

NORTH BRANFORD PUBLIC SCHOOLS

Essential Curriculum

Science

Grade 9

General Science (Honors, A, B and C-levels)

Upon completion of grade 9, students will be able to:

- Describe the effects of adding energy to matter in terms of the motion of atoms and molecules, and the resulting phase changes.
- Explain how energy is transferred by conduction, convection and radiation.
- Describe energy transformations among heat, light, electricity and motion.
- Explain the relationship among voltage, current and resistance in a simple series circuit.
- Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.
- Describe the relationship between current and magnetism
- Explain how heat is used to generate electricity.
- Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity.
- Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity.
- Describe the general structure of the atom, and explain how the properties of the first 20 elements in the Periodic Table are related to their atomic structures
- Describe how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding).
- Explain the chemical composition of acids and bases, and explain the change of pH in neutralization reactions.
- Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules.
- Describe combustion reactions of hydrocarbons and their resulting by-products.
- Explain the general formation and structure of carbon-based polymers, including synthetic polymers, such as polyethylene.
- Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers.
- Explain how the chemical structure of polymers affects their physical properties.
- Explain the short- and long-term impacts of landfills and incineration of waste materials on the quality of the environment.
- Explain how chemical and physical processes cause carbon to cycle through the major earth reservoirs.
- Explain how solar energy causes water to cycle through the major earth reservoirs.
- Explain how internal energy of the Earth causes matter to cycle through the magma and the solid earth.
- Explain how the release of sulfur dioxide (SO₂) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures.
- Explain how the accumulation of carbon dioxide (CO₂) in the atmosphere increases Earth's "greenhouse" effect and may cause climate changes.
- Explain how the accumulation of mercury, phosphates and nitrates affects the quality of water and the organisms that live in rivers, lakes and oceans.
- Explain how land development, transportation options and consumption of resources may affect the environment.
- Describe human efforts to reduce the consumption of raw materials and improve air and water quality.

Curriculum Embedded Performance Tasks:

- **SOLAR COOKER**

- **SYNTHETIC POLYMERS**
- **ACID RAIN**

NORTH BRANFORD PUBLIC SCHOOLS

Essential Curriculum

Science

Grade 10

Biology I (Honors, A, B and C-levels)

Upon completion of grade 10, students will be able to:

- Explain the general formation and structure of carbon-based polymers including the biopolymers such as carbohydrate.
- Describe significant similarities and differences in the basic structure of plant and animal cells.
- Describe the general role of DNA and RNA in protein synthesis.
- Describe the general role of enzymes in metabolic cell processes.
- Explain the role of the cell membrane in supporting cell functions.
- Describe the similarities and differences between bacteria and viruses.
- Describe how bacterial and viral infectious diseases are transmitted, and explain the roles of sanitation, vaccination and antibiotic medications in the prevention and treatment of infectious diseases.
- Explain how bacteria and yeasts are used to produce foods for human consumption.
- Describe, in general terms, how the genetic information of organisms can be altered to make them produce new materials.
- Explain the risks and benefits of altering the genetic composition and cell products of existing organisms.
- Explain how meiosis contributes to the genetic variability of organisms.
- Use the Punnett Square technique to predict the distribution of traits in mono- and di-hybrid crossings.
- Deduce the probable mode of inheritance of traits (e.g., recessive/dominant, sex-linked) from pedigree diagrams showing phenotypes.
- Describe the difference between genetic disorders and infectious diseases.
- Explain how the processes of genetic mutation and natural selection are related to the evolution of species.
- Explain how the current theory of evolution provides a scientific explanation for fossil records of ancient life forms.
- Describe how structural and behavioral adaptations increase the chances for organisms to survive in their environments.
- Describe the factors that affect the carrying capacity of the environment.
- Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations.
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- Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations.
- Explain how technological advances have affected the size and growth rate of human populations throughout history.

Curriculum Embedded Performance Tasks:

- **ENZYMES**
- **YEAST POPULATION DYNAMICS**