14. Coordination and response

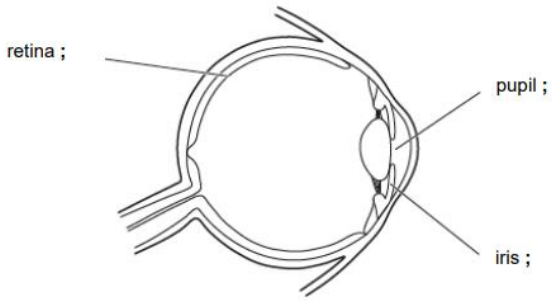
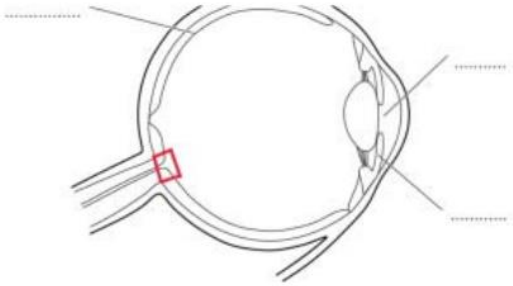
14.2 Sense organs

Paper 3 and 4

Marking Scheme

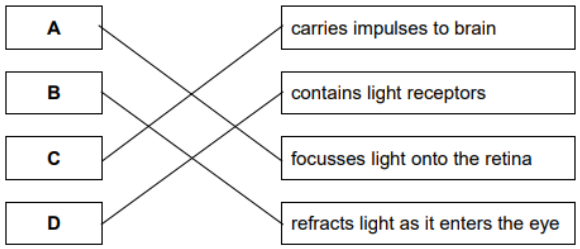
Q1.

(a)	*any three from:* chemical ; sound ; touch / pressure / pain ; temperature ;	**3**	

(b)(i)		**3**	
(b)(ii)	**X** on diagram where optic nerve meets the retina ; 	**1**	**A** centre of X within the red box / circle around optic disc
(c)(i)	refracted ; lens ; receptors ; brain ;	**4**	

(c)(ii)	(pupil diameter) gets bigger / dilates / AW ;	**1**	

Q2.

(a)(i)	 ;;;	**3**	3 marks for 4 correct lines 2 marks for 2 or 3 correct lines 1 mark for 1 correct line **R** each additional line
(a)(ii)	**X** drawn on the blind spot ;	**1**	
(b)	*any three from:* iris widens / AW ; pupil becomes smaller / AW ; to reduce the amount of light entering (the eye) / to prevent too much light entering the eye / to adapt to bright light conditions / AW ; to prevent damage (to the retina) ; ref. to (pupil light) reflex ;	**3**	
(c)	*any two from:* temperature ; touch / pressure ; pain ;	**2**	

Q3.

(a)	groups of receptor cells ; responding to specific stimuli ;	**2**
(b)(i)	retina ;	**1**
(b)(ii)	*any three from:* cornea ; pupil / iris ; lens ; AVP ;	**3**
(b)(iii)	label line ending on the optic nerve ;	**1**
(b)(iv)	transmits (electrical) impulses to the brain / AW ;	**1**

Q4.

(a)	iris shaded on diagram ;	1	
(b)	cornea → controls how much light enters eye iris → refracts light lens → focuses light retina → carries impulses to brain optic nerve → contain light receptors ;;;	3	1 mark for 1 correct 2 marks for 2 / 3 correct 3 marks for 4 correct
(c)(i)	(change in) temperature / cold / fear ;	1	
(c)(ii)	(hair) erector muscles ;	1	

Q5.

(a)	1 (groups of) receptor (cells / tissues) OR group of tissues, working together / to perform specific function ; 2 detecting / sense / reacting / responding, (specific named) stimuli / (change in) surrounding OR transmits impulse to (sensory) neurone ;	2	

(c)	*any four from:* *distribution:* 1 both (rods and cones) found in, retina / A ; 2 (high concentration of / more) cones / no rods, are found in the fovea / **B** ; 3 no rods or cones, at blind spot / **C** ; *function:* 4 (rods / cones) are light receptors OR detect / respond / sensitive, to light OR convert light energy to, (nerve / electrical) impulse ; 5 rods sense / detect / respond to, low light intensity / dim light / AW / give night vision **and** give, greyscale / black and white, image ; 6 cones sense / detect / respond to, high light intensity / bright light / AW **and** detect colour / give colour vision / (different cones) absorb different wavelengths (of light) ;	4	

Q6.

(a)(i)	*any two from:* eggs laid in / larvae live in, water and adults live on land / AW ; two stage life cycle / AW ; gas exchange occurs through skin (and lungs) ; larva have gills and adults have lungs ; moist skin (described) ; AVP ;	**2**	
(a)(ii)	**G** cornea ; **H** lens ;	**2**	

Q7.

(c)(i)	**P** draw on the graph in the fovea (area on the graph where there is the highest number of cone cells and no rod cells) ; **Q** draw on the graph in the blind spot (area on the graph where there are no cone cells or rod cells) ;	**2**	

(c)(ii)	*any five from:* *describe:* 1 more rod cells than cone cells ; 2 (number of) cone cells peak, in the middle / at the fovea ; 3 there are no rod cells where the number of cone cells is highest ; 4 ref. to uneven distribution of rod cells, either side of the, middle / fovea ; 5 no rod cells **and** no cone cells at blind spot ; *explanation:* 6 light absorbed (by a pigment) ; 7 rods detect low light (intensity) ; 8 (rods) do not detect colour ; 9 (rods) provide night vision / AW ; 10 (cones) detect high light (intensity) ; 11 (cones) detect colour ; 12 any detail, e.g. three different types of cone ; 13 (no rods and cones at blind spot) because of optic nerve ;	**5**	
(c)(iii)	more rods present **and** no / fewer cones present ; rods at the fovea / rods mainly at periphery ;	**2**	**A** more rods than cones **A** more rods in the middle

Q8.

<table>
<tr><td>(a)(i)</td><td>refraction ;</td><td>1</td><td></td></tr>
<tr><td>(a)(ii)</td><td>any three from:
ciliary muscles contract ;
tension in suspensory ligaments decreases ;
lens becomes more convex ;
causing more refraction ;</td><td>3</td><td></td></tr>
<tr><td>(b)(i)</td><td>any four from:
rods / cones, are light receptors OR detect / respond / sensitive, to light ;

rods:
sensitive to / function in, light of low intensity OR used for night vision ;
provide black and white vision ;

cones:
sensitive to light of high intensity ;
ref. to three different types of cone ;
provide colour vision ;
AVP ;</td><td>4</td><td></td></tr>
<tr><td>(b)(ii)</td><td><table><tr><th rowspan="2">receptor</th><th colspan="3">distribution across the retina</th></tr><tr><th>peripheral retina</th><th>blind spot</th><th>fovea</th></tr><tr><td>rods</td><td>many</td><td>none</td><td>none / few</td></tr><tr><td>cones</td><td>few</td><td>none</td><td>many</td></tr></table>;
;
;</td><td>3</td><td>one mark for each correct column</td></tr>
</table>

Q9.

<table>
<tr><td>(b)(i)</td><td>motor ;</td><td>1</td><td></td></tr>
<tr><td>(b)(ii)</td><td><table><tr><th>part of the eye</th><th>function</th><th>letter in Fig. 1.1</th></tr><tr><td>suspensory ligament</td><td>• controls / changes, shape / size, thickness, of lens
• ref. to accommodation / focusing
• attachment of lens to ciliary muscles</td><td>G</td></tr><tr><td>circular muscles / iris</td><td>contracts in response to a bright light</td><td>E</td></tr><tr><td>cornea</td><td>refracts / bends, light</td><td>D</td></tr><tr><td>fovea</td><td>contains a high density of cones for colour vision</td><td>J</td></tr></table>;;;;</td><td>4</td><td>one mark per row</td></tr>
<tr><td>(c)(i)</td><td>(ciliary muscles) contract / conduction of (nerve) impulses ;</td><td>1</td><td></td></tr>
</table>

Q10.

<table>
<tr><td>(c)</td><td>blinking / pupil reflex / iris reflex / accommodation / corneal reflex / tear reflex / AVP ;</td><td>1</td><td></td></tr>
</table>

Q11.

(b)(i)	groups of receptor cells ; responding to specific stimuli ;	**2**	

(b)(ii)	<table><tr><td>action</td><td>structure</td></tr><tr><td>relaxes</td><td>circular muscles (of the iris) ;</td></tr><tr><td>contracts</td><td>radial muscles (of the iris) ;</td></tr><tr><td>widens</td><td>pupil ;</td></tr></table>	**3**	

Q12.

(b)(i)	fovea ;	**1**	
(b)(ii)	lens drawn with correct shape and position ; light rays are shown refracted in, cornea / lens ; light rays focused on fovea ;	**3**	
(b)(iii)	(ciliary) muscles relax ; suspensory ligaments are, taut / tight / tense / are pulled / AW ; so ligaments pull on lens ; lens is, thin(ner) / flatter / less convex / elliptical shape / stretched ; light is refracted less ;	**3**	
(c)	*idea that* size of pupil, decreases / constricts / gets smaller ; iris in the correct context ; circular muscles (of iris) contract ; radial muscles (of iris) relax ; ref to antagonistic muscles ;	**3**	

Q13.

(a)	accommodation ; antagonistic ; peripheral ; optic ; brain ;	**5**	

Q14.

(a)	<table><tr><th>function</th><th>name of part</th><th>letter on Fig. 4.1</th></tr><tr><td>carries impulses to the brain</td><td>optic nerve</td><td>**Y** ;</td></tr><tr><td>focuses light onto the back of the eye</td><td>lens</td><td>**S** ;</td></tr><tr><td>controls the tension of the suspensory ligaments</td><td>ciliary, muscles / body</td><td>**Q** ;</td></tr><tr><td>tissue the detects light and colour</td><td>retina</td><td>**W** ;</td></tr><tr><td>location of most cone cells</td><td>fovea</td><td>**X** ;</td></tr></table>	**5**	one mark for each correct row
(b)(i)	antagonistic ;	**1**	
(b)(ii)	accommodation ;	**1**	

(c)	cones are less sensitive in low light ; cones detect colour ; rods work in low light but can't detect colour / AW ;	**2**	