

Question	Answer	Mark	Guidance
2 (a)	endocrine ; hormone ; cortex / cortical ; target / effector ;	4	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
2 (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 / Ca²⁺ , channels open and calcium ions / Ca²⁺ , enter (cell by diffusion) ;</p> <p>4 (more) calcium ions / Ca²⁺ , 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 <i>this mp</i> if mp 3 not awarded because Na⁺ stated instead of Ca²⁺ IGNORE 'secretion' as given in question</p>

Question	Answer	Mark	Guidance
2 (b) (ii)	<p>1 (continues to be secreted) as long as <u>blood / 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>	2 max	<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	

Question	Answer	Mark	Guidance
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)	idea that 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 + 5.9 or (7.0 – 5.9) + 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>

Question	Answer	Mark	Guidance
3	<p>patient might have had a drink containing sugar ; 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	<p>1 if blood glucose falls , extremely / dangerously / too / very , low ;</p> <p>2 if patient , cannot produce (enough) glucagon / produces little glucagon ;</p> <p>3 <i>idea that</i> glucose source cannot be taken by mouth ;</p>	1 max	<p>1 CREDIT hypoglycaemic / hypoglycaemia IGNORE "below normal" alone</p> <p>2 CREDIT ref to dysfunctional , α cells / glucagon receptors</p> <p>3 CREDIT 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>
1	(glucagon) released by the alpha / α , cells in, islets of Langerhans / pancreas ;		<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>
2	promotes / AW , conversion of glycogen to glucose / glycogenolysis , in, liver / muscle / effector , cells ;		<p>2 Any description must correspond correctly to term DO NOT CREDIT if glucagon converts glycogen directly</p>
3	ref gluconeogenesis / described ;		<p>3 Any description must correspond correctly to term IGNORE imprecise ref to glucagon <i>doing the conversion</i></p>
4	ref conversion of triglycerides to (free) fatty acids / lipolysis / increased use of fatty acids in respiration ;		<p>4 Any description must correspond correctly to term IGNORE imprecise ref to glucagon <i>doing the conversion</i></p>
5	negative feedback , reduces / inhibits , the secretion of glucagon ;		<p>5 DO NOT CREDIT stopping glucagon secretion</p>
6	glucagon , reduces / inhibits , insulin secretion ;	4 max	<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, pancreas , glycogenolysis, gluconeogenesis, islet, glycogen, effector, 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 (x) if QWC has not been awarded You should use the green dot to identify the QWC terms that you are crediting.</p>
	Total	13	

Question	Answer	Marks	Guidance
2 (a) (i)	(thermoregulatory centre in) hypothalamus ;	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 hypothalamus</p>
2 (a) (ii)	<u>thermoreceptor</u> / <u>peripheral</u> temperature receptor ;	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 'heat' / 'sensory cell'</p>
2 (a) (iii)	<u>negative feedback</u> / <u>thermoregulation</u> ;	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 homeostasis</p>
2 (b) (i)	<u>M</u> and <u>N</u> and <u>P</u> ;	1	<p>If the answer is correct and an additional letter is given that is incorrect then = 0 marks</p> <p>All 3 correct letters required for one mark IGNORE J</p>
2 (b) (ii)	<u>K</u> and <u>O</u> ;	1	<p>If the answer is correct and an additional letter is given then = 0 marks</p> <p>Both correct letters required for one mark</p>
2 (b) (iii)	<u>L</u> ;	1	<p>Mark the first answer. If the answer is correct and an additional letter is given that is incorrect then = 0 marks</p> <p>ACCEPT J</p>

Question	Answer	Marks	Guidance
2 (b) (iv)	N ;	1	Mark the first answer. If the answer is correct and an additional letter is given then = 0 marks
2 (c) (i)	Look for ref to , heat loss / cooling , at any point in the answer before awarding any marks large surface area (to lose heat) ; (thin) so , blood flows / (named) blood vessel are , close to the (skin) surface (to lose heat) ; (movement) increases air movement over , skin / surface (to lose heat) ;	2 max	DO NOT CREDIT evaporation of heat IGNORE ref to sweating ACCEPT SA:Vol
2 (c) (ii)	Needs to be in the context of reducing heat loss from the blood blood loses less heat because , less <u>blood</u> flows to feet / warm <u>blood</u> diverted from arterioles to veins or less <u>blood</u> flows to feet so core body temperature maintained ;	1	DO NOT CREDIT prevents / stops , blood flowing to feet ACCEPT 'extremities' for 'feet' IGNORE ref to vasoconstriction of peripheral arterioles DO NOT CREDIT vasoconstriction of shunt vessels IGNORE ref to countercurrent (as not answering Q)
	Total	10	

Question	Answer	Marks	Guidance
4 (a)	<p>endocrine ;</p> <p>islets of Langerhans ;</p> <p>glycogen ;</p> <p>glycogenolysis ;</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> <p>ACCEPT 'isles' / 'eyelets' (as phonetic)</p> <p>DO NOT CREDIT 'islands'</p> <p>spelling must be correct</p> <p>spelling must be unambiguous</p> <p>IGNORE hydrolysis</p>
(b)	(i)	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 thyroxine / (named) corticosteroid</p>
(ii)	<p>adrenaline / epinephrine / noradrenaline / norepinephrine ;</p> <p>impulses along parasympathetic nerve / impulses along vagus nerve / nerve endings releasing acetylcholine ;</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>Ref to structure alone is not good enough</p> <p>CREDIT 'stimulation' / 'action potentials', for 'impulses along'</p> <p>ACCEPT 'activates' / 'uses', parasympathetic / vagus , nerve</p> <p>DO NOT CREDIT 'messages' / 'signals' / 'information'</p>
	Total	6	

Question	Expected Answers	Marks	Additional Guidance
4 (a)	<p>1 <u>water potential</u> / Ψ, of plasma / outside cells, would be higher than that of the (blood) cells ;</p> <p>2 water would enter (blood) <u>cells</u> ;</p> <p>3 blood cells, swell / (might) burst / lyse ;</p>	2 max	<p>1 Must be a clear comparative statement relating to outside and inside cells CREDIT ora IGNORE water concentration</p> <p>2 IGNORE osmosis / down water potential gradient</p> <p>3 CREDIT haemolysis / haemolysed DO NOT CREDIT plasmolysis / turgid Note: 'cells become turgid and burst' = 0 'cells swell and become turgid' = 0</p>
4 (b)	<p><i>type of monomer</i> amino acid ;</p> <p><i>name of bond</i> peptide / amide ;</p>	2	<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>DO NOT CREDIT amine</p> <p>IGNORE covalent DO NOT CREDIT dipeptide / polypeptide</p>

Question	Expected Answers	Marks	Additional Guidance
4 (c)	<p>1 osmoreceptor / neurosecretory ;</p> <p>2 hypothalamus ;</p> <p>3 axon(s) ;</p> <p>4 posterior pituitary ;</p> <p>5 collecting duct ;</p> <p>6 (plasma / cell) membrane(s) ;</p> <p>7 aquaporins(s) ;</p> <p>8 osmosis ;</p>	8	<p>Mark the first answer on each prompt line in the passage. If the answer is correct and an additional answer is given for that 'gap' that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT phonetic spelling throughout</p> <p>1 : ACCEPT osmotic receptor</p> <p>2</p> <p>3</p> <p>4 DO NOT CREDIT 'pituitary' without correct qualification</p> <p>5 : ACCEPT distal (convoluted) tubule / second convoluted tubule</p> <p>6</p> <p>7 DO NOT CREDIT aqua pores</p> <p>8</p>

Question	Expected Answers	Marks	Additional Guidance
4 (d)	<p>1 <i>how ADH is dealt with as a protein</i> in, liver / hepatocytes ;</p> <p>2 hydrolysis / acted on by protease ;</p> <p>3 deamination / amine group removed / formation of ammonia / formation of NH_3 ;</p> <p>4 ornithine cycle / formation of urea / formation of $\text{CO}(\text{NH}_2)_2$;</p> <p>5 amino acids / keto acids, used in (named) metabolic pathway ;</p> <p>6 <i>how ADH or urea is dealt with as a small molecule</i> in kidney ;</p> <p>7 (ultra)filtered from blood / moves from blood into nephron ;</p> <p>8 (because) small molecule ;</p> <p>9 urea not (all) reabsorbed / ADH not reabsorbed / (ADH or urea) present in urine ;</p> <p>10 <u>excreted</u> ;</p>	<p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>3 max</p> <p>15</p>	<p>DO NOT CREDIT if linked directly to excretion eg 'excreted by the liver'</p> <p>'broken down' is not quite enough</p> <p>DO NOT CREDIT 'amine group deaminated'</p> <p>DO NOT CREDIT 'amino acid enters ornithine cycle'</p> <p>eg</p> <ul style="list-style-type: none"> • amino acids used for protein synthesis • keto acids used in, Krebs cycle / respiration • used in gluconeogenesis <p>DO NOT CREDIT 'removed as urine'</p> <p>DO NOT CREDIT if linked directly to the liver eg 'excreted by the liver'</p>
TOTAL		15	

Question	Expected Answers	Marks	Additional Guidance
5 (a) (i)	<p><i>2nd messenger</i> cAMP / cyclic AMP / cyclic adenosine monophosphate ;</p> <p><i>1st messenger</i> adrenaline / adrenalin ;</p>	2	<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>ACCEPT CAMP / camp</p> <p>DO NOT CREDIT adenine monophosphate</p> <p>IGNORE chemicals not named in Fig. 5.1</p>
5 (a) (ii)	<p>1 <u>glycogen</u> → <u>glucose</u> / <u>glycogenolysis</u> ;</p> <p>2 by <u>hydrolysis</u> ;</p> <p>3 <i>correct ref to</i> protein kinase / glycogen phosphorylase kinase (activates glycogen phosphorylase) <i>or</i> glycogen phosphorylase (stimulates conversion of glycogen) <i>or</i> inhibition of glycogen synthase (preventing glucose conversion to glycogen) ;</p>	1 max	<p>1 : DO NOT CREDIT gluconeogenesis / glycogenesis</p> <p>2 : This term must be used, or a derived term.</p> <p>3 :</p>

Question	Expected Answers	Marks	Additional Guidance
5 (a) (iii)	<p>1 different tissues have different (types of adrenaline) receptors ;</p> <p>2 (causing) cAMP concentration to increase or decrease ;</p> <p>3 second messenger (may be) different ;</p> <p>4 cAMP / second messenger , activates , different / other , enzymes / enzyme reactions (in different target cells) ;</p>	2 max	<p>IGNORE reasons not related to adrenaline (as Q specifies 'how the adrenaline molecule can cause ...')</p> <p>IGNORE descriptions of stated effects in different tissues as Q asks <i>how</i> adrenaline causes these different effects</p> <p>1</p> <p>2 ACCEPT adenylyl cyclase / cAMP , inhibited</p> <p>3</p> <p>4</p>

Question	Expected Answers	Marks	Additional Guidance
5 (b)	1	4 max	1
	2		2
	3		3
	4		4
	5		5
	6		6
	7		7
	8		8
	9		9
	QWC – technical terms used appropriately with correct spelling ;	1	Correct use of adrenalin(e) (Identify using the tick 1 <input checked="" type="checkbox"/> AND MUST BE INCLUDED FOR QWC TO BE AWARDED) plus use of 2 terms from: cardiovascular centre, medulla oblongata, sino-atrial node, vagus or parasympathetic, carotid, accelerator or sympathetic, chemoreceptor You should use the GREEN DOT to identify the remaining QWC terms that you are crediting. Please insert a QWC symbol next to the PENCIL ICON, followed by a tick (✓) if QWC has been awarded or a cross (x) if QWC has not been awarded
TOTAL		10	

Question	Answer	Marks	Guidance
1	<p>(a) (i) 1 <i>idea of</i> maintaining (relatively) stable internal, environment / state ;</p> <p>2 within (narrow) limits / within (narrow) range / about a set point ;</p> <p>3 even though environment is changing ;</p>	2 max	<p>1 Need the idea of 'constant' or 'steady' and 'regulation' or 'keeping' and in the body</p> <p>2 ACCEPT about the 'norm'</p> <p>IGNORE ref to negative feedback (as mechanism rather than definition) / optimum conditions</p> <p>CREDIT mps 2 & 3 (only) if response is in terms of example(s) e.g. temperature / blood glucose</p> <p>Note 'maintaining a stable body temperature' = 0 'keeping your body temperature at 37°C' = 1 (mp 2) 'even though it is getting cold' = 1 (mp 3)</p>

Question	Answer	Marks	Guidance
1	<p>(a) 1 β cells / α cells / receptors , detect , change / increased / decreased , in blood glucose (concentration) ;</p> <p>2 if high(er) glucose (concentration) , beta / β , cells (in pancreas) release insulin ;</p> <p>3 (increased) uptake / absorption , of glucose by , liver / muscle / effector , cells ;</p> <p>4 enters through glucose transport proteins (in cell surface membrane) ;</p> <p>5 glucose converted to glycogen / glycogenesis ;</p> <p>6 increased (use of glucose in) , respiration / ATP production ;</p> <p>7 if low(er) glucose (concentration) , alpha / α , (in pancreas) cells release glucagon ;</p> <p>8 (increased) conversion of glycogen to glucose / glycogenolysis ;</p> <p>9 (increased) conversion of other compounds (amino acids / lipids) to glucose / gluconeogenesis ;</p> <p>10 glucose leaves cells , by facilitated diffusion / through glucose channels ;</p> <p>11 AVP ;</p>	<p>5 max</p>	<p>1 CREDIT correct ref to detection by α/a (low) or β/b (high) IGNORE monitor / stimulate / figures quoted</p> <p>2 ACCEPT 'produce' rather than release DO NOT CREDIT B cells</p> <p>3 CREDIT increased permeability of named cell to glucose IGNORE 'use' / target cell</p> <p>4 CREDIT GLUT channels</p> <p>5 unambiguous spelling only of <u>glycogen</u> and <u>glycogenesis</u></p> <p>6 DO NOT CREDIT in context of α and β cells ACCEPT 'increased respiration by body'</p> <p>7 unambiguous spelling only of glucagon ACCEPT 'produce' rather than release</p> <p>8 unambiguous spelling only of <u>glycogen</u> and <u>glycogenolysis</u></p> <p>9 unambiguous spelling only of <u>gluconeogenesis</u></p> <p>11 e.g. correct cellular detail for insulin release or in effector cells ... <ul style="list-style-type: none"> • insulin binds to receptor on plasma membrane of hepatocytes • correct ref to secondary messenger (cAMP) e.g. ref to inhibitory effect(s) of hormone ... <ul style="list-style-type: none"> • conversion in cells / secretion of antagonist </p>
<p>QWC – technical terms used appropriately and spelt correctly ;</p>	<p>1</p>	<p>Use of three terms from: receptor, effector, alpha, gluconeogenesis, facilitated diffusion beta, glycogen, glucagon, facilitated diffusion insulin, glycogenesis, glycogenolysis, glycolysis</p> <p>Please insert a QWC symbol next to the pencil icon, followed by a tick (✓) if QWC has been awarded or a cross (x) if QWC has not been awarded</p> <p>You should use the green dot to identify the QWC terms that you are crediting.</p>	

Question		Answer	Marks	Guidance
1	(b) (i)	requires (daily), insulin / hormone, injections ; is not affected by dietary changes ;	1 max	ACCEPT insulin is not being produced in sufficient quantities
1	(b) (ii)	<i>idea that</i> has developed in , an old(er) person / middle age / a 55 year old ;	1	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 DO NOT CREDIT references to diet, as this was ineffective but use NBOD icon to indicate this
Total			10	

Question	Answer	Marks	Guidance
2 (a) (i)	liver ;	1	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
2 (a) (ii)	<p>1 (high intake of protein) leads to a large amount of amino acids ;</p> <p>2 (excess) amino acids cannot be stored ;</p> <p>3 <u>amino acids</u> deaminated or <u>amine</u> group / NH_2, removed / converted to ammonia ;</p> <p>4 (large amount of) ammonia enters ornithine cycle (for conversion to urea) ;</p> <p>5 increased , <u>blood</u> / <u>plasma</u> , concentration of urea (leads to more urea in , filtrate / urine) ;</p> <p>6 high concentration of , amino acids / urea , in blood increases water absorption from urine ;</p>	3 max	<p>1 Must emphasise the idea of <i>leading to</i> , more / too many / lots of , amino acids</p> <p>3 DO NOT CREDIT deamination of protein IGNORE amino group</p> <p>4 ACCEPT ref to urea cycle instead of ornithine cycle correct diagram of the cycle</p>
2 (b)	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 kidney disease / nephritis / kidney failure / pregnancy IGNORE type 1 or 2</p>

Question	Answer	Marks	Guidance
2 (c) (i)	(human) chorionic gonadotrop(h)in / hCG;	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 phonetic spelling (a vowel between the ch and r) DO NOT CREDIT chronic ACCEPT combinations of lower and upper case letters DO NOT CREDIT letters in the incorrect order (eg hGC)</p>

Question	Answer	Marks	Guidance
2 (c) (ii)	<p>1 LH binds to, anti-LH / its complementary (free / mobile / with dye), antibodies ;</p> <p>2 this (LH-anti-LH) antibody complex moves along (test stick together with urine) ;</p> <p>3 this (LH-anti-LH) antibody complex binds (only) with, immobilised antibodies specific to them / lower band of immobilised antibodies ;</p> <p>4 (only) control antibodies bind with, immobilised antibodies specific to them / upper band of immobilised antibodies ;</p> <p>5 <i>idea that</i> binding of antibody (with dye to its immobilised anti-antibody) produces coloured line ;</p> <p>6 2 lines indicates , positive result / presence of LH or darker line = more LH or 'control' / top , line indicates the strip is working (correctly) or 'control' / top , line alone indicates no LH ;</p>	3 max	<p>ACCEPT joins / attaches , for 'bind' throughout IGNORE 'reacts with' DO NOT CREDIT active site / enzyme references instead of antibodies If a candidate's <u>whole answer is in terms of pregnancy</u> testing, DO NOT CREDIT mps 1, 2 & 3</p> <p>1 ACCEPT hormone for LH 'specific' for 'complementary'</p> <p>2 IGNORE urine moving along the stick on its own</p> <p>5 Award in context of either LH or control line</p> <p>6 DO NOT CREDIT this alternative in context of positive pregnancy result</p>
	Total	9	

Question	Answer	Marks	Guidance
5 (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>
5 (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>

Question	Answer	Marks	Guidance
5 (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)'</p> <p>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>
5 (c) (i)	ribosome / <u>rough</u> endoplasmic reticulum / <u>RER</u> ;	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>

Question	Answer	Marks	Guidance
5 (c) (ii)	<ol style="list-style-type: none"> 1 transported to Golgi ; 2 modified / processed , in Golgi ; 3 packaged into / stored in , (Golgi) vesicle(s) ; 4 vesicles transported towards , plasma / cell surface , membrane ; 5 AVP ; 	3 max	<p>IGNORE ref. to mechanism of insulin secretion 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) • role of cytoskeleton • use of ATP (in context of, modification / movement)</p>
	Total	11	

Question	Expected Answer	Mark	Additional Guidance
3 (a)	<p>1 less ventilation / <i>Idea of difficulty in exhaling due to less recoil / small surface area for gaseous exchange / less oxygen entering capillaries / less oxygen entering blood ;</i></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 increased acidity (as CO₂ / lactate builds up) interfering with / affects , enzymes / respiratory metabolism ;</i></p>	2 max	<p>IGNORE 'produces' energy in any mark point</p> <p>1 DO NOT CREDIT no oxygen</p> <p>2 DO NOT CREDIT no respiration</p> <p>3 DO NOT CREDIT 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>ACCEPT 'sugar' for glucose</p> <p>IGNORE (excess) glucose lost in urine (as does not answer the Q)</p> <p>Only CREDIT ora if candidate clearly states that the sequence of events does not happen in this case</p> <p>1 DO NOT CREDIT no glucose uptake</p> <p>2 IGNORE produces energy DO NOT CREDIT no respiration / no ATP / no glucose</p>

Question	Expected Answer	Mark	Additional Guidance
3 (c)	<p>1 <i>idea of slow rate of / sluggish , blood flow</i> or <i>low(er) blood pressure ;</i></p> <p>2 <i>less / irregular amount of,</i> <i>oxygen (reaching cells) for ,</i> <i>(aerobic) respiration / oxidative phosphorylation ;</i></p> <p>3 <i>less glucose (reaching cells) for respiration ;</i></p> <p>4 <i>(so) less ATP produced ;</i></p> <p>5 <i>idea of increased acidity (as CO₂ / lactate builds up)</i> <i>interfering with / affects ,</i> <i>enzymes / respiratory metabolism ;</i></p>	2 max	<p>IGNORE 'produces' energy in any mark point</p> <p>1 IGNORE 'heart doesn't beat strongly enough' or 'heart beat is inefficient' IGNORE ref to volume of blood without time/rate</p> <p>2 DO NOT CREDIT no oxygen / no respiration</p> <p>3 IGNORE sugar DO NOT CREDIT no glucose / no respiration</p> <p>4 DO NOT CREDIT no ATP</p>

Question	Expected Answer	Mark	Additional Guidance
3 (d) (i)	<p>1 less pyruvate for, link reaction / Krebs cycle or link reaction / Krebs cycle, cannot take place / reduced or 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>		<p>2 IGNORE produces energy</p> <p>3 DO NOT CREDIT no ATP IGNORE produces energy IGNORE muscle fatigue</p> <p>5 CREDIT 'lactic acid' instead of 'lactate' ACCEPT muscle cramps</p>
3 (d) (ii)	<p>1 <i>idea that B lymphocytes do not respond to cytokines (that have been produced) ;</i></p> <p>2 little, energy / ATP, for B cell, mitosis / clonal expansion ;</p> <p>3 little, energy / ATP, for, production / release, of antibodies ;</p>	3 max	
	Total	10	

Question	Expected Answer	Mark	Additional Guidance
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>ACCEPT α and β cells in islets of Langerhans DO NOT CREDIT α cells in islets of Langerhans DO NOT CREDIT β cells in islets of Langerhans</p>

Question	Expected Answer	Mark	Additional Guidance
4 (a)	(ii) use ✓ ¹		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.
	<i>endocrine</i> H1 hormone(s) released directly into blood ; H2 beta / β , cells , secrete / produce / release , insulin ; H3 alpha / α , cells , secrete / produce / release , glucagon ; H4 islet / α and β , cells , detect / monitor , blood glucose concentration ; 3 max		H1 DO NOT CREDIT carried / transported , in H2 ACCEPT b cells H3 ACCEPT a cells DO NOT CREDIT incorrect spelling of glucagon H4 ACCEPT a and b cells α cells and β cells secrete glucagon and insulin = 2 marks α cells and β cells secrete insulin and glucagon = 0 marks
	<i>exocrine</i> E1 fluid / juice / secretion / enzymes , released into <u>duct</u> ; E2 (release triggered by) nervous / hormonal , stimulation ; E3 pancreatic secretions into , gut / small intestine / <u>duodenum</u> ; E4 alkaline / pH 8 / (sodium) hydrogen carbonate ; E5 containing 2 <u>named enzyme(s)</u> ; 3 max		E1 IGNORE substances DO NOT CREDIT carried / transported , in
	QWC – technical terms used appropriately with correct spelling ;	4 max 1	E5 CREDIT 2 enzymes but no more than 1 enzyme from each bullet point • lipase • amylase / carbohydrase • trypsin / chymotrypsin / protease / trypsinogen / chymotrypsinogen
			Do not award if endocrine & exocrine are muddled. Use of 3 terms from: hormone(s), beta, alpha, glucagon, islet(s), pancreatic, duodenum, enzyme(s), amylase, trypsin(ogen) / chymotrypsin(ogen) You should use the GREEN DOT to identify the QWC terms that you are crediting. Please insert a QWC symbol next to the PENCIL ICON, followed by a tick (✓) if QWC has been awarded or a cross (x) if QWC has not been awarded

Question	Expected Answer	Mark	Additional Guidance
4 (b)	D A G H C F ; ; ; ;		All letters in correct sequence = 4 marks If letters are not all in the correct sequence, then mark as follows: D at the beginning and F at the end = 1 mark A somewhere before G = 1 mark G somewhere before H = 1 mark H somewhere before C = 1 mark
4 (c) (i)	<ol style="list-style-type: none"> 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 ; 	4	<p>Mark the first <u>two</u> advantages</p> <ol style="list-style-type: none"> 1 e.g. can meet demand / can be mass produced IGNORE ref to speed 6 ACCEPT ref to not spreading prions IGNORE spread of disease from pigs / no rejection DO NOT CREDIT genetically identical insulin
4 (c) (ii)	<ol style="list-style-type: none"> 1 (has the potential to) cure / do more than manage , the condition ; 2 long term effect / permanent / no need for repeated treatments ; 	2	<ol style="list-style-type: none"> 1 e.g. no need to restrict diet 2 e.g. no need to inject insulin (regularly)
	Total	13	

Question	Expected Answer	Mark	Additional Guidance
4	(a) (i) starch contains (only) glucose and sucrose contains , 50% glucose or glucose and fructose ; by <u>hydrolysis</u> , starch releases more glucose / sucrose releases less glucose ;	2	
4	(a) (ii) both starch and cellulose are (only) made of glucose ; starch , is digestible / can be broken down and cellulose , is indigestible / cannot be broken down ; (named) enzyme present for starch digestion / no (named) enzyme present for cellulose digestion ;	2 max	
4	(b) 1 low / decrease , starch ; 2 as starch has the <u>greatest</u> effect on blood glucose conc. ; 3 increase / include , cellulose / fibre / roughage / fat / protein / meat , as no effect on blood glucose ; 4 some / medium amount of , sugars / sucrose / lactose ; 5 <i>idea of limiting</i> , sucrose / lactose / fat / protein , as causes an increase in insulin and will make cells less responsive (to insulin) ;	3 max	1 ACCEPT 'no starch' 2 'substantial' or 'high' or 'big' is not quite enough 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 <u>no</u> effect)

Question	Expected Answer	Mark	Additional Guidance												
4 (c)	<table border="1"> <thead> <tr> <th data-bbox="279 1646 327 1814">type of compound</th> <th data-bbox="279 1400 327 1646">glycogen</th> <th data-bbox="279 1052 327 1400">glucagon</th> </tr> </thead> <tbody> <tr> <td data-bbox="327 1646 550 1814"></td> <td data-bbox="327 1400 550 1646"> carbohydrate OR polysaccharide </td> <td data-bbox="327 1052 550 1400"> hormone OR polypeptide OR protein </td> </tr> <tr> <td data-bbox="550 1646 965 1814">role of compound</td> <td data-bbox="550 1400 965 1646"> storage OR to provide glucose (when blood glucose conc. falls) OR can undergo glycogenolysis </td> <td data-bbox="550 1052 965 1400"> binds to cell receptor OR causes conversion of glycogen to glucose OR stimulates glycogenolysis OR increases (blood) glucose concentration </td> </tr> <tr> <td data-bbox="965 1646 1228 1814">site of production</td> <td data-bbox="965 1400 1228 1646"> liver OR hepatocytes </td> <td data-bbox="965 1052 1228 1400"> pancreas OR islets of Langerhans OR alpha / α, cells </td> </tr> </tbody> </table>	type of compound	glycogen	glucagon		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	3	<p>Award one mark per row</p> <p>both <i>glycogen</i> and <i>glucagon</i> IGNORE polymer or macromolecule unless qualified <i>glycogen</i> DO NOT CREDIT complex sugar / sugar</p> <p>both <i>glycogen</i> and <i>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	glycogen	glucagon													
	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	[10]													