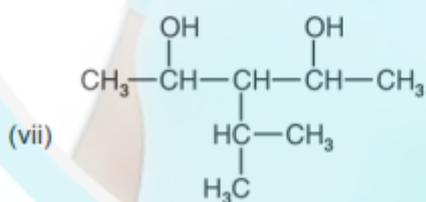
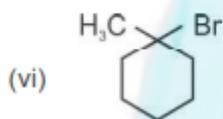
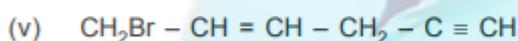
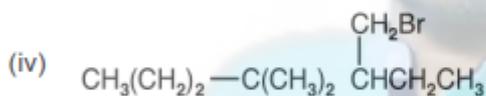
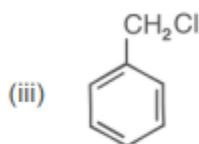
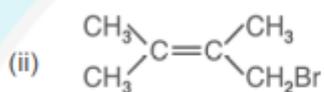
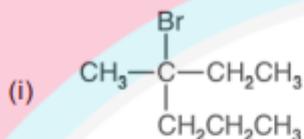


THE MOTHER'S INTERNATIONAL SCHOOL
CHEMISTRY
CLASS -XII
Practice Worksheet

HALOALKANES AND HALOARENES

1. Write the IUPAC names of the following compounds.



Chemistry for all

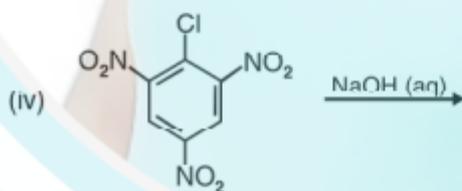
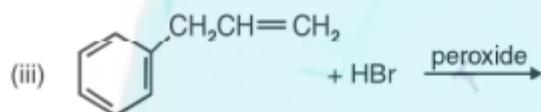
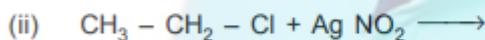
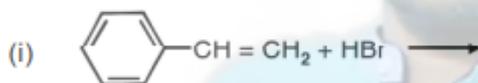
2. Write the structure of following halogen compounds

- (i) 2-chloro-3-methylpentane
- (ii) 2-(2-chlorophenyl)-1-iodooctane
- (iii) 1-bromo-4-sec-butyl-2-methylbenzene.
- (iv) p-bromotoluene.
- (v) chlorophenylmethane

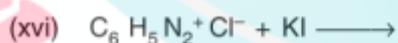
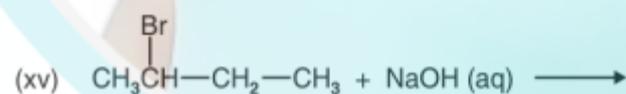
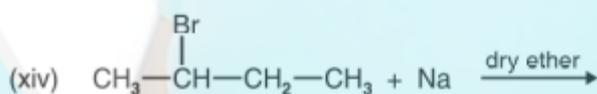
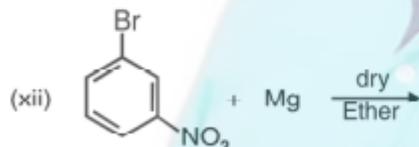
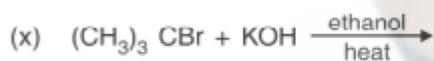
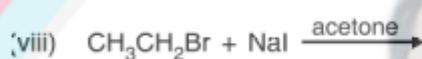
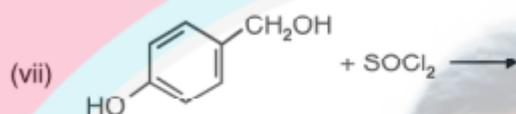
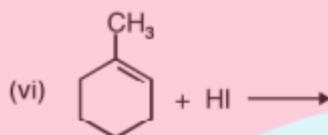
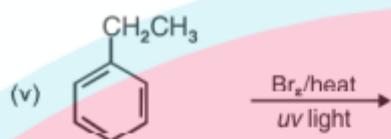
3. Arrange the following in the increasing order of property indicated :

- (i) bromomethane, chloromethane, dichloromethane. (Increasing order of boiling points).
- (ii) 1-chloropropane, isopropyl chloride, 1-chlorobutane (Increasing order of boiling point)
- (iii) dichloromethane, chloroform, carbon tetrachloride. (Increasing order of dipole moment.
- (iv) CH_3F , CH_3Cl , CH_3Br , CH_3I (Increasing reactivity towards nucleophilic substitution and increasing order of dipole moment)
- (v) *o,m,p*-dichlorobenzenes (Increasing order of melting points).

4. Complete the following reactions :



Chemistry for all

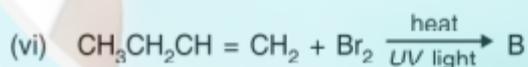
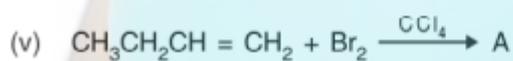
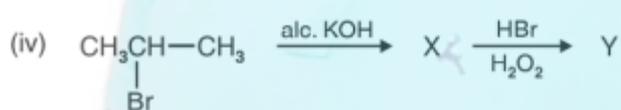
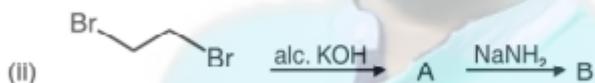
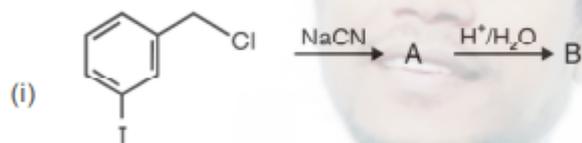


Chemistry for all

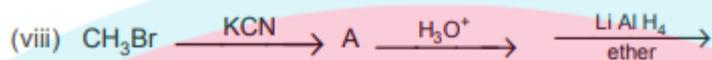
5. How will you bring about the following conversions?

- (i) benzene to 3-bromonitrobenzene
- (ii) ethanol to but-1-yne
- (iii) 1-bromopropane to 2-bromopropane
- (iv) benzene to 4-bromo-1-nitrobenzene
- (v) aniline to chlorobenzene
- (vi) 2-methyl-1-propene to 2-chloro-2-methylpropane
- (vii) ethyl chloride to propanoic acid
- (viii) but-1-ene to n-butyl iodide
- (ix) benzene to phenylchloromethane.
- (x) tert-butyl bromide to isobutyl bromide.

6. Identify the products formed in the following sequence :



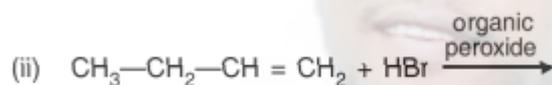
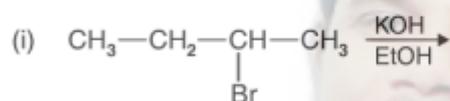
Chemistry for all



7. Explain the following reactions with suitable example :

- (i) Finkelstein reaction.
- (ii) Swarts reaction.
- (iii) Wurtz reaction.
- (iv) Wurtz-Fitting reaction
- (v) Friedel-Craft's alkylation reaction.
- (vi) Friedel-Craft's acylation reaction
- (vii) Sandmeyer reaction.

8. Write the major products and name the rule responsible for the formation of the product.



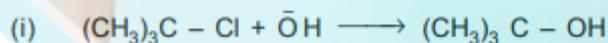
9. Write the difference between

- (i) enantiomers and diastereomers
- (ii) retention and inversion of configuration.
- (iii) electrophilic and nucleophilic substitution reactions.

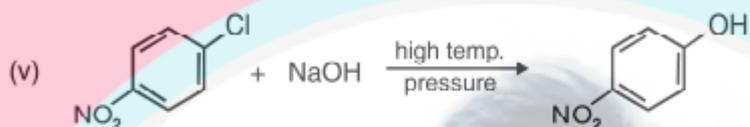
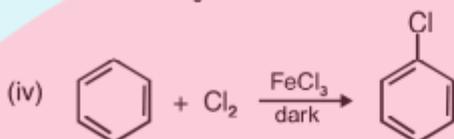
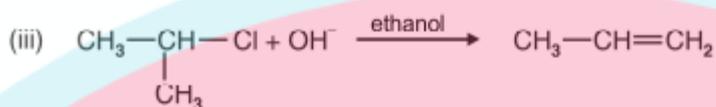
10. Give a chemical test to distinguish between the following pairs of compounds:

- (i) chlorobenzene and cyclohexylchloride.
- (ii) vinyl chloride and ethyl chloride.
- (iii) n-propyl bromide and isopropyl bromide.

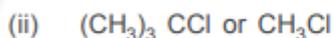
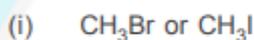
11. Give mechanism of the following reactions :



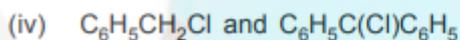
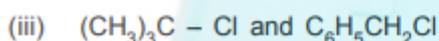
Chemistry for all



12. Which compound in each of the following pairs will react faster in S_N2 reaction with OH⁻ and why?



13. In the following pairs which halogen compound undergoes faster SN1 reaction?



14. Give reasons for the following :

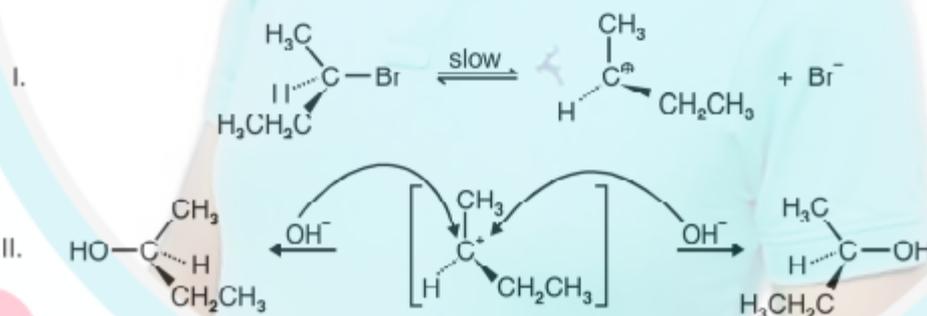
(i) The bond length of C-Cl bond is larger in haloalkanes than that in haloarenes.

(ii) Although alkyl halides are polar in nature but are not soluble in water.

Chemistry for all

- (iii) tert-butyl bromide has lower boiling point than n-Butyl bromide.
- (iv) haloalkanes react with KCN to form alkyl cyanide as main product while with AgCN alkyl isocyanide is the main product.
- (v) sulphuric acid is not used in the reaction of alcohol with KI.
- (vi) thionyl chloride is the preferred reagent for converting ethanol to chloroethane.
- (vii) haloalkanes undergo nucleophilic substitution reaction easily but haloarenes do not undergo nucleophilic substitution under ordinary conditions.
- (viii) chlorobenzene on reaction with fuming sulphuric acid gives ortho and para chlorosulphonic acids.
- (ix) 2, 4-dinitro chlorobenzene is much more reactive than chlorobenzene towards hydrolysis reaction with NaOH.
- (x) Grignard reagent should be prepared under anhydrous conditions.
- (xi) the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
- (xii) neopentyl bromide undergoes nucleophilic substitution reactions very slowly
- (xiii) vinyl chloride is unreactive in nucleophilic substitution reaction.
- (xiv) An optically inactive product is obtained after the hydrolysis of optically active 2- bromobutane.

[Hint : The hydrolysis reaction occurs by S_N1 pathway. The carbocation is formed first which gives a mixture of (\pm) butan-2-ol in the second step].



- (xv) methyl iodide is hydrolysed at faster rate than methyl chloride.

Chemistry for all

15. Write the different products and their number formed by the monochlorination of following compounds :

- (i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- (ii) $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$
- (iii) $(\text{CH}_3)_2\text{CHCH}(\text{CH}_3)_2$

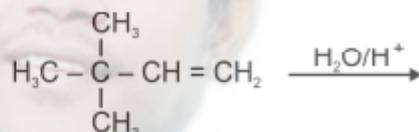
[Hint : (i) Two, (ii) four, (iii) three

16. (a) When 3-methylbutan-2-ol is treated with HBr, the following reaction takes places :

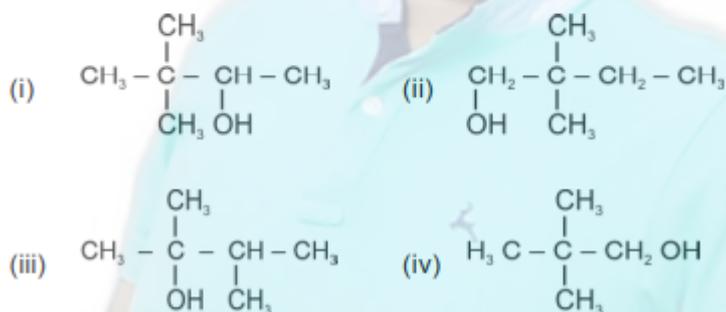


Give the mechanism for this reaction.

(b) In the following reaction :



major and minor products are :



Ans. Major (iii) minor (i)

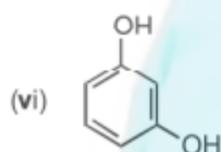
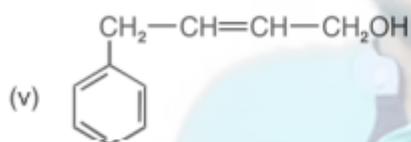
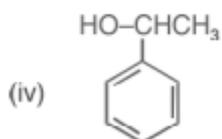
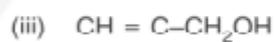
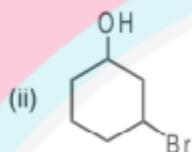
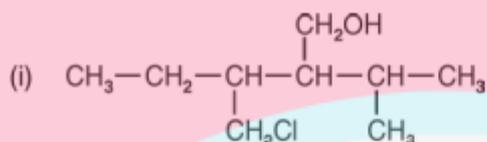
17. Give one use of each of following :

- | | |
|----------------------------|---------------|
| (i) Freon-12 | (ii) DDT |
| (iii) Carbon tetrachloride | (iv) Iodoform |

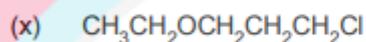
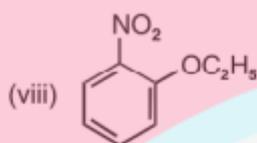
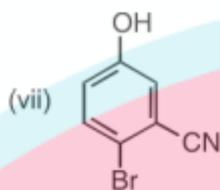
Chemistry for all

ALCOHOLS, PHENOLS AND ETHERS

1. Write IUPAC names of the following compounds :



Chemistry for all



2. Write the structures of the compounds whose names are given below :

(i) 3, 5-dimethoxyhexane-1, 3, 5-triol

(ii) cyclohexylmethanol

(iii) 2-ethoxy-3-methylpentane

(iv) 3-chloromethylpentan-2-ol

(v) p-nitroanisole

3. Describe the following reactions with example :

(i) Hydroboration oxidation of alkenes

(ii) Acid catalysed dehydration of alcohols at 443K.

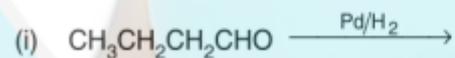
(iii) Williamson synthesis

(iv) Reimer-Tiemann reaction.

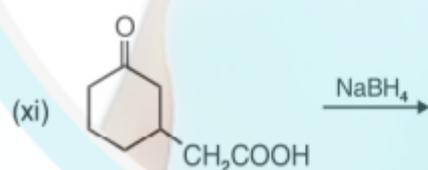
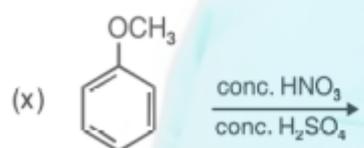
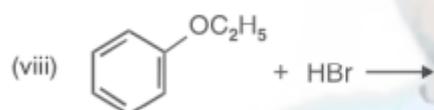
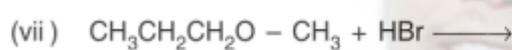
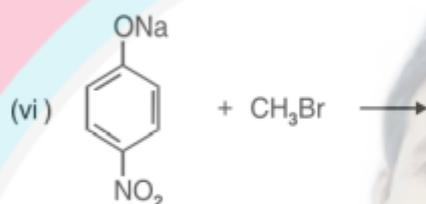
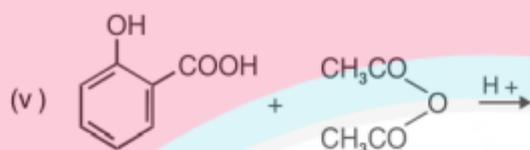
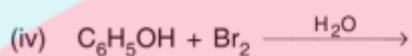
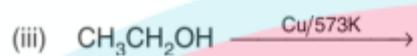
(v) Kolbe's reaction

(vi) Friedel-Crafts acylation of Anisole.

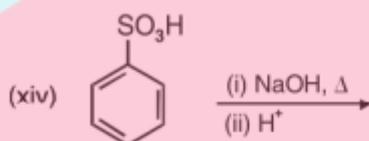
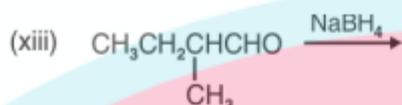
4. Complete the following reactions :



Chemistry for all



Chemistry for all



5. What happens when :

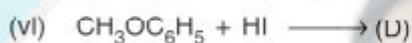
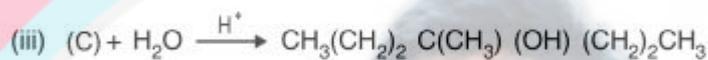
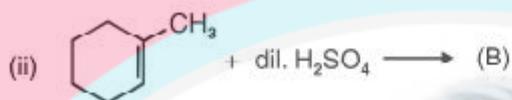
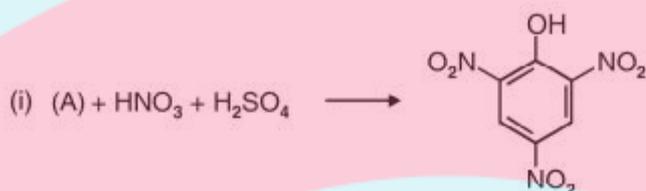
- (i) aluminium reacts with tert-butyl alcohol
- (ii) phenol is oxidised with chromic acid
- (iii) cumene is oxidised in the presence of air and the product formed is treated with dilute acid.
- (iv) phenol is treated with conc. HNO_3 .
- (v) phenol is treated with chloroform in presence of dilute NaOH .

6. How will you convert

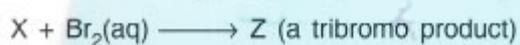
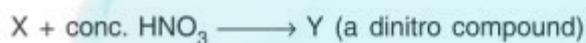
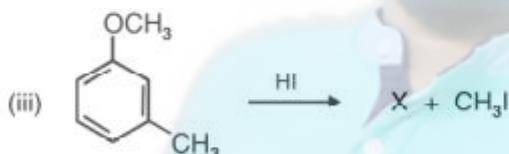
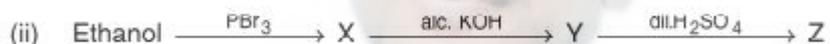
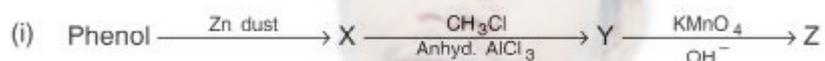
- (i) propene to propan-1-ol.
- (ii) anisole to phenol
- (iii) butan-2-one to butan-2-ol
- (iv) ethanal to ethanol
- (v) phenol to ethoxybenzene
- (vi) 1-phenylethene to 1-phenylethanol
- (vii) formaldehyde to cyclohexylmethanol
- (viii) butyl bromide to pentan-1-ol.
- (ix) toluene to benzyl alcohol
- (x) 1-propoxypropane to propyl iodide
- (xi) ethyl bromide to 1-ethoxyethane
- (xii) methyl bromide to 2-methoxy-2-methylpropane
- (xiii) ethyl bromide to ethoxybenzene
- (xiv) ethanol to benzyl ethyl ether.

Chemistry for all

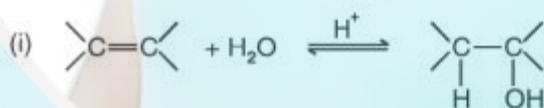
7. Identify the missing reactant or product A to D in the following equations:



8. Identify X, Y and Z in the following sequence of reactions :



10. Write the mechanism for following reactions :



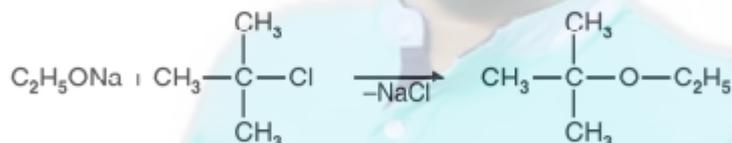
(acid catalysed hydration of alkenes)

Chemistry for all

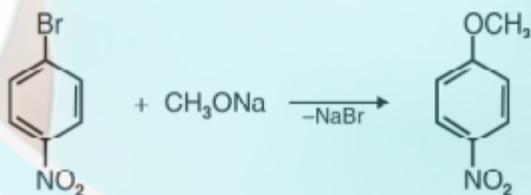
- (ii) $\text{CH}_3 - \text{CH}_2 - \text{OH} \xrightarrow[443 \text{ K}]{\text{H}^+} \text{CH}_2 = \text{CH}_2$
(acid catalysed dehydration of alcohols)
- (iii) $2\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[413 \text{ K}]{\text{H}^+} \text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
(acid catalysed nucleophilic substitution reaction)
- (iv) $\text{CH}_3\text{OCH}_3 + \text{HI} \longrightarrow \text{CH}_3\text{OH} + \text{CH}_3\text{I}$
- (v) $(\text{CH}_3)_3\text{C} - \text{O} - \text{CH}_3 + \text{HI} \longrightarrow \text{CH}_3\text{OH} + (\text{CH}_3)_3\text{C} \text{I}$

11. Give reason for the following :

- (i) The C–O–C bond angle in dimethyl ether is (111.7°)
- (ii) Alcohols have higher boiling points than ethers of comparable molecular masses.
- (iii) Phenols are more acidic than alcohols.
- (iv) Nitrophenol is more acidic than o-methoxyphenol.
- (v) Phenol is more reactive towards electrophilic substitution reaction than benzene.
- (vii) The following is not an appropriate method for the preparation of t-butyl ethyl ether :

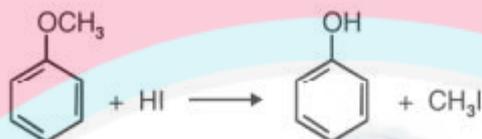


- (a) What would be the major product of this reaction?
- (b) Write suitable reaction for the preparation of t-butyl ethyl ether.
- (viii) The following is not an appropriate method for the preparation of 1-methoxy-4-nitrobenzene;



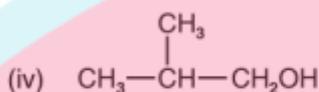
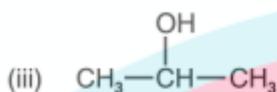
Chemistry for all

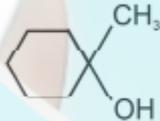
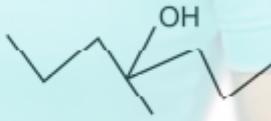
- (x) Write the suitable reaction for the preparation of 1-methoxy-4-nitrobenzene
- (ix) o-nitrophenol is steam volatile but p-nitrophenol is not.
- (x) phenol is less polar than ethanol.
- (xi) The phenyl methyl ether reacts with HI to form phenol and iodomethane and not iodobenzene and methanol.



- (xii) methanol is less acidic than water.
 - (xiii) alcohols can act as weak base as well as weak acids.
 - (xiv) phenols do not give protonation reaction readily.
 - (xvi) absolute ethanol can not be obtained by fractional distillation of ethanol and water mixture.
12. Arrange the following in the increasing order of property shown :
- (i) methanol, ethanol, diethylether, ethyleneglycol. (Boiling points)
 - (ii) phenol, o-nitrophenol, m-nitrophenol, p-nitrophenol. (Acid strength)
 - (iii) dimethylether, ethanol, phenol. (Solubility in water)
 - (iv) n-butanol, 2-methylpropan-1-ol, 2-methylpropan-2-ol. (Acid strength)
13. Give a chemical test to distinguish between the following pair of compounds.
- (i) n-propyl alcohol and isopropylalcohol
 - (ii) methanol and ethanol
 - (iii) cyclohexanol and phenol.
 - (iv) propan-2-ol and 2-methylpropan-2-ol.
 - (v) phenol and anisole
 - (vi) ethanol and diethyl ether
- *14. Which of the following compounds gives fastest reaction with HBr and why?
- (i) $(\text{CH}_3)_3\text{COH}$
 - (ii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

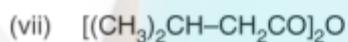
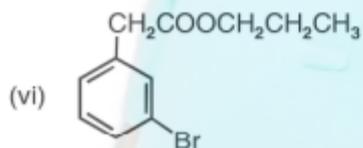
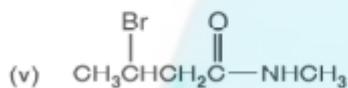
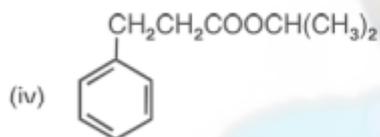
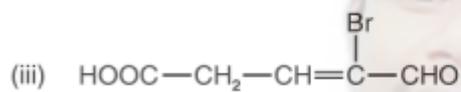
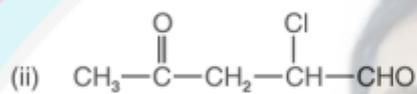
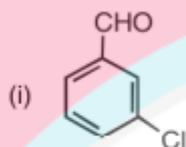
Chemistry for all



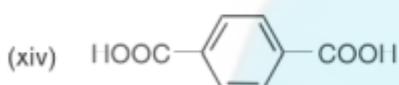
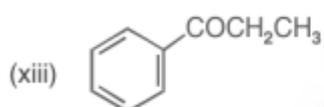
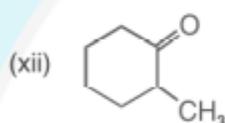
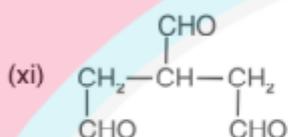
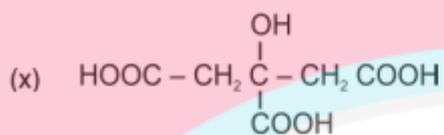
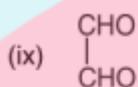
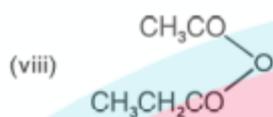
- *15. What is the function of ZnCl_2 (anhyd) in Lucas test for distinction between 1° , 2° and 3° alcohols.
16. An alcohol A ($\text{C}_4\text{H}_{10}\text{O}$) on oxidation with acidified potassium dichromate gives carboxylic acid B ($\text{C}_4\text{H}_8\text{O}_2$). Compound A when dehydrated with conc. H_2SO_4 at 443 K gives compound C. Treatment of C with aqueous H_2SO_4 gives compound D ($\text{C}_4\text{H}_{10}\text{O}$) which is an isomer of A. Compound D is resistant to oxidation but compound A can be easily oxidised. Identify A, B, C and D and write their structures.
- *17. An organic compound A having molecular formula $\text{C}_6\text{H}_6\text{O}$ gives a characteristic colour with aqueous FeCl_3 . When A is treated with NaOH and CO_2 at 400 K under pressure, compound B is obtained. Compound B on acidification gives compound C which reacts with acetyl chloride to form D which is a popular pain killer. Deduce the structure of A, B, C and D. What is the common name of Drug D?
18. An ether A ($\text{C}_5\text{H}_{12}\text{O}$) when heated with excess of hot concentrated HI produced two alkyl halides which on hydrolysis form compounds B and C. Oxidation of B gives an acid D whereas oxidation of C gave a ketone E. Deduce the structures of A, B, C, D and E.
19. Phenol, $\text{C}_6\text{H}_5\text{OH}$ when it first reacts with concentrated sulphuric acid, forms Y. Y is reacted with concentrated nitric acid to form Z. Identify Y and Z and explain why phenol is not converted commercially to Z by reacting it with conc. HNO_3 .
20. Synthesise the following alcohols from suitable alkenes.
- (a) 
- (b) 
21. How are the following ethers prepared by williumson synthesis?
- (a) Ethoxybenzene (b) 2-methoxy-2-methylpropane

ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

1. Indicate the electrophilic and nucleophilic centres in acetaldehyde.
2. Write the IUPAC names of the following organic compounds :



Chemistry for all



3. Explain the following reactions giving one example of each :

- (i) Rosenmund reduction reaction
- (ii) Stephen reaction
- (iii) Etard reaction
- (iv) Gatterman-Koch reaction
- (v) Aldol condensation
- (vi) Cross aldol condensation
- (vii) Cannizzaro reaction
- (viii) Decarboxylation reaction

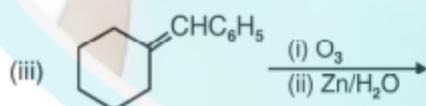
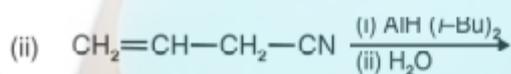
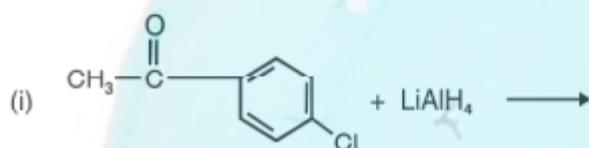
Chemistry for all

- (ix) Kolbe's reaction
- (x) Hell-Volhard-Zelinsky reaction
- (xi) Clemmensen reduction
- (xii) Wolff-Kishner reduction
- (xiii) Haloform reaction.

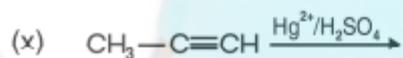
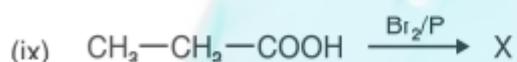
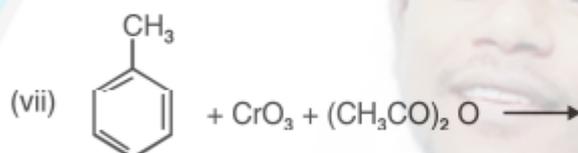
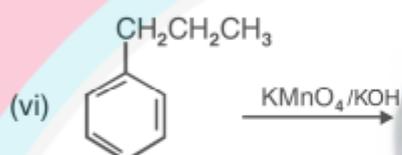
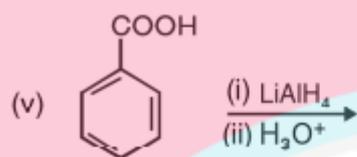
4. How will you convert :

- (i) Isopropyl chloride to 2-methylpropionaldehyde.
- (ii) benzene to benzaldehyde
- (iii) benzoic acid to acetophenone
- (iv) propene to propanal
- (v) butanoic acid to 2-hydroxybutanoic acid
- (vi) benzoic acid to m-nitrobenzyl alcohol
- (vii) propanol to propene
- (viii) propanol to butan-2-one.
- (ix) methyl magnesium bromide to ethanoic acid
- (x) benzoic acid to benzyl chloride
- (xi) acetone to chloroform
- (xii) acetylene to acetic acid
- (xiii) formaldehyde to propanol
- (xiv) acetophenone to 2-phenylbutan-2-ol

5. Complete the following reactions :



Chemistry for all



6. How will you prepare the following derivatives of acetone?

- (i) 2, 4-DNP derivative
- (ii) Schiff's base
- (iii) Oxime

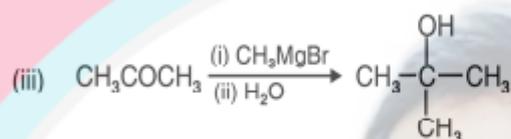
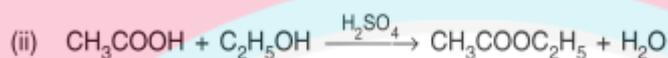
Chemistry for all

7. Arrange the following in the increasing order of the property indicated

(i) CH_3CHO , HCHO , CH_3COCH_3 , $\text{C}_6\text{H}_5\text{CHO}$ (reactivity towards HCN)

(ii) propan-1-ol, propanone, propanal (boiling point)

8. Give the reaction mechanism for following reactions :



9. Give one chemical test to distinguish between following pair of compounds:
Write the chemical reaction involved.

(i) propan-2-ol and propanone

(ii) ethyl acetate and methyl acetate

(iii) benzaldehyde and benzoic acid

(iv) benzaldehyde and acetaldehyde

(v) formic acid and acetic acid

(vi) propanal and propan-1-ol

(vii) ethanoic acid and ethylethanoate

(viii) CH_3CHO and CH_3COCH_3

(ix) CH_3CHO and HCHO

(x) acetophenone and benzophenone

10. Give reason for the following (i) cyclohexanone form cyanohydrin in good yield but 2, 2, 6 – trimethylcyclohexanone does not.

(ii) Benzaldehyde does not give Fehling's test.

(iii) The alpha H atoms in ethanal are acidic in nature.

(iv) p-nitrobenzaldehyde is more reactive than benzaldehyde towards nucleophilic addition reactions.

Chemistry for all

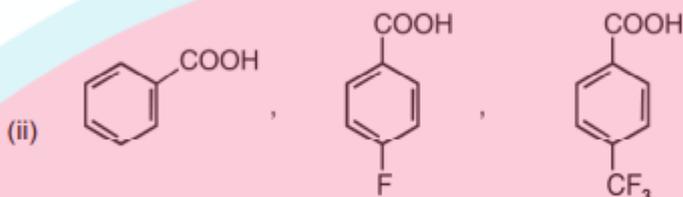
- (v) Acetic acid does not give sodium bisulphite addition product.
 - (vi) For the formation of ethyl acetate from acetic acid and ethanol in presence of sulphuric acid, the reaction mixture is heated to remove water as fast as it is formed.
 - (vii) Chloroacetic acid has lower pka value than acetic acid.
 - (viii) Monochloroethanoic acid is a weaker acid than dichloroethanoic acid.
 - (ix) Benzoic acid is stronger acid than ethanoic acid.
 - (x) Aldehydes are more reactive towards nucleophilic reagents than ketones .
 - (xi) Benzaldehyde does not undergo aldol condensation.
 - (xii) Formic acid reduces Tollens' reagent.
 - (xiii) Electrophilic substitution in benzoic acid takes place at m-position.
 - (xiv) Carboxylic acids do not give characteristic reactions of carbonyl group.
 - (xv) Formaldehyde gives Cannizzaro reaction whereas acetaldehyde does not.
 - (xvi) tert-butyl benzene cannot be oxidised with KMnO_4 .
 - (xviii) There are two $-\text{NH}_2$ groups in semicarbazide. However, only one $-\text{NH}_2$ group is involved in the formation of semicarbazones.
 - (xix) Benzoic acid is less soluble in water than acetic acid.
 - (xx) Formic acid is a stronger acid than acetic acid.
- *11. You are given four different reagents Zn-Hg/HCl , $\text{NH}_2\text{NH}_2/\text{OH}^-$ in Glycol, H_2/Ni and NaBH_4 . Select one reagent for the following transformation and give reasons to justify your answer.



- *12. An organic compound (A) having molecular formula $\text{C}_5\text{H}_{10}\text{O}$ gives a positive 2, 4-DNP test. It does not reduce Tollens' reagent but forms an addition compound with sodium hydrogen sulphite. On reaction with I_2 in alkaline medium, it forms a yellow precipitate of compound B and another compound C having molecular formula $\text{C}_4\text{H}_7\text{O}_2\text{Na}$. On oxidation with KMnO_4 , [A] forms two acids D and E having molecular formula $\text{C}_3\text{H}_6\text{O}_2$ and $\text{C}_2\text{H}_4\text{O}_2$ respectively. Identify A, B, C, D and E.
- *13. Formaldehyde and acetaldehyde on treatment with dil. NaOH form A which on heating changes to B. When B is treated with HCN , it forms C. Reduction of C with DIBAL-H yields D which on hydrolysis gives E. Identify A, B, C, D and E.

*18. Arrange the following acids in the order of increasing acid strength

(i) formic acid, benzoic acid, acetic acid



(iii) $\text{CH}_3\text{CH}_2\text{COOH}$, $\text{C}_6\text{H}_5\text{COOH}$, CH_3COOH , $\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$

*19. During the reaction of a carbonyl compound with a weak nucleophile, H^+ ions are added as catalyst. Why?

*20. During reaction of carbonyl compound with 2, 4-DNP reagent, the pH of the reaction mixture has to be maintained between 3 and 4. Why?

*21. An aromatic compound X with molecular formula C_9H_{10} gives the following chemical tests :

- (i) Forms 2, 4-DNP derivative
- (ii) Reduces Tollens' reagent
- (iii) Undergoes Cannizzaro reaction
- (iv) On vigorous oxidation gives 1, 2-benzenedicarboxylic acid.

Identify X and write its IUPAC name. Also write the reactions involved in the formation of above mentioned products.

22. Iodoform can be prepared from, all except.

- (i) Ethyl methyl ketone
- (ii) Isopropyl alcohol
- (iii) 3-methylbutan-2-one
- (iv) Isobutyl alcohol

Chemistry for all