Class XII

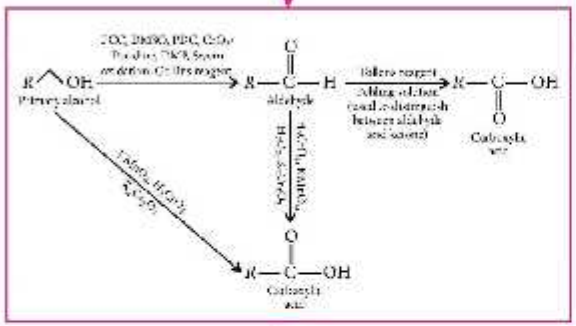
OXIDATION REACTIONS

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.

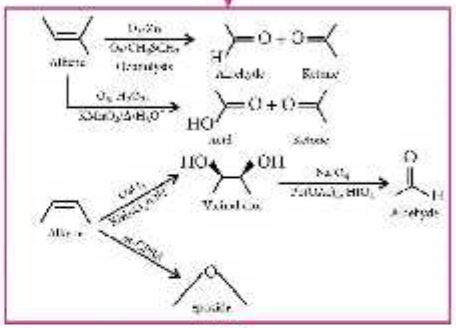
CONCEPT MAP

Oxidation Processes

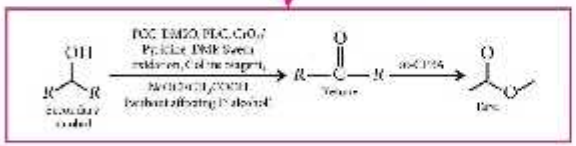
Oxidation of Primary Alcohols



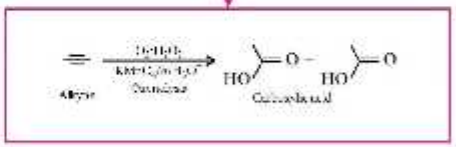
Oxidation of Alkenes



Oxidation of Secondary Alchols

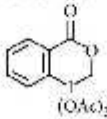


Oxidation of Alkynes

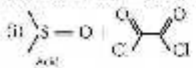


Important Reagents

1. PCC ⇒ Pyridinium chlorochromate $[C_5H_5NH]\,[CrO_3Cl]$
2. DMP ⇒ Dess – Martin Periodinane



3. Swern Oxidation → In swern oxidation, following reagents are used :



(ii) NR_3

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

4. Collins reagent ⇒ It is a complex of CrO_3 with pyridine in CH_2Cl_2
5. m CPBA → m Chloroperoxybenzoic acid.
6. Jones reagent ⇒ Chromic acid in aqueous acetone.

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

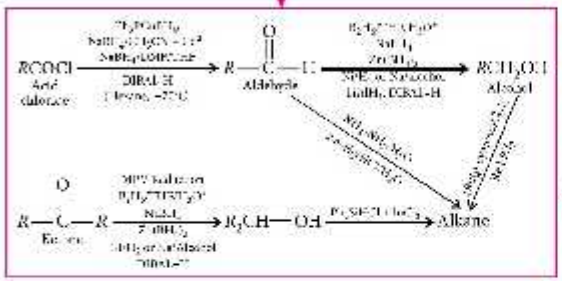
Redox Reactions

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.

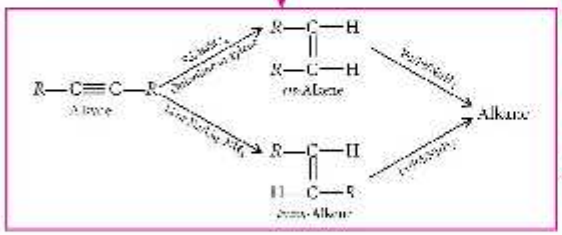
CONCEPT MAP CLASS XII

Reduction Processes

Reduction of Oxygen Containing Compounds



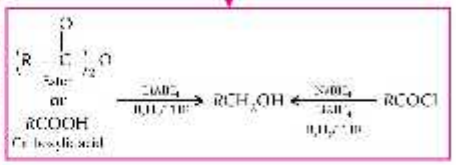
Reduction of Unsaturated Compounds



Important Named Reduction Reactions and Reagents

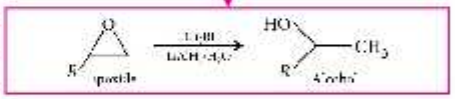
- Zn—Hg/H_2O ⇒ Clemmensen reduction
- NH_2—NH_2/H_2O ⇒ Wolff-Kishner reduction
- $Al[O—CH(CH_3)_2]_3$ – $CH_3CH(OH)—CH_3$ ⇒ Meerwein Ponndorf Verley reduction (MPV Reduction)
- DIBAL—H ⇒ Di-iso-butyl aluminium hydride (Highly reactive, hard to control, explodes on heating, grinding or on exposure to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

Reduction to Alcohol

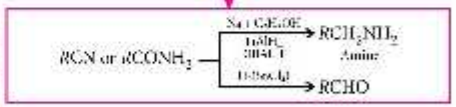


Reduction of Benzoyl Chloride

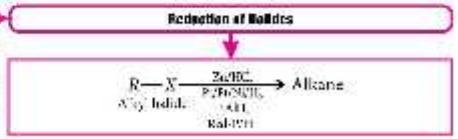
Reduction of Epoxide



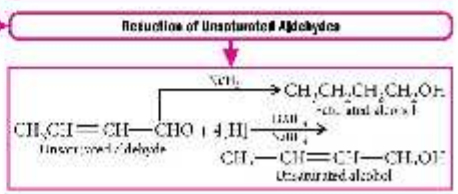
Reduction of N-containing Compounds



Reduction of Halides



Reduction of Unsaturated Aldehydes



MasterJEE
IIT-JEE Medical Foundations
MASTERJEE CLASSES