

Mark Scheme for June 2010

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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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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 <u>kJ</u> 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'] 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. • depression • aggression • liver , damage / failure • heart attack • masculinisation of female athletes • feminisation of male athletes • infertility</p> <p>7 e.g. • 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)	<p>starch contains (only) glucose and sucrose contains , 50% glucose or glucose and fructose ;</p> <p>by <u>hydrolysis</u> , starch releases more glucose / sucrose releases less glucose ;</p>	2	
4	(a)	(ii)	<p>both starch and cellulose are (only) made of glucose ;</p> <p>starch , is digestible / can be broken down and cellulose , is indigestible / cannot be broken down ;</p> <p>(named) enzyme present for starch digestion / no (named) enzyme present for cellulose digestion ;</p>	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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