

Human Biology

Advanced Subsidiary GCE

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

Mark Scheme for January 2011

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Question		Expected Answer	Mark	Additional Guidance
1	(a)	<p><i>structure 1</i> beta / β , pleat / pleated sheet ;</p> <p>and <i>structure 2</i> alpha / α , helix ;</p>	1	<p>Both structures need to be named correctly for one mark. DO NOT CREDIT b for beta or a for alpha For each structure, mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks</p>
	(b)	<p><u>hydrogen</u> (bond) ; 1 max</p> <p>weak bond ; between , slightly negative and slightly positive / δ-negative and δ-positive , atoms / groups / charges ;</p> <p>oxygen has (slightly) negative charge ; hydrogen has (slightly) positive charge ; 2 max</p>	3 max	<p>One mark for the name and max 2 for description.</p> <p>CREDIT 'between carboxyl and amino groups' CREDIT presence of dipole DO NOT CREDIT 'between positive and negative'</p> <p>DO NOT CREDIT reference to ions</p>
	(c)	<p><i>from flow diagram</i></p> <p>1 primary ; 2 quaternary ; 3 globular ; 4 haemoglobin / (named) enzyme / named globular protein ; 5 fibrin / named fibrous protein ;</p>	5	<p>e.g. thrombin / antibody e.g. keratin / collagen</p>

Question			Expected Answer	Mark	Additional Guidance
1	(d)	(i)	ribosome(s) / <u>rough</u> ER ;	1	Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks CREDIT <u>RER</u>
		(ii)	Golgi (body / apparatus / vesicle) ;	1	Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks
Total				11	

Question		Expected Answer	Mark	Additional Guidance																				
2	(a)	(named) ions ; urea ; hormones ; amino acids ; glucose ; (named) blood gases ;	2 max	Mark the first TWO answers only. IGNORE vitamins / minerals / plasma proteins / antibodies / clotting factors CREDIT electrolytes CREDIT named hormone if correct e.g. insulin DO NOT CREDIT steroid hormones e.g. oestrogen																				
	(b) (i)	lymph / lymphatic (vessel / capillary) ;	1	Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks DO NOT CREDIT 'lymph node' or 'lymph gland'																				
	(ii)	<table border="1"> <thead> <tr> <th>component</th> <th>blood plasma</th> <th>tissue fluid</th> <th></th> </tr> </thead> <tbody> <tr> <td>erythrocytes</td> <td>✓</td> <td>✗</td> <td>;</td> </tr> <tr> <td>sodium ions</td> <td>✓</td> <td>✓</td> <td>;</td> </tr> <tr> <td>fibrinogen</td> <td>✓</td> <td>✗</td> <td>;</td> </tr> <tr> <td>glucose</td> <td>✓</td> <td>✓</td> <td>;</td> </tr> </tbody> </table>	component	blood plasma	tissue fluid		erythrocytes	✓	✗	;	sodium ions	✓	✓	;	fibrinogen	✓	✗	;	glucose	✓	✓	;	4	One mark for each correct row. DO NOT CREDIT hybrid ticks Both ticks <u>and</u> crosses must be used. Do not interpret blank spaces for crosses.
component	blood plasma	tissue fluid																						
erythrocytes	✓	✗	;																					
sodium ions	✓	✓	;																					
fibrinogen	✓	✗	;																					
glucose	✓	✓	;																					
	(c) (i)	(named) cells are removed / centrifugation / use a centrifuge / described ;	1	IGNORE removal of calcium ions ALLOW e.g. 'spin in machine' for described																				
	(ii)	no / less, fibrinogen / clotting factors (in serum) ;	1	CREDIT clotting factors / fibrinogen, present in (stored) plasma																				
Total			9																					

Question			Expected Answer	Mark	Additional Guidance
3	(a)	(i)	A ;	1	<p>Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ALLOW phospholipid bilayer</p>
		(ii)	C ;	1	<p>Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ALLOW intrinsic or channel protein</p>
	(b)		insoluble in (phospho)lipids ; large ; polar / hydrophilic / not hydrophobic ;	2 max	IGNORE reference to glucose being soluble in water
	(c)	(i)	<p>1 <i>idea that</i> lipoprotein / (large) molecules / cells / bacteria, move towards membrane ;</p> <p>2 membrane invaginates / AW ;</p> <p>3 engulfed ;</p> <p>4 vesicle forms (around, molecules / cells / bacteria) ;</p> <p>5 (vesicle) nipped off from membrane / AW, and enters cell ;</p> <p>6 AVP ;</p>	4 max	<p>ACCEPT marks from fully labelled or annotated diagrams</p> <p>CREDIT 'substances close to or in contact with membrane'</p> <p>e.g. engulfing triggered when bacteria bind to membrane reference to phagocytosis receptor-mediated process requires ATP</p>

Question			Expected Answer	Mark	Additional Guidance
3	(c)	(ii)	<i>idea that</i> membrane , structure / function, disrupted ; AVP ;	1 max	DO NOT CREDIT 'cell bursting' or reference to rigidity CREDIT change in stability or change in fluidity of cell membrane e.g. raised blood LDL levels atherosclerosis steroid hormones not synthesised
Total				9	

Question		Expected Answer	Mark	Additional Guidance
4	(a)	<p>1 by , lipase / enzyme(s) ;</p> <p>2 hydrolysis / described ;</p> <p>3 breaks ester bonds ;</p> <p>4 between / producing , fatty acids <u>and</u> glycerol ;</p>	3 max	
		QWC ;	1	<p>Two of the following terms, used in the appropriate context with correct spelling: enzyme ester glycerol hydrolysis</p>
	(b)	<p>constituent of , phospholipids / cell membranes ; respiratory substrate / energy source ;</p> <p>AVP ;</p>	2 max	<p>Mark the first TWO answers only.</p> <p>IGNORE energy store, insulation, storage of fat-soluble vitamins, protection of organs, <u>fast</u> energy source</p> <p>DO NOT CREDIT reference to energy being created or produced or made</p> <p>e.g. steroid synthesis maintaining healthy cholesterol levels</p>
	(c) (i)	<p><i>saturated fatty acids</i> do not contain , double bonds between <u>carbon</u> atoms ; do not have change in bond angle in the hydrocarbon tail / AW ; have <u>higher</u> (relative) proportion of hydrogen / AW ;</p>	2 max	<p>CREDIT suitable ora for unsaturated fatty acids IGNORE reference to properties of saturated fats e.g. solid at room temperature</p> <p>CREDIT do not have C=C bonds</p>
	(ii)	<p><i>polyunsaturated fatty acids</i> have , more than one / many , double <u>carbon</u> bond (in hydrocarbon tail) ;</p>	1	<p>CREDIT have more than one or many C=C bonds</p>
Total			9	

Question		Expected Answer		Mark	Additional Guidance
5	(a)	1 2 3 4 5	<p>patient , standing (up straight) / not slouching ;</p> <p>zero the meter / make sure that the indicator is at bottom (of the scale) ;</p> <p>deep inhalation (to fill lungs with air) / AW ;</p> <p>ensure lips form seal around mouthpiece / AW ;</p> <p>exhale , forcibly / AW , in one continuous breath ;</p>	3 max	<p>DO NOT CREDIT deep breath unqualified. CREDIT deep breath <u>in</u></p> <p>CREDIT ‘breathe out as hard as you can for as long as you can’</p>
	(b) (i)	D1 D2 D3 R1 R2 R3 R4	<p><i>description</i></p> <p>(with increasing age) PEFR increases <u>and</u> then decreases ;</p> <p>PEFR peaks at 35 (± 1) years ;</p> <p>comparative figures ;</p> <p><i>reasons</i></p> <p>chest size increasing from 20 to 35 years ;</p> <p>increasing lung capacity to 35 years ;</p> <p><i>idea that ageing affects lung tissue ;</i></p> <p>more exposure to pollution (affecting lungs) ; 3 max</p>	4 max	<p>Max 3 for reasons</p> <p>CREDIT peak flow values <u>with units</u> (or calculated difference e.g. subtraction or multiplication) for 2 stated ages</p> <p>CREDIT lung capacity decreases after 35 years IGNORE reference to surfactant ALLOW intercostal muscles or diaphragm weakens with age e.g. have been smoking longer</p>
	(ii)	10 ; ;		2	<p>If answer is incorrect or not given to a whole number or incorrectly rounded, then allow one mark for</p> <p>$50 \div 500$</p> <p>or</p> <p>$(500 - 450) \div 500$</p>

Question			Expected Answer		Mark	Additional Guidance
5	(c)	(i)	<p>(named) respiratory diseases ; obstruction of airways / choking / suffocation ; cardiac arrest / heart attack / myocardial infarction ; AVP ; ;</p>		2 max	<p>Mark the first TWO answers only. IGNORE asthma as given in stem of the question</p> <p>e.g. bronchitis, COPD, emphysema or pneumonia</p> <p>e.g. electrocution traumatic brain injury anaesthesia anaphylactic or electric shock (not shock alone) poisoning drug overdose (near) drowning</p>
		(ii)	<ol style="list-style-type: none"> 1 tilt head back (to open airway) ; 2 check airway for obstructions ; 3 pinch nose and seal mouth ; 4 give two (rescue) breaths ; 5 look to see if chest is rising ; 6 repeat (if necessary) / AW ; 7 <i>idea of oxygen being delivered to the patient ;</i> 	3 max		<p>IGNORE ref to procedure used for children</p> <p>e.g. one breath every five seconds</p>
Total					14	

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(i)	closed (circulation) ;	1	Mark the first answer. If a further answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(ii)	materials / named example , flow in one direction ;	1	IGNORE ref to speed
	(b)	(i)	<p>1 smooth muscle contracts <u>and</u> relaxes ;</p> <p>2 <i>idea that</i> it controls , size / diameter, of lumen ;</p> <p>3 elastic tissue stretches <u>and</u> recoils ;</p> <p>4 allows artery (wall) to stretch , when ventricles contract / during (ventricular) systole ;</p> <p>5 and recoil , when ventricles relax / during (ventricular) diastole ;</p> <p>6 maintains blood at high pressure ;</p>	3 max	<p>DO NOT CREDIT contraction in context of pumping</p> <p>IGNORE vasoconstriction / vasodilation</p> <p>DO NOT CREDIT elastic tissue expands or contracts</p> <p>ALLOW expand in place of stretch when referring to artery (wall)</p>
			QWC ;	1	<p>Two of the following terms, used in the appropriate context with correct spelling:</p> <p>smooth muscle contract(s)</p> <p>diameter elastic</p> <p>recoil systole</p> <p>diastole</p>
		(ii)	<p><i>in veins</i></p> <p>same volume of blood passing through ;</p> <p>(diameter of) lumen is large ;</p> <p>(so) blood at low pressure ;</p> <p>(so) blood flows slowly ;</p>	2 max	CREDIT suitable ora statements for arteries
Total				8	

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