

Human Biology

Advanced Subsidiary GCE **F221**

Molecules, Blood and Gas Exchange

Mark Scheme for June 2010

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Question		Expected Answer	Mark	Additional Guidance
1	a	trachea ;	1	ACCEPT windpipe DO NOT CREDIT cartilage / cartilage rings
	b	made of more than one type of tissue ; cartilage (rings) and elastic ; (working together) to perform a (particular / specific) function ;	2 max	CREDIT idea of collection of tissues (plural) ACCEPT 'a group of tissues' Must name both for the mark CREDIT 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	DO NOT CREDIT excrete
	d	(i) Y erythrocyte / red blood (cell) ; Z <u>squamous</u> epithelial (cell) ;	2	ACCEPT RBC ACCEPT macrophage DO NOT CREDIT 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 with units divided by 15 (Scale bar measured at 30 mm) e.g. 30mm / 15 30/15 receives no mark (as no units stated).
Total			10	

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 or produces antibodies or 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 or produces antibodies or 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>DO NOT CREDIT statements which contradict e.g. B and T lymphocytes produce antibodies</p> <p>ACCEPT 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>
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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 once only in either b (i) or b (ii)</p> <p>DO NOT CREDIT 'cell membrane' alone</p>																				

Question		Expected Answer	Mark	Additional Guidance
	(ii)	(cytoplasm) granular / has granules ; have, cell surface / plasma, membrane ;	1	DO NOT CREDIT reference to cell surface / plasma membrane if 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	IGNORE ref to lack of calcium ions CREDIT protein denatured, correct reference to tertiary structure affected / active site altered DO NOT CREDIT <u>no</u> protein OR <u>no</u> factor present OR <u>no</u> factor produced
Total			8	

Question		Expected Answer	Mark	Additional Guidance	
3	a	haemocytometer ;	1	ACCEPT phonetic spelling	
	b	(i)	15 ;	1	
		(ii)	all cells (in field of view) counted ; north-west rule, not applied by trainee ;	2	CREDIT description of a lack of consistent counting rule for squares e.g. they should not have counted cells on the south and east or cells on the edge at top right in and bottom left out or 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) IGNORE reference to determining an average
(iv)	anaemia ; heavy / excessive, blood loss ; AVP ;	1 max	DO NOT CREDIT error in counting (as the final count is stated as being accurate) IGNORE sickle cell ACCEPT named example e.g. injury / surgery DO NOT CREDIT blood loss unqualified e.g. just given blood e.g. disease / condition that leads to anaemia (e.g. bone marrow cancer, Vitamin B ₁₂ 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	CREDIT idea that leucocytes become more visible CREDIT 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	CREDIT the idea of contrast between different organelles or named organelles
d	P1 P2 P3 S1 S2 S3	a (small) drop, of blood placed on (microscope) slide ; use a (clean), slide / spreader, to spread the blood ; allow slide to air dry ; 2 max add, fixative / named fixative ; add, a named stain ; rinse with, water ; 2 max	3 max	AWARD 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. DO NOT CREDIT 'add a thin smear' e.g. alcohol, methanol e.g. Romanovsky / Leishmann's / Eosin / Wright's / Giemsa / Haemotoxylin
Total			13	

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

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

Question		Expected Answer	Mark	Additional Guidance
6	a	<p>named product must be linked with its suitable use for 2 marks</p> <p>P1 plasma ; U1 use e.g. loss of blood during childbirth, replacement of clotting factors ;</p> <p>P2 platelets ; U2 use e.g. leukaemia, thrombocytopenia, <u>aplastic</u> anaemia ;</p> <p>P3 packed, red blood cells ; U3 use e.g. anaemia ;</p> <p>P4 leuco-depleted blood ; U4 use e.g. <u>aplastic</u> anaemia, recipients of frequent transfusions ;</p> <p>P5 clotting factors / cryoprecipitate ; U5 use e.g. haemophilia ;</p> <p>P6 serum ; U6 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>ACCEPT during cardiac surgery</p> <p>DO NOT CREDIT 'clotting diseases' unless related to low platelet counts</p> <p>ACCEPT after surgery or childbirth (when diluted)</p> <p>ACCEPT named example e.g. fibrinogen ACCEPT 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	DO NOT CREDIT 'cells freeze' alone ACCEPT 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 extremes of pH ; changes in concentration of, H ⁺ / H ions / hydrogen ions ; breaks, hydrogen / ionic, bonds ; changes, charge / structure / shape, of <u>active site</u> ; 2 max		3 max
Total			9	

Total 60 marks

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Facsimile: 01223 552553