OCR
Oxford Cambridge and RSA

GCE

Applied Science

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

Advanced Subsidiary GCE

Mark Scheme for June 2016

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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.

<table>
<tr><th colspan="3">Question</th><th>Answer/indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td>a</td><td></td><td>
<table>
<tr><th>Hazard</th><th>Risk</th><th>Precaution to protect the physiologist</th></tr>
<tr><td>Handling the patient's blood</td><td>Contamination / infection / disease</td><td>Wear gloves / wash hands / put blood in sealed containers;</td></tr>
<tr><td>Using a hypodermic needle</td><td>Needle (stick) injury/ damage to the skin/ blood vessels ruptured/ blood loss/cuts</td><td>Handle the needle carefully/ training/ use only new or sterilised needles/ safe disposal;</td></tr>
</table>
</td><td>4</td><td>One mark for each correct response in each box.
The precaution response must correspond to a correct risk to obtain the mark.

Ignore biohazard
Ignore protective clothing as a precaution
Accept mixing of blood

Accept scratching / pricking / splitting
Ignore sharps / unqualified stick

Example - safe disposal =. appropriate / proper / correct</td></tr>
<tr><td></td><td>b</td><td>i</td><td>ECG/ electrocardiograph / electrocardiogram</td><td>1</td><td>Accept phonetic spelling</td></tr>
<tr><td></td><td></td><td>ii</td><td>1 heart beat per 5 squares/ 5 x 0.2 seconds = 1 beat per second;
60;</td><td>2</td><td>correct response = 2 marks (with no calculation shown)</td></tr>
<tr><td></td><td></td><td>iii</td><td>Patient/heart is, healthy/normal/diseased/has problems;

Named abnormality - bradycardia / tachycardia /ventricular fibrillation/ sinus arrhythmia;

Description of abnormality – bradycardia = slow rate/wider spaced peaks. tachycardia = fast rate/ closer peaks. ventricular fibrillation = 'fluttering' pattern. sinus arrhythmia = irregularly spaced peaks;</td><td>3</td><td>Ignore any reference to fitness/ stress
Accept correct ref to heart beat

One named abnormality ONLY.
Accept phonetic spellings</td></tr>
</table>

Question			Answer/indicative content	Marks	Guidance
	c	i	**Similarities** *Any two from:* Strap/band/cuff (placed around upper arm); Arm at heart level; The strap/band/cuff is, pumped up/tightened; Obtain, diastolic / systolic, values ; **Differences** *Any two from:* Stethoscope used for manual / not needed for digital; Digital inflates automatically / manual pumped; Digital/on screen, values / values read off mercury column for manual; Results can be stored(for digital); Portable (for digital); Involves personal judgement (for manual) /ORA for digital;	4	**Ignore** putting the patient at rest /ref to units **Ignore** digital uses batteries/ power / makes sounds **Accept** listening = use of stethoscope **Accept** digital is automatic **Accept** digital values appear automatically
		ii	133/85 **OR** 133/80; mmHg;	2	
		iii	(Blood pressure) increases/higher; *Any two from:* (more) oxygen **needed**; (more) carbon dioxide removed; to/from/for/by, cells/ tissues/muscles (linked to CO_2, O_2, blood);	3	**Ignore** high Mark independently of reference to blood pressure **Ignore** refs to energy/ATP
			Total	**19**	

Question			Answer	Marks	Guidance
2	a		<table><tr><td>Calorimetery</td><td></td></tr><tr><td>Electrophoresis</td><td></td></tr><tr><td>Gas chromatography</td><td>✓</td></tr><tr><td>Microscopy</td><td></td></tr></table>	1	More than one tick = 0 marks
	b		Low(er) red blood cell (count) ; High(er) white blood cell (count) ;	2	
	c	i	Glucose; Water; Energy/ATP;	3	**Accept** correct formulae **Accept** water and energy/ATP in either order **Ignore** reference to **number** of ATP molecules
		ii	*Any two from:* Exercise / **increased** muscle contraction / high rate of (cellular) respiration; Vasoconstriction / limited blood supply; Low oxygen levels ; **Fewer** mitochondria;	2	**Accep**t no oxygen **Ignore** reference to energy
	d	i	*Any three from:* Viral proteins act as antigen; Antibody binds with antigen; Enzyme-antibody (forms); Substrate added; Rinse to remove **excess** (reactants); Colour change;	3	A/W **Accept** any order for responses – they are key features not steps **Ignore** antibody **matches** antigen / blocking agent **Ignore** unqualified reference to rinsing **Ignore** diagrams
		ii	**Colour** of, red blood cells/blood, masks the colour change;	1	**Ignore** plasma does not contain RBCs
			Total	**12**	

Question			Answer	Marks	Guidance
3	a		*Any two from:* Heart beat not strong enough / low pulse pressure; To, maintain/create/increase, pressure; Blood in veins at low pressure; No valves in tubing; No muscle in tubing;	2	
	b		*Any two from:* Gives, good/ clear/ detailed/ better ,image /high resolution, of soft tissues/kidneys; Real time/live/3D, images; Less harmful/non-ionising;	2	**Accept** reverse arguments for X-ray scanner
	c		*Any three from:* Gel used (on surface of skin); Waves, pass through skin/enter body; Waves, echo/bounce off/reflect at, interface /tissue /organs /objects /structures; Waves return to the **sensor/probe**; Image formed;	3	**Ignore** unqualified reflection **Accept** sensor/probe acts as a microphone
	d	i	3.5 (to) 7.5;	1	
	d	ii	9.0 / 9 / 9.00;	1	
	d	iii	*Any two from:* Comparison e.g. too high; Can control/maintain/monitor/check (glucose levels/it); Take insulin (if needed); Reduce glucose intake; Seek medical help if needed;	2	**Ignore** too low **Accept** sugar = glucose **Ignore** 'carbohydrate' **Ignore** refs to exercise

Question			Answer	Marks	Guidance
	e		*Any two from:* Diet contains **high** levels of/ too much, glucose/sugar; **High** levels of insulin produced ; Body /cells, less sensitive / resistant, to insulin;	2	A/W **Ignore** carbohydrates/fats/unhealthy diet/exercise **Ignore** immune **Ignore** refs to symptoms
	f		***Medical issues*:** Wendy has (type 2) diabetes/another medical condition; Age related medical issues ; ***Ethical issues:*** Who is more deserving of transplant?, with reason; Age discrimination/Karina is young(er)/may live longer;	4	A/W **accept** reverse argument **accept** any realistic medical issue e.g. anaesthetic / surgery / infection / recovery e.g. Wendy only recently developed kidney failure/ Karina had kidney failure since childhood/ Karina may have young family; **accept** reverse argument **accept** any realistic ethical issue **ignore** references to God and religious beliefs
			Total	**17**	

Question			Answer	Marks	Guidance
4	a	i	*Any three from:* Shake thermometer/ check liquid below, normal range/body temperature / avoid handling bulb; Place **under** the **tongue**; Leave for at least 30 seconds; Hold thermometer horizontally when taking the reading;	3	A/W **Accept** points in any order **Ignore** refs to room temperature **Ignore** set to zero
	a	ii	*Potential hazard* – breaking the glass (of the thermometer) / toxic liquid / mercury *Precaution* – do not bite the glass stem/ use with care; ***OR*** *Potential hazard* – bacteria / viruses / pathogens ; *Precaution* – use, sterilised/ new/ clean, thermometer ; ***OR*** *Potential hazard* – thermometer too far back in throat/choking; Pre*caution* – place (thermometer) **under** tongue;	1	A/W precaution **must** relate to the hazard **Ignore** germs/dirty/contamination /disease/infections **Accept** any other realistic, linked hazard and precaution
	a	iii	*Any three from:* Ear / tympanic ; Tape / band / (plastic) strip /strap; Rectal / anal ; Electronic / digital ; Infrared;	3	Mark as a list **Reject** inner ear **Ignore** mercury/underarm/electric

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td>b</td><td>i</td><td>Contraction/ narrowing / smaller lumen (of blood vessels) ;
Arteriole ;</td><td>2</td><td>Ignore constrict/shrink/vessel gets smaller
Reject contraction of capillary walls</td></tr>
<tr><td></td><td>b</td><td>ii</td><td>Less blood flow to, skin/surface capillaries;
Reduces heat loss / maintains/keeps, body temperature;</td><td>2</td><td>Ignore slower blood flow
Ignore increases/ controls body temperature</td></tr>
<tr><td></td><td>c</td><td></td><td>
<table>
<tr><th>Symptom</th><th>Hyperthermia</th><th>Hypothermia</th></tr>
<tr><td>Excessive sweating</td><td>✓</td><td></td></tr>
<tr><td>Blue lips</td><td></td><td>✓</td></tr>
<tr><td>Constant shivering</td><td></td><td>✓</td></tr>
<tr><td>Dehydration</td><td>✓</td><td></td></tr>
<tr><td>Unconsciousness</td><td>✓</td><td>✓</td></tr>
</table>
</td><td>2</td><td>Correct left column = 1 mark
Correct right column = 1 mark</td></tr>
</table>

Question			Answer/indicative content	Marks	Guidance
	d		**[Level 0]** Candidate includes **fewer than two** valid points. ***(0 marks)*** **[Level 1]** Candidate gives a basic description of the graph **or** suggests an explanation for the link between the number of deaths and mean monthly temperature. They should include at least **two valid points,** with little evidence of a logical order. ***(1 – 2 marks)*** **[Level 2]** Candidate gives a description of the graph **and** suggests an explanation for the link between the number of deaths and mean monthly temperature. There should be **at least four** valid points, in some logical order. ***(3 – 4 marks)*** **[Level 3]** Candidate gives a detailed description of the graph **and** explains the link between the higher number of deaths and the mean temperatures, including **at least six** valid points. At least two of the points must be 'Explanations'. The answer follows a clear logical order. ***(5 - 6 marks)***	6	**Valid scientific points:** **Description** of graph • Temperature is between 15 - 4^{o}C during the year • Highest temperature/ 15^{o}C recorded in August/July/summer • Lowest temperature/ 4^{o}C recorded in February/winter • Number of deaths from 1200 – 1500/1550/below 1600 approximately • Highest death rate/ 1500-1550 in February • Lowest death rate/ 1200 in August • Correlation between deaths and temperature/ highest deaths when temperatures were at their lowest • Example of link between lower temperatures and increased number of deaths – giving data for named months • AVP for other correct data statement – max 2 valid points **Suggested explanation** for link • Older people are more vulnerable/cannot cope • (Older) people may develop hypothermia • (Hypothermia develops) when a minimum critical temperature is reached / < 32^{o}C • Babies are more vulnerable • (Babies) may develop hypothermia/cannot cope • Death occurs if, core/body, temp falls below 25^{o}C • (**Note** - Hypothermia can kill = two valid points) • People with a poor diet/limited heating are more vulnerable to hypothermia
			Total	**19**	

Question			Answer	Marks	Guidance
5	a	i	**Damage to alveoli -** Reduces the **surface** area ; **Damage to capillaries -** Prevents normal blood, flow/ supply / blood flow affected ; Blood enters alveoli and prevents effective gas exchange;	3	
	a	ii	*Any three from:* Correct ref to direction of **diffusion**; From the alveoli / across RBC membranes / down diffusion gradients; (Oxygen)transported in red blood cells / RBCs ; (Oxygen) carried by haemoglobin/ forms oxyhaemoglobin; (Oxygen) transported in blood <u>plasma</u> ; From, red blood cells/ RBCs/oxyhaemoglobin, to muscle (cells) ;	3	**Example** - direction of diffusion = lungs to blood / blood to muscles
	a	iii	*Any two from:* (Airway/trachea) may become, blocked /narrowed; Oxygen/air flow, is, restricted/slowed/less efficient; **Cilia** may not function normally; (So) reduced **remova**l of bacteria/dust particles;	2	**Ignore** breathless **Ignore** air flow disturbed **Give BOD** for work harder = not functioning normally **Ignore** more bacteria trapped **Accept** less effective removal of bacteria
	b		*Any three from:* Zero the meter before use; Hold meter horizontally; Seal lips around mouthpiece; (Patient / Milosz must) breathe in deeply (before using meter) ; (Make sure the patient / Milosz) blows hard as possible into the meter ; Repeat, readings/test;	3	**Ignore** breathing out long/far/deeply/sharply

Question			Answer	Marks	Guidance
	c		**[Level 0]** Candidate includes **fewer than two** valid points. ***(0 marks)*** **[Level 1]** Candidate shows a basic understanding of how to use a spirometer **and/or** to ensure patient safety, including at least **two valid points** but with little or no explanation. With little evidence of a logical order. ***(1 – 2 marks)*** **[Level 2]** Candidate shows an understanding of how to use a spirometer **and** to ensure patient safety including **at least four** valid points. The explanation follows some logical order. ***(3 – 4 marks)*** **[Level 3]** Candidate shows a high level of understanding and gives a good description of how to use a spirometer, **and** showing a good grasp of how to ensure patient safety, including **at least six** valid points. The explanation follows a clear logical order. ***(5 - 6 marks)***	6	**Valid scientific points:** **Using the spirometer** • Attach all pipes to correct positions • Chamber contains water/check level • Attach the floating air-filled chamber lid • Spirometer/floating chamber/ machine, contains oxygen • Attach pen to extended arm • Pen/equipment makes a trace • Put nose clip on patient • Patient puts **lips** around mouth piece • Ask patient to breathe in and out as normal • Turn on the rotating drum of kymograph **Safety of patient** • Use only **medical grade** oxygen • Make sure mouthpiece is sterilised/clean/new • Make sure, CO_2 – absorber/**soda** lime/limewater, is in container / CO_2 absorbed/removed • Check indicator to show when soda lime is exhausted • Only involve patient for a minute • Make sure patient is not asthmatic or does not have another respiratory or circulatory condition

Question			Answer/indicative content	Marks	Guidance
	d		**Tidal volume:** measure the **vertical** distance between an (adjacent) peak **and** trough **OR** use the units on the vertical axis to determine cm^3 breathed in/out ; **Breathing rate:** measure the distance between / count number of adjacent peaks **or** troughs, in relation to time **OR** use the units on the horizontal axis to determine breathes per minute	2	A/W **accept** answers from a correctly labelled diagram **Accept** number of peaks per minute
	e		*Breathing in / inspiration*: intercostal **and** diaphragm (muscles) contract; rib cage / thorax, volume increases **or** pressure decreases ; *Breathing out / expiration:* intercostal **and** diaphragm (muscles) relax; rib cage / thorax, volume decreases / air space gets smaller **or** pressure increases;	4	**Reject** internal intercostals (muscles) contract **Accept** more space **Reject** external intercostals (muscles) contract
			Total	**23**	

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