OCR
Oxford Cambridge and RSA

GCE

Applied Science

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

Advanced Subsidiary GCE

Mark Scheme for June 2017

G622/01 **Mark Scheme**

June 2017

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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.

Annotations

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	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

Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

Question			Answer	Marks	AO element	Guidance
1	(a)	(i) E/U	Blood, flows/leaks (freely, from atrium to ventricle); Backflow (of blood) /blood returns;	**2**	AO1	A/W **Ignore** valves remain open
		(ii) E/U	Aorta;	**1**	AO1	More than one tick negates the mark
	(b)	(i) E/U	*Any one from:* Does **not** show, moving/real time/live, images / blood flow; Can **not** be manipulated/moved to show different angles/views (of the valves moving);	**1**	AO1	 **Accept** still images
		(ii) E/U	Ultrasound;	1	AO1	
	(c)	(i) A/B	QRS;	1	AO2	
		(ii) E/U	60; (to) 80;	2	AO1	**Accept** +/- 2 for both values **Accept** 80 to 60
		(iii) C/D	Fingers/stethoscope **and** correct location of pulse; Count for appropriate time;	2	AO1	**Accept** e.g. wrist neck, ankle, brachial artery **Accept** times up to 1 minute **Ignore** repeats
	(d)	(i) C/D	*Any two from;* Organ/tissue rejection / auto-immune response; May not, survive the surgery/make full recovery/ may die; Problems with blood pressure: Risk of infection / transplant may carry disease;	2	AO2	A/W **Ignore** unqualified complications / stress /affect quality of life
		(ii) C/D	 Younger/fitter patients may benefit more / not cost effective / other patients may have to wait longer; Patient/family may be anxious/stressed about outcome;	2	AO2	A/W **Ignore** age unqualified **Ignore** religion, poor quality of life
			Total	**14**		

2	**(a)**	**(i) E/U**	Aerobic; Oxygen; Energy/ATP; Glucose/oxygen;	4	AO1	**Ignore** oxyhaemoglobin/nutrients
		(ii) A/B C/D E/U	**[Level 0]** Candidate includes **fewer than two** valid points. ***(0 marks)*** **[Level 1]** Candidate shows a basic understanding of how carbon dioxide is removed from the muscle cells **and/or** the blood stream 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 carbon dioxide is removed from the muscle cells **and** the blood stream 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 carbon dioxide is removed from the muscles cells **and** the blood stream. Must include **at least one valid point** referencing **Figure 2.1**, and including **at least six** valid points. The explanation follows a clear logical order. ***(5 - 6 marks)***	6	AO1 and AO2	**Valid scientific points:** **Carbon dioxide removed from the muscle cells** • CO_2 **produced** (in muscle/mitochondria) • High levels of CO_2 in the muscle • Low levels of CO_2 in tissue fluid/blood/RBCs/ other, cells/tissues • CO_2 leaves muscle/enters blood, by **diffusion** • Along/down, a diffusion/concentration gradient /from high to low concentration **NB CO_2 leaves muscle/enters blood, along/down a diffusion gradient = 2 marks** **Carbon dioxide removed from the blood stream** • At the alveoli/air sacs/lungs • High levels of CO_2 in the blood/plasma/RBCs • Low levels of CO_2 in alveoli/air sacs/lungs • CO_2 leaves by **diffusion** • Along/down, a diffusion/concentration gradient /from high to low concentration **NB CO_2 leaves along/down a diffusion gradient = 2 marks** **With reference to Figure 2.1** • Muscle cells close to the capillary / small gap / thin layer of tissue fluid • Capillary **wall** is thin / one cell thick • Red blood cell close to capillary wall / thin layer of plasma • Short diffusion distance(s)

	(b)	**(i)** **A/B**	**FIRST CHECK THE ANSWER.** **If answer is 3.25 award 2 marks** 6.5 x 0.5 / 6.5÷2; 3.25;	2	AO2	 **Accept** calculation in range **6.4** to **6.6** (squares deep) x 0.5 (dm^3) **Accept** value in range 3.20 – 3.30
		(ii) **A/B** **C/D**	Male value = 6dm^3 /6.0dm^3/6.00dm^3; Female value = 4.25dm^3; This value closer to female/further from male;	3	AO1 and AO2	**Reject** a range for male or female values A/W
		(iii) **C/D**	Breathing rate = 12; breaths per, minute/min / breaths min^{-1};	2	AO2	. **Ignore** bpm
		(iv) **E/U**	Increase/become greater/rise;	1	AO1	
		(v)	**Gaseous exchange at lungs** Increase/greater rate, of gaseous exchange/diffusion; **More** oxygen/carbon dioxide delivered to alveoli/air sacs/respiratory surface/lungs; **Muscle contraction** *Any two from:* Greater rate/faster/stronger/more (muscle contraction)/work harder; **More** oxygen delivered / carbon dioxide removed; Greater rate of aerobic respiration / more energy/ATP released (for muscle contraction);	4	AO2	**Maximum 2** marks for each part of question A/W I**gnore** more oxygen, needed/inhaled AW **Ignore** more oxygen needed
			Total	**22**		

<table>
<tr>
<td>3</td>
<td>(a)</td>
<td>(i)
E/U</td>
<td>To avoid contamination/infection of the nurse;

To avoid contamination/infection of the patient/blood/sample;</td>
<td>2</td>
<td>AO1</td>
<td>A/W
Accept if ‘contamination’ not attributed = contamination of nurse
Ignore unqualified biological hazard

Accept blood borne disease / correctly named pathogen/disease</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii)
E/U</td>
<td>
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Clean and prick the skin</td></tr>
<tr><td>2</td><td>Put biosensor/strip in contact with blood/damaged blood vessel/finger;</td></tr>
<tr><td>3</td><td>Obtain a reading / record results;</td></tr>
</table>
</td>
<td>2</td>
<td>AO1</td>
<td>A/W

Ignore clinistix
Mark across rows 2 and 3 if steps in correct sequence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(iii)
E/U</td>
<td>Sharps/yellow/biohazard bin;</td>
<td>1</td>
<td>AO1</td>
<td>Accept special bin
Ignore unqualified bin</td>
</tr>
</table>

<table>
<tr>
<td></td>
<td>(b)</td>
<td>(i)
A/B
C/D</td>
<td>Any three from:
<table>
<tr><th>Type 1 diabetes</th><th>Type 2 diabetes</th></tr>
<tr><td>Insulin, dependent/given</td><td>Non-insulin dependent / insulin not (always) given / controlled by diet</td></tr>
<tr><td>Juvenile/early years onset/born with it</td><td>Late/adult onset/starts any time / obesity;</td></tr>
<tr><td>Cannot be prevented/cannot be cured</td><td>Can be delayed with exercise/healthy lifestyle/ avoiding excess sugar in diet;</td></tr>
<tr><td>Body cells, destroy/attack insulin-producing cells / auto-immune response / produce, little/no insulin</td><td>Do not produce enough insulin/ body/cells less responsive to insulin;</td></tr>
</table></td>
<td>3</td>
<td>AO1</td>
<td>Must have correct paired statements for each mark

Ignore refs to genetics / inheritance
Ignore develops unqualified

Ignore unqualified preventable

Accept other correct actions to delay onset of type 2

Ignore insulin does not work in body</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii)
A/B</td>
<td>Any two from:

To check sugar/glucose/carbohydrate intake;
To give dietary advice/plans;
Excess sugar intake is linked to the onset of type 2 diabetes;
The diet may relate to her glucose levels;</td>
<td>2</td>
<td>AO2</td>
<td>A/W

Ignore see how much insulin needed</td>
</tr>
<tr>
<td></td>
<td>(c)</td>
<td>A/B
C/D</td>
<td>Any two from:
To establish a ‘zero/fasting level’ / starting point / baseline reading;
To compare, starting level/recovery time, with others;
To avoid glucose/sugar in food affecting test results;</td>
<td>2</td>
<td>AO1</td>
<td>Accept unfair/unreliable test</td>
</tr>
</table>

	(d)	**A/B C/D**	**[Level 0]** Candidate includes **fewer than two** valid points. ***(0 marks)*** **[Level 1]** Candidate gives a basic description **and/or** comparison of the curves 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 gives a description **and** comparison of the curves, including **at least four valid points**, with some logical order. ***(3 – 4 marks)*** **[Level 3]** Candidate describes **and** compares **and** explains the curves. They should include **at least six valid points**, with **at least one 'Explanation' point**. Follows a clear logical order. ***(5 - 6 marks)*** ***NB explanation point(s) can contribute to scores at levels 1 and 2***	6	AO1 and AO2	**Valid scientific points:** **Description** • Starting level of 8 • Increase to approx.* 15 / almost doubles / for *100 minutes / accept any correct value increase at named time • Decrease to *14 / to *125 minutes/the end / does not return to normal / accept any correct value decrease at named time **Comparison** • Healthy patient's levels lower overall • Healthy patient starts with, lower level/ 4 /* half • Healthy patient level increases to, *6.5/to *30 mins/ increases less / accept any correct paired values/differences between values at named time • Healthy patient's level drops sooner/at *30 mins • Healthy patient returns to starting level/4 **Explanation** • Glucose (drink) taken into blood • Low/no insulin levels released • Limited effect on glucose levels • Some glucose, metabolised/oxidised/converted to glycogen/used up/broken down OR *vice versa* in context of glucose levels continuing to rise • Less able to respond to insulin ***NB * = approx. = realistic values in the region of***
			Total	**18**		

<table>
<tr>
<td>4</td>
<td>(a)</td>
<td>(i)
A/B
C/D</td>
<td>Any six from:

<table>
<tr><th>X-ray scanner</th><th>MRI scanner</th></tr>
<tr><td>Uses ionizing radiation</td><td>Non-ionizing</td></tr>
<tr><td>Does not use magnetism</td><td>Uses magnetism</td></tr>
<tr><td>High bone definition/bone seen clearly / poor soft tissue resolution/soft tissue not seen clearly</td><td>Good soft tissue resolution/soft tissue seen clearly</td></tr>
<tr><td>2D image/not 3D</td><td>3D image</td></tr>
<tr><td>Scan completed in a few seconds/quick</td><td>Scan completed in 10 – 15 minutes/ longer</td></tr>
<tr><td>May create birth defects/diseases</td><td>No biological hazards</td></tr>
<tr><td>Does not involve confined space / not noisy</td><td>Confined space / claustrophobic / noisy</td></tr>
<tr><td>Can be used with metal implants</td><td>Cannot be used with metal implants</td></tr>
</table>
</td>
<td>6</td>
<td>AO1</td>
<td>A/W
Each response marked independently
Two marks can be awarded in one box, e.g. MRI = non ionising, as uses magnets = 2 marks
Accept ionised = ionising

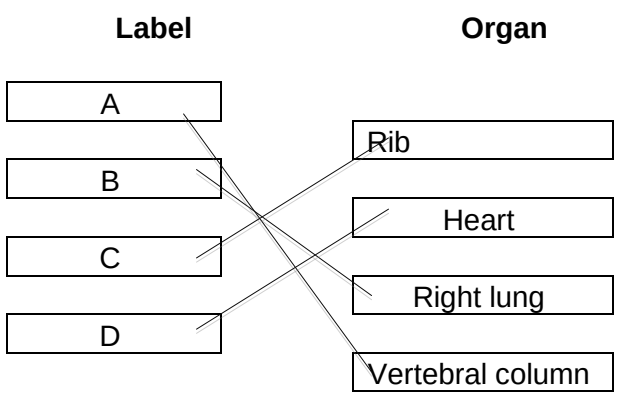
Accept correct named example of a soft tissue

Ignore cost/availability</td>
</tr>
</table>

		(ii) A/B C/D	**Use of X-ray scanner** To detect, broken/damaged bones / damaged cartilage; **Use of MRI scanner** To detect damage to, soft tissue/internal organs/blood vessels/nerves / detect internal bleeding;	2	A02	Benefit **must** be linked to type of scanner A/W **Ignore** broken hand **Accept** any correctly-named soft tissue **Ignore** unqualified internal injuries

		(iii) E/U			4		Mark only as **paired statements**. Each correct pair of statements = 1 mark. **Maximum** 2 marks for Tomek and 2 marks for Radiographer **Accept** not in for too long **Ignore** harm **Ignore** uncooperative **Ignore** wearing headphones **Ignore** extracted metal injuring radiographer

Procedure	**Risks**	**Ways of minimising the risks**
X-ray	**Tomek** Cell/DNA, damage/mutation / cancer	Avoid excessive use of X-rays / use alternative scan / wear protective clothing
	Radiographer Cell/DNA, damage/mutation / cancer	Leave the room / wear protective clothing / wear detection badge
MRI	**Tomek** *Any one from:* Ear damage / noise causes stress	Wear ear plugs / headphones
	Panic attack / claustrophobia	Calm the patient / play music / sedation / alternative scan / panic button
	Cannot fit into the space	Use a, modified/larger, MRI scanner
	Damage to tissue due to metal objects/implants	Remove metal objects / avoid using MRI scan if metal implants /check, with patient/medical history
	Radiographer *Any one from:* Ear damage / noise causes stress	Wear ear plugs / leaves the room
	Electrocution	Effective training

	(b)	**(i) E/U**		4	AO2	Each correct line = 1 mark
		(ii) C/D	*Any two from:* Vertebral column/label A, is on the lower part/at bottom, of image; Heart/ label D is, on the upper part of the image/above vertebral column; Right lung is on the left side of the image; Sternum is at top of image;	2	AO2	A/W
			Total	**18**		

5	**(a)**	**(i)** **E/U**	Blood pressure = mmHg; Temperature = 36.5; (to) 37.2; Peak flow = $dm^3\ min^{-1}$;	4	AO1	One mark for **each** correct value of the temperature range **Accept** +/- 0.1 ^{0}C variation **Accept** values only in correct position, if only one value correct
		(ii) **C/D**	Fastest rate / greatest force; (Of) air breathed out/blown out/exhaled/expired;	2	AO1	Accept forced expiratory flow rate = 2 marks
	(b)	**(i)** **A/B**	*Any two from:* Pad/cuff (on arm); Leads/wires are fully connected; Equipment at zero; Wait until, Ben/athlete, using the cycle at a, fixed/constant speed before taking the readings;	2	AO2	A/W **Reject** on leg **Ignore** check equipment not faulty **Ignore** repeats
		(ii) **E/U**	**Description** Increase; **Explanation** *Any two from:* Heart contracts, more strongly/harder; Increased, stroke volume/cardiac output; The heart/pacemaker/SAN receives nervous stimulation; The heart/pacemaker/SAN receives hormones/adrenaline; More carbon dioxide released/generated during exercise;	3	AO1	**Maximum** 1 mark for correct explanation of blood pressure if blood pressure is **decreasing**. **Ignore** faster / slower **Accept** message = nervous stimulation
		(iii) **E/U**	*Any two from:* Could fall off/may need to be held on; Sweat (on forehead); Inaccurate/imprecise/qualitative not quantitative / subjective; Not representative of, positioned close to, core/internal, temperature;	2	AO1	A/W **Ignore** unreliable

	(c)	**(i) E/U**	*Any two from:* To test; To repeat / retest / do more tests; To save/compare/for reference OR in case one lost/damaged;	2	AO1	A/W **Accept** to test in another lab/to test twice
		(ii) E/U	ELISA;	1	AO1	**Accept** phonetic spelling of ELISA **Accept** immunological assay/ serological test / enzyme linked immunosorbent assay
		(iii) C/D	**1. Performance-enhancing drug** *Any one from:* Unfair / cheating; Damaging/harmful/unhealthy effect;	1	AO2	 A/W
			2. Diseases such as hepatitis *Any one from:* Identify the virus; Give treatment; May cause underperformance; Reduce spread (of hepatitis/it/virus);	1	AO2	 A/W
			Total	**18**		

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