

**Applied Science**

Advanced GCE **G622**

Monitoring the Activity of the Human Body

**Mark Scheme for June 2010**

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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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Question			Expected Answers	Marks	Additional Guidance
1	a	i	veins ✓	1	<b>ignore</b> name of vein <b>accept</b> venules
		ii	arteries ✓	1	<b>ignore</b> name of artery
		iii	veins ✓	1	
		iv	carries <u>oxygenated</u> blood ✓	1	<b>accept</b> carries <u>lowest</u> levels of carbon dioxide
		v	capillary ✓	1	
	b	i 1	A trachea / windpipe ✓ B alveolus / alveoli / air sacs ✓ C bronchiole ✓ D diaphragm ✓	4	<b>accept - A cartilage ring</b>
		i 2	intercostal (external) ✓ flattened ✓ increases / expands ✓ decreases ✓ atmosphere / air / outside body <b>AND</b> lungs/alveoli ✓	5	<b>reject</b> internal <b>accept</b> straight  <b>both</b> atmosphere/etc and lungs for the mark
		ii 1	less ✓ more ✓ air / lungs ✓ blood ✓ body ✓	5	

Question			Expected Answers	Marks	Additional Guidance
1	b	ii 2	<p><b>oxygen</b> - any <b>three</b> from:            (oxygen) combines with <u>haemoglobin</u> / <u>oxyhaemoglobin</u> ✓            red blood cell / RBC / erythrocyte ✓            picks up/loading/combining, of oxygen at <b>region of high oxygen</b> levels i.e. lungs ✓            release/ unloading of oxygen at <b>region of low oxygen</b> levels/ respiration/ respiring tissue e.g. muscle ✓</p> <p><b>nutrients</b> - any <b>two</b> from:            (nutrients), in solution / dissolved ✓            named example of soluble nutrient ✓            in <u>plasma</u> ✓            (picks up / loading of nutrients) at region of <b>high nutrient levels</b> e.g. ileum /            (release / unloading of nutrients) at region of <b>low nutrient levels</b> e.g. muscle ✓</p>	5	<p><b>accept</b> oxygen association at the lungs</p> <p><b>accept</b> oxygen dissociation at the respiring tissue</p>
<b>Total</b>				<b>24</b>	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	<b>Barack:</b> litigation / George has an accident (and sues) ✓	1	
			<b>George - any two from:</b> possible over-exertion ✓ dehydration ✓ pulled muscle ✓ slip / fall (on treadmill) ✓ moving parts on treadmill ✓ electrocution ✓	2	
		ii	<b>Barack:</b> low risk because equipment likely to be checked on regular basis/ George is an experienced athlete ✓	1	risk must be <u>qualified</u>
			<b>George:</b> low risk being an experienced athlete/ equipment likely to be checked on regular basis ✓	1	risk must be <u>qualified</u> do not credit mark if repeated explanation shown for Barack
		iii	<b>Barack - any two from:</b> check G's medical history ✓ check equipment safety records ✓ check running surface / mat secure / dry ✓ check/supervise, G's use of the equipment ✓	2	
			<b>George - any two from:</b> needs to know what to do / correct use of equipment ✓ drinking water available ✓ needs to know what to do if stressed ✓ proper running shoes ✓	2	<b>accept</b> e.g. warming up / cooling down
		iv	report incident via name / telephone number to (within centre) ✓ record any incident ✓	2	<b>accept</b> telephone 999 if qualified/ serious accident

Question			Expected Answers	Marks	Additional Guidance
2	b	i	aerobic ✓ mitochondria / mitochondrion ✓	2	
		ii	lactic acid / lactate ✓	1	
		iii	<u>oxygen</u> debt / hypoxia / hypoxic / fatigued ✓	1	<b>reject</b> cramp <b>ignore</b> tired/ exhausted
		iv	oxidised / changed to pyruvate / changed to pyruvic acid / recycled to glycogen ✓	1	<b>reject</b> 'removed / broken down owtte'
<b>Total</b>				<b>16</b>	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	60 – 80 <u>beats min<sup>-1</sup></u> ✓ 36.5 – 37.2 <u>°C</u> ✓ 135/85 <u>mmHg</u> ✓	3	<b>accept</b> other appropriate units for pulse rate <b>accept</b> specific values within each range
		ii	<b>A</b> 6 ✓ <b>B</b> 5 ✓ <b>C</b> 2 ✓ <b>D</b> 4 ✓ <b>E</b> 1 ✓	5	
	b	i	brain / hypothalamus ✓	1	
		ii	<u>increased/more muscle contraction</u> ✓ 1 generates heat / respiratory heat / raises body temperature / make body warmer ✓	2	
		ii	2 any <b>four</b> from: sweat <u>glands</u> release / produce sweat ✓ water/sweat evaporates ✓ heat required (to change liquid into vapour) / owtte ✓ heat (for evaporation) taken from underlying tissues/ skin / owtte ✓ body temperature lowered ✓	4	<b>ignore</b> liquid/fluid – with reference to sweat evaporating  <b>ignore</b> keeping body cool
		ii	3 <b>vasoconstriction</b> - any <b>three</b> from: happens if <u>too</u> cold / body temperature falling markedly / OWTTE ✓ shunts close off surface capillaries/ arteriole (muscle) contracts to close off blood flow to surface capillaries ✓ <b>less</b> blood to surface ✓ <b>less</b> heat loss ✓ by radiation / conduction / convection ✓  <b>OR</b> <b>vasodilation</b> - converse statements	3	answer should relate to <b>either</b> vasoconstriction <b>OR</b> vasodilation do not award for both – but allocate higher mark
			<b>Total</b>	<b>18</b>	

Question		Expected Answers	Marks	Additional Guidance
4	a	J before H ✓ H before F ✓ F before G ✓ G before E ✓	4	
	b	i	1	<b>ignore</b> reference to increased/decreased in relation to resistance <b>accept</b> making tissue fluid
		ii	2	<b>ignore</b> pumping / beating
		iii	4	
	c	i	1	<b>ignore</b> units
		ii	1	<b>ignore</b> units
		iii	4	
		A bicuspid/mitral/ <u>left</u> atrio-ventricular (AV), valve closes ✓ B semilunar/aortic, valve opens ✓ C semilunar/aortic, valve closes ✓ D bicuspid/mitral/ <u>left</u> atrio-ventricular (AV), valve opens ✓	4	
		<b>Total</b>	<b>17</b>	



Question			Expected Answers	Marks	Additional Guidance
5	a	i	<p>any <b>two</b> from:</p> <p>preliminary examination ✓</p> <p>acceptable examples ✓✓</p>	2	<p><b>allow</b> soft tissue scan e.g. bladder function test / tumour location / prenatal examination</p> <p><b>ignore</b> unqualified conditions</p>
		ii	<p>any <b>two</b> from:</p> <p><u>non-ionising</u> radiation technique ✓</p> <p>no (known) harmful side-effects ✓</p> <p>good soft tissue <u>resolution</u> ✓</p> <p>non-invasive ✓</p> <p>real-time images / immediate result ✓</p> <p><u>relatively</u> cheap / cheaper / widely available / portable ✓</p>	2	<p><b>ignore</b> 3D image / quick</p>

Question	Expected Answers	Marks	Additional Guidance
5 a iii	<p><b>[Level 1]</b> Candidate shows a high level description supported by a full explanation of how the ultrasound scanner can be used, including <b>at least five</b> valid points expressed clearly and logically. There are few, if any, errors in spelling, punctuation and grammar.</p> <p style="text-align: right;"><b>(5 – 6 marks)</b></p> <p><b>[Level 2]</b> Candidate shows some understanding, giving a sound description of how an ultrasound scanner can be used, including <b>at least three</b> valid points expressed clearly and logically. There may be occasional errors in spelling, punctuation and grammar.</p> <p style="text-align: right;"><b>(3 – 4 marks)</b></p> <p><b>[Level 3]</b> Candidate shows a basic understanding of how the ultrasound scanner can be used incorporating <b>at least one</b> valid point but with little or no explanation. Errors of grammar punctuation and spelling may be intrusive.</p> <p style="text-align: right;"><b>(1 - 2 marks)</b></p> <p>Expected knowledge and understanding could include the following valid points:</p> <ul style="list-style-type: none"> <li>• uses sound <u>waves</u></li> <li>• (sound waves) in range 2 – 20 MHz</li> <li>• (waves) transmitted/received (using a probe)</li> <li>• probe has a transducer / a piezo crystal</li> <li>• probe acts as a ‘loudspeaker’ <b>and</b> as a ‘microphone’</li> <li>• different probes used for different situations / investigations</li> <li>• gel used to close probe-air-skin gap / coupling gel</li> <li>• waves that do not penetrate reflect</li> <li>• echo patterns</li> <li>• images viewed on, monitor/screen/computer, / stills</li> </ul>	6	<p><i>Level 1 example:</i> Ultrasound uses sound waves in the range 2 – 20 MHz. Sound waves are transmitted and received using a probe. A gel is used to close probe-air-skin gap. Sound waves that do not penetrate a material are reflected. The ‘echoes’ are converted into images.</p> <p><i>Level 2 example:</i> Ultrasound uses sound waves. Some sound waves are reflected. The ‘echoes’ are converted into images.</p> <p><i>Level 3 example:</i> Ultrasound uses sound waves and ‘echoes’ are converted into images.</p> <p><b>accept</b> (waves) sent/ picked up</p> <p><b>accept</b> (waves) bounced back</p> <p><b>accept</b> image formed (unqualified)</p>

Question		Expected Answers	Marks	Additional Guidance
5	b	<p><b>[Level 1]</b> Candidate shows a high level description supported by a full explanation of the benefits and risks involved, including <b>at least four</b> valid points (including at least one benefit) expressed clearly and logically. There are few, if any, errors in spelling, punctuation and grammar. <i>(4 – 5 marks)</i></p> <p><b>[Level 2]</b> Candidate shows some understanding, giving a sound description of the benefits and/or risks involved, including <b>at least two</b> valid points expressed clearly and logically. There may be occasional errors in spelling, punctuation and grammar. <i>(2 – 3 marks)</i></p> <p><b>[Level 3]</b> Candidate shows a basic understanding of the benefits and/or risks, incorporating <b>at least one</b> valid point but with little or no explanation. <i>(1 mark)</i></p>	5	<p>Expected knowledge and understanding could include the following valid points:</p> <p><b>benefits:</b>  increase life expectancy ✓  better quality of life / pain relief ✓  choice available ✓  AVP ✓</p> <p><b>risks (maximum four):</b>  trauma of receiving the diagnosis likely to have effects on mental state ✓  medical procedures could be dangerous ✓  anaesthesia may have complications ✓  may have poor quality of life post surgery ✓  not understand what's going on ✓  getting an infection in hospital ✓  AVP ✓</p> <p><b>ignore</b> references to costs/NHS/family</p>
		<b>Total</b>	<b>15</b>	

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