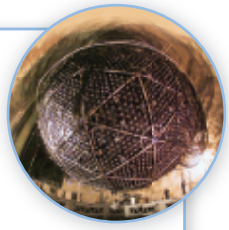
Chapter 5 Summary

5.1 Evolution of the Atomic Model

Key Concepts

- John Dalton's atomic theory described elements in terms of atoms, which he believed to be small, indivisible particles that make up all matter.
- Joseph John Thomson determined that atoms contain negatively charged particles, which are now called electrons. He developed a model of the atom that shows electrons inserted throughout a mass of positively charged material.



- Ernest Rutherford updated the model of the atom as mostly empty space, with a small, dense, positively charged nucleus in the centre. His continued work, as well as that of others, eventually led to identification of the proton and neutron in the nucleus.
- Neils Bohr revised Rutherford's model of the atom by stating that electrons are stable in specific energy levels around the nucleus.

5.2 The Structure of the Atom

Key Concepts

- Atoms are made up of protons, neutrons, and electrons. Protons are positively charged, neutrons have no charge, and electrons are negatively charged.
- The atomic number of an atom is the number of protons in the nucleus. It is always a whole number and identifies the element. The mass number of an atom is the total number of protons and neutrons. Like the atomic number, it is always a whole number.

- Protons and neutrons make up the nucleus and account for most of the mass of the atom. Electrons occupy energy levels outside the nucleus.
- Bohr-Rutherford models are used to depict the atomic structures of elements.
- An element is made up of isotopes, which are atoms that have the same number of protons but different numbers of neutrons.

5.3 The Periodic Table

Key Concepts

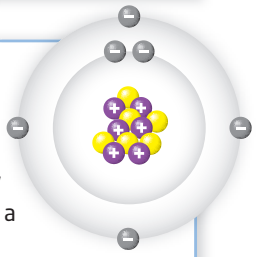
- The modern periodic table is organized according to increasing atomic number, with a regular repeating pattern in the properties of the elements.
- Metals are usually solids at room temperature, shiny, good conductors, malleable, and ductile. Non-metals are usually gases or solids at room temperature, not shiny, poor conductors, brittle, and not ductile. Metalloids share properties of both metals and non-metals.

- Poisoning by metals in the environment is a serious problem. Mercury contamination of fish has severely affected the health and traditional practices of Aboriginal peoples.
- In the periodic table, a period is a horizontal row of elements. A group, or family, is a vertical column of elements. Four major groups of elements in the periodic table are the alkali metals, alkaline-earth metals, halogens, and noble gases.

5.4 Trends in the Periodic Table

Key Concepts

- In the periodic table, there are trends in the properties of elements. These are influenced by the arrangement of electrons in the atoms of the elements.
- Valence electrons help to determine many properties of the element. The number of valence electrons in an atom is the same for elements in a group but increases as you move across a period.



- The noble gases are non-reactive because they have a full set of valence electrons. The reactivity of other elements is based on their tendency to gain, lose, or share electrons to achieve a full set of valence electrons.
- The size of an atom increases as you move down a group in the periodic table. The size of an atom also increases as you move from right to left across a period in the periodic table.