IB Biology HL 3-4 **Name_____**
Chapter 1 Review

1.1 Introduction to Cells

- Be able to list parts of cell theory and list some atypical examples of cells (striated muscle, giant algae, aseptate fungal hyphae)
- Be able to list the 7 functions of life and how they are demonstrated by a *Paramecium* and a photosynthetic unicell (we looked at *Scenedesmus*, the book talks about *Chlamydomonas)*
- Understand that multicellular organisms have properties that emerge from the interaction of their cellular components (the sum is greater than the parts kind of idea)
- Specialized tissues can develop by cell differentiation in multicellular organisms (this is a BIG theme in IB Biology). Differentiation involves the expression of some genes and not others.
- The capacity of stem cells to divide and differentiate along different pathways is necessary in embryonic development and also makes stem cells suitable for therapeutic uses.
- Be able to describe the use of stem cells to treat Stargardt's disease and one other named condition.
- Be able to discuss the ethics of the therapeutic use of stem cells from specially created embryos, from umbilical cord blood, and from an adult's own tissues.
- Skill: Be able to use a light microscope to investigate structure of cells and tissues.
- Skill: Be able to draw cell structures as seen with a light microscope.
- Skill: Be able to calculate magnification of drawings and the actual size of structures shown in drawings or micrographs.

1.2 Ultrastructure of Cells

- Prokaryotes have simple cell structure without compartments, while eukaryotes have a compartmentalized structure.
- Prokaryotes divide by binary fission and eukaryotes divide by mitosis and cytokinesis
- Electron microscopes work by focused beams of electrons and have a much higher resolution than light microscopes.
- Applications: Be able to describe the structure and function of organelles within exocrine gland cells of the pancreas and within palisade mesophyll cells of the leaf. (Look at the pictures in the section).
- Skills: Be able to draw the ultrastructure of prokaryotic and eukaryotic cells.
- Skill: Be able to interpret electron micrographs to identify organelles and deduce function of specialized cells (again, look at the pictures in the section)

1.3 Membrane Structure

- Phospholipids form bilayers in water due to the amphipathic properties of phospholipid molecules.
- Membrane proteins are diverse in terms of structure, position in the membrane, and function.
- Cholesterol is a component of animal cell membranes (reduces membrane fluidity and permeability to some solutes among other things)
- Skill: Be able to draw the fluid mosaic model.
- Skill: Be able to analyze evidence that led to the proposal of the Davson-Danielli model (railroad tracks)
- Skill: Be able to analyze evidence that falsified the D-D model and led to the Singer-Nicolson model of the membrane

1.4 Membrane Transport

- Particles move across membranes by simple diffusion, facilitated diffusion, osmosis, and active transport
- The fluidity of membranes allows materials to be taken into cells by endocytosis or released by exocytosis
- Vesicles move materials within cells (remember that vesicles form and then fuse with other membranes; in other words, they are temporary)
- Be able to describe the structure and function of the sodium-potassium pump for active transport and potassium channels for facilitated diffusion
- Skill: Be able to estimate osmolarity in tissues when they are bathed in hypotonic and hypertonic solutions. Also, understand that tissues or organs to be used in medical procedures must be bathed in isotonic solutions to prevent osmosis

1.5 The Origin of Cells

- Cells can only be formed by division of pre-existing cells (this is part of cell theory)
- The first cells must have arisen from non-living material
- The origin of eukaryotic cells can be explained by the endosymbiotic theory
- Be able to describe the evidence from Pasteur's experiments that spontaneous generation of cells and organisms does not now occur on Earth

1.6 Cell Division

- Mitosis is the division of the nucleus into two genetically identical daughter nuclei
- Chromosomes condense by supercoiling during mitosis
- Cytokinesis occurs after mitosis and is different in plant and animal cells
- Interphase is a very active phase of the cell cycle with many processes occurring in the nucleus and cytoplasm (remember G1, S, and G2).
- Cyclins are involved in the control of the cell cycle
- Mutagens, oncogenes, and metastasis are involved in the development of primary and secondary tumours
- Application: Be able to outline the correlation between smoking and incidence of cancers (look at the section on pp 57-59 that includes many cancers, not just lung cancer)
- Skill: Be able to identify the phases of mitosis in cells viewed with a microscope.
- Skill: Be able to determine the mitotic index from a micrograph (Divide the number of cells in a phase of mitosis by the total number of cells)