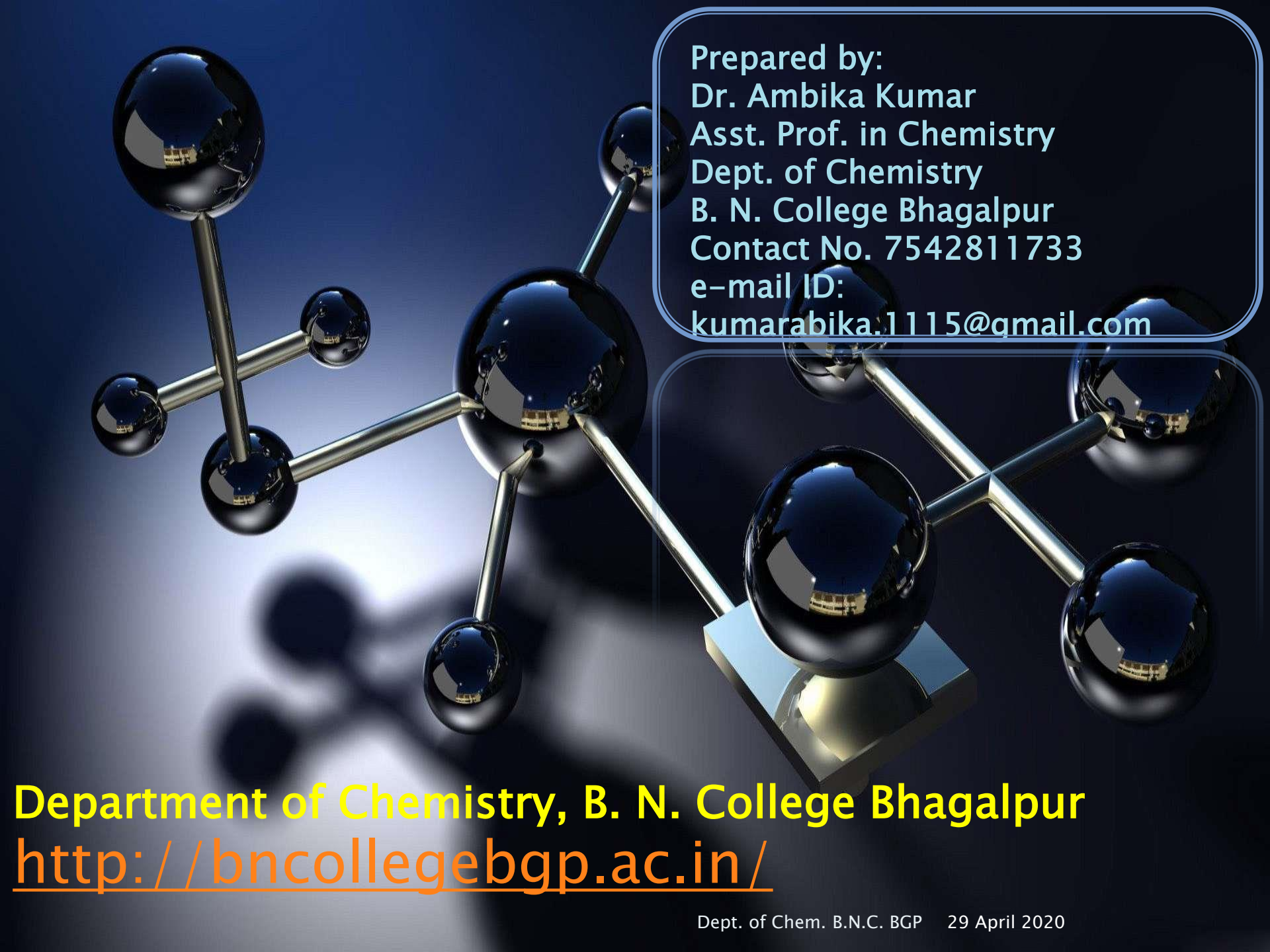

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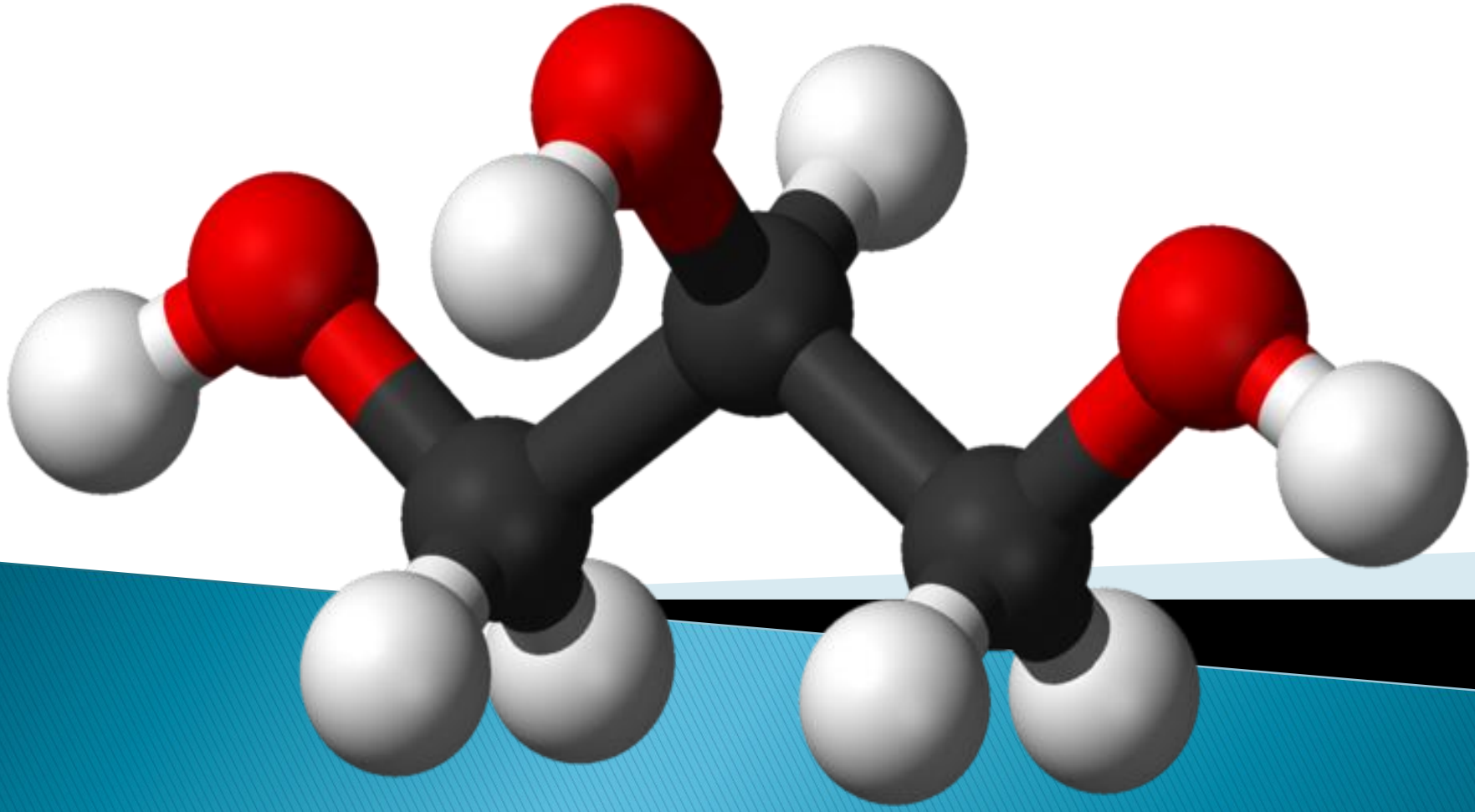
Glycerol



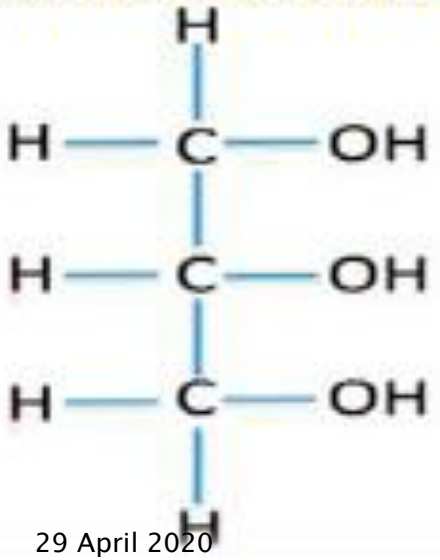
INTRODUCTION

- Glycerol also referred as glycerine is a chemical compound that is generally non-toxic, sweet tasting, vicious liquid.
- The chemical structure shows that each carbon atom is bonded to a ***hydroxyl (-OH)*** group.
- Because of this, glycerine is also known as ***Polyol***, which is an alcohol containing more than one hydroxyl group.
- These hydroxyl groups are also responsible for the ***hydroscopic*** nature of glycerol.
- Its systematic name is prop-1,2,3-triol
- Glycerol was first obtained as a bi-product of soap manufacture through saponification of fats.

Chemical Formula

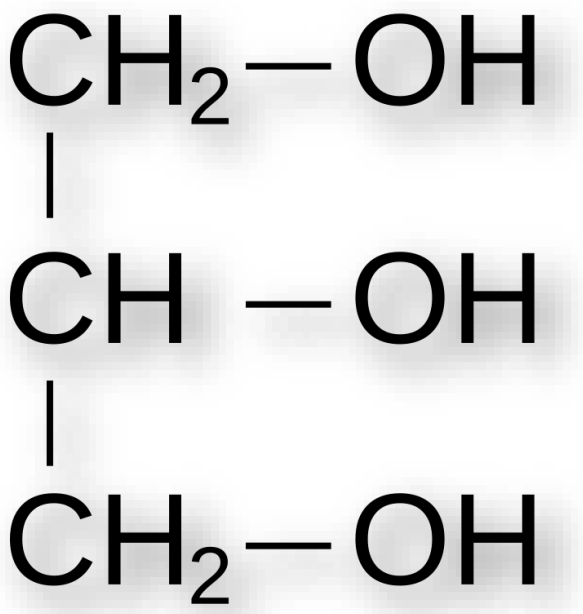
$C_3H_8O_3$

Chemical Structure

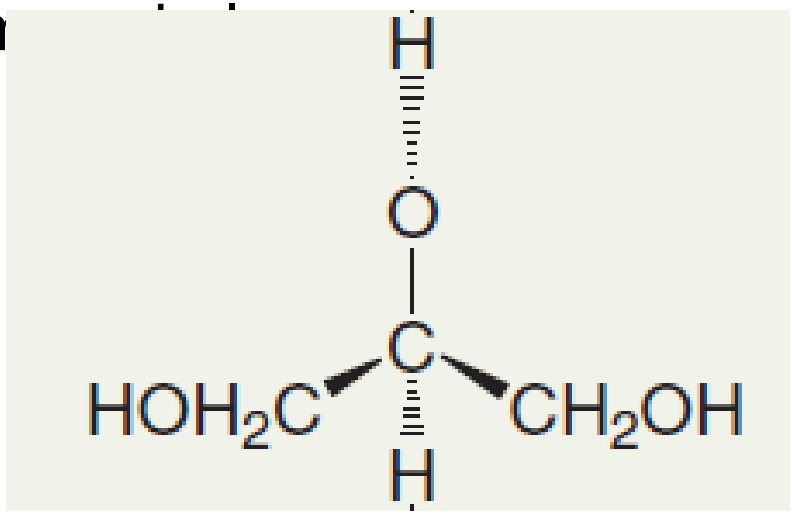


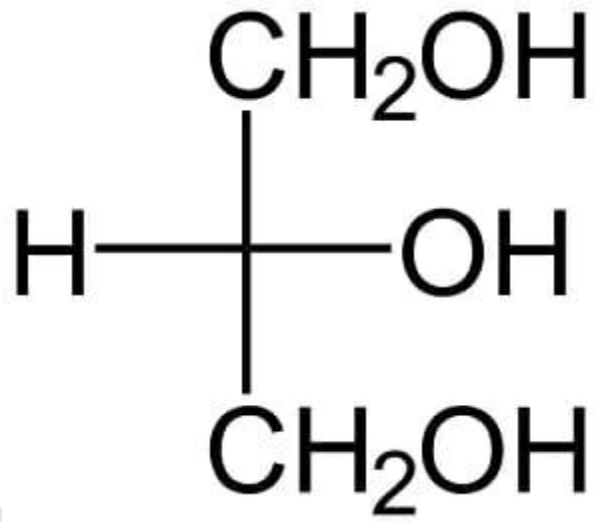
Glycerol Structure:

Glycerol is a trihydroxy sugar alcohol with three carbon atoms and three hydroxyl groups. The presence of multiple hydroxyl groups and carbon atoms makes it an organic polyol compound with the IUPAC name of 1, 2, 3 – Propanetriol. The structure of glycerol can be represented in a number of ways:

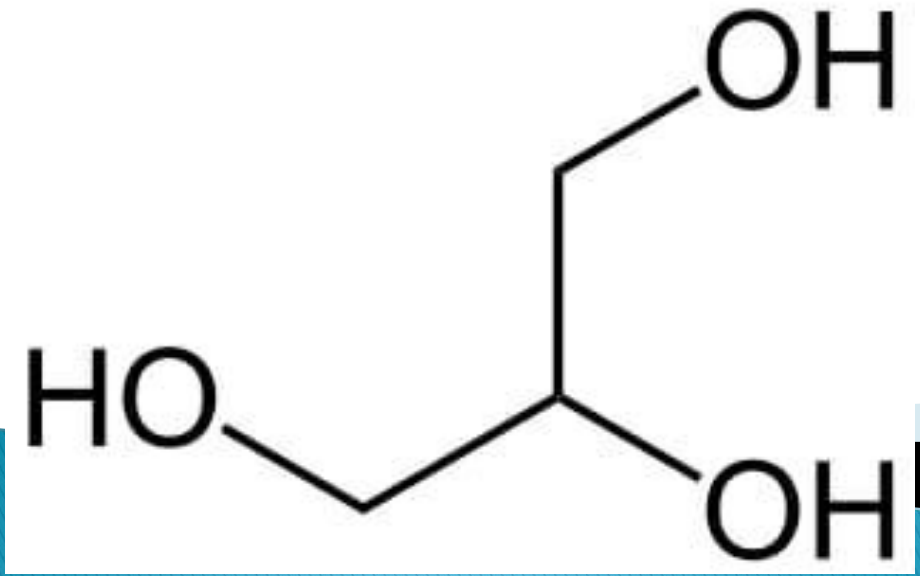


The simplest is the image below (right side), showing the basic backbone of three carbon atoms, each of them covalently bonded to a hydroxyl group. Alternately, the molecule can be represented as a Fischer projection, centered on the second carbon atom, as seen in the in





In addition, the molecule can be shown with a more accurate depiction of bond angles, without the explicit representation of the hydrogen atoms.

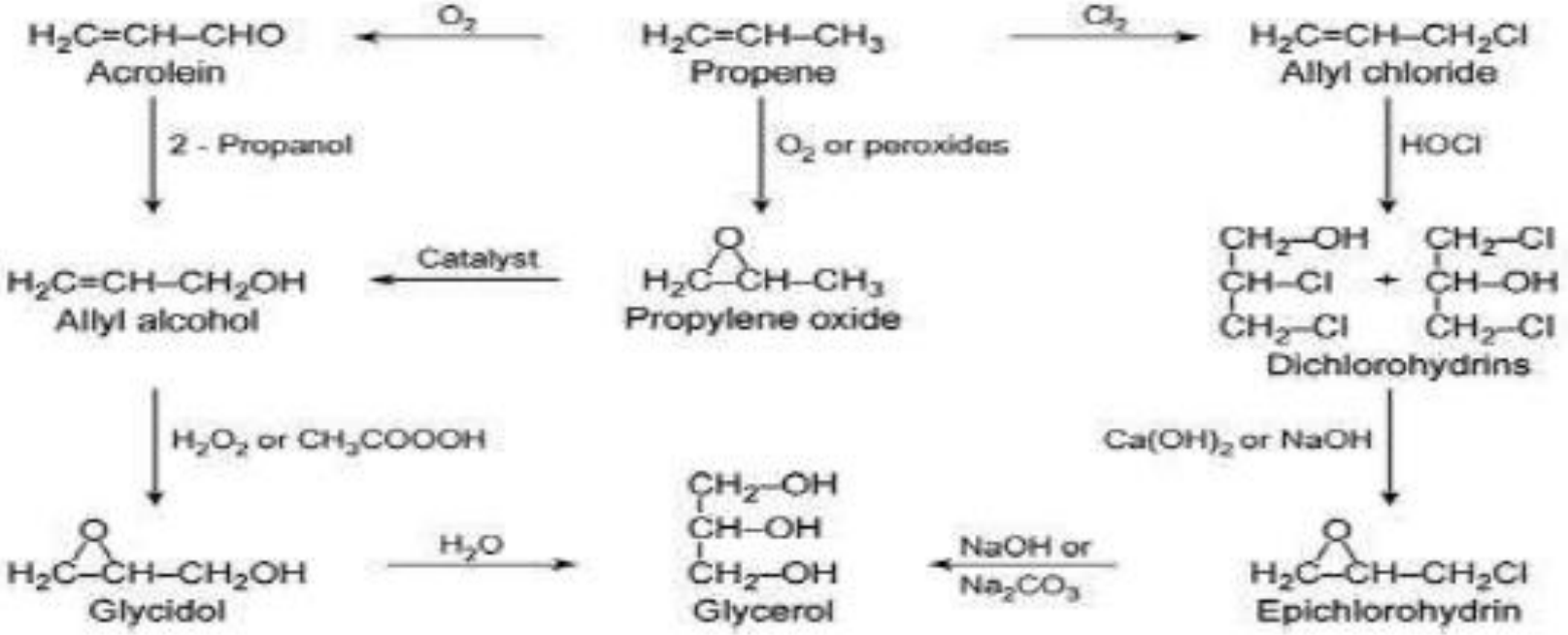


Preparation of Glycerol:

1. From Propene:

It involves three steps:

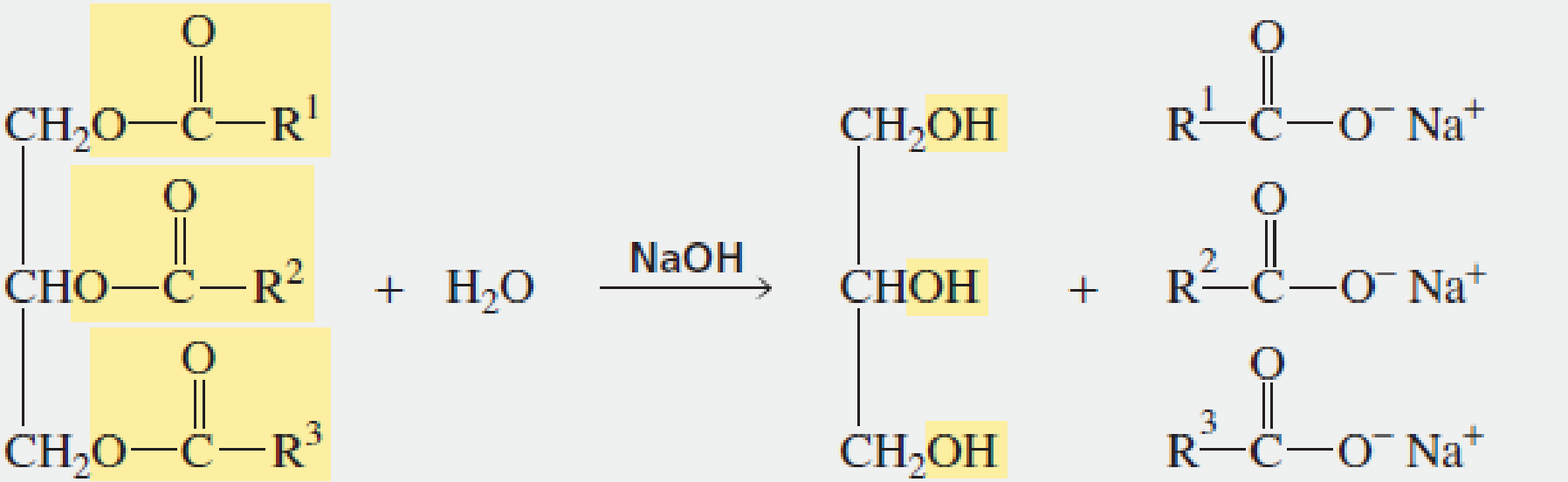
- **Allyl Chloride- epichlorohydrin (industrially important step)***
- Acrolein-allyl alcohol-glycidol
- Propene oxide-allyl alcohol-Glycidol



*** Epichlorohydrin process is most important, as it involves the chlorination of propene to give allyl chloride, which is oxidized with hypochloride to dichlorohydrins, which further reacts with strong base to give epichlorohydrine. Epichlorohydrine is than hydrolysed to give GLYCEROL**

2. From a fat/oil:

When the ester group of a fat or an oil are hydrolyzed in a basic solution, glycerol and fatty acids are formed. Since the solution is basic, the fatty acids formed are in their basic forms:



PHYSICAL PROPERTIES

- DENSITY: 1.261 g/cm3
- BOILING POINT: 2900C
- MELTING POINT: 18.170C

These values show that glycerol is denser than water.

- Glycerol is completely soluble in water and alcohol. This is because of the presence of the hydroxyl group.
- These hydroxyl groups present are also responsible for the hydroscopic nature of glycerol.
- Glycerol is slightly soluble in ether, ethyl acetate and dioxane. It is insoluble in hydrocarbons.
- Glycerol is a useful solvent for many solids, both organic and inorganic which is particularly important for the preparations in pharmaceuticals.
- The solubility of gases in glycerol, like other liquids depends on temperature and pressure

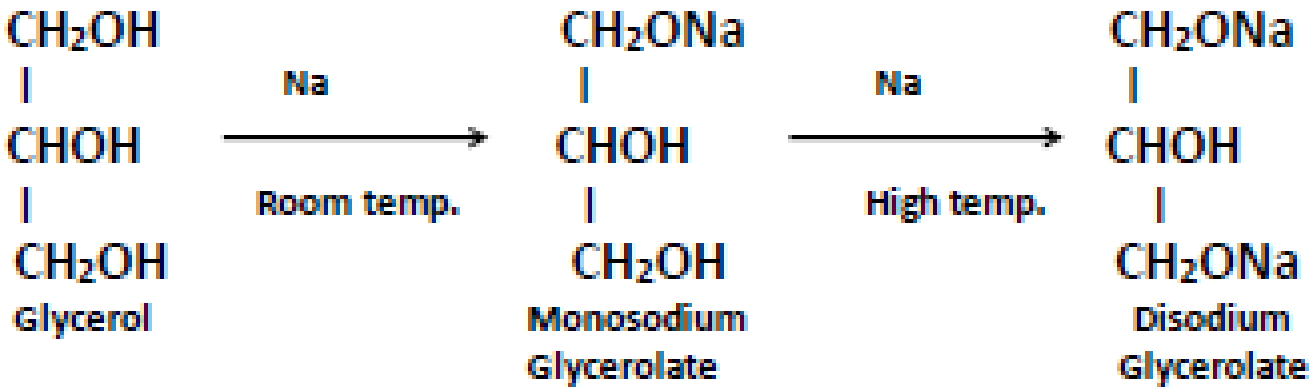
CHEMICAL PROPERTIES

It gives reactions characteristic of primary and secondary –OH groups. The carbon atoms in glycerol may be designated as α, β, α' as shown:

$CH_2OH.\ CHOH.\ CH_2OH$

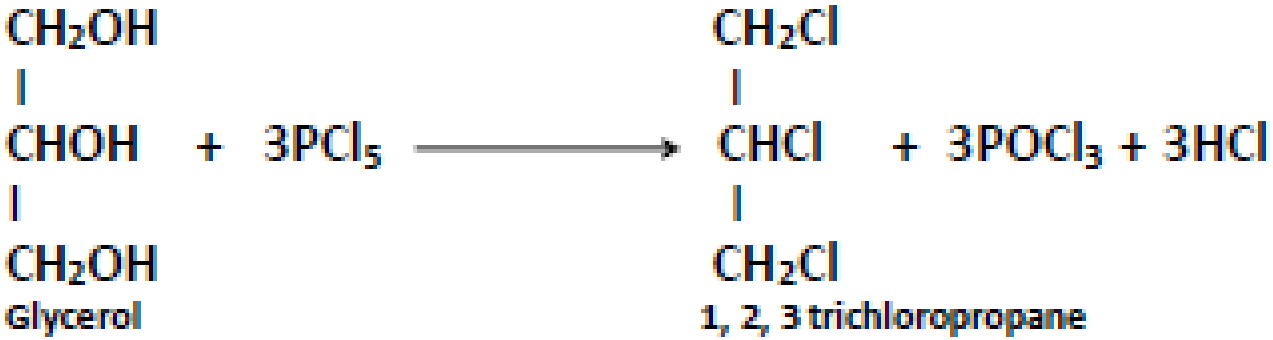
α β α'

1. REACTION WITH SODIUM



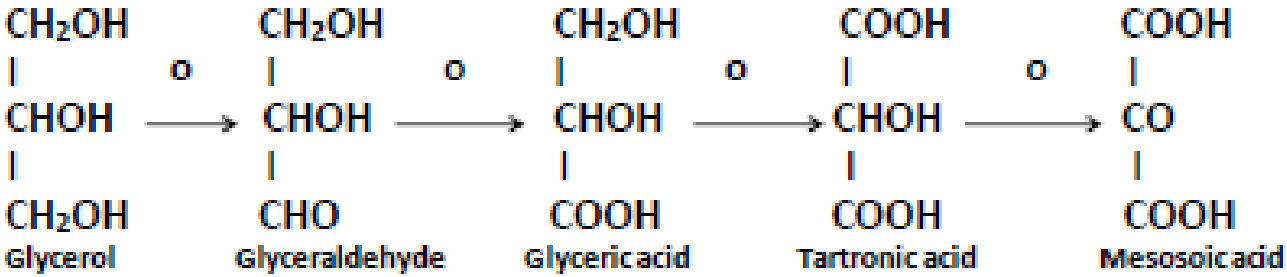
2. REACTION WITH PHOSPHOROUS HALIDES

When treated with phosphorous pentachloride, all the three hydroxyl groups replaced by chlorine atoms.



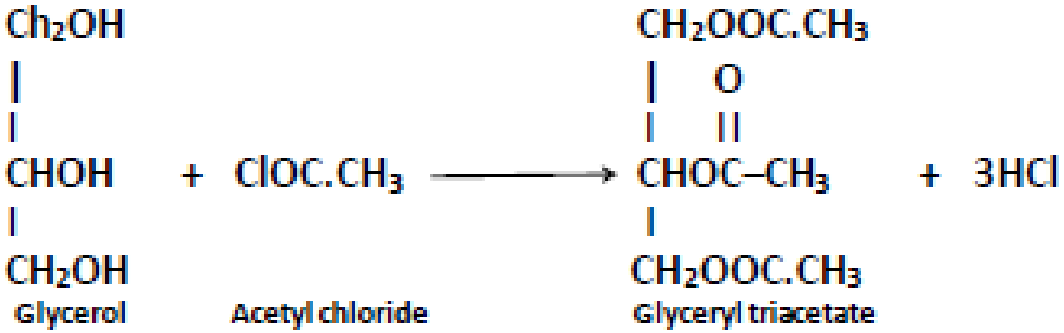
3. OXIDATION

It yields a variety of products depending upon the nature of the oxidising agent used. Dilute nitric acid gives glyceric and tartronic acid.



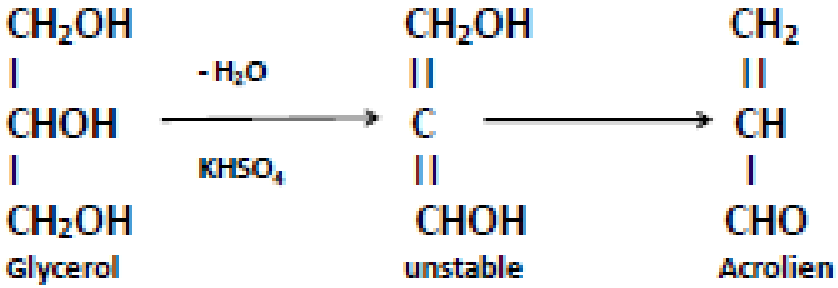
4. ACETYLATION

When heated with acetyl chloride, it forms glyceryl triacetate.

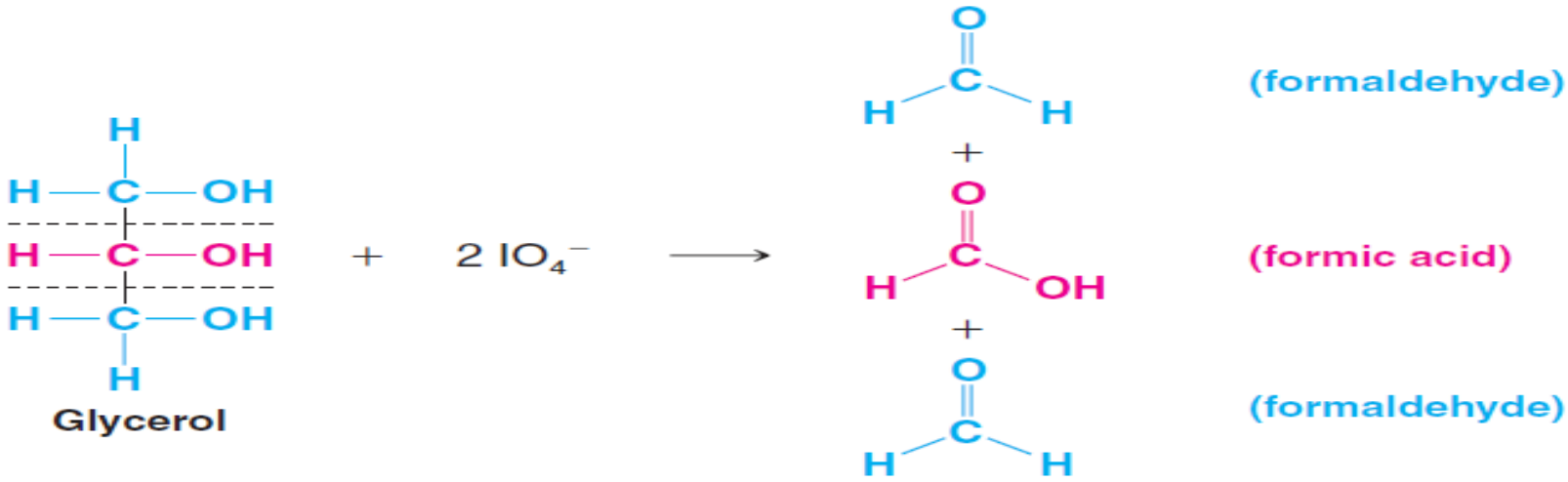


5. DEHYDRATION

When heated with dehydrating agents like sulphuric acid, potassium hydrogen sulphate, etc., it gives acrylic aldehyde (acrolien).



6. When three or more —CHOH groups are contiguous, the internal ones are obtained as *formic acid*. Periodate oxidation of glycerol, for example, gives two molar equivalents of formaldehyde and one molar equivalent of formic acid:



USES


GLYCERIN


CVS
ARTIFICIAL TEARS
LUBRICANT EYE DROPS
• Relieves dry, irritated eyes
• Soothes & lubricates
CVS
ARTIFICIAL TEARS
LUBRICANT EYE DROPS

- Large quantity of glycerine is consumed in the manufacture of nitro-glycerine, cosmetics and medicinal preparations.
- It is also used in the production of printer's roller and of inks for use in rubber stamps.
- The hydroscopic properties of glycerol cause it to be used in keeping tobacco moist and to keep leather soft.
- The most common use of glycerol in USA is I food products, where it acts as a sweetener and as a thicker in many foods. For example, it is added to ice cream to improve the texture and to candy products and baked goods to increase the sweetness of the product.
- Glycerol is used in the preparation of personal care products, such as skin, hair and soap products (23 percent) and in oral hygiene products, such as toothpastes and mouthwashes (17 percent).
- Some of the products that include glycerol are moisturiser, detergents, hair colouring agents, mascara, nail polish remover, perfumes, body lotions, hair spray, shaving cream, lipsticks, cough medicines, shampoos and hair conditioner.
- It is used in the manufacture of explosives.
- Used in the production of a variety of plastics and players, such as polyetherpolyols, urethanes and alkyd resins.
- Used as a lubricant in pumps, bearings, gaskets and other mechanical systems.
- Used as an emulsifying agent.
- Used as an antifreeze
- Used in number of medical applications, such as treatment of glaucoma and stroke.

For objective pattern questions on Glycerol, visit:

https://www.sanfoundry.com/organic-chemistry-questions-answers-preparation-glycerol/