**Topic 11 Study Guide – Animal Physiology**

Remember, this is just a GUIDE. You should do other things to ACTIVELY MAKE YOUR BRAIN THINK other than reading through this. Make flashcards, go to my website and re-watch simulations, draw diagrams, build models, form study groups, or ANYTHING ELSE to help you learn. The more activities/things you do with info, the stronger your long-term memory becomes because you are making more connections with the material. To adequately prepare for the exam, you should be able to elaborate upon each of the understandings, applications and skills set forth by the IB curriculum.

**Topic 11.1 – Antibody Production and Vaccination**

**Understandings:**

* Every organism has unique molecules on the surface of its cells.
* Pathogens can be species-specific although others can cross species barriers.
* B lymphocytes are activated by T lymphocytes in mammals. [Limit the immune response to mammals. ]
* Activated B cells multiply to form clones of plasma cells and memory cells.
* Plasma cells secrete antibodies.
* Antibodies aid the destruction of pathogens.
* White cells release histamine in response to allergens.
* Histamines cause allergic symptoms.
* Immunity depends upon the persistence of memory cells.
* Vaccines contain antigens that trigger immunity but do not cause the disease.
* Fusion of a tumour cell with an antibody-producing plasma cell creates a hybridoma cell.
* Monoclonal antibodies are produced by hybridoma cells.

**Applications:**

* Smallpox was the first infectious disease of humans to have been eradicated by vaccination.
* Monoclonal antibodies to HCG are used in pregnancy test kits.
* Antigens on the surface of red blood cells stimulate antibody production in a person with a different blood group.

**Skills:**

* Analysis of epidemiological data related to vaccination programmes.

**\*\*Heavy Hitters Topic 11.1 – Practice by Trying to Draw or Write as Essay**

* Principles of vaccination
* Explain immune response
* Process of making monoclonal antibodies
* Active vs passive immunity
* Antibiotics will not work on viruses (only kill biotic (living) things, like bacteria)
* HIV infection – review from SL – look at bioninja

**Topic 11.2 Movement**

**Understandings:**

* Bones and exoskeletons provide anchorage for muscles and act as levers
* Synovial joints allow certain movements but not others
* Movement of the body requires muscles to work in antagonistic pairs
* Skeletal muscle fibres are multinucleate and contain specialised endoplasmic reticulum
* Muscle fibres contain many myofibrils
* Each myofibril is made up of contractile sarcomeres
* The contraction of the skeletal muscle is achieved by the sliding of actin and myosin filaments
* ATP hydrolysis and cross bridge formation are necessary for the filaments to slide
* Calcium ions and the proteins tropomyosin and troponin control muscle contractions

**Applications:**

* Antagonistic pairs of muscles in an insect leg

**Skills:**

* Annotation of a diagram of the human elbow
* Drawing labelled diagrams of the structure of a sarcomere
* Analysis of electron micrographs to find the state of contraction of muscle fibres

**\*Heavy Hitters Paper 2 Topic 11.2 -– Practice by Trying to Draw or Write as Essay**

* Draw and label a diagram of a sarcomere
* Explain the process of muscle contraction
* Explain role of ATP in muscle contraction
* Label structures of elbow diagram (muscles, bones, joint, tendon, ligament)

**Topic 11.3 The Kidneys**

**Understandings:**

* All animals are either osmoregulators or osmoconformers
* The Malpighian tubule system in insects and the kidney carry out osmoregulation and the removal of nitrogenous wastes
* The composition of blood in the renal artery is different from that in the renal vein
* The ultrastructure of the glomerulus and Bowman’s capsule facilitate ultrafiltration
* The proximal convoluted tubule selectively reabsorbs useful substances by active transport
* The loop of Henle maintains hypertonic conditions in the medulla
* ADH controls reabsorption of water in the collecting duct
* The length of the loop of Henle is positively correlated with the need for water conservation in animals
* The type of nitrogenous waste in animals is correlated with evolutionary history and habitat

**Applications:**

* Consequences of dehydration and overhydration
* Treatment of kidney failure by hemodialysis or kidney transplant
* Blood cells, glucose, proteins and drugs are detected in urinary tests

**Skills:**

* Drawing and labelling a diagram of the human kidney
* Annotation of diagrams of the nephron

**\*\*Heavy Hitters Topic 11.3 – Practice by Trying to Draw or Write as Essay**

* Compare blood in the renal artery vs renal vein
* How does the structure of the nephron enable the kidney to function
* Explain the process of ultrafiltration
* Explain the role of the nephron in maintaining water balance in the blood (osmoregulation)
* Explain how nephron changes the composition of the blood
* Explain the process of ADH secretion and how it is controlled
* Outline processes in kidney related to osmoregulation

**Topic 11.4 Sexual Reproduction**

**Understandings:**

* Spermatogenesis and oogenesis both involve mitosis, cell growth, two divisions of meiosis and differentiation
* Processes in spermatogenesis and oogenesis result in different numbers of gametes with different amounts of cytoplasm
* Fertilization in animals can be internal or external
* Fertilization involves mechanisms that prevent polyspermy
* Implantation of the blastocyst in the endometrium is essential for the continuation of pregnancy
* hCG stimulates the ovary to secrete progesterone during early pregnancy
* The placenta facilitates the exchange of materials between the mother and fetus
* Estrogen and progesterone are secreted by the placenta once it has formed
* Birth is mediated by positive feedback involving estrogen and oxytocin

**Applications:**

* The average 38-week pregnancy in humans can be positioned on a graph showing the correlation between animal size and the development of the young at birth for other mammals

**Skills:**

* Annotation of diagrams of seminiferous tubule and ovary to show the stages of gametogenesis
* Annotation of diagrams of mature sperm and egg to indicate functions

**\*\*Heavy Hitters Topic 11.4 – Practice by Trying to Draw or Write as Essay**

* Explain process of spermatogenesis
* Compare the process of spermatogenesis and oogenesis
* Explain the structure and function of the placenta
* Describe the process of fertilization in humans
* Outline hormonal control of the process of birth
* Annotate drawings of mature egg and sperm, as well as ovaries and testis to show stages of gametogenesis
* Role of HCG in early pregnancy – what it does, where it is secreted from (embryo)