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

Question			Expected Answers	Marks	Additional Guidance
1	(c)		<table><tr><th>cell / tissue</th><th>function in the lungs</th><th></th></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>	4	**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
			Total	**11**	

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**	

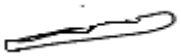
Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	**1** at low temperatures, all stain is in cells **OR** no stain in surrounding solution **;**		*MP 1 awarded for observation that the stain was no longer in the surrounding solution and not for the % of cells containing the stain.* **ACCEPT** 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)		<table><tr><th>xylem vessel</th><th>phloem sieve tube element</th><th></th></tr><tr><td></td><td></td><td></td></tr><tr><td>present</td><td>absent</td><td>;</td></tr><tr><td>present</td><td>absent</td><td>;</td></tr><tr><td>(water and), minerals / ions / salts</td><td>products of photosynthesis / sucrose / assimilates / amino acids / minerals / ions / salts / plant ‘hormones’</td><td>;</td></tr><tr><td>(only) up stem / towards leaves</td><td>both directions / up and down / from source to sink</td><td>;</td></tr></table>		*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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