

GCE

Human Biology

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

Advanced Subsidiary GCE

Mark Scheme for June 2014

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning of annotation
	Tick
	Cross
	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate 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

* Quality of Written Communication

Question			Answer	Mark	Guidance
1	(a)	(i)	hydrogen ; carboxyl (group) ;	2	CREDIT correct symbols i.e. H and COOH CREDIT correct answers on the diagram if no written answers provided DO NOT CREDIT hydrogen molecule ACCEPT carboxylic acid IGNORE group
		(ii)	amine (group) <u>and</u> carboxyl (group) ;	1	ACCEPT amino and carboxylic acid CREDIT correct chemical symbols i.e. NH ₂ and COOH
		(iii)	dipeptide ;	1	IGNORE water
	(b)	(i)	(amino acids are) soluble in water / AW ; increase (in amino acid concentration) lowers, water potential / AW ;	2	CREDIT correct ref to zwitterions CREDIT water potential becomes more negative CREDIT ORA
		(ii)	<i>idea that oxygen is non-polar ;</i>	1	
	(c)		carrier proteins ; move molecules against the concentration gradient / AW ; energy / ATP, required ;	2max	IGNORE channel proteins
Total				9	

Question		Answer	Mark	Guidance
2	(a)	C first and D last ; A before E ; E before F ;	3	correct sequence (B) C A E F D
	(b) (i)	ref to <u>differential</u> stain ; erythrocyte contains haemoglobin (which is red) ; leucocyte has a nucleus that, picks up the stain / AW ;	2max	CREDIT correct named stain e.g. Leishman's or Wright's
	(ii)	9 ;;	2	If answer incorrect, allow one mark for: 10000 / 1100 OR Answer not given to nearest whole number (e.g. 9.09.....)
	(c) (i)	wear gloves ; eye protection ; ref safe disposal ; AVP ;	2max	e.g. lab coats cover wounds sterilisation of equipment
	(ii)	<i>idea that</i> range will show smallest and largest value for diameter ; <i>idea that</i> mean takes all data into consideration ; <i>idea that</i> ranges may overlap ; <i>idea that</i> anomalies can be identified ; <i>idea that</i> a statistical analysis could be done ; <i>idea that</i> the conclusion would be (more) <u>valid</u> ;	2max	look for idea of variation in size within each sample CREDIT correct ref to reliability in context to the mean ACCEPT ref to comparing means or other correct example of a statistical analysis IGNORE reference to accuracy and reliability
		Total	11	

Question			Answer	Mark	Guidance
3	(b)	(i)	lower temperature slows down, metabolic reactions / AW (in red blood cells) ;	1	
		(ii)	to prevent clotting ;	1	CREDIT ORA
	(c)		to prevent an immune response in the patient ; to prevent patient's blood from producing antibodies ; (patients) may need multiple transfusions ; <i>Idea that patient may be immunocompromised ;</i>	1max	e.g. patients with HIV or patients undertaking chemotherapy
	(d)		(to prevent) ice crystals forming in the cells ; (which) disrupt cell membranes ; <i>idea that cells will not be destroyed when thawed / AW ;</i>	2max	ACCEPT idea that water expands as it freezes inside cell
	(e)		(small drop of) blood added to antigen (of virus) ; if blood contains antibody it will attach to antigen ; AVP ;	2max	e.g. ref to agglutination observed ref to ELISA ref to PCR
			Total	12	

Question		Answer	Mark	Guidance
4	(a)	<p>P right ventricle ; Q septum ; R left atrium ; S pulmonary artery ;</p>	4	IGNORE bundle of His or Purkyne fibres
	(b)	<p><i>atria</i> walls are thinner than ventricles as blood only needs to be pushed down to ventricles ;</p> <p><i>ventricles</i> left wall is thicker than right as blood needs to be pushed around whole body ;</p>	2	<p>CREDIT ref to R for 'atria' and P for 'ventricle' for mp 1</p> <p>CREDIT ORA</p> <p>CREDIT ORA</p>
	(c)	<p>1 atrio-ventricular valves open to allow the ventricles to fill with blood ;</p> <p>2 AV valves (forced) close to prevent, flow of blood from ventricles to atria / backflow, during ventricular systole ;</p> <p>3 semi-lunar valves are (forced) open during ventricular systole ;</p> <p>4 SL valves prevent backflow of blood into heart during ventricular diastole ;</p>	3max	<p>CREDIT correctly named valves throughout.</p> <p>ACCEPT for MP2, MP3, MP4 correct ref to pressure differences in place of systole or diastole</p>
		QWC ;	1	<p>Two of the following terms, used in the appropriate context with correct spelling:</p> <p>atrio-ventricular ventricle(s) atrium / atria systole semi-lunar diastole</p>

Question			Answer	Mark	Guidance
4	(d)	(i)	find <u>named</u> artery ; press on artery, with two fingers ; calculation of bpm ;	2max	CREDIT radial or carotid e.g. 15 seconds and multiply by 4
		(ii)	<i>idea that</i> the, heart / named chamber, does not fully empty ; AVP ;	1max	ACCEPT blood pools e.g. fibrillation damages endothelium (triggering clotting)
			Total	13	

Question		Answer	Mark	Guidance
5	(a)	<p><i>arteriole</i> wall has (smooth) muscle (fibres) ;</p> <p>(smooth) muscle contracts to make lumen narrower OR (this) decreases flow of blood to tissues OR maintains blood pressure ;</p> <p><i>capillary</i> thin wall / small lumen / gaps between (endothelial) cells ; <i>idea that</i> it allows exchange of materials (between blood and tissues) ;</p> <p><i>venule</i> wall has less (smooth) muscle OR large lumen (diameter) OR valves ;</p> <p>(<i>lumen</i>) <i>idea of</i> large blood volume OR (<i>valves</i>) <i>idea of</i> preventing backflow ;</p> <p>CREDIT <u>ONCE</u> FOR ANY NAMED BLOOD VESSEL</p> <p>smooth endothelium ;</p> <p>reduces, friction / AW ;</p>	6max	<p>CREDIT ORA</p> <p>CREDIT ORA</p> <p>CREDIT wall is one cell thick</p> <p>ACCEPT short diffusion pathway</p> <p>DO NOT CREDIT in the context of smooth muscle</p>

Question			Answer	Marks	Guidance
5	(b)	(i)	<i>idea that</i> one arteriole , supplies many capillaries / AW ; <i>idea of</i> loss of, plasma / AW , from capillaries (leading to loss of pressure) ;	1max	CREDIT higher cross-sectional area reduces rate of flow or pressure DO NOT CREDIT loss of blood IGNORE lymph
		(ii)	<i>idea that</i> there is more time for exchange of materials ;	1	CREDIT named materials e.g. respiratory gases
			Total	8	

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