

# Grade 9 Sciences

## Units of Study

<b>UNIT 1:</b>	<b>Cells and Metabolism</b>	<b>Start:</b> August/January	<b>Duration:</b> 8 Weeks
<ul style="list-style-type: none"> <li>• <b>Concepts:</b> Systems - human physiological systems: Balance- how the body maintains a constant environment to enable it to function.</li> <li>• <b>Subject Specific Skills:</b> Students will explore the structure and function of different cell types and their possible application. We will study nutrition and digestion and the roles of various enzymes in maintaining homeostasis in the human body.</li> <li>• <b>Learning Experiences:</b> Students will use microscopes to look at cell structures. Students will conduct a research lab about an aspect that affects enzyme activity.</li> </ul>			
<b>UNIT 2:</b>	<b>Atoms and the Periodic table</b>	<b>Start:</b> August/February	<b>Duration:</b> 8 Weeks
<ul style="list-style-type: none"> <li>• <b>Concepts:</b> Change: Balance - chemical equations &amp; charges; Patterns - periodicity, trends; Relationships - molar ratio, acidity</li> <li>• <b>Subject Specific Skills:</b> Students will transform periodic table data, describe relationships of atoms in a reaction, and conduct an experiment to distinguish between a strong acid and a weak acid.</li> <li>• <b>Learning Experiences:</b> Students will explore the trends of the periodic table through graphs, model the interactions between atoms, and communicate using acid base conventions.</li> </ul>			
<b>UNIT 3:</b>	<b>Systems and Cycles</b>	<b>Start:</b> Nov/April	<b>Duration:</b> 8 Weeks
<ul style="list-style-type: none"> <li>• <b>Concepts:</b> Systems: Balance &amp; Consequences - Systems related to photosynthesis, cell respiration, nutrient cycles, flow of energy and classification.</li> <li>• <b>Subject Specific Skills:</b> Students will explore the role of cycles in different systems. They will see how these systems function and work together as part of photosynthesis and respiration to enable organisms to survive. These systems relate to Interactions between organisms and how they are classified.</li> <li>• <b>Learning Experiences:</b> Students will investigate different systems. They will conduct a research assignment into Food Resources, Diets and Consequences. They will learn how to do academic research and write a report. They will be able to explain their scientific knowledge in a unit test.</li> </ul>			
<b>UNIT 4:</b>	<b>Forces and Motion</b>	<b>Start:</b> Nov/April	<b>Duration:</b> 9 Weeks
<ul style="list-style-type: none"> <li>• <b>Concepts:</b> Systems: Consequences &amp; interactions - Newtonian forces, energy needs; Patterns - graphing</li> <li>• <b>Subject Specific Skills:</b> Students will be able to describe motion through graphing and manipulating vectors. Using this data they will discern patterns that allow them to generalize about the energy changes at play.</li> <li>• <b>Learning Experiences:</b> Students will study motion through mathematical concepts as well as hands on experiences. They will also apply their understanding of energy transfers to discuss the dynamics involved in car safety.</li> </ul>			

# Grade 9 Sciences

## Unit 1: Cells and Metabolism

**Start:** Aug/Feb

**Duration:** 8 Weeks

### LEARNING EXPERIENCES:

In this unit, students will explore the structure and function of different cell types. They will learn about stem cells and their possible application. We will study about nutrition and how different components are broken down through digestion. Also covered is the role of enzymes in this process and the importance of homeostasis in maintaining balance inside organisms. All students will conduct a research lab about some aspect that affects enzyme activity.

### KEY CONCEPT: Systems

#### Related Concepts / Subject Specific:

Balance, Form, Function

### STATEMENT OF INQUIRY:

How does form relate to function in biological systems?

### INQUIRY QUESTIONS:

#### Factual:

What defines an organism?  
How is the body of a living thing organised?  
How does a cell's structure affect its function?

#### Conceptual:

How does form relate to function in biological systems?  
How do the parts of the cell work together to make a more complex unit?

#### Debatable:

How much should humans manipulate their bodies to improve them?

### OBJECTIVES AND ASSESSMENT CRITERIA:

#### A: Knowing and understanding

The student can use their scientific knowledge to solve problems in familiar situations and also suggest solutions to problems that are set in unfamiliar situations. The student can use information given to them to make a judgement that is based on scientific information, not just from a 'feeling'.

#### B: Inquiring and Designing

The student will learn how to design scientific investigations. They will learn how to write a research question that could be tested in a scientific investigation. They can make a useful hypothesis/prediction for an experiment, and can explain what will be changed in an experiment and how they will collect the data appropriately.

#### C: Processing and evaluating

The student will learn how to collect and process their data and be able to understand what that data means. They will learn how to know whether the results are valid. They will be encouraged to think about future experiments that could be done in this area of study.

#### D: Reflecting on the impacts of science

Students will be taught to explain the ways that science is used to address specific issues (both locally and globally). They will learn how to discuss and weigh up the good and the bad implications of using a particular application to solve an issue. They will be coached in how to use the right scientific words for the right occasion. They will learn how to give references for the work of others that they have used.

### ATLs:

Self management, Thinking.

### RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be provided on Classroom.

### SUMMATIVE ASSESSMENT TASKS:

- Criterion A - End of unit test.
- Criteria B/C - Lab Report to determine 'factors affecting enzyme activity'.

# Grade 9 Sciences

## Unit 2: Atoms and the Periodic table

**Start:** Aug/Feb

**Duration:** 8 Weeks

### LEARNING EXPERIENCES:

In this unit, students will explore chemical bonding and how this affects chemical reactions. They will see how elements are arranged on the periodic table and the trends in electronegativity. We will also study about acid/base properties and the causes and effects of acid rain. All students will conduct a research lab about distinguishing between strong and weak acids.

### KEY CONCEPT: Change & Relationships

**Related Concepts / Subject Specific:**  
Balance, Patterns, Transformation.

### STATEMENT OF INQUIRY:

Our understanding of individual relationships allows us to understand influences and explain global patterns.

### INQUIRY QUESTIONS:

<b>Factual:</b>	How do we express chemical reactions? How do we describe atoms/compounds? What is acid rain?
<b>Conceptual:</b>	What are compounds/mixtures? Why/how do atoms join together? What is an acid base reaction? How do we measure acidity?
<b>Debatable:</b>	What causes acid rain? What is an acid/base (why do we define it that way?)?

### OBJECTIVES AND ASSESSMENT CRITERIA:

<b>A: Analyzing</b>	The student can use their scientific knowledge to solve problems in familiar situations and also suggest solutions to problems that are set in unfamiliar situations. The student can use information given to them to make a judgement that is based on scientific information, not just from a 'feeling'.
<b>B: Organizing</b>	The student will learn how to design scientific investigations. They will learn how to write a research question that could be tested in a scientific investigation. They can make a useful hypothesis/prediction for an experiment, and can explain what will be changed in an experiment and how they will collect the data appropriately.
<b>C: Producing Text</b>	The student will learn how to collect and process their data and be able to understand what that data means. They will learn how to know whether the results are valid. They will be encouraged to think about future experiments that could be done in this area of study.
<b>D: Using Language</b>	Students will be taught to explain the ways that science is used to address specific issues (both locally and globally). They will learn how to discuss and weigh up the good and the bad implications of using a particular application to solve an issue. They will be coached in how to use the right scientific words for the right occasion. They will learn how to give references for the work of others that they have used.

### ATLs:

Social; Research.

### RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be provided on Classroom.

### SUMMATIVE ASSESSMENT TASKS:

- Criterion A - End of unit test.
- Criteria B/C - Lab Report to distinguish between 'Strong and Weak Acids'.

# Grade 9 Sciences

## Unit 3: Systems and Cycles

**Start:** Nov/April

**Duration:** 8 Weeks

### LEARNING EXPERIENCES:

In this unit, students will explore the role of cycles in different systems. They will see how these systems function and work together as part of photosynthesis and respiration to enable organisms to survive. We will study the interactions between organisms and how energy is transferred between them. We will also investigate how organisms can be classified to organise diverse life forms. All students will conduct a research assignment into Food Resources, Diets and Consequences.

### KEY CONCEPT: Systems

### Related Concepts / Subject Specific:

Balance, Consequences.

### STATEMENT OF INQUIRY:

Using a holistic systems approach helps us understand storages, flows, transfers and transformations in a wide variety of natural systems.

### INQUIRY QUESTIONS:

#### Factual:

What are the reactants and products for photosynthesis? How is energy transferred within ecosystems? What are the important ranks for understanding biological classification?

#### Conceptual:

What are the differences between photosynthesis and respiration? Why is it very important to understand the flow of energy in ecosystems? Why are there so many more species of invertebrates than vertebrates?

#### Debatable:

Which is more important - respiration or photosynthesis? Are 'species' a human construct? Why are Latin species names used instead of Arabic or Esperanto? Al Jahiz and Aristotle - convergence or plagiarism?

### OBJECTIVES AND ASSESSMENT CRITERIA:

#### A: Knowing and understanding

The student can use their scientific knowledge to solve problems in familiar situations and also suggest solutions to problems that are set in unfamiliar situations. The student can use information given to them to make a judgement that is based on scientific information, not just from a 'feeling'.

#### B: Inquiring and designing

The student will learn how to design scientific investigations. They will learn how to write a research question that could be tested in a scientific investigation. They can make a useful hypothesis/prediction for an experiment, and can explain what will be changed in an experiment and how they will collect the data appropriately.

#### C: Processing and evaluating

The student will learn how to collect and process their data and be able to understand what that data means. They will learn how to know whether the results are valid. They will be encouraged to think about future experiments that could be done in this area of study.

#### D: Reflecting on the impacts of science

Students will be taught to explain the ways that science is used to address specific issues (both locally and globally). They will learn how to discuss and weigh up the good and the bad implications of using a particular application to solve an issue. They will be coached in how to use the right scientific words for the right occasion. They will learn how to give references for the work of others.

### ATLs:

Self management, Research, Thinking

### RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be provided on Classroom.

### SUMMATIVE ASSESSMENT TASKS:

- Criterion A - End of unit test.
- Criteria D - Research Report on Food sustainability.

# Grade 9 Sciences

## Unit 4: Forces and Motion

**Start:** Nov/Apr

**Duration:** 9 Weeks

### LEARNING EXPERIENCES:

In this unit, students will explore the principles of kinematics and motion. They will practice interpreting speed and acceleration graphs. We will also apply formulate to calculate related values and investigate Newton's laws. This topic also included principles related to forces, and linking forces to work done, gravitational potential and kinetic energy. All students will conduct a research assignment into the physics of cell phone safety.

### KEY CONCEPT: Systems

### Related Concepts / Subject Specific:

Consequences, Interactions, Patterns.

### STATEMENT OF INQUIRY:

The pattern in which objects move within a dynamic system is a consequence of the interactions between them.

### INQUIRY QUESTIONS:

#### Factual:

What are vector and scalar quantities? What are force, impulse, work and energy? What are the Laws of Newton?

#### Conceptual:

How do you solve problems related to force, impulse, work and energy?  
How has technology succeeded in eliminating all risks from car travel?  
How is energy transformed from one form to another?

#### Debatable:

If energy is always conserved why do we need to save energy?  
Classical physics believed that the future of the universe could be predicted from knowledge of the present state. To what extent can knowledge of the present give us knowledge of the future?

### OBJECTIVES AND ASSESSMENT CRITERIA:

#### A: Knowledge & Understanding

The student can use their scientific knowledge to solve problems in familiar situations and also suggest solutions to problems that are set in unfamiliar situations. The student can use information given to them to make a judgement that is based on scientific information, not just from a 'feeling'.

#### B: Inquiring and Designing

The student will learn how to design scientific investigations. They will learn how to write a research question that could be tested in a scientific investigation. They can make a useful hypothesis for an experiment, and can explain what will be changed and how they will collect the data appropriately.

#### C: Processing and evaluation

The student will learn how to collect and process their data and be able to understand what that data means. They will learn how to know whether the results are valid. They will be encouraged to think about future experiments that could be done in this area of study.

#### D: Using Language

Students will be taught to explain the ways that science is used to address specific issues (both locally and globally). They will learn how to discuss and weigh up the good and the bad implications of using a particular application to solve an issue. They will be coached in how to use the right scientific words for the right occasion. They will learn how to give references for the work of others.

### ATLs:

Communication; Thinking; Self management

### RESOURCES / LITERATURE OPTIONS:

- Links to websites and other resources will be provided on Classroom.

### SUMMATIVE ASSESSMENT TASKS:

- Criterion A - End of unit test.
- Criteria D - Video presentation on car safety.