

**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 <b>must</b> 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	<b>CREDIT</b> correct symbols i.e. H and COOH <b>CREDIT</b> correct answers on the diagram if no written answers provided <b>DO NOT CREDIT</b> hydrogen molecule <b>ACCEPT</b> carboxylic acid <b>IGNORE</b> group
		(ii)	amine (group) <u>and</u> carboxyl (group) ;	1	<b>ACCEPT</b> amino and carboxylic acid <b>CREDIT</b> correct chemical symbols i.e. NH <sub>2</sub> and COOH
		(iii)	dipeptide ;	1	<b>IGNORE</b> water
	(b)	(i)	(amino acids are) soluble in water / AW ; increase (in amino acid concentration) lowers, water potential / AW ;	2	<b>CREDIT</b> correct ref to zwitterions <b>CREDIT</b> water potential becomes more negative <b>CREDIT</b> 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	<b>IGNORE</b> channel proteins
<b>Total</b>				<b>9</b>	

Question		Answer	Mark	Guidance
2	(a)	<b>C</b> first and <b>D</b> last ; <b>A</b> before <b>E</b> ; <b>E</b> before <b>F</b> ;	3	correct sequence (B) <b>C A E F D</b>
	(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	<b>CREDIT</b> correct named stain e.g. Leishman's or Wright's
	(ii)	9 ;;	2	If answer incorrect, allow <b>one</b> mark for: 10000 / 1100  <b>OR</b> 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 <b>all</b> 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  <b>CREDIT</b> correct ref to reliability in context to the mean  <b>ACCEPT</b> ref to comparing means or other correct example of a statistical analysis <b>IGNORE</b> reference to accuracy and reliability
		<b>Total</b>	<b>11</b>	



Question			Answer	Mark	Guidance
3	(b)	(i)	lower temperature slows down, metabolic reactions / AW (in red blood cells) ;	1	
		(ii)	to prevent clotting ;	1	<b>CREDIT ORA</b>
	(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	<b>ACCEPT</b> 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
			<b>Total</b>	<b>12</b>	

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

Question			Answer	Mark	Guidance
4	(d)	(i)	find <u>named</u> artery ; press on artery, with two fingers ; calculation of bpm ;	2max	<b>CREDIT</b> 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	<b>ACCEPT</b> blood pools  e.g. fibrillation damages endothelium (triggering clotting)
			<b>Total</b>	<b>13</b>	

Question		Answer	Mark	Guidance
5	(a)	<p><i>arteriole</i> wall has (smooth) muscle (fibres) ;</p> <p>(smooth) muscle contracts to make lumen narrower <b>OR</b> (this) decreases flow of blood to tissues <b>OR</b> 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 <b>OR</b> large lumen (diameter) <b>OR</b> valves ;</p> <p>(<i>lumen</i>) <i>idea of</i> large blood volume <b>OR</b> (<i>valves</i>) <i>idea of</i> preventing backflow ;</p> <p><b>CREDIT <u>ONCE</u> FOR ANY NAMED BLOOD VESSEL</b></p> <p>smooth endothelium ;</p> <p>reduces, friction / AW ;</p>	6max	<p><b>CREDIT</b> ORA</p> <p><b>CREDIT</b> ORA</p> <p><b>CREDIT</b> wall is one cell thick</p> <p><b>ACCEPT</b> short diffusion pathway</p> <p><b>DO NOT CREDIT</b> 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	<b>CREDIT</b> higher cross-sectional area reduces rate of flow or pressure  <b>DO NOT CREDIT</b> loss of blood <b>IGNORE</b> lymph
		(ii)	<i>idea that</i> there is more time for exchange of materials ;	1	<b>CREDIT</b> named materials e.g. respiratory gases
			<b>Total</b>	<b>8</b>	



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