

## **Mark Scheme for June 2011**

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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
In ALL questions	<p><b>CREDIT AW throughout</b> i.e. credit any alternatively worded statement that conveys the same sense as the whole mark point. If a particular word is essential and no other will do it is <u>underlined</u>.</p> <p><b>ACCEPT</b> incorrect spellings if they are recognisable and sound the same when pronounced, even for underlined terms. If correct spelling is essential, this will be indicated in the Additional Guidance. For QWC marks, correct spelling <b>and</b> context are necessary.</p> <p><b>IGNORE</b> wrong or vague statements unless Additional Guidance states <b>DO NOT CREDIT</b>, in which case the mark point is not awarded.</p>		

Question		Expected Answer		Mark	Additional Guidance					
1	(a)					<b>Award 1 mark for each correct side by side comparison.</b> Comparative statements <b>must</b> be made on the same row.  <b>ALLOW two valid comparisons in the same pair of boxes, e.g</b> <table border="1"><tr><td>Cell body at end of neurone in the CNS</td><td>Cell body in middle and in the PNS</td></tr></table> <b>= 2 marks</b>  mps 2, 3 and 4 can be taken from a labelled diagram All mps can be taken from annotated diagrams	Cell body at end of neurone in the CNS	Cell body in middle and in the PNS		
			Cell body at end of neurone in the CNS	Cell body in middle and in the PNS						
			1	<table><tr><th><i>motor neurone</i></th><th><i>sensory neurone</i></th></tr><tr><td>cell body in CNS</td><td>cell body , not in CNS / in PNS</td></tr></table> ;			<i>motor neurone</i>	<i>sensory neurone</i>	cell body in CNS	cell body , not in CNS / in PNS
			<i>motor neurone</i>	<i>sensory neurone</i>						
			cell body in CNS	cell body , not in CNS / in PNS						
			2	<table><tr><td>cell body at end (of neurone)</td><td>cell body , not at end / in middle (of neurone)</td></tr></table> ;			cell body at end (of neurone)	cell body , not at end / in middle (of neurone)		
			cell body at end (of neurone)	cell body , not at end / in middle (of neurone)						
			3	<table><tr><td>dendrites connect directly to cell body</td><td>dendrites do not connect directly to cell body <b>or</b> dendrites at the end(s) of , dendron / axon</td></tr></table> ;			dendrites connect directly to cell body	dendrites do not connect directly to cell body <b>or</b> dendrites at the end(s) of , dendron / axon		
dendrites connect directly to cell body	dendrites do not connect directly to cell body <b>or</b> dendrites at the end(s) of , dendron / axon									
4	<table><tr><td>long(er) axon</td><td>short(er) axon</td></tr></table> ;	long(er) axon	short(er) axon							
long(er) axon	short(er) axon									
5	<table><tr><td>dendron absent / no dendron</td><td>dendron present</td></tr></table> ;	dendron absent / no dendron	dendron present							
dendron absent / no dendron	dendron present									
6	<table><tr><td>ends at motor end plate</td><td>starts at / connects to , (sensory) receptor</td></tr></table> ;	ends at motor end plate	starts at / connects to , (sensory) receptor							
ends at motor end plate	starts at / connects to , (sensory) receptor									
3										

Question			Expected Answer	Mark	Additional Guidance
1	(b)		<p>1 - 60 to -70 ;</p> <p>2 depolarisation ;</p> <p>3 <u>threshold potential</u> / <u>threshold value</u> ;</p> <p>4 all or nothing ;</p> <p>5 size / magnitude ;</p> <p>6 <u>frequency</u> ;</p>	6	<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><b>1 ACCEPT</b> any single figure or range (within this range) Must be a negative number</p> <p><b>4 ALLOW</b> all or none</p> <p><b>5 ALLOW</b> amplitude <b>DO NOT CREDIT</b> intensity / strength / value / potential difference / voltage</p>
			<b>Total</b>	<b>9</b>	

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	0.0017 ; ;	2	<ul style="list-style-type: none"> <li>Correct answer, given to 4 dp = 2 marks</li> <li>If answer <b>not</b> shown on answer line, <b>CREDIT</b> correct answer written in the appropriate space in the table.</li> <li>If answer is incorrectly rounded <b>or</b> rounded to the wrong number of dp <b>or</b> written in standard form (<math>1.7 \times 10^{-3}</math>) then award 1 working mark</li> <li>If answer is incorrect then award 1 working mark for seeing <math>1 \div 576</math> <b>or</b> <math>1 \div 24^2</math></li> </ul>
2	(a)	(ii)	1 (internal) radius / diameter , of capillary tube ;  2 cross-sectional area (of capillary tube) ; 3 (use) $\pi r^2 h$ ;	1 max	1 <b>ACCEPT</b> radius / diameter , of bubble <b>ACCEPT</b> width of tube  2 <b>ACCEPT</b> cross-sectional area of bubble
2	(a)	(iii)	1 (sodium) hydrogen carbonate ;  2 bubble in , $\text{CO}_2$ / exhaled air ; 3 dry ice ;	1 max	1 <b>ACCEPT</b> bicarbonate <b>DO NOT CREDIT</b> carbonate

[illegible]

Question			Expected Answer	Mark	Additional Guidance
2	(c)		<p><i>intensity</i></p> <p>1 in deeper water there is , less / lower , light <u>intensity</u> ;</p> <p>2 (these pigments) can absorb what (little) light there is ;</p> <p><i>wavelength</i></p> <p>3 not all wavelengths of light can penetrate or mainly shorter wavelengths can penetrate or (mostly) blue light (450 – 520 nm) penetrates ;</p> <p>4 (these pigments) can absorb wavelengths of light that can penetrate (deeper water) ;</p>	2 max	<p><b>IGNORE</b> ref to photosynthesis (as 'photosynthetic' stated in Q)</p> <p>2 <b>ACCEPT</b> trap / harvest / capture <b>IGNORE</b> use / collect</p> <p>3 idea of restricted range of wavelengths able to penetrate (rather than wavelengths are different) <b>ACCEPT</b> 'higher frequency' instead of 'shorter wavelength'</p> <p>4 <b>ACCEPT</b> trap / harvest / capture <b>IGNORE</b> use / collect</p>
			Total	12	



Question			Expected Answer	Mark	Additional Guidance
3	(a)		<p>1 less ventilation /  <i>Idea of</i> difficulty in exhaling due to less recoil /  small surface area for gaseous exchange /  less oxygen entering capillaries /  less oxygen entering blood ;</p> <p>2 less oxygen (reaching cells) for ,  (aerobic) respiration / oxidative phosphorylation ;</p> <p>3 (so) less ATP produced ;</p> <p>4 <i>idea of</i> increased acidity (as CO<sub>2</sub> / lactate builds up)  interfering with / affects ,  enzymes / respiratory metabolism ;</p>	2 max	<p><b>IGNORE</b> 'produces' energy in any mark point</p> <p>1 <b>DO NOT CREDIT</b> no oxygen</p> <p>2 <b>DO NOT CREDIT</b> no respiration</p> <p>3 <b>DO NOT CREDIT</b> no ATP</p>
3	(b)		<p>1 not enough / less , glucose uptake into <u>cells</u> ;</p> <p>2 not enough / less , glucose / substrate , for ,  respiration / ATP production ;</p> <p>3 glucose not , stored as / converted to , glycogen ;</p>	2 max	<p><b>ACCEPT</b> 'sugar' for glucose</p> <p><b>IGNORE</b> (excess) glucose lost in urine  (as does not answer the Q)</p> <p><b>Only CREDIT ora</b> if candidate clearly states that the  sequence of events does <b>not</b> happen in this case</p> <p>1 <b>DO NOT CREDIT</b> no glucose uptake</p> <p>2 <b>IGNORE</b> produces energy  <b>DO NOT CREDIT</b> no respiration / no ATP /  no glucose</p>

Question			Expected Answer	Mark	Additional Guidance
3	(c)		<p><b>1</b> <i>idea of</i> slow rate of / sluggish , blood flow <b>or</b> low(er) blood pressure ;</p> <p><b>2</b> less / irregular amount of , oxygen (reaching cells) for , (aerobic) respiration / oxidative phosphorylation ;</p> <p><b>3</b> less glucose (reaching cells) for respiration ;</p> <p><b>4</b> (so) less ATP produced ;</p> <p><b>5</b> <i>idea of</i> increased acidity (as CO<sub>2</sub> / lactate builds up) interfering with / affects , enzymes / respiratory metabolism ;</p>	<b>2 max</b>	<p><b>IGNORE</b> 'produces' energy in any mark point</p> <p><b>1 IGNORE</b> 'heart doesn't beat strongly enough' or 'heart beat is inefficient' <b>IGNORE</b> ref to volume of blood without time/rate</p> <p><b>2 DO NOT CREDIT</b> no oxygen / no respiration</p> <p><b>3 IGNORE</b> sugar <b>DO NOT CREDIT</b> no glucose / no respiration</p> <p><b>4 DO NOT CREDIT</b> no ATP</p>

Question			Expected Answer	Mark	Additional Guidance
3	(d)	(i)	<p>1 less pyruvate for , link reaction / Krebs cycle <b>or</b> link reaction / Krebs cycle , cannot take place / reduced <b>or</b> only / mainly , glycolysis takes place ;</p> <p>2 no / little , oxidative phosphorylation ;</p> <p>3 less , energy / ATP , for muscle contraction / resulting in muscle weakness / for mental processes ;</p> <p>4 <u>anaerobic</u> respiration takes place ;</p> <p>5 lactate / decrease in pH , causing aching muscles ;</p>	3 max	<p>2 <b>IGNORE</b> produces energy</p> <p>3 <b>DO NOT CREDIT</b> no ATP <b>IGNORE</b> produces energy <b>IGNORE</b> muscle fatigue</p> <p>5 <b>CREDIT</b> 'lactic acid' instead of 'lactate' <b>ACCEPT</b> muscle cramps</p>
3	(d)	(ii)	<p>1 <i>idea that</i> B lymphocytes do not respond to cytokines (that have been produced) ;</p> <p>2 little , energy / ATP , for B cell , mitosis / clonal expansion ;</p> <p>3 little , energy / ATP , for , production / release , of antibodies ;</p>	1 max	
			<b>Total</b>	<b>10</b>	

Question			Expected Answer	Mark	Additional Guidance
4	(a)	(i)	islet(s) of Langerhans ;	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 = 0 marks</p> <p><b>ACCEPT</b> <math>\alpha</math> and <math>\beta</math> cells in islets of Langerhans  <b>DO NOT CREDIT</b> <math>\alpha</math> cells in islets of Langerhans  <b>DO NOT CREDIT</b> <math>\beta</math> cells in islets of Langerhans</p>

Question			Expected Answer	Mark	Additional Guidance
4	(a)	(ii)	<p><i>endocrine</i></p> <p><b>H1</b> <u>hormone</u>(s) released directly into blood ;</p> <p><b>H2</b> <b>beta</b> / <math>\beta</math> , cells , secrete / produce / release , insulin ;</p> <p><b>H3</b> <b>alpha</b> / <math>\alpha</math> , cells , secrete / produce / release , <b>glucagon</b> ;</p> <p><b>H4</b> <b>islet</b> / <math>\alpha</math> and <math>\beta</math> , cells , detect / monitor , blood glucose concentration ; <b>3 max</b></p> <p><i>exocrine</i></p> <p><b>E1</b> fluid / juice / secretion / enzymes , released into <u>duct</u> ;</p> <p><b>E2</b> (release triggered by) nervous / hormonal , stimulation ;</p> <p><b>E3</b> <b>pancreatic</b> secretions into , gut / small intestine / <b>duodenum</b> ;</p> <p><b>E4</b> alkaline / pH 8 / (sodium) hydrogen carbonate ;</p> <p><b>E5</b> containing 2 <u>named enzyme</u>(s) ; <b>3 max</b></p>	4 max	<p>If endocrine and exocrine terms are muddled, then ignore endocrine and exocrine refs but only award max 2 for <u>both sections</u> and do not award the QWC mark.</p> <p><b>H1</b> <b>DO NOT CREDIT</b> carried / transported , in</p> <p><b>H2</b> <b>ACCEPT</b> b cells</p> <p><b>H3</b> <b>ACCEPT</b> a cells <b>DO NOT CREDIT</b> incorrect spelling of glucagon</p> <p><b>H4</b> <b>ACCEPT</b> a and b cells <math>\alpha</math> cells and <math>\beta</math> cells secrete glucagon and insulin = <b>2 marks</b> <math>\alpha</math> cells and <math>\beta</math> cells secrete insulin and glucagon = <b>0 marks</b></p> <p><b>E1</b> <b>IGNORE</b> substances <b>DO NOT CREDIT</b> carried / transported , in</p> <p><b>E5</b> <b>CREDIT</b> 2 enzymes but no more than 1 enzyme from each bullet point</p> <ul style="list-style-type: none"> <li>• lipase</li> <li>• <b>amylase</b> / carbohydrase</li> <li>• <b>trypsin</b> / <b>chymotrypsin</b> / protease / trypsinogen / chymotrypsinogen</li> </ul>
			<p><b>QWC</b> – technical terms used appropriately with correct spelling ;</p>	1	<p><b>Do not award if endocrine &amp; exocrine are muddled.</b></p> <p>Use of 3 terms from:  <b>hormone(s),</b>                      <b>beta,</b>                      <b>alpha,</b>  <b>glucagon,</b>                      <b>islet(s),</b>                      <b>pancreatic,</b>  <b>duodenum,</b>                      <b>enzyme(s),</b>                      <b>amylase,</b>  <b>trypsin(ogen) / chymotrypsin(ogen)</b></p> <p><b>You should use the GREEN DOT to identify the QWC terms that you are crediting.</b></p> <p><b>Please insert a QWC symbol next to the PENCIL ICON, followed by</b></p> <p style="padding-left: 40px;">a tick (✓) if QWC has been awarded or a cross (✗) if QWC has not been awarded</p>

Question			Expected Answer	Mark	Additional Guidance
4	(b)		D A G H C F ; ; ; ;	4	All letters in correct sequence = 4 marks  If letters are <b>not all</b> in the correct sequence, then mark as follows: <b>D</b> at the beginning and <b>F</b> at the end = 1 mark <b>A</b> somewhere before <b>G</b> = 1 mark <b>G</b> somewhere before <b>H</b> = 1 mark <b>H</b> somewhere before <b>C</b> = 1 mark
4	(c)	(i)	1 idea of plentiful / dependable , supply ; 2 cheap ; 3 not cruel to pigs / more ethical ; 4 no religious objections / can be used by vegetarians ; 5 reliable , quality / standard ; 6 (exact match to) human insulin / no allergic reaction ;	2	<b>Mark the first <u>two</u> advantages</b>  1 e.g. can meet demand / can be mass produced <b>IGNORE</b> ref to speed  6 <b>ACCEPT</b> ref to not spreading prions <b>IGNORE</b> spread of disease from pigs / no rejection <b>DO NOT CREDIT</b> genetically identical insulin
4	(c)	(ii)	1 (has the potential to) cure / do more than manage , the condition ; 2 long term effect / permanent / no need for repeated treatments ;	1 max	1 e.g. no need to restrict diet  2 e.g. no need to inject insulin (regularly)
			<b>Total</b>	<b>13</b>	

Question			Expected Answer	Mark	Additional Guidance
5	(a)		<p><b>P</b> cortex ;</p> <p><b>Q</b> ureter ;</p>		<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>Q</b> <b>Correct spelling only</b>  <b>DO NOT CREDIT</b> incorrect spelling of ureter</p>

Question			Expected Answer	Mark	Additional Guidance
5	(b)	(i)	<p>1 <b>ultrafiltration</b> ;</p> <p>2 <b>afferent</b> arteriole is wider than <b>efferent</b> arteriole ;</p> <p>3 high <b>blood pressure</b> in glomerulus / high(er) <b>hydrostatic pressure</b> in glomerulus (than in Bowman's capsule) ;</p> <p>4 <i>idea that</i> <b>endothelium</b> / wall of capillary , has gaps to , allow / prevent , passage (of substances / cells) ;</p> <p>5 <i>idea that</i> <b>basement membrane</b> stops removal of , large molecules / cells ;</p> <p>6 <b>podocytes</b> / <b>epithelial</b> cells of Bowman's capsule , have (finger-like) projections / processes ;</p> <p>7 (projections) ensure gaps to allow passage (of substances) ;</p>	3 max	<p>4 e.g. fenestrations in capillary wall don't allow red blood cells to leave <b>DO NOT CREDIT</b> cell walls of capillaries</p> <p>5 e.g. basement membrane (only) allows small molecules to pass through</p>
			<p><b>QWC</b> – technical terms used appropriately and spelt correctly ;</p>	1	<p>Use of <b>3</b> terms in the correct context from: <b>afferent</b>, <b>efferent</b>, <b>blood pressure</b> / <b>hydrostatic pressure</b>, <b>endothelium</b> / <b>endothelial</b>, <b>basement membrane</b>, <b>podocyte(s)</b>, <b>epithelial</b> / <b>epithelium</b>, <b>ultrafiltration</b></p> <p>You should use the <b>GREEN DOT</b> to identify the QWC terms that you are crediting. Please insert a QWC symbol next to the <b>PENCIL ICON</b>, followed by a tick (✓) if QWC has been awarded or a cross (x) if QWC has not been awarded</p>



Question			Expected Answer	Mark	Additional Guidance
5	(b)	(ii)	<p>1 (large) protein / amino acids , present ;</p> <p>2 blood (cells) present ;</p> <p>3 glucose present ;</p> <p>4 more water present / more dilute ;</p> <p>5 more , ions / salts / electrolytes , present ;</p> <p>6 (more) vitamins present ;</p>	2 max	<p><b>Mark as prose - award marks wherever they occur</b></p> <p>1 <b>ACCEPT</b> more , protein / amino acids  <b>ACCEPT</b> appropriately named protein e.g.  albumin / antibodies / immunoglobulins</p> <p>3 <b>DO NOT CREDIT</b> more glucose</p>
5	(c)	(i)	<p>protein / polypeptide ;</p>	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> alpha helix / intrinsic / transmembrane  <b>DO NOT CREDIT</b> glycoprotein</p>
5	(c)	(ii)	<p>1 the ions (in solution) are  too large to pass through the channel  <b>or</b>  the channel is too narrow for the ions (in solution)  to pass through ;</p> <p>2 shapes not compatible ;</p> <p>3 <i>idea that</i> positive charge (in the channel) repels the  (positively charged) ions ;</p>	2 max	<p><b>Mark the first <u>two</u> suggestions</b></p> <p>1 <b>ACCEPT</b> gap / hole for channel</p> <p>3 <b>DO NOT CREDIT</b> repels and/or attracts</p>
			<b>Total</b>	<b>11</b>	

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(i)	<u>adrenal cortex</u> ;	1	<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 = 0 marks  <b>IGNORE</b> endocrine gland(s)
6	(a)	(ii)	inner mitochondrial membrane / crista / location described ;	1	<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 = 0 marks  e.g. between the inter-membrane space and the matrix <b>IGNORE</b> stalked particles / ATP synthetase
6	(b)	(i)	<u>positive feedback</u> ;	1	<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 = 0 marks  <b>IGNORE</b> respiratory acidosis / hyperventilation
6	(b)	(ii)	<u>cyclic photophosphorylation</u> ;	1	<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 = 0 marks  <b>DO NOT CREDIT</b> cyclic phosphorylation
6	(b)	(iii)	cell signalling ;	1	<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 = 0 marks  <b>IGNORE</b> homeostasis
			<b>Total</b>	<b>5</b>	

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