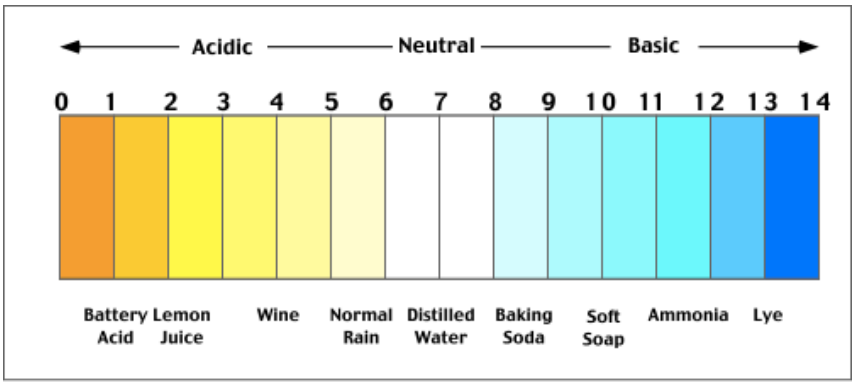
BIOL108 LECTURE NOTES

Lecture 2:

Basic Chemistry

- Atoms are the smallest unit of matter
    - Electrons (outside), Protons and neutrons (in the nucleus)
    - To be stable – must have 8 electrons on the outer ring
- A small number of elements make up living things
- Molecules: two or more atoms joined
- Compound: two or more elements joined together
    - DNA: complex compound
- Covalent Reactions e.g. Oxygen + 2Hydrogen = H-O-H (H_2O water)
    - Molecules of water stick to one another as they have a slight + and – charge (+ comes from H, - comes from O)
    - Hydrogen bonding keeps water liquid – between 0 and 100C
    - Water is a universal solvent – facilitates chemical reactions
    - Hydrogen bonding gives water cohesion – used for transport
    - Hydrogen bonding means that large amounts of energy must be gained or lost for water temperature to change significantly – stabilises temperature of organisms and oceans
    - Ice is less dense than water and floats
- pH scale:
    - More H ions = more acidic



    - Acid rain – acidic gases released into atmosphere, gases dissolve in rainwater
- Organic Molecules: always contain carbon and hydrogen
    - Structure of carbon atom allows it to form a large variety of molecules with various other elements
- Building Polymers: large molecules made by joining many smaller molecules (monomers)
    - Monomers = amino acid, nucleotide, fatty acids
    - Polymers = protein, nucleic acid, fat
- Carbohydrates: C, H and O – short term energy storage
    - Sugars are simple carbohydrates e.g. glucose
    - Glucose is released by liver as a source of energy
    - Simple sugars may be joined together in a condensation reaction to make disaccharides
- Polysaccharides: many sugars
    - Starch is the storage form of glucose in plant cells
    - Glycogen is the storage form of glucose in animal cells
    - Cellulose is a polysaccharide that makes up plant cell walls
        - Animals that rely on cellulose as a food source have bacteria that can digest cellulose
- Lipids: insoluble in water
    - Fats and oils – long term energy storage, insulate
        - Formed when glycerol condenses with fatty acid
    - Phospholipids – phosphate group
    - Steroids – complex structure of 4 carbon rings and have hormonal activity
- Proteins: polymers of amino acids
    - Joined together in condensation reactions
    - 20 different amino acids in proteins – arranged to make proteins

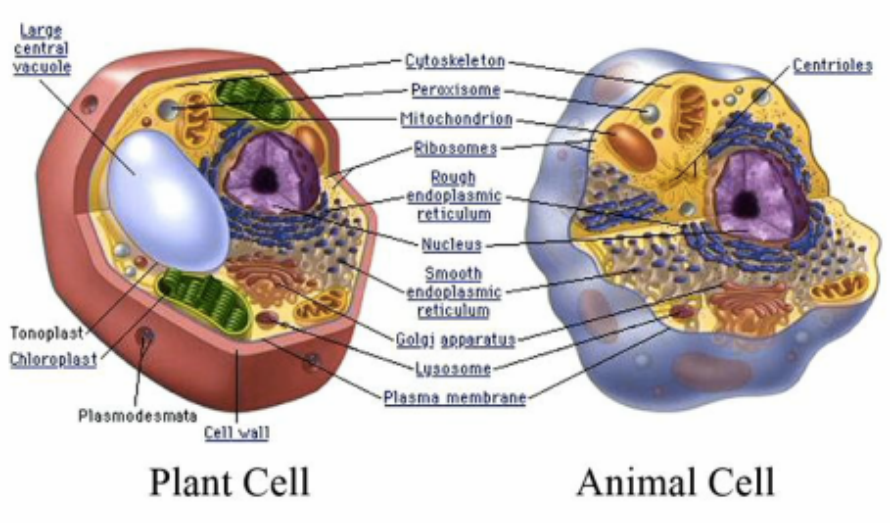
- Function:
  - Structure – components of bodies
  - Transport – haemoglobin
  - Defence – antibodies in immune system
  - Synthesis and Breakdown – enzymes
  - Communication – control body processes
- Nucleic Acid: DNA and RNA, long polymers of nucleotides
  - DNA structure

Lecture 3: Cell Structure

- Cell = smallest unit of life
  - Arise from pre-existing cells
- Discovering Cells:
  - Robert Hooke – "cells" after observing cork
  - Leeuwenhoek – described bacteria, sperm and single celled organisms

Schleiden (plant cells), Schwann (animal/plant cells = have independence),

  - chow (cells from pre-existing cells)



- Components of Cells:
  - Cell walls – structural support, cellulose
  - Plasma membrane – boundary of cells, regulates import/export, made of embedded proteins and phospholipid bilayer
  - Nucleus – membrane bound body containing DNA, sit of RNA transcription
    - Defining feature of eukaryotic cells
    - Bound by a double membrane nuclear envelope
    - Site of ribosomal subunit synthesis (protein synthesis)
  - Mitochondrion – aerobic cellular respiration
    - Powerhouse of the cell
    - Organelle composed of outer membrane and inner cristae
    - Produce ATP (energy)
    - Converts carbohydrates to oxygen, CO_2 and water
  - Chloroplast – responsible for photosynthesis
    - Captures the sun's energy and converts it to ATP
    - Thylakoids in grana stacks in stroma fluid
    - Photosynthesis/Respiration equations
  - Endoplasmic Reticulum – site of photosynthesis in proteins, transport of products by vesicle formation
    - Rough ER is a series of folded membranes studded with ribosomes
    - Products of ER are enclosed in vesicles for transport
  - Ribosome – Directs the synthesis of proteins from mRNA
  - Lysosome – contains enzymes that break down waste, involved in intracellular digestion