OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE **F211**

Cells, Exchange and Transport

Mark Scheme for June 2010

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Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	**A** = plasma / cell surface**,** membrane **;** **B** = DNA / chromosome / chromatin / genetic material **;**	2	**DO NOT CREDIT** membrane, cell membrane **DO NOT CREDIT** chromosome**s** (do not accept plural) **CREDIT** loop of / circle of, DNA **DO NOT CREDIT** plasmid, RNA **ACCEPT** nucleoid
1	(a)	(ii)	production of ATP **;** aerobic respiration **;**	max 1	**ACCEPT** named stages of aerobic respiration e.g. Krebs cycle, oxidative phosphorylation, ETC, chemiosmosis, link reaction, substrate level phosphorylation **DO NOT CREDIT** glycolysis, ATP *for* respiration **DO NOT CREDIT** *produce* energy (in form of ATP) **IGNORE** provide / release energy unqualified
1	(a)	(iii)	protein synthesis / translation **;** photosynthesis / described **;**	2	**ACCEPT** production / creation, of proteins / polypeptides, assembly of proteins from amino acids **IGNORE** autotrophic nutrition **DO NOT CREDIT** absorption of light unqualified
1	(b)		large surface area to volume ratio **;** small so demand for**,** O_2 / CO_2**,** is low **;** *idea of:* diffusion (alone) is adequate to meet needs **;**	2	**ACCEPT** large SA**:**Vol or large SA/Vol **ACCEPT** small Vol**:**SA ratio or small Vol/SA **DO NOT CREDIT** large surface area alone **IGNORE** gases alone, nutrients **ACCEPT** *idea of* : body SA large enough to meet needs by diffusion **ACCEPT** idea of : diffusion distance short

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(c)</td><td></td><td>
<table>
<tr><td>cell / tissue</td><td>function in the lungs</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>recoil
OR
return to original, size / shape
OR
to help expel air
OR
prevents alveoli bursting</td><td>;</td></tr>
<tr><td></td><td>waft / wave / move / AW, mucus</td><td>;</td></tr>
<tr><td></td><td>secrete / release / produce, mucus</td><td>;</td></tr>
<tr><td></td><td>constrict the airway / AW</td><td>;</td></tr>
</table>
</td><td>4</td><td>IGNORE stretch / expand
ACCEPT ref to lungs, alveoli, airways recoiling etc
DO NOT CREDIT ref trachea / bronchi recoiling

ACCEPT transport / remove, mucus
DO NOT CREDIT dirt particles without ref to mucus

DO NOT CREDIT excrete mucus

ACCEPT narrows lumen OR controls, airflow / diameter, of airways
DO NOT CREDIT ref to alveoli OR greater airflow</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>11</td><td></td></tr>
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Question			Expected Answers	Marks	Additional Guidance
2	(a)		visible / can be seen / increase contrast **;** named example of what is now visible (after staining) **;**	2	*First mark is for 'seeing' and the second mark is for 'recognising' what can now be seen.* **ACCEPT** see detail **IGNORE** ref to resolution **ACCEPT** recognise different *types* of white blood cell **ACCEPT** can (now) see**,** nucleus / organelles / named organelles **IGNORE** recognise parts inside red blood cell **IGNORE** can now see red blood cells (already visible) 'can now see red and white blood cells' = 2 marks
2	(b)	(i)	3D shape can be seen / greater depth of field **;** can see**,** surface features / detail **;**	max 1	**DO NOT CREDIT** shape alone **ACCEPT** 'you can see what is on the surface' **IGNORE** 'you see the surface better' because this needs further clarification i.e. features, shape, named structure
		(ii)	smaller / named, organelle (becomes visible) **;** shapes / details of organelles **;**	max 1	**ACCEPT** named structure(s) such as lysosome, RER, mitochondrion, ribosome, Golgi , vesicle, nucleolus **DO NOT CREDIT** nucleus or chloroplast (already visible)

Question			Expected Answers	Marks	Additional Guidance
2	(c)		*This is a QWC question* **1** fetal <u>haemoglobin</u> has a high<u>er</u> **<u>affinity</u>** (for oxygen) (than adult haemoglobin) **;** **2** (fetal Hb) takes up oxygen in low(er) **partial pressure** of oxygen **;** **3 placenta** has low partial pressure of oxygen **;** **4** at low partial pressure of oxygen / in placenta**,** adult (oxy)haemoglobin will **dissociate** / AW **;**	max 3	**IGNORE** oxyhaemoglobin for haemoglobin **ACCEPT** Hb for <u>haemoglobin</u> (but not HbO) **ACCEPT** fetal Hb becomes *more* saturated at a *low(er)* partial pressure of oxygen **ACCEPT** ppO_2 / pO_2 / oxygen tension / O_2 concentration, for partial pressure of oxygen **ACCEPT** in placenta mother's haemoglobin, releases its oxygen / saturation drops
			QWC (two terms used in correct context and spelt correctly)**;**	max 1	Any **two** terms from the following**:** affinity, dissociate / dissociation, placenta, partial pressure / oxygen tension, saturation / saturated

Question			Expected Answers	Marks	Additional Guidance
2	(d)	(i)	curve to right of curve A **;** appropriate sigmoid shape **;**	2	Curve should start at 0% on y axis and reach at least 80% on y axis
2	(d)	(ii)	**1** (actively respiring tissue) needs / requires, *more* oxygen **;** **2** for aerobic respiration / to release *more* energy **;** **3** (actively respiring tissue produces) *more* CO_2 **;** **4** haemoglobin involved in transport of CO_2 **;** **5** less haemoglobin available to combine with O_2 **;** **6** (Bohr shift) causes *more* oxygen to be released **;**	max 2	*idea* of '*more*' should be clear as shown (MP 1,2,3,6) **ACCEPT** make *more* ATP **ACCEPT** produces *a lot* of CO_2 / as CO_2 levels rise **CREDIT** detail to include carbonic acid dissociation / formation of haemoglobinic acid / HHb etc **DO NOT CREDIT** oxygen released *more* quickly / quicker **ACCEPT** oxygen released *more***,** readily / easily 'More CO_2 produced so more O_2 released' = 2 marks
			Total	**12**	

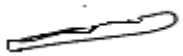
Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	**1** at low temperatures, all stain is in cells **OR** no stain in surrounding solution **;**		*MP 1 awarded for observation that the stain was no longer in the surrounding solution and not for the % of cells containing the stain.* **ACCEPT** the stain is not evenly distributed between cells and solution **ACCEPT** stain doesn't move out of cells
			2 (taken up / held) against**,** diffusion / concentration**,** gradient **;**		**ACCEPT** *up* the diffusion gradient
			3 at high temperature stain not held in cells **;**		**ACCEPT** solution now contains stain **ACCEPT** 0% = none / no cells (stained) *MP **1** and **3** - must be stated rather than inferred from quoted figs*
			4 at high temperature enzymes denatured so no ATP for active transport (of stain) **;**		**IGNORE** 'enzymes denatured' alone **CREDIT** active transport / carrier, proteins denatured **ACCEPT** mitochondria stopped working so no ATP produced
			5 use of correct comparative figs to illustrate a point **;**		e.g. 97% at 30°C but 0% at 80°C **IGNORE** figs without units
			AVP **; ;**	max 2	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(ii)	cells**,** dead / not respiring **;** no, (metabolic) energy / ATP**,** to take up stain **;** AVP **;**	max1	**DO NOT CREDIT '**burst' as these cannot be seen **ACCEPT** inhibitor present / membrane impermeable **ACCEPT** no functioning mitochondria
3	(b)	(i)	(membrane) structure disrupted **;** (phospho)lipid bilayer**,** melts / more fluid **;** (membrane) proteins / carrier molecules**,** denatured / unable to function **;** (membrane) becomes more permeable **;**	max 1	*Mark first suggestion and if correct award mark – if further answers contradict first answer do not award mark.* **ACCEPT** damaged, destroyed, break down **IGNORE** *membrane**,*** denatured / more fluid **IGNORE** lipid *molecules* melt **ACCEPT** lose shape for denatured **ACCEPT** leaky **IGNORE** refs to bonds breaking

Question			Expected Answers	Marks	Additional Guidance
3	(b)	(ii)	membrane <u>permeable</u> (to stain) **;** methylene blue, leaked out of cells / released to solution **;** by diffusion / down concentration gradient **;**	max 2	**IGNORE** leaky **ACCEPT** stain / blue / pigment, moved out **IGNORE** lost *colour* / *colour* moved out (it is in stem of question) **ACCEPT** by active transport (assuming thermostable enzymes) blue / stain, diffuses out = 2 marks
3	(c)		*accuracy* take readings at intermediate temperatures (between 50 °C – 70 °C) **;** *reliability* take more, readings at each temperature / repetitions **;**	2	*Mark first suggestion only* **DO NOT CREDIT** wider temperature range OR more temperatures unqualified OR more regular intervals **ACCEPT** take readings every 5 degrees / °C **ACCEPT** ref. to haemocytometer **ACCEPT** colorimeter used to measure colour intensity of blue solution **DO NOT CREDIT** ref to use of c<u>a</u>lorimeter **ACCEPT** repeat experiment (ideally 3 readings for each temperature) , increase the number of cells observed **ACCEPT** replica / replicate for repeat

Question			Expected Answers	Marks	Additional Guidance
3	(d)		nucleus divides / mitosis **;** *idea of* : cell**,** swells on one side / bulges **;** nucleus / cytoplasm / organelles**,** move into**,** bud / bulge **;** pinches off / cell wall forms**,** (so bud becomes a separate cell) **;**	max 2	**ACCEPT** asexual reproduction / cloning **IGNORE** cell splits, ref to genetically identical cells **IGNORE** *bud* forms on side **IGNORE** replicated DNA enters bud **ACCEPT** cytokinesis **IGNORE** two cells are formed / bud separates unqualified
			Total	**10**	

Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)	*plant cell / Y, has*: a wall ; chloroplasts ; vacuole ;	max 2	Credit reverse argument **ACCEPT** thylakoid, discs / membranes OR granum(a) **IGNORE** chlorophyll
4	(a)	(ii)	 **A1** a vacuole ; **E1** to take up water / to become turgid ; **A2** cell wall thicker on one side ; **E2** causes, cell to bend / open stoma(ta) ; **A3** mitochondria ; **E3** generates ATP (for active transport) ;	max 2	*Mark adaptation (A) as stand-alone* *Ensure explanation (E) stated is appropriately linked to adaptation* **DO NOT CREDIT** curved cell wall / thick cell wall unqualified **ACCEPT** close stoma(ta) if adaptation correct **IGNORE** ref to chloroplasts
4	(b)	(i)	two homologous chromosomes circled ;	1	**ACCEPT** one circle around both chromosomes or two circles The two chromosomes must be of same length 

4	**(b)**	**(ii)**	*three* chromosomes, one from each pair **;** chromosomes drawn as one bar **;**	2	*Chromosomes should be of different lengths however if two are of similar length, look for different centromere position to award mark* **ACCEPT**  **DO NOT CREDIT** two joined together at centromere 
			Total	**7**	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	osmosis **;**	1	
		(ii)	**2** = symplast (pathway) **;** **3** = apoplast (pathway) **;**	2	**ACCEPT** symplastic **ACCEPT** apoplastic
		(iii)	S **;**	1	

Question			Expected Answers	Marks	Additional Guidance
5	(b)		*This is a QWC question* **1** water moves into xylem down **water potential** gradient **;** **2 root pressure** / high (**hydrostatic**) **pressure** at bottom of xylem **;** **3** water vapour loss / **transpiration** / **evaporation**, at leaves / top of plant **;** **4** (creating) low (hydrostatic) pressure at top of xylem **;** **5** water**,** under **tension** / pulled up (in a continuous column) **;** **6 cohesion** between water molecules / described **;** **7 adhesion** of water molecules to xylem / described **;** **8 capillary action** / described **;** **9** water moves up (xylem / stem) by **mass flow ;** **10** from high(er) (hydrostatic) pressure to low(er) (hydrostatic) pressure / down (hydrostatic) pressure gradient **;**	max 4	**ACCEPT** ψ for water potential **ACCEPT** water moves from high ψ to low ψ **IGNORE** drawn for pulled up **ACCEPT** ref to xylem being very narrow so water rises
			QWC (three terms used in correct context and spelt correctly) **;**	1	Any **three** terms from the following **:** water potential, hydrostatic pressure, transpiration / evaporation, cohesion / cohesive, adhesion / adhesive, tension, root pressure, capillary action / capillarity, mass flow

Question			Expected Answers	Marks	Additional Guidance
5	(c)				

xylem vessel	phloem sieve tube element	
present	absent	;
present	absent	;
(water and), minerals / ions / salts	products of photosynthesis / sucrose / assimilates / amino acids / minerals / ions / salts / plant 'hormones'	;
(only) up stem / towards leaves	both directions / up and down / from source to sink	;

One mark per row

Both statements must be correct to achieve mark

DO NOT CREDIT ticks and crosses

Read whole list – if any suggestion is wrong then do not award mark

XYLEM

DO NOT CREDIT 'nutrients' OR 'water' alone

PHLOEM

ACCEPT 'sugar' in place of sucrose
IGNORE unspecified 'solutes'
DO NOT CREDIT glucose

ACCEPT arrows ↑ (xylem) ↓↑ (phloem)
DO NOT CREDIT 'all directions'
IGNORE ref to pits / lateral movement

			Total	**13**	

Question			Expected Answers	Marks	Additional Guidance
6	(a)		a single value between 67 and 80 **; ;**	max 2	two marks for correct answer If answer incorrect, allow one mark for appropriate working i.e. 60 divided by time from trace selected by candidate
6	(b)		heart rate**,** slower / lower / reduced / 60 – 63 beats per minute **;** rest period / diastole longer **;** ventricle takes longer to contract / ventricular systole longer **;**	max 2	*Mark first point on each numbered line* **ACCEPT** length of one beat is longer **DO NOT CREDIT** 'slows heart's activity' **ACCEPT** T wave elongated / increases from 0.24s to 0.32s / increases by 0.1 s **IGNORE** name of chamber **ACCEPT** R wave slightly elongated / increases from 0.07s to 0.12s / increases by 0.05 s
6	(c)		SAN**,** is pacemaker / initiates heart beat **;** (SAN sends) impulse / wave of excitation**,** over atria (walls) **;** AVN delays impulse **;** (AVN) sends impulse down**,** septum / bundle of His / Purkyne fibres **;**	max 3	**ACCEPT** *starts*, wave of excitation / action potential / electrical impulse **IGNORE** 'sends out' (wave) **IGNORE** *through* / *to,* the atrium **DO NOT CREDIT** signal / message for impulse, **allow ecf** **DO NOT CREDIT** pulse **IGNORE** delays contraction **ACCEPT** Purkinje
			Total	**7**	

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