

# **Human Biology**

Advanced Subsidiary GCE **F221**

Molecules, Blood and Gas Exchange

## **Mark Scheme for June 2010**

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Question		Expected Answer	Mark	Additional Guidance
1	a	trachea ;	1	<b>ACCEPT</b> windpipe <b>DO NOT CREDIT</b> cartilage / cartilage rings
	b	made of more than one type of tissue ;  cartilage (rings) <b>and</b> elastic ; (working together) to perform a (particular / specific) function ;	2 max	<b>CREDIT</b> idea of collection of tissues (plural) <b>ACCEPT</b> 'a group of tissues'  Must name both for the mark <b>CREDIT</b> a description of the function
	c	(i) group of cells, working together / performing a (specific) function ; group of, specialised / differentiated (cells) ;	1 max	
		(ii) <i>type of cell</i> goblet (cell) ;  <i>function</i> produce / secrete / release, mucus ;	2	<b>DO NOT CREDIT</b> excrete
	d	(i) <b>Y</b> erythrocyte / red blood (cell) ;  <b>Z</b> <u>squamous</u> epithelial (cell) ;	2	<b>ACCEPT</b> RBC  <b>ACCEPT</b> macrophage <b>DO NOT CREDIT</b> monocyte (as only present in circulation)
		(ii) 2000 ;;	2	Correct answer = 2 marks, even if no working shown  If the answer is incorrect, award 1 mark for seeing correct measurement <b>with</b> units divided by 15 (Scale bar measured at 30 mm) e.g. 30mm / 15  30/15 receives no mark (as no units stated).
<b>Total</b>			<b>10</b>	

Question		Expected Answer			Mark	Additional Guidance																				
2	a	<table border="1"> <thead> <tr> <th>cell</th> <th>diagram</th> <th>function</th> <th></th> </tr> </thead> <tbody> <tr> <td>erythrocyte</td> <td></td> <td>transport of oxygen as oxyhaemoglobin</td> <td></td> </tr> <tr> <td>lymphocyte</td> <td></td> <td>differentiates / AW, into <u>plasma</u> cell <b>or</b> produces antibodies <b>or</b> named role in immune response</td> <td>;</td> </tr> <tr> <td>neutrophil</td> <td></td> <td>(destruction of pathogens by) phagocytosis / described</td> <td>;</td> </tr> <tr> <td>platelet</td> <td></td> <td>(aid in) clotting (of blood)</td> <td>;</td> </tr> </tbody> </table>			cell	diagram	function		erythrocyte		transport of oxygen as oxyhaemoglobin		lymphocyte		differentiates / AW, into <u>plasma</u> cell <b>or</b> produces antibodies <b>or</b> named role in immune response	;	neutrophil		(destruction of pathogens by) phagocytosis / described	;	platelet		(aid in) clotting (of blood)	;	3 max	<p>Only mark the first response / statement / sentence given by the candidate regardless of if they write any more as the stem of the question only asks for ONE function.</p> <p><b>DO NOT CREDIT</b> statements which contradict e.g. B and T lymphocytes produce antibodies</p> <p><b>ACCEPT</b> specific immune response, correct reference to helper cell, produce memory cells</p> <p>e.g. engulf, foreign material / micro-organism</p> <p>e.g. creates, plug / barrier</p>
	cell	diagram	function																							
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b	(i)	<p>no / lack, nucleus ; have cytoplasm ; have, cell surface / plasma, membrane ;</p>			1 max	<p>Only mark the first response / statement / sentence given by the candidate regardless of if they write any more as the stem of the question only asks for ONE similarity.</p> <p>Credit reference to cell surface / plasma membrane <b>once only</b> in either b (i) or b (ii)</p> <p><b>DO NOT CREDIT</b> 'cell membrane' alone</p>																				

Question		Expected Answer	Mark	Additional Guidance
	(ii)	(cytoplasm) granular / has granules ; have, cell surface / plasma, membrane ;	1	<b>DO NOT CREDIT</b> reference to cell surface / plasma membrane <b>if</b> answer given in b (i)
c	(i)	prothrombin → thrombin ; fibrinogen → fibrin ;	2	For each marking point, both sides of the arrow need to be correct If only one correct for each reaction = 0 marks  Each mark point should be considered independently
	(ii)	change in, structure / shape, of, (named) protein / factor ;  not enough, (named) protein / factor, present / produced ;	1 max	<b>IGNORE</b> ref to lack of calcium ions  <b>CREDIT</b> protein denatured, correct reference to tertiary structure affected / active site altered  <b>DO NOT CREDIT</b> <u>no</u> protein <b>OR</b> <u>no</u> factor present <b>OR</b> <u>no</u> factor produced
<b>Total</b>			<b>8</b>	

Question		Expected Answer	Mark	Additional Guidance	
3	a	haemocytometer ;	1	<b>ACCEPT</b> phonetic spelling	
	b	(i)	15 ;	1	
		(ii)	all cells (in field of view) counted ; north-west rule, not applied by trainee ;	2	<b>CREDIT</b> description of a <b>lack of</b> consistent counting rule for squares e.g. they should not have counted cells on the south and east  <b>or</b> cells on the edge at top right in and bottom left out <b>or</b> cells on the edge at top left in and bottom right out
		(iii)	dilution factor / initial dilution, taken into account ; of 1 in 200 ;  three or more counts in different squares completed ; <u>mean</u> , obtained / calculated ;	2 max	A statement of 'need to multiply by 200' gets both mark point one and two (2 marks awarded)  <b>IGNORE</b> reference to determining an average
(iv)	anaemia ;  heavy / excessive, blood loss ;  AVP ;	1 max	<b>DO NOT CREDIT</b> error in counting (as the final count is stated as being accurate)  <b>IGNORE</b> sickle cell  <b>ACCEPT</b> named example e.g. injury / surgery <b>DO NOT CREDIT</b> blood loss unqualified e.g. just given blood  e.g. disease / condition that leads to anaemia (e.g. bone marrow cancer, Vitamin B <sub>12</sub> deficiency, iron deficiency)		

Question		Expected Answer	Mark	Additional Guidance
c	(i)	makes it easier to see the leucocytes ; fewer number of leucocytes than erythrocytes ;	1 max	<b>CREDIT</b> idea that leucocytes become more visible <b>CREDIT</b> idea that fewer leucocytes are present compared to erythrocytes
	(ii)	nuclei of leucocytes is stained ; (so) allows identification of different leucocytes (by shape of nucleus) ;  makes different structures appear, a different colour / darker, than other structures ;	2 max	<b>CREDIT</b> the idea of contrast between different organelles or named organelles
d	<b>P1</b> <b>P2</b> <b>P3</b>  <b>S1</b> <b>S2</b>  <b>S3</b>	a (small) drop, of blood placed on (microscope) slide ; use a (clean), slide / spreader, to spread the blood ; allow slide to air dry ; <b>2 max</b>  add, fixative / named fixative ; add, a <b>named</b> stain ;  rinse with, water ;  <b>2 max</b>	<b>3 max</b>	<b>AWARD</b> only 2 marks max for preparation (P marks) and only 2 marks max for staining (S marks). P marks must be before of the S marks.  <b>DO NOT CREDIT</b> 'add a thin smear'  e.g. alcohol, methanol e.g. Romanovsky / Leishmann's / Eosin / Wright's / Giemsa / Haemotoxylin
<b>Total</b>			<b>13</b>	

Question		Expected Answer	Mark	Additional Guidance
4	a	<p>muscle ;  polysaccharide / polymer / macromolecule ;</p> <p><u><math>\alpha</math></u> / <u>alpha</u>, glucose ;</p> <p><u>glycosidic</u> ;</p> <p>enzymes ;  water ;  condensation ;  hydrolysis ;</p>	8	<p><b>DO NOT CREDIT</b> 'carbohydrate' as given in the question</p> <p><b>DO NOT CREDIT</b> 'glucose' unqualified or 'monosaccharide'</p> <p><b>DO NOT CREDIT</b> 'covalent'</p> <p><b>ACCEPT</b> polymerisation  <b>ACCEPT</b> hydrolytic <b>OR</b> catabolic</p>
	b	<p><i>glucose is</i>  <b>soluble</b> ;  <b>water potential</b> of cells, lowers / more negative ;  water would enter cells ;  by <b>osmosis</b> / (glucose has) <b>osmotic</b> effect on cells ;  down <b>water potential gradient</b> ;  cells, die / lyse / burst ;  AVP ;</p>	3 max	<p><b>IGNORE</b> statements relating to glycogen</p> <p><b>DO NOT CREDIT</b> 'cells pop' <b>OR</b> 'cells explode'  e.g. idea that glucose can not accumulate inside the cell due to equilibrium reached with blood glucose concentration</p>
		<p><b>QWC</b> ~ two technical terms used in correct context and correctly spelt ;</p>	1	<p><b>osmosis / osmotic</b></p> <p>PLUS 1 term from the following:  <b>soluble</b>  <b>water potential</b>  <b>water potential gradient</b></p>
<b>Total</b>			<b>12</b>	



Question		Expected Answer	Mark	Additional Guidance
5	a	1 atria fills with blood / increased pressure in <b>atria</b> ,	4 max	<b>IGNORE</b> reference to atrial wall contracting / atrial systole  <b>CREDIT</b> comparative statements e.g. pressure in ventricles is higher than in atria closes AV valves  <b>OR</b> pressure in atria is higher than in ventricles opens AV valves  <b>CREDIT</b> idea of preventing back flow of blood
		2 forces AV valve open ;		
	3 <b>ventricle</b> (wall) contracts / ventricular <b>systole</b> / increased pressure in ventricles ;			
		4 AV valve is forced shut ;		
		5 correct reference to pressure differences between chambers ;		
		6 <b>chordae tendinae</b> prevent inversion ;		
		<b>QWC</b> ~ two technical terms used in correct context and correctly spelt ;	1	2 terms from: <b>systole</b> <b>atria / atrial / atrium</b> <b>ventricle</b> <b>chordae tendinae</b>
	b	(i) <b>K</b> tricuspid ; <b>L</b> semi-lunar ;	2	<b>ACCEPT</b> <u>right</u> AV (valve) <b>ACCEPT</b> aortic (valve)
		(ii) <u>ventricular</u> systole / contraction of <u>ventricles</u> ;	1	<b>ACCEPT</b> ventricular diastole <b>DO NOT CREDIT</b> 'ventricles' or 'systole' or 'diastole' alone
<b>Total</b>			<b>8</b>	

Question		Expected Answer	Mark	Additional Guidance
6	a	<p>named product must be linked with its suitable use for 2 marks</p> <p><b>P1</b> plasma ; <b>U1</b> use e.g. loss of blood during childbirth, replacement of clotting factors ;</p> <p><b>P2</b> platelets ; <b>U2</b> use e.g. leukaemia, thrombocytopenia, <u>aplastic</u> anaemia ;</p> <p><b>P3</b> packed, red blood cells ; <b>U3</b> use e.g. anaemia ;</p> <p><b>P4</b> leuco-depleted blood ; <b>U4</b> use e.g. <u>aplastic</u> anaemia, recipients of frequent transfusions ;</p> <p><b>P5</b> clotting factors / cryoprecipitate ; <b>U5</b> use e.g. haemophilia ;</p> <p><b>P6</b> serum ; <b>U6</b> use e.g. source of antibodies ;</p>	2 max	<p>Only mark the first response / statement / sentence given by the candidate regardless of if they write any more as the stem of the question only asks for ONE product (and specific use).</p> <p>The use must be appropriate to the stated product</p> <p><b>ACCEPT</b> during cardiac surgery</p> <p><b>DO NOT CREDIT</b> 'clotting diseases' unless related to low platelet counts</p> <p><b>ACCEPT</b> after surgery or childbirth (when diluted)</p> <p><b>ACCEPT</b> named example e.g. fibrinogen <b>ACCEPT</b> named linked use e.g. afibrinogenaemia</p>
	b	<p>antigens from virus added to drop of blood ; (idea that) if antibody is present (in the blood) it will attach to antigen ;</p> <p>use of PCR (to identify viral DNA) ; use of ELISA (to detect antigens) ;</p>		2 max

Question		Expected Answer	Mark	Additional Guidance
c	(i)	blood would freeze ; ice (crystals) would form, inside (blood) cells ; ruptures cell membrane(s) ;  (so blood would be) unsuitable for use ;	2 max	<b>DO NOT CREDIT</b> 'cells freeze' alone  <b>ACCEPT</b> reference to cell membrane damage, cells lysed, cells burst
	(ii)	<i>factor</i> pH ;  <i>why it must be controlled</i> enzymes / proteins, denatured / tertiary structure changed, by <b>extremes</b> of pH ;  changes in concentration of, H <sup>+</sup> / H ions / hydrogen ions ; breaks, hydrogen / ionic, bonds ; changes, charge / structure / shape, of <u>active site</u> ;  2 max		3 max
<b>Total</b>			<b>9</b>	

Total 60 marks

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