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

Question			Answer	Marks	Guidance
2	(a)			5	**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.)

control element	made of protein	binds to a protein	codes for protein	
insulin	✓	✓	×	;
c AMP	×	✓	×	;
lac I (inhibitor) gene	×	✓	✓	;
lac O (operator) gene	×	✓	×	;
homeotic gene product	✓	×	×	;

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

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>husky in Fig. 2.2 has
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 ;</td><td>3 max</td><td>CREDIT correct non-subjective visible differences wherever they appear (read as prose)
IGNORE causes

DO NOT CREDIT eyes dilated</td></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<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>
</table>
</td><td>6 max</td><td>CREDIT first correct answer per box if not contradicted later. No requirement for calm and frightened comments to be opposites.

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

CREDIT brain, bladder in first column for 1 mark

CREDIT arterioles constricted for less blood flow (context gut in frightened mammal)

CREDIT named secretions, eg saliva, gastric juice.</td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td>(c)</td><td></td><td>
<table>
<tr><th></th><th>calm mammal
Fig. 2.1</th><th>frightened mammal
Fig. 2.2</th></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>
</td><td>4</td><td>First Answer in each box (0 marks if additional answer contradicts)

DO NOT CREDIT adrenaline for noradrenaline
CREDIT ecf for second line if name matches NS division stated</td></tr>
<tr><td></td><td>(d)</td><td></td><td>adrenal (glands) ;
(adrenal) medulla ;</td><td>2</td><td>First Answer (0 marks if additional answer contradicts)
DO NOT CREDIT medulla oblongata or medulla alone</td></tr>
<tr><td></td><td>(e)</td><td>(i)</td><td>1 adrenaline binds to receptor ;

2 complementary / specific, fit / shape ;

3 G protein activated ;
4 adenyl(ate) cyclase activated ;

5 ATP converted to cAMP ;

6 cAMP activates, proteins / enzymes ;
7 by, altering 3D structure / phosphorylation ;</td><td>4 max</td><td>IGNORE neurones
ACCEPT attaches to
DO NOT ACCEPT detected by, recognised by

IGNORE stimulated (mps 3, 4 6)
CREDIT AW eg made active, caused to work (3,4,6)

ACCEPT named enzymes eg kinases</td></tr>
<tr><td></td><td>(e)</td><td>(ii)</td><td>idea that one / named, molecule causes, production / activation of, many others ;

idea that this multiplying effect is repeated at, next / every / later step ;
idea of recycling / temporary binding, of cAMP ;</td><td>2</td><td>ACCEPT 1 adrenaline → many cAMP molecules
1 molecule causes many responses (in cell)
CREDIT idea of amplification / cascade effect
IGNORE chain reaction, domino effect</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>21</td><td></td></tr>
</table>

Question			Expected Answers					Marks	Additional Guidance
4	(a)				*excretion*	*secretion*			**One mark per row.** **CREDIT** converse statements on either side or unmatched statements for each **IGNORE** name or type of product without qualification **DO NOT CREDIT** any ref to egestion in 'excretion'
			1	*one difference*	(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	*one example of a product*	urea / carbon dioxide / water / bile *pigment* / named example	hormone / enzyme / antibodies / mucus / bile *salts* / neurotransmitter / named example	;		2 **IGNORE** sweat / urine / bile / saliva / salt / (named) digestive juice

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

Question			Expected Answers	Marks	Additional Guidance
	(c)	(i)			**Max 1 if referring to insulin receptors**
			1 unable to produce (enough) insulin / do not secrete insulin / produces ineffective insulin ;		1 **DO NOT CREDIT** 'excrete' as incorrect
			2 insulin-producing cells / beta cells / islets of Langerhans, not functioning (correctly) / damaged / destroyed / attacked ;		2 **ALLOW** lack of beta cells / ref to b cells **DO NOT CREDIT** alpha cells / B cells (if lymphocytes implied)
			3 by (body's own) immune system / by (body's own) antibodies / auto-immune disease ;		3 **CREDIT** description
			4 (idea of) family history / genetic / hereditary ;		
			5 (condition can be) triggered by , virus / environmental factor ;		5 e.g. • shock • drugs side effect • (pancreatic) cancer • infection / disease
				2 max	
	(c)	(ii)			**Mark the first 3 responses only**
			1 increasing age / older / ageing / more prevalent over 40 ;		1 **DO NOT CREDIT** age without 'older' implication
			2 (idea of) family history / genetic / hereditary ;		
			3 (more common in) males ;		
			4 (more common in) some ethnic groups / African / Afro-Caribbean / Asian / Hispanic / Oceanic ;		
			5 obese / overweight / fat around abdomen ;		5 **CREDIT** 'apple shaped'
			6 high / frequent, intake of , sugar / highly processed food / high GI food ;		6 **IGNORE** 'poor diet' / 'bad diet' / 'unhealthy diet' **IGNORE** fat / carbohydrate , in diet
			7 lack of physical activity / sedentary lifestyle ;		
			8 high blood pressure ;		8 **CREDIT** history of , heart attack / stroke
			9 excessive alcohol intake ;		9 idea of *too much* is needed
				3 max	
			Total	**10**	