

Introduction to Biology

Course Description

This course is perfect for Grade 7+ who have little or no prior experience with chemistry. There is no prerequisite. We will go over the basics of biology and get prepared for high school honors biology classes. This class is interactive and there will be minimum homework. The class will be 60 minutes long. No textbook is required.

Course Units

1. Chemistry of Life

- 1.1 Atoms, Molecules, Ions, and Bonds
- 1.2 Properties of Water
- 1.3 Organic Molecules
- 1.4 Chemical Reactions in Metabolic Processes

2. Cell Structure and Function

- 2.1 Structure and Function of the Cell
- 2.2 Prokaryotes and Eukaryotes
- 2.3 Movement of Substances

3. Cellular Respiration

- 3.1 Energy Basics
- 3.2 Generating ATP
- 3.3 Glycolysis
- 3.4 The Krebs Cycle
- 3.5 Oxidative Phosphorylation
- 3.6 Mitochondria
- 3.7 How Many ATP?
- 3.8 Anaerobic Respiration

4. Photosynthesis

- 4.1 Noncyclic Photophosphorylation
- 4.2 Cyclic Photophosphorylation
- 4.3 Calvin Cycle
- 4.4 Chloroplasts
- 4.5 Chemiosmosis in Chloroplasts
- 4.6 Photorespiration
- 4.7 Capturing Free Energy Without Light

5 Cell Communication

- 5.1 Signal Transduction Pathways
- 5.2 Gated Ion Receptors
- 5.3 Disease and Cancer

6 Cell Cycle

- 6.1 Mitosis and Cytokinesis
- 6.2 Meiosis
- 6.3 Mitosis versus Meiosis
- 6.4 Genetic Variation
- 6.5 Regulation of the Cell Cycle

7 Heredity

- 7.1 Complete Dominance, Monohybrid Cross
- 7.2 Complete Dominance, Dihybrid Cross
- 7.3 Test Crosses
- 7.4 Incomplete Dominance
- 7.5 Codominance
- 7.6 Multiple Alleles
- 7.7 Polygenic Inheritance
- 7.8 Linked Genes and Crossing Over
- 7.9 Sex Chromosomes and Sex-Linked Inheritance
- 7.10 X-Inactivation
- 7.11 Nondisjunction
- 7.12 Human Genetic Disorders
- 7.13 Environmental Influences on Phenotypic Expression
- 7.14 Non-Nuclear Inheritance

8 Gene Expression and Regulation

- 8.1 Early Experiments
- 8.2 DNA Replication
- 8.3 Protein Synthesis
- 8.4 Mutations
- 8.5 Viruses
- 8.6 Prokaryotes
- 8.7 Regulation of Gene Expression
- 8.8 Biotechnology

9 Evolution

- 9.1 Evidence for Evolution
- 9.2 Natural Selection
- 9.3 Sources of Variation
- 9.4 Causes of Changes in Allele Frequencies
- 9.5 Hardy-Weinberg (Genetic) Equilibrium
- 9.6 Speciation
- 9.7 Maintaining Reproductive Isolation
- 9.8 Patterns of Evolution
- 9.9 Microevolution vs. Macroevolution
- 9.10 The Origin of Life

10 Ecology

- 10.1 Population Ecology
- 10.2 Human Population Growth
- 10.3 Community Ecology
- 10.4 Coevolution
- 10.5 Ecological Succession
- 10.6 The Flow of Energy in Ecosystems
- 10.7 Species Diversity and Trophic Interactions
- 10.8 Biogeochemical Cycles
- 10.9 Human Impact on Ecosystems