

Question		Answer	Marks	Guidance
1	(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) DO NOT CREDIT 'islands'</p> <p>spelling must be correct</p> <p>spelling must be unambiguous 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)	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 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		Answer	Marks	Guidance																								
2	(a)	<table border="1"> <thead> <tr> <th>control element</th> <th>made of protein</th> <th>binds to a protein</th> <th>codes for protein</th> </tr> </thead> <tbody> <tr> <td>insulin</td> <td>✓</td> <td>✓</td> <td>✗</td> </tr> <tr> <td>c AMP</td> <td>✗</td> <td>✓</td> <td>✗</td> </tr> <tr> <td><i>lac</i> I (inhibitor) gene</td> <td>✗</td> <td>✓</td> <td>✓</td> </tr> <tr> <td><i>lac</i> O (operator) gene</td> <td>✗</td> <td>✓</td> <td>✗</td> </tr> <tr> <td>homeotic gene product</td> <td>✓</td> <td>✗</td> <td>✗</td> </tr> </tbody> </table>	control element	made of protein	binds to a protein	codes for protein	insulin	✓	✓	✗	c AMP	✗	✓	✗	<i>lac</i> I (inhibitor) gene	✗	✓	✓	<i>lac</i> O (operator) gene	✗	✓	✗	homeotic gene product	✓	✗	✗	5	<p>Award one mark for each correct row. DO NOT CREDIT blank spaces, multiple answers or hybrid ticks (a tick that has been crossed through, so it cannot be judged if it is a tick or a cross.)</p>
control element	made of protein	binds to a protein	codes for protein																									
insulin	✓	✓	✗																									
c AMP	✗	✓	✗																									
<i>lac</i> I (inhibitor) gene	✗	✓	✓																									
<i>lac</i> O (operator) gene	✗	✓	✗																									
homeotic gene product	✓	✗	✗																									

Question		Answer	Marks	Guidance
2	(b)	<p><i>RNA polymerase</i></p> <p>1 makes (m / messenger / t / transfer / r / ribosomal) RNA ;</p> <p>2 <u>transcription</u> ;</p> <p>3 one strand (DNA) used / short section used / one strand formed ;</p> <p><i>DNA polymerase</i></p> <p>4 <u>DNA replication</u> ;</p> <p>5 semi-conservative / both strands used / whole length used / 2 strands formed ;</p> <p>6 before , nuclear / cell , division ;</p>	4	<p>2 CREDIT transcribes / transcribed</p> <p>3 Must be a clear statement</p> <p>4 CREDI replicates / replicated</p> <p>5 Must be a clear statement</p> <p>6 CREDIT before , mitosis / meiosis / cytokinesis CREDIT in S phase (of interphase) IGNORE interphase unqualified</p>
2	(c)	<p>1 apoptosis ;</p> <p>2 cytoskeleton ;</p> <p>3 enzymes ;</p> <p>4 phagocytosis ;</p> <p>5 mitosis / mitotic cell division ;</p> <p>6 tumour ;</p>	6	<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 ACCEPT 'apoptosis' as phonetic</p> <p>2 ACCEPT cell skeleton</p> <p>3 CREDIT proteases / lysosomes</p> <p>6 ACC PT cancer / carcinoma</p>
		Total	15	

Question		Answer	Marks	Guidance																		
3	(a)	<p><i>husky in Fig. 2.2 has</i> ears, laid back / held low / not upright ; pupils, dilated / bigger ; different / tensed / lower, posture ; hair (on neck) standing up / hackles raised ; mouth open / showing teeth / teeth bared / snarling / tongue withdrawn ; tail standing up / held high ;</p>	3 max	<p>CREDIT correct non-subjective visible differences wherever they appear (read as prose) IGNORE causes</p> <p>DO NOT CREDIT eyes dilated</p>																		
	(b)	<table border="1"> <tbody> <tr> <td>organ</td> <td>calm mammal</td> <td>frightened mammal</td> </tr> <tr> <td>heart ;</td> <td>rate slow / small force ;</td> <td>rate fast / great force ;</td> </tr> <tr> <td>lungs ;</td> <td>breathing, slow / shallow ;</td> <td>breathing, fast / deep ;</td> </tr> <tr> <td>(skeletal) muscle / arteries to muscle ;</td> <td>less, active / blood flow ;</td> <td>more, active / blood flow ;</td> </tr> <tr> <td>liver ;</td> <td>glucose → glycogen / glucose taken up ;</td> <td>glycogen → glucose / glucose released ;</td> </tr> <tr> <td>gut / named part of gut ;</td> <td>peristalsis / secretions / digestion / blood flow to gut, occurring ;</td> <td>no / less, peristalsis / secretions / digestion / blood flow to gut ;</td> </tr> </tbody> </table>	organ	calm mammal	frightened mammal	heart ;	rate slow / small force ;	rate fast / great force ;	lungs ;	breathing, slow / shallow ;	breathing, fast / deep ;	(skeletal) muscle / arteries to muscle ;	less, active / blood flow ;	more, active / blood flow ;	liver ;	glucose → glycogen / glucose taken up ;	glycogen → glucose / glucose released ;	gut / named part of gut ;	peristalsis / secretions / digestion / blood flow to gut, occurring ;	no / less, peristalsis / secretions / digestion / blood flow to gut ;	6 max	<p>CREDIT first correct answer per box if not contradicted later. No requirement for calm and frightened comments to be opposites.</p> <p>IGNORE steady, regular, normal with respect to calm mammal CREDIT reasonable figures for heart and breathing rates CREDIT AW such as stroke volume, cardiac output (of heart), tidal volume, ventilation rate (of lungs). ACCEPT named muscle(s) ACCEPT ecf across table for structures that are not organs, eg bronchioles</p> <p>CREDIT brain, bladder in first column for 1 mark</p> <p>CREDIT arterioles constricted for less blood flow (context gut in frightened mammal)</p> <p>CREDIT named secretions, eg saliva, gastric juice.</p>
organ	calm mammal	frightened mammal																				
heart ;	rate slow / small force ;	rate fast / great force ;																				
lungs ;	breathing, slow / shallow ;	breathing, fast / deep ;																				
(skeletal) muscle / arteries to muscle ;	less, active / blood flow ;	more, active / blood flow ;																				
liver ;	glucose → glycogen / glucose taken up ;	glycogen → glucose / glucose released ;																				
gut / named part of gut ;	peristalsis / secretions / digestion / blood flow to gut, occurring ;	no / less, peristalsis / secretions / digestion / blood flow to gut ;																				

Question		Answer	Marks	Guidance									
	(c)	<table border="1"> <tr> <td></td> <td>calm mammal Fig. 2.1</td> <td>frightened mammal Fig. 2.2</td> </tr> <tr> <td>division</td> <td>parasympathetic ;</td> <td>sympathetic ;</td> </tr> <tr> <td>neuro-transmitter</td> <td>acetylcholine / ACh ;</td> <td>noradrenaline / NA norepinephrine / NE ;</td> </tr> </table>		calm mammal Fig. 2.1	frightened mammal Fig. 2.2	division	parasympathetic ;	sympathetic ;	neuro-transmitter	acetylcholine / ACh ;	noradrenaline / NA norepinephrine / NE ;	4	<p>First Answer in each box (0 marks if additional answer contradicts)</p> <p>DO NOT CREDIT adrenaline for noradrenaline CREDIT ecf for second line if name matches NS division stated</p>
	calm mammal Fig. 2.1	frightened mammal Fig. 2.2											
division	parasympathetic ;	sympathetic ;											
neuro-transmitter	acetylcholine / ACh ;	noradrenaline / NA norepinephrine / NE ;											
	(d)	adrenal (glands) ; (adrenal) medulla ;	2	<p>First Answer (0 marks if additional answer contradicts)</p> <p>DO NOT CREDIT medulla oblongata or medulla alone</p>									
	(e) (i)	<p>1 adrenaline binds to receptor ;</p> <p>2 complementary / specific, fit / shape ;</p> <p>3 G protein activated ;</p> <p>4 adeny(ate) cyclase activated ;</p> <p>5 ATP converted to cAMP ;</p> <p>6 cAMP activates, proteins / enzymes ;</p> <p>7 by, altering 3D structure / phosphorylation ;</p>	4 max	<p>IGNORE neurones ACCEPT attaches to DO NOT ACCEPT detected by, recognised by</p> <p>IGNORE stimulated (mps 3, 4 6) CREDIT AW eg made active, caused to work (3,4,6)</p> <p>ACCEPT named enzymes eg kinases</p>									
	(e) (ii)	<p><i>idea that one / named, molecule causes, production / activation of, many others ;</i></p> <p><i>idea that this multiplying effect is repeated at, next / every / later step ;</i></p> <p><i>idea of recycling / temporary binding, of cAMP ;</i></p>	2	<p>ACCEPT 1 adrenaline → many cAMP molecules 1 molecule causes many responses (in cell) CREDIT idea of amplification / cascade effect IGNORE chain reaction, domino effect</p>									
		Total	21										

Question		Expected Answers		Marks	Additional Guidance				
4	(a)	1	<table border="1"> <thead> <tr> <th><i>excretion</i></th> <th><i>secretion</i></th> </tr> </thead> <tbody> <tr> <td> (metabolic) waste or toxin / harmful or substance is to be removed from body or does not use vesicles </td> <td> useful product or used in cell communication (e.g. to target tissues) or released from glands (ducts or ductless) or uses vesicles or remain in body </td> </tr> </tbody> </table>	<i>excretion</i>	<i>secretion</i>	(metabolic) waste or toxin / harmful or substance is to be removed from body or does not use vesicles	useful product or used in cell communication (e.g. to target tissues) or released from glands (ducts or ductless) or uses vesicles or remain in body	;	<p>One mark per row.</p> <p>CREDIT converse statements on either side or unmatched statements for each</p> <p>IGNORE name or type of product without qualification</p> <p>DO NOT CREDIT any ref to egestion in 'excretion'</p>
			<i>excretion</i>	<i>secretion</i>					
(metabolic) waste or toxin / harmful or substance is to be removed from body or does not use vesicles	useful product or used in cell communication (e.g. to target tissues) or released from glands (ducts or ductless) or uses vesicles or remain in body								
2	<table border="1"> <tbody> <tr> <td> urea / carbon dioxide / water / bile pigment / named example </td> <td> hormone / enzyme / antibodies / mucus / bile salts / neurotransmitter / named example </td> </tr> </tbody> </table>	urea / carbon dioxide / water / bile pigment / named example	hormone / enzyme / antibodies / mucus / bile salts / neurotransmitter / named example	;	<p>2 IGNORE sweat / urine / bile / saliva / salt / (named) digestive juice</p>				
urea / carbon dioxide / water / bile pigment / named example	hormone / enzyme / antibodies / mucus / bile salts / neurotransmitter / named example								

Question			Expected Answers		Marks	Additional Guidance
			3	<i>one similarity</i> requires ATP or (involved in) homeostasis or (compounds) produced by cell(s) / produced by metabolism / need to cross membrane / need to move through membrane / need to leave cell / (may be) transported in blood	3	CREDIT method of leaving cell e.g. exocytosis IGNORE going into cells (as some excretory products do)

Question	Expected Answers	Marks	Additional Guidance
(b)	<p>S1 glucose is not the only substrate / there are other substrates ; E1 named alternative substrate ; or</p> <p>S2 ATP is produced / energy is released ; E2 (by) substrate level / oxidative, phosphorylation ; or</p> <p>S3 ATP / energy, required ; E3 (for) phosphorylation / glycolysis ; or</p> <p>S4 is not a single step reaction / other steps involved / other products / other intermediates ; E4 named stage(s) / named intermediate compound(s) ; or</p> <p>S5 enzymes are involved ; E5 dehydrogenation / decarboxylation / oxidative phosphorylation / named (respiratory) enzyme ; or</p> <p>S6 coenzymes / NAD, involved ; E6 oxidative phosphorylation / link reaction / Krebs cycle / glycolysis ; or</p> <p>S7 glucose does not, combine / react , (directly) with oxygen ; E7 (oxygen) used in oxidative phosphorylation / is final electron acceptor / is final hydrogen acceptor ;</p>	<p>S & C</p> <p>2</p>	<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>CREDIT one statement and a suitable explanation related to that (first) given statement (e.g. S3 + E3 but not S4 + E1)</p> <p>DO NOT AWARD 2 marks for 2 statements or 2 explanations</p> <p>1 'fats can (also) be respired' = E1 'fats can be respired as well as glucose' = S1 + E1</p> <p>S2 DO NOT CREDIT energy produced / made / created</p> <p>4 Krebs cycle / ETC , happens = E4 'other stages such as link reaction are involved' = S4 +</p> <p>E4 E4 e.g. pyruvate / acetyl CoA / acetate IGNORE NAD(H) / FAD(H) / ATP</p> <p>S6 DO NOT CREDIT NADP</p>

Question		Expected Answers	Marks	Additional Guidance
(c)	(i)	<p>1 unable to produce (enough) insulin / do not secrete insulin / produces ineffective insulin ;</p> <p>2 insulin-producing cells / beta cells / islets of Langerhans, not functioning (correctly) / damaged / destroyed / attacked ;</p> <p>3 by (body's own) immune system / by (body's own) antibodies / auto-immune disease ;</p> <p>4 (idea of) family history / genetic / hereditary ;</p> <p>5 (condition can be) triggered by , virus / environmental factor ;</p>	2 max	<p>Max 1 if referring to insulin receptors</p> <p>1 DO NOT CREDIT 'excrete' as incorrect</p> <p>2 ALLOW lack of beta cells / ref to b cells DO NOT CREDIT alpha cells / B cells (if lymphocytes implied)</p> <p>3 CREDIT description</p> <p>5 e.g. <ul style="list-style-type: none"> • shock • drugs side effect • (pancreatic) cancer • infection / disease </p>
(c)	(ii)	<p>1 increasing age / older / ageing / more prevalent over 40 ;</p> <p>2 (idea of) family history / genetic / hereditary ;</p> <p>3 (more common in) males ;</p> <p>4 (more common in) some ethnic groups / African / Afro-Caribbean / Asian / Hispanic / Oceanic ;</p> <p>5 obese / overweight / fat around abdomen ;</p> <p>6 high / frequent, intake of , sugar / highly processed food / high GI food ;</p> <p>7 lack of physical activity / sedentary lifestyle ;</p> <p>8 high blood pressure ;</p> <p>9 excessive alcohol intake ;</p>	3 max	<p>Mark the first 3 responses only</p> <p>1 DO NOT CREDIT age without 'older' implication</p> <p>5 CREDIT 'apple shaped'</p> <p>6 IGNORE 'poor diet' / 'bad diet' / 'unhealthy diet' IGNORE fat / carbohydrate , in diet</p> <p>8 CREDIT history of , heart attack / stroke</p> <p>9 idea of <i>too much</i> is needed</p>
		Total	10	