

Mark Scheme for June 2010

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| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|-----|---|------|---|
| 1 | (a) | (i) | <p>X adenine ;</p> <p>Y ribose ;</p> <p>Z (tri / 3) phosphate(s) ;</p> | 3 | <p>Mark the first answer for each letter. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>X IGNORE nitrogenous base / base / A DO NOT CREDIT adenosine</p> <p>Y IGNORE pentose / sugar DO NOT CREDIT ribulose / hexose</p> <p>Z IGNORE chemical formulae (as Q asks for name) DO NOT CREDIT phosphorus / phosphoryl (PO)</p> |

| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|------|---|-------|--|
| 1 | (a) | (ii) | <p>1 transfers energy / energy 'currency' / releases energy / universal energy molecule / energy intermediate / (immediate) source of energy ;</p> <p>2 phosphate(s) can be removed by <u>hydrolysis</u> ;</p> <p>3 to , release / provide , <u>30kJ</u> (mol⁻¹) energy ;</p> <p>4 (energy released for) metabolism / appropriate named reaction / appropriate reaction described ;</p> <p>5 ADP can attach a phosphate (forming ATP) during , respiration / photosynthesis ;</p> <p>6 energy released in , small 'packets' (to prevent cell damage) / suitable quantity ;</p> | 3 max | <p>1 IGNORE contains energy DO NOT CREDIT produce energy</p> <p>2 ATP → ADP + P_(i) by <u>hydrolysis</u> or ATP + H₂O → ADP + P_(i) (must include water)</p> <p>3 ACCEPT 28 – 32 kJ DO NOT CREDIT produce energy</p> <p>4 e.g. • muscle contraction • active transport • phosphorylation • glycolysis • during movement binding to proteins to change their shape IGNORE respiration / photosynthesis unqualified</p> <p>5 CREDIT during, oxidative phosphorylation / chemiosmosis / substrate level phosphorylation / photophosphorylation</p> <p>NOTE 'it releases 30kJ of energy when a phosphate is removed by hydrolysis' = 3 marks (mps 3, 1 and 2)</p> |

| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|------|--|-------|--|
| 1 | (b) | (i) | crista ; | 1 | <p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT 'cristae' / 'inner mitochondrial membrane' IGNORE 'stalked particles'</p> |
| 1 | (b) | (ii) | chemiosmosis / oxidative phosphorylation ; | 1 | <p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>IGNORE description of chemiosmosis [e.g. • 'ATP synthesis' • 'electron flow along electron carriers']</p> <p>IGNORE 'aerobic respiration' IGNORE 'electron transport chain' alone (as this is not a process)</p> |
| 1 | (c) | (i) | <p>1 <u>substrate</u> respired changes over time ;</p> <p>2 initially respire (mostly) , glucose / carbohydrate ;</p> <p>3 lower / decrease in / 0.75 , RQ indicates (more) , fat / lipid , as substrate or as time goes by (more) lipid is respired ;</p> <p>4 glucose / carbohydrate , used up / decreases (over time) ;</p> <p>5 protein not likely to be used as substrate / protein only used as a last resort ;</p> | 3 max | <p>1 Needs to be a clear statement and not just names and not inferred from candidate's complete answer</p> <p>2 IGNORE respiring protein</p> <p>3 IGNORE respiring protein</p> <p>5 'Less protein respired' isn't quite enough for this mp</p> |

| Question | | Expected Answer | Mark | Additional Guidance |
|--------------|----------|---|-------------|--|
| 1 | (c) (ii) | <p><i>This is a QWC question</i></p> <p>1 peripheral / skin , thermoreceptors / (heat) receptors , stimulated (by decrease in external temp) ;</p> <p>2 (impulses sent to / blood temperature monitored in) hypothalamus / sensory cortex ;</p> <p>3 vasoconstriction of , arterioles / small arteries , to reduce heat loss ;</p> <p>4 (prevents heat loss by) radiation / conduction / convection ;</p> <p>5 <u>increased</u> , metabolic rate / metabolism / respiration , to generate heat (energy) ;</p> <p>6 (release of) adrenaline / thyroxine ;</p> <p>7 shivering / (involuntary) muscle spasms , to generate heat (energy) ;</p> <p>8 erector / hair , muscles raise , (skin) hair / fur , to trap , air / heat ;</p> <p>9 AVP ;</p> | 4 max | <p>Only CREDIT answers that refer to preventing a decrease in body temperature – no ora</p> <p>IGNORE negative feedback (Q only about preventing decrease)</p> <p>3 ACCEPT ‘pre-capillary sphincter’ instead of ‘arterioles’ DO NOT CREDIT other blood vessels but allow QWC</p> <p>5 Emphasis needs to be on increase / higher rate / more</p> <p>7 Needs the idea of generating heat not just ‘to keep warm’</p> <p>9 e.g. • specific behavioural response (such as huddling / increased exercise / move to find sun) • involvement of sympathetic nervous system • reduce sweating / reduce panting / stop panting</p> <p>DO NOT CREDIT ‘stop sweating’</p> |
| | | <p>QWC - technical terms used appropriately and spelt correctly ;</p> | | <p>Use of three terms from: peripheral, thermoreceptor(s), hypothalamus, cortex, vasoconstriction, metabolic rate / metabolism, adrenaline, thyroxine, erector radiation / conduction / convection</p> <p>Please insert a QWC symbol next to the mark total bracket, followed by a tick (✓) if QWC has been awarded or a cross (×) if QWC has not been awarded You should use the green dot to identify the QWC terms that you are crediting.</p> |
| Total | | | [16] | |

| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|------|---|------|---|
| 2 | (a) | (i) | vein / venule ; | 1 | <p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>IGNORE further qualification (e.g. central / hepatic) but DO NOT CREDIT inappropriate name (e.g. renal vein / hepatic portal vein)</p> |
| 2 | (a) | (ii) | hepatocyte(s) / hepatic cells ; | 1 | <p>IGNORE 'liver cells' (as given in Q) and 'sinusoid cells'</p> <p>A list must include 'hepatocytes' or 'hepatic cells' and not include an incorrect cell e.g. hepatocytes and Kupffer cells = 1 hepatocytes and α cells = 0 liver cells and Kupffer cells = 0</p> |
| 2 | (b) | | <u>deamination</u> ; carbon dioxide / CO_2 ; urea / $\text{CO}(\text{NH}_2)_2$; water / H_2O ; | 4 | <p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>If a formula is given for compounds D, E and F then the formula given must be correct in order to be awarded the mark e.g. E 'urea (CONH_2)' = 0 as the formula is incorrect</p> |

| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|-----|---|-------|--|
| 2 | (c) | (i) | <p><i>This is a QWC question</i></p> <p>1 (testing for) human chorionic gonadotrophin / hCG ;</p> <p>2 hormone small so can pass from blood into filtrate (at Bowman's capsule) ;</p> <p>3 monoclonal / immobilised , antibodies / immunoglobulin , on stick ;</p> <p>4 antibodies attached to , marker / dye ;</p> <p>5 hormone , binds / complementary , to antibody ;</p> <p>6 (triggers) appearance of colour / line becomes visible ;</p> <p>7 AVP ;</p> | 3 max | <p>Max 2 (instead of 3) for content if use the term , receptor / antigen / enzyme , throughout instead of antibody</p> <p>1 ACCEPT HCG This mark can be awarded for hCG but the name must be given in full for QWC</p> <p>3 ALLOW 'strip' instead of stick</p> <p>5 IGNORE specificity</p> <p>7 e.g. • reference to the second line to validate test • different antibody for second line • 2 coloured lines = pregnant</p> |
| | | | <p>QWC - technical terms used appropriately and spelt correctly ;</p> | 1 | <p>Use of three terms from: human chorionic gonadotrophin, filtrate, monoclonal, immobilised, antibody(ies), complementary</p> |

| Question | | | Expected Answer | Mark | Additional Guidance |
|--------------|-----|------|--|-------------|---|
| 2 | (c) | (ii) | <p>1 fairness / giving unfair advantage / does not give an 'even playing field' ;</p> <p>2 <i>idea of</i> health risks / dangerous / unhealthy / fatal / side effects ;</p> <p>3 specified health risk ;</p> <p>4 <i>idea of</i> distrust of 'outstanding' performances / does not reflect athlete's natural talent / sport should reflect athlete's natural talent ;</p> <p>5 <i>idea of</i> pressure to keep up with rival competitors ;</p> <p>6 <i>idea that</i> can train for longer (without tiring) / can respire longer (without tiring) / can recover from injury quicker / can build up muscle mass ;</p> <p>7 AVP ;</p> | 3 max | <p>IGNORE enhances performance (as given in Q)</p> <p>1 ACCEPT comment about cheating IGNORE idea of should be available to all</p> <p>2 IGNORE 'has an effect on health' as must imply negative effect</p> <p>3 e.g. <ul style="list-style-type: none"> • depression • aggression • liver , damage / failure • heart attack • masculinisation of female athletes • feminisation of male athletes • infertility </p> <p>7 e.g. <ul style="list-style-type: none"> • up to the individual to decide • idea that athletes should be role models </p> |
| Total | | | | [13] | |

| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|------|---|-------|---|
| 3 | (a) | (i) | <p>Credit in either order</p> <p>ATP ; reduced NAD<u>P</u> / NAD<u>P</u>H / NAD<u>P</u>H₂ / NAD<u>P</u>H + H⁺ ;</p> | 2 | <p>Mark the first two answers. If either of the answers is correct and an additional answer (i.e. 3rd etc) is given that is incorrect or contradicts the correct answer then -1 for each additional incorrect answer</p> <p>DO NOT CREDIT reduced NAD / NADH / NADH₂ / NADH + H⁺</p> <p>DO NOT CREDIT oxygen / O₂ (as not used in Calvin cycle)</p> <p>e.g. ATP (✓) and NADPH (✓) and GP (-1) = 1 NADH (x) and ATP (✓) and oxygen (-1) = 0 GP (x) and H₂O (x) and ATP and NADPH = 0 ATP (✓) and NADPH (✓) and GP (-1) and H₂O (-1) = 0</p> |
| 3 | (a) | (ii) | <p>1 regenerates / produces , ribulose biphosphate / RuBP ;</p> <p>2 so cycle can continue / for (further) CO₂ fixation / to combine with CO₂ ;</p> <p>3 formation of (named) , sugar / glucose / hexose / sucrose / starch / cellulose ;</p> <p>4 formation of (named) , fat / triglyceride / lipid / fatty acids / glycerol / amino acids / protein / nucleic acids / nucleotides ;</p> <p>5 10x TP for RuBP <u>and</u> 2x TP for production or most TP used to produce RuBP <u>and</u> the rest for production ;</p> | 3 max | <p>3 IGNORE carbohydrate without qualification but CREDIT suitably named carbohydrate</p> <p>5 Needs to refer to both CREDIT 5/6 regenerated <u>and</u> the rest for production</p> |

| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|------|--|-------|--|
| 3 | (b) | (i) | <p>oxygen used <u>and</u> carbon dioxide , produced / excreted ;</p> <p>(only) occurs in the light / light (energy) required or uses , (same) photosynthetic enzyme / Rubisco or involves Calvin cycle ;</p> | 2 | <p>DO NOT CREDIT comments that categorically state 'it <u>is</u> respiration'</p> <p>CREDIT 'sun' instead of 'light' IGNORE ref to light dependent stage</p> <p>[S & C x 2]</p> |
| 3 | (b) | (ii) | <p>1 reduces (rate of) photosynthesis / increases (rate of) photorespiration ;</p> <p>2 less Rubisco available for CO₂ / more oxygen competing with CO₂ for Rubisco / more O₂ binding to Rubisco O₂ outcompetes CO₂ for Rubisco ;</p> <p>3 less CO₂ , fixation / for Calvin cycle ; 4 CO₂ given off ;</p> <p>5 less , glycerate 3-phosphate / GP / TP , produced ; 6 less RuBP , regenerated / formed ;</p> | 3 max | <p>2 ACCEPT oxygen blocks active site of Rubisco CREDIT 'enzyme' instead of 'Rubisco' Needs to convey the idea that oxygen more successful / more oxygenase activity Be careful not to credit RuBP</p> <p>5 IGNORE number before name unless used to & indicate more or less (compare flow charts) 6</p> <p>[S & C x 3]</p> |

| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|-------|---|-------------|--|
| 3 | (b) | (iii) | <p><i>idea that oxygen ,</i> not a substrate for / cannot bind to / will not compete for , PEP carboxylase</p> <p>or PEP carboxylase , is only specific to carbon dioxide ;</p> | 1 | ACCEPT PEP carboxylase cannot 'fix' oxygen [S & C x 1] |
| | | | Total | [11] | |

| Question | | | Expected Answer | Mark | Additional Guidance |
|----------|-----|------|---|-------|--|
| 4 | (a) | (i) | starch contains (only) glucose and sucrose contains , 50% glucose or glucose and fructose ; by <u>hydrolysis</u> , starch releases more glucose / sucrose releases less glucose ; | 2 | |
| 4 | (a) | (ii) | both starch and cellulose are (only) made of glucose ; starch , is digestible / can be broken down and cellulose , is indigestible / cannot be broken down ; (named) enzyme present for starch digestion / no (named) enzyme present for cellulose digestion ; | 2 max | |
| 4 | (b) | | <p>1 low / decrease , starch ;</p> <p>2 as starch has the <u>greatest</u> effect on blood glucose conc. ;</p> <p>3 increase / include , cellulose / fibre / roughage / fat / protein / meat , as no effect on blood glucose ;</p> <p>4 some / medium amount of , sugars / sucrose / lactose ;</p> <p>5 <i>idea of</i> limiting , sucrose / lactose / fat / protein , as causes an increase in insulin and will make cells less responsive (to insulin) ;</p> | 3 max | <p>1 ACCEPT 'no starch'</p> <p>2 'substantial' or 'high' or 'big' is not quite enough</p> <p>3 IGNORE the idea that , fat / protein , increases insulin and could indirectly lower blood glucose (as this is not relevant to Type 2 diabetes) DO NOT CREDIT little effect / less effect (as table shows no effect)</p> |

| Question | | Expected Answer | | Mark | Additional Guidance | |
|--------------|-----|--------------------|--|---|---|---|
| 4 | (c) | | glycogen | glucagon | <p>Award one mark per row</p> <p><i>both glycogen and glucagon</i> IGNORE polymer or macromolecule unless qualified</p> <p><i>glycogen</i> DO NOT CREDIT complex sugar / sugar</p> <p><i>both glycogen and glucagon</i> Look for qualification of glycogenolysis</p> <p><i>glycogen</i> ACCEPT muscle / brain</p> <p><i>glucagon</i> ACCEPT 'a cells' IGNORE pancreas DO NOT CREDIT beta / β, cells</p> | |
| | | type of compound | carbohydrate OR polysaccharide | hormone OR polypeptide OR protein | | ; |
| | | role of compound | storage OR to provide glucose (when blood glucose conc. falls) OR can undergo glycogenolysis | binds to cell receptor OR causes conversion of glycogen to glucose OR stimulates glycogenolysis OR increases (blood) glucose concentration | | ; |
| | | site of production | liver OR hepatocytes | pancreas OR islets of Langerhans OR alpha / α , cells | | ; |
| Total | | | | 3 | | |
| | | | | [10] | | |

| Question | | | Expected Answer | Mark | Additional Guidance |
|--------------|-----|------|--|-------------|--|
| 5 | (c) | (i) | <p>1 attacked by the body's (own) immune system ;</p> <p>2 (immune system) mistakes / treats / recognises , body cells / neurones / myelin , as , 'foreign' / non self ;</p> <p>3 correct ref. to , antibodies / (named) phagocytes / (named) B lymphocytes / (named) T lymphocytes ;</p> | 2 max | 1 Named parts of the immune system are credited in mp 3 – not in this mp |
| 5 | (c) | (ii) | <p>1 (damage to) myelin / sheath / Schwann cell(s) ;</p> <p>2 removes / has less , insulation ;</p> <p>3 interferes with / slows / stops , conduction of , (nerve) impulse / action potential or slows / stops / prevents , saltatory conduction / described ;</p> <p>4 occurs , in sensory neurones / towards brain / towards CNS / from sensory organ / from receptor ;</p> | 2 max | <p>1 IGNORE damaged neurone (as given in Q) IGNORE damaged axon</p> <p>3 e.g. • more gaps where depolarisation needs to take place • shorter local , circuits / currents</p> |
| Total | | | | [10] | |

[END]

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