Chemistry 12

Foundational Outcomes

NOVA SCOTIA
NOUVELLE-ÉCOSSE

2020–2021

Website References

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Prepared by the Department of Education and Early Childhood Development

This is the most recent version of the current curriculum materials as used by teachers in Nova Scotia.

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EECD has made suggestions for prioritizing outcomes to assist teachers as they support student learning. Teachers will need to make their professional decisions based on the needs of their students.

The Foundational Outcomes identified in this document represent outcomes determined to be relevant for future learning in the discipline. Decisions about foundational outcomes were made in consultation with teachers, science specialists and post-secondary institution expectations. The foundational outcomes are meant to guide teachers in making decisions about creating learning experiences that will prepare and engage their learners in a responsive way. However, a teacher's professional judgment remains the most crucial factor for responding effectively to the needs of learners.

It might be relevant for teachers to review or to seek out learning outcomes from an earlier curriculum or grade level in order to support learners moving forward with current curriculum. Sometimes, however, current curricular learnings do not directly rely on learning from the previous year and current curriculum can be engaged in without additional review.

The learning environment (face-to-face, blended, online) will continue to be an important factor that will impact the types of learning experiences with which learners are able to engage. While learning science in a hands-on, experimental way is preferred, should laboratory experiments not be possible due to public health concerns, teachers are encouraged to offer online experiment simulations, to record scientific phenomena to discuss, notice, observe and unpack with learners, to support simple, safe experiments that could be done at home, to provide authentic data that can be analysed etc…

Integrated, project-based learning and inquiry-based learning (especially in areas that connect STSE) allow for learner choice and flexible pacing which is particularly effective for students to not only learn new concepts but also for demonstrating their learning.

It is suggested that the focus for science in grades 9-12 be on using the foundational outcomes to focus on foundational understandings for future learning, encouraging cross-cutting scientific themes and application of learning. Weighting for course modules should be reflective of the amount of time spent exploring the outcomes in the module.

Unit: Thermochemistry

<u>Subtopic: THERMOCHEMISTRY STSE</u>

- compare the molar enthalpies of several combustion reactions involving organic compounds (324-7)
- write and balance chemical equations for combustion reactions of alkanes, including energy amounts (324-1)

<u>Subtopic: EXPERIMENTS WITH ENERGY CHANGES</u>

- define endothermic reaction, exothermic reaction, specific heat, enthalpy, bond energy, heat of reaction, and molar enthalpy (324-2)

- calculate and compare the energy involved in changes of state in chemical reactions (324-3)

Subtopic: THERMOCHEMISTRY AND POTENTIAL ENERGY

- illustrate changes in energy of various chemical reactions, using potential energy diagrams (324-5)

Subtopic: BONDING AND HESS'S LAW

- calculate the changes in energy of various chemical reactions using bond energy, heats of formation, and Hess's Law (324-4)

Unit: Solutions, Kinetics, and Equilibrium

Subtopic: CONCENTRATION, PROPERTIES, AND SOLUBILITY

- determine the molar solubility of a pure substance in water (323-6)

Subtopic: SOLUBILITY AND PRECIPITATES

- explain the variations in the solubility of various pure substances, given the same solvent (323-7)
- use the solubility generalizations to predict the formation of precipitates (323-8)

Subtopic: COLLISION THEORY, REACTION MECHANISMS, AND CATALYSTS

- describe collision theory and its connection to factors involved in altering reaction rates (ACC-2)
- describe a reaction mechanism and catalyst's role in a chemical reaction (ACC-3)

Subtopic: EQUILIBRIUM

- define the concept of equilibrium as it pertains to solutions (323-3)

Subtopic: LE CHÂTELIER'S PRINCIPLE AND EQUILIBRIUM CONSTANT

- explain how different factors affect solubility, using the concept of equilibrium (323-5)

Unit: Acids and Bases

Subtopic: PROPERTIES AND DEFINITIONS OF ACIDS AND BASES

- describe and apply classification systems and nomenclature used in acids and bases (214-1)
- describe various acid-base definitions up to the Brønsted-Lowry definition (320-1)

Subtopic: ACID/BASE REACTIONS

- predict products of acid-base reactions (320-2)

Subtopic: USING THE EQUILIBRIUM CONCEPT WITH ACIDS AND BASES

- compare strong and weak acids and bases using the concept of equilibrium (320-3)
- calculate the pH of an acid or a base given its concentration, and vice versa (320-4)

Subtopic: ACID/BASE TITRATIONS

- determine the concentration of an acid or base solution using stoichiometry (320-6)

Subtopic: H+, OH–, AND LE CHÂTELIER

- describe the interactions between H+ ions and OH– ions using Le Châtelier's principle (320-5)

Unit: Electrochemistry

Subtopic: REDOX AND HALF-REACTIONS

- compare oxidation-reduction reactions with other kinds of reactions (322-3)
- write and balance half-reactions and net reactions (322-2)

Subtopic: ELECTROCHEMICAL AND ELECTROLYTIC CELLS

- illustrate and label the parts of electrochemical and electrolytic cells and explain how they work (322-4)

Subtopic: REDOX REACTIONS WITH STANDARD REDUCTION POTENTIALS

- predict whether oxidation-reduction reactions are spontaneous based on their reduction potentials (322-5)
- predict the voltage of various electrochemical cells (322-6)

Subtopic: ENERGY EFFICIENCY OF CELLS

- compare electrochemical and electrolytic cells in terms of energy efficiency, electron flow/transfer, and chemical change (322-7)