

Question	E answers	Mark	Additional Guidance								
1 (a (i))	<table border="1"> <tr> <td>stimulus</td> <td>(blue) light / (change in) light intensity / dim to bright light ;</td> </tr> <tr> <td>receptor cells</td> <td>cones / rods ;</td> </tr> <tr> <td>effector</td> <td>(circular) muscle, of / in, iris ;</td> </tr> <tr> <td>response</td> <td>pupil, gets smaller / constricts / AW ;</td> </tr> </table>	stimulus	(blue) light / (change in) light intensity / dim to bright light ;	receptor cells	cones / rods ;	effector	(circular) muscle, of / in, iris ;	response	pupil, gets smaller / constricts / AW ;	[4]	<p>ignore retina (as it is a tissue)</p> <p>R ciliary muscle R radial muscle</p> <p>R muscle / pupil, contracts ignore muscle contraction</p>
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(ii)	<p><i>if marked in the context of accommodation or a mixture of the two reflexes, then mark to max 3</i></p> <p>1 (nervous / electrical) <u>impulses</u> ;</p> <p>2 sent by / initiated by, (named) receptors / sensory cells / retina ; R if optic nerve, sends / initiates / AW, the impulse</p> <p>3 via / along / through, <u>sensory neurone(s)</u> / <u>optic nerve</u></p> <p>4 to, brain / CNS / grey matter ; ignore spinal cord</p> <p>5 (from the brain) via / along / through, <u>motor neurone</u> (to effector) ;</p>	[max 4]	<p>MP1 – M5 ignore ‘signals’ / ‘messages’ / AW</p> <p>ignore relay / connector / inter-, neurone ;</p> <p>ignore ‘impulses to brain’ after the response has happened</p>								

Question	Answers	Mark	Additional Guidance
<p>1 (b) 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>11</p> <p>12</p> <p>13</p> <p>14</p>	<p>increase in, heart / pulse, rate ;</p> <p>increase in, breathing rate / depth of breathing ;</p> <p><u>more</u> oxygen, taken in / absorbed ; <i>linked to MP2</i></p> <p>for (increase rate of) <u>aerobic</u> respiration ;</p> <p><u>more energy released</u> ; R energy produced</p> <p>vasodilation in / arteries widen in / <u>more</u> blood to, muscle / brain ;</p> <p><u>more</u> oxygen to muscles ; <i>linked to MP1 or MP6</i></p> <p>vasoconstriction in / <u>less</u> blood to, gut / skin ;</p> <p>stimulates, breakdown / conversion, of glycogen to glucose in liver ;</p> <p>increases <u>glucose</u> (concentration) in the <u>blood</u> ;</p> <p>dilates pupils ;</p> <p>lets more light into eye ;</p> <p>heightened sensitivity / increased mental awareness / AW ;</p> <p>AVP ; e.g. increased width of (named) airways, increase in blood pressure</p>	[max 5]	<p>R 'lots of heart beats' unqualified / increases heart beat</p> <p>MP3 accept oxygen taken in faster</p> <p>MP4 ignore metabolic rate increases</p> <p>MP6 accept faster blood supply to muscle</p> <p>MP7 accept faster supply of oxygen to muscle</p> <p>MP8 accept slower blood supply to gut / skin</p> <p>MP9 ignore glycogen to glucose in muscle</p> <p>MP10 does not have to be linked to MP9</p> <p>MP13 R 'excited'</p>
<p>(c)</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p>	<p><i>assume answers are about involuntary unless told otherwise</i></p> <p>automatic / no conscious decision / does not involve thought / involves decision making ;</p> <p>higher centres / AW, of brain not involved ;</p> <p>faster / immediate ;</p> <p>response always the same ;</p> <p>involves, one / small number of, muscle(s) ;</p> <p>may involve glands ;</p> <p>they are protective / AW ;</p>	[max 2]	<p>ignore voluntary / involuntary responses can / cannot be controlled unqualified</p>

2 (a)	A <u>cell membrane</u> ; B cytoplasm ; C nucleus	[3]	
(b) (i)	retina ;	[1]	
(ii)	fovea / yellow spot ; blind spot / optic disc / end of optic nerve ;	[2]	
(c)	1 light absorbed (by a pigment) ; 2 rods detect low light (intensity) ; 3 give 'black and white' vision / do not detect colour ; 4 provide night vision / AW ; 5 cones detect high light (intensity) ; 6 cones detect colour ; 7 any detail, e.g. three different types of cone ; 8 convert light into (electrical) <u>impulses</u> ; 9 <u>impulses</u> sent to brain ; 10 via, neurones / sensory nerve / optic nerve ;	[max 4]	
		[Total: 10]	

Question		Answers	Marks	Additional Guidance
3	(a)	A – pancreas ; B – insulin ; C – <u>glucagon</u> ;	[3]	A Islet(s) of Langerhans <i>although not an organ</i>
	(b)	(i) liver ;	[1]	
	(ii)	glycogen less reactive than glucose ; <i>idea that</i> is not lost from cell by diffusion ; not used up in respiration ; decreases concentration of solute(s) ; <i>idea that</i> this prevents a decrease in water potential ; so reducing excess uptake of water ; by osmosis ; prevents cell bursting (as a result of osmosis) ;	[max 2]	
	(c)	<u>negative feedback</u> ;	[1]	
	(d) (i)	gene identified / location found ; cut from, DNA / chromosome ; inserted into, plasmid / vector ; plasmid inserted into bacterium ; AVP ;	[max 3]	restriction enzymes / ligases

	(ii)	<p><i>advantages for max 2</i> increases, yield / production ; increases profits ; fewer animals need to be kept ; less waste / less pollution ;</p> <p><i>disadvantages to max 2</i> puts health of animals at risk ; consumers may not buy 'genetically modified food' ; ref to health scares with hormonally-treated animals ; ref to health scares with use of GM products ; AVP ; e.g. ref to milk surpluses</p>	[max 3]	e.g. mastit A GM
	[Total: 13]			

Question	E	Answers	Marks	Additional Guidance
4	(a)	detect / sense / feel, changes / stimuli ; make response(s) / react / AW ;	2	ignore specific example of response
	(b)	F to skin receptor ; G to sensory neurone ; H to biceps ;	3	Label line to actual part only. R lines to motor end plate or neurone
	(c)	automatic ; no thought required / not a conscious action ; stimulus always leads to the same response ;	max 2	ignore refs to speed of response A no (higher centres in) brain involved A fixed response
	(d)	1 rapid response ; 2 protective / AW ; 3 mechanical damage / injury ; 4 e.g. ; 5 already present immediately after birth ;	max 3	i.e. before learning can take pla
	(e)	1 heart beats faster ; 2 increased rate of breathing ; 3 trachea / bronchi / bronchioles / airways, dilate / widen 4 vasoconstriction / AW, in gut / skin; 5 vasodilation / AW, in muscles ; 6 stimulates breakdown of glycogen in the liver ; 7 increases blood glucose concentration ; 8 dilate pupils ; 9 heightened sensitivity / increased mental awareness / AW;	max 3	A increase pulse (rate) A more oxygen to muscles R 'adrenaline breaks down glycogen' A sharper senses / more alert / AW
			[Total: 13]	