Question			Answer	Marks	Guidance
1	(a)		cell signalling **;**	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**
1	(b)	(i)	synaptic (cleft / space / gap) **;**	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** **ALLOW** synapse **DO NOT CREDIT** synoptic / synopse / synapsis

Question			Answer	Marks	Guidance
1	(b)	(ii)	**1** (named) **neurotransmitter** / **acetylcholine ,** released from **pre-synaptic** / first **,** cell / membrane **;** **2** **diffus**es across **,** gap / cleft / **synaptic cleft** ***or*** reaches second **,** neurone / cell / membrane **,** by diffusion **;** **3** attaches to **, receptors** / binding sites of sodium channels **,** on **post-synaptic** membrane / membrane of second cell **;** **4** neurotransmitter / acetylcholine **,** broken down (in cleft) **;**	2 max	**DO NOT CREDIT a mark point** if stated that complete *vesicles* (even if containing neurotransmitter) are involved ***1*** *release of neurotransmitter* must be clearly stated ***2*** **IGNORE** synapse ***3*** **DO NOT CREDIT** post-synaptic knob / bulb ***Note*** *that a statement reading:* *'Diffuses across and attaches to receptors on the post-synaptic membrane'* **= 2 marks** (mps 2 & 3) ***4*** **CREDIT** ref to action of cholinesterase
			QWC – technical terms used appropriately and spelt correctly **;**	1	Use of **three** terms from: **neurotransmitter**, **acetylcholine**, **pre-synaptic / presynaptic**, **diffus**e / **diffus**ion, **synaptic cleft**, **receptor**, **post-synaptic / postsynaptic** 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.

Question			Answer	Marks	Guidance
1	(b)	(iii)	**1** ensures movement of **,** impulse / action potential **,** in one direction (only) **;** **2** integration **or** one neurone can **,** connect to / receive impulses from / transmit impulses to **,** many neurones **;** **3** allows summation **;** **4** *idea* that filters out **,** 'background' / low level **,** stimuli **or** ensures that only stimulation that is strong enough will be passed on**;** **5** AVP **;**	3 max	**IGNORE** ref to 'signals' / 'messages' / coordination ***1*** **ACCEPT** description eg ACh only released from presynaptic and receptors only on postsynaptic ***3*** **ACCEPT** description eg enough action potentials arrive to trigger depolarisation in next neurone ***5*** eg • permits **,** memory / learning • acclimatisation (or described) • prevents continuous stimulation of neurones • synapses are of two types – excitatory and inhibitory
1	(c)	(i)	endotherm(s) **;**	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** **CREDIT** homoiothermic

Question			Answer	Marks	Guidance
1	(c)	(ii)	(vaso)dilation **;**	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** **IGNORE** 'arteriole' **DO NOT CREDIT** 'arterial dilation'
1	(d)	(i)	thyroxine / adrenaline**;**	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** adrenalin / thyroxin **/** epinephrin(e)
1	(d)	(ii)	hypothalamus **;**	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**
			Total	**12**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>L glomerulus ;

M Bowman’s / renal , capsule ;

N proximal convoluted tubule ;</td><td>3</td><td>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

L ACCEPT ‘capillary knot’
IGNORE ‘capillary unqualified’

N IGNORE ‘first’
IGNORE PCT / pct (as Q asks for ‘name’)</td></tr>
<tr><td>2</td><td>(b)</td><td></td><td>
<table>
<tr><th>statement</th><th>part(s) of the nephron</th></tr>
<tr><td>walls are impermeable to water</td><td>ascending (limb of loop of Henle) ;</td></tr>
<tr><td>glucose is reabsorbed into the blood</td><td>proximal convoluted tubule / N ;</td></tr>
<tr><td>ADH acts on the walls</td><td>collecting duct / distal convoluted tubule ;</td></tr>
<tr><td>contains podocytes</td><td>Bowman’s capsule / renal capsule / M ;</td></tr>
<tr><td>most of the water is reabsorbed into the blood</td><td>proximal convoluted tubule / N ;</td></tr>
</table>
</td><td>5</td><td>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks

ACCEPT rising limb

ACCEPT pct / first convoluted tubule

ACCEPT DCT / dct / second convoluted tubule

ACCEPT pct / first convoluted tubule</td></tr>
</table>

Question			Answer	Marks	Guidance
2	(c)		**1** *role of loop of Henle is to* cause a decrease in **water potential** in / establish water potential gradient going down **, <u>medulla</u> ;** **2** (as) in **ascending** limb **active transport** outwards of **,** solutes / (sodium and chloride) **ions ;** **3** (walls of) **descending** limb permeable to water **;** **4** water removed from descending limb **;** **5** water potential of tissues surrounding collecting duct is low(er) than fluid inside it **;** **6** water removed from **,** filtrate / urine (in collecting duct) **;** **7** AVP **;**	4 max	***1*** **Do not award** for a simple statement that 'there is a lower water potential in the medulla' ***2*** **ACCEPT** 'pumped' for active transport ***3*** **IGNORE** ref to permeability to ions ***5*** **ACCEPT** 'contents of collecting duct' ***7*** eg • acts as a countercurrent **,** system / multiplier • the drier the habitat the longer the loop • *idea that* urea contributes to low water potential in medulla • (facilitated) diffusion of ions out of the loop at the bottom
			QWC – technical terms used appropriately and spelt correctly **;**	1	Use of **three** terms from: **water potential**, **medulla**, **ascending**, **active transport** (or derived term), **ion**(s), **descending** **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.**
			Total	**13**	

Question			Answer	Marks	Guidance
3	(a)		crista(e) / inner mitochondrial membrane **;**	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** thylakoid membrane / lamella(e) (of chloroplast)
3	(b)	(i)	**A** has more stain than **B** **and** **C** has none **;**	1	All 3 seeds must be mentioned Staining ref. could relate to area or intensity of stain. **DO NOT CREDIT** implication that C has any staining **ACCEPT** 'shading' instead of 'staining' **IGNORE** ref to presence or absence of TTC (as it is present in all regions of all seedlings and it is the *staining* that is important)
3	(b)	(ii)	**1** *idea that* shaded areas in **A** are respiring **;** **2** *idea that* 22^{o}C is suitable temperature for respiration **;** **3** reduced **,** NAD / FAD / coenzymes **,** produced in **,** glycolysis / link reaction / Krebs cycle **;** **4** lots of / more **,** electron transfer (to TTC) / (oxidative) phosphorylation / chemiosmosis **;**	2 max	***1*** **ACCEPT** a description of the respiring area(s) eg the outer regions of the seed are respiring ***3*** **ACCEPT** NADH / $NADH^{+}$ / $NADH + H^{+}$ / $NADH_2$ / FADH / $FADH^{+}$ / $FADH + H^{+}$ / $FADH_2$

Question			Answer	Marks	Guidance
3	(b)	(iii)	(named stage of) respiration uses **,** enzymes / proteins in ETC / electron carriers **;** *group B* not enough kinetic energy for **,** ESC formation / substrates and enzymes to collide (successfully) **;** *group C* enzymes / proteins in ETC / electron carriers **,** denatured by **,** high temperature / (almost) boiling water **;**	2 max	**IGNORE** coenzymes ***Note** that a statement reading:* 'the respiratory enzymes are denatured by 90^{o}C in C' **= 2 marks** (mps 1 and 3)
3	(c)	(i)	ethanal **;**	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** acetaldehyde **IGNORE** formulae (as name asked for in Q)
3	(c)	(ii)	ethanal **;**	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** acetaldehyde **IGNORE** formulae (as name asked for in Q)

Question			Answer	Marks	Guidance
3	(c)	(iii)	ethanol **and** carbon dioxide **;**	1	**Mark the first 2 answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** formulae **IGNORE** alcohol unless specified as 'ethyl alcohol' **IGNORE** (oxidised) NAD **DO NOT CREDIT** NADP / reduced NAD / ATP
3	(c)	(iv)	**1** releases NAD **,** to accept more H / to be reduced again / so glycolysis can continue **or** allows (some) ATP to be generated (in glycolysis) **;** **2** (some ATP available) for named cellular process **;** **3** AVP **;**	2 max	***1*** the idea that cells can still respire is not quite enough ***2*** eg • active transport • endocytosis / exocytosis / pinocytosis • mitosis / meiosis • protein synthesis • DNA replication • Calvin cycle / light-independent stage of photosynthesis ***3*** eg • stated situation where oxygen is in short supply (e.g. waterlogging / compacted soil / roots situated very deep in soil) **IGNORE** can respire in low oxygen conditions (as stated in Q)
			Total	**11**	

Question			Answer	Marks	Guidance
4	(a)		*oxygen* **1** oxygen ***only*** produced in one (named) stage of photosynthesis **;** **2** oxygen ***produced*** might be used for respiration **;** *carbon dioxide* **3** CO_2 ***only*** used in one (named) stage of photosynthesis **;** **4** CO_2 ***produced*** during respiration might be used for **,** photosynthesis / light independent reaction / Calvin cycle **;** **5** O_2 / CO_2 / both **,** could be an underestimate **or** represents net production (O_2) **or** represents net use (CO_2) **;**	2 max	***1*** **CREDIT** for O_2 'only measures the rate of the light dependent stage / photolysis' ***3*** **CREDIT** for CO_2 'only measures the rate of the Calvin cycle' ***5*** **ACCEPT** a description e.g. 'measurement is less than expected because not all the oxygen produced can be measured' (but not if expressed in terms of terms of experimental error – e.g. dissolves in the water) **IGNORE** refs to reliability / accuracy
4	(b)	(i)	light <u>intensity</u> **;**	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**

Question			Answer	Marks	Guidance
4	(b)	(ii)	carbon dioxide <u>concentration</u> / partial pressure of CO_2 / temperature **;** AVP **;**	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** **'**high' or 'low', as these indicate situations rather than factors eg • stomatal density • stomatal size • chlorophyll concentration • number of chloroplasts • enzyme turnover rate **IGNORE** (temporary) changes in stomatal **,** opening / closing **IGNORE** ref to water availability
	(b)	(iii)	(aerobic / anaerobic) respiration **;**	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** Krebs cycle / link reaction / decarboxylation **DO NOT CREDIT** photorespiration (as light intensity stated as being low)

Question			Answer	Marks	Guidance
4	(b)	(iv)	**1** at 0 **,** respiration only / no photosynthesis **;** *between 0 and X* **2** *idea that* (rate of) respiration is greater than (rate of) photosynthesis **;** *at X* **3** *idea that* (rate of) respiration equals (rate of) photosynthesis / at compensation point **;** *after X* **4** *idea that* (rate of) photosynthesis is greater than (rate of) respiration **;**	3 max	Assume that candidate is answering in the same order as the bullet points, unless otherwise indicated. **IGNORE** photorespiration throughout **CREDIT** **'**Calvin cycle' for 'photosynthesis' throughout For **mps 2, 3 & 4** must include clear ref. to both respiration and photosynthesis ***2*** **DO NOT CREDIT** no photosynthesis
4	(c)	(i)	reduced NADP / NADPH / $NADPH_2$ / $NADPH^+$ **;** ATP **;** oxygen **;**	3	**Mark the first 3 answers.** **IGNORE** numbers of molecules **ACCEPT** O_2 (to be consistent with the other answers to this question)

Question			Answer	Marks	Guidance
4	(c)	(ii)	**1** prevents <u>photophosphorylation</u> **;** **2** cyclic **<u>and</u>** non-cyclic **;** **3** no / less **,** ATP / reduced NADP **,** for **,** light-independent stage / Calvin cycle / GP to TP **;** **4** no (named) substrate made for <u>respiration</u> **;**	2 max	***3*** 'no ATP for photosynthesis' is not quite enough **DO NOT CREDIT** (oxidised) NADP ***4*** substrate eg glucose / starch / carbohydrate / sucrose / sugars **IGNORE** triose phosphate / food / nutrients
			Total	**13**	

Question			Answer	Marks	Guidance
5	(a)	(i)	islet(s) of Langerhans **;**	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** **IGNORE** α and β cells
5	(a)	(ii)	beta / β **;**	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** b **IGNORE** islets (of Langerhans) **DO NOT CREDIT** B (confusion with immune system)

Question			Answer	Marks	Guidance
5	(b)		*in gap order* **1** increases **;** **2** glycolytic / glycolysis **;** **3** depolarised **;** **4** calcium **;** **5** exocytosis **;**	5	**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*** **CREDIT** rises / gets higher **ACCEPT** 'is high' ***2*** **IGNORE** metabolic / respiratory ***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 ***4*** **IGNORE** Ca or Ca^{2+} (as Q has asked for words) **DO NOT CREDIT** if incorrect symbols given (e.g. Ca^{+} , CA^{2+})
5	(c)	(i)	ribosome / <u>rough</u> endoplasmic reticulum / <u>R</u>ER **;**	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** **IGNORE** rRNA (as this is not *where* proteins are made)

Question			Answer	Marks	Guidance
5	(c)	(ii)	**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	**IGNORE** ref. to mechanism of insulin secretion **IGNORE** ref. to negative feedback control of insulin secretion ***2*** **DO NOT CREDIT** if ref. to carbohydrate ***4*** **IGNORE** 'fuses with membrane' ***5*** eg • detail of modification (splitting / recombining, polypeptide) • role of cytoskeleton • use of ATP (in context of, modification / movement)
			Total	**11**	