

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><b>ignore</b> retina (as it is a tissue)</p> <p><b>R</b> ciliary muscle <b>R</b> radial muscle</p> <p><b>R</b> muscle / pupil, contracts <b>ignore</b> muscle contraction</p>
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response	pupil, gets smaller / constricts / AW ;										
<p>(ii)</p> <p>1 (nervous / electrical) <u>impulses</u> ;</p> <p>2 sent by / initiated by, (named) receptors / sensory cells / retina ; <b>R</b> 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 ; <b>ignore</b> spinal cord</p> <p>5 (from the brain) via / along / through, <u>motor neurone</u> (to effector) ;</p>	<p><i>if marked in the context of accommodation or a mixture of the two reflexes, then mark to max 3</i></p>	[max 4]	<p><b>MP1 – M5 ignore</b> ‘signals’ / ‘messages’ / AW</p> <p><b>ignore</b> relay / connector / inter-, neurone ;</p> <p><b>ignore</b> ‘impulses to brain’ after the response has happened</p>								

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<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> ; <b>R</b> 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><b>R</b> 'lots of heart beats' unqualified / increases heart beat</p> <p><b>MP3</b> accept oxygen taken in faster</p> <p><b>MP4 ignore</b> metabolic rate increases</p> <p><b>MP6</b> accept faster blood supply to muscle</p> <p><b>MP7</b> accept faster supply of oxygen to muscle</p> <p><b>MP8</b> accept slower blood supply to gut / skin</p> <p><b>MP9 ignore</b> glycogen to glucose in muscle</p> <p><b>MP10</b> does not have to be linked to <b>MP9</b></p> <p><b>MP13 R</b> '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><b>ignore</b> voluntary / involuntary responses can / cannot be controlled unqualified</p>

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

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

	<b>(ii)</b>	<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 <b>A GM</b>
	<b>[Total: 13]</b>			

Question	E	Answers	Marks	Additional Guidance
4	(a)	detect / sense / feel, changes / stimuli ; make response(s) / react / AW ;	2	<b>ignore</b> specific example of response
	(b)	<b>F</b> to skin receptor ; <b>G</b> to sensory neurone ; <b>H</b> to biceps ;	3	Label line to actual part only. <b>R</b> 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	<b>ignore</b> refs to speed of response <b>A</b> no (higher centres in) brain involved <b>A</b> fixed response
	(d)	<b>1</b> rapid response ; <b>2</b> protective / AW ; <b>3</b> mechanical damage / injury ; <b>4</b> e.g. ; <b>5</b> already present immediately after birth ;	max 3	i.e. before learning can take pla
	(e)	<b>1</b> heart beats faster ; <b>2</b> increased rate of breathing ; <b>3</b> trachea / bronchi / bronchioles / airways, dilate / widen <b>4</b> vasoconstriction / AW, in gut / skin; <b>5</b> vasodilation / AW, in muscles ; <b>6</b> stimulates breakdown of glycogen in the liver ; <b>7</b> increases blood glucose concentration ; <b>8</b> dilate pupils ; <b>9</b> heightened sensitivity / increased mental awareness / AW;	max 3	<b>A</b> increase pulse (rate)  <b>A</b> more oxygen to muscles <b>R</b> 'adrenaline breaks down glycogen'  <b>A</b> sharper senses / more alert / AW
			<b>[Total: 13]</b>	