



St. Mel's Catholic School

## SCIENCE STANDARDS

### Grade Eight

#### FOCUS ON PHYSICAL SCIENCE

##### Motion

**1.0 The velocity of an object is the rate of change of its position. As a basis for understanding this concept, students know:**

- 1.1 position is defined relative to some choice of standard reference point and a set of reference directions.
- 1.2 average speed is the total distance traveled divided by the total time elapsed. The speed of an object along the path traveled can vary.
- 1.3 how to solve problems involving distance, time, and average speed.
- 1.4 that to describe the velocity of an object, one must specify both direction and speed.
- 1.5 changes in velocity can be changes in speed, direction, or both.
- 1.6 how to interpret graphs of position versus time, and speed versus time for motion in a single direction.

##### Forces

**2.0 Unbalanced forces cause changes in velocity. As a basis for understanding this concept, students know:**

- 2.1 a force has both direction and magnitude.
- 2.2 when an object is subject to two or more forces at once, the effect is the cumulative effect of all the forces.
- 2.3 when the forces on an object are balanced, the motion of the object does not change.
- 2.4 how to identify separately two or more forces acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.
- 2.5 when the forces on an object are unbalanced, the object will change its motion (that is, it will speed up, slow down, or change direction).
- 2.6 the greater the mass of an object, the more force is needed to achieve the same change in motion.
- 2.7 the role of gravity in forming and maintaining planets, stars, and the solar system.

##### Structure Of Matter

**3.0 Elements have distinct properties and atomic structure in the scientific realm created by God. All matter is comprised of one or more of over 100 elements. As a basis for understanding this concept, students know:**

- 3.1 the structure of the atom and how it is composed of protons, neutrons, and electrons.
- 3.2 compounds are formed by combining two or more different elements.



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3.3 atoms and molecules form solids by building up repeating patterns such as the crystal

structure of NaCl or long chain polymers.

3.4 the states (solid, liquid, gas) of matter depend on molecular motion.

3.5 in solids, the atoms are closely locked in position and can only vibrate; in liquids, the atoms and molecules are more loosely connected and can collide with and move past one another; in gases, the atoms or molecules are free to move independently, colliding frequently.

3.6 how to use the periodic table to identify elements in simple compounds.

### **Earth In The Solar System (Earth Science)**

**4.0 The structure and composition of the universe can be learned from the study of stars and galaxies and their evolution. As a basis for understanding this concept, students know:**

4.1 galaxies are clusters of billions of stars, and may have different shapes.

4.2 the sun is one of many stars in our own Milky Way galaxy. Stars may differ in size, temperature, and color.

4.3 how to use astronomical units and light years as measures of distance between the sun, stars, and Earth.

4.4 stars are the source of light for all bright objects in outer space. The moon and planets do not shine by their own light, but by reflected sunlight.

4.5 the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.

### **Reactions**

**5.0 Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept, students know:**

5.1 reactant atoms and molecules interact to form products with different chemical properties.

5.2 the idea of atoms explains the conservation of matter: in chemical reactions, the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.

5.3 chemical reactions usually liberate heat or absorb heat.

5.4 physical processes include freezing and boiling, in which a material changes form with no chemical reaction.

5.5 how to determine whether a solution is acidic, basic or neutral.

### **Chemistry of Living Systems (Life Sciences)**

**6.0 Principles of chemistry underlie the functioning of biological systems as created by God. As a basis for understanding this concept, students know:**

6.1 carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living things.



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6.2 living things are made of molecules largely consisting of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.

6.3 living things have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins and DNA.

### **Periodic Table**

**7.0 The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept, students know:**

7.1 how to identify regions corresponding to metals, nonmetals, and inert gases.

7.2 elements are defined by the number of protons in the nucleus, which is called the atomic number. Different isotopes of an element have a different number of neutrons in the nucleus.

7.3 substances can be classified by their properties, including melting temperature, density, hardness, heat, and electrical conductivity.