

# Chem11 Chemical/Physical Reactions :

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**Physical properties** are properties that can be determined without a change in the composition of a substance.

**Chemical properties** are those that can be observed only when a substance undergoes a change in composition.

A **physical reaction** is a change that doesn't result in the formation of new substances (but physical properties can change).

A **chemical reaction (or change)** occurs when one or more species react to form one or more new species (substances).

**Exothermic reactions** are those which give off energy, such as a combustion reaction.

**Endothermic reactions** are those which absorb energy, such as the absorption of light energy, in the photosynthesis reaction.

Examples of physical properties - state (gas, liquid, solid), color, odor, taste, solubility, hardness, melting point, boiling point, specific heat, conductivity.

Examples of chemical properties - Enthalpy change (energy released or absorbed when a new substance is formed), oxidation number change (this is the number of electrons an atom loses or gains in a chemical reaction).

**Examples : physical reactions** : a) ice melts to form water.

This reaction is written as :  $\text{H}_2\text{O(s)} \rightarrow \text{H}_2\text{O(l)}$

The (s) means solid and (l) means liquid. In other reactions (g) means gas and (aq) means aqueous (dissociated in water).

b) salt is dissolved in water

This reaction is written as :  $\text{NaCl(s)} \rightarrow \text{Na}^{\text{(aq)}} + \text{Cl}^{\text{(aq)}}$

In this physical reaction, salt will dissociate into its component ions,  $\text{Na}^+$  and  $\text{Cl}^-$ . Water will break apart all ionic compounds (ionic compounds are composed of a metal and a non-metal). This is a physical reaction since when the solution evaporates, we are left with  $\text{NaCl(s)}$ .

**Example : chemical reaction** : burning propane



In this reaction, new species (compounds) are formed and energy is released. Therefore, this is a chemical reaction.