

Mark Scheme for January 2012

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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.

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Annotations

| Annotation | Meaning |
|---|---------------------------------------|
|  | correct response |
|  | incorrect response |
|  | benefit of the doubt |
|  | benefit of the doubt not given |
|  | error carried forward |
|  | information omitted |
|  | ignore |
|  | reject |
|  | contradiction |

Subject-specific Marking Instructions

- / = alternative and acceptable answers for the same marking point
- (1) = separates marking points
- allow = answers that can be accepted
- not = answers which are not worthy of credit
- reject = answers which are not worthy of credit
- ignore = statements which are irrelevant
- () = words which are not essential to gain credit
- = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
- ecf = error carried forward
- AW = alternative wording
- ora = or reverse argument

| Question | | | Answer | Marks | Guidance |
|----------|-----|-------|--|-------|---|
| 1 | (a) | (i) | 900(J) (1) | 1 | ignore 90% allow 0.9kJ |
| | | (ii) | 2(J) (2) BUT allow 1 mark if two steps are correctly and clearly calculated and shown (1) | 2 | |
| | | (iii) | (lost through) heat / respiration / movement (1) egestion / faeces / excretion / not all food digested / not all food eaten (1) | 2 | mark as one paragraph allow energy transferred to other members of food web / organisms not shown in diagram / AW (1) ignore waste allow excrete waste / named waste (1) for growth means a maximum of one mark can be scored |
| | (b) | (i) | any one from: may enter food chains / (bio)accumulation (1) may harm other organisms (that are not pests) (1) pests may become resistant to pesticide (1) reduce biodiversity (1) | 1 | allow description of bioaccumulation ignore cost / pollution / harms environment / run off ignore residue on crop / in soil / AW ignore disrupts/ affects other organisms / food chains ignore immune |
| | | (ii) | control organisms may leave area / control organisms may get eaten by something else / control not as quick as by pesticides / takes longer / not all pests are killed / may become a pest themselves / reproduces unchecked / disturbs food chains (1) | 1 | ignore eats other organisms |

| Question | | Answer | Marks | Guidance |
|----------|-----|---|----------|--|
| | (c) | (growing plants) without soil / in nutrient solution / in fertiliser solution (1) | 1 | allow valid description eg in gel / in beads ignore just water / liquid / fluid |
| | | Total | 8 | |

| Question | | Answer | Marks | Guidance |
|----------|-----|---|----------|--|
| 2 | (a) | (root) hairs (1) increase / large surface area (1) OR partially-permeable (1) for osmosis (1) | 2 | for full marks must be one idea fully explained allow deep / long roots (1) to reach (water) far underground (1) allow spreading roots (1) to collect (water) over wide area (1) |
| | (b) | xylem (1) | 1 | ignore veins / vascular bundles |
| | (c) | (i) | 2 | |
| | | any two from: lots of water enters cell / cell is full of water (1) high pressure of water / cell contents / cytoplasm (1) cell contents / cytoplasm / cell membrane push against cell wall (1) no more water can enter cell by osmosis (1) | | |
| | | (ii) | 1 | allow (water / particles) have more (kinetic) energy |
| | | Total | 6 | |

| Question | | | Answer | Marks | Guidance |
|----------|-----|------|---|----------|---|
| 3 | (a) | (i) | ammonium (compounds) / ammonia (1) | 1 | allow nitrites allow correct chemical formulae |
| | | (ii) | nitrifying (bacteria) (1) | 1 | ignore named species not nitrogen-fixing |
| | (b) | | amino acids (1) lightning / nitrogen-fixing bacteria (1) | 2 | allow DNA / nucleic acids / ATP / chlorophyll (1) ignore enzymes allow examples: Azotobacter / Clostridium / Rhizobium (1) |
| | (c) | (i) | requires energy (from respiration) / can move against / up concentration gradient / AW (1) | 1 | allow correct higher level references to ATP ignore diffusion is passive not diffusion against the concentration gradient |
| | | (ii) | to move against concentration gradient / (nitrates) only present in low concentrations in the soil / high(er) concentrations (of nitrates) in plant (1) | 1 | ignore reference to rate of absorption ignore more minerals in the plant than in soil not diffusion against the concentration gradient |
| | | | Total | 6 | |

| Question | | Answer | Marks | Guidance |
|----------|-----|--|----------|---|
| 4 | (a) | <p>high levels of carbon dioxide build-up in the blood <input checked="" type="checkbox"/></p> <p>high levels of carbon dioxide build-up in exhaled air <input type="checkbox"/></p> <p>high levels of oxygen build-up in exhaled air <input type="checkbox"/></p> <p>high levels of oxygen build-up in the blood <input type="checkbox"/></p> | 1 | more than one box ticked scores zero |
| | (b) | (i) | 1 | allow largest amount of air exchanged in a single breath allow volume of air exchanged in a deep breath allow maximum / largest volume of air taken in during one breath allow maximum / largest volume of air breathed out in one breath allow total capacity minus residual volume |
| | | (ii) | 1 | allow answer in range 1.5 – 1.7 |
| | | (iii) | 2 | |
| | (c) | any one from: shortage of donors (1) tissue match / rejection (1) similar size / age (1) | 1 | ignore long waiting list allow (many) donors organs may not be healthy ignore same blood group allow close tissue match / close genetic match |
| | (d) | mitosis (1) immuno-suppressant (1) | 2 | |
| | | Total | 8 | |

| Question | | | Answer | Marks | Guidance |
|--------------|-----|------|--|----------|--|
| 5 | (a) | (i) | (cartilage) replaced / added / joined by calcium / phosphorous (1) | 1 | allow calcification / ossification allow replaced / added / joined by phosphate ignore reacts with minerals / mineralisation / minerals deposited allow mineralisation by calcium / phosphorous / phosphate |
| | | (ii) | ball (and socket) (1) movements in more than one plane / in most directions (1) | 2 | allow universal joint (1) allow movement in three axes (1) allow rotation / in all directions / (all) around / swivel / 360° ignore wide range of movement / flexible |
| | (b) | | (elderly have) brittle bones / osteoporosis (1) | 1 | allow poor bone density / fragile bones allow demineralisation of bone / bones have less calcium / phosphorous ignore soft / weak / spongy bones |
| | (c) | | antibodies in Esther's blood / plasma and antigens on red blood cells (1) agglutination / blood forms clumps / antibodies bind to / attack antigens / agglutinins react (with antigens) (1) (Esther) would be able to receive blood groups B and O (1) | 3 | allow anti A antibodies and B antigens (1) ignore try to reject each other ignore blood clots ignore references to rhesus |
| Total | | | | 7 | |

| Question | | Answer | Marks | Guidance |
|--------------|-----|---|----------|---|
| 6 | (a) | ovary <input checked="" type="checkbox"/> oviduct <input type="checkbox"/> uterus <input type="checkbox"/> vagina <input type="checkbox"/> | 1 | more than one box ticked scores zero |
| | (b) | progesterone / LH / luteinising hormone (1) | 1 | ignore testosterone |
| | (c) | due to adrenaline / due to a hormone that passes into foetus (1) | 1 | allow (Sue's) hormones can cross the placenta |
| | (d) | (increased levels of carbon dioxide in blood) by the brain (1) increased breathing rate / depth (1) | 2 | allow by chemoreceptors / medulla / carotid (body) / aortic (body) (1) ignore reference to incorrect regions of the brain allow more nerve impulses sent to intercostal / diaphragm muscles heart beats faster / stronger / hyperventilation / panting (1) ignore breathes heavily |
| Total | | | 5 | |

| Question | | | Answer | Marks | Guidance |
|----------|-----|------|---|----------|---|
| 7 | (a) | (i) | provide food for yeast / so yeast can turn it / make it into alcohol (1) | 1 | allow respiration / fermentation of yeast ignore reacts with the yeast / allows the yeast to grow not for aerobic respiration |
| | | (ii) | to increase rate of fermentation / respiration / growth / alcohol production (1) | 1 | must have the idea of increase in rate to gain mark eg so yeast can grow (0) but so yeast can grow faster / quickly(1) allow so enzymes work at optimum temperatures / work faster / work efficiently (1) ignore so reaction occurs faster / yeast works faster ignore increased collisions unless refers to substrate and enzymes ignore so the yeast will not die |
| | (b) | | $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ (2) | 2 | correct symbols = 1 correct balancing = 1 numbers must be subscript letters must be capitals |
| | (c) | (i) | penicillin (1) | 1 | allow antibiotics ignore <i>Penicillium</i> |
| | | (ii) | <i>Entamoeba</i> is not a bacterium / fungus / <i>Entamoeba</i> is a protozoan (1) | 1 | allow does not kill protozoans / only kills bacteria / fungus ignore does not kill <i>Entamoeba</i> / only kills some microorganisms / is not a virus |
| | | | Total | 6 | |

| Question | | | Answer | Marks | Guidance |
|--------------|-----|------|--|----------|--|
| 8 | (a) | (i) | restriction (enzyme) (1) | 1 | allow endonuclease ignore nuclease / exonuclease / restrictive not DNA polymerase |
| | | (ii) | ligase (1) | 1 | |
| | (b) | | may not be safe to eat bananas / resistant gene may enter environment (1) | 1 | allow people may not buy / eat the bananas / the gene pool will be reduced / less variation in population (1) ignore side effects unless qualified (eg side effects on humans) ignore cost |
| | (c) | (i) | springtail (1) | 1 | |
| | | (ii) | any two from: aerate (soil) (1) improve drainage (1) mix up (soil layers) (1) neutralise (acid) soils (1) break down organic matter / leaves (1) | 2 | mark as one paragraph allow increase oxygen /air (in soil) / provide air channels (1) allow introduce water channels (1) allow mix up minerals (1) allow increase pH of soil (1) not decrease pH of soil ignore releases minerals decomposing negates this marking point only |
| | (d) | (i) | methane (1) | 1 | allow CH ₄ |
| | | (ii) | two from: uses waste products (1) reduction of net carbon dioxide emissions (1) less release of other named pollutant (eg SO ₂ or particulates) (1) renewable / sustainable (1) | 2 | allow reverse arguments allow less CO ₂ released / lower carbon footprint / carbon neutral / less greenhouse gases / less risk of global warming (1) not does not give off CO ₂ allow biofuels do not take millions of years to form (1) |
| Total | | | | 9 | |

| Question | | | Answer | Marks | Guidance |
|----------|-----|------|--|----------|---|
| 9 | (a) | (i) | 36.0 and 43.5 (1) | 1 | both answers needed for one mark any order allow +/- 0.5 |
| | | (ii) | <p>any two from: increases optimum temperature / works best at 50°C instead of 40°C (1)</p> <p>more active at higher temperatures / more active at quoted temperature (43.5°C - 60°C) (1)</p> <p>less variation in activity / activity is less affected by temperature (1)</p> <p>between 36 – 43.5°C activity is lower (1)</p> | 2 | <p>assume answer refers to immobilised enzymes unless stated</p> <p>allow higher level answers eg denatures at a higher temperature (1)</p> <p>allow tested / works over a narrower range of temperatures (1) ignore reference to 25 - 35°C</p> |
| | (b) | (i) | sucrose (1) | 1 | allow invertose not sucrose |
| | | (ii) | fructose / glucose (1) | 1 | allow reducing sugar / dextrose |
| | | | Total | 5 | |

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