

# New Curriculum: Grades 8-10 Chemistry Expectations

## Grade 8

**Content:** Students are expected to know the following

- kinetic molecular theory (KMT)
- atomic theory and models
- protons, neutrons, and quarks
- electrons and leptons

### Big Ideas – Elaborations

The behaviour of matter can be explained by the kinetic molecular theory and atomic theory.

- What are some practical applications of the kinetic molecular theory?
- What is the relationship between the atomic theory and kinetic molecular theory?

### Curricular competencies – Elaborations

- Questioning and predicting
  - How do matter and energy connect to the kinetic molecular theory?
- Qualitative: evidence expressed through words, descriptions, interviews, narratives
- Quantitative: evidence expressed through numbers and measurement
- Accuracy: how close a measured value is to the actual value
- Precision: how close measurements of the same type are to each other

### Content – Elaborations

- kinetic molecular theory (KMT): explains how particles move in different states
- atomic theory: provides evidence for the existence of atoms and molecules
- models: models can be used to represent:
  - the arrangement and motion of particles in different phases
  - the arrangement of and forces that bind protons, neutrons, and electrons in an atom
  - the quarks and leptons in protons, neutrons, and electrons
- protons, neutrons, and quarks: protons and neutrons (made of quarks) are held together in the nucleus by a strong nuclear force
- electrons and leptons: electrons (a type of lepton) are held at a distance from the nucleus through electromagnetism

## Grade 9

### **Content: Students are expected to know the following**

- element properties as organized in the **periodic table**
- the arrangement of electrons determines the **compounds** formed by elements

### **Curricular Competencies:** Students are expected to be able to do the following

#### Questioning and predicting

- Formulate multiple hypotheses and predict multiple outcomes

#### Planning and conducting

- Ensure that safety and ethical guidelines are followed in their investigations

#### Processing and analyzing data and information

- Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent and independent) and identifying inconsistencies
- Construct, analyze and interpret graphs (including interpolation and extrapolation), models and/or diagrams
- Use knowledge of scientific concepts to draw conclusions that are consistent with evidence
- Analyze cause-and-effect relationships

#### Evaluating

- Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions
- Describe specific ways to improve their investigation methods and the quality of the data
- Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled
- Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and secondary sources

#### Communicating

- Formulate physical or mental theoretical models to describe a phenomenon

### **Big Ideas – Elaborations**

The electron arrangement of atoms impacts their chemical nature.

- Which patterns are shown on the periodic table?
- How can the periodic table be represented in a different form?

### **Content – Elaborations**

- periodic table: The periodic table groups elements according to their atomic number and properties (e.g., atomic size, metals/non-metals/semi-metals, chemical families, diatomic elements).
- compounds:
  - ionic and covalent
  - names and formulas

## Grade 10

**Content:** Students are expected to know the following

- rearrangement of atoms in chemical reactions
- acid-base chemistry
- law of conservation of mass
- energy change during chemical reactions
- practical applications and implications of chemical processes, including First Peoples perspectives
- law of conservation of energy
- transformation of potential and kinetic energy

### Curricular Competencies

Questioning and predicting

- Formulate multiple hypotheses and predict multiple outcomes

Planning and conducting

- Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative)
- Ensure that safety and ethical guidelines are followed in their investigations

Processing and analyzing data and information

- Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent and independent) and identifying inconsistencies
- Construct, analyze, and interpret graphs (including interpolation and extrapolation), models, and/or diagrams
- Use knowledge of scientific concepts to draw conclusions that are consistent with evidence
- Analyze cause-and-effect relationships

Evaluating

- Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions

Communicating

- Formulate physical or mental theoretical models to describe a phenomenon

### Big Ideas – Elaborations

Chemical processes require energy change as atoms are rearranged.

*Sample questions to support inquiry with students:*

- In what ways do atoms rearrange during reactions?
- How is energy involved in chemical processes?
- What chemical processes — personal, local, or global — affect your life?
- What safety considerations need to be taken into account when dealing with chemicals?

### Curricular competencies – Elaborations

Evaluating:

*Sample questions to support inquiry with students:*

- What are possible sources of error when measuring energy change in a reaction?

Applying and innovating:

*Sample questions to support inquiry with students:*

- How would you design an emergency response plan for a chemical spill in your area?

### Content – Elaborations

- reactions: types include synthesis, decomposition, single-double replacement, combustion/oxidation, neutralization
- energy change:
  - exothermic and endothermic
  - **activation energy!**
- practical applications and implications: household chemical safety (e.g., ammonia and bleach), combustion (e.g., kindling temperature, ignition point, oxygen concentration), polymer chemistry, semiconductors, resource extraction (e.g., ore, fracking), pulp and paper chemistry, food chemistry, corrosion/prevention, tanning, traditional medicines, phytochemistry, pharmaceuticals, environmental remediation, water quality, oil spill cleanup
- impacts of energy transformations: pollution, habitat destruction, carbon dioxide output