

Question		Answer	Mark	Guidance
1	(a)	<p>endocrine ; hormone ; cortex / cortical ; target / effector ;</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>
1	(b)	(i)		
		<p>1 glucose , respired / phosphorylated / metabolised , to produce ATP ;</p> <p>2 ATP , blocks / closes , potassium ion channel(s) <b>and</b> potassium ions / <math>K^+</math> , build up (inside cell) / cannot leave ;</p> <p>3 (voltage-gated) calcium ion / <math>Ca^{2+}</math> , channels open <b>and</b> calcium ions / <math>Ca^{2+}</math> , enter (cell by diffusion) ;</p> <p>4 (more) calcium ions / <math>Ca^{2+}</math> , resulting in , movement of vesicles to membrane / exocytosis / described ;</p>	4	<p><b>IGNORE</b> the numbered prompt lines, but the events <b>must</b> be in the correct sequence.</p> <p>1 <b>IGNORE</b> 'glucose is broken down to form ATP'</p> <p>2 ion must be indicated at least once If symbol used, must have correct charge <b>IGNORE</b> ref to 'depolarisation' (as not indicated on fig.)</p> <p>3 ion must be indicated at least once If symbol used, must have correct charge <b>IGNORE</b> ref to polarisation</p> <p>4 if ion had been mentioned in stage 3, then allow 'calcium' alone for this mp <b>ACCEPT</b> ecf <b>for this mp</b> if mp 3 not awarded because <math>Na^+</math> stated instead of <math>Ca^{2+}</math> <b>IGNORE</b> 'secretion' as given in question</p>

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1	(b)	(ii)	<p>1 (continues to be secreted) as long as  <u>blood</u> / <u>plasma</u> , glucose (concentration) ,  remains high / is higher than normal ;</p> <p>2 (sufficient) ATP is still present  and so K<sup>+</sup> channels remain closed ;</p> <p>3 (exocytosis) still being triggered by ,  calcium ions / Ca<sup>2+</sup>;</p>	<p>2 max</p>	<p><b>IGNORE</b> ref to what happens once the glucose level returns to normal and secretion stops (as Q asks about the continued secretion of insulin)</p> <p><b>3 CREDIT</b> Ca<sup>2+</sup> , still present / remain high  <b>CREDIT</b> exocytosis continues until Ca<sup>2+</sup> can be removed from cell</p>
			<b>Total</b>	<b>10</b>	

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2	(a)	(i)	<p>1 (hormone) binds to <u>receptor</u> ;</p> <p>2 causing , cascade of events / enzyme reactions ;</p> <p>3 may involve switching , on / off, genes ;</p> <p>4 only , present / needed , in small , concentrations / quantities (to have an effect) ;</p> <p>5 may have effect on more than one , location / target tissue ;</p> <p>6 <i>idea that</i> effect may involve interaction of more than one hormone ;</p>	2 max	<p><b>IGNORE</b> prompt lines and mark as prose</p> <p>1 <b>ACCEPT</b> (hormone) complementary shape to <u>receptor</u></p> <p>1 <b>ACCEPT</b> attach</p> <p>1 <b>IGNORE</b> fit</p> <p>3 <b>CREDIT</b> ref to changing gene expression</p>
	(a)	(ii)	<p>1 (most) plant cells retain ability to differentiate / <u>totipotent</u> ;</p> <p>2 plants have , meristems / meristematic tissue ;</p> <p>3 <i>idea that</i> plant cells can de-differentiate and then differentiate into a different cell type;</p> <p>4 (most) animal cells are , differentiated / not totipotent / not pluripotent / only able to differentiate into the same type(s) of cell / are multipotent;</p>	2 max	<p>2 <b>ACCEPT</b> named meristematic tissue e.g. shoot apex / root apex / cambium</p> <p>4 <b>ACCEPT</b> 'stem cells found in few (named) tissues' 'bone marrow cells only differentiate into blood cells'</p>

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(a)	(iii)	<p><b>1</b> (inter-species / triploid) hybrids , are sterile / cannot reproduce sexually;</p> <p><b>2</b> polyploidy (in the hybrid) provides duplicate of each chromosome ;</p> <p><b>3</b> (polyploidy) allows the hybrid to , carry out meiosis / form gametes <b>or</b> (polyploidy) restores fertility / overcomes sterility ;</p> <p><b>4</b> (hybrids are) <u>reproductively isolated</u> (from other species);</p> <p><b>5</b> increased, cell size / grain size, increases yield;</p> <p><b>6</b> sterile hybrids expensive for farming (especially in developing countries);</p> <p><b>7</b> (plants) stronger/more vigorous/ healthier;</p>	<b>2 max</b>	<p><b>1 CREDIT</b> hybrid from named examples e.g. einkorn (wheat) x , wild / goat , grass emmer (wheat) x wild grass</p> <p><b>2 IGNORE</b> ref to 'more than two sets of chromosomes' as this is given in Q</p> <p><b>3 ACCEPT</b> 'chromosome number doubling restores fertility'</p> <p><b>3 ACCEPT</b> can reproduce sexually</p> <p><b>4 ACCEPT</b> gametes incompatible with other species</p> <p><b>5 ACCEPT</b> seed size</p> <p><b>7</b> must be a comparative statement <b>7 ACCEPT</b> less prone to disease / greater hybrid vigour <b>7 IGNORE</b> pest resistance</p>

Question		Answer	Marks	Guidance
	(b)	<p><i>cress seedlings</i></p> <p><b>C1</b> apical cells / apex/ tip(of shoot), produce , auxin / IAA ;</p> <p><b>C2</b> diffusion / active transport (down shoot / through parenchyma) ;</p> <p><b>C3</b> greater auxin (concentration) on shaded side of stem ;</p> <p><b>C4</b> auxin causes cell <u>w</u>all loosening ;</p> <p><b>C5</b> auxin causes cell , elongation / expansion ;</p> <p><b>C6</b> further detail of changes in cell <b>w</b>all ;</p> <p><i>Human</i></p> <p><b>H1</b> retina / rods / receptors, detect light / AW ;</p> <p><b>H2</b> action potentials/ depolarisation/nervous impulse, along sensory neurone (membrane) ;</p> <p><b>H3</b> intermediate neurone (in brain) / (somatic) motor neurone / neuromuscular junction ;</p> <p><b>H4</b> correct ref to detail of synaptic transmission;</p> <p><b>H5</b> depolarisation / contraction, of muscle fibre(s);</p> <p><b>H6</b> correct ref to detail of muscle contraction;</p>	<p><b>7 max</b></p>	<p><b>C1 ACCEPT</b> secretes /releases</p> <p><b>C2 CREDIT</b> PIN (polar auxin transport)</p> <p><b>C3 ACCEPT</b> auxin, moves to / collects on, shaded side</p> <p><b>C3 IGNORE</b> found on shaded side</p> <p><b>C4 ACCEPT</b> cell <u>w</u>alls become,stretchy / less rigid</p> <p><b>C4 IGNORE</b> weakened cell <u>w</u>alls</p> <p><b>C6</b> e.g. H<sup>+</sup> ions pumped into cell wall / low pH to allow enzymes to work / bonds broken within cellulose in wall</p> <p><b>H1 IGNORE</b> ref to cones</p> <p><b>H2 / H3 DO NOT CREDIT signals / messages</b></p> <p><b>H2 IGNORE</b> ref to optic nerve</p> <p><b>H3 CREDIT</b> ref to relay neurone</p> <p><b>H5 ACCEPT</b> muscle cell</p> <p><b>H6</b> e.g. actin and myosin slide over each other</p>
<b>Total</b>			<b>13</b>	

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3	(a)	(i)	diabetes (mellitus) ;	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> hyperglycaemia  <b>IGNORE</b> Type 1 or Type 2  <b>DO NOT CREDIT</b> hypoglycaemia</p>
3	(a)	(ii)	<i>idea that</i> time needed , to restore normal (blood) glucose concentration / for insulin to act (fully) ;	1	
3	(a)	(iii)	18.6 ; ;	2	<p><b>Correct answer = 2 marks</b>, even if no working shown.</p> <p><b>If answer is incorrect</b>, then <b>ALLOW</b> 1 mark for seeing:  <math>1.1 \div 5.9</math> or <math>(7.0 - 5.9) \div 5.9</math> or 118.6 or 118.64</p> <p><b>If the answer is not correctly rounded to 1dp</b>, then <b>ALLOW</b> 1 mark for seeing a correct unrounded answer e.g. 18.64</p>
3	(b)		<p><b>1</b> HbA1C / glycosylated Hb , contained within , red blood cell(s) / erythrocyte(s) ;</p> <p><b>2</b> red blood cells / erythrocyte(s) , have limited life span / live for 8 to 12 weeks  <b>or</b>  red blood cells / erythrocyte(s) , break down after , 12 weeks / 3 months ;</p> <p><b>3</b> HbA1C / glycosylated Hb , broken down , in liver / by hepatocytes / by Kupffer cells ;</p>	2 max	<p><b>CREDIT</b> RBC / rbc for 'red blood cell' throughout</p> <p><b>3 IGNORE</b> ref to recycling</p>

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3	(c)		<p>patient might have had a drink containing sugar ;</p> <p>AVP ;</p>	1 max	<p><b>DO NOT CREDIT</b> ref to having eaten (as patient had confirmed that he had not eaten)</p> <p><b>CREDIT</b> ref to a specific sugar-containing drink</p> <p>e.g. ● patient was nervous and secreted adrenaline ● other medication interferes with glucose levels ● patient's haemoglobin does not bind effectively with glucose (e.g. anaemia / sickle cell)</p>
3	(d)	(i)	<p><b>1</b> if blood glucose falls , extremely / dangerously / too / very , low ;</p> <p><b>2</b> if patient , cannot produce (enough) glucagon / produces little glucagon ;</p> <p><b>3</b> <i>idea that</i> glucose source cannot be taken by mouth ;</p>	1 max	<p><b>1</b> <b>CREDIT</b> hypoglycaemic / hypoglycaemia <b>IGNORE</b> 'below normal' alone</p> <p><b>2</b> <b>CREDIT</b> ref to dysfunctional , <math>\alpha</math> cells / glucagon receptors</p> <p><b>3</b> <b>CREDIT</b> a suitable reason (e.g. fitting or in a coma)</p>

Question			Answer	Mark	Guidance
3	(d)	(ii)	<p>when blood glucose concentration decreases</p> <p>1 (glucagon) released by the , <b>alpha</b> / <math>\alpha</math> , cells in , <b>islets</b> of Langerhans / <b>pancreas</b> ;</p> <p>2 promotes / AW , conversion of <b>glycogen</b> to glucose / <b>glycogenolysis</b> , in , liver / muscle / <b>effector</b> , cells ;</p> <p>3 ref <b>gluconeogenesis</b> / described ;</p> <p>4 ref conversion of triglycerides to (free) fatty acids / lipolysis / increased use of fatty acids in respiration ;</p> <p>5 <b>negative feedback</b> , reduces / inhibits , the secretion of glucagon ;</p> <p>6 glucagon , reduces / inhibits , insulin secretion ;</p>	4 max	<p><b>IGNORE</b> ref to insulin or events following an increase in blood glucose concentration</p> <p>1 <b>DO NOT CREDIT</b> 'alpha cells are produced'</p> <p>2 <b>Any description must</b> correspond correctly to term <b>DO NOT CREDIT</b> if glucagon <i>converts</i> glycogen directly</p> <p>3 <b>Any description must</b> correspond correctly to term <b>IGNORE</b> imprecise ref to glucagon <i>doing the conversion</i></p> <p>4 <b>Any description must</b> correspond correctly to term <b>IGNORE</b> imprecise ref to glucagon <i>doing the conversion</i></p> <p>5 <b>DO NOT CREDIT</b> stopping glucagon secretion</p> <p>6 <b>DO NOT CREDIT</b> stopping insulin secretion</p>
			<b>QWC</b> – technical terms used appropriately and spelled correctly ;	1	<p>Use of <b>three</b> terms from:</p> <p><b>alpha,</b> <b>islet,</b> <b>pancreas ,</b> <b>glycogen,</b> <b>glycogenolysis,</b> <b>effector,</b> <b>gluconeogenesis,</b> <b>negative feedback</b></p> <p>Please insert a <b>QWC</b> symbol next to the pencil icon, followed by a tick (✓) if <b>QWC</b> has been awarded or a cross (×) if <b>QWC</b> has not been awarded You should use the green dot to identify the <b>QWC</b> terms that you are crediting.</p>
			<b>Total</b>	<b>13</b>	



Question			Answer	Marks	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 = <b>0 marks</b></p> <p><b>IGNORE</b> <math>\alpha</math> and <math>\beta</math> cells</p>
4	(a)	(ii)	beta / $\beta$ ;	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> b  <b>IGNORE</b> islets (of Langerhans)  <b>DO NOT CREDIT</b> B (confusion with immune system)</p>

Question			Answer	Marks	Guidance
4	(b)		<p><i>in gap order</i></p> <p>1 increases ;</p> <p>2 glycolytic / glycolysis ;</p> <p>3 depolarised ;</p> <p>4 calcium ;</p> <p>5 exocytosis ;</p>	5	<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>1 <b>CREDIT</b> rises / gets higher <b>ACCEPT</b> 'is high'</p> <p>2 <b>IGNORE</b> metabolic / respiratory</p> <p>3 <b>ACCEPT</b> 'less negative / more positive , on the inside (than previously)' <b>or</b> 'less positive / more negative , on the outside (than previously)' <b>IGNORE</b> figures (as Q has asked for words) <b>DO NOT CREDIT</b> ionised / polarised</p> <p>4 <b>IGNORE</b> Ca or Ca<sup>2+</sup> (as Q has asked for words) <b>DO NOT CREDIT</b> if incorrect symbols given (e.g. Ca<sup>+</sup> , CA<sup>2+</sup>)</p>
4	(c)	(i)	<p>ribosome / <u>rough</u> endoplasmic reticulum / <u>RER</u> ;</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> rRNA (as this is not <i>where</i> proteins are made)</p>

Question			Answer	Marks	Guidance
4	(c)	(ii)	<p>1 transported to Golgi ;</p> <p>2 modified / processed , in Golgi ;</p> <p>3 packaged into / stored in , (Golgi) vesicle(s) ;</p> <p>4 vesicles transported towards , plasma / cell surface , membrane ;</p> <p>5 AVP ;</p>	3 max	<p><b>IGNORE</b> ref. to mechanism of insulin secretion</p> <p><b>IGNORE</b> ref. to negative feedback control of insulin secretion</p> <p><b>2 DO NOT CREDIT</b> if ref. to carbohydrate</p> <p><b>4 IGNORE</b> 'fuses with membrane'</p> <p><b>5</b> eg • detail of modification (splitting / recombining, polypeptide)</p> <ul style="list-style-type: none"> <li>• role of cytoskeleton</li> <li>• use of ATP (in context of, modification / movement)</li> </ul>
			<b>Total</b>	<b>11</b>	