OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE **A2 H421**

Advanced Subsidiary GCE **AS H021**

Mark Scheme for the Units

January 2009

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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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Advanced Subsidiary GCE Biology (H021)

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F211 Cells, Exchange and Transport

Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	**A** <u>smooth</u> endoplasmic reticulum / SER **B** nuclear, membrane / envelope **;** **C** mitochondrion **;** **D** nucleolus **;**	**4**	*mark first response on each line **only*** **ACCEPT** nucleus, membrane / envelope **ACCEPT** mitochondria **DO NOT ACCEPT** nucleous
	(a)	(ii)	(mitochondria) vary in shape **;** longer than wide **;** cut in different planes / angles / AW **;** just divided / growing **;** artefact / deformed during preparation of section **;**	**2 max**	 **ACCEPT** sausage shaped/long and thin **ACCEPT** if shown by drawing *need comparative statement* **ACCEPT** C has been cut in longitudinal plane, E has been cut in transverse, section / plane **ACCEPT** one cut horizontally, other cut vertically **ACCEPT** in different positions / one viewed from above the other from the side

Question			Expected Answers	Marks	Additional Guidance
1	(a)	(iii)	*correct answer = two marks* 3.75 / 3.8 **;;** *if answer incorrect **ALLOW** one mark for correct working*	 **2**	**ACCEPT** if 3.75 or 3.8 is seen anywhere in response (even if later rounded to 4) **Max 1** if response is 4 with no working *how to award one mark for working e.g.* candidate shows correct calculation but wrong answer actual length = $\frac{20 \times 15}{80}$ **OR** candidate uses magnification (x4000) in calculation: actual length = 15000 / 4000 **;** length of C should be 15mm / 15000μm **ACCEPT** ecf for working mark if length of C is not measured correctly but incorrect figure is used in calculation correctly
1	(b)	(ii)	proteins moved to Golgi (apparatus / body) **;** processed / modified / AW **;** into <u>vesicles</u> **;** (vesicle) moved to, plasma / cell surface, membrane **;** (vesicles) <u>fuse</u> with membrane **;** <u>exocytosis</u> **;**	 **3 max**	 e.g. carbohydrate group added **DO NOT ACCEPT** reprocessed idea that product of processing is placed into vesicles for transport **DO NOT ACCEPT** vacuole – but do not penalise more than once **DO NOT ACCEPT** 'cell membrane'
				[Total: 11]	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>
<table>
<tr><th>description</th><th>letter</th></tr>
<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>a plant cell that has been placed in a strong sugar solution</td><td></td></tr>
</table>
</td><td>3</td><td></td></tr>
<tr><td>2</td><td>(b)</td><td></td><td>water moves out of cell ;
by osmosis ;

cell has, high<u>er</u> / great<u>er</u> / <u>less</u> negative, <u>water potential</u> (than surrounding solution) / ORA ;

(water moves) <u>down</u> <u>water potential</u> gradient/from high to low <u>water potential</u> ;</td><td>3 max</td><td>note: this is explain not describe

ACCEPT Ψ for water potential
must be comparative – DO NOT ACCEPT high alone

DO NOT ACCEPT across or along water potential gradient
DO NOT ACCEPT ref to water concentration anywhere
IGNORE ref to solute potentials</td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
2	(c)		*small, non-polar substances* **diffuse** (through membrane / **phospholipid bilayer**) **;** *large substances* (using), **transport** / **carrier**, proteins **;** **endocytosis** / **phagocytosis** / described **;** *polar substances* through, pore / **channel**, proteins **;** (using), transport / carrier, proteins **;** *general – must be used in correct context, each **once only*** ref to **facilitated diffusion ;** ref to **active transport** / use of ATP **;** ***4 max*** QWC – technical terms spelled **AND** used in correct context **;** ***1***	**5 max**	**ACCEPT** diffusion / diffuses **ACCEPT** protein pump **DO NOT ACCEPT** channel proteins here **ACCEPT** pinocytosis apply only to large / polar substances apply only to large / polar substances **DO NOT ACCEPT** ref to active transport with channel proteins (three from: phospholipid / bilayer / diffusion / facilitated diffusion / active transport / transport protein / carrier protein / channel protein / pinocytosis / endocytosis / phagocytosis) if protein spelled incorrectly throughout, only penalise once
				[Total : 11]	

Question			Expected Answers		Additional Guidance
3	(a)	(i)	a cell that is, unspecialised / not differentiated ; capable of, division / mitosis ; able to, differentiate / specialise / become other cell types ;	2 max	**DO NOT ACCEPT** replication **ACCEPT** totipotent / pluripotent / omnipotent
3	(a)	(ii)	cambium / meristem / early embryonic cells ;	1	**ACCEPT** plants have no stem cells
	(b)		growth (of tissue / organism) ; replace (cells) / repair (tissues) ; asexual reproduction/cloning / producing genetically identical cells ; maintain chromosome number in all cells ;	3	*initially mark first response on each line, if not all lines used, go back and credit further correct points* **DO NOT ACCEPT** growth of cells **DO NOT ACCEPT** repair of cells **ACCEPT** ref to maintain, haploid / diploid, number
	(c)	(i)	higher percentage remain leukaemia free (for five years) / AW ; **ORA** use of figs ;	2	*Need clear comparative statement* **DO NOT ACCEPT** 'more people' e.g. 60% cf. 38% approx. one and a half times more 22% more e.g. **ALLOW** one mark for: '60% given cord blood cells survive, 38% given marrow cells survive for five years' **ALLOW** two marks for: '60% given cord blood cells survive but only 38% given marrow cells survive for five years' as this is a comparative statement

Question			Expected Answers		Additional Guidance
	(c)	(ii)	1 greater availability of cord cells / more likely to find donors; 2 easier to harvest / no pain for donor ; 3 cells at earlier stage of development ; 4 can be stored for future, use/repair / gene therapy, of donor ; 5 slightly mismatched cord cells work (almost) as well as marrow cells ;	**2**	**ACCEPT ORA** throughout **ACCEPT** easier to extract/obtain / less risky / less invasive **ACCEPT** can differentiate into wider range of cells **DO NOT ACCEPT** cells younger
				[Total : 10]	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>large / active, organisms have high(er), demand for oxygen / need to remove CO_2 ;
small(er), <u>surface area to volume ratio / SA:V / surface area:volume</u> ;
surface area too small / distance too large / diffusion takes too long (to supply needs) ;</td><td>2 max</td><td>ACCEPT ORA throughout
IGNORE ref to nutrients

ACCEPT diffusion too slow
look for reason why diffusion not good enough</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>create / maintain, (steep), diffusion / concentration, gradient ;
<table><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>epithelium</td><td>short (diffusion) distance ;</td></tr><tr><td>capillaries</td><td>delivers carbon dioxide (to be removed from blood) / carries oxygen away (from alveoli) ;
short (diffusion) distance ;</td></tr><tr><td>diaphragm / intercostal muscles</td><td>ventilation / supply of oxygen (to alveoli) / removal of carbon dioxide (from alveoli) ;</td></tr></table></td><td>3 max</td><td>could give mark in any row as an additional mark – but only once

DO NOT ACCEPT any vague reference to ‘gases’ throughout

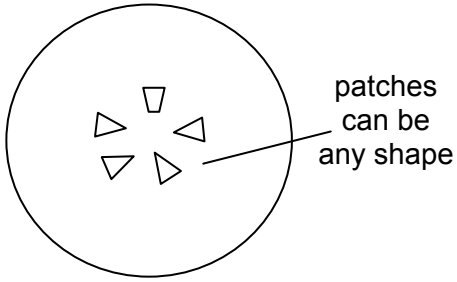
ACCEPT short diffusion distance here even if given above

ACCEPT breathing in and out / AW</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>(c)</td><td></td><td>diaphragm (contracts / flattens and) moves downwards ;
intercostal muscles <u>contract</u> to move ribs, up / out ;
increase <u>volume</u> of thorax ;
reduce pressure inside thorax ;
to below atmospheric pressure/creates pressure gradient / AW ;</td><td>4 max</td><td>IGNORE ref to internal / external
ACCEPT increase volume of lungs / chest
ACCEPT decrease pressure in lungs / chest
must ensure the pressure gradient is in correct direction – lower in lungs</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
4	(d)	(i)	a clear **X** placed on any part of trace where line is sloping down **;**	1	**ACCEPT** label line with **X** **DO NOT ALLOW X** on tip of crest / trough
4	(d)	(ii)	3 dm^3 **;**	1	correct units **must** be given **ACCEPT** litres
				[Total: 11]	

Question			Expected Answers	Marks	Additional Guidance
5	(a)		*single circulatory system:* blood passes through the heart once for each, circulation / circuit / cycle, of the body **;** *closed circulatory system:* the blood is maintained inside vessels **;**	**2**	**DO NOT ACCEPT** ref to <u>cardiac</u> cycle **DO NOT ACCEPT ‘**blood passes through heart once’ - it must be clear there is a circuit / return to heart **ACCEPT** description e.g. heart to gills to body to heart **ACCEPT** ref to no separate pulmonary and systemic systems **ACCEPT** ref to lungs **ACCEPT** names of two types of vessel as alternative to ‘vessels’
5	(b)	(i)	**T** SAN / sinoatrial node **;** **U** AVN / atrioventricular node **;** **V** bundle of His / Purkyne tissue **;**	**3**	**ACCEPT** pacemaker **DO NOT ACCEPT** sinoarterial / artrial node **DO NOT ACCEPT** arterioventricular node **ACCEPT** Purkinje

Question			Expected Answers	Marks	Additional Guidance
5	(b)	(ii)	**T** / SAN, creates / initiates / starts / originates, **excitation ;** wave (of excitation) spreads over **atrial,** wall / muscle **;** ref to, AVN / **U ;** atria contract / atrial **systole ;** contraction is synchronised / AW **;** delay at AVN **;** (excitation spreads) down **septum ;** ref to, **bundle of His** / **Purkyne** fibres **;** ventricles contract / ventricular systole, from, **apex** / bottom **;** QWC – technical terms, spelled **AND** used in correct context	**4 max** **1**	**ACCEPT** acts as **pacemaker** **ACCEPT** impulse / action potential / depolarisation **DO NOT ACCEPT** electricity / signal / message **DO NOT ACCEPT** if response suggests that brain needed to trigger SAN **ACCEPT** EITHER in context of both atria OR both ventricles contracting together **ACCEPT** Purkinje any **three** from: pacemaker, sinoatrial node, atrioventricular node, excitation, atrial / atrium / atria, septum, Purkyne, bundle of His, ventricle(s) / ventricular, apex, systole.
				[Total: 10]	

Question			Expected Answers	Marks	Additional Guidance
6	(a)		3 – 5 discrete patches in ring (near centre) ;	1	if xylem drawn then phloem must be labelled **DO NOT ACCEPT** vascular bundles around edge **DO NOT ACCEPT** if phloem occupies more than half total width 
6	(b)		**A** / labelled carbon can be observed in the phloem soon after being supplied to the plant ; **B** / the rate of flow of sugars in the phloem is higher than diffusion ; **C** / an insect such as an aphid feeds by inserting its proboscis (mouth parts) into the phloem ;	max 2	*mark first two letters only*

Question			Expected Answers	Marks	Additional Guidance
	(c)		*source* site where, sucrose / sugars / assimilates, loaded (into phloem) / AW ; *sink* site where, sucrose / sugars / assimilates, unloaded / removed (from phloem) / AW ;	2	**DO NOT ACCEPT** glucose / substance throughout **ACCEPT** where, sucrose / sugars / assimilates, produced/created or converted from stored products **DO NOT ACCEPT** terms 'loading' and 'unloading' in wrong context **ACCEPT** where, sucrose / sugars / assimilates, stored or used (in metabolic processes) **DO NOT ACCEPT** 'required' or 'needed' instead of 'used'
6	(d)		(sugars) cannot pass the cut / AW ; decrease water potential ; water moves into cells ; (damage triggers) increased cell division ; to produce cells to store sugars ; cut causes, gall / infection ;	2 max	**ACCEPT** sugars, stuck above cut / stuck at top of tree / can't move down/build up above cut
				[Total: [7]	

Grade Thresholds

Advanced Subsidiary GCE Biology H021 H421
January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
F211	Raw	60	46	41	36	31	26	0
	UMS	90	72	63	54	45	36	0

Specification Aggregation Results

The first AS aggregation for this specification will be in June 2009.

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

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