Grade 12 Biology
Overview of Topics

Unit 1: Biochemistry

Big Ideas

- Biological molecules and their chemical properties affect cell structure, cellular processes and biochemical reactions in all living organisms.
- Food, pharmaceutical, and medical industries use technological applications that affect biological processes and cellular functions.

Biological Molecules

- intermolecular interactions
- bond & molecule polarity - influence on intermolecular interactions
- functional groups
- major reactions: acid-base, redox, condensation, hydrolysis, phosphorylation (substrate-level and oxidative)
- macromolecules: properties, functions, monomers, bonds
- enzymes and their role in catalysis

The Cell and its Components

- major cell structures (the ones that came up over and over)
- endomembrane system and role in transport
- fluid mosaic model of the cell membrane - features and properties
- passive and active transport - definitions, examples

Unit 2: Metabolic Processes

Big Ideas

- All metabolic processes involve chemical changes and energy conversions.
- An understanding of metabolic processes enables people to make informed choices with respect to a range of personal, societal, and environmental issues.

Energy and Cellular Respiration

- endergonic vs. exergonic reactions - energy changes, stability
- ATP - role in the cell
- electron carriers - role in the two major metabolic pathways (respiration and photosynthesis), and examples
- mitochondrial structure
- stages of cellular respiration - location, major intermediate molecules, major outcomes
- alternative metabolic pathways - general concepts

Photosynthesis

- chloroplast structure
- stages of photosynthesis - location, major intermediate molecules, major outcomes
- factors affecting photosynthetic rate

Unit 3: Molecular Genetics

Big Ideas

- DNA contains all the genetic information for any living organism,
- Proteins control a wide variety of cellular processes
- Genetic research and biotechnology have social, legal, and ethical implications

DNA Structure & Replication

- double helix model of DNA - features and properties
- molecular events of DNA replication: initiation, elongation, termination + enzymes involved

Protein Synthesis

- RNA structure
- Central Dogma
- the genetic code
- molecular events of transcription and translation: initiation, elongation, termination + enzymes/molecules involved
- eukaryotic mRNA processing

Regulation of Gene Expression

- prokaryotic operons - inducible vs. repressible (general principles)
- role of transcription factors in eukaryotic gene regulation

Biotechnology

- producing recombinant DNA: steps and enzymes involved, challenges
- gel electrophoresis
- DNA fingerprinting: RFLP and STR markers
- dideoxy DNA sequencing

Unit 4: Homeostasis

Big Ideas

- Organisms have strict limits on the internal conditions that they can tolerate
- Systems that maintain homeostasis rely on feedback mechanisms and can be affected by environmental factors

The Nervous System

- homeostasis
- negative vs. positive feedback
- divisions of nervous system – central, peripheral (+ subdivisions)
- structure of neuron
- nerve potential: resting, action potential, depolarization, hyperpolarization
- action potential – events and properties
- synaptic transmission

Excretory System

- structures of the nephron
- formation of urine in the nephron: filtration, reabsorption, secretion, osmosis
- roles in homeostasis: water-salt balance, pH, endocrine roles

Endocrine System

- steroid vs. protein hormones
- role of pituitary as "master gland"
- regulation of growth and metabolism: hGH, thyroxine, parathyroid hormone, calcitonin
- regulation of sugar: insulin and glucagon
- stress response: short-term vs. long-term
- hormonal control of reproduction