Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1		i	Female without SMA ✓	1 (AO 2.1)	**Examiner's Comments** Less than half of the candidates were able to use the information given to identify the correct phenotype. Incorrect responses typically selected one of the options given in the following question (e.g. heterozygous, homozygous dominant, or homozygous recessive). Other candidates attempted to write the genotype rather than state the phenotype.
		ii	Homozygous recessive ✓	1 (AO 3.1b)	**Examiner's Comments** This was answered correctly by around half of all candidates. There didn't appear to be a common distractor. Where there was an incorrect response, it was evenly spread between the other options.
		iii	Person **C** has SMA ✓ Their motor neurones cannot pass impulses to their muscles ✓ Their muscles cannot contract ✓	3 (AO 2.1 x 3)	**ALLOW** signals as AW for impulses **ALLOW** muscles cannot move **Examiner's Comments** Less than half of all candidates gained a mark on this question. Where 1 mark was given, it was usually for identifying that person C had SMA. Candidates were unable to then develop their response, tending just to repeat the information given in the question.
			Total	**5**	
2		i	Similarity: (They both) have a brain ✓	2 (2 x AO 2.1)	**ALLOW** eyes are close to the brain

<table>
<tr><td></td><td></td><td></td><td>Difference:

(Only the) human has a spinal cord

OR

Octopus does not have a spinal cord ✓</td><td></td><td>IGNORE spine alone

<u>Examiner's Comments</u>

The majority of candidates scored on this question by being able to identify that the octopus and humans both have a brain. Candidates were challenged with the difference and couldn't identify that the spinal cord was missing from the octopus which makes up the CNS. The most common incorrect response from the candidates was generic, about both having nerves and not being specific about the CNS.</td></tr>
<tr><td></td><td></td><td>ii</td><td>Idea the nerve impulses do not have far to travel / takes less time for information to reach the brain/CNS ✓</td><td>1
(AO 2.1)</td><td>ALLOW idea of response/reactions will be faster/quicker/take less time
IGNORE reflexes
IGNORE reference to speed of nerve impulses/electrical signals
IGNORE send information from brain to eye

<u>Examiner's Comments</u>

Many candidates were able to identify the idea of a faster reaction time. The most common incorrect response candidates made was by not being comparative; that the response is faster or takes less time.</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>3</td><td></td></tr>
<tr><td>3</td><td></td><td></td><td>A</td><td>1
(AO 1.1)</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>1</td><td></td></tr>
<tr><td>4</td><td></td><td></td><td>
<table>
<tr><th>Structure</th><th>Part of the nervous system</th><th>Part of the endocrine system</th><th>Not part of either system</th></tr>
<tr><td>Insulin producing cells in the pancreas</td><td></td><td>✓</td><td></td></tr>
<tr><td>Kidney tubules</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td>5
(5 ×AO 1.1)</td><td>One mark for each correct row

<u>Examiner's Comments</u>

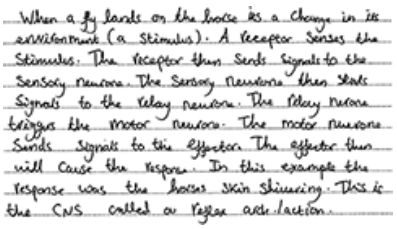
This question discriminated between candidates at different grades well. The majority achieved 3 or more marks in identifying structures of the nervous and endocrine system.

Assessment for learning</td></tr>
</table>

			<table><tr><td>Pituitary gland</td><td></td><td>✓</td><td></td></tr><tr><td>Spinal cord</td><td>✓</td><td></td><td></td></tr><tr><td>Temperature receptors in the skin</td><td>✓</td><td></td><td></td></tr></table> ✓✓✓✓✓		The most common incorrect response was not identifying insulin producing cells in the pancreas was part of the endocrine system. Candidates thought it was not part of either system. Centres could reinforce the key endocrine glands in future as a key knowledge gap.
			Total	**5**	
5			**D**	1 (AO 2.1)	
			Total	**1**	
6			**C**	1 (AO 2.1)	
			Total	**1**	
7			**A**	1 (AO 2.1)	
			Total	**1**	
8			(Person 2 has) the dominant allele (A) ✓ Unable to control their blood glucose levels / have diabetes ✓ Would not be able to feel stimuli / slower responses/reactions/reflexes ✓	3 (AO 3.1a) (AO 2.1) (AO 2.1)	**ALLOW** person 2 is heterozygous **ALLOW** reference to a specific symptom of diabetes **IGNORE** low blood sugar **ALLOW** reference to a specific stimulus **<u>Examiner's Comments</u>** This question had one of the highest no responses. The question tested the application of knowledge and understanding of scientific ideas and analysis of information to interpret. Over half of candidates scored here but very few gained full marks. The most common mark given was for symptoms of diabetes. Very few candidates identified the person had inherited the dominant allele.
			Total	**3**	
9	a	i	(Person is) short sighted ✓ **And any one from:**	2 (2 × AO 2.1)	Incorrect defect identified then no marks **ALLOW** has myopia

			Eye (ball) is too long / Lens is too powerful / Light/ray refracts too much / Light/rays not focused at the retina / Light/rays focussed in front of the retina ✓		**ALLOW** image not focused at the retina **ALLOW** image focussed in front of the retina **Examiner's Comments** More successful candidates could recognise the defect was short sightedness. Only a small number of candidates could describe the cause. Most candidates just repeated the stem of the question.
		ii	(glasses/contacts with) concave/diverging lenses / laser eye surgery ✓	1 (1 × AO 2.1)	**ALLOW** ecf for incorrect defect identified in Q20(a)(i) **Examiner's Comments** Only the more successful candidates knew the correct lens to use. Most candidates gave a generic answer of 'glasses'
	b		Change the shape of the lens / Accommodation / Focus the light (on retina) ✓	1 (1 × AO 1.1)	**ALLOW** makes clear fluid that fills the space between cornea and iris **IGNORE** contract/relax **DO NOT ALLOW** control pupil size **Examiner's Comments** This was a very challenging question for the candidates to gain marks. It's AO1 knowledge and understanding. It had the highest 'no response' attempts to answer this question.
	c		Prevent rejection ✓	1 (1 × AO 2.1)	**ALLOW** do not attack the cells/no immune response **IGNORE** same DNA **ALLOW** ORA for using donor stem cells **Examiner's Comments** This question was challenging for the candidates. The most common none scoring response was that the stem cells are their own cells.
			Total	**5**	

10			Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Provides a detailed description of a reflex arc with most components in the right order **AND** Identifies the structures involved in this specific reflex *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Provides a description of a reflex arc with some components in the correct order **AND** Identifies a structure involved in this specific reflex **OR** Provides a detailed description of a reflex arc with most components in the right order *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Provides a basic description of some components of a reflex arc **OR** Identifies a structure involved in this specific reflex *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*	6 (3 × AO 1.1) (3 × AO 2.1)	**AO1 Demonstrate knowledge and understanding of scientific ideas of a reflex arc** • Stimulus detected is by the receptor • Electrical impulses • Pass along sensory neurone • to the relay neurone • to the motor neurone • to the effector/muscle • Bypass the brain • Fast/automatic **AO2 Apply knowledge and understanding of scientific ideas to the horse reflex.** • Stimulus is the fly • The receptors are in the skin • The horse muscle/effector contracts • Response is skin shivering Maximum Level 1,2 marks if reflex action goes to the brain **Examiner's Comments** In this Level of Response question, examiners were looking for a detailed description of a reflex arc and applying it to this specific reflex. Candidates did find this challenging and those that did not get above a Level 1 was due to either not having sufficient knowledge of what a reflex was or included that the brain is involved in the response. **Misconception** A majority of candidates incorrectly identified the brain involved in a reflex action. This is AO1 knowledge and understanding. Candidates could

					benefit with revisiting co-ordinated response versus reflex action to improve their understanding. Exemplar 1  When a fly lands on the horse its a change in its environment (a stimulus). A receptor senses the stimulus. The receptor then sends signals to the sensory neurone. The sensory neurone then sends signals to the relay neuron. The relay neuron triggers the motor neurone. The motor neurone sends signals to the effector. The effector then will cause the respon. In this example the response was the horses skin shivering. This is the CNS called a reflex arc/action. Exemplar 1 shows a Level 3 response which gained 6 marks. The candidate has correctly identified the fly as the stimulus and the response is the skin shivering which identifies structures involved in this specific reflex arc. In addition, there is a detailed description of a reflex arc - stimulus detected by receptors, then signals along sensory to relay to motor neurone to effector for the response.
			Total	**6**	