

Applied Science

Advanced Subsidiary GCE

Unit **G622**: Monitoring the Activity of the Human Body

Mark Scheme for June 2012

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.















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1. Annotations

Annotation	Meaning
	Tick
	Cross
	Benefit of doubt
	Error carried forward
	Example/Reference
	Ignore
	Not answered question
	Benefit of doubt not given
	Large dot (Key point attempted)
	Reject
	Contradiction
	Error in no. of significant figures
	Unclear
	Omission mark

2. **Abbreviations, annotations and conventions used in the detailed Mark Scheme** (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	separates marking points
not	answers which are not worthy of credit
reject	answers which are not worthy of credit
ignore	statements which are irrelevant
accept	answers that can be accepted
()	words which are not essential to gain credit
—	underlined words must be present in answer to score a mark
ecf	error carried forward
AW	alternative wording
ora	or reverse argument

Question		Answer	Marks	Guidance															
1	(a)	E/U	<table border="1"> <tr> <td>normal value</td> <td>unit of measurement</td> </tr> <tr> <td>36.5 to 37.2 ✓</td> <td>°C ✓</td> </tr> <tr> <td>15 – 18</td> <td>breaths per minute</td> </tr> <tr> <td>0.4 to 0.5 ✓</td> <td>dm³</td> </tr> <tr> <td>400 – 600 ✓</td> <td>dm³ min⁻¹</td> </tr> <tr> <td>120/80 ✓</td> <td>mmHg</td> </tr> <tr> <td>60 – 80</td> <td>beats per minute</td> </tr> </table>	normal value	unit of measurement	36.5 to 37.2 ✓	°C ✓	15 – 18	breaths per minute	0.4 to 0.5 ✓	dm ³	400 – 600 ✓	dm ³ min ⁻¹	120/80 ✓	mmHg	60 – 80	beats per minute	5	<p>accept degrees <u>Celsius/centigrade</u> ranges expected for body temperature, tidal volume and peak flow but accept single values on or between the limits both values for blood pressure must be stated for the mark, and in the correct order accept 120 – 80 = 120/80</p>
		normal value		unit of measurement															
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E																			
(b)	E	sphygmomanometer ✓	1	accept phonetic spelling – must have ‘g’ not eg sphyrometer															
(c)	E D C	<p>EITHER (typical/manual technique) fingers placed on, wrist/radial/neck/carotid/ankle/brachial/ inside arm ✓ <u>count</u> pulse/beats ✓ over a, specified/appropriate/set, time period ✓</p> <p>OR (digital sphygmomanometer technique) apply, strap/arm band ✓ turn on digital sphygmomanometer ✓ (record pulse) reading on screen ✓</p>	3	<p>only accept stethoscope if in correct context reject under chin</p> <p>ignore take pulse reading ignore short period accept time period = max. 60 secs</p>															
(d)	(i)	<p>morning/AM/appropriate time and afternoon/PM/appropriate time ✓ <u>267.5 / 268</u> ✓</p> <p><i>plus any two from:</i> increased (peak flow rate)/ increased from AM to PM ✓ correct reference to data to support increase ✓</p> <p>levels off during final four days ✓ correct reference to data to support levelling off ✓</p> <p>differences between AM and PM readings is reduced ✓ correct reference to data to support reduction in difference ✓</p>	2 2	<p>accept when wake up and go to bed accept correct reference to sleeping</p> <p>accept converse ignore ref. to volume of air leaving lungs increases</p>															

Question		Answer	Marks	Guidance
	(ii) E E/U	A C B D ✓✓	2	A immediately before C C immediately before B B immediately before D 3 correct = 2 marks 1 or 2 correct = 1 mark accept names / linking arrows
(e)	(i) E/U	<u>spirometer</u> ✓	1	accept phonetic spelling
	(ii) D	<u>W</u> ✓	1	
	(iii) D	exercise / stress / standing up / more frequent/ increased/ deeper breathing (for reading B) ✓	1	accept converse for reading A accept increased activity ignore reference to changing activity reject recovering from exercise / after exercise
		Total	18	

Question			Answer	Marks	Guidance
2	(a)	(i) E/U E/U E E	A = vena cava ✓ B = aorta ✓ C = (left) atrium ✓ D = tricuspid <u>valve</u> / (right) atrio ventricular <u>valve</u> / AV <u>valve</u> ✓	4	accept phonetic spellings reject right atrium reject left AV
		(ii) E E D D	- <i>function of A</i> bring/delivers/receives, deoxygenated blood / blood from body ✓ to (right) atrium ✓ - <i>function of D</i> to prevent back flow of blood (into the right atrium from the right ventricle) ✓ allows/channels, blood flow from atrium to ventricle ✓	2 2	accept blood to be oxygenated = deoxygenated ignore bringing blood to 'heart' reject pumps/forces blood reject left atrium ignore a general reference to heart/tricuspid valve contracting reject reference to left side structures
	(b)	B C	(left) ventricle wall (point Y) creates greater (blood) pressure / stronger contraction/greater force/pressure of (left) ventricle wall (point Y) therefore blood under greater pressure ✓ blood travels, further/greater distance/around body/ overcome higher resistance of systemic circulation ✓	1 1	accept converse argument for right ventricle wall (point X) accept qualified reference to pressure eg enough pressure ignore 'supports' more blood pressure
	(c)	A A	any two from: backflow occurs / blood, returns back/leaks, to, right atrium/chamber above ✓ lower blood pressure reaching the lungs ✓ reduced gaseous exchange / less oxygen, enters blood /exchanged, at lungs / blood (leaving the heart) is not fully oxygenated / less carbon dioxide removed from blood at lungs ✓ less energy/lethargic ✓	2	reject references to volume of blood (reaching lungs) reject mixing of oxygenated and deoxygenated blood reject not oxygenated

Question		Answer	Marks	Guidance												
	(d)	(i) C adrenaline ✓	1	accept thyroxine/epinephrine												
		(ii) C A accelerates/ increases/ speeds up, heart (beat) rate/strength of contraction/stroke volume/cardiac output ✓ SAN/pacemaker, is target site ✓	2	OWTTE accept increases pulse rate ignore references to sympathetic/parasympathetic reject adrenal hormone												
	(e)	E/U E/U E <table border="1" data-bbox="495 520 1140 839"> <tbody> <tr> <td>uses a non-invasive technique.</td> <td>✓</td> </tr> <tr> <td>is a disposable piece of equipment.</td> <td></td> </tr> <tr> <td>does not need a trained technician.</td> <td></td> </tr> <tr> <td>shows parts of the heart moving.</td> <td>✓</td> </tr> <tr> <td>gives a three-dimensional image.</td> <td>✓</td> </tr> <tr> <td>gives a clear X-ray image of the heart.</td> <td></td> </tr> </tbody> </table>	uses a non-invasive technique.	✓	is a disposable piece of equipment.		does not need a trained technician.		shows parts of the heart moving.	✓	gives a three-dimensional image.	✓	gives a clear X-ray image of the heart.		3	If more than three responses – deduct one mark for each additional response
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Question	Answer	Marks	Guidance
(f) E/U E D B B A	<p>[Level 0] Candidate includes fewer than three valid points. (0 marks)</p> <p>[Level 1] Candidate shows a basic understanding of the different sources of information used in the diagnosis of heart defects, including at least three valid points. For two marks, valid points must be taken from at least two techniques. (1 – 2 marks)</p> <p>[Level 2] Candidate shows an understanding, of the different sources of information used in the diagnosis of heart defects, including at least four valid points. For four marks, valid points must be taken from at least three techniques, expressed clearly. (3 – 4 marks)</p> <p>[Level 3] Candidate shows a high level of understanding of the different sources of information used in the diagnosis of heart defects, including at least five valid points. For six marks, valid points must be taken from all four techniques, expressed clearly and logically. (5 – 6 marks)</p> <p><i>N.B. The number of ticks on the script will not always directly equate with the numbers of marks given.</i></p>	6	<p>valid points for the techniques - ultrasound images</p> <ul style="list-style-type: none"> • view soft tissues • heart action/heart beating /real time (images)/ blood flow • high resolution (of images)/ but interference of rib cage • named example of defect eg tumour, VSD, faulty valves, blocked blood vessels etc. <p>ignore unqualified blockages/ cholesterol/ fat around heart</p> <p>ECG traces</p> <ul style="list-style-type: none"> • heart/pulse rate (ie the speed/ fast/ slow) • heart beat/ rhythm (ie the pattern) • strength of contraction • example of defect eg irregular (heart beat), tachycardia, bradycardia, sinus arrhythmia and ventricular fibrillation/ VF etc. <p>accept irregular heart beat = 2 valid points accept rate at which the heart is beating = 1 valid point</p> <p>blood pressure readings</p> <ul style="list-style-type: none"> • abnormal/high/low blood pressure / correct reference to average/normal values (120/80 mm Hg) <p>pulse rate readings</p> <ul style="list-style-type: none"> • (high/ low/ abnormal) heart rate / (irregular/ abnormal) heart beat / not in range of 60 – 80 beats per minute <p>accept converse argument</p>
	Total	24	

Question			Answer	Marks	Guidance
3	(a)	C	X-rays absorbed by, bones/ribs ✓	3	accept a comparison statement ignore references to X-rays passing through/ reflected/ bouncing off/ less able to penetrate bones more X-rays absorbed by bones/ribs = 2 marks
		B A	less X-rays absorbed by soft tissues/lungs, different intensities of X-ray (therefore) reach the plate ✓ low levels of X-ray appear as white / high levels of X-ray appear dark ✓		
	(b)	E/U	<u>heart</u> ✓	1	
	(c)	C	<i>ethical arguments in favour</i>	2	OWTTE
		B	rights - she has the right to life/full medical intervention/ right to know ✓ benefit - the treatment may improve her, quality/length, of life / reduction of pain ✓	2	
		C B	<i>ethical arguments against</i> any two from: she is too old for the treatment ✓ money spent on her could be used for younger people / younger people benefit more ✓ her quality of life (post-operative/treatment) may be poor / may acquire an infection / may not cope with the treatment ✓		accept too old cope with treatment = 2 marks ignore references to religious beliefs ignore treatment is expensive unless qualified

Question	Answer	Marks	Guidance																								
(d)	<p>E/U E/U C C B B</p> <p>for radiographer using CAT scanner</p> <table border="1" data-bbox="394 272 1240 647"> <thead> <tr> <th>hazard</th> <th>risk</th> <th>safety precaution</th> </tr> </thead> <tbody> <tr> <td>(ionising) radiation ✓</td> <td>damage/harm to, cell/tissue/organ, / cancer / build up over time in workplace ✓</td> <td>stand behind safety or lead screen / wear a lead apron or safety clothing / leave CAT room / wear detection badge ✓</td> </tr> <tr> <td>or (high voltage) electricity ✓</td> <td>electric shock ✓</td> <td>test equipment/training ✓</td> </tr> </tbody> </table> <p>for patient having an MRI scan</p> <table border="1" data-bbox="394 730 1240 1310"> <thead> <tr> <th>hazard</th> <th>risk</th> <th>safety precaution</th> </tr> </thead> <tbody> <tr> <td>(external/ internal) metal/ magnetic source ✓</td> <td>movement of/ damage caused by metal objects ✓</td> <td>check for/ remove, metal objects / check patient notes / use another technique ✓</td> </tr> <tr> <td>or (loud) noise ✓</td> <td>damage to ears / deafness ✓</td> <td>wear ear protectors/ headphones ✓</td> </tr> <tr> <td>or confined space / claustrophobia ✓</td> <td>panic / stress / claustrophobia ✓</td> <td>calm / relax / listen to music / sedate patient/ use another technique / check patient notes ✓</td> </tr> <tr> <td>or large body size ✓</td> <td>panic / getting stuck ✓</td> <td>use larger scanner ✓</td> </tr> </tbody> </table>	hazard	risk	safety precaution	(ionising) radiation ✓	damage/harm to, cell/tissue/organ, / cancer / build up over time in workplace ✓	stand behind safety or lead screen / wear a lead apron or safety clothing / leave CAT room / wear detection badge ✓	or (high voltage) electricity ✓	electric shock ✓	test equipment/training ✓	hazard	risk	safety precaution	(external/ internal) metal/ magnetic source ✓	movement of/ damage caused by metal objects ✓	check for/ remove, metal objects / check patient notes / use another technique ✓	or (loud) noise ✓	damage to ears / deafness ✓	wear ear protectors/ headphones ✓	or confined space / claustrophobia ✓	panic / stress / claustrophobia ✓	calm / relax / listen to music / sedate patient/ use another technique / check patient notes ✓	or large body size ✓	panic / getting stuck ✓	use larger scanner ✓	6	<p>reject if risk and safety precaution marks do not relate to correct hazard</p> <p>reject risk/safety precautions if hazard is incorrect</p> <p>accept radioactive waves = radiation</p> <p>reject unqualified screen / clothing / infrequent use/ lower dose/ keep or move away as far as possible</p> <p>ignore electricity as a hazard</p> <p>ignore unqualified reference to artificial joints</p> <p>accept claustrophobia in only hazard or risk, not both response boxes</p>
hazard	risk	safety precaution																									
(ionising) radiation ✓	damage/harm to, cell/tissue/organ, / cancer / build up over time in workplace ✓	stand behind safety or lead screen / wear a lead apron or safety clothing / leave CAT room / wear detection badge ✓																									
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or large body size ✓	panic / getting stuck ✓	use larger scanner ✓																									
	Total	14																									

Question		Answer	Marks	Guidance
4	(a)	E D eat/drink fewer, glucose/carbohydrate-rich, foods ✓	2	reject take insulin tablets unless qualified eg metformin accept carbs / sugar ignore healthy diet / exercise reject sugar hit
	(b)	D C C any correctly-named condition eg leukaemia / anaemia / AIDS/ HIV / cancer / hepatitis ✓ correct type of blood cell counted eg RBC = anaemia, WBC = leukaemia/AIDS/HIV, WBC/RBC = hepatitis ✓ correct level (in blood cell count) eg low (RBC) = anaemia, high (WBC) = leukaemia/cancer, low (WBC) = AIDS/HIV, low (RBC/WBC) = hepatitis ✓	3	accept iron deficiency = anaemia ignore bone disease but apply following marking points as for leukaemia reject blood doping = 0 marks reject incorrect link between condition and type accept lack of = low, lots of = high accept level mark if no reference to type
	(c)	(i) E/U E/U any two from: alcohol / drugs / ketamine / cannabis / amphetamines / cocaine / methadone / morphine / diamorphine (heroin) / ecstasy ✓ ✓	2	ignore anabolic steroids
		(ii) D C B take blood (sample) / pin-prick of blood ✓ sample is divided into two ✓ analysis of sample / name one appropriate analytical technique ✓	3	ignore reference to breathalyser accept gas chromatography, high pressure liquid chromatography, spectroscopy, ELISA test, pin-prick method if qualified eg biosensor – as an analytical technique

Question		Answer	Marks	Guidance
	(d) D B B A A	<p>[Level 0] Candidate includes fewer than three valid points. <i>(0 marks)</i></p> <p>[Level 1] Candidate shows a basic understanding of how the ELISA test is used to identify hepatitis, including at least three valid points. Response includes at least one rinse, addition of the antigen and antibody and looking for an enzyme reaction/ colour change/fluorescence. <i>(1 mark)</i></p> <p>[Level 2] Candidate shows an understanding, clearly describing how the ELISA test is used to identify hepatitis including at least four valid points across all three stages and including a clear reference to addition of antibody-enzyme (complex). <i>(2 – 3 marks)</i></p> <p>[Level 3] Candidate shows a high level of understanding of how the ELISA test is used to identify hepatitis, including at least six valid points. A clear and logical description from all three stages, including repeated rinsing of well, the relevant use of the antibody-enzyme (complex) and the final addition of the substrate. <i>(4 – 5 marks)</i></p> <p><i>N.B. The number of ticks on the script will not always directly equate with the numbers of marks given.</i></p>	5	<p>list of correct terms across all three stages but no description = 1 max.</p> <p>valid points</p> <p>stage 1 – binding the antigen to the well</p> <ul style="list-style-type: none"> • add antibodies (to bottom of well) • rinse the well • add binding agent (binds areas of well wall not occupied by antibody) • rinse the well • add (blood) serum sample/antigen • antigen binds to antibody • rinse the well <p>stage 2 – using the antibody-enzyme</p> <ul style="list-style-type: none"> • add antibody-enzyme (complex) • complex binds to antigen • rinse the well (following addition of antibody-enzyme complex) <p>stage 3 – completing the final reaction</p> <ul style="list-style-type: none"> • substrate added • enzyme reaction occurs • colour (change) / fluorescence
		Total	15	

Question			Answer	Marks	Guidance
5	(a)	(i) E/U E/U	glucose/sugar (C ₆ H ₁₂ O ₆) + oxygen (O ₂) ✓ carbon dioxide (CO ₂) + water (H ₂ O) ✓	2	accept either order within each marking point accept correctly-written formulae balanced equation is not necessary
		(ii) E	ATP ✓	1	
		(iii) D	lactic acid ✓	1	accept lactate
		(iv) E/U E/U	heat ✓ light ✓	2	
		(v) E/U E	aerobic site = mitochondrion/mitochondria ✓ anaerobic site = cytoplasm/cytosol ✓	2	ignore references to cristae or matrix
	(b)	E E D	nerve impulse transmission ✓ active transport ✓ metabolic reactions eg sperm swimming / cilia beating / cell division / meiosis / mitosis / correctly-named reaction ✓	3	ignore nerve communication / digestion / growing
	(c)	(i) C D	respiratory problem asthma / emphysema / (lung) cancer / COPD / lung disease / (physical) damage/injury of lungs / damage from smoking ✓ circulatory problem heart disease / anaemia / atherosclerosis / low blood pressure / (physical) damage/injury of heart/blood vessels / ventricular fibrillation ✓	2	ignore explanations of low oxygen levels in blood
		(ii) B A	less oxygen/glucose (in blood) / limited transport of oxygen/glucose ✓ muscles need, oxygen/glucose, for <u>aerobic</u> respiration ✓	2	reject energy carried in blood accept <u>anaerobic</u> respiration if linked to absence of oxygen ignore references to energy in aerobic respiration

Question		Answer	Marks	Guidance				
(d)	B B A A	CAT scanner	4	<p>two correct responses within each box = 1 mark</p> <p>ignore references to portable/ trained person/ high voltage/ easy to use/ identify</p> <p>ignore references to cost for advantages</p> <p>do not award 2 marks for same but converse feature across the two boxes</p>				
		<table border="1"> <thead> <tr> <th>advantages</th> <th>disadvantages</th> </tr> </thead> <tbody> <tr> <td> <i>any two from:</i> images of, tumours/soft tissues/(named) organs ✓ gives 3D images ✓ non-invasive ✓ quick diagnosis ✓ </td> <td> <i>any two from:</i> (ionizing/high) radiation doses ✓ repeated use/accumulative use, can cause cancer ✓ expensive ✓ requires cooperative or sedated patient ✓ </td> </tr> </tbody> </table>			advantages	disadvantages	<i>any two from:</i> images of, tumours/soft tissues/(named) organs ✓ gives 3D images ✓ non-invasive ✓ quick diagnosis ✓	<i>any two from:</i> (ionizing/high) radiation doses ✓ repeated use /accumulative use, can cause cancer ✓ expensive ✓ requires cooperative or sedated patient ✓
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		Total	19					

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