OCR
RECOGNISING ACHIEVEMENT

GCE

Human Biology

Advanced Subsidiary GCE

Unit **F221:** Molecules, Blood and Gas Exchange

Mark Scheme for June 2011

Oxford Cambridge and RSA Examinations

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Question			Answer	Mark	Guidance
1	a		**A** mitochondrion / mitochondria **;** **B** nucleolus **;** **C** Golgi (apparatus / body) **;** **D** rough endoplasmic reticulum / Rough ER / RER **;** **E** lysosome / vesicle **;**	**5**	***C*** **IGNORE** SER ***E*** **DO NOT CREDIT** vacuole
	b		*type of leucocyte* ***(1 mark)*** neutrophil / granulocyte **;** *reason* ***(1 mark)*** lobed nucleus **or** granular cytoplasm **;**	**2**	**Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks** **Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks**
	c	**(i)**	maintains cell structure **;** AVP **;**	**1 max**	**ACCEPT** 'supports the cell' e.g. stops the cell bursting freely permeable idea of protection
		(ii)	*palisade mesophyll cells* have lower energy demands / AW **;** have lower metabolic rate **;** do not have a role in phagocytosis **;**	**1 max**	**ora** for leucocyte **DO NOT CREDIT** 'produce' less energy **CREDIT** plants have lower metabolic rate **CREDIT** named metabolic reaction e.g. active transport
		(iii)	chloroplast **;** permanent vacuole **;** tonoplast **;** starch grains **;**	**1 max**	**ACCEPT** large or central vacuole **DO NOT CREDIT** 'starch' alone
			Total	**10**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>2</td><td>a</td><td></td><td>
<table>
<tr><th>adaptation of lungs</th><th>feature</th></tr>
<tr><td>air brought into the alveoli by ventilation is rich in oxygen</td><td>A ;</td></tr>
<tr><td>endothelium of capillaries is made of flattened cells</td><td>C ;</td></tr>
<tr><td>there are millions of alveoli in each lung</td><td>B ;</td></tr>
<tr><td>the wall of each alveolus is folded</td><td>B ;</td></tr>
</table>
</td><td>4</td><td></td></tr>
<tr><td></td><td>b</td><td></td><td>idea of gases only diffusing through two layers of cells ;

air in alveolus has higher oxygen concentration than in, blood / capillary ; ora
oxygen diffuses from, air / alveolus, into, blood / capillary ;

air in alveolus has lower CO_2 concentration than in, blood / capillary ; ora
carbon dioxide diffuses from, blood / capillary, into, air / alveolus ;

(diffusion) down concentration gradient / described ;</td><td>4 max</td><td>DO NOT CREDIT short distance for diffusion as this is stated in stem of the question

Statement needs to be comparative

Statement needs to be comparative

ACCEPT carbon dioxide takes the opposite route if mp 3 has already been awarded

ACCEPT ‘down a diffusion gradient’</td></tr>
</table>

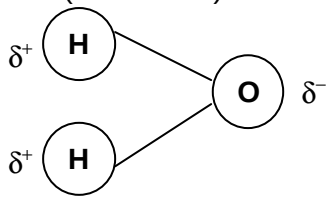
Question			Answer	Mark	Guidance
	c	(i)	surfactant **;** lowers surface tension of alveoli **or** prevents alveoli from sticking together **or** prevent alveoli collapsing **or** reduces the effort required to breathe in (lung compliance) **;**	**2**	
	c	(ii)	gases must diffuse through a thicker than normal layer of fluid **;** (so) longer diffusion pathway / AW **;** rate of gas exchange is decreased / slower diffusion **;**	**2 max**	**ACCEPT** decreases efficiency of gas exchange
			Total	**12**	

Question			Answer		Mark	Guidance
3	a		1	**globular** (protein) **;**		
			2	*idea of* proteins having primary, secondary and tertiary structure **;**		
			3	(has) **quaternary** structure **;**		
			4	four **polypeptide** chains **;**		
			5	two **alpha** and two **beta** (polypeptide) chains **;**		**DO NOT CREDIT** beta-pleated or alpha helix chains
			6	contains **prosthetic** group(s) **;**		
			7	each polypeptide has a haem (prosthetic) group **;**		**CREDIT** has four haem groups
			8	haem group contains iron **;**		
			9	(shape of) molecule held by named bonds **;** ***3 max***		***9*** e.g. ionic / disulfide (disulphide) / hydrogen / hydrophobic / hydrophilic
			Q	**QWC ~** technical terms used in correct context and correctly spelt **;**		**2 terms from:** **globular** **quaternary** **polypeptide** **alpha** **beta** **prosthetic**
					4	
	b	(i)	12.01 **;;**		**2**	**Correct answer = 2 marks** If the answer is incorrect or is given to the wrong number of decimal places, **CREDIT** 1 mark for working $\frac{16.10}{1.34}$

Question			Answer	Mark	Guidance
		(ii)	*cause* ***(1 mark)*** iron deficiency **or** AVP **;** *reason* ***(1 mark)*** *idea of* mass of haemoglobin (per 100 cm^3 of blood) is lower than normal **or** *idea of* mass of haemoglobin (per 100 cm^3 of blood) is outside normal (reference) range **;**	**2**	e.g. liver disease / kidney disease / vit B12 deficiency (pernicious anaemia) / sickle cell anaemia (as lower no of RBCs) / undergoing cancer treatment **DO NOT CREDIT** childbirth (as = loss of blood)
		(iii)	***B*** *has* fewer erythrocytes (than in smear **A**) **;** (some) erythrocytes that are larger (than in smear **A**) **;** erythrocytes more varied in shape / AW **;**	**2 max**	**ACCEPT** red blood cells / RBCs throughout
			Total	**10**	

Question			Answer	Mark	Guidance
4	a		**X** sinoatrial node **;** **Y** atrioventricular node **;** **Z** Bundle of His **;**	3	**ACCEPT** SAN / SA node **ACCEPT** AVN / AV node **DO NOT CREDIT** VAN **ACCEPT** Purkyne / Purkinje, fibres
	b	**1** **2** **3** **4** **5** **6** **7** **8** **9** **Q**	(electrical impulse) spreads across **atria ;** (through) branched / interconnecting, cardiac muscle (cells) **;** (impulse) can not pass (to **ventricles**) due to, fibrous / non-conducting, tissue **;** (impulse) passes to, Y / AVN **;** (impulse is) delayed at Y / AVN **;** impulse then passes down the septum **;** (through) Z / **bundle of His ;** impulse reaches **apex** of the heart **;** (impulse) spreads through, **ventricle** (walls) / **Purkyne fibres ;** ***4 max*** **QWC ~** technical terms used in correct context and correctly spelt **;**	5	***1*** heart tissue stated in Q ***9*** **ACCEPT** 'Purkinje' instead of Purkyne **2 terms from:** **atria OR atrium OR atrial** **ventricle(s) OR ventricular** **bundle of His atrioventricular node** **Purkyne fibres apex**
			Total	8	

Question			Answer		Mark	Guidance
5	a		1	put on (sterile) gloves ;		
			2	check wound for objects (e.g. glass) / do not remove object from wound ;		
			3	(if nothing in wound) place pad over / make a pad around the object ;		
			4	press firmly / secure pad in place ;		
			5	if blood soaks through apply a second pad (on top) ;		
			6	if wound is in, limb / arm / leg, raise it (above heart) ;	3 max	
	b	(i)	prothrombin ;		1	**Correct spelling only**
		(ii)	fibrinogen ;		1	**ACCEPT** phonetic spelling e.g. fibrinigen
		(iii)	cofactors ;		1	
		(iv)	less, inactive molecule / M / prothrombin, produced (by diseased liver) ;			**CREDIT** less substrate or less fibrinogen produced
			less, active enzyme / thrombin, formed ;			If fibrinogen is used in answer to **mp 1** then **credit** less substrate for the enzyme thrombin for **mp 2**
			idea of fewer, successful collisions / active sites occupied / ES complexes produced ;			
			slow(er), reaction / rate of reaction ;			
			less, fibrin / product, produced ;		3 max	**CREDIT** less fibrinogen broken down by thrombin
				Total	9	

Question			Answer	Mark	Guidance
6	a		oxygen has, slight / small / delta / δ, negative (charge) **;** hydrogen has, slight / small / delta / δ, positive (charge) **;** dipole is formed / molecule has unequal distribution of charge **;**	**2 max**	**ACCEPT** d (lower case) for δ **ACCEPT** d (lower case) for δ  Allow 1 max for incorrect molecular structure of water
	b		glucose is polar **and** lipids are non-polar **;** glucose, attracts water molecules / is hydrophilic **;** lipids, repel water molecules / are hydrophobic **;**	**2 max**	
	c	**(i)**	**B** or **C ;**	**1**	
		(ii)	**A ;**	**1**	
		(iii)	**B ;**	**1**	
	d	**(i)**	anaemia **;** during / after, surgery **;** blood loss after childbirth **;** AVP **;**	**1 max**	**ACCEPT** thalassaemia e.g. excessive blood loss after trauma chemotherapy leukaemia

Question			Answer		Mark	Guidance
		(ii)	1	*idea of* cells and diluting solution needing the same water potential ;		
			2	(solute) lowers water potential of solution ;		
			3	if water potential (of solution) is lower than red cell then water will leave cells ; **ora**		**mp 3** and **mp 6** must be consistent with direction of water movement
			4	by osmosis ;		
			5	down water potential gradient / described ;		**DO NOT CREDIT** along water potential gradient
			6	cells will, crenate / shrivel ; **ora**		
			7	blood cells will not be suitable for use in the body / AW ;		
					3 max	
				Total	**11**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

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14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

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