

Applied Science

Advanced Subsidiary GCE

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

Mark Scheme for June 2013

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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.

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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 |

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 |

IMPORTANT UPATE:

ADDITIONAL OBJECTS: You **must** annotate the additional objects for each script you mark. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU, likely to be 'seen', a cross or the highlighting tool.

CROSSED OUT, RUBRIC ERROR (OPTIONAL QUESTIONS) AND MULTIPLE RESPONSES

Crossed-out Responses: Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions: Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses: When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses: When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**): Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**): If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response): Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

| Question | | Answer | Marks | Guidance | | | | | | | | | | | | | | | | |
|---------------------|-----|---|---------------------|---|------------|--|------------|---|--------------|---|--------|--|------------|---|----------------|--|-------------------|--|---|--|
| 1 | (a) | <table border="1"> <tr><td>articular cartilage</td><td></td></tr> <tr><td>fat tissue</td><td></td></tr> <tr><td>femur bone</td><td>✓</td></tr> <tr><td>patella bone</td><td>✓</td></tr> <tr><td>muscle</td><td></td></tr> <tr><td>tibia bone</td><td>✓</td></tr> <tr><td>synovial fluid</td><td></td></tr> <tr><td>synovial membrane</td><td></td></tr> </table> | articular cartilage | | fat tissue | | femur bone | ✓ | patella bone | ✓ | muscle | | tibia bone | ✓ | synovial fluid | | synovial membrane | | 2 | <p>3 correct responses = 2 marks 2 correct responses = 1 mark 1 or 0 correct responses = 0 marks</p> <p>accept any clear response</p> <p>deduct 1 mark for every additional tick response beyond 3</p> |
| articular cartilage | | | | | | | | | | | | | | | | | | | | |
| fat tissue | | | | | | | | | | | | | | | | | | | | |
| femur bone | ✓ | | | | | | | | | | | | | | | | | | | |
| patella bone | ✓ | | | | | | | | | | | | | | | | | | | |
| muscle | | | | | | | | | | | | | | | | | | | | |
| tibia bone | ✓ | | | | | | | | | | | | | | | | | | | |
| synovial fluid | | | | | | | | | | | | | | | | | | | | |
| synovial membrane | | | | | | | | | | | | | | | | | | | | |
| | (b) | <p>any <i>two</i> from:</p> <ul style="list-style-type: none"> • risk: tissue damage (by metal) precaution: remove jewellery / check for metal implants / questionnaire / use of alternative scan / do not use ✓ • risk: panic / be claustrophobic precaution: sedate/ calm / relax / play music (to patient) / questionnaire / use of alternative scan / do not use ✓ • risk: hearing damage precaution: wear, headphones/earplugs/earbuds ✓ | 2 | <p>accept related hazard – magnetic equipment / magnetism / metal in body</p> <p>accept related hazard – restricted space / claustrophobia</p> <p>accept related hazard – (loud) noise</p> | | | | | | | | | | | | | | | | |

| Question | Answer | Marks | Guidance |
|----------|--|----------|--|
| (c) | <p>[Level 0] Candidate includes fewer than two valid points. <i>(0 marks)</i></p> <p>[Level 1] Candidate shows a basic understanding of how to use a combination of CAT scan and/or MRI scanner results, including at least two valid points but with little or no explanation. With little evidence of a logical order. <i>(1 – 2 marks)</i></p> <p>[Level 2] Candidate shows an understanding of how to use a combination of CAT scan and MRI scanner results including at least four valid points. The explanation follows some logical order. <i>(3 – 4 marks)</i></p> <p>[Level 3] Candidate shows a high level of understanding and gives a full explanation of how to use a combination of CAT scan and MRI scanner results, including at least six valid points. The explanation follows a clear logical order. <i>(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>valid points: CAT/MRI scan ...</p> <ul style="list-style-type: none"> • gives 3D images <p>CAT scan ...</p> <ul style="list-style-type: none"> • good/clear, bone/cartilage/hard tissue, resolution/detail • shows, bone/cartilage/hard tissue, damage • shows, bone density/osteoporosis • shows, cancer/tumours <p>ignore reference to soft tissue for CAT</p> <p>MRI ...</p> <ul style="list-style-type: none"> • (good) soft tissue resolution/detail • shows ligaments/tendons/muscles/fat (tissue) - ignore cartilage • shows damaged nerves • better resolution between normal and abnormal tissues <p>ignore reference to, bone/synovial fluid, for MRI</p> |
| | Total | 9 | |

| Question | | Answer | Marks | Guidance |
|----------|-----|---|-------|---|
| 2 | (a) | <p>any two from:</p> <p>thick wall ✓</p> <p>small / narrow lumen ✓</p> <p>no valves ✓</p> <p>thick/more, muscle/elastic tissue (layer in wall) ✓</p> <p>thick/more, fibrous layer in wall ✓</p> <p>crenated / folded, endothelium/inner lining ✓</p> | 2 | <p>ignore references to function</p> <p>accept reverse arguments for veins</p> <p>ignore large wall</p> <p>reject cell wall</p> <p>accept thin/thinner</p> |
| | (b) | carries oxygenated blood (to the heart) ✓ | 1 | if direction of blood flow given – must be correct |
| | (c) | <p>atrio-ventricular valve:</p> <p>prevents backflow (of blood) / opens/allows, for blood flow in, one/right, direction ✓</p> <p>semi-lunar valve:</p> <p>prevents backflow, from the aorta/into (left) ventricle / opens to allow blood, into aorta/from ventricle ✓</p> | 2 | <p>ignore reference to named parts in this section</p> <p>named parts must be given for mark in this section</p> |
| | (d) | ultrasound ✓ | 1 | ignore scan |

| Question | | Answer | Marks | Guidance |
|----------|---------|--|-------|---|
| | (e) | <p>[Level 0] Candidate includes fewer than two correct valid points. (0 marks)</p> <p>[Level 1] Candidate shows a basic understanding of how blood pressure and/or CO₂ levels change with activity, including at least two valid points but with little or no explanation. With little evidence of a logical order. (1–2 marks)</p> <p>[Level 2] Candidate shows an understanding of how both blood pressure and CO₂ levels change with activity, including at least four valid points. The explanation follows some logical order. (3–4 marks)</p> <p>[Level 3] Candidate shows a high level of understanding and gives a full explanation of how both blood pressure and CO₂ levels changes with activity, including at least six valid points. The explanation follows a clear logical order. (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</p> <p>blood pressure: description:</p> <ul style="list-style-type: none"> • increases <p>explanation:</p> <ul style="list-style-type: none"> • heart beats, more strongly/harder (ignore faster) • increases stroke volume • redirection of blood to muscles <p>carbon dioxide levels: description:</p> <ul style="list-style-type: none"> • increases <p>explanation:</p> <ul style="list-style-type: none"> • increased aerobic respiration <p>general explanation:</p> <ul style="list-style-type: none"> • CO₂ (levels) detected by chemoreceptors • blood pressure detected by baroreceptors • involves, cardiovascular centre / medulla / accelerator centre • impulses along the sympathetic neurons/nerves, to heart/SAN <p>accept vice versa for lower body activity/CO₂ (levels)</p> |
| | (f) | <p>(G) C B D A F (E) ✓✓✓✓</p> <p>C immediately before B B immediately before D D immediately before A A immediately before F</p> | 4 | <p>one mark for each correct sequence</p> <p>4 correct = 4 marks 3 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark</p> |
| | (g) (i) | <p><u>120/80</u> ✓ <u>mmHg</u> ✓</p> | 2 | |

| Question | | Answer | Marks | Guidance |
|--------------|------|---|-----------|---|
| | (ii) | <p>difference</p> <p>18-year-old = lower / 40-year-old = higher/more (pressure) ✓</p> <p>reason <i>any one from: 18-year-old has.....</i> less, heart problems/circulatory disease/cholesterol/plaque (deposits) ✓ increased, exercise/activity ✓ fewer years, drinking alcohol/smoking ✓</p> | 2 | <p>accept reverse argument</p> <p>ignore values if comparison correct if only values given must be correct (40-year-old male =135/85(mmHg) female = 133/85(mmHg))</p> <p>accept reverse argument</p> <p>accept example of circulatory disease eg narrowing of blood vessels (40-year-old)</p> <p>ignore fitness levels/stress</p> |
| (h) | (i) | <p>2 beats per second ✓</p> <p>120 ✓</p> | 2 | correct answer = 2 marks |
| | (ii) | <p>heart rate, increases/faster/more than normal ✓</p> <p>normal/average, (heart rate at rest) is 60–80 beats per minute ✓</p> | 2 | <p>accept the, trace/rate, is double that of normal = 2 marks</p> <p>ignore 120bpm unqualified</p> <p>accept any single value within the range</p> |
| Total | | | 24 | |

| Question | | | Answer | Marks | Guidance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-------------|-------|---|-------------|---|--------------|--|------------|--|--|----------|-------|--------------|----------|-------|--------------|---------|--|--|---|--|--|---|-----------|---|--|--|--|---|--|----------------------|---|--|--|--|---|--|---|--|
| 3 | (a) | (i) | <u>12</u> ✓ | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | (ii) | <u>4</u> and <u>6</u> ✓ difference = <u>2</u> ✓ | 2 | accept <u>4.0</u> <u>6.0</u> accept <u>2.0</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | (iii) | <u>0.8</u> and <u>1.6</u> ✓ <u>100</u> (%) ✓ | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | (iv) | any three from: B/exercise tidal volume increases / deeper breaths ✓ B/exercise breathing (rate), increases/faster / more breaths ✓ A/rest tidal volume stays constant ✓ A/rest breathing rate stays constant ✓ increase CO ₂ levels detected ✓ more O ₂ needed / more CO ₂ produced ✓ within B tidal volume increases over time ✓ within B breathing rate slows over time / takes time to detect the change in the CO ₂ levels ✓ | 3 | ignore description of trace eg peaks and troughs are closer together. ignore heavier breathing accept correct references to, chemoreceptors / respiratory centre / medulla | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | (v) | <u>10</u> ✓ | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | (vi) | one mark for each correct row <table border="1" style="margin-left: 20px;"> <thead> <tr> <th rowspan="2">muscle type</th> <th colspan="3">inspiration</th> <th colspan="3">expiration</th> </tr> <tr> <th>contract</th> <th>relax</th> <th>not involved</th> <th>contract</th> <th>relax</th> <th>not involved</th> </tr> </thead> <tbody> <tr> <td>abdomen</td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>diaphragm</td> <td>✓</td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>external intercostal</td> <td>✓</td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> </tr> </tbody> </table> | muscle type | inspiration | | | expiration | | | contract | relax | not involved | contract | relax | not involved | abdomen | | | ✓ | | | ✓ | diaphragm | ✓ | | | | ✓ | | external intercostal | ✓ | | | | ✓ | | 3 | accept any clear response deduct the mark for any additional response within each row |
| muscle type | inspiration | | | | expiration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | contract | relax | not involved | contract | relax | not involved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| abdomen | | | ✓ | | | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| diaphragm | ✓ | | | | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| external intercostal | ✓ | | | | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Question | | Answer | Marks | Guidance |
|--------------|---------|---|-----------|--|
| | (b) (i) | (1) 6 4 3 5 2 ✓✓✓ 1 immediately before 6 6 immediately before 4 4 immediately before 3 3 immediately before 5 5 immediately before 2 | 3 | 1 correct = 1 mark 2/3 correct = 2 marks 5/4 correct = 3 marks |
| | (ii) | 410 dm ³ / highest reading is used ✓ normal range is <u>400–600</u> (dm ³) ✓ | 2 | must show 'yes' to gain 1 or 2 marks, if no = 1 mark max (for second marking point only) |
| | (c) (i) | (rate), reduced/becomes less/slower ✓ Less, oxygen/air, taken in and this reduces <u>diffusion gradient</u> (at the lungs) ✓ | 2 | must be a, change/comparison ignore less efficient |
| | (ii) | less/decrease/reduced, strength / weaker (contraction) / (increased) fatigue ✓ AND any one from: less oxygen, to muscles/to cells/in blood ✓ build up of lactic acid ✓ less, energy/ATP, available ✓ | 2 | ignore slower contraction accept can't contract as much accept lack of oxygen = less oxygen accept a lot of lactic acid = build up of lactic acid |
| | (d) | any two from: comparison ✓ identify a problem / to see, if unhealthy/healthy / fitness levels ✓ to identify treatment ✓ | 2 | |
| Total | | | 23 | |

| Question | | | Answer | Marks | Guidance |
|--------------|-----|------|--|----------|--|
| 4 | (a) | (i) | <p>advantage – easy/simple (to use) / reliable / safer / no need to clean / non-invasive / no distress / child-friendly ✓</p> <p>disadvantage – not accurate / not precise / could fall off skin / forehead not a good indicator of core temperature ✓</p> | 2 | <p>ignore 'quick' = advantage</p> <p>ignore not reliable</p> |
| | | (ii) | <p>any two from:</p> <p>tympanic (membrane) / ear ✓</p> <p>infrared ✓</p> <p>electronic / digital ✓</p> | 2 | ignore mercury / electrical / oral / rectal |
| | (b) | | <p>any three from:</p> <p>sweating ✓</p> <p>vasodilation ✓</p> <p>hairs lie flat (on skin) ✓</p> <p>lowered metabolic rate ✓</p> | 3 | <p>ignore moving into shade / lying down</p> <p>ignore unqualified sweat glands</p> <p>ignore general reference to blood vessels, widening/moving closer, to skin</p> <p>accept erector pili muscles relax</p> |
| | (c) | | <u>38</u> ✓ | 1 | |
| Total | | | | 8 | |

| Question | | | Answer | Marks | Guidance |
|----------|-----|-------|--|-------|---|
| 5 | (a) | (i) | non-ionising / no , radiation/X-rays ✓ non-intrusive / non-invasive ✓ | 2 | ignore reference to cancer/harmless/pain free |
| | | (ii) | <i>any two from:</i> excludes air / no gap ✓ prevents/reduces, reflection (of the wave) ✓ improves transmission of wave / passes through more easily (into / out of body) ✓ acts as a lubricant ✓ | 2 | ignore clearer image accept waves cannot travel through the air accept bouncing back = reflection accept absorption |
| | | (iii) | (suitable), treatment / medication ✓ | 1 | reject inappropriate treatments |
| | | (iv) | description: image/ultrasound, is, unclear/blurred/distorted ✓ explanation: fat (layer/tissue), interrupts/absorbs/reflects, (waves) ✓ | 2 | 1 mark for correct description 1 mark for correct explanation accept difficult/has to pass through lots of fat ignore reference to radiation |
| | (b) | | may not cope / causes distress / may not lead to a successful outcome / may die ✓ resources/treatment/money, could be used, on younger patients/elsewhere ✓ | 2 | OWTTE ignore unqualified reference to age ignore unqualified use of money |

| Question | | Answer | Marks | Guidance | | | | | | | | | | |
|--|---|---|-----------|----------|------------------------------------|---|--|---------------------------------|---------------------------------|---------------------------------|-------------------|--|---|---|
| | (c) | <p><i>any two from each column:</i></p> <table border="1"> <thead> <tr> <th>procedure</th> <th>reason</th> </tr> </thead> <tbody> <tr> <td>safe disposal of, needles/sharps ✓</td> <td>reduce/prevent, risk of, needle stick/injury /contamination ✓</td> </tr> <tr> <td>use new/sterile equipment/sterilise skin ✓</td> <td>reduce/prevent, contamination ✓</td> </tr> <tr> <td>medic/technician wears gloves ✓</td> <td>reduce/prevent, contamination ✓</td> </tr> <tr> <td>cover the wound ✓</td> <td>reduce/prevent, contamination/excessive blood loss ✓</td> </tr> </tbody> </table> | procedure | reason | safe disposal of, needles/sharps ✓ | reduce/prevent, risk of, needle stick/injury /contamination ✓ | use new/sterile equipment/sterilise skin ✓ | reduce/prevent, contamination ✓ | medic/technician wears gloves ✓ | reduce/prevent, contamination ✓ | cover the wound ✓ | reduce/prevent, contamination/ excessive blood loss ✓ | 4 | <p>only give marks for reasons if linked to correct procedure</p> <p>ignore references to infections/disease/training/transfer of microbes/viruses</p> <p>ignore clean</p> |
| procedure | reason | | | | | | | | | | | | | |
| safe disposal of, needles/sharps ✓ | reduce/prevent, risk of, needle stick/injury /contamination ✓ | | | | | | | | | | | | | |
| use new/sterile equipment/sterilise skin ✓ | reduce/prevent, contamination ✓ | | | | | | | | | | | | | |
| medic/technician wears gloves ✓ | reduce/prevent, contamination ✓ | | | | | | | | | | | | | |
| cover the wound ✓ | reduce/prevent, contamination/ excessive blood loss ✓ | | | | | | | | | | | | | |
| | | Total | 13 | | | | | | | | | | | |

| Question | | Answer | Marks | Guidance |
|--------------|---------|---|-----------|---|
| 6 | (a) | (A), F, E, (H), C, B, (G), D, I, (J) ✓✓✓✓ | 4 | 6 letters correct = 4 marks 4/5 letters correct = 3 marks 3 letters correct = 2 marks 2 letters correct = 1 mark 1 letter correct = 0 marks |
| | (b) | Technician may, have AIDS/ transfer HIV/the virus ✓ | 1 | accept AIDS = HIV |
| | (c) | HIV not detected but patient still HIV positive / patient thinks they do not have AIDS ✓ plus any two from: no treatment given ✓ unprotected sex/share needles/via blood/via saliva ✓ patient could pass on HIV /increase spread ✓ | 3 | OWTTE accept AIDS = HIV accept unsafe sex ignore urine/kissing |
| | (d) | Hepatitis ✓ | 1 | accept any other correct virus-based disease or TB, cancer, pneumonia, drugs, pregnancy, flu, leishmaniasis, haemolytic anaemia, chlamydia, E. coli, malaria, Lyme disease ignore type of hepatitis/unqualified anaemia |
| | (e) (i) | <u>60</u> AND <u>30</u> | 1 | |
| | (ii) | any three from: increase sample size / more people ✓ wider range of people (gender/age/lifestyle/ethnicity) ✓ wider range of/different/more, countries ✓ proportional/representative, sample ✓ | 3 | ignore references to levels of risk ignore unqualified more data |
| Total | | | 13 | |

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