**Biology Semester 1 Final Review**

**Unit 1 – Characteristics of Life & Systems**

Characteristics of Life

* Biology is the study of living things
* 7 Characteristic of life
	+ 1. Cellular Organization
		2. Uses Energy
		3. Reproduction
		4. Requires Water
		5. Respond to the Environment
		6. Uses DNA as genetic material
		7. Development
* Metabolism – all the chemical reactions that an organism carries out
	+ - Nutrition (eating food)
		- Transport (moving the nutrients in your body)
		- Respiration (Breaking food down into energy)
		- Excretion (getting rid of waste)
		- Synthesis (incorporation of food nutrients)
		- Regulation
* Homeostasis
	+ - The processes that keep living organisms stable in constantly changing environments

Systems

* An organized group of related parts that interact to form a whole
* Eg. Engine, humans, etc.

Microscopy

* 
* Diagraph adjusts amount of light
* Total magnification =ocular \* objective
* Wet mount slide
	+ 1. Take out a clear, clean slide.
		2. Place 2 drops of water on the middle of the slide.
		3. Carefully place specimen in the middle of water.
		4. Gently lower cover slip onto water drops.

**Unit 2 – Scientific Method**

Scientific Process

* Variables
	+ IV (MV) – what you change
	+ DV (RV) – what is measured due to change
	+ CV – what is kept the same
* Groups
	+ Control group – setup without IV (MV)
	+ Experimental group – setup with IV (MV)

**Unit 3 – Ecology, Pyramids and Populations**

Ecology

* The study of the interactions of living organisms with one another and their physical environments
* Levels of organisation
	+ Biosphere
	+ Ecosystem
	+ Community
	+ Population
	+ Organism
	+ System
	+ Organ
	+ Tissue
	+ Cell
	+ Molecule
	+ Atom
* Interactions
	+ Predation : + / -
	+ Parasitism: +/ -
	+ Commensalism: + / 0
	+ Mutualism: + / +
* Biotic – all living factors of an ecosystem
* Abiotic – all the non-living components of an ecosystem (amount of rain, temp, etc.)
* Food Chain – describes the feeding relationships and the path of energy
* Food Web – shows interactions between a wide variety of organisms in environment

Pyramid Models

* Trophic Levels
	+ Autotroph – capture energy from the sun and turn it into energy (plants)
	+ Heterotroph – Consumers, gets energy by eating plats or other organisms
		- Primary
		- Secondary
		- Tertiary
	+ Saprotroph – an organisms that feeds off of the dead or decaying organic matter
		- Decomposers-release energy back into the environment to be recycled
		- Detritivores
* Energy flow
	+ 90% percent of energy is given off as heat
	+ 10% moves onto the next trophic level
* Biomass – the mass of an animal minus water

Populations

* Population – all the members of a species that live in the same place at one time
* Dispersion
	+ Uniform – organized
	+ Random – scattered
	+ Clumped – forms groups
* Growth rates
	+ Depends upon:
		- + birth, emigration
		- - death, immigration
	+ Logistic
	+ Exponential (J-shaped)
	+ Carrying capacity – the number of individuals the environment can support over a long period of time
* Limiting factors
	+ Density Independent Factors – weather, fires, floods
	+ Density Dependent Factors – food shortages, space limitations, waste accumulation

**Unit 4 – Human Impact**

Cycles

* Hydrologic Cycle
	+ 
	+ Condensation
	+ Precipitation
	+ Evaporation
	+ Transpiration – release of water through the leaves of plants into the atmosphere
		- More humidity = less transpiration
		- Higher temp = more transpiration
		- More wind = more transpiration
		- Stomata – pores in plant leaves that let out water
* Carbon Cycle
	+ 
	+ Photosynthesis
		- Water and carbon make energy (glucose)
	+ Respiration
		- Energy makes water and carbon
* Nitrogen Cycle
	+ 
	+ Nitrogen gas makes up 79% of atmosphere
	+ Plants and animals need nitrogen to make proteins and DNA

**Unit 5 – Cell Discovery & Theory, Cell Structure & Function**

Cell Discovery & Theory

* First Microscope – Zacharias Jansen
* First Cell – Antony van Leewenhoek
	+ Discovered bacteria, protists, sperm cells, blood cells and nematodes
* Plants are made of cells – Mattias Schleiden 1838
* Animals are made of cells – Theodore Shwann 1839
* Cell Theory – Rudolf Virchrow
	+ All living things are composed of one or more cells
	+ In organisms, cells are the basic structure and function
	+ All cells are produced from pre-existing cells

Microscopy

* Light microscope
	+ 1,000x, uses light, can see living things, coloured images
* Electron Microscope
	+ 100,000x, uses wavelength of electrons, can’t look at living specimens, black and white images

Cell Structure & Function

* Prokaryotes
	+ no nucleus
	+ Single celled organism
	+ No membrane bound organelles
	+ Made up of Cell Wall and DNA
	+ Bacteria
* Eukaryotes
	+ Has a nucleus
	+ Membrane-bound organelles
	+ Genetic material – in nucleus
	+ Multi and single-cellular organisms
	+ Plants and Animals
* Cell Membrane – surrounds the cell, controls movement in and out of the cell
* Cytoplasm – fills the space inside the cell, maintains structure
* Cytosol – fluid environment, mostly water
* Cytoskeleton – fibres crisscrossing the cell, gives cell shape, track for organelles to move on, enables cells to move and divide
* Organelles - sub-cellular structures, perform specialized tasks
* Nucleus – brain of cell, stores DNA (instructions for making proteins)
	+ Nuclear Envelope: controls movement in and out of cell
	+ Nuclear Pore: holes that allow movement between nucleus and cytoplasm
	+ Nucleolus: dense region in the nucleus, where ribosomes are made
	+ Chromatin: genetic material (DNA) which is organised into chromosomes during cell division
* Endoplasmic Reticulum – highway of cell, interconnected network of channels that aid in the movement of molecules in the cell
	+ Rough ER
		- Ribosomes found on surface
		- Proteins leave ribosome and enter into ER where they are modified
	+ Smooth ER
		- No ribosomes on surface
		- Makes lipids
		- Breaks down alcohol and drugs
* Vesicles – small membrane enclosed sacs, transport molecules from ER to Golgi Apparatus
* Ribosome – makes proteins and found in the cytosol or on the ER
* Golgi Apparatus – processes/sorts/packages protein/lipids (from ER) for distribution within the cell
* Mitochondria – “powerhouse”, converts food into usable energy for the cell
* Vacuole – fluid filled sacs that store water, food molecules, ions and enzymes
	+ Animal cells have small vacuoles
	+ Plant cells have on large central vacuole
* Lysosomes “suicide sac”, carry enzymes to destroy cellular waste, break down damaged/worn out parts, defend cell from invading bacteria/viruses
* Animal Cells
	+ Centrioles, 2 cylindrical organelles (together make centrosome), aid in moving chromosomes during cell division, found in animals and algae
* Plant Cells
	+ Cell Wall – gives cell shape and support and provides protection
	+ Chloroplast – changes sunlight into food
	+ Central Water Vacuole
* Unicellular
	+ Single cell
	+ Bacteria, Amoeba
* Multicellular
	+ Larger organisms
	+ Different cells have different functions
	+ Humans, spiders

**Unit 7 – Lipids, Cell Membrane & Transport**

Lipids

* Organic molecule
	+ Not soluble in H20, but are soluble in oils
	+ More energy in lipids than carbohydrates
	+ Made up of C,H,O , but very little O
* Triglyceride – 1 glycerol and 3 fatty acids
	+ Saturated fatty acid – solid at room temp
	+ Unsaturated fatty – liquid at room temp
* Phospholipid- same structure as triglyceride but with 1 phosphate group
* Steroids – hormones and cholesterol

Cell Membrane and Regulation

* Cell membrane regulates what comes in and out of the cell, maintains homeostasis
* 
	+ Hydrophobic – water fearing
	+ Hydrophilic – water loving
* Fluid Mosaic
	+ Fluid – the bilayer is fluid, can move side to side
	+ Mosaic – assortment of different proteins
* Proteins
	+ Receptor Protein
		- Transmits into from outside of the cell into the cell
		- Specifically shaped proteins that fit all the way through the bilayer
		- Specifically shaped molecule fits into the protein, this causes a change on the other side of the molecule that causes a change inside of the cell
		- Eg. Hormones
	+ Marker Protein
		- Proteins that recognize self and non-self, eg. transplants
		- Only on the outside of the bilayer
		- Your body relies on marker proteins to tell one cell from another
	+ Channel Protein
		- Specifically shaped proteins that fit all the way through the lipid bilayer
		- Used to transport polar sugars, amino acids and ions (Na+)
		- Particular channels fit only certain particles (lock and key)
* Types of membrane
	+ Permeable – nearly all molecules can pass through
	+ Impermeable – nothing can pass through
	+ Semi-permeable (selectively permeable) – many molecules can pass, many cannot

Passive Transport

* Passive transport – does not expend cellular energy for movement to take place
* Parts of a solution
	+ Solute – what gets dissolved
	+ Solvent – what does the dissolving, more plentiful than solute
	+ Solution – the mixture of solvent and solutes
* 3 types of passive Transport
	+ Diffusion
		- Passive transport without a membrane
		- Transport of molecules from an area of higher to lower concentration, until equilibrium
	+ Osmosis
		- Passive transport with a membrane
		- Diffusion through a membrane
		- Movement of H2O, from high to low concentration, until equilibrium
	+ Facilitated Diffusion
		- Protein channels in the cell membrane accept only specific molecules
		- Many of these protein channels are “two-way” and are called pores
		- These transport ions or molecules (solutes) through membranes in either direction
* 3 types of Solutions
	+ Hypertonic – water leaves the cell
		- Cell shrinks
	+ Hypotonic – water enters the cell
		- Cell grows
	+ Isotonic – even amounts of solvent/ solute

Active Transport

* Needs energy

**Unit 8 – Photosynthesis and Respiration**

Photosynthesis

* The process by which light energy (from the sun) is converted to chemical energy stored in Glucose
	+ Glucose can then be used to fuel all life processes
* Autotrophs: organisms that make their own food
* In plant cells, photosynthesis takes place in the Chloroplast
	+ Thylakoid: where light energy is absorbed, and ATP (cellular energy) is made
	+ Granum (Grana): stack of Thylakoid
	+ Stroma: fluid surrounding grana. It is where glucose is made
* 6CO2 + 6H2O -> C6H12O6 + 6O2
* Light Dependent Reaction
	+ Thylakoid membrane
	+ Light energy -> Oxygen gas and ATP
	+ Green pigment, absorbs all but green wavelength light
* Light Independent Reaction (Calvin Cycle)
	+ Stroma
	+ CO2 and ATP -> Glucose
	+ Energy in ATP bonds is used to make glucose using CO2. Some of the energy from the sun is stored in the bonds of glucose
	+ CO2 enters the leaf through the stroma

Respiration

* Breaks down glucose into ATP (energy for the cell)
* In the Mitochondria
* 3 steps
	1. Glycolysis
		+ Glucose is broken down into smaller parts (2 molecules of Pyruvic acid)
		+ Produces some ATP
	2. Citric acid cycle
		+ Pyruvic acid is broken into CO2
		+ More ATP is produced
	3. Electron transport chain (ETC)
		+ Hydrogen is released and forms with oxygen to create water
		+ More ATP is produced (produces most ATP)
* C6H12O6 + 6O2 --> 6CO2 + 6H2O + energy (ATP)
* Aerobic respiration
	+ Needs oxygen
	+ Produces most ATP
* Anaerobic respiration
	+ Does not need Oxygen
	+ Only happens in oxygen deprived environments
	+ Does not produce as much ATP as aerobic