HHB Unit 3.1 Divisions of the Nervous System & Neural Pathways LOs

| Lesson(s) | ..by the end of the lesson(s) I should know… |
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| Nervous System Organisation | ☐ the **central nervous system** (CNS) includes the brain and the spinal cord<br>☐ The **peripheral nervous system** (PNS) consists of the peripheral nerves and includes the **somatic nervous system** (SNS) and **autonomic nervous system** (ANS)<br>☐ The SNS contains sensory and motor neurons<br>☐ Sensory neurons take impulses from sense organs to the CNS<br>☐ Motor neurons take impulses form the CNS to muscles and glands<br>☐ the ANS consists of **sympathetic** and **parasympathetic** nervous systems which have fibres that are antagonistic to each other<br>☐ **sympathetic system** speeds up heart and breathing rates while slowing down peristalsis and production of intestinal secretions<br>☐ **parasympathetic system** slows the heart and breathing rates but speed up peristalsis and production of intestinal secretions |
| Neural Pathways | ☐ neural pathways are routes taken by impulses through the nervous system<br>☐ in **converging neural pathways**, impulses from several neurons travel to one neuron, this increases the sensitivity to excitatory and inhibitory signals<br>☐ in **diverging neural pathways**, impulses from one neuron travel to several neurons so affecting more than one destination at the same time<br>☐ in **reverberating neural pathways**, neurons later in the pathway link with earlier neurons, sending the impulse back through the pathway. This allows repeated stimulation of the pathway. |

HHB Unit 3.2 The Cerebral Cortex LOs

| Lesson(s) | ..by the end of the lesson(s) I should know… |
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| cerebral cortex | ☐the **cerebral cortex** is the centre of conscious thought. It also recalls memories and alters behaviour in light of experience.<br>☐The cerebral cortex has functions localised in regions including sensory, motor and association areas<br>☐the **sensory area** receives impulses from the skin, organs and muscle<br>☐the **motor area** sends impulses to the skeletal muscles<br>☐there are **association areas** involved in language processing, personality, imagination and intelligence<br>☐the **cerebrum** is divided into the left and right **cerebral hemispheres**<br>☐information from one side of the body is processed by the cerebral hemisphere that is located on the opposite side of the cerebrum<br>☐the **corpus callosum** transfers information between the two cerebral hemispheres |

HHB Unit 3.3 Memory LOs

| | ..by the end of the lesson(s) I should know… |
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| Memory | ☐memory involves the encoding, storage and retrieval of information<br>☐memories include past experiences, knowledge and thoughts<br>☐all information entering the brain passes through the **sensory memory** and enters the **short-term memory (STM)**<br>☐items in the STM may be transferred to the **long-term memory (LTM)** or be discarded |
| sensory memory | ☐sensory memory retains all the audio or visual input received for a few seconds |
| short term memory | ☐**memory span** is the number of discrete items, such as letters, words or numbers, that the STM can hold<br>☐**STM** has a limited capacity and holds information for a short time<br>☐STM capacity can be improved by **chunking**, in which the items to be remembered are clustered based on items' semantic features (meaning) or perceptual features<br>☐the **serial position effect** is the tendency of a person to recall the first and last items in a series best and the middle items worst<br>☐items can be retained in the STM by **rehearsal** or lost by **displacement** or **decay**<br>☐STM can process data to a limited extent, this 'working memory model' explains why STM can perform simple cognitive tasks |
| LTM | ☐LTM has an unlimited capacity and holds information for a long time<br>☐information can be transferred the the LTM by **rehearsal**, **organisation** or **elaboration**<br>☐rehearsal is regarded as a **shallow** form of encoding information into LTM<br>☐**elaboration** is regarded as a form of **deeper** form of encoding which leads to improved information retention<br>☐**Retrieval** from LTM is aided by **contextual cues**<br>☐Contextual cues relate to the **time** and **place** when the information was initially encoded into LTM |

HHB Unit 3.4 The Cells of the Nervous System and neurotransmitters at synapses LOs

| | ..by the end of the lesson(s) I should know… |
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| neurons | ☐ **neurons** are nerve cells<br>☐ neurons have a cell body and fibres called **dendrites** and **axons**<br>☐ three types of neuron are **sensory, inter** and **motor**<br>☐ **myelination** is the covering of axon fibres with a **myelin sheath** which insulates them, increasing the speed of nervous impulses<br>☐ myelination continues from birth to adolescence<br>☐ responses to stimuli in the first two years of life are not as rapid or coordinated as those in an older child or adult<br>☐ certain diseases destroy the myelin sheath causing a loss of coordination<br>☐ **glial cells** physically support neurons and produce myelin sheaths |
| neurotransmitters at synapses | ☐ **synapses** are gaps at the junctions between neurons<br>☐ **neurotransmitters** are chemicals that relay impulses across the synaptic cleft<br>☐ **synaptic vesicles** containing chemical **neurotransmitters** are found in pre-synaptic neurons<br>☐ they are released into the **synaptic cleft** on arrival of an impulse<br>☐ they **diffuse** across the cleft and bind to receptors in the **membrane of the postsynaptic neuron**<br>☐ **receptors** in the **post-synaptic membrane** respond to neurotransmitters<br>☐ neurotransmitters must be removed from the synaptic cleft rapidly by **enzymes** or **reuptake**, to prevent continuous stimulation of the postsynaptic neurons<br>☐ receptors determine whether a signal is **excitatory** or **inhibitory**<br>☐ synapses can filter out weak stimuli resulting from insufficient secretion of neurotransmitter<br>☐ summation of a series of weak stimuli can release enough neurotransmitter to trigger an impulse<br>☐ converging neural pathways can release sufficient neurotransmitter molecules to reach the threshold to trigger an impulse |

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| mood & behaviour | ☐**endorphins** are neurotransmitters that stimulate neurons involved in reducing intensity of pain,<br>☐**increased levels of endorphins** are also linked to the feelings of pleasure obtained from activities such as eating, sex and prolonged exercise<br>☐endorphin production increases in response to severe injury, prolonged and continuous exercise, stress and certain foods<br>☐**dopamine** is a neurotransmitter that induces feelings of pleasure and reinforces particular behaviour by activating the reward pathway in the brain<br>☐**the reward pathway** involves neurons which secrete or respond to dopamine, it is activated by beneficial behaviour e.g. eating when hungry |
| medicinal drugs | ☐some medicinal drugs are used because they affect the way that neurotransmitters function<br>☐**agonist** (or agonistic) drugs are chemicals that bind to and stimulate specific receptors, mimicking the action of a neurotransmitter at a synapse<br>☐**antagonist** (or antagonistic) drugs are chemicals that bind to specific receptors, blocking the action of a particular neurotransmitter at a synapse<br>☐some drugs inhibit the enzymes that should remove the neurotransmitter from the synaptic cleft<br>☐some drugs can act by inhibit the enzymes that degrade neurotransmitters or inhibiting reuptake of the neurotransmitter at the synapse causing an enhanced effect |
| recreational drugs | ☐recreational drugs can also act as agonist or antagonists<br>☐they affect neurotransmission at the synapses in the brain, altering an individual's **mood, cognition (thinking), perception and behaviour**<br>☐many recreational drugs affect neurotransmission in the **reward** pathway of the brain<br>☐drug **addiction** is caused by repeated use of drugs that act as antagonists<br>☐**antagonists** block specific receptors causing the nervous system to respond by increasing their number and sensitivity, resulting in **sensitisation**<br>☐**sensitisation** leads to addiction where the individual craves more of the drug<br>☐**drug tolerance** results from repeated use of drugs that act as agonists<br>☐**agonists** stimulate specific receptors causing the nervous system to decrease their number and sensitivity, resulting in **desensitisation**<br>☐**desensitisation** leads to drug tolerance where the individual must take more of the drug to get an effect |

HHB Unit 3.5 Non-specific Body Defences LOs

| | ..by the end of the lesson(s) I should know… |
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| defences | ☐**non-specific defences** can be physical and chemical<br>☐epithelial cells form a physical barrier<br>☐closely-packed epithelial cells are found in the skin and inner linings of the digestive and respiratory systems<br>☐specialised cells produce chemical secretions against invading pathogens (bacteria, virus or other disease-causing organism)<br>☐secretions include tears, saliva, stomach acid and mucus |
| inflammatory reasponse | ☐**histamine** is released by **mast cells**,<br>☐histamine causes **vasodilation** and increased **capillary permeability**<br>☐increased blood flow leads to accumulation of **phagocytes** and **clotting elements** to the site of infection |
| phagocytes | ☐**phagocytes** are white blood cells that recognise pathogens and destroy them by phagocytosis<br>☐**phagocytosis** involves the engulfing of pathogens and destroying them with digestive **enzymes** contained in **lysosomes**<br>☐phagocytes release **cytokines** which attract more phagocytes to the site of infection.<br>☐cytokines are **protein** molecules that act as a **signal** to specific white blood cells causing them to accumulate at the site of infection |

HHB Unit 3.6 Specific cellular defences against pathogens LOs

| Lesson(s) | ..by the end of the lesson(s) I should know… |
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| lymphocytes | ☐ **antigens** are molecules, often proteins, on cell surfaces that can trigger an immune response<br>☐ **lymphocytes** are white blood cells involved in the specific immune response<br>☐ lymphocytes respond to **specific antigens** on invading pathogens<br>☐ lymphocytes have a single type of **membrane receptor** which is **specific** for one antigen<br>☐ **antigen binding** leads to repeated lymphocyte division resulting in the formation of a **clonal** population of identical lymphocytes<br>☐ there are two broad categories of lymphocyte, called **T lymphocytes** and **B lymphocytes** |
| B lymphocytes | ☐ B lymphocytes produce **antibodies** against antigens, which leads to the destruction of the pathogen<br>☐ antibodies are Y-shaped proteins<br>☐ antibodies have receptor binding sites specific to a particular antigen on a pathogen<br>☐ antibodies become bound to antigens, **inactivating** the pathogen<br>☐ **antibody-antigen complexes** can then be destroyed by **phagocytosis**<br>☐ B lymphocytes can respond to antigens on harmless substances e.g. pollen, this hypersensitive response is called an **allergic reaction** |

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| T lymphocytes | ☐ **T lymphocytes** destroy infected body cells by recognising antigens of the pathogen on the cell membrane and inducing apoptosis<br>☐ **Apoptosis** is programmed cell death caused by proteins released by T lymphocytes diffusing into the infected cells<br>☐ The remains of the dead cells are removed by **phagocytosis**<br>☐ **T lymphocytes** can normally distinguish between the antigens of the body's own cells (**self antigens**) and those on infected cells (**non-self antigens**)<br>☐ in **autoimmunity** there is an error in the immune system leading to **autoimmune diseases** e.g. type 1 diabetes and rheumatoid arthritis<br>☐ **autoimmune diseases** are caused by a failure of the regulation of the immune system leading to T lymphocytes responding to self-antigens and attacking the body tissues |
| immunological memory | ☐ after one exposure to an antigen some T and B lymphocytes produced survive long-term as **memory cells**<br>☐ in a second exposure to the same antigen these memory cells rapidly give rise to a new clone of specific lymphocytes<br>☐ the **secondary immune response** produces antibodies at a **faster rate** and in **higher concentration** compared to the primary immune response<br>☐ the secondary response provides **immunity** to the disease as the invading pathogens are destroyed before the individual shows symptoms |
| HIV | ☐ the human immunodeficiency virus (**HIV**) attacks and destroys **T lymphocytes**<br>☐ HIV therefore causes depletion of T lymphocytes which leads to AIDS<br>☐ AIDS = **Acquired Immune Deficiency Syndrome**<br>☐ Individuals with AIDS have a **weakened immune system** and are therefore more vulnerable to infections |

HHB Unit 3.7 Immunisation LOs

| | ..by the end of the lesson(s) I should know… |
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| vaccinations | ☐active immunity can be developed by **vaccination** with antigens from infectious pathogens to create a **memory cells**<br>☐**adjuvants** can be mixed with antigens from infectious pathogens to enhance the immune response generated by a vaccine<br>☐sources of antigens for vaccines include **inactivated pathogen toxins**, **dead pathogens**, **parts of pathogens** and **weakened pathogens** |
| herd immunity | ☐**herd immunity** occurs when large percentage of a population is immunised<br>☐in herd immunity, **non-immunised individuals are protected** as there is a lower probability that they will come into contact with infected individuals<br>☐the **herd immunity threshold** depends on the disease, the effectiveness of the vaccine and the contact parameters for the population<br>☐in the UK a number of diseases are immunised against as part of **public health programmes**<br>☐mass vaccination programmes aim to **establish herd immunity** to a disease<br>☐widespread vaccination may not be possible due to **poverty** in developing world or when a percentage of the population **rejects** the vaccine in the developed world |
| antigenic variation | ☐some pathogens can **change their antigens**, this is called antigenic variation<br>☐these pathogens can therefore **evade** the immunological memory, as it no longer recognises the antigens<br>☐the virus that causes **influenza** undergoes antigenic variation and so remains a public health problem<br>☐individuals at risk of influenza must be vaccinated **annually** |

HHB Unit 3.8 Clinical Trials of & Vaccines and Drugs LOs

| | ..by the end of the lesson(s) I should know… |
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| clinical trails | ☐vaccines and drugs undergo clinical trials to establish their safety and effectiveness before being licensed for use<br>☐designs of **clinical trials** include **randomised, double-blind** and **placebo-controlled protocols**<br>☐a **placebo** is a treatment which is inactive, it does not contain the vaccine or drug being tested<br>☐placebo-control trials allow **valid** comparisons to be made between the effect of the treatment and no treatment<br>☐in **double blind** trials neither the researchers not the subjects know which group are given the treatment and which are given the placebo<br>☐subjects in clinical trials are divided into groups in a **randomised** way to reduce **bias** in the distribution of characteristics such as gender, age<br>☐results from the groups are compared to determine if there are any **statistically significant differences** between them<br>☐**suitable group size** is important when carrying out a clinical trial to increase the reliability of results and reduce the effect of any error |