

15. Hydroxy Compounds

- Increasing the number of OH groups increases hydrophilicity and solubility, as hydrogen bonds can be formed between the OH groups and the water molecules.
- Alcohols are miscible with most organic solvents as the hydrocarbon portions can interact with the hydrocarbon portions of other organic substance via id-id interactions.
- Alcohols can thus act as **solvents** to dissolve both **water-soluble substances** and **organic substances**.
- The more e- donating alkyl groups present, the lower the acidity of the alcohols.
- In esterification, concentrated H₂SO₄ serves 2 purposes
 1. Supplies H⁺ ions to catalyse the reaction.
 2. Removes the H₂O produced in the reaction and shifts the position of equilibrium to the right, increasing the yield of the ester formed.
- Alcohols are **weak acids** and only react with strong bases such as sodium amide, sodium hydride and reactive metals such as sodium (**does not react with NaOH**)
- *phenols however, react with **NaOH**
- Anhydrous conditions must be used in acylation as the acid chloride hydrolyses readily in water
- Observation for **acylation**: Steamy white fumes of HCl evolved, which turn damp blue litmus paper red.

Esterification	Acylation
Incomplete reaction	Complete reaction
Lower yield	High yield
Heating required	Reaction occurs at rtp
H ₂ SO ₄ catalyst required <ul style="list-style-type: none">- Provides H⁺ ions to catalyse the reaction- Removes H₂O in product to shift position of equilibrium to the right, increasing yield of ester formed	No catalyst required

- In testing for an alcohol (dry HX gas, PX₃, PCl₅, SOCl₂), thionyl chlorides are preferred as its side products are gases which can be easily removed.
- *hydration of alkenes to form alcohols requires **cold conc. H₂SO₄**, followed by **H₂O, heat**.
- Dehydration of alcohol, apart from excess conc. sulfuric acid at 170 degrees celsius, can also pass alcohol vapour over aluminium oxide catalyst and heat at 350 degrees celsius!
- Note that for **halogenation** using dry HX(g), **iodine** always requires extra steps, i.e. to produce RI for dry HX(g), NaI, conc. H₃PO₄ & to produce RI for PX₃, red P + I₂ (in situ) as conc. H₂SO₄ will oxidise NaI and PI₃ is unstable, respectively.
- KMnO₄ can be used in neutral, alkaline and acidic medium whereas K₂Cr₂O₇ can ONLY function in a medium of H₂SO₄.

- **Phenol** is a weaker nucleophile as the lone pair of electrons on the O atom is delocalised into the benzene ring, therefore it can only react with **acyl chlorides** and not **carboxylic acids** as the positive charge on the carbon atom in acyl chlorides is stronger as it is attached to two highly electronegative atoms instead of one in carboxylic acid.
- Use **FeCl₃** to distinguish phenol, a violet complex is formed.
- Phenol is a solid! It dissolves in NaOH to give a colourless solution.