additional Guidance
6	(a)	(i)	<p><b>diaphragm / intercostal</b> muscles, contract :</p> <p><b>diaphragm</b> moves down / ribs move upwards <u>and</u> outwards ;</p> <p><b>volume</b> of <b>thorax</b> increased ;</p> <p><b>pressure</b> inside thorax falls ;</p> <p>to below atmospheric pressure (so air enters lungs) ;</p> <p><b>2 max for mechanism</b></p>		<p><i>First two points are marked independently</i></p> <p><b>DO NOT CREDIT</b> <i>internal</i> intercostal muscles contract</p> <p><b>DO NOT CREDIT</b> diaphragm flattens alone</p> <p><b>ACCEPT</b> movement of diaphragm pushes digestive organs down</p> <p><b>DO NOT ACCEPT</b> expands (for increased volume)</p> <p><b>DO NOT ACCEPT</b> size for volume</p> <p><b>ACCEPT</b> capacity for volume</p> <p><b>ACCEPT</b> lungs / chest (cavity), for thorax</p> <p><b>DO NOT CREDIT</b> pressure gradient alone - <i>direction</i> of gradient must be specified</p>
			<p><b>QWC:</b></p> <p>accept three technical terms used and spelt correctly ;</p>		<b>3 max</b>



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Question			Expected Answers	Marks	Additional Guidance
6	(a)	(ii)	it falls / goes down / AW ;	1	<b>ACCEPT</b> decreases in volume / volume gets smaller <b>DO NOT CREDIT</b> empties, closes, flattens, deflates, becomes smaller <b>DO NOT ACCEPT</b> amount for volume
6		(iii)	soda lime / sodium hydroxide / potassium hydroxide / calcium hydroxide ;	1	<b>ACCEPT</b> correct formulae NaOH / KOH / Ca(OH) <sub>2</sub> <b>DO NOT ACCEPT</b> calcium oxide <b>ACCEPT</b> limewater, lime soda
6	(b)		to ensure all air breathed comes from chamber <b>OR</b> to prevent, escape of air / entry of air, through nose ;		<b>ACCEPT</b> air may be breathed in or out through nose <b>ACCEPT</b> ensures breathes through mouth
			make results <u>invalid</u> ;	2 max	<b>DO NOT ACCEPT</b> ref accuracy, reliability, false results <b>DO NOT ACCEPT</b> invalid <b>and</b> accuracy / reliability (use of <b>both</b> terms) anywhere in the answer

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6	(c)		use (medical grade) oxygen / fresh air ;	2 max	<i>Note question relates to measuring <b>vital capacity</b></i> <b>ACCEPT</b> ensure there is enough oxygen / air
			disinfect mouthpiece ;		<b>ACCEPT</b> change / wash mouthpiece
			ref. to health of subject ;		e.g. asthmatics
			ref to correct functioning of equipment ;		e.g. maintain constant temperature (so that volume of gases is not affected) ensure, valve / hinge, is working level of water correct no leaks / airtight / lips sealed around mouthpiece
			<b>Total</b>	<b>9</b>	

# Grade Thresholds

Advanced GCE (Biology) (H021 H421)  
January 2010 Examination Series

## Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
F211	Raw	60	40	35	31	27	23	0
	UMS	90	72	63	54	45	36	0
F212	Raw	100	69	62	56	50	44	0
	UMS	150	120	105	90	75	60	0
F214	Raw	60	40	36	32	28	25	0
	UMS	90	72	63	54	45	36	0

## Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
H021	300	240	210	180	150	120	0

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
H021	8.8	28.6	54.1	78.4	95.1	100.0	1505

**1505 candidates aggregated this series**

For a description of how UMS marks are calculated see:

<http://www.ocr.org.uk/learners/ums/index.html>

Statistics are correct at the time of publication.