



# GCE

## Biology

Advanced GCE F214

Communication, Homeostasis & Energy

# Mark Scheme for June 2010

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

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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<sup>-1</sup>) 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>	<p><b>3 max</b></p>	<p>1 <b>IGNORE</b> contains energy <b>DO NOT CREDIT</b> produce energy</p> <p>2 ATP → ADP + P<sub>(i)</sub> by <u>hydrolysis</u> <b>or</b> ATP + H<sub>2</sub>O → ADP + P<sub>(i)</sub> (must include water)</p> <p>3 <b>ACCEPT 28 – 32 kJ</b> <b>DO NOT CREDIT</b> produce energy</p> <p>4 e.g. • muscle contraction • active transport • phosphorylation • glycolysis • during movement binding to proteins to change their shape <b>IGNORE</b> respiration / photosynthesis unqualified</p> <p>5 <b>CREDIT</b> during, oxidative phosphorylation / chemiosmosis / substrate level phosphorylation / photophosphorylation</p> <p><b>NOTE</b> 'it releases 30kJ of energy when a phosphate is removed by hydrolysis' = 3 marks (mps 3, 1 and 2)</p>

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Question			Expected Answer	Mark	Additional Guidance
1	(b)	(i)	crista ;	1	<p><b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>ACCEPT</b> 'cristae' / 'inner mitochondrial membrane'  <b>IGNORE</b> 'stalked particles'</p>
1	(b)	(ii)	chemiosmosis / oxidative phosphorylation ;	1	<p><b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>IGNORE</b> description of chemiosmosis  [e.g. • 'ATP synthesis'  • 'electron flow along electron carriers']  <b>IGNORE</b> 'aerobic respiration'  <b>IGNORE</b> '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  <b>or</b>  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 <b>IGNORE</b> respiring protein</p> <p>3 <b>IGNORE</b> respiring protein</p> <p>5 'Less protein respired' isn't quite enough for this mp</p>

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

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2	(a)	(i)	vein / venule ;	1	<p><b>Mark the first answer.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>IGNORE</b> further qualification (e.g. central / hepatic) <b>but</b>  <b>DO NOT CREDIT</b> inappropriate name                      (e.g. renal vein / hepatic portal vein)</p>
2	(a)	(ii)	hepatocyte(s) / hepatic cells ;	1	<p><b>IGNORE</b> '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 <math>\alpha</math> cells = 0                      liver cells and Kupffer cells = 0</p>
2	(b)		<p><u>deamination</u> ;                      carbon dioxide / <math>\text{CO}_2</math> ;                      urea / <math>\text{CO}(\text{NH}_2)_2</math> ;                      water / <math>\text{H}_2\text{O}</math> ;</p>	4	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></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. <b>E</b> 'urea (<math>\text{CONH}_2</math>)' = 0 as the formula is incorrect</p>

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2	(c)	(i)	<p><i>This is a QWC question</i></p> <p>1 (testing for) <b>human chorionic gonadotrophin</b> / hCG ;</p> <p>2 hormone small so can pass from blood into <b>filtrate</b> (at Bowman’s capsule) ;</p> <p>3 <b>monoclonal / immobilised , antibodies</b> / immunoglobulin , on stick ;</p> <p>4 antibodies attached to , marker / dye ;</p> <p>5 hormone , binds / <b>complementary</b> , to antibody ;</p> <p>6 (triggers) appearance of colour / line becomes visible ;</p> <p>7 AVP ;</p>	3 max	<p><b>Max 2 (instead of 3) for content if use the term , receptor / antigen / enzyme , throughout instead of antibody</b></p> <p>1 <b>ACCEPT</b> HCG This mark can be awarded for hCG but the name must be given in full for QWC</p> <p>3 <b>ALLOW</b> ‘strip’ instead of stick</p> <p>5 <b>IGNORE</b> 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><b>QWC</b> - technical terms used appropriately and spelt correctly ;</p>		1



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2	(c)	(ii)	1	fairness / giving unfair advantage / does not give an 'even playing field' ;	3 max	<b>IGNORE</b> enhances performance (as given in Q)
			2	<i>idea of</i> health risks / dangerous / unhealthy / fatal / side effects ;		1 <b>ACCEPT</b> comment about cheating 2 <b>IGNORE</b> 'idea of should be available to all'
			3	specified health risk ;		2 <b>IGNORE</b> 'has an effect on health' as must imply negative effect
			4	<i>idea of</i> distrust of 'outstanding' performances / does not reflect athlete's natural talent / sport should reflect athlete's natural talent ;		3 e.g. • depression • aggression • liver , damage / failure • heart attack • masculinisation of female athletes • feminisation of male athletes • infertility
			5	<i>idea of</i> pressure to keep up with rival competitors ;		7 e.g. • up to the individual to decide • idea that athletes should be role models
			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 ;		
			7	AVP ;		
<b>Total</b>				<b>[13]</b>		

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

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

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

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Question		Expected Answer	Mark	Additional Guidance
4	(a) (i)	<p>starch contains (only) glucose  <b>and</b>                      sucrose contains , 50% glucose <b>or</b> 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  <b>and</b>                      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 <b>and</b>                      will make cells less responsive (to insulin) ;</p>	3 max	<p>1 <b>ACCEPT</b> 'no starch'</p> <p>2 'substantial' or 'high' or 'big' is not quite enough</p> <p>3 <b>IGNORE</b> the idea that , fat / protein , increases                      insulin and could indirectly lower blood glucose                      (as this is not relevant to Type 2 diabetes)  <b>DO NOT CREDIT</b> little effect / less effect                      (as table shows <b>no</b> effect)</p>

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



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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	<p>1 Named parts of the immune system are credited in mp 3 – not in this mp</p>
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 <b>or</b> 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 <b>IGNORE</b> damaged neurone (as given in Q) <b>IGNORE</b> damaged axon</p> <p>3 e.g. • more gaps where depolarisation needs to take place • shorter local , circuits / currents</p>
<b>Total</b>				<b>[10]</b>	

[END]



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