
A-LEVEL

APPLIED SCIENCE

SC14 – The Healthy Body
Mark scheme

8770
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Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from aqa.org.uk

| Question | Part | Sub-part | Marking guidance | | Mark | Comment |
|----------|------|----------|---|-----|------|---|
| 1 | a | i | Dipstick / clinistix; dip into urine; check (colour) against reference chart OR digital urine glucose meter; dip into urine / urinate onto sensor; compare reading with normal range | AO1 | 3 | ignore reference to checking blood glucose levels |
| 1 | a | ii | Does not penetrate the body | AO1 | 1 | 'it doesn't cut the skin' is insufficient |
| 1 | b | i | 3.5–7.5 mmol l ⁻¹ | AO1 | 1 | |
| 1 | b | ii | Insulin causes uptake of glucose by cells / (cells then convert) glucose to glycogen / reduces blood glucose (levels) Glucagon converts glycogen back to glucose (from liver and muscle stores) / increases blood glucose (levels) | AO1 | 2 | |
| 1 | b | iii | Deviation from the norm causes a response; response produced causes a return to the norm | AO2 | 2 | allow description of an example for both MP's |

Total 9

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|---|---|--|-----|---|----------------------|
| 2 | a | <p>For calcium, any two of:</p> <ul style="list-style-type: none"> • inadequate bone development; • inadequate tooth development; • decreased blood clotting; • reduced nerve/muscle development; • reduced oxygen-carrying capacity; <p>For iron, any two of:</p> <ul style="list-style-type: none"> • tired; fatigued; anaemic; • reduced red blood cells; • reduced oxygen-carrying capacity; • increased infection; | AO1 | 4 | ignore bone diseases |
| 2 | b | <p>any two of:</p> <ul style="list-style-type: none"> • (increased) cardiovascular disease; • hypertension / high blood pressure; • (increased risk of) stroke; • (increased risk of) kidney damage or dehydration; | AO1 | 2 | |

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| 2 | c | i | <p>any four of:</p> <ul style="list-style-type: none"> • (increased) cardiovascular disease; • (increased) atherosclerosis; • narrowed arteries; • (increased risk of) stroke; • (increased) type II diabetes; • painful joints; • (increased risk of osteo)arthritis | AO2 | 4 | <p>ignore psychological effects increased blood pressure or increase cholesterol levels are insufficient</p> <p>if more than four responses given, apply the list rule</p> |
| 2 | c | ii | <p>any two of:</p> <ul style="list-style-type: none"> • not enough physical activity; • not enough fruit / veg / fibre; • eat (convenience) foods high in fat/sugar or eat too much | AO2 | 2 | <p>allow not enough of your '5 a day' for MP2 unhealthy diet is insufficient</p> |

Total 12

| 3 | a | i | <p>any four of,</p> <ul style="list-style-type: none"> • <u>Complex</u> carbohydrates; • digested to glucose; • glucose converted to glycogen; • glycogen stored in liver and muscles; • slow release energy; • (therefore) energy available throughout the race; • through respiration; | AO2 | Max 4 | | | | | | | |
|-------|-------|---|--|-------|-------|------------|---|-----|---|-----|---|--|
| 3 | a | ii | <p>any three of,</p> <ul style="list-style-type: none"> • Instant energy; • glucose needed for respiration; • when glycogen stores are depleted; • glucose does not need to be digested/broken down to be absorbed into the blood; | AO2 | Max 3 | | | | | | | |
| 3 | b | i | <p>The marking scheme for this part of the question includes an assessment of the Quality of Written Communication (QWC). There are no discrete marks for the assessment of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below.</p> <table border="1" data-bbox="577 1182 1301 1422"> <thead> <tr> <th data-bbox="577 1182 678 1219">Level</th> <th data-bbox="678 1182 790 1219">Marks</th> <th data-bbox="790 1182 1301 1219">Descriptor</th> </tr> </thead> <tbody> <tr> <td data-bbox="577 1321 678 1358">3</td> <td data-bbox="678 1321 790 1358">4-5</td> <td data-bbox="790 1219 1301 1422"> <p>An answer will be expected to meet most of the criteria in the level descriptor</p> <p>Answer is full and detailed and is supported by an appropriate range of relevant points such as those given</p> </td> </tr> </tbody> </table> | Level | Marks | Descriptor | 3 | 4-5 | <p>An answer will be expected to meet most of the criteria in the level descriptor</p> <p>Answer is full and detailed and is supported by an appropriate range of relevant points such as those given</p> | AO2 | 5 | |
| Level | Marks | Descriptor | | | | | | | | | | |
| 3 | 4-5 | <p>An answer will be expected to meet most of the criteria in the level descriptor</p> <p>Answer is full and detailed and is supported by an appropriate range of relevant points such as those given</p> | | | | | | | | | | |

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|--|--|--|---|-----|--|--|--|--|
| | | | | | <p>below:</p> <ul style="list-style-type: none"> - argument is well structured with minimal repetition or irrelevant points - accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling, punctuation and grammar. | | | |
| | | | 2 | 2-3 | <ul style="list-style-type: none"> -answer has some omissions but is generally supported by some of the relevant points below: -the argument shows some attempt at structure -the ideas are expressed with reasonable clarity but with a few errors in the use of technical terms, spelling, punctuation and grammar. | | | |
| | | | 1 | 0-1 | <ul style="list-style-type: none"> -answer is largely incomplete. It may contain some valid points which are not clearly linked to an argument structure -unstructured answer -errors in the use of technical terms, spelling, punctuation and grammar or lack of fluency | | | |
| | | | <p>A good answer could be:</p> <p><i>Water levels are depleted due to sweating, which means that the kidneys need to conserve water while still eliminating waste products.</i></p> <p><i>When the blood water levels get too low, osmoreceptors in the hypothalamus detect this. ADH is released from the pituitary gland making the collecting ducts of the kidney more permeable to water.</i></p> | | | | | |

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| | | | <i>The result is that more water is reabsorbed, making the urine more concentrated.</i> | | | |
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| 3 | b | ii | <p>any two of,</p> <ul style="list-style-type: none"> • maintains blood pressure; • helps with temperature regulation; • maintains appropriate blood concentrations; • maintains appropriate cell concentrations; • maintains ionic balance | AO2 | Max 2 | Accept 'maintains blood volume' if only one mark point given, allow a second mark for the appropriate explanation of its importance |
|---|---|----|---|-----|-------|---|

Total 14

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| 4 | a | i | <ul style="list-style-type: none">• Scale correct;• points plotted correctly;• appropriate line of best fit | AO3 | 3 | |
| 4 | a | ii | any two of, <ul style="list-style-type: none">• pH 1 is the highest rate of activity;• the activity of protease decreases as pH increases;• change in pH has a greater effect at low pH levels;• protease activity stops at pH8 / between pH7 and 8; | AO3 | 2 | accept converse |
| 4 | b | | No product would be produced; the reaction rate would drop / reach zero | AO3 | 2 | allow 'stops reacting' for MP2 |

Total 7

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| 5 | a | i | Fewer; larger | AO2 | 2 | ignore shape of alveoli ignore references to surface area |
| 5 | a | ii | any two of: <ul style="list-style-type: none"> • reduced surface area (for gas exchange); • less diffusion; • less oxygen into the blood (from the alveoli); | AO1 | 2 | 'diffusion is more difficult' is insufficient |
| 5 | b | i | Maximum amount of air that can be breathed in / out | AO1 | 1 | |
| 5 | b | ii | any two of: <ul style="list-style-type: none"> • deep(est) inhalation; • (fully) exhale through the spirometer; • best of three taken; | AO1 | 2 | |
| 5 | c | | any four of: <ul style="list-style-type: none"> • Intercostal muscles contract / ribs move up (and out); • diaphragm moves down / contracts / flattens; • volume of the thorax increases • pressure inside the thorax decreases; • air moves down a pressure gradient | AO2 | 4 | sequence of events must be logical |

Total 11

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| 6 | a | i | any two of: <ul style="list-style-type: none"> • Same age; • Same health; • Same fitness; • Same size / weight / BMI; • Same sex | AO3 | 2 | allow 'similar' throughout ignore 'height' |
| 6 | a | ii | any two of: <ul style="list-style-type: none"> • repeat; • diet; • pace / speed; • gradient; • resting measured as baseline | AO3 | 2 | ignore references to averaging results |
| 6 | b | i | fast for 12 hours; (sit at) rest; wear a respirometer; total amount of oxygen used is measured | AO1 | 4 | |
| 6 | b | ii | don't have to stay in a special room / can be done at home / anywhere | AO1 | 1 | ignore 'quicker' ignore answers that suggest the subject can move around |
| 6 | c | | any two of: larger surface area ; loses more heat (than a taller athlete of the same mass) | AO2 | 2 | ignore references to muscle mass |

Total 11

| | | | | | | |
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| 7 | a | | <p>any two of,</p> <ul style="list-style-type: none"> body will produce more <u>haemoglobin / Hb</u>; to / in order to take up / carry / deliver an adequate amount of oxygen; (because) the pressure is lower | AO2 | 2 | ignore 'red blood cells' 'less oxygen' is insufficient |
| 7 | b | | the illness would be classed as self-inflicted; treating him takes away resources from people who are ill due to no fault of their own | AO2 | 2 | allow arguments related to waste of NHS money if well explained for 2 nd MP |
| 7 | c | | <p>345 600 (cm³ per hour) gains 2 marks</p> <p>1 compensation mark for: 80 × 72 = 5760 or 80 × 72 or 5760</p> | AO2 | 2 | Correct answer alone gains 2 marks |
| 7 | d | i | <ul style="list-style-type: none"> C₆H₁₂O₆ + 6O₂; → 6H₂O + 6CO₂ | AO1 | 2 | <p>Allow 1 compensation mark for correct reactants and products, but not balanced.</p> <p>Chemical formulae must be correctly written.</p> |

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|---|-----|---|---|--------------|---|-----|---|--|
| 7 | d | ii | The marking scheme for this part of the question includes an assessment of the Quality of Written Communication (QWC). There are no discrete marks for the assessment of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below. | | | AO1 | 5 | |
| | | | Level | Marks | Descriptor | | | |
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| | | | | | | |
|--|--|--|---|--|--|--|
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| | | | <p>A good answer could be:</p> <p><i>Glycolysis occurs in the cytoplasm. Here glucose is broken down into pyruvate before entering mitochondria for the link reaction to take place.</i></p> <p><i>NAD is reduced in both the link and Krebs cycle, as well as a little ATP. The bulk of ATP is made in the electron transport chain.</i></p> | | | |

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|---|---|--|--|-----|---|--|
| 7 | e | | <ul style="list-style-type: none"> • more energy for muscle contraction; • (because) aerobic respiration generates more ATP (than anaerobic respiration); • lactic acid build up (could cause discomfort) | AO2 | 3 | |
|---|---|--|--|-----|---|--|

Total 16

| Question | A01 | A02 | A03 |
|----------|-----|-----|-----|
| 1 | 7 | 2 | 0 |
| 2 | 6 | 6 | 0 |
| 3 | 0 | 14 | 0 |
| 4 | 0 | 0 | 7 |
| 5 | 5 | 6 | 0 |
| 6 | 5 | 2 | 4 |
| 7 | 7 | 9 | 0 |
| total | 30 | 39 | 11 |