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**GCSE Additional Science**



**Module B6 – Brain and Mind:**

**What you should know**

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| **Name:**  **Science Group:**  **Teacher:** |

**R.A.G. each of the statements to help focus your revision:**

*R = Red: I don’t know this A = Amber: I partly know this G = Green: I know this*

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| **B6.1 How do animals respond to changes in their environment?** | **R.A.G.** |
| I recall that a stimulus is a change in the environment of an organism |  |
| I understand that simple reflexes produce rapid involuntary responses to stimuli |  |
| I understand that the simplest animals rely on reflex actions for the majority of their behaviour |  |
| I understand that these reflex actions help to ensure that the simplest animals respond to a stimulus in a way that is most likely to result in their survival, to include finding food and sheltering from predators |  |
| I can recall examples of simple reflexes in humans, to include newborn reflexes (e.g. stepping, grasping, sucking), pupil reflex, knee jerk and dropping a hot object |  |
| I understand that nervous co-ordination, including simple reflexes, requires:  a. receptors to detect stimuli  b. processing centres to receive information and coordinate responses  c. effectors to produce the response |  |
| I understand that receptors and effectors can form part of complex organs, for example:  a. light receptor cells in the retina of the eye  b. hormone secreting cells in a gland  c. muscle cells in a muscle |  |
| I understand that nervous systems use electrical impulses for fast, short-lived responses including simple reflexes |  |
| I can recall that hormones are chemicals that are produced in glands, travel in the blood and bring about slower, longer-lasting responses, e.g. insulin and oestrogen |  |
| I can recall that the development of nervous and hormonal communication systems depended on the evolution of multicellular organisms. |  |

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| **B6.2 How is information passed through the nervous system?** | **R.A.G.** |
| I can recall that nervous systems are made up of neurons (nerve cells) linking receptor cells (e.g. in eyes, ears and skin) to effector cells (in muscles/glands) |  |
| I can recall that neurons transmit electrical impulses when stimulated |  |
| I can recall that an axon is a long extension of the cytoplasm in a neuron and is surrounded by a cell membrane |  |
| I can understand that some axons are surrounded by a fatty sheath, which insulates the neuron from neighbouring cells and increases the speed of transmission of a nerve impulse |  |
| I can recall that in humans and other vertebrates the central nervous system (CNS) is made up of the spinal cord and brain |  |
| I can recall that in the mammalian nervous system the CNS (brain and spinal cord) is connected to the body via the peripheral nervous system (PNS) (sensory and motor neurons) |  |

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| **B6.2 How is information passed through the nervous system? *Continued*** | **R.A.G.** |
| I understand that the CNS coordinates an animal’s responses via:  a. sensory neurons carrying impulses from receptors to the CNS  b. motor neurons carrying impulses from the CNS to effectors |  |
| I understand that within the CNS, impulses are passed from sensory neurons to motor neurons through relay neurons |  |
| I describe the nervous pathway of a spinal reflex arc to include receptor, sensory neuron, relay neuron, spinal cord, motor neuron and effector |  |
| **I understand that this arrangement of neurons into a fixed pathway allows reflex responses to be automatic and so very rapid, since no processing of information is required** |  |
| I can recall that there are gaps between adjacent neurons called synapses and that impulses are transmitted across them |  |
| **I understand that at a synapse an impulse triggers the release of chemicals transmitter substances) from the first neuron into the synapse, which diffuse across and bind to receptor molecules on the membrane of the next neuron** |  |
| **I understand that only specific chemicals bind to the receptor molecules, initiating a nerve impulse in the next neuron** |  |
| I can recall that some toxins and drugs, including Ecstasy, beta blockers and Prozac, affect the transmission of impulses across synapses |  |
| **I understand that Ecstasy (MDMA) blocks the sites in the brain’s synapses where the transmitter substance, serotonin, is removed** |  |
| **I understand that the effects of Ecstasy on the nervous system are due to the subsequent increase in serotonin concentration** |  |
| I can recall that the cerebral cortex is the part of our brain most concerned with intelligence, memory, language and consciousness |  |
| I understand that scientists can map the regions of the brain to particular functions (including studies of patients with brain damage, studies in which different parts of the brain are stimulated electrically, and brain scans such as MRI, showing brain structure and activity). |  |

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| **B6.3 Can reflex responses be learned?** | **R.A.G.** |
| I understand that a reflex response to a new stimulus can be learned by introducing the secondary (new) stimulus in association with the primary stimulus, and that this is called conditioning |  |
| I can describe and explain two examples of conditioning, including Pavlov’s dogs |  |
| **I understand that in a conditioned reflex the final response (e.g. salivation) has no direct connection to the secondary stimulus (e.g. ringing of a bell)** |  |
| **I understand that conditioned reflexes are a form of simple learning that can increase an animal’s chance of survival** |  |
| **I can recall that in some circumstances the brain can modify a reflex response via a neuron to the motor neuron of the reflex arc, for example keeping hold of a hot object.** |  |

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| **B6.4 How do humans develop more complex behaviour?** | **R.A.G.** |
| I understand that the evolution of a larger brain gave early humans a better chance of survival |  |
| I can recall that mammals have a complex brain of billions of neurons that allows learning by experience, including social behaviour |  |
| I understand that during development the interaction between mammals and their environment results in neuron pathways forming in the brain |  |
| I understand that learning is the result of experience where:  a. certain pathways in the brain become more likely to transmit impulses than others  b. new neuron pathways form and other neuron pathways are lost |  |
| I understand that this is why some skills may be learnt through repetition |  |
| **I understand that the variety of potential pathways in the brain makes it possible for the animal to adapt to new situations** |  |
| **I understand the implications of evidence suggesting that children may only acquire some skills at a particular age, to include language development in feral children** |  |
| 8. describe memory as the storage and retrieval of information |  |
| I can recall that memory can be divided into short-term memory and long-term memory |  |
| I understand that humans are more likely to remember information if:  a. they can see a pattern in it (or impose a pattern on it)  b. there is repetition of the information, especially over an extended period of time  c. there is a strong stimulus associated with it, including colour, light, smell, or sound |  |
| I understand how models can be used to describe memory (including the multi-store model) to include short-term memory, long-term memory, repetition, storage, retrieval and forgetting |  |
| I understand that models are limited in explaining how memory works |  |

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| **Grades A\* - C (Higher)** | All statements shown in **bold** as well as all statements shown in normal type. |
| **Grades C – G (Foundation)** | All statements shown in normal type. |