

## Chemistry Unit Review

## Safety

- Workplace Hazardous Materials Information System (WHMIS)

## Terms

- **Matter** – anything that has mass and volume.
- **Mass** - a measure of the quantity of an object. (g, kg,)
- **Volume** - a measure of space taken up (mL, L)

## 3 states of matter

- Solid
- Liquid
- gas

## Changes of states

- **Melting** – Change from a solid to a liquid
- **Evaporation** - Change from a liquid to a gas
- **Condensation** - Change from a gas to a liquid
- **Freezing** - Change from a liquid to a solid
- **Sublimation** - Change from a solid to a gas
- **Deposition** - Change from a gas to a solid

## The Particle Theory of Matter

1. All matter is composed of very tiny objects called particles.
2. Each Pure substance has its own kind of particles, different from the particles of other pure substances.
3. Particles present in matter are always in motion. They may be vibrating back and forth, as in a solid, or moving in all directions, as in a gas. In a liquid, particles stay close together but can slide past one another.
4. The particles in a substance attract each other. The amount of attraction is different for different kinds of particles. All particles have spaces between them.

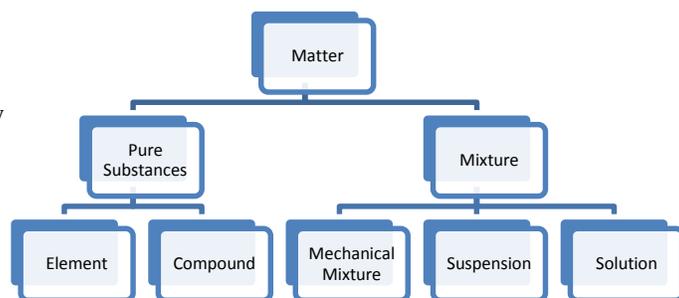
## Classification of Matter

**Pure substance** - made up of only one kind of matter

- **Element** - A pure substance that cannot be broken down into any simpler substance by chemical means.
- **Compound** - A pure substance that is made from two or more elements that are combined together chemically.

**Mixtures** - A mixture is a combination of pure substances.

- **Mechanical Mixture (heterogeneous mixture)** - Different substances that make up the mixture are visible
- **Suspension** - A cloudy mixture in which tiny particles of one substance are held within another.
- **Solution (homogeneous mixture)** - Different substances that make it up are not individually visible



**Physical Properties** - describes a characteristic of a substance that can be observed or measured without changing the composition of matter.

**Chemical property** - describes the ability of a substance to change into a new substance or substances.

1. Combustibility is the ability of a substance to burn. In order to burn a substance requires Oxygen
2. Light sensitivity is a chemical property of that can cause new substances to form when light hits it.
3. Reacting with an acid is a chemical property where when acid is poured on a substance it produces a gas and bubbles.

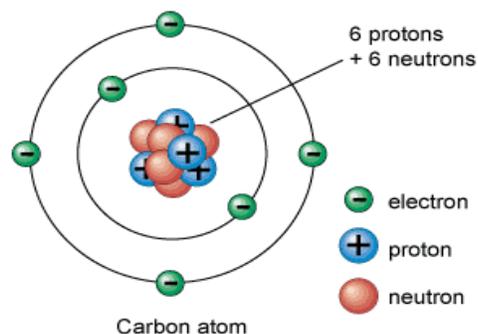
**Chemical reaction** - a process in which a chemical change occurs.

- Clues that a chemical change has occurred
  - Change in colour
  - Formation of a solid (precipitate)
  - Formation of a gas
  - Formation of a gas

- The change is difficult to reverse

### The Atom

- **Protons** - Heavy positively charged found in the nucleus
- **Neutrons** - are neutral particles that have the same mass as protons and are located in the nucleus
- **Electrons** - Negatively charged particles with almost no mass. They circle the nucleus at different energy levels.



### The Elements

- Metals
  - Malleable: The ability to be hammered or bent into a shape.
  - Lustre: They are shiny in appearance.
  - Ductile: They can be pulled into a wire.
  - Conductor of electricity: Electricity can travel through the metal.
- Non-Metals
  - Non-conductor of electricity in its solid form
  - At room temperature most are gasses (11) or solids (5) and only one is liquid.
  - Solids are brittle and lack the lustre of metals
- Metalloids
  - Some elements do not fit as metals or non-metals. These fit on either side of the staircase that divides the metals and the non-metals.
  - They have some properties of metals and some properties of non-metals. They are called **semiconductors** because they do not conduct electricity well.

### The Periodic Table

- ▶ Atomic number - the number of protons in an atom of an element.
- ▶ Atomic mass - the average mass of an element's atoms.
- ▶ Ion charge - the electric charge that an atom takes on when it loses or gains electrons.

### Determining the number of neutrons

- ▶ Subtract the atomic number (# of protons) from the Atomic mass (# of protons and neutrons)
  - **Atomic mass – atomic number (A – Z = N)**

### Bohr Diagrams

- Each orbit has a set number of electrons.

| Orbit # | # of Electrons |
|---------|----------------|
| 1       | 2              |
| 2       | 8              |
| 3       | 8              |
| 4       | 18             |

## Questions:

1. What is the main difference between a pure substance and a mixture? Name an example of each.
2. What is a chemical change?
5. Explain the difference between cohesion and adhesion, using an example.
6. Explain why particles of water in the air can form frost on a cold window.
7. Name a physical property that is:
  - (a) shared by gold, copper, and iron
  - (b) shared by gold and copper but not iron
12. Classify and compare the following mixtures.
  - (a) a drink made by dissolving drink crystals in water
  - (b) a cup of tea with tea leaves in it
  - (c) tomato juice
13. How can the application of heat result in a chemical change? Explain, using an example.

15. If water freezes inside of a building's water pipes, the pipes may burst. Explain why this happens.

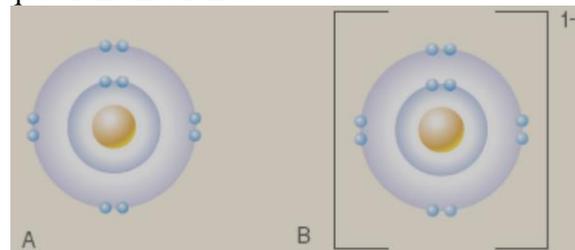
### Chapter 5

1. What is the smallest amount of an element that can exist?
2. Compare and contrast the charge, the location in an atom, and the relative mass of an electron with those of a neutron.
3. Beginning with the innermost shell, list the maximum number of electrons that an atom can have in its first three shells.
8. (a) If an atom has 43 protons, what element is it?(b) If an atom contains 66 electrons, what element is it?
10. Draw a Bohr diagram of a chlorine atom.
11. Draw a Bohr diagram of a chlorine ion.

### More Questions

1. Define the term "compound." Give an example.
2. (a)  $H_2O_2$  What elements are present in this substance and in what ratio?
  - (b) Identify hydrogen peroxide as an ionic compound or a molecular compound.
    - (a) nitrogen(b) lithium (c) aluminum (d) oxygen (e) chlorine (f) sodium (g) xenon (h) copper
4. Write the chemical name for each of the following ionic compounds.
  - (a) KI (b)  $CaCl_2$  (c)  $AlBr_3$
5. Write the formula for each of the following ionic compounds.
  - (a) lithium nitride (b) iron(II) chloride (c) sodium hydroxide
6. Write the chemical name for each of the following molecular compounds.
  - (a)  $PF_5$  (b)  $Cl_2O_3$  (c)  $CF_4$
7. Write the formula for each of the following molecular compounds.
  - (a) nitrogen monoxide (b) carbon disulphide (c) phosphorus tribromide
11. (a) What is the main difference between ionic bonds and the bonds in a molecule?
  - (b) Which generally have higher melting temperatures: ionic compounds or molecular compounds?

55. Use the Bohr diagrams below to answer the questions that follow.



- (a) Name the elements shown.
  - (b) Did the ion shown in B form by losing an electron or gaining an electron?
  - (c) Would the atom shown in A be likely to be found in an ionic compound? Explain.
  - (d) Would the ion in B be more likely to bond with  $Ca^{2+}$  or with  $O^{2-}$ ? Explain.
56. Draw Bohr diagrams to depict atoms of the following elements.
    - (a) oxygen (b) sodium (c) hydrogen