

Question		Answer	Mark	Guidance
1	(a)	<p>endocrine ; hormone ; cortex / cortical ; target / effector ;</p>	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>
1	(b)	(i)		
		<p>1 glucose , respired / phosphorylated / metabolised , to produce ATP ;</p> <p>2 ATP , blocks / closes , potassium ion channel(s) and potassium ions / K^+ , build up (inside cell) / cannot leave ;</p> <p>3 (voltage-gated) calcium ion / Ca^{2+} , channels open and calcium ions / Ca^{2+} , enter (cell by diffusion) ;</p> <p>4 (more) calcium ions / Ca^{2+} , resulting in , movement of vesicles to membrane / exocytosis / described ;</p>	4	<p>IGNORE the numbered prompt lines, but the events must be in the correct sequence.</p> <p>1 IGNORE 'glucose is broken down to form ATP'</p> <p>2 ion must be indicated at least once If symbol used, must have correct charge IGNORE 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 IGNORE ref to polarisation</p> <p>4 if ion had been mentioned in stage 3, then allow 'calcium' alone for this mp ACCEPT ecf for this mp if mp 3 not awarded because Na^+ stated instead of Ca^{2+} IGNORE '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⁺ channels remain closed ;</p> <p>3 (exocytosis) still being triggered by , calcium ions / Ca²⁺;</p>	<p>2 max</p>	<p>IGNORE 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>3 CREDIT Ca²⁺ , still present / remain high CREDIT exocytosis continues until Ca²⁺ can be removed from cell</p>
			Total	10	

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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>IGNORE prompt lines and mark as prose</p> <p>1 ACCEPT (hormone) complementary shape to <u>receptor</u></p> <p>1 ACCEPT attach</p> <p>1 IGNORE fit</p> <p>3 CREDIT 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 ACCEPT named meristematic tissue e.g. shoot apex / root apex / cambium</p> <p>4 ACCEPT 'stem cells found in few (named) tissues' 'bone marrow cells only differentiate into blood cells'</p>

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

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

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3	(a)	(i)	diabetes (mellitus) ;	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 hyperglycaemia IGNORE Type 1 or Type 2 DO NOT CREDIT 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>Correct answer = 2 marks, even if no working shown.</p> <p>If answer is incorrect, then ALLOW 1 mark for seeing: $1.1 \div 5.9$ or $(7.0 - 5.9) \div 5.9$ or 118.6 or 118.64</p> <p>If the answer is not correctly rounded to 1dp, then ALLOW 1 mark for seeing a correct unrounded answer e.g. 18.64</p>
3	(b)		<p>1 HbA1C / glycosylated Hb , contained within , red blood cell(s) / erythrocyte(s) ;</p> <p>2 red blood cells / erythrocyte(s) , have limited life span / live for 8 to 12 weeks or red blood cells / erythrocyte(s) , break down after , 12 weeks / 3 months ;</p> <p>3 HbA1C / glycosylated Hb , broken down , in liver / by hepatocytes / by Kupffer cells ;</p>	2 max	<p>CREDIT RBC / rbc for 'red blood cell' throughout</p> <p>3 IGNORE 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>DO NOT CREDIT ref to having eaten (as patient had confirmed that he had not eaten)</p> <p>CREDIT 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) <ol style="list-style-type: none"> 1 if blood glucose falls , extremely / dangerously / too / very , low ; 2 if patient , cannot produce (enough) glucagon / produces little glucagon ; 3 <i>idea that</i> glucose source cannot be taken by mouth ; 	1 max	<ol style="list-style-type: none"> 1 CREDIT hypoglycaemic / hypoglycaemia IGNORE 'below normal' alone 2 CREDIT ref to dysfunctional , α cells / glucagon receptors 3 CREDIT a suitable reason (e.g. fitting or in a coma)

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3	(d)	(ii)	<p>when blood glucose concentration decreases</p> <p>1 (glucagon) released by the , alpha / α , cells in , islets of Langerhans / pancreas ;</p> <p>2 promotes / AW , conversion of glycogen to glucose / glycogenolysis , in , liver / muscle / effector , cells ;</p> <p>3 ref gluconeogenesis / described ;</p> <p>4 ref conversion of triglycerides to (free) fatty acids / lipolysis / increased use of fatty acids in respiration ;</p> <p>5 negative feedback , reduces / inhibits , the secretion of glucagon ;</p> <p>6 glucagon , reduces / inhibits , insulin secretion ;</p>	4 max	<p>IGNORE ref to insulin or events following an increase in blood glucose concentration</p> <p>1 DO NOT CREDIT 'alpha cells are produced'</p> <p>2 Any description must correspond correctly to term DO NOT CREDIT if glucagon <i>converts</i> glycogen directly</p> <p>3 Any description must correspond correctly to term IGNORE imprecise ref to glucagon <i>doing the conversion</i></p> <p>4 Any description must correspond correctly to term IGNORE imprecise ref to glucagon <i>doing the conversion</i></p> <p>5 DO NOT CREDIT stopping glucagon secretion</p> <p>6 DO NOT CREDIT stopping insulin secretion</p>
			QWC – technical terms used appropriately and spelled correctly ;	1	<p>Use of three terms from: alpha, islet, pancreas , glycogen, glycogenolysis, effector, gluconeogenesis, negative feedback</p> <p>Please insert a QWC symbol next to the pencil icon, 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	13	

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4	(a)	(i)	islet(s) of Langerhans ;	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 α and β cells</p>
4	(a)	(ii)	beta / β ;	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 b IGNORE islets (of Langerhans) DO NOT CREDIT B (confusion with immune system)</p>

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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>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>1 CREDIT rises / gets higher ACCEPT 'is high'</p> <p>2 IGNORE metabolic / respiratory</p> <p>3 ACCEPT 'less negative / more positive , on the inside (than previously)' or 'less positive / more negative , on the outside (than previously)' IGNORE figures (as Q has asked for words) DO NOT CREDIT ionised / polarised</p> <p>4 IGNORE Ca or Ca²⁺ (as Q has asked for words) DO NOT CREDIT if incorrect symbols given (e.g. Ca⁺ , CA²⁺)</p>
4	(c)	(i)	<p>ribosome / <u>rough</u> endoplasmic reticulum / <u>RER</u> ;</p>	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 rRNA (as this is not <i>where</i> proteins are made)</p>

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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>IGNORE ref. to mechanism of insulin secretion</p> <p>IGNORE ref. to negative feedback control of insulin secretion</p> <p>2 DO NOT CREDIT if ref. to carbohydrate</p> <p>4 IGNORE 'fuses with membrane'</p> <p>5 eg • detail of modification (splitting / recombining, polypeptide)</p> <ul style="list-style-type: none"> • role of cytoskeleton • use of ATP (in context of, modification / movement)
			Total	11	