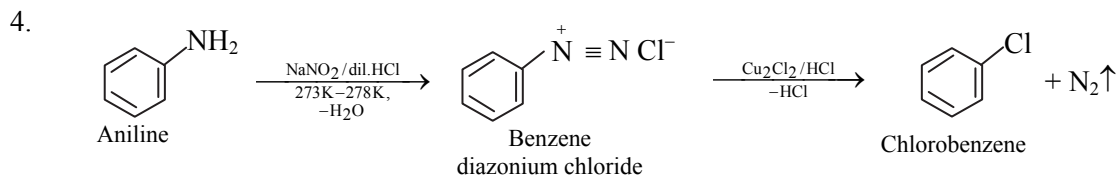
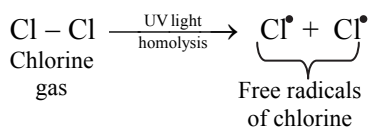


10 Haloalkanes and Haloarenes

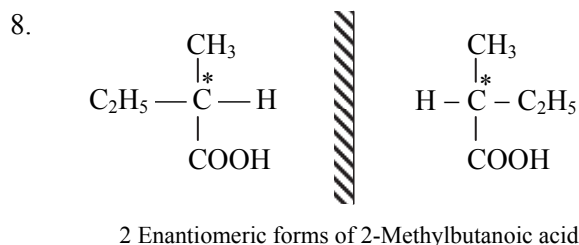
1. Alkyl chlorides or alkyl bromides on reaction with $\text{Hg}_2\text{F}_2/\text{CoF}_3/\text{SbF}_3$ give corresponding alkyl fluorides. Fluorine reacts with alkanes in an explosive manner, hence direct halogenation is not a suitable method for preparation of alkyl fluorides. Hydrogen fluoride (HF) is least reactive acid and hence, reacts slowly with alcohols; thus alkyl fluorides are not practically prepared by this method.



6. A covalent bond between two atoms of the same element or two atoms having nearly the same electronegativity undergoes cleavage on exposure to UV light or at high temperature. The cleavage of this type results in the formation of free radicals.



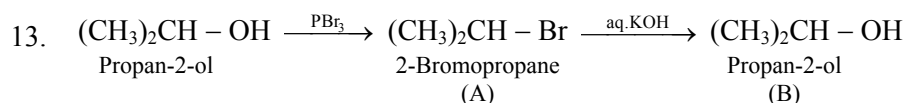
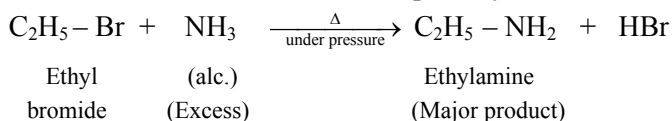
7. For the isomeric alkyl halides, the boiling points decrease with branching because the branching of the chain makes the molecule more compact and thereby decreases the surface area. Due to the decrease in surface area, the magnitude of van der Waals forces of attraction decreases and consequently, the boiling point of the branched chain compound is less than those of the straight chain compound. Thus, boiling point among the isomeric alkyl halides like n-butyl chloride, sec-butyl chloride, isobutyl chloride and tert-butyl chloride follows the order: $1^\circ > 2^\circ > 3^\circ$.



All the four groups attached to the central carbon atom [marked with asterisk (*)] are different. Hence, it is asymmetric and it can exist in two enantiomeric forms.

10. CH_3Br undergoes alkaline hydrolysis on treatment with KOH and water by SN^2 mechanism.

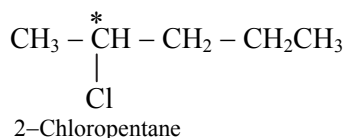
12. When excess of ammonia is used, primary amine is obtained as a major product.



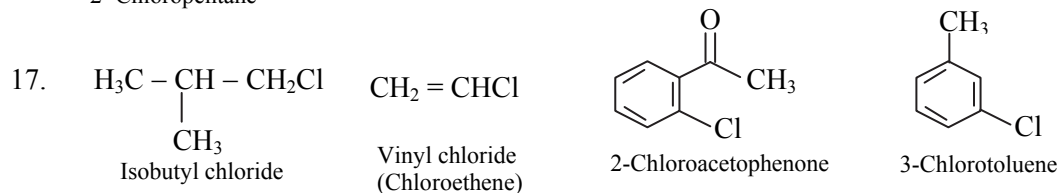
15. For the same alkyl group 'R', the boiling points of alkyl chlorides, bromides and iodides follow the order, $\text{RI} > \text{RBr} > \text{RCl} > \text{RF}$. This is because, with the increase in the size of the halogen, the magnitude of van der Waal's forces increases and consequently, the boiling points increase.



16. If all the four valencies of carbon are satisfied with four different groups, then the carbon atom is called chiral.

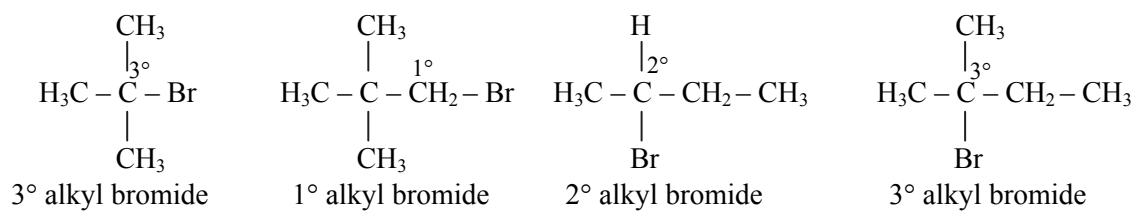


(It has a chiral carbon atom indicated by an asterisk.)

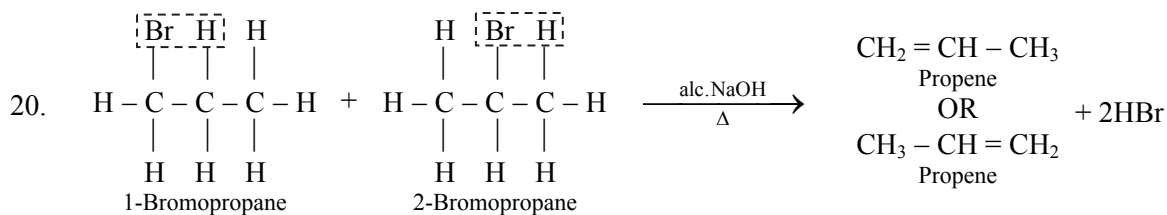
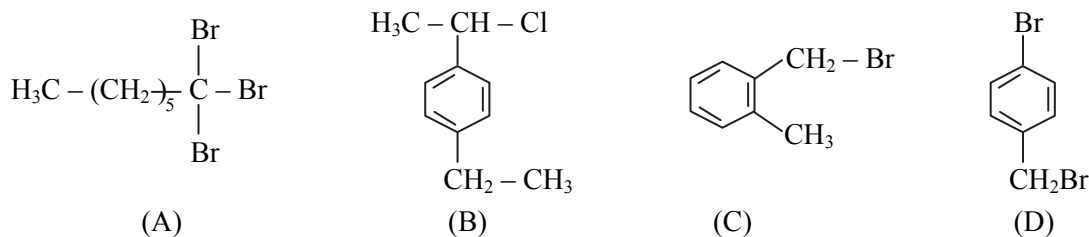


Halogen atom is attached to the sp^3 hybridised carbon atom of an alkyl group in case of isobutyl chloride only.

18. In secondary alkyl bromide, bromine atom is attached to the secondary carbon atom.

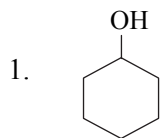


19. In haloarenes, halide group is directly attached to the sp^2 hybridised carbon atom of aromatic ring.



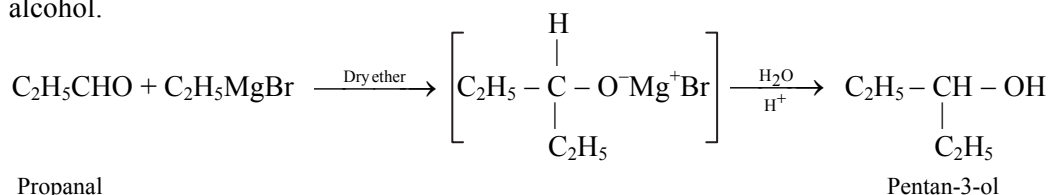
11

Alcohols, Phenols and Ethers

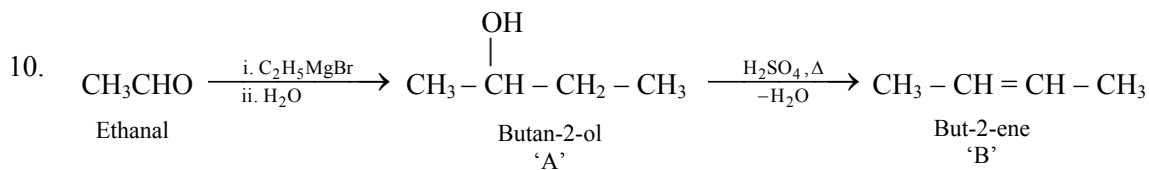
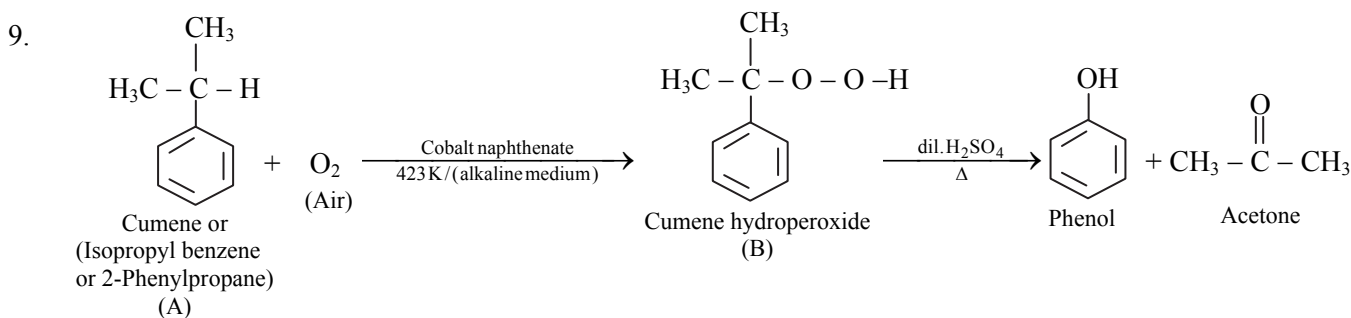
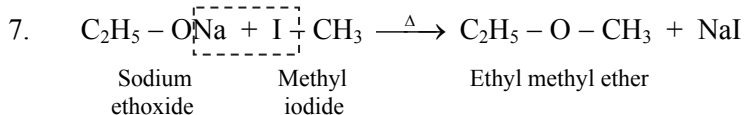
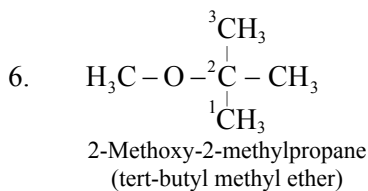
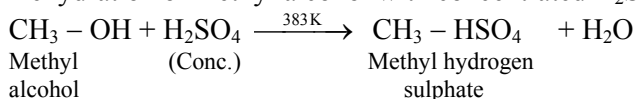


Cyclohexanol is a secondary alcohol because -OH group is linked to 2° carbon atom. In Phenol, the -OH group is attached to the benzene ring and not to cyclohexane.

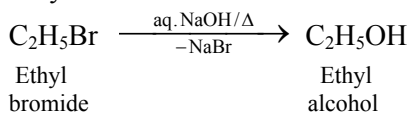
2. When an aldehyde other than formaldehyde reacts with a Grignard's reagent, the product is a secondary alcohol.



3. Dehydration of methyl alcohol with concentrated H₂SO₄ gives methyl hydrogen sulphate.



11. Ethyl bromide on treatment with aqueous NaOH yields ethyl alcohol.





Molar mass of ethyl bromide = 109 g mol^{-1}

Molar mass of ethyl alcohol = 46 g mol^{-1}

Given weight of ethyl bromide = 10.9 g

$$\therefore \text{No. of moles of ethyl bromide} = \frac{10.9 \text{ g}}{109 \text{ g mol}^{-1}} = 0.1 \text{ mol}$$

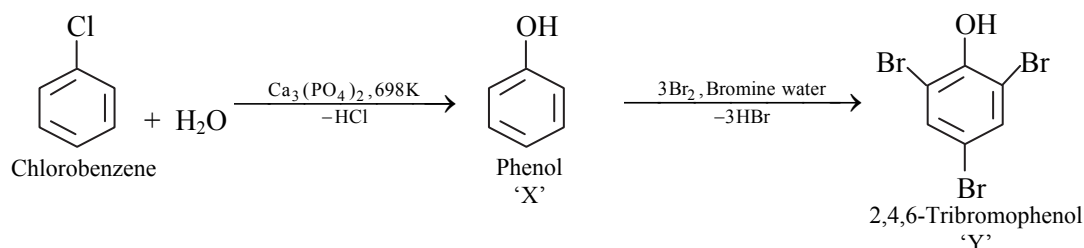
0.1 mol of ethyl bromide will give 0.1 mol of ethyl alcohol.

$$\therefore \text{Mass of ethyl alcohol obtained will be} = 0.1 \times 46 = 4.6 \text{ g}$$

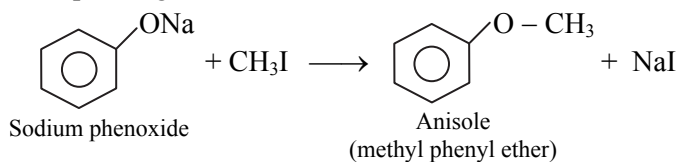
However, yield of the reaction is 60%

$$\therefore \text{Mass of ethyl alcohol obtained} = 4.6 \times \frac{60}{100} = 2.76 \text{ g}$$

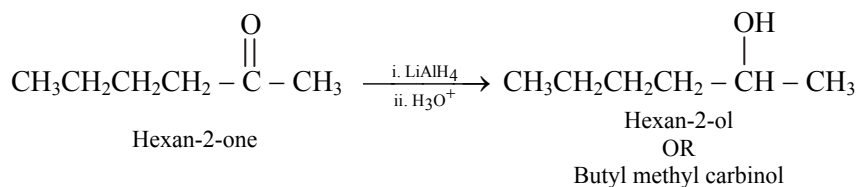
12.



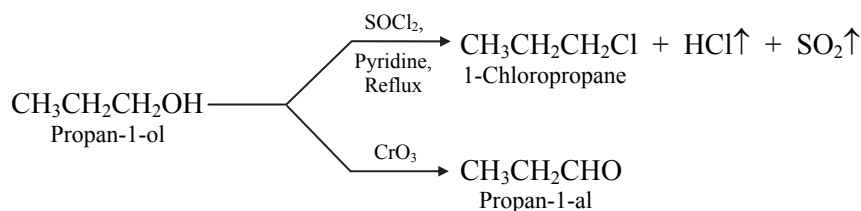
13. In the Williamson synthesis, a sodium alkoxide/phenoxide reacts with an alkyl halide to form the corresponding ether.



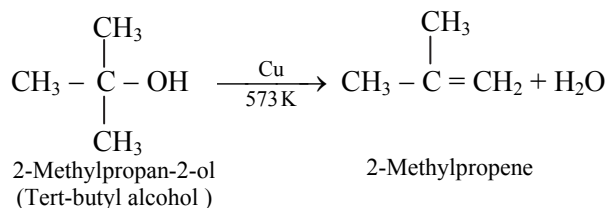
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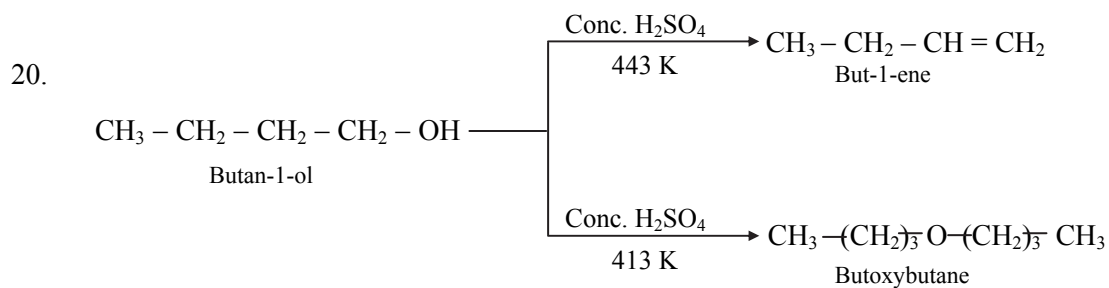
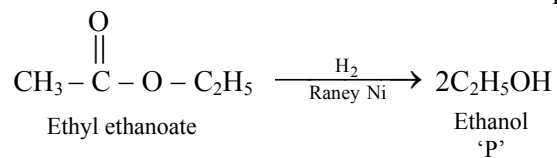
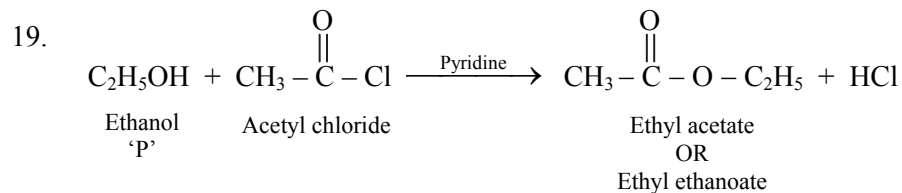
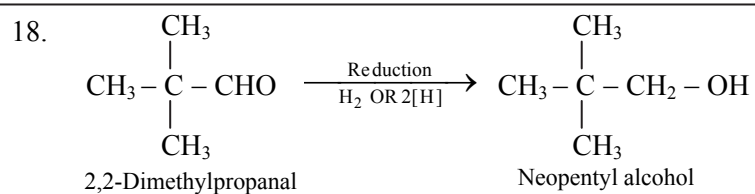


15.



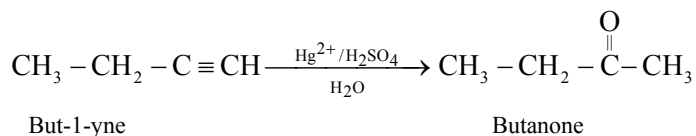
17. Compound 'A' is a tertiary alcohol as it reacts instantaneously with Lucas reagent (conc. HCl + anhydrous ZnCl_2) at room temperature. It contains four carbon atoms hence, it is tert-butyl alcohol. It reacts with heated copper at 573 K to give dehydration product i.e., 2-methylpropene.



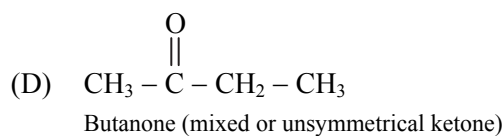
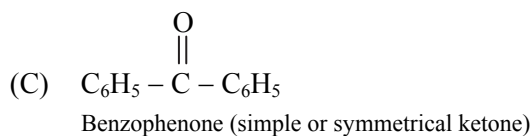
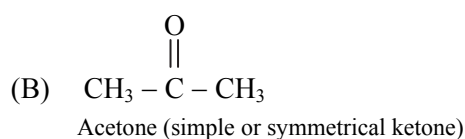
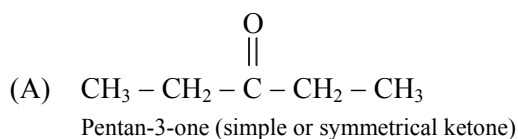


12 Aldehydes, Ketones and Carboxylic Acids

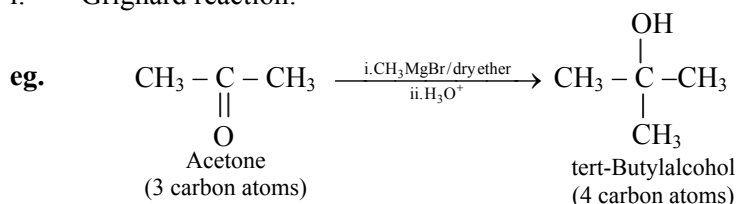
1. It is hydration of alkynes.



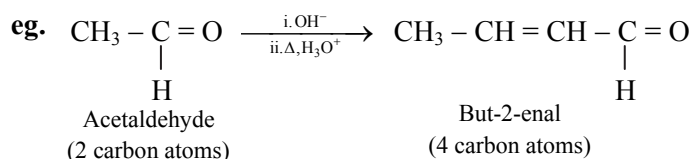
2. In simple ketones, both alkyl or aryl groups attached to carbonyl carbon are identical. In mixed ketones, the two alkyl or aryl groups attached to the carbonyl carbon are different.



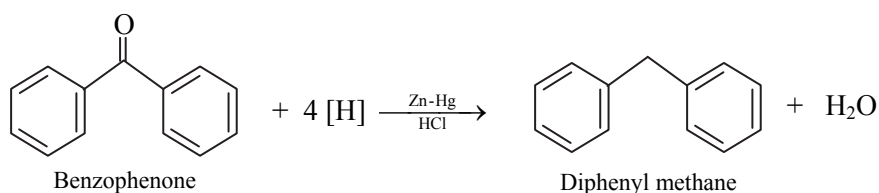
3. Only aldehydes show reducing property with Fehling's solution and not the ketones.
4. Benzophenone i.e., option (A), benzaldehyde i.e., option (B) and 2,2-dimethylpropanal do not undergo aldol condensation since they do not contain any α -hydrogen atom.
5. i. Grignard reaction:



- ii. Aldol condensation:



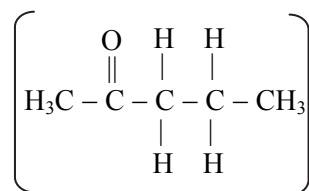
6. The carbonyl group of aldehydes and ketones is reduced to CH_2 group by Clemmensen reduction.



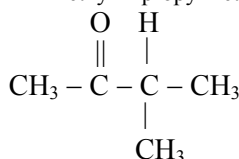
7. Formaldehyde (HCHO) lacks an active α -hydrogen atom and so it can undergo Cannizzaro reaction.



8. Methyl n-propyl ketone i.e., Pentan-2-one can exhibit chain isomerism, position isomerism and functional isomerism as follows:

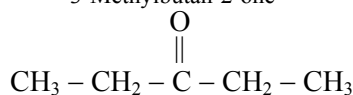


Methyl n-propyl ketone



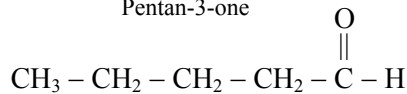
(Chain isomerism)

3-Methylbutan-2-one



(Position isomerism)

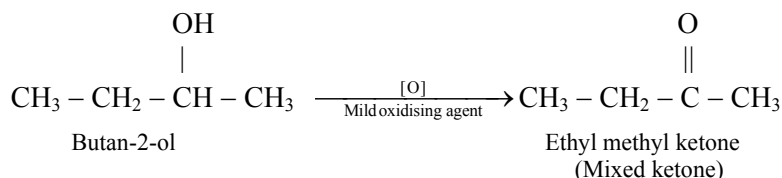
Pentan-3-one



(Functional isomerism)

Pentanal

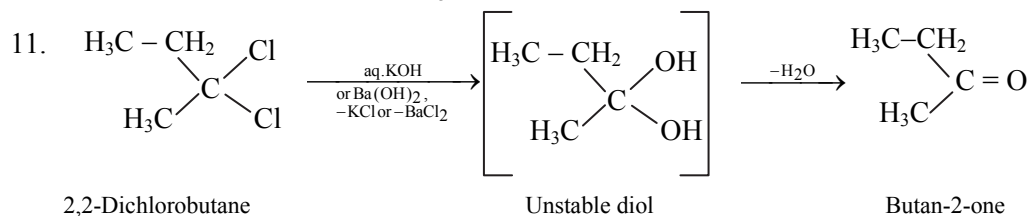
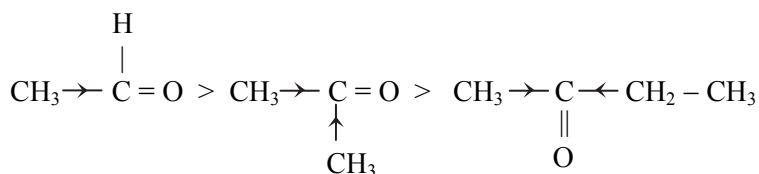
9.



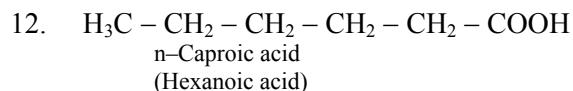
$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ and $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$ are primary alcohols which yield corresponding aldehydes as their oxidation products. $(\text{CH}_3)_3\text{COH}$ is a tertiary alcohol which undergoes oxidation with difficulty and on its oxidation it will yield acetone (symmetrical ketone) as the product.

10. The reactivities of carbonyl compounds depends upon the magnitude of the positive charge on the carbonyl carbon. More the charge, higher is the reactivity.

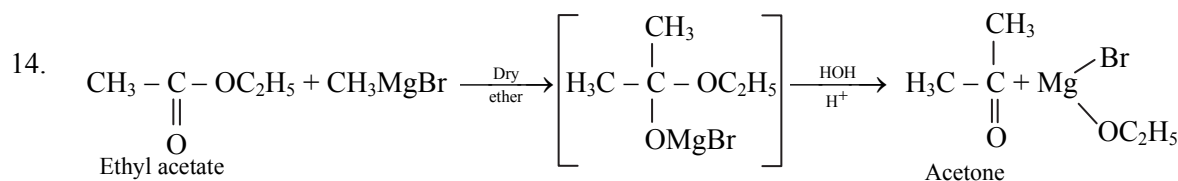
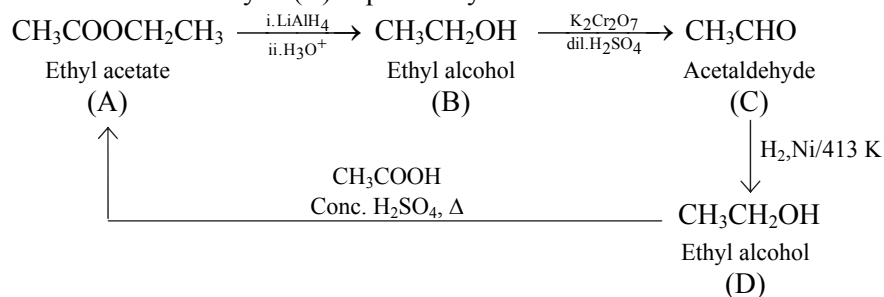
The introduction of alkyl groups (+I effect) decreases the reactivity of the carbonyl group (as positive charge on carbon is reduced). The reactivity also depends on the steric effect. As steric hindrance increases, the reactivity decreases.



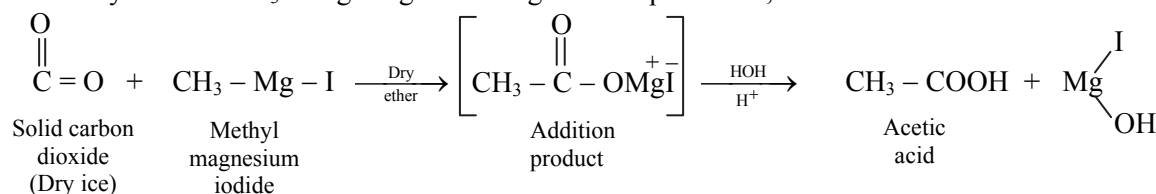
Thus, ketone (butan-2-one) is obtained as a product which bears the functional group >C=O



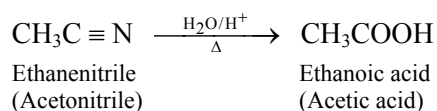
13. Trimer of acetaldehyde (C) is paraldehyde.



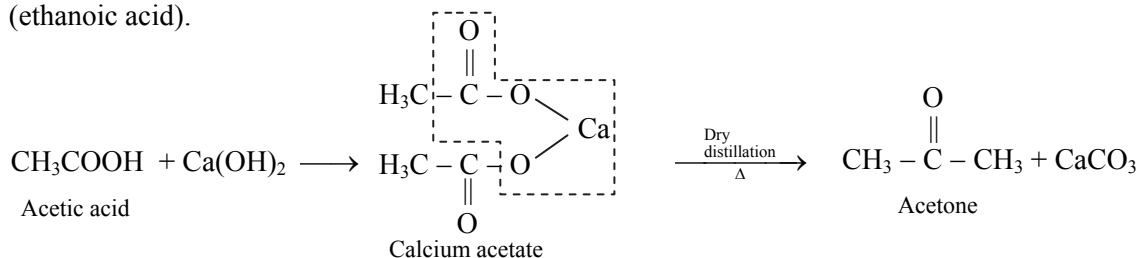
15. Carboxylation of $\text{CH}_3 - \text{Mg} - \text{I}$ gives an organic compound i.e., acetic acid.



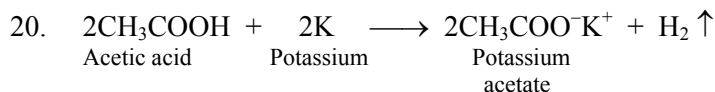
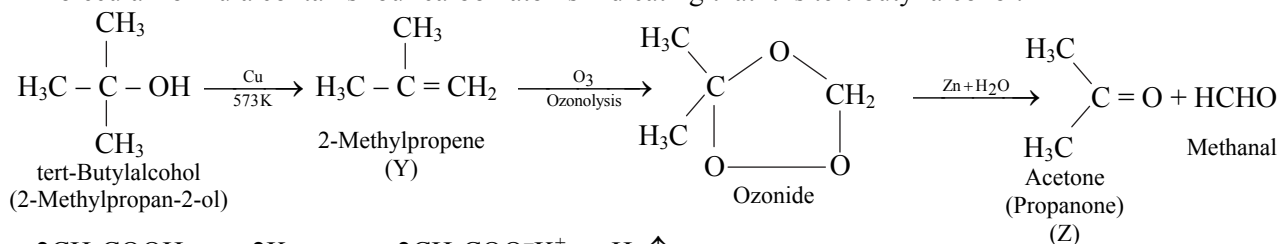
Acetic acid can also be obtained from acid hydrolysis of acetonitrile.



16. The dry distillation of calcium salts of carboxylic acids other than formic acid produces ketone. Since acetone is the product, the calcium salt must be calcium acetate and therefore the acid is acetic acid (ethanoic acid).

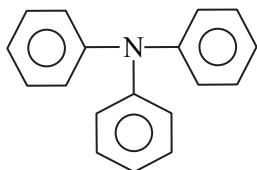


19. As compound 'X' reacts instantaneously with Lucas reagent at room temperature, it is a tertiary alcohol. Its molecular formula contains four carbon atoms indicating that it is tert-butyl alcohol.



13 Organic Compounds Containing Nitrogen

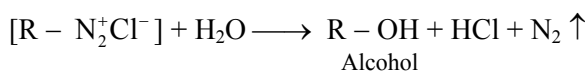
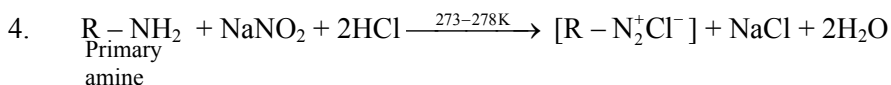
1. Triphenylamine is an example of tertiary arylamine, since the nitrogen atom is bonded to three phenyl groups.



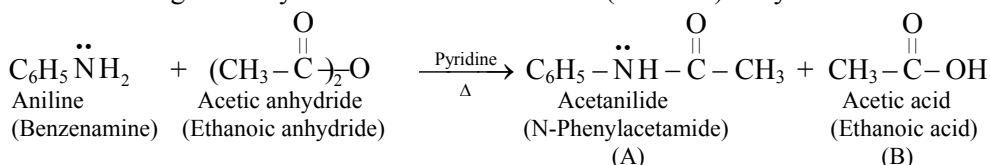
Triphenylamine
(3°)

2. To compare basicity of amines in water three factors viz., inductive effect, solvation effect and steric hindrance should be taken into consideration. Thus, in aqueous phase, the order of basic strength of the given amines is $(\text{C}_2\text{H}_5)_2\text{NH} > (\text{C}_2\text{H}_5)_3\text{N} > \text{C}_2\text{H}_5\text{NH}_2$.
- (2°) (3°) (1°)

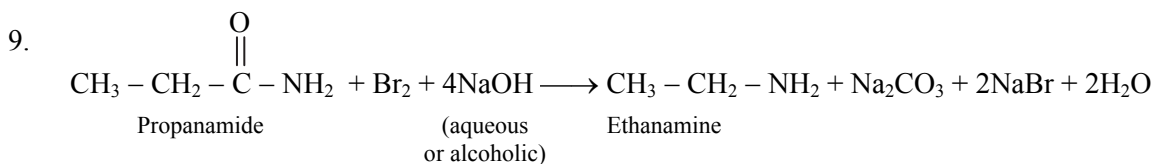
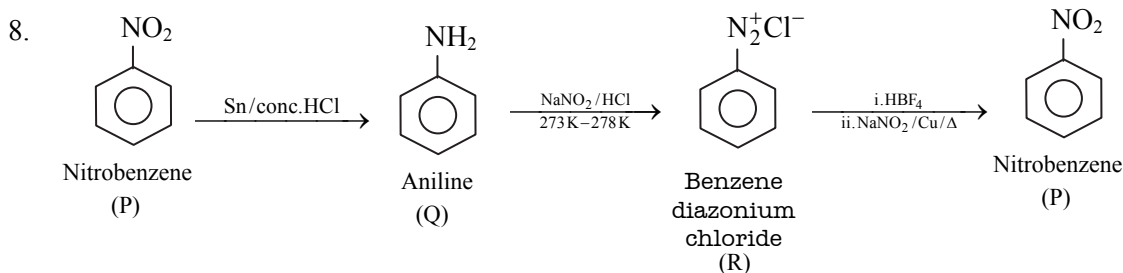
3. Alkyl cyanides on acid hydrolysis gives corresponding carboxylic acids and not primary amines. Primary amines are obtained from alkyl cyanides on reduction using sodium and ethanol (Mendius reduction).



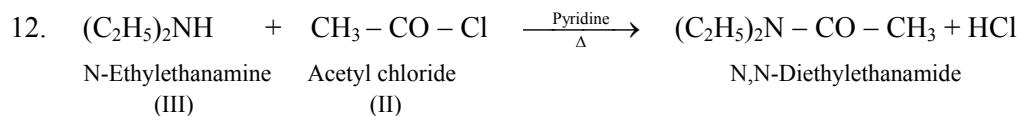
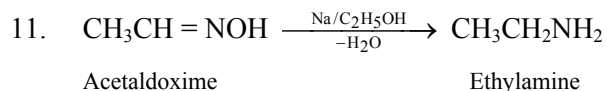
5. Aniline undergoes acetylation reaction with acetic (ethanoic) anhydride.



7. Electron releasing groups like $-\text{OCH}_3$, $-\text{CH}_3$, $-\text{NH}_2$ increase the basic strength of substituted aniline, whereas electron withdrawing groups like $-\text{NO}_2$, $-\text{C}_6\text{H}_5$, $-\text{SO}_3$, $-\text{COOH}$, $-\text{CN}$, $-\text{X}$ decrease the basic strength of substituted aniline.

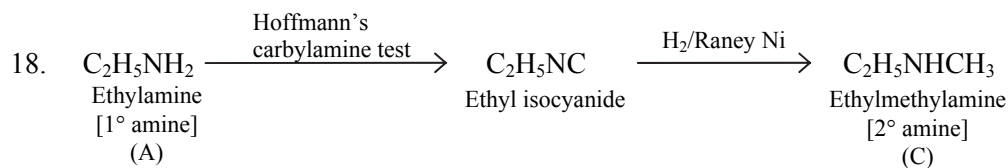
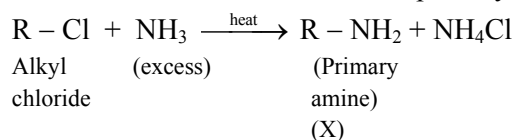


10. $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$ is called Hinsberg's reagent. They react with secondary amine to form a product that is insoluble in alkalis like KOH. This reaction is used to separate 1° , 2° and 3° amine from their mixture.

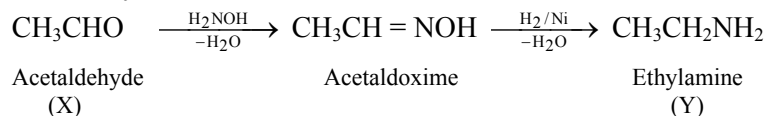


13. Aniline [$\text{C}_6\text{H}_5\text{NH}_2$] has more number of resonance structures [five resonating structures] than anilinium ion [two resonating structures]. Thus, aniline is more stable than anilinium ion [$\text{C}_6\text{H}_5\text{NH}_3^+$].

15. When excess of ammonia is used, primary amine can be obtained as a major product.

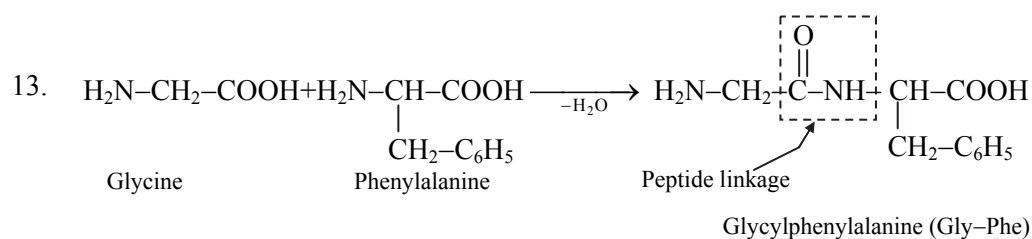


20. The aliphatic primary amine with molecular formula $\text{C}_2\text{H}_7\text{N}$ is ethylamine ($\text{C}_2\text{H}_5\text{NH}_2$). So, the product (Y) is ethylamine. Aldehydes or ketones react with hydroxylamine to form corresponding oximes, which on catalytic hydrogenation give corresponding primary amines. Thus, the starting carbonyl compound (X) is acetaldehyde.



14 Biomolecules

- Option (D) is β -D-2-Deoxyribose which is the sugar present in DNA.
- The six membered cyclic ring structures of glucose are called pyranose structures as they resemble pyran, a six membered heterocyclic ring containing five carbon atoms and one oxygen atom.
- Sucrose is a non-reducing sugar due to the absence of the free aldehydic or ketonic group. Thus, it does not show any reducing test of the aldehydes.
- Testosterone is a hormone.
- All naturally occurring enzymes are proteins; but all proteins are not enzymes. The α -amino acids are building block of both proteins and enzymes.
- Except ketotriose (dihydroxyacetone), all aldoses and ketoses are optically active.
- In aqueous solutions, α -amino acids behave as zwitter ions and show amphoteric behaviour as they react both with acids and bases. Isoleucine [option (B)] and proline [option (C)] are α -amino acids.

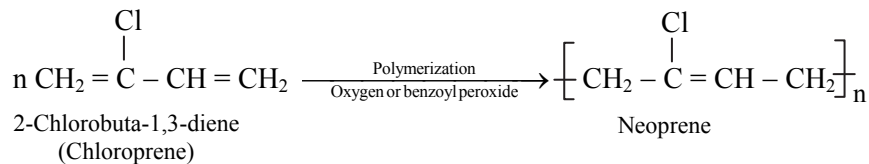


- Sucrose is a disaccharide while glucose, fructose and xylose are monosaccharides.

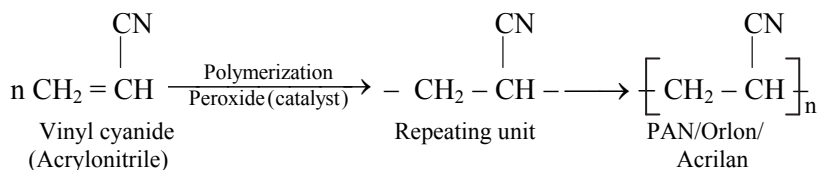
15 Polymers

2. Natural rubber is the natural biodegradable polymer, dextran is a synthetic biodegradable polymer and PVC and nylon are synthetic and non-biodegradable polymers.

4.

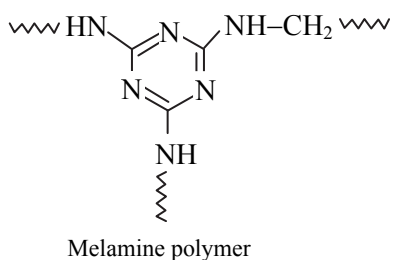


5. Thermosetting polymers do not soften on heating and harden on cooling. Hence, they cannot be remoulded, recycled or reused.
6. Terylene (Dacron) is used for making terylene fibres which are resistant to heat, crease, chemicals, light, moths, bacteria, etc.
7. Fibres like Nylon-6,6 have strong intermolecular forces (hydrogen bonds or dipole-dipole interactions).
8. Acrilan is a polymer of acrylonitrile i.e., vinyl cyanide $[\text{CH}_2 = \text{CH} - \text{CN}]$.



9. Buna-S is the copolymer of styrene and buta-1,3-diene whereas teflon, PVC and PAN are homopolymers.
10. All copolymers are a type of heteropolymers in which multiple units of each monomer are polymerized in a chain.

15.



16 Chemistry in Everyday Life

1. In human body, prontosil is converted to sulphanilamide.
2. Cetyltrimethyl ammonium bromide is a cationic detergent. Sodium stearate is a soap. Sodium n-dodecylbenzenesulphonate is an anionic detergent.
4. Naproxen and aspirin are analgesics whereas novestrol is an antifertility drug.
6. Radiotherapy involves the use of radiations. Competitive inhibition is mechanism of action of drug on enzyme.
7. Active part is the part of enzyme where substrate is held and the chemical reaction takes place. Drug target is the biological macromolecule with which the drugs interact.
9. 0.3 ppm aqueous solution of Cl_2 is used as disinfectant.
10. The chemicals which are added to food to prevent the growth of microbes and to avoid spoilage of food are called as food preservatives.
11. Nardil \Rightarrow Phenelzine [Antidepressant drug]