**Area of Learning: SCIENCE — Chemistry**

**Grade 12**

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**BIG IDEAS**

- Reactants must collide to react, and the **reaction rate** is dependent on the surrounding conditions.
- **Dynamic equilibrium** can be shifted by changes to the surrounding conditions.
- **Saturated solutions** are systems in equilibrium.
- **Acid or base strength** depends on the degree of ion dissociation.
- **Oxidation and reduction** are complementary processes that involve the gain or loss of electrons.

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**Learning Standards**

<table>
<thead>
<tr>
<th>Curricular Competencies</th>
<th>Content</th>
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<tbody>
<tr>
<td><strong>Students are expected to be able to do the following:</strong></td>
<td><strong>Students are expected to know the following:</strong></td>
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</tbody>
</table>
| **Questioning and predicting** | • reaction rate  
• collision theory  
• energy change during a chemical reaction  
• reaction mechanism  
• catalysts  
• dynamic nature of chemical equilibrium  
• Le Châtelier’s principle and equilibrium shift  
• equilibrium constant ($K_{eq}$)  
• saturated solutions and solubility product ($K_{sp}$)  
• relative strength of acids and bases in solution  
• water as an equilibrium system  
• weak acids and weak bases  
• titration  
• hydrolysis of ions in salt solutions  
• applications of acid-base reactions  
• the oxidation-reduction process  
• electrochemical cells  
• electrolytic cells  
• quantitative relationships |
| • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest  
• Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world  
• 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)  
• Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods  
• Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data  
• Apply the concepts of accuracy and precision to experimental procedures and data:  
  • significant figures  
  • uncertainty  
  • scientific notation | |
| **Processing and analyzing data and information** | |
| • Experience and interpret the local environment | |
### Curricular Competencies

- Apply First Peoples perspectives and knowledge, other ways of knowing, and local knowledge as sources of information
- Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies
- Construct, analyze, and interpret graphs, 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 their 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 in primary and secondary sources
- Consider the changes in knowledge over time as tools and technologies have developed
- Connect scientific explorations to careers in science
- Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in primary and secondary sources
- Consider social, ethical, and environmental implications of the findings from their own and others’ investigations
- Critically analyze the validity of information in primary and secondary sources and evaluate the approaches used to solve problems
- Assess risks in the context of personal safety and social responsibility
## Learning Standards (continued)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Applying and innovating</strong></td>
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<tr>
<td>• Contribute to care for self, others, community, and world through individual or collaborative approaches</td>
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<tr>
<td>• Cooperatively design projects with local and/or global connections and applications</td>
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<tr>
<td>• Contribute to finding solutions to problems at a local and/or global level through inquiry</td>
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<td>• Implement multiple strategies to solve problems in real-life, applied, and conceptual situations</td>
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<td>• Consider the role of scientists in innovation</td>
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<tr>
<td><strong>Communicating</strong></td>
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<tr>
<td>• Formulate physical or mental theoretical models to describe a phenomenon</td>
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<tr>
<td>• Communicate scientific ideas and information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations</td>
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<tr>
<td>• Express and reflect on a variety of experiences, perspectives, and worldviews through <strong>place</strong></td>
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