Mark scheme – The Nervous System (F)

Question			Answer/Indicative content	Marks	Guidance
1			C ✓	1 (AO2.1)	
			Total	**1**	
2			B ✓	1 (AO1.1)	
			Total	**1**	
3			C	1 (AO 1.1)	
			Total	**1**	
4			D	1 (AO 1.1)	
			Total	**1**	
5			B	1 (AO 1.1)	
			Total	**1**	
6			D	1 (AO 1.1)	
			Total	**1**	
7			A	1 (AO 1.1)	**Examiner's Comments** ? **Misconception** This is an AO1.1 question testing recall of the structure of the eye and its functions. Many candidates chose either C or B. Only candidates who performed well overall chose the correct answer A. Candidates seem to have the misconception that light enters the eye first through either the pupil or lens and very few were aware of the function of the cornea.
			Total	**1**	
8		i	(sensory) receptor ✓	1 (AO2.1)	**IGNORE** neurone
		ii	brain ✓ motor ✓	2 (AO1.1)	**ALLOW** CNS **IGNORE** relay

			Total	3	
9	i		(the allele) is recessive ✓	1 (AO 2.1)	**ALLOW** neither dominant **Examiner's Comments** Candidates need to apply their knowledge and understanding of genetics to achieve this mark. It differentiated well with the higher ability candidates' understanding that the allele is recessive. The majority of candidates referred to the number of eyes, and that they need two to become stronger / dominant, which did not gain credit.
	ii		The retina is damaged/doesn't function ✓	1 (AO 1.1)	**ALLOW** retina detects light / focuses the image / contains light receptors **Examiner's Comments** This was a well differentiated question. The majority of lower ability candidates did not gain the mark as common answers were too generalised such as 'it affects the eyes'.
			Total	2	
10	a		pupil has dilated (in diagram B)✓ radial muscles contracted✓ to allow more light into the eye✓	3 (AO 2.1) (AO 1.1) (AO 1.1)	**ALLOW** pupil is larger **IGNORE** eyes / iris dilated **ALLOW** reflex action has occurred **Examiner's Comments** Candidates needed to recall details of how light entering the eye is controlled and apply this to the situation described in the question to be successful. Candidates often got mixed up in describing changes moving from the beach to the café. Although many could describe the change in size of the pupil few could explain how it happens. Radial muscles were not mentioned and where muscles were mentioned this was usually incorrect as they referred to ciliary muscles and suspensory ligaments. The understanding that this was a reflex action was rarely seen.
	b	i	person **X** is short–sighted✓ person **Y** is long–sighted✓	2 (AO 2 x 2.1)	**ALLOW** person X is myopic / has myopia **ALLOW** person Y is hypermetropic / has hypermetropia (hyperopia) **Examiner's Comments** The question assessed application of knowledge of eye defects. Most candidates referred to short sighted and long sighted with many identifying the correct person. However, some identified the defects but made the incorrect choice of person.
		ii	person X concave/divergent lens **and** person Y convex/convergent lens✓ idea that concave lenses diverge light rays /	3 (AO 1.1) (AO 2 x 2.1)	**ALLOW** minus powered lens **ALLOW** plus powered lens **Allow** diagram showing lens diverging light

11			person X needs a lens to diverge light rays (before they enter the eye)✓ idea that convex lenses converge light rays / person Y needs a lens to converge light rays (before they enter the eye)✓		 **Allow** diagram showing lens converging light Must be stated which diagram refers to which lens or person. **Examiner's Comments** Candidates needed to recall the appropriate lenses required to correct the eye defects and explain how these lenses work to gain maximum marks. The identification of the corrective lenses was achieved by higher ability candidates, but it was very rare to see anyone demonstrate an understanding of how these corrective lenses work. Both corrective lenses needed to be correctly identified to score the first marking point and some candidates only managed to identify one. **Exemplar 3** This exemplar indicates that the candidate clearly understands what is happening to light rays after passing through the corrective lens. Although they have not used the correct terminology of diverging and converging, credit has been given to the descriptions of what is happening to the light rays. The marks awarded for an explanation of how the lenses work could have been gained from a diagram, but this type of response was not seen. This could be an area for candidates to develop their examination technique to recognise when diagrams could support an answer, if they find difficulty in writing down their ideas.
		Total		**8**	
11			brain✓ egg✓ oestrogen✓ progesterone✓	4 (AO 4 x 1.1)	**ALLOW** estrogen **Examiner's Comments** Here AO1.1 recall was assessed for the role of hormones in the menstrual cycle. Most candidates gained one mark for the egg. Some also identified the brain and some got all four marks. However,

					occasionally candidates unfortunately got the two hormones the wrong way around.
		Total		**4**	
12	a	sight✓		1 (AO 2.2)	**ALLOW** visual **ALLOW** to see when it's coming **ALLOW** light **IGNORE** eyes **Examiner's Comments** The question assessed AO2.2. Very few candidates identified that sight/light was the stimulus, many referring to the distance the ruler dropped. This indicates a lack of understanding of what a stimulus is, linked to the receptors involved.
	b	use ten left (dominant) hand students / ten right (dominant) hand students✓ opposite non–dominant hand tested for left/right handedness✓ **Any one from:** similar sample sizes / similar aged groups✓ compare means for each group✓		3 (AO 3 x 3.3a)	**ALLOW** add another table where student is left handed **ALLOW** same reaction room **ALLOW** compare reaction times for each group **ALLOW** set amount of left/right handed people **Examiner's Comments** This question assessed AO3, analysis of information to improve experimental procedures. Very few candidates identified the need to keep the number of left/right (dominant) handed the same as in the experiment. Even fewer suggested testing the non-dominant hand. However, many candidates did gain marks for comparing the means.
	c	receptor✓ motor neurone✓		2 (AO 2 x 1.1)	**correct order needed** **Examiner's Comments** The question assessed recall AO1.1 for the structure of a reflex arc. Where candidates gained marks, it was usually for the motor nerve. Some also got the receptor but, there were instances where candidates couldn't quite recall the correct name and words like reaction and reactor were seen.
	d	i	mode = 0.26 (seconds) ✓	1 (AO 2.2)	**Examiner's Comments** This question assessed AO2.2. Most had the correct response to this question. Occasionally candidates would forget the decimal point and put 26 or 0.25 as their answer.
		ii	(means are identical so) no difference between reaction time in each hand ✓ (mode shows) non–dominant hand most often faster reaction✓	2 (AO 2 x 3.2b)	**ALLOW** they are very similar to each other **ALLOW** left side quicker/better to catch ruler **Examiner's Comments** This question assessed AO2.2. Most had the correct response to this

14				question. Occasionally candidates would forget the decimal point and put 26 or 0.25 as their answer.	
	e		include the units✓ record results in rank order✓	**2 (AO 2 x 3.3b)**	**ALLOW** put seconds in headings **ALLOW** sort the order **Examiner's Comments** This question set out to assess AO3, analyse information to improve experimental procedures, specifically related to recording data. Few candidates responded to the question in terms of improving the recording of their results. Most included experimental design elements to increase reliability or accuracy but not the actual recording of the data. Some candidates correctly identified that recording raw data of distance would be valuable (for peer review) and higher ability candidates did recognise that rank ordering the data would have improved the recording to help the mode calculation.
		Total		**11**	
13	a		detected by receptors in skin (1)	1	to gain marks these need to be in the correct sequence
			impulse sent along sensory neurone (1)	1	
			to spinal cord / CNS (1)	1	
			impulse sent along motor neurone (1)	1	**ignore** brain
			to (hand / arm) muscles / effectors (1)	1	
	b	i	conclusion: as diameter increases so does speed of impulse (1)	1	
		i	but there are exceptions e.g. all speeds for B are greater than for C even though the diameters overlap (1)	1	must include example, but **allow** other valid examples from data
		ii	cannot make a (valid) conclusion (1)	1	
		ii	although D has lowest speeds it also has the smallest diameter (and the results might be due to this) (1)	1	
		Total		**9**	
14			D	1	
		Total		**1**	
15			D	1	

		Total	**1**	
16	a	detected by receptors in skin (1)	1	To gain marks these need to be in correct sequence
		impulse sent along sensory neurone (1)	1	
		to spinal cord / CNS (1)	1	
		impulse sent along motor neurone (1)	1	**ignore** brain
		to (hand / arm) muscles / effectors (1)	1	
	b	to avoid (further) damage (1)	1	**allow** ora
		the reaction needs to be rapid (1)	1	
		the brain would slow down the reaction time (1)	1	
		Total	**8**	
17		B	1	
		Total	**1**	
18		B	1	
		Total	**1**	