OCR
Oxford Cambridge and RSA

GCE

Applied Science

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

Advanced Subsidiary GCE

Mark Scheme for June 2015

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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.

1	**a**	**i**	*any three from:* EITHER **manual** use (two) fingers; find pulse e.g. wrist, neck, ankle, brachial, radial, carotid; count (pulse readings) for 15/30/60 seconds; multiply count to calculate beats per minute; OR **electronic** fix, device/band to, wrist/arm; switch device on; record reading (in beats per minute)	3	**accept** responses in any order and more than one response in a box. **ignore** reference to stethoscope / at rest / finger clips **ignore** calculation if measured for 60 seconds
		ii	sphygmomanometer;	1	**accept** phonetic spellings
		iii	135/85;	1	**accep**t 135/**80**
		iv	systolic – (heart) contraction/contracting; diastolic – (heart) relaxation/relaxing /resting;	2	**ignore** pumping / pushing / beating **ignore** filling
	b	**i**	32;	1	**accept** any value within range 32-25
		ii	vasoconstriction / constriction/contraction/narrowing of, arterioles / blood redirected, from skin/ to organs;	1	**reject** capillaries/arteries/veins/venules **ignore** unqualified blood vessels **reject** blood vessels moving

	c		<table><tr><th>**Admitted to hospital**</th><th>**Treated at home**</th></tr><tr><td>Risk: *any one from:* • trauma of moving out of home / ambulance journey • shock of treatment may trigger heart attack • not surrounded by family/friends / lonely • contract an illness in hospital • occupying a hospital bed needed for others • hospital busy • indifferent / busy hospital staff</td><td>Risk: *any one from:* • may not obtain care needed • home may not be kept (sufficiently) warm • may have complications / heart attack/ emergency • no equipment / resources / trained people</td></tr><tr><td>Benefit: *any one from:* • can obtain care if needed • 24 hour support available • surrounded by trained staff • surgery rapidly available for heart condition • equipment/resources available</td><td>Benefit: *any one from:* • familiar environment/ less stressful • not occupying a hospital bed • surrounded by family / friends • cheap / less money needed</td></tr></table>	4	OWTTE **accept** any one correct response within each box
			Total	**13**	

2	**a**	**i**	mitochondrion / mitochondria / cristae; ATP / adenosine triphosphate; cytoplasm / cytosol; lactic acid / lactate; ATP;	5	**reject** any reference to energy **accept** lactic acid / ATP in either order **reject** any reference to energy
		ii	*any two from:* **burning of fuels** light given off; requires, higher activation energy/higher temperatures/ignition; carbon monoxide could be released; **cellular respiration** can produce lactic acid; enzyme controlled produces ATP; oxygen always needed for burning fuels / cellular respiration can be anaerobic;	2	**accept** reverse argument if qualified for cellular respiration. **ignore** heat / sound / energy / water **ignore** greenhouse gases **accept** reverse argument if qualified for burning of fuels.
	b		*any two from:* transports/carries, oxygen/carbon dioxide/ lactic acid/glucose; **blood,** pumped/moved, around body/along vessels; double circulation / systemic and pulmonary systems; all, organs/tissues, supplied with, blood vessels/capillaries; capillary **wall** one cell thick; baroreceptor/chemoreceptor; responds to hormones e.g. adrenalin;	2	**ignore** references to red blood cells/haemoglobin **ignore** unqualified pumping **accept** oxygenated blood and deoxygenated blood separated
	c		low(er)/less/decreased/lack of, **oxygen** / oxyhaemoglobin ; high(er)/more/increased, **carbon dioxide;** high(er)/more/increased, **lactate/lactic acid**;	3	**ignore** blood pressure/viscosity **accept** decrease blood pH/increased acidity

	d	**i**	incomplete ring of cartilage - keep, lumen/ trachea/bronchi/ airway, open / gives support / keeps shape / prevents being crushed; smooth muscle - contraction / decrease, lumen size/airway; goblet cells - produce, mucus/phlegm; elastic tissue - recoil / relaxation / increase, lumen size/ airway/trachea /return to original(shape);	4	**accept** prevents sides sticking together **accept** flexibility of trachea **ignore** allows food down oesophagus **ignore** protection (unqualified) **ignore** reference to elastic tissue expanding / stretching
		ii	peak flow meter;	1	**reject** unqualified peak flow
		iii	*any two from:* cilia cannot move mucus; mucus builds up; lumen/respiratory tract/airway/trachea/bronchi/bronchioles, narrowed;	2	**accept** role of cilia is to move mucus
		iv	thin/one cell thick, **resulting** in, a short diffusion distance/faster diffusion rate; large surface area **for,** more efficient gaseous exchange/increased rate of diffusion;	2	**ignore** reference to air passing
			Total	**21**	

<table>
<tr>
<td>3</td><td>a</td><td></td>
<td>
<table>
<tr><th>hazard</th><th>precaution</th></tr>
<tr><td>needle / syringe / break in skin / blade</td><td>use new / sterile needles only / safe disposal / training</td></tr>
<tr><td>breakage / leakage / spillage / chemicals</td><td>clear up spillage / sterilise bottle / container / petri dish / check lids / bottle tops / use hazard labels / training / wear gloves /wear goggles / protective clothing</td></tr>
<tr><td>(tissue sample/blood /chemicals,) enters mouth/eyes/nose/mucus membranes / via inhalation</td><td>wear mask / goggles / use sterile mouthwash immediately / training</td></tr>
</table>
</td>
<td>6</td>
<td>precaution must relate correctly to hazard

ignore unqualified reference to blood/sample contact</td>
</tr>
<tr>
<td></td><td>b</td><td></td>
<td>red blood cells - anaemia / leukaemia;
white blood cells- leukaemia / cancer / HIV / AIDS / immunosuppression</td>
<td>2</td>
<td>ignore sickle cell anaemia
mark first answer if list given
ignore references to blood doping</td>
</tr>
<tr>
<td></td><td>c</td><td>i</td>
<td>any two from:
gas chromatography;
high performance liquid chromatography / HPLC;
ELISA test;
mass, spectroscopy / spectrometry / MS;
UV absorption / UVA;
electrophoresis;</td>
<td>2</td>
<td>accept correctly named equipment or technique
ignore unqualified reference to chromatography / spectroscopy</td>
</tr>
<tr>
<td></td><td></td><td>ii</td>
<td>performance-enhancing drugs
(anabolic androgenic) steroids eg. stanozolol / testosterone / nandrolone / beta-blockers / erythropoietin (EPO) / modafinil;
recreational drugs
cannabis (cannabinoids) / amphetamines / cocaine / caffeine / methadone / morphine / heroin (diamorphine) / weed / LSD / ecstacy / MDMA / ketamine / nicotine / khat;</td>
<td>2</td>
<td>4 correct responses = 2 marks
2 or 3 correct responses = 1 mark

accept other realistic responses e.g. tobacco / viagra</td>
</tr>
<tr>
<td></td><td></td><td></td>
<td>Total</td>
<td>12</td>
<td></td>
</tr>
</table>

4	**a**	**i**	give patient a **known amount** of, glucose/sugar drink; *any **one** from:* record, blood glucose levels / base line reading / take readings; take blood samples until reading returns to base line figure;	2	 **ignore** zero timing
		ii	3.5 – 7.5; mmol dm^{-3} **OR** mmol/dm^3;	2	
		iii	*any two from:* (very) high levels of glucose in, **blood/plasma**; insulin is not produced / (cells may be) insensitive/resistant to insulin; (kidney) cannot reabsorb excess glucose / (kidney) **treats** glucose as a waste product;	2	

	b		[0 marks] Candidate does not include any correct valid points. [1 - 2 marks] Candidate shows a basic understanding including at least **two valid points** but with little or no explanation, with little evidence of a logical order. [3 – 4 marks] Candidate shows an understanding of blood-glucose monitoring and some knowledge of use of results including at **least four valid points**. The explanation follows some logical order. [5 - 6 marks] Candidate shows a high level of understanding and gives a full explanation of blood-glucose monitoring and with a sound knowledge of the use of the results for both type 1 and type 2 diabetes, including at **least six valid points**. The explanation follows a clear logical order.	6	valid points *blood-glucose monitoring* • take blood sample / prick finger • (add to) clinistix / biosensor / blood glucose monitor / blood glucose machine; • record/register the reading/glucose level • repeat regularly/daily *use of results by type 1/ type 2 diabetics* • inject insulin; • (inject insulin) if glucose level too high; • increase glucose intake; • (increase glucose intake)if glucose level too low *use of results by type 2 only* • increase exercise/decrease glucose intake • (increase exercise/decrease glucose intake) if glucose level too high
	c		*any two from:* pancreas/Islets of Langerhans/insulin producing cells, **already, damaged**/unable to produce sufficient insulin (due to the pregnancy); pancreas **cannot recover** from (gestational) damage; (body/cells) are **already, less sensitive**/resistant to insulin levels;	2	**ignore** reference to obesity **accept** permanent effect on pancreas
			Total	**14**	

5	**a**		*any three from* difference in densities (of bones/implants/muscles); bones/implants/denser material, produce white images / muscles produce dark images; bones/implants/denser material, absorb more, X-ray/radiation/ waves; ORA for muscles comparisons relating to the X-rays hitting the photographic plate;	3	**accep**t correct reference to X-rays passing through **accept** more X-rays hitting plate = darker image ORA **/** suitable descriptions of photographic plate e.g. board/film
	b		use of magnets / creates a magnetic force; *any one from;* contains, metal/implant; (implant), may tear through skin/ cause injury/damage equipment/distort image;	2	accept metal =implant
	c	**i**	real-time images / can see things moving / 3-D images; good, soft tissue/blood vessel, resolution/image;	2	**ignore** references to non invasive / non ionising/quick. **accept** answers in either line **ignore** clear soft tissue

<table>
<tr>
<td></td><td></td><td>ii</td>
<td>
<table>
<tr><th>structural similarities</th><th>structural differences</th></tr>
<tr><td>any two from:
have a <u>lumen</u>;
(walls) have same layers;
endothelium / one-cell thick lining;
(walls) contains collagen / fibrous layer;
(walls) have <u>smooth muscle</u>;
(walls) contains elastic, tissue/fibres;</td><td>any two from(ORA):
<u>lumen</u> is larger in veins;
veins have thinner walls;
valves in veins ;
thinner collagen / fibrous layer in veins;
thinner/less, <u>smooth muscle</u> in veins;
thinner/less, elastic, tissue/fibres in veins;</td></tr>
</table>
</td>
<td>2</td>
<td>4 correct responses = 2 marks
2 or 3 correct responses = 1 mark
1 or 0 correct responses = 0 marks
ignore veins are larger

ignore references to function or features of blood</td>
</tr>
<tr>
<td></td><td></td><td></td><td>Total</td><td>9</td><td></td>
</tr>
</table>

6	**a**		Only exhaled air passes through soda lime – avoids inhaling soda lime / soda lime can be harmful; Medical-grade air – avoid inhaling, toxic gases/microorganisms/dust;	2	**ignore** unqualified particles **ignore** safe/clean/unpolluted, air/ oxygen
	b	**i**	0.6 / 0.7;	1	**accept** any value within range 0.6 – 0.7
		ii	0.4 (to) 0.5 AND higher ;	1	correct range and comparison **= 1 mark** **allow** ecf for incorrect value from graph
		iii	**EITHER** will increase; more oxygen; **OR** will remain constant; same level of oxygen	2	**accept** correct references to oxygen debt
	c	**i**	increased fatigue / reduced, diaphragm/muscle, strength; ORA cycling has a greater effect; ORA correct data quote referring to **both** running and cycling;	3	cycling causes **greater** fatigue =2 marks **accept** correct reference to fatigue/ decreased muscle strength/ weaker muscles ORA **accept** realistic values read from graph for data quotes e.g. running drops 1 unit/132 to 131 e.g. cycling drops 6 units/ 132 to126
		ii	*any two from:* not enough/lack of, oxygen / anaerobic respiration / oxygen debt; lactic acid/lactate, builds up/produced; carbon dioxide, builds up/produced; glycogen reserves used up;	2	

		iii	**lung volume** *description* – becomes smaller / limited; *explanation* – diaphragm, cannot be lowered as far/will contract less; **peak flow** *description* – overall reduction (in exhalation); *explanation* – diaphragm, cannot be lowered as far/will contract less;	4	 **ignore** reference to force/strength **accept** weaker exhalation **ignore** reference to force/strength

	d		**E/U** **E** **D** **C** **B** **A**	**[0 marks]** Candidate does **not** include any correct valid points. **[1 - 2 marks]** Candidate shows a basic understanding of how to use pulse rate to monitor fitness levels **and/or** limited reference to changes taking place in the cardiovascular system, including at least **two valid points** but with little or no explanation. With little evidence of a logical order. **[3 – 4 marks]** Candidate shows an understanding of how to use pulse rate to monitor fitness levels **and** an outline discussion of changes taking place in the cardiovascular system, including **at least four** valid points. The explanation follows some logical order. **[5 - 6 marks]** Candidate shows a high level of understanding **and** gives a full explanation of how to use pulse rate to monitor fitness levels **and** gives details of the changes taking place in the cardiovascular system including **at least six** valid points. The explanation follows a clear logical order.	6	**valid points** *using pulse rate to monitor fitness levels* • reference to pulse rate, before/during/after exercise • normal pulse rate = 60-80bpm • compare her pulse rate(unqualified), overtime /with others/ with average • compare her **resting** pulse rate, over time/with others • compare her **exercise** pulse rate, over time/with others • **determine** recovery rate/time • compare her **recovery rate**, over time / with that of others *changes in cardiovascular system as fitness increases* • lower, heart/pulse rate (unqualified) • lower resting, heart/pulse, rate • lower exercise, heart/pulse, rate • faster recovery rate • more blood pumped (through heart) / greater cardiac output • stronger/more, cardiac muscle/heart • greater stroke volume • growth of capillaries into muscle tissue • increased efficiency (of system) • reduced blood pressure • decreased risk of heart disease **ignore** reference to gaseous exchange/ cellular respiration
				Total	**21**	
				Paper total	**90**	

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