Biology 30 (Grade 12)

Designed to help students achieve the Saskatchewan curricular outcomes for Biology 30 in an individualized learning system, this resource includes six workbook units with corresponding score keys, tests, and test keys. Students will need to use the two-volume corresponding text that is listed with the workbook set.

Upon completion of each unit, the student should be able to:

Unit 1: Cell Structure and Function

- Describe the structures and functions of cell components.
  - Review evidence for the existence of cells.
  - Observe, sketch, and describe a representative sampling of plant and animal cells.
  - Describe the structure of a cell membrane.
  - Describe the functions of the organelles found in eukaryotic cells.
  - Contrast the structure of prokaryotic and eukaryotic cells.
- Explain how the processes of diffusion and active transport are accomplished in a cell.
  - Identify the factors that influence the rate and direction of diffusion.
  - Examine the mechanisms of active transport by identifying and explaining the two processes.
    - Process One involves the expenditure of energy where a carrier molecule takes a substance from one side of a membrane to the other side of the membrane.
    - Process Two involves the in-pocketing of material by a membrane – pinocytosis and exocytosis.
  - Identify how osmosis is related to diffusion and the value of osmosis to living organisms.
  - Compare the similarities and differences between active and passive transport.

Unit 2: Photosynthesis and Respiration

- Explain in detail how the processes of photosynthesis and respiration are accomplished in a cell.
  - Recognize how the ATP-ADP system and the NAD-NADH system transfer energy within a cell.
  - Describe the processes involved in photosynthesis and then compare the process of photosynthesis with respiration.
  - Examine how the structure of the leaf is adapted for the processes involved in photosynthesis.
  - Indicate the importance of the light and dark reactions in the process of photosynthesis.
  - Compare aerobic and anaerobic metabolism.

Unit 3: Genetics, Part I

- Discuss the relationships among chromosomes, genes, and DNA.
  - Describe how the genetic code is carried on the DNA.
  - Outline the process of replication.
  - Compare mitosis and meiosis.
  - Describe the process of transcription.
  - Describe the functions of mRNA, tRNA, amino acids, and ribosomes in protein synthesis.
  - Consider the purposes of gene mapping.

- Discuss the similarities and differences between sex chromosomes and somatic chromosomes.
- Using examples from living organisms, discuss the importance of asexual and sexual reproduction to their growth and survival.

Unit 4: Genetics, Part II

- Explain the significance of Mendel's experiments and observations, and the laws derived from them.
  - Explain the concept of independent events.
  - Understand that the probability of an independent event is not altered by the outcomes of previous events.
  - Describe Mendel's experiments and observations.
  - Describe the relationship between genotype and phenotype.
  - Use the concept of the gene to explain Mendel's laws.
  - Describe the ideas of dominant and recessive traits with examples.
  - Consider the value of the Punnett square by creating examples of mono and dihybrid crosses.
  - Explain the law of segregation.
- Explain incomplete dominance, multiple alleles, multiple gene interaction, and pleiotropy.

Unit 5: Genetics, Part III

- Examine sex determination and sex-linked traits in the context of human genetics.
- Discuss the similarities and differences between sex chromosomes and somatic chromosomes.
- Describe the causes and effects of both chromosome and gene mutations.
- Discuss several human genetic disorders.
- Delineate the impact of biotechnology on our society.
  - Describe the basic processes involved in the production of recombinant DNA.
  - Discuss examples of current uses of recombinant DNA technology in the agricultural and pharmaceutical industries.
  - Discuss the techniques of genetic screening.
  - Consider the implications of genetic screening of adults, children, and fetuses.

Unit 6: Evolution

- Explain how the evolutionary theory unifies biology.
  - Describe how individual variations are produced.
  - Discuss the action of natural selection on individuals, populations, and species.
  - Explain how Darwin's observations led to his inferences about evolution.
  - Compare the development of theories of evolutionary change.
- Recognize evidence of evolution.
  - Discuss the use of the fossil record in the creation of lines of phylogeny.
  - Examine data from comparative anatomy and comparative embryology.
  - Describe instances of evolution documented in earth history.
  - Discuss the theory of continental drift and how that might have contributed to the changing variety of organisms that exist today. Where possible, consider examples.

- Examine broad climatic changes during the earth's history (ice ages, melting of the ice caps) and consider how these changes may have contributed to the changing organisms.
- Examine the effects of migration and mutations on evolutionary change.

❖ Discuss how evolution proceeds.
- Compare gradualism and punctuated equilibrium.
- Discuss the implications of the Hardy-Weinberg principle.
- Describe the role of isolation in speciation.
- Identify both pre-mating and post-mating barriers to recombination and reproduction.
- Consider the speciation and development of humans.

❖ Explain the controversy that exists between those who support evolutionary theory and those that support creation as a direct act of God, and list resources that identify with the latter position.