

OXIDATION REACTIONS

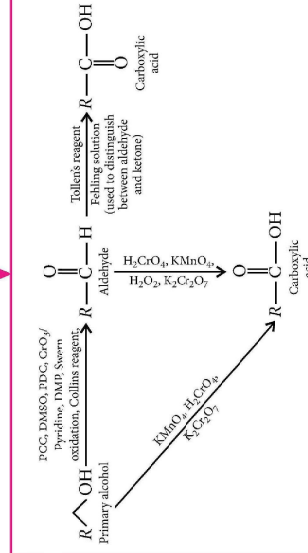
Oxidation reactions are very useful in organic synthesis as well as for distinguishing different organic compounds. In daily life also oxidation reactions are involved in various processes such as metabolism, photosynthesis, corrosion, rancidity, etc.

Class
XII

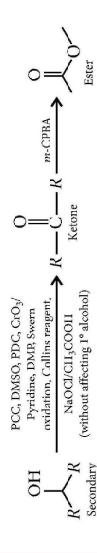
CONCEPT MAP

Oxidation Processes

Oxidation of Primary Alcohols



Oxidation of Secondary Alcohols



Important Reagents

1. PCC $\Rightarrow$ Pyridinium chlorochromate $[C_5H_5NH][CrO_3Cl]$
2. DMP $\Rightarrow$ Dess - Martin Periodinane
3. Swern Oxidation $\Rightarrow$ In swern oxidation, following reagents are used :

$$(i) \text{ } \begin{array}{c} \text{O} \\ \parallel \\ \text{S} \\ \text{Acid} \end{array} + \text{O} = \text{C} = \text{O} + \text{Cl} - \text{C} = \text{O}$$

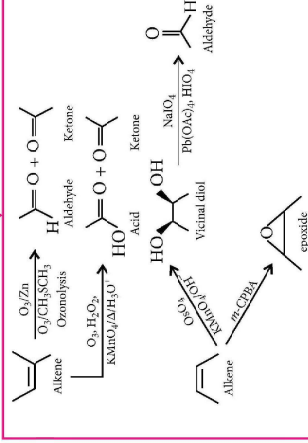
Used to avoid the use of toxic metals such as chromium.

Collins reagent $\Rightarrow$ It is a complex of CrO_3 with pyridine in CH_2Cl_2 .

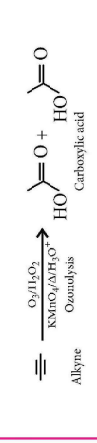
m -CPBA $\Rightarrow$ m -Chloroperoxybenzoic acid.

Jones reagent $\Rightarrow$ Chromic acid in aqueous acetone.

Oxidation of Alkenes



Oxidation of Alkynes



Importance of DMP Reagent

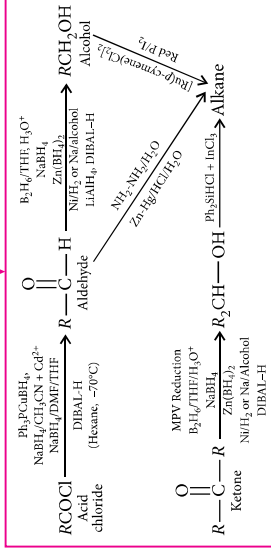
- Using periodinane has several advantages over chromium and DMSO based oxidation.
 - Milder conditions
 - Shorter reaction times
 - Higher yield
 - Simplified workups
 - High chemoselectivity
 - Tolerance of sensitive functional groups
 - Long shelf life
- Using DMP conditions, alcohols can be oxidised to aldehydes / ketones without affecting furan rings, sulphides, vinyl ethers and secondary amides.

Redox Reactions

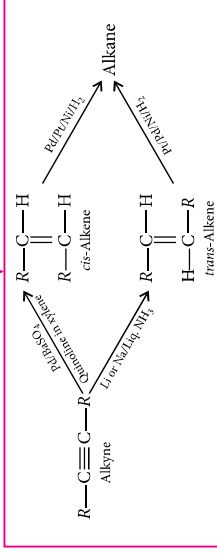
Redox reactions are very important in day to day life, these found vast applications in photosynthesis, production of chemicals, extraction of metals, electrochemical cells and quantitative analysis. Some important reduction processes are discussed here.

Reduction Processes

Reduction of Oxygen Containing Compounds



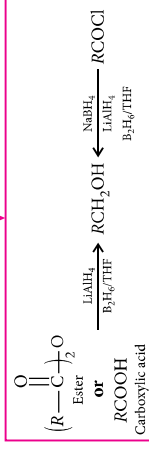
Reduction of Unsaturated Compounds



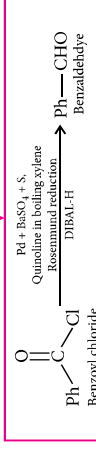
Important Named Reduction Reactions and Reagents

- $Zn-Hg/H_2O \Rightarrow$ Clemmensen reduction
- $NH_2-NH_2/H_2O \Rightarrow$ Wolff-Kishner reduction
- $Al(O-CH(CH_3)_2)_3 + CH_3CH=CH_2 \Rightarrow$ Meerwein-Ponndorf-Verley reduction (MPV Reduction)
- $DIBAL-H \Rightarrow$ Di-*iso*-butyl aluminium hydride (Highly reactive, hard to control, explodes on heating, grinding or on exposure to water)
- $H_2[SnCl_4] \Rightarrow$ Stephen's reduction (RCN to $RCHO$)
- $Pd + BaSO_4 +$ quinoline in boiling xylene $\Rightarrow$ Lindlar's catalyst
- Reduction of alkynes to *trans*-alkene using $Li, Na/Liq. NH_3 \Rightarrow$ Birch reduction

Reduction to Alcohol



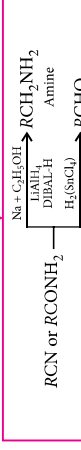
Reduction of Benzoyl Chloride



Reduction of Epoxide



Reduction of N-containing Compounds



Reduction of Halides



Reduction of Unsaturated Aldehydes

