

CHEMISTRY STUDY MATERIALS FOR CLASS 10

(NCERT Based notes of Chapter -04)

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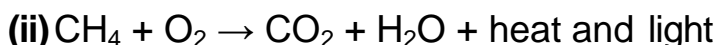
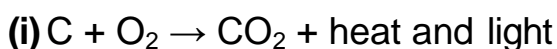
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CARBON AND ITS COMPOUND

CHEMICAL PROPERTIES OF CARBON COMPOUNDS

COMBUSTION

All the carbon compounds burn in oxygen and yield carbon dioxide and water vapour. Heat and light are also released during this process. This reaction is called **combustion**.



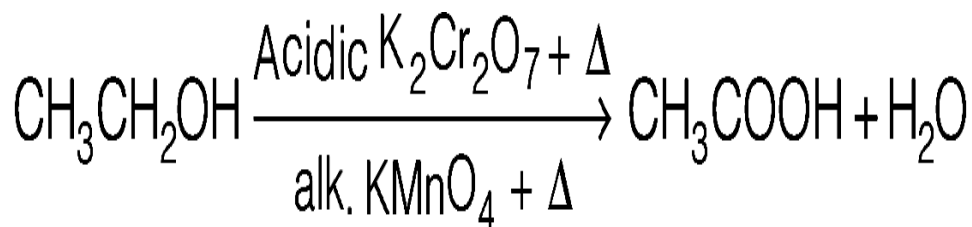
Further, once carbon and its compounds ignite, they keep on burning without the requirement of additional energy. That's why these compounds are used as fuels.

Saturated hydrocarbons give a clean flame due to their complete combustion whereas, **unsaturated hydrocarbons** give a yellow flame with lots of black smoke as they do not undergo complete combustion.

OXIDATION

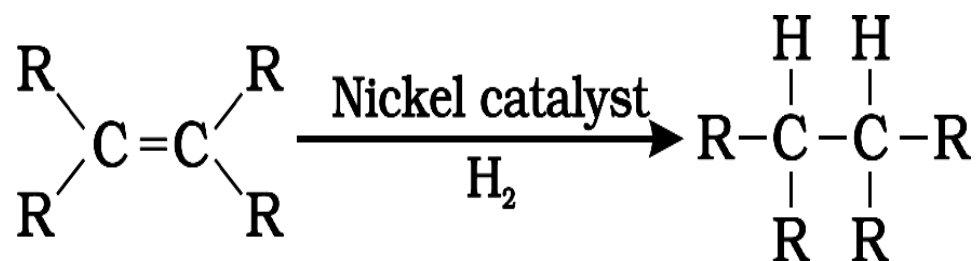
Oxidation is a process of intake of oxygen and removal of hydrogen. Those substances which are capable of providing oxygen to other substances are called oxidising agents.

e.g., *alkaline* $KMnO_4$ and acidified $K_2Cr_2O_7$ can both behave as oxidising agents.



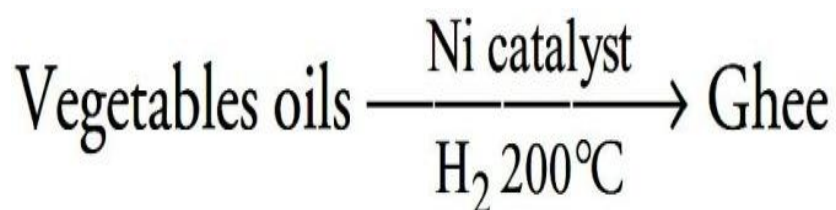
ADDITION REACTION

The reaction in which a reagent adds completely on a substance without the removal of small molecules is called **addition reactions**. *For example*, addition of hydrogen (in the presence of catalysts like **Palladium or Nickel**) to unsaturated hydrocarbons, yields saturated hydrocarbons (**Hydrogenation**).



Hydrogenation (addition of hydrogen) of vegetable oil (which are unsaturated compounds) in the presence of nickel catalyst gives ghee (saturated compounds).

This process is called **hardening of oils**.



SUBSTITUTION REACTION

The reactions in which a reagent substitutes (replaces) an atom or a group of atoms from the reactant (substrate) are called **substitution reactions**. These are generally shown by saturated compounds and benzene.

Most of the saturated hydrocarbons are fairly inert and unreactive in the presence of most reagents. So, presence of sunlight is necessary for their substitution reactions.

When chlorine is added to hydrocarbons at a rapid rate, in the presence of sunlight, Cl replaces H atom one by one.

FUELS AND FLAMES

FUELS

Those carbon compounds which have stored energy in them and burn with heat and light are called **fuels**. The released energy (heat or light) is utilised for various purposes like for cooking food, running machines in factories, etc. In fuels, the carbon can be in Free State as present in coal, coke and charcoal or in combined state as present in petrol, LPG, kerosene, petroleum, natural gas, etc. Those fuels which were formed by the decomposition of the remains of the pre-historic plants and animals (fossils) buried under the earth long ago are called **fossils fuels**.

For example, coal, petroleum and natural gas.

COAL

It is a complex mixture of compounds of carbon, hydrogen and oxygen and some free carbon along with traces of nitrogen and sulphur.

It was formed by the decomposition of plants and trees buried under the earth millions of years ago.

PETROLEUM

It is dark viscous foul smelling oil and is also known as **rock oil** or **black gold**.

It was formed by the decomposition of the remains of extremely small plants and animals buried under the sea millions of years ago.

FLAME

A flame is the region where combustion (or burning) of gaseous substances takes place. *Depending upon the amount of oxygen available and burning of fuels, flames are of following two types*

(i) Blue or Non-luminous Flame

When the oxygen supply is sufficient, the fuels burn completely producing a blue flame. Since, light is not produced during this type of combustion, so the flame is called ***non-luminous*** (non- light giving flame),

e.g., burning of LPG in gas stove

(ii) Yellow or Luminous Flame

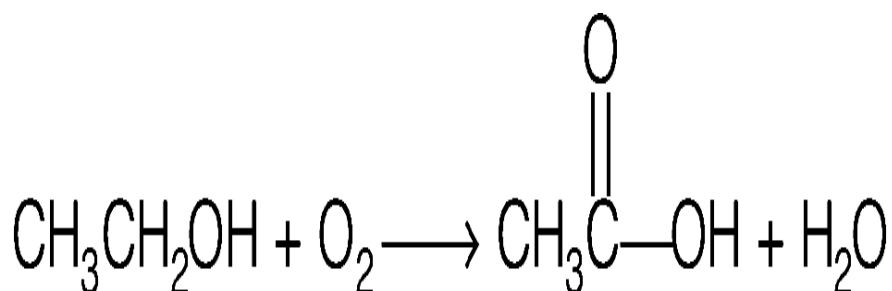
In the insufficient supply of air, the fuels burn incompletely and produce yellow flame. The colour of the flame is yellow because of the presence of unburnt carbon particles. This flame produces light so also known as ***luminous flame***.

e.g., burning of wax vapours

INTEXT QUESTIONS PAGE NO. 71

Q1. Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

Ans: Since the conversion of ethanol to ethanoic acid involves the addition of oxygen to ethanol, it is an oxidation reaction.



Q2. A mixture of oxygen and Ethyne is burnt for welding. Can you tell why a mixture of Ethyne and air is not used?

Answer:

When Ethyne is burnt in air, it gives a sooty flame. This is due to incomplete combustion caused by limited supply of air. However, if Ethyne is burnt with oxygen, it gives a clean flame with temperature 3000°C because of complete combustion. This oxy-acetylene flame is used for welding. It is not possible to attain such a high temperature without mixing oxygen. This is the reason why a mixture of Ethyne and air is not used.