



PRACTICE MCQS

CLASS 12 CHEMISTRY (TERM - I)
**HALOALKANES AND
HALOARENES**

BY
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learning simplified





Question 1:

Which of the following isomer has the highest melting point?

- (a) 1, 2-dichlorobenzene
- (b) 1, 3 -dichlorobenzene
- (c) 1, 4-dichlorobenzene
- (d) all isomers have same melting points

Answer: (c) 1, 4-dichlorobenzene

p - Dichlorobenzene is more symmetrical than the o- and m- isomers. So, it fits more closely in the crystal lattice. So, more energy is required to break the crystal lattice of p - dichlorobenzene. Therefore p - dichlorobenzene has highest melting point and lower solubility as compared to ortho and meta isomers. It has melting point of 53.5 degree Celsius.

Question 2:

Which of the following is a correct statement for C_2H_5Br ?

- (a) It reacts with metallic Na to give ethane.
- (b) It gives nitroethane on heating with aqueous solution of $AgNO_2$
- (c) It gives C_2H_5OH on boiling with alcoholic potash.
- (d) It forms diethylthioether on heating with alcoholic KSH.

Answer: (b) It gives nitroethane on heating with aqueous solution of $AgNO_2$

It gives nitroethane on heating with aqueous solution of $AgNO_2$ (C_2H_5Br reacts with metallic Na to give ethane, gives ethene on boiling with alcoholic potash. and forms C_2H_5SH (thiol) on heating with alcoholic KSH).

**Question 3:**

Alkenes decolourise bromine water in presence of CCl_4 due to formation of:

- (a) allyl bromide
- (b) vinyl bromide
- (c) bromoform
- (d) vicinal dibromide

Answer:(d) vicinal dibromide

**Question 4:**

Reaction of $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$ with aqueous sodium hydroxide follows _____.

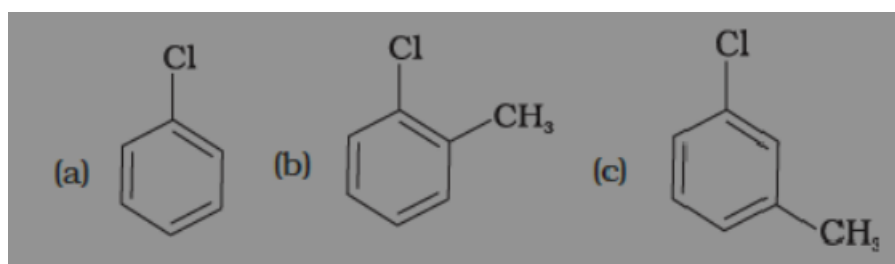
- (a) $\text{S}_{\text{N}}1$ mechanism
- (b) $\text{S}_{\text{N}}2$ mechanism
- (c) Any of the above two depending upon the temperature of reaction
- (d) Saytzeff rule

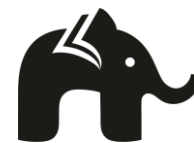
Answer: (a) $\text{S}_{\text{N}}1$ mechanism

In $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$ carbocation is $\text{C}_6\text{H}_5^{(+)}\text{CH}_2$ which is stable due to resonance.

Question 5:

Arrange the compounds in increasing order of rate of reaction towards nucleophilic reaction:-





- (a) (iii) < (ii) < (i)
- (b) (ii) < (iii) < (i)
- (c) (i) < (iii) < (ii)
- (d) (i) < (ii) < (iii)

Answer: (d) (i) < (ii) < (iii)

Presence of electron withdrawing group at ortho and para position facilitate the nucleophilic substitution reaction and hence, enhances the rate of reaction.

Compound (iii) has three electron withdrawing groups at ortho and para positions w.r.t. chlorine while compound (ii) has only one electron withdrawing group and there is no electron withdrawing group in compound (i).

So, the increasing order of rate of reaction towards nucleophilic substitution is d). (i) < (ii) < (iii).

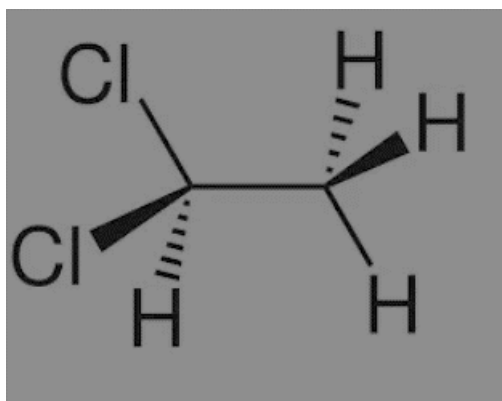
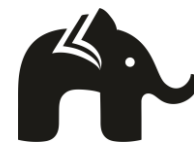
Question 6:

Ethylidene chloride is a/an _____.

- (a) vicinal-dihalide
- (b) gem-dihalide
- (c) allylic halide
- (d) vinylic halide

Answer: (b) gem-dihalide

Ethylidene chloride is a gem – dihalide. Gem Dihalide is a compound that have two halogen atoms on the same carbon atom. Ethylidene chloride is isomeric compound. The IUPAC name of ethylidene chloride is 1,1-Dichloroethane.

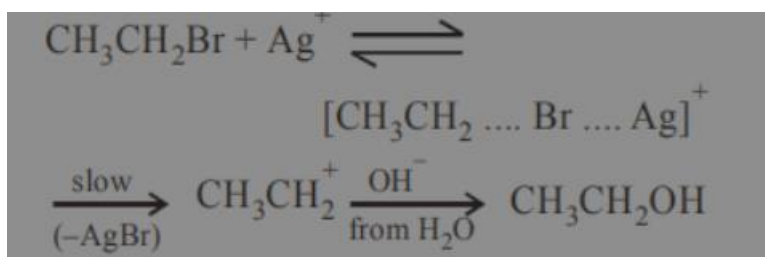
**Question 7:**

Ethanol can be prepared more easily by which reaction?

- (i) $\text{CH}_3\text{CH}_2\text{Br} + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{CH}_2\text{OH}$
- (ii) $\text{CH}_3\text{CH}_2\text{Br} + \text{Ag}^+$ (in boiling water) $\rightarrow \text{CH}_3\text{CH}_2\text{OH}$
- (a) by (i) reaction
- (b) by (ii) reaction
- (c) Both reactions proceed at same rate
- (d) by none of these

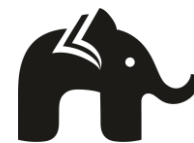
Answer: (b) by (ii) reaction

Heavy metal ions, particularly Ag^+ , catalyse $\text{S}_{\text{N}}1$ reaction because of presence of empty orbital.

**Question 8:**

What should be the correct IUPAC name for diethyl bromomethane?

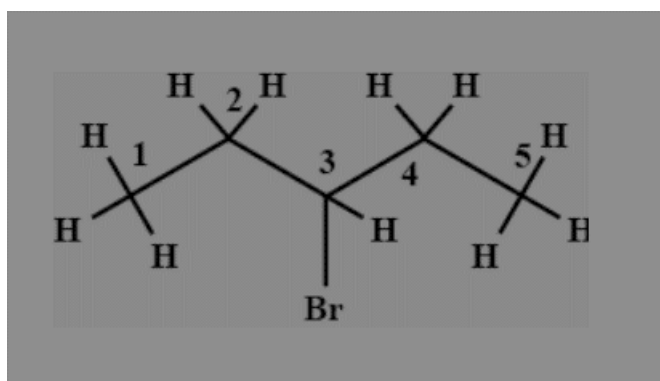
- (a) 1-Bromo-1, 1-diethylmethane



- (b) 3-Bromopentane
- (c) 1-Bromo-1-ethylpropane
- (d) 1-Bromopentane

Answer: (b) 3-Bromopentane

The correct IUPAC name for diethyl bromomethane is 3-Bromopentane. It has molecular formula $C_5H_{11}Br$.



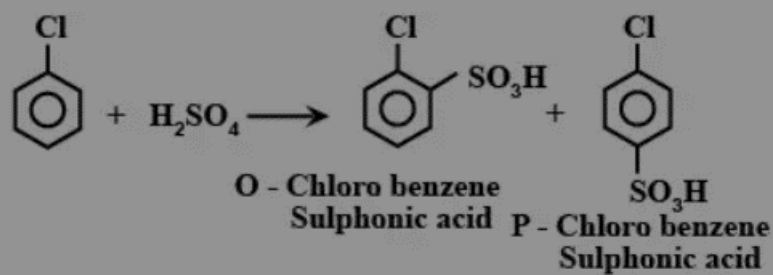
Question 9:

On sulphonation of C_6H_5Cl

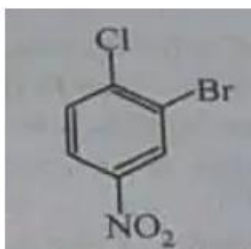
- (a) m-chlorobenzenesulphonic acid
- (b) Benzenesulphonic acid is formed
- (c) o-chlorobenzenesulphonic acid is formed
- (d) o- and p-chlorobenzenesulphonic acid is formed

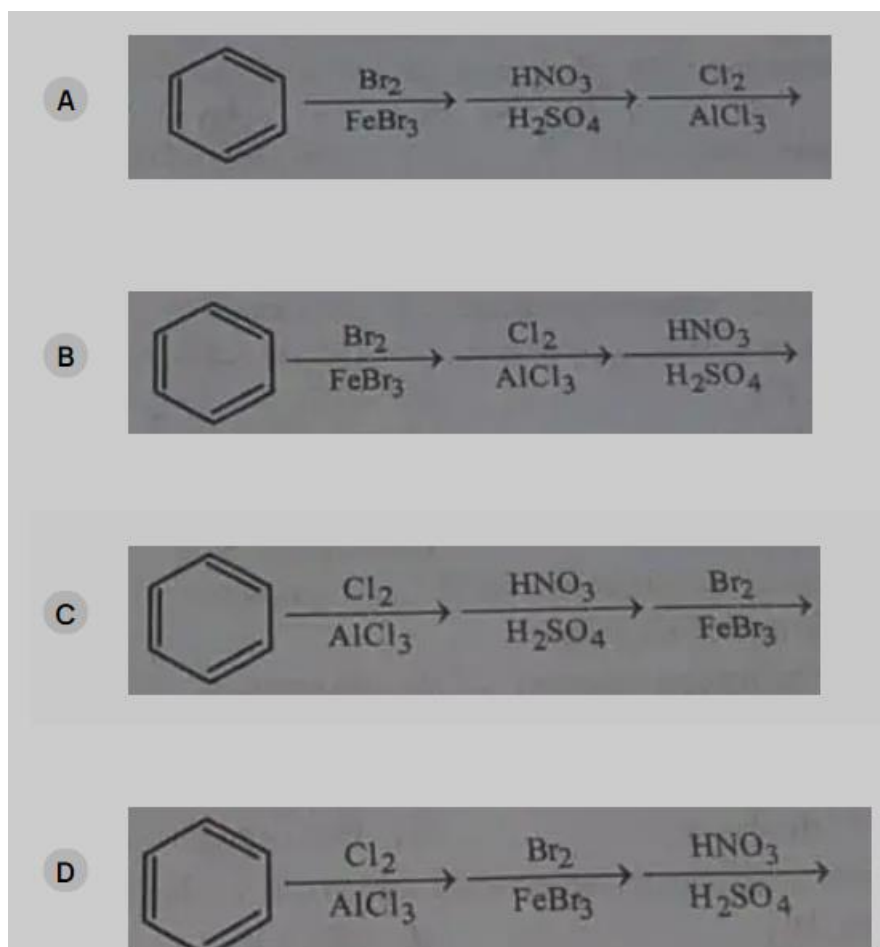
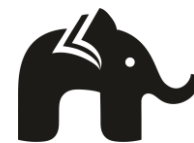
Answer: (d) o- and p-chlorobenzenesulphonic acid is formed

The reaction of chlorobenzene with sulphuric acid is shown as in the diagram.

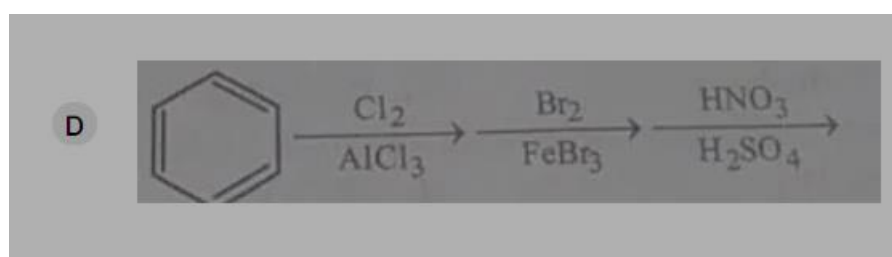
**Sulphonation****Question 10:**

Which of the following synthetic schemes would be the best for the synthesis of the compound, 2-bromo-1-chloro-4-nitrobenzene?



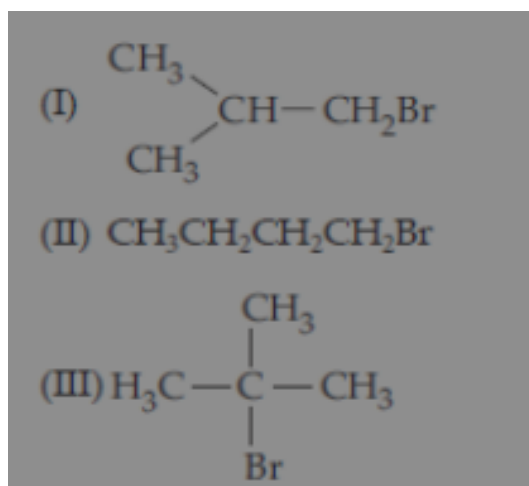
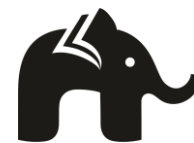


Answer:



Question 11:

Arrange the following compounds in increasing order of their boiling points.



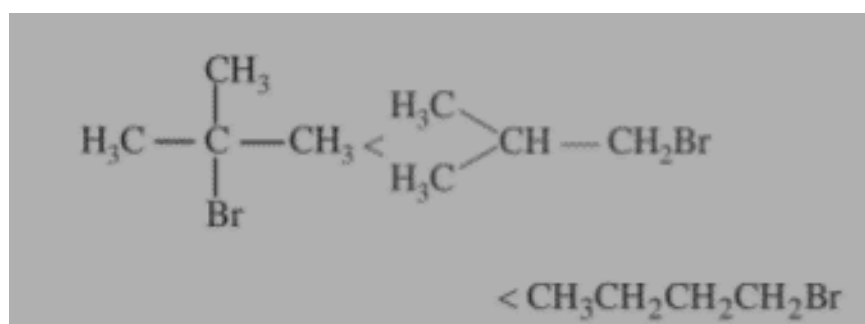
- (a) (ii) < (i) < (iii)
 (b) (ii) > (i) > (iii)
 (c) (ii) > (iii) > (i)
 (d) (iii) > (ii) > (i)

Answer: (c) (ii) > (iii) > (i)

Greater the surface area, greater will be the boiling point of a compound.

Surface area decreases with increase in branching.

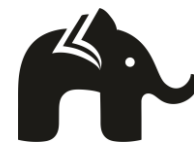
Increasing order of boiling point: -



Question 12:

When hydrogen chloride acid gas is treated with propene in presence of benzoyl peroxide, it gives

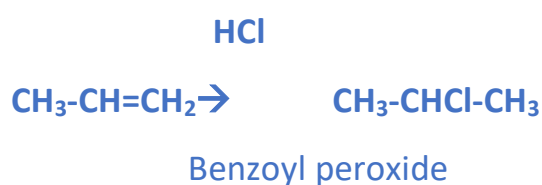
- (a) 2-Chloropropane



- (b) Allyl chloride
- (c) No reaction
- (d) n-Propyl chloride.

Answer: (a) 2-Chloropropane

Peroxide effect is observed only in case of HBr. Therefore, addition of HCl to propene even in the presence of benzoyl peroxide occurs according to Markownikov's rule.



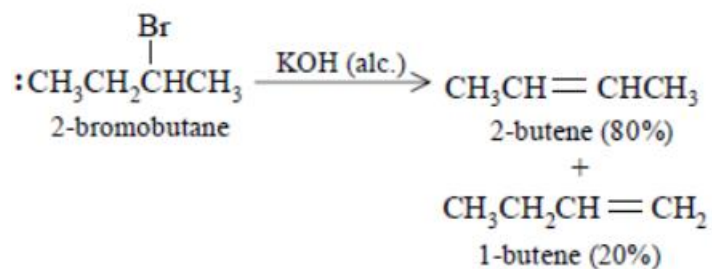
Question 13:

Elimination of bromine from 2 - bromobutane results in the formation of

- (a) equimolar mixture of 1 and 2 - butene
- (b) predominantly 2 - butene
- (c) predominantly 1 - butene
- (d) predominantly 2 – butyne

Answer: (b) predominantly 2 - butene

In elimination reaction of alkyl halide major product is obtained according to Saytzeff rule, which states that when two alkenes may be formed, the alkene which is most substituted one predominates. Therefore, predominantly (80%) 2-butene will be produced.

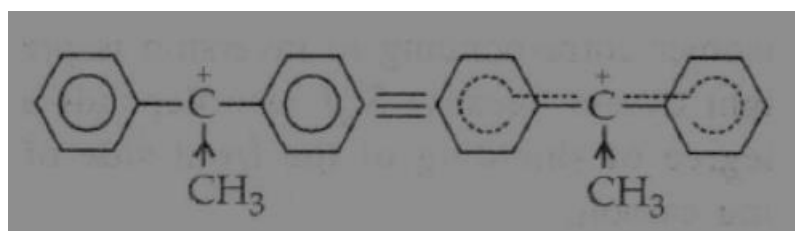
**Question 14:**

Which one is most reactive towards S_N1 reaction?

- (a) $\text{C}_6\text{H}_5\text{CH}(\text{C}_6\text{H}_5)\text{Br}$
- (b) $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$
- (c) $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)(\text{C}_6\text{H}_5)\text{Br}$
- (d) $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$

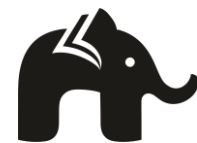
Answer: (c) $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)(\text{C}_6\text{H}_5)\text{Br}$

S_N1 reactions proceed via the formation of a carbocation intermediate. More stable is the carbocation more reactive is the alkyl/aryl halide towards S_N1 . In $\text{C}_6\text{H}_5\text{C}^+(\text{CH}_3)(\text{C}_6\text{H}_5)$ carbocation, the two phenyl rings by their -R effect and - CH_3 by its +I effect diminish the positive charge and make it stable.



Assertion Reason Based Questions

In the following questions from 15 to 18 a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.



- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Question 15:

Assertion (A): Alkyl halides are insoluble in water.

Reason (R): Alkyl halides have halogen attached to sp^3 hybrid carbon.

Answer: (b) Both A and R are true but R is not the correct explanation of A.

Alkyl halides are insoluble in water. (correct) Reason: Alkyl halides have halogen attached to sp^3 hybrid carbon. (correct) Alkyl halides are insoluble in water because they are unable to form hydrogen bonds with water or break pre-existing hydrogen bonds.

Question 16:

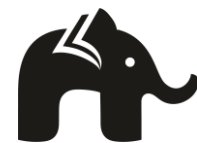
Assertion (A): Alkyl fluorides are prepared by heating AgF with alkyl halides.

Reason (R): Because direct fluorination of alkanes occurs slowly with rupture of $C-C$ bonds.

Answer: (c) A is true but R is false.

Alkyl fluorides are obtained by heating alkyl chloride or bromide in the presence of metallic fluorides like AgF or SbF_3 , the reaction is known as Swartz reaction.



**Question 17:**

Assertion (A): Phosphorus chlorides (tri and penta) are preferred over thionyl chloride for the preparation of alkyl chlorides from alcohols.

Reason (R): Phosphorus chlorides give pure alkyl halides.

Answer: (d) A is false but R is true.

Thionyl chloride is preferred over PCl_3 and PCl_5 for the preparation of alkyl chlorides from alcohols because thionyl chloride gives pure alkyl halide as other two products ($\text{SO}_2 + \text{HCl}$) are escapable gases.

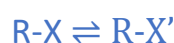
Question 18:

Assertion (A): Alkyl iodide can be prepared by treating alkyl chloride/bromide with NaI in acetone.

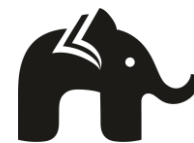
Reason (R): NaCl/NaBr are soluble in acetone while NaI is not.

Answer: (c) A is true but R is false.

This is Finkelstein reaction which involves the conversion of an alkyl chloride/bromide to an alkyl iodide by the addition of sodium iodide in acetone. Because sodium iodide is soluble in acetone and NaCl and NaBr are not, the equilibrium is shifted by the precipitation of insoluble salt.



The equilibrium position of the reaction depends on the nucleophilicity of the anion, whether a good leaving group is present and whether one anion is better stabilised than the other in a given solvent.



Question 19:

DDT was first prepared in 1873 but it was not until 1939 that Paul Muller at Geigy pharmaceuticals in Switzerland, discovered the effectiveness of DDT as an insecticide, he was awarded Noble Prize for this discovery in 1948 in subject

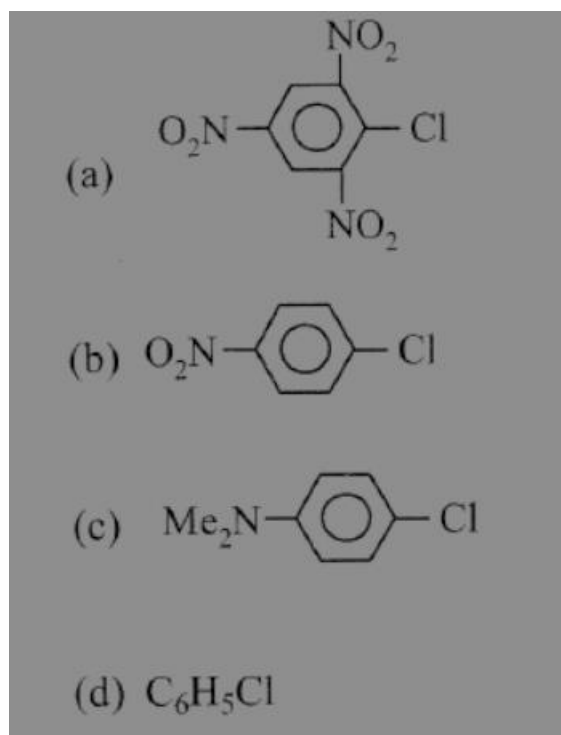
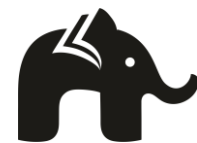
- (a) Chemistry.
- (b) Medicines and Physiology.
- (c) Biochemistry.
- (d) Pharmaceuticals.

Answer 19: (b) Medicines and Physiology.

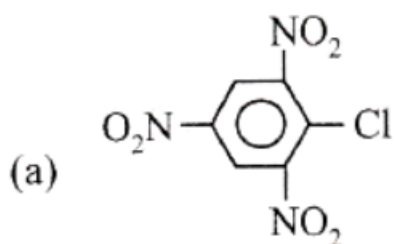
Due to the effectiveness of DDT as an insecticide belong to Medicines and Physiology. It is particularly very effective against Anopheles mosquitoes which spread malaria.

Question 20:

Which chloro derivative of benzene among the following would undergo hydrolysis most readily with aqueous sodium hydroxide to furnish the corresponding hydroxy derivative?



Answer:

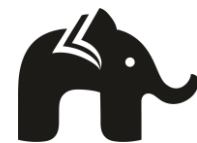


Cl in 2, 4, 6-trinitrochlorobenzene is activated by three $-NO_2$ groups at o and p-positions to show S_N1 reactions.

Question 21:

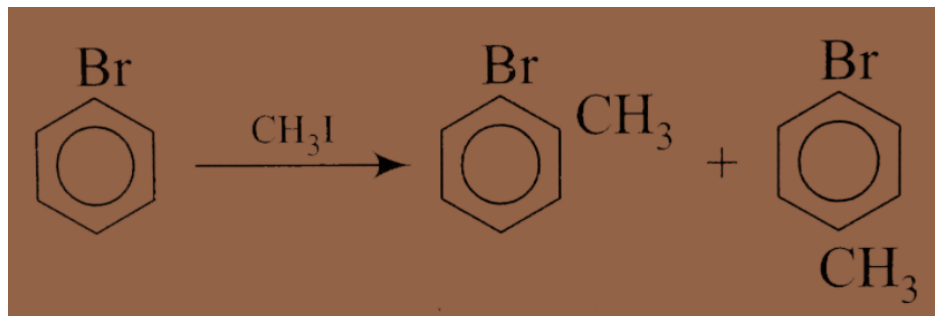
Fridel-crafts' reaction of bromobenzene with methyl iodide gives

- (a) o-bromotoluene
- (b) p-bromotoluene
- (c) o-and p-bromotoluene
- (d) m-bromotoluene



Answer: (c) o- and p-bromotoluene

Bromo group, o- and p- directing.

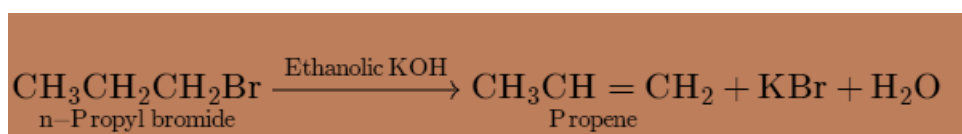


Question 22:

n-Propyl bromide on treatment with ethanolic potassium hydroxide produces:

- (a) propane
- (b) propene
- (c) propyne
- (d) propanol

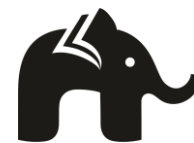
Answer: (b) propene



Question 23:

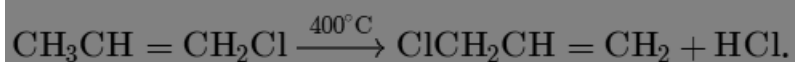
When chlorine is passed through propene at 400°C, which of the following is formed?

- (a) PVC
- (b) Allyl chloride
- (c) Propyl chloride
- (d) 1, 2-Dichloroethane



Answer: (b) Allyl chloride

When chlorine gas is reacted with propene at high temperature (400° C), then substitution takes place in place of addition reaction. Hence, allyl chloride is formed.



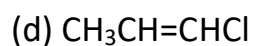
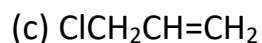
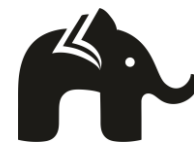
Case-Study Based Questions

Question 24:

Nucleophilic substitution reactions are of two types; substitution nucleophilic bimolecular (SN₂) and substitution nucleophilic unimolecular (SN₁) depending on molecules taking part in determining the rate of reaction. Reactivity of alkyl halide towards SN₁ and SN₂ reactions depends on various factors such as steric hindrance, stability of intermediate or transition state and polarity of solvent. SN₂ reaction mechanism is favoured mostly by primary alkyl halide or transition state and polarity of solvent, SN₂ reaction mechanism is favoured mostly by primary alkyl halide then secondary and then tertiary. This order is reversed in case of SN₁ reactions.

The following questions are multiple choice question. Choose the most appropriate answer:

1. Which of the following is most reactive towards nucleophilic substitution reaction?
(a) C₆H₅Cl
(b) CH₂=CHCl



2. Isopropyl chloride undergoes hydrolysis by

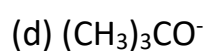
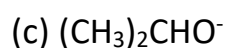
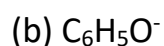
(a) $\text{S}_{\text{N}}1$ mechanism

(b) $\text{S}_{\text{N}}2$ mechanism

(c) $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ mechanism

(d) neither $\text{S}_{\text{N}}1$ nor $\text{S}_{\text{N}}2$ mechanism

3. The most reactive nucleophile among the following is



4. Tertiary alkyl halides are practically inert to substitution by $\text{S}_{\text{N}}2$ mechanism

because of

(a) insolubility

(b) instability

(c) inductive effect

(d) steric hindrance

Answer:

1. (c) $\text{ClCH}_2\text{CH}=\text{CH}_2$

It is more reactive towards nucleophilic substitution reaction because carbocation formed at allylic position is highly stabilized through resonance.

Allyl chloride > Vinyl chloride > Chlorobenzene.



2. (c) S_N1 and S_N2 mechanism

Isopropyl chloride undergoes hydrolysis via both S_N1 and S_N2 mechanisms.

Both of them yield the same result/ products.



3. (a) CH_3O^-

Smaller size the of the nucleophile more reactive it is.

4. (d) steric hindrance

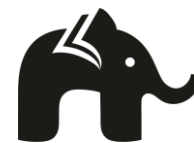
The repulsion between the alkyl or any other groups present on a carbon atom, if the distance between the two is less than Vander Waals radius, than it is said to be the steric hindrance. That is the reason why tertiary alkyl halides are practically inert to substitution by S_N2 mechanism as there is steric hindrance.

Question 25:

Alkyl halides are prepared by the free radical halogenation of alkanes, addition of halogen acids to alkenes, replacement of -OH group of alcohols with halogens using phosphorus halides, thionyl chloride, or halogen acids. Aryl halides are prepared by electrophilic substitution to arene. Fluorine and iodides are best prepared by the halogen exchange method. These compounds find wide applications in industry as well as in day-to-day life. These compounds are generally used as solvents and as starting materials for the synthesis of a large number of organic compounds.

1. The best method for the conversion of an alcohol into an alkyl chloride is by treating the alcohol with

(a) PCl_5



- (b) Dry HCl in the presence of anhydrous ZnCl_2
- (c) SOCl_2 in presence of pyridine
- (d) None of these

2. The catalyst used in the preparation of an alkyl chloride by the action of dry HCl on alcohol is

- (a) anhydrous AlCl_3
- (b) FeCl_3
- (c) anhydrous ZnCl_2
- (d) Cu

3. An alkyl halide reacts with metallic sodium in dry ether. The reaction is known as:

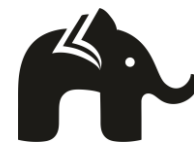
- (a) Frankland's reaction
- (b) Sandmeyer's reaction
- (c) Wurtz reaction
- (d) Kolbe's reaction

4. Fluorobenzene ($\text{C}_6\text{H}_5\text{F}$) can be synthesized in the laboratory

- (a) By direct fluorination of benzene with F_2 gas
- (b) By reacting bromobenzene with NaF solution
- (c) By heating phenol with HF and KF
- (d) From aniline by diazotization followed by heating the diazonium salt with HBF_4

Answer:

1. (c) SOCl_2 in presence of pyridine



The best method for the conversion of an alcohol to alkyl chloride is by treating the alcohol with SOCl_2



The formed products leave the alkyl chloride as they are gases and hence pure alkyl chloride is obtained.

2. (c) anhydrous ZnCl_2

Primary and secondary alkyl chlorides are prepared from the respective alcohols by using HCl gas and anhydrous ZnCl_2 (Grove's process).

Note:- Tertiary alcohols are very reactive and hence they react readily with conc. HCl even in the absence of ZnCl_2 .

3. (c) Wurtz reaction

Wurtz reaction: It involves the interaction of two molecules of an alkyl halide (preferably bromide or iodide) with metallic sodium in presence of dry ether to form symmetrical alkanes containing double the number of carbon atoms present in the alkyl halide. For example,



4. (d) From aniline by diazotization followed by heating the diazonium salt with HBF_4

Bromobenzene cannot undergo substitution reaction with NaF to form fluorobenzene. The reactions are as shown.

