Topic 7 - Chemical Change Notes ...H1

1 Vocabulary ...H1

1.1 Chemical Change ...H2

A chemical change happens when one chemical substance is transformed into one or more different substances, such as when iron becomes rust.

1.2 Reactant ...H2

Any of the chemicals that are present at the start of a chemical reaction.

1.3 Product ...H2

Any of the chemicals that are produced as a result of a chemical reaction.

1.4 Precipitate ...H2

To come out of a liquid solution into solid form.

1.5 Synthesis ...H2

The reaction of elements or compounds to form more complex compounds.

1.6 Reactions ...H2

A transformation in which one or more substance is converted into another by combination or decomposition.

1.7 Effervescence ...H2

The escape of gas from solution in a liquid, especially the escape of carbon dioxide from a carbonated drink.

1.8 Concentration ...H2

The proportion of a substance in a whole.

1.9 Physical Change ...H2

A usually reversible change in the physical properties of a substance, as size or shape

1.10 Word Equation ...H2

a word equation is a chemical reaction expressed in words rather than chemical formulas.

1.11 Catalyst ...H2

A substance that increases the rate of a chemical reaction without being consumed in the process.

1.12 Reaction Rate ...H2

the speed at which a chemical reaction proceeds.

2 Reactions ...H1

What is a Reaction?

- The end products have different properties than each of the individual reactants.
- **Chemical equations** are a way to write out a chemical reaction. They can be written in word form, or in symbol form.
- **The Law of Conservation of Mass** - states that the total amount of mass is the same before and after a chemical reaction.

2.1 How do Chemicals React and Combine? ...H2

How do Chemicals React and Combine?

- Chemical reactions are happening all the time around us.
- Chemical reactions occur when substance **combine** or **break apart**.
- The starting substancse are called **reactants**.
- The ending substances are called the **products**.

Definition

Compound - substance that forms when 2 or more elements combine **chemically**.
Mixture - substance that forms when two or more elements combine **physically**.
Solution - is a mixture that looks like a single substance and has the same properties throughout (evenly distributed),
Solute - the substance that dissolves.
Solvent - the subsatnce into which the solute dissolves.
Suspension - a mixture in which the components are dispersed, but large enough to see and to settle out.

3 Physical Change ...H1

What is a Physical change?

When two or more substance combine and:

- The bonds between atoms are not broken
- It is generally reversible
- Don't make new substances

4 Chemical Change ...H1

What is a Chemical change

When two or more substance combine and:

- A new substance is formed
- A solid appears or disappears
- The temperature of substances changes spontaneously
- A colour change occurs
- Bubbles appear

- A flame appears or light is produced
- Where the chemical bonds between particles in molecules are broken or when new bonds are formed

A **new** substance is formed. These changes are **irreversible** or **permanent**. The new substance formed will have **different** properties compared to its original elements.

4.1 Endothermic Chemical Reactions ...H2

What is an Endothermic chemical reaction?

- Endothermic reactions absorb energy from the atmosphere in order to proceed
- Endothermic reactions absorb energy, a temperature drop is measured during the reaction
- Endothermic reactions are characterized by positive heat flow (into the reaction)

4.2 Exothermic Chemical Reactions ...H2

What is an Exothermic chemical reaction?

Some chemical reactions release energy in the form of heat, light, or sound. These are exothermic reactions. Exothermic reactions may occur spontaneously.
They are denoted by a negative heat flow (heat is lost to the surroundings). In the lab, exothermic reactions produce heat or may even be explosive.

4.3 Evidence of a Chemical Reaction ...H2

A chemical reaction is the process by which the atoms in one or more chemicals are rearranged to form new chemicals. Chemical reactions change substances into other substances. Evidence of a chemical reaction is said to have occured if you can observe one or more of the folliwing things when chemicals are mixed.

- A temperature change
- A change in colour
- A new substance forming like a gas or a solid precipitate
- Disappearance of one or more reactants

4.4 Precipitates ...H2

Precipitates

Precipitation is the creation of a solid form a solution. When the reaction occurs in a liquid solution, the solid formed is called the precipitate.

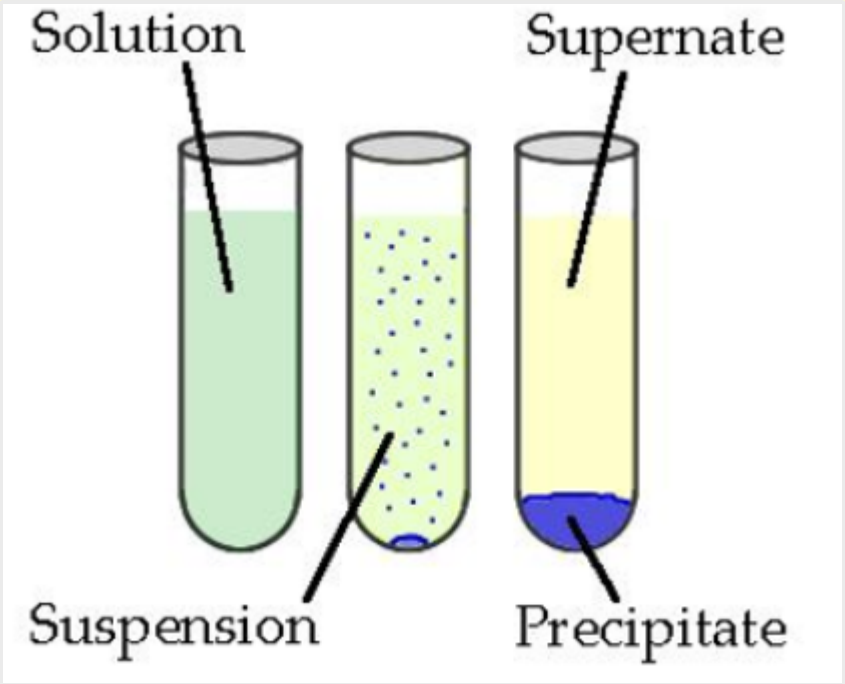

Diagram of a Participate

5 Writing Chemical Formulas ...H1

5.1 The Chemical Formula ...H2

Sodium Chloride, aka salt, has the formula NaCl. You read the formula like so ('N-a-C-l'). Sodium chloride is a solid compound and has the structure shown below, with sodium and chloride particles packed together tightly. There are no separate molecules, but the formula tells you that there are equal numbers of sodium and chlorine atoms.

A chemical formula is a shorthand way of showing which elements are in a compound. It also tells you how many atoms of each element are present in one molecule of the compound. For example, water has the formula H_2O. This tells you that each molecule of water contains two atoms of hydrogen (H) and one atom of oxygen (O).

5.2 How do we name compounds? ...H2

Hydroxide

A compound that contains hydroxide ions, OH^- (a negatively charged ion made up of oxygen and hydrogen) is named a **hydroxide**.

Example

- Potassium **hydroxide** - contains potassium ions and hydroxide ions.

5.3 Various Types of Chemical Formulas ...H2

5.3.1 Metallic and Non-Metallic ...H3

5.3.1.1 Two Elements ...H4

Rules

1. The **metallic** element is named **first**.
2. The name of the **non-metal** is **shortened**.
3. The suffix **'ide'** is added to the shortened name.

Example

NaCl - Sodium Chloride
$MgBr_2$ - Magnesium Bromide

5.3.1.2 Three or more elements ...H4

Rules

1. The **metallic** element is named first.
2. The **chemical radical** is named second.

Example

$FeSO_4$ - Iron Sulfate
$Mg(NO_3)_2$ - Magnesium Nitrate

5.3.2 Non-Metallic and Non-Metallic ...H3

Rules

1. If **hydrogen** is present, it is named first.
2. If **no hydrogen** is present, the **solid non-metal** is named first.
3. If only **two elements** are present, the name of the second is shortened and the suffix '-ide' is added to the shortened form.
4. If only **two elements** are present, **prefixes** 'mon-', 'di-', 'tri-', 'tetra-' etc. are used on the name of the second to indicate how many atoms of it there are in the formula.
5. If **more than two elements** are present, the first is **named** and this is followed by the name of the **radical**.

Example

HCl - Hydrogen Chloride
CO_2 - Carbon Dioxide
H_2CO_3 - Hydrogen Carbonate

5.3.3 Common Names ...H3

The common names of particular elements have to be memorized.

Example

HCl - Hydrochloric Acid
H_2O - Water

5.4 -ate Endings ...H2

-ate endings

A compound that contains a negatively charged polyatomic ion containing oxygen usually has a name ending in **-ate**.

Example

- Copper (II) sulph**ate** - contains oxygen atoms in the sulphate ion
- Sodium nitr**ate** - contains oxygen atoms in the nitrate ion

5.5 Subscripts ...H2

- A subscript refers to the number found on the lower right side of an element or attached to a compound.
- These numbers tell you how many atoms of which elements the equation is made up of.
- A subscript can never be changed to balance an equation.

Remember

It is not necessary to write the subscript 1.
The oxygen atom is usually written at the end of the formula.