

# **Human Biology**

Advanced Subsidiary GCE

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

## **Mark Scheme for January 2012**

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## Annotations

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded
	Verbal Construction

Question			Answer	Marks	Guidance
1	(a)	(i)	ciliated epithelium ;	1	<b>DO NOT CREDIT</b> cilia alone <b>IGNORE</b> goblet cells
		(ii)	trachea / bronchi / bronchus / bronchioles ;	1	If more than one answer provided ALL must be correct
		(iii)	(cell needs to) produce ATP / release energy ; for cilia, movement / AW ;	2	<b>DO NOT CREDIT</b> 'produce energy' <b>ACCEPT</b> to produce or secrete mucus
		(iv)	goblet cells secrete mucus ; mucus traps, pathogens / bacteria ;  <u>cilia</u> waft, mucus back up (to throat to be swallowed) ;	3	<b>IGNORE</b> traps infection OR disease OR germs
	(b)	(i)	squamous / pavement, epithelium ; endothelium ;	1 max	
		(ii)	thin (wall) / (wall is) one cell thick ; for , increased rate of exchange / short(er) diffusion distance (of gases) ;  flattened / thin, cells ; for, increased rate of exchange / short(er) diffusion distance (of gases) ;  fenestrations / pores / gaps ; allows, white blood cells / phagocytes, to move, in / out <b>OR</b> allows (easy) formation of tissue fluid ;  smooth, inner surface / lining (of wall) ; reduces friction ;	4 max	<b>Mark the first suggestion on each pair of prompt lines</b>          <b>IGNORE</b> smooth epithelium OR smooth endothelium
			<b>Total</b>	<b>12</b>	



Question		Answer	Marks	Guidance
	(ii)	<p><i>process</i> facilitated diffusion <b>OR</b> active transport ;</p> <p><i>two uses</i> respiration ; ATP production ; energy, source / release ; conversion to / stored as, glycogen ;</p>	<p>1</p> <p>1 max</p>	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p>Any <b>two</b> uses required for 1 mark.</p> <p><b>DO NOT CREDIT</b> production of energy <b>DO NOT CREDIT</b> energy store</p>
		<b>Total</b>	<b>7</b>	

Question			Answer	Marks	Guidance
3	(a)	(i)	<p><i>P wave</i> impulses passing through atrial, <u>wall</u> / <u>muscle</u> ; atria contract / atrial systole ; blood passes, through AV valves / into ventricles ;</p> <p><i>QRS complex</i> impulses passing through ventricular, <u>wall</u> / <u>muscle</u> ; ventricles contract / ventricular systole ; AV valves shut / semi-lunar valves open ; blood, leaves ventricles / enters (named) arteries ; <b>3 max</b></p>	4 max	<p><b>DO NOT CREDIT</b> signal or messages <b>DO NOT CREDIT</b> hybrid terms e.g. arterial systole</p> <p><b>ACCEPT</b> impulses passing through Purkyne Fibres</p> <p><b>ACCEPT</b> leaves heart</p>
		(ii)	68 to 73 ; ;	2	<p><b>Correct answer = 2 marks</b></p> <p>If answer incorrect or not given to the nearest whole number, then <b>ALLOW</b> 1 mark for correctly showing calculation e.g. <math>60 \div 0.84</math></p>
	(b)	(i)	(trace) <b>D</b> ;	1	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>
		(ii)	(trace) <b>C</b> ;	1	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>
		(iii)	(trace) <b>C</b> ;	1	<b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>

Question		Answer	Marks	Guidance
	(c) (i)	Y stroke volume ; Z cardiac output ;	2	<b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>  <b>IGNORE SV</b> <b>IGNORE CO</b>
	(ii)	(heart) muscle <u>contracts</u> more strongly ; (heart) muscle / wall, of left ventricle thickens ;	1 max	<b>IGNORE</b> ref to volume of blood being pumped out (as given in Q)  <b>ACCEPT</b> hypertrophy
<b>Total</b>			<b>12</b>	

Question		Answer	Marks	Guidance
4	(a)	<p><i>Award marking points in any order</i></p> <p>amino / amine (group) ;            carboxyl / carboxylic (group) ;</p>	2	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>DO NOT CREDIT</b> chemical symbols alone e.g. COOH</p> <p><b>ACCEPT</b> carboxylic acid group</p>
	(b) (i)	<p><i>award marks on diagram as follows</i></p> <p><b>H</b> removed from amino group from one amino acid ;  <b>OH</b> removed from carboxylic group of other amino acid ;</p> <p>removal of, water / H<sub>2</sub>O ;</p> <p>correct bond shown between two amino acids ;</p>	3 max	<p>i.e.</p> $\begin{array}{c} \text{O} \quad \text{H} \\ \parallel \quad   \\ -\text{C}-\text{N}- \end{array}$
	(ii)	<p>peptide ;</p>	1	<p><b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> covalent</p>

Question		Answer	Marks	Guidance						
	(c)	<p><b>hydrogen</b> bonds ;  <b>disulfide</b> bonds ;  <b>ionic</b> bonds ;  <b>hydrophobic / hydrophilic</b>, interactions ;      <b>2 max</b></p> <p>further detail of named bond ;</p> <p>(bonds / interactions) maintain <b>tertiary</b> structure ;  <i>idea that</i> (bonds / interactions)  maintain , folding / coiling / AW , of the structure ;</p>	4 max	<p><b>IGNORE</b> ref to secondary structure</p> <p><b>ACCEPT</b> Van der Waal's forces</p> <p>e.g. (hydrogen bond) between partially charged atoms  (disulfide bond) between sulfur atoms or cysteines  (ionic bond) between charged atoms  (hydrophobic or hydrophilic interactions) between  nonpolar or polar regions</p>						
		<p><b>QWC</b> ~ technical terms  used in correct context and correctly spelt ;</p>	1	<p><b>2 terms from:</b></p> <table style="width: 100%; text-align: center;"> <tr> <td><b>hydrogen</b></td> <td><b>disulfide</b></td> <td><b>ionic</b></td> </tr> <tr> <td><b>hydrophobic</b></td> <td><b>hydrophilic</b></td> <td><b>tertiary</b></td> </tr> </table>	<b>hydrogen</b>	<b>disulfide</b>	<b>ionic</b>	<b>hydrophobic</b>	<b>hydrophilic</b>	<b>tertiary</b>
<b>hydrogen</b>	<b>disulfide</b>	<b>ionic</b>								
<b>hydrophobic</b>	<b>hydrophilic</b>	<b>tertiary</b>								
		<b>Total</b>	<b>11</b>							

Question		Answer	Marks	Guidance
5	(a)	<i>idea that</i> energy needed for a reaction to take place ;	1	
	(b)	(i) <i>as initial rate of reaction increases (A)</i> more, successful collisions / collisions between substrate and <b>active site</b> ; (so) more active sites are occupied ; more, <b>enzyme-substrate complexes</b> / ESCs, formed ; substrate (concentration) is <b>limiting factor</b> ;  <b>max 2</b>  <i>as rate of reaction becomes constant (B)</i> substrate is in excess / substrate (concentration) not limiting ; enzyme (concentration) is now the limiting factor ; all active sites occupied <b>or</b> <i>idea that</i> substrate molecules are 'waiting for' active site ; <b>max 2</b>	3 max	
		<b>QWC</b> ~ technical terms used in correct context and correctly spelt ;	1	<b>2 terms from:</b> <b>limiting factor</b> <b>enzyme-substrate complex</b> <b>active site</b>
		(ii) <i>idea that</i> thrombin catalyses fibrinogen to fibrin ; less fibrin produced / longer to produce (enough) fibrin ; clot takes longer to form ;	2 max	<b>ACCEPT</b> scab instead of clot
		<b>Total</b>	<b>7</b>	

Question		Answer	Marks	Guidance	
6	(a)	biconcave ; organelle(s) ; nucleus ; haemoglobin ; diffusion ;	5	<b>Mark the first answer in each gap.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>  <b>ACCEPT</b> membrane-bound organelle(s)  <b>ACCEPT</b> passive or simple diffusion <b>DO NOT CREDIT</b> facilitated diffusion	
	(b)	(i)	(as diameter of the cell increases) the SA: Vol decreases ; comparative figs. (for leucocyte <u>and</u> erythrocyte) ;	2	to include diameter with units <u>and</u> SA:Vol for both cell types
		(ii)	erythrocyte is, not spherical / not a sphere / biconcave ; a biconcave shape increases surface area <u>and</u> decreases volume ;  using a sphere for calculating gives smaller value of SA:Vol ; <i>idea that</i> a different, calculation / formula, would be needed (for a biconcave shape) ;	2 max	<b>CREDIT</b> ora

Question		Answer	Marks	Guidance
	(b) (iii)	<p><i>Look for the idea of</i></p> <p>smaller surface area : volume ratio ;  (so) less exchange of gases / AW ;</p> <p>less flexible ;  (so) unable to pass through capillaries ;</p> <p>AVP ;  AVP ;</p>	2 max	<p><b>ACCEPT</b> ora throughout</p> <p>e.g. less oxygen available to cells for respiration  more anaerobic respiration  spherocytes recognised as damaged  spherocytes more easily damaged  spherocytes (constantly) broken down (in spleen)</p>
		<b>Total</b>	<b>11</b>	

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