

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	ignore name of vein accept venules
		ii	arteries ✓	1	ignore name of artery
		iii	veins ✓	1	
		iv	carries <u>oxygenated</u> blood ✓	1	accept 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	accept - A cartilage <u>ring</u>
		i 2	intercostal (external) ✓ flattened ✓ increases / expands ✓ decreases ✓ atmosphere / air / outside body AND lungs/alveoli ✓	5	reject internal accept straight both 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>oxygen - any three from: (oxygen) combines with <u>haemoglobin</u> / <u>oxyhaemoglobin</u> ✓ red blood cell / RBC / erythrocyte ✓ picks up/loading/combining, of oxygen at region of high oxygen levels i.e. lungs ✓ release/ unloading of oxygen at region of low oxygen levels/ respiration/ respiring tissue e.g. muscle ✓</p> <p>nutrients - any two from: (nutrients), in solution / dissolved ✓ named example of soluble nutrient ✓ in <u>plasma</u> ✓ (picks up / loading of nutrients) at region of high nutrient levels e.g. ileum / (release / unloading of nutrients) at region of low nutrient levels e.g. muscle ✓</p>	5	<p>accept oxygen association at the lungs</p> <p>accept oxygen dissociation at the respiring tissue</p>
Total				24	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	Barack: litigation / George has an accident (and sues) ✓	1	
			George - any two from: possible over-exertion ✓ dehydration ✓ pulled muscle ✓ slip / fall (on treadmill) ✓ moving parts on treadmill ✓ electrocution ✓	2	
		ii	Barack: low risk because equipment likely to be checked on regular basis/ George is an experienced athlete ✓	1	risk must be <u>qualified</u>
			George: 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	Barack - any two from: check G's medical history ✓ check equipment safety records ✓ check running surface / mat secure / dry ✓ check/supervise, G's use of the equipment ✓	2	
			George - any two from: 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	accept e.g. warming up / cooling down
		iv	report incident via name / telephone number to (within centre) ✓ record any incident ✓	2	accept 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	reject cramp ignore tired/ exhausted
		iv	oxidised / changed to pyruvate / changed to pyruvic acid / recycled to glycogen ✓	1	reject 'removed / broken down owtte'
Total				16	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	60 – 80 <u>beats min⁻¹</u> ✓ 36.5 – 37.2 <u>°C</u> ✓ 135/85 <u>mmHg</u> ✓	3	accept other appropriate units for pulse rate accept specific values within each range
		ii	A 6 ✓ B 5 ✓ C 2 ✓ D 4 ✓ E 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 four 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	ignore liquid/fluid – with reference to sweat evaporating ignore keeping body cool
		ii	3 vasoconstriction - any three 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 ✓ less blood to surface ✓ less heat loss ✓ by radiation / conduction / convection ✓ OR vasodilation - converse statements	3	answer should relate to either vasoconstriction OR vasodilation do not award for both – but allocate higher mark
			Total	18	

Question		Expected Answers	Marks	Additional Guidance
4	a	J before H ✓ H before F ✓ F before G ✓ G before E ✓	4	
	b	i	1	ignore reference to increased/decreased in relation to resistance accept making tissue fluid
		ii	2	ignore pumping / beating
		iii	4	
	c	i	1	ignore units
		ii	1	ignore 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 ✓		
		Total	17	

Question			Expected Answers	Marks	Additional Guidance
5	a	i	<p>any two from:</p> <p>preliminary examination ✓</p> <p>acceptable examples ✓✓</p>	2	<p>allow soft tissue scan e.g. bladder function test / tumour location / prenatal examination</p> <p>ignore unqualified conditions</p>
		ii	<p>any two 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>ignore 3D image / quick</p>

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

Question		Expected Answers	Marks	Additional Guidance
5	b	<p>[Level 1] Candidate shows a high level description supported by a full explanation of the benefits and risks involved, including at least four 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>[Level 2] Candidate shows some understanding, giving a sound description of the benefits and/or risks involved, including at least two valid points expressed clearly and logically. There may be occasional errors in spelling, punctuation and grammar. <i>(2 – 3 marks)</i></p> <p>[Level 3] Candidate shows a basic understanding of the benefits and/or risks, incorporating at least one 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>benefits: increase life expectancy ✓ better quality of life / pain relief ✓ choice available ✓ AVP ✓</p> <p>risks (maximum four): 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>ignore references to costs/NHS/family</p>
		Total	15	

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