**Curriculum**

**Physical Science**

**Course Overview**

The Physical Science course focuses on the scientific exploration of the physical world, and provides an introduction to chemistry in the First Semester, and to physics in the Second Semester. Laboratory work forms an integral part of the course, and the students are shown how to carry out basic calculations using scientific formulas.

**Department Standards**

**STANDARD 1: THE NATURE OF SCIENCE**

**STANDARD 2: SCIENCE AND TECHNOLOGY**

**STANDARD 3: THE PHYSICAL SETTING**

**STANDARD 4: THE LIVING ENVIRONMENT**

**STANDARD 5: SCIENCE AND SOCIETY**

**Benchmarks**:

[Science Department Standards & Benchmarks](http://acidale.on-rev.com/dante/Science/Standards%26BenchmarksK-12.docx)

**Performance Indicators**

**Physical Science**

**Performance Indicators**

Interpret Scientific Theories, Laws and Models

Recognize the parts of an Experimental Design

Classify variables as independent, dependent or fixed (controlled)

Differentiate between Quantitative and Qualitative Observations

Apply the ranges of size for everyday quantities to the nearest order of magnitude

Understand what scientific standards are and why they are used

Implement the appropriate fundamental SI units for physical quantities and derive all other units such as those used for quantities such as velocity, force and energy

Execute the conversion of SI units including the use of prefixes

Explain how matter is classified

Differentiate between Pure Substances and Mixtures

Differentiate between types of homogeneous mixtures based on physical properties

Differentiate between physical properties and chemical properties

Differentiate between a physical change and a chemical change

Understand the contributions of Dalton, Thompson, Rutherford and Bohr made to the understanding of the atom

Classify the parts of the nuclear atom: state the charge, mass and position of protons, neutrons and electrons

Apply the atomic notation for an isotope to calculate the number of protons, neutrons and electrons in an atom or ion given suitable data

Compare mass number, relative mass number for isotopes of an element

Summarize the rules for determining electron configuration and write the electron configuration for a given atom using a Lewis Dot diagram

Apply the names and symbols of the elements from the periodic table and interpret the arrangement of the table

Explain the arrangement of elements in the periodic table in order of increasing atomic number

Differentiate between a group and a period

Understand the significance of a period to each element and deduce the relationship between the electron configuration of an element and its position in the periodic table

Compare the physical and chemical similarities between elements in the same representative group/family

Attribute the number of valence electrons for an element based on its position in the periodic table

Understand the properties of metals and alloys based on electron distribution

Understand the changes in atoms during the formation of chemical compounds

Explain the formation of ions and be able write the electron configuration for a given ion

Compare the electron configuration of and ion to the nearest noble gas

Understand how the sharing of electrons can result in stable covalent bonds

Apply correctly the conventions to name and write the chemical formula for a given element or compound

Classify from either the chemical properties or chemical formula a compound as metallic, ionic or molecular

Recognize the evidence that indicates a chemical reaction has occurred.

Write word and formula equations for the reactions of: composition (formation), decomposition, single replacement, double replacement and hydrocarbon combustion

Predict the products of a reaction based on reaction type

Compare the chemical activity of metals.

Determine the coefficients for the reactants and the products in order to balance a given chemical equation Identify and write the energy component for an endothermic and an exothermic reaction

State the number of atoms and molecules of each species present for a given chemical equation

Define the mole

Explain why scientists use the mole

Calculate the molar mass of a substance

Convert between mass and moles of a substance using molar mass

Define the terms solute, solvent and solution

Calculate values for the concentration of solutions.

Describe the factors that affect solubility

Apply solubility rules and flame tests for qualitative analysis

Describe the properties of an acid and a base

Understand the use of pH in describing acids and bases

Evaluate environmentally significant substances

Know the appropriate SI units for physical quantities in particular those for length, mass, time and temperature and the prefixes commonly used including scientific notation

Estimate values for everyday quantities to the nearest order of magnitude.

Read measurements with the correct degree of precision for the instrument given

Discuss scientific standards and why they are used

Know appropriate SI units and prefixes for the physical quantities of length, mass, time and temperature

Convert between different units of SI quantities

Read measurements with the correct degree of precision for the instrument given

Perform calculations using derived units for quantities such as density, area, volume and speed

Perform calculations to the appropriate number of significant digits

Perform calculations using scientific notation

Distinguish between accuracy and precision

Draw a graph from relevant data and including a title, properly labelled axes, appropriate scales and a line of best fit

Understand the significance of determining the slope and area of a graph

Distinguish between scalar and vector quantities and give examples of each

Define the concepts of distance, position, displacement, speed, velocity and acceleration to describe the motion of objects

Explain the difference between instantaneous, constant and average values of speed, velocity and acceleration

Solve problems for uniformly accelerated, one -dimensional motion by using the kinematic equations

Draw and analyze graphs of the kinematic quantities (distance, velocity and acceleration) as a function of time

Recognize that acceleration of a body in a vacuum near the Earth's surface is the acceleration of free fall (g)

State Newton's First Law of Motion (Inertia) and analyze situations in which the conditions apply

Identify forces acting on an object and draw free body diagrams representing the forces acting

State Newton's Second law of Motion (Net Force) and explain how unbalanced forces that act on a body result in the body's acceleration (F = ma)

Calculate the weight of an object (force of gravity) using the expression W = mg

Understand the friction forces (static, sliding, rolling and fluid) that oppose motion

Identify all the forces acting (e.g gravity, normal, thrust, drag, tension, lift) on a body using free body diagrams in order to calculate the net force.

State and apply Newton's Third Law of Motion (action and reaction)to show that for every interaction between two objects, there are a pair of equal and opposite forces acting.

Apply Newton’s 3rd Law.

Define thermal energy, heat and temperature

Conduct heat transfer experiments

**Assessments**

**Physical Science**

**Assessments**

**First Quarter**

Lab: Observing a Candle

Lab: Observation & Experimentation

Lab: Examination of Mixtures

Summative Unit Test 1

Lab: Electron Configuration

Summative Unit Test 2

Lab: Ionic and Molecular Compounds

Summative Unit Test 3

**Second Quarter**

Lab: Types of Chemical Reactions

Lab: What is a Mole?

Summative Unit Test 4

Lab: Formation of Precipitates

Lab: Factors affecting Solubility

Summative Unit Test 5

Lab: Properties of Acids & Bases

Summative Unit Test 6

First Semester Exam

**Third Quarter**

Science Skills Review Assignment

Lab: Uniform Motion

Lab: Non-Uniform Motion

Summative Unit Test 7

Lab: Forces

Lab: Newton’s Laws

Summative Unit Test 8

**Fourth Quarter**

Lab: Phase Change of a Pure Substance

Summative Unit Test 9

Lab: Work-Energy Transfer

Lab: Conservation of Energy

Summative Unit Test 10

Lab: Specific Heat Capacity

Lab: Latent Heat Lab

Summative Unit Test 11

Second Semester Exam

**Core Topics**

**Physical Science**

**Core Topics**

**First Quarter**

Nature of Science

Classification of Matter

Atomic Theory

Periodic Table

Formation and Nomenclature of Compounds

**Second Quarter**

Chemical Reactions

The Mole Concept

Solutions

Solubility

Properties of Acids/Bases

Environmental Chemistry

Science Skills - Measurement

**Third Quarter**

KINEMATICS

Graphical Analysis

Scalars and Vectors

Distance and Displacement

Speed and Velocity

Acceleration

Free Fall and Projectiles

DYNAMICS

Forces & Inertia

Newton’s Laws

Momentum

**Fourth Quarter**

THE PHYSICS OF MATTER

Changing States of Matter

The nature of a gas

The nature of Fluids

WORK, ENERGY and POWER

Work and Power

Mechanical Energy

Mechanical Advantage

**Specific Content**

**Physical Science**

**Specific Content**

**First Quarter**

The Nature of Science

Scientific Method

Experimental Design

Physical Quantities

SI Units and Measurement: Dimensional Analysis and Unit Conversions

Composition of Matter

Classification of Matter

Pure Substances and Mixtures

Physical and Chemical Properties

Physical and Chemical Changes

Atomic Theory

Models of the Atom: Dalton, Thompson, Rutherford, Bohr

Structure of the Atom: Atomic Notation, Nucleus (Neutrons and Protons) and Electrons

Isotopes

Electron Configuration

The Periodic Table

Groups (Families) and Periods

Relationship to Electron Configuration

Representative Groups

Structure of Metals

Metallic Bonding

Ionic Bonding

Formation of Simple Ions

Transition Metal Ions

Polyatomic Ions

Writing and Naming of Ionic Compounds

Covalent Bonding

Writing and Naming Covalent Compounds

Chemical properties of Metallic, Ionic and Covalent Compounds

**Second Quarter**

Evidence of chemical reactions

Types of chemical reactions

Writing chemical reactions

Exothermic and endothermic reactions

Balancing chemical reactions

Conservation of mass

Rates of Reaction

The mole as a number: Avogadro's number

Determination of molar mass

Conversion between mass/mole/number

Solutions

Rate of Solution

Solubility

Properties of Acids/Bases

Environmental Chemistry

Science Skills - Measurement

**Third Quarter**

Scientific standards

Conversions among SI prefixes

Reading measurements with appropriate precision

Significant digits

Graphing and slope

Scalar and vector quantities

Displacement and distance

Velocity and speed

Description of an object’s motion

Instantaneous and average speed

Acceleration

Gravity

Free fall

Projectile motion

Forces

Free body diagrams to represent forces

Newton’s first law of motion

Newton’s second law of motion

Newton’s third law of motion

**Fourth Quarter**

Heat, thermal energy and temperature

Heat transfer

Conductors and insulators

Kinetic theory

Kelvin and Celsius temperature scales

Heat capacity

Phases of matter

Heating and cooling curves

Heat of fusion, heat of vaporization

First law of thermodynamics

Second law of thermodynamics

**Resources**

**Physical Science**

**Resources**

Nature of Science: Text Ch. 1.1, 1.2, 1.3

Classification of Matter: Text Ch. 2.1, 2.2, 2.3

Atomic Theory: Text Ch. 4.1, 4.2, 4.3

Periodic Table: Text Ch. 5.1, 5.2, 5.3

Formation and Nomenclature of Compounds Text Ch. 6.4, 6.1, 6.2, 6.3

Chemical Reactions: Text Ch.7.2, 7.3

The Mole Concept: Text Ch. 7.1

Solutions: Text Ch 8.1

Solubility: Text Ch. 8.2

Properties of Acids/Bases: Text Ch. 8.3,8.4

Environmental Chemistry: Internet

Science Skills (Measurement): Text Ch. 1.3

Measurement and SI units: Text Ch 1.3

Graphical Analysis: Text Ch. 1.4

Distance and Displacement: Text Ch. 11.1

Scalars and Vectors: Text Ch. 11.1

Speed and Velocity: Text Ch. 11.2

Acceleration: Text Ch. 11.3

Free Fall: Text Ch. 11.3

Forces & Inertia: Text Ch. 12.1

Newton’s Laws: Text Ch. 12.2

Momentum: Text Ch. 12.3

Changing States of Matter Text Ch. 3.1

The nature of a gas Text Ch. 3.3

The nature of Fluids Text Ch. 13

Work and Power Text Ch. 14.1

Mechanical Energy Text Ch. 14.2

Mechanical Advantage Text Ch. 14.3