1. Which of the following haloalkanes reacts with aqueous KOH most easily?
(a) 1-Bromobutane (b) 2-Bromobuatane
(c) 2-Bromo-2-methypropane (d) 2-Chlorobutane

2. The main difference in C-X bond of a haloalkane and a haloarene is
(a) C-X bond in haloalkanes is shorter than haloarenes.
(b) in haloalkanes the C attached to halogen in C-X bond is SP^3 hybridized while in haloarenes it is sp^2 hybridized.
(c) C-X bond in haloarenes acquires a double bond character due to higher electronegativity of X than haloalkanes.
(d) Haloalkanes are less reactive than haloarenes due to difficulty in C-X cleavage in haloalkanes.

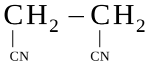
3. An alkyl chloride produces a single alkene on reaction with sodium ethoxide and ethanol. The alkene further undergoes hydrogenation to yield 2-methylburtane. Identify the alkyl chloride from amongst the following.
(a) $ClCH_2CH(CH_3)CH_2CH_3$
(b) $ClCH_2CH_2CH_2CH_3$
(c) $ClCH_2CH(CH_3)CH_2CH_3$
(d) $CH_3C(Cl)(CH_3)CH_2CH_3$

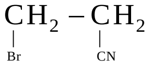
4. Reaction of trans-2-phenyl-1-bromocuyclopentane on reaction with alcoholic KOH produces
(a) 4-phenycyclopentene (b) 2-phenycyclopentene
(c) 1-phenycyclopentene (d) 3-phenylcyclopenetene.

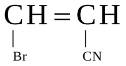
5. Identify (Z) in the following reaction series,

$$C_2H_5I \xrightarrow[\text{KOH}]{\text{Alcoholic}} (X) \xrightarrow{Br_2} (Y) \longrightarrow (Z)$$

(a) CH_3-CH_2-CN

(b) 
$\underset{CN}{CH_2}-\underset{CN}{CH_2}$

(c) 
$\underset{Br}{CH_2}-\underset{CN}{CH_2}$

(d) 
$\underset{Br}{CH}=\underset{CN}{CH}$

6. The ease of dehydrohalogenation of alkyl halide with alcoholic KOH is
(a) $3° < 2° < 1°$ (b) $3° > 2° > 1°$
(c) $3° < 2° > 1°$ (d) $3° > 2° < 1°$

7. Elimination of bromine from 2-bromobutane result in the formation of
(a) Equimolar mixture of 1 and 2 –butene
(b) Predominantly 2-butene
(c) Predominantly 1-butene
(d) Predominantly 2-butyne

8. Which of the following haloalkanes is most reactive.
(a) 1-Chloropropane (b) 1-Bromopropane
(c) 2-Chloropropane (d) 2-bromopropane

9. Alkyl halides react with metallic sodium in dry ether producing.
(a) Alkanes with same number of carbon atoms.
(b) alkanes with double the number of carbon atoms
(c) Alkenes with triple the number of carbon atoms
(d) Alkenes with same number of carbon atoms.

10. Which alkyl halide is preferentially hydrolysed by S_N1 mechanism
(a) $(CH_3)_3CCl$ (b) $CH_3CH_2CH_2Cl$
(c) CH_3CH_2Cl (d) CH_3Cl

11. Cyanide ions acts as an ambident nucleophile. From which end it acts as a stronger nucleophile in aqueous medium?
(a) It acts as a stronger nucleophile from carbon end.
(b) It acts as a stronger nucleophile from nitrogen end.
(c) It depends on the nature of the alky halide

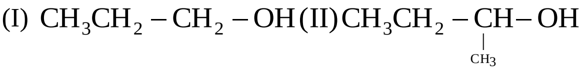
(d) It has same strength from both the ends.

12. An organic halogen compound which is used as refrigerant in refrigerators and air conditioners is
(a) BHC (b) CCl_4 (c) Freon (d) $CHCl_3$

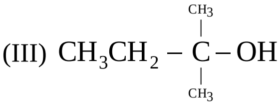
13. Chloroform is kept in dark coloured bottles because
(a) It reacts with clear glass
(b) It undergoes chlorination in transparent glass bottles
(c) It is oxidized to poisonous gas, phosgene in sunlight
(d) It starts burning when exposed to sunlight.

14. Which one is correct?
(a) Freon -14 is CF_4, Freon-13 is CF_3Cl, Freon -12 is CF_2Cl_2 and Freon-11 is $CFCl_3$
(b) Freons are chlorofluorocarbons
(c) Freons are used as refrigerants.
(d) All the above

15. The order of reactive of following alcohols with halogen acids is____________



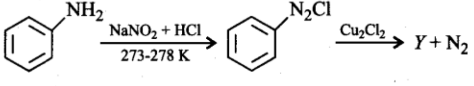
(I) $CH_3CH_2-CH_2-OH$ (II) $CH_3CH_2-\underset{CH_3}{\underset{|}{CH}}-OH$

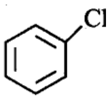


(III) $CH_3CH_2-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-OH$

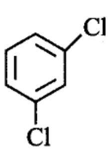
(a) (I) > (II)> (III) (b) (III)>(II)>(I)
(c) (II)> (I)>(III) (d) (I)>(III)>(II)

16. Identify the compound 'Y' in the following reaction



(a) 

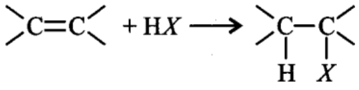
(b) 

(c) 

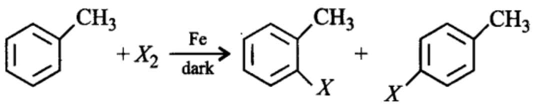
(d) 

17. Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reaction is
(a) Electrophilic elimination reaction
(b) Electrophilic substitution reaction
(c) Free radical addition reaction
(d) Nucleophilic substitution reaction

18. Which of the following is halogen exchange reaction
(a) $RX + NaI \rightarrow RI + NaX$

(b) 

(c) $R-OH+HX \xrightarrow{ZnCl_2} R-X+H_2O$

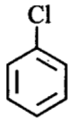
(d) 

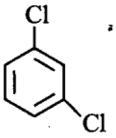
19. Which reagent will you use for the following reaction
$CH_3CH_2CH_2CH_3 \longrightarrow CH_3CH_2CH_2CH_2Cl + CH_3CH_2CHClCH_3$
(a) Cl_2 / UV light
(b) $NaCl + H_2SO_4$
(c) Cl_2 gas in dark

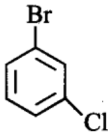
(d) Cl_2 gas in the presence of iron in dark

20. Arrange the following compound in the increasing order of their densities.

(I)

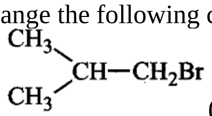

(II)


(III)


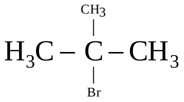
(IV)


(a) (I)< (II) <(III)< (IV) (b) (I)< (III) <(IV)< (II)
(c) (IV)< (III) <(II)< (I) (d) (II)< (IV) <(III)< (I)

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

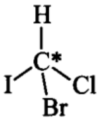
(I)


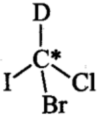
(II) $CH_3CH_2CH_2CH_2Br$

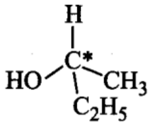
(III)

$H_3C-\underset{Br}{\overset{CH_3}{C}}-CH_3$

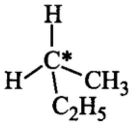
(a) (II)< (I) <(III) (b) (I)< (II) <(III)
(c) (III)< (I) <(II) (d) (III)< (II) <(I)

22. In which of the following molecules carbon atom marked with asterisk (*) is asymmetric?

(I)


(II)


(III)


(IV)


(a) (I), (II), (III) , (IV) (b) (I), (II), (III)
(c) (II), (III), (IV) (d) (I), (III), (IV)

23. The position of –Br in the compound in $CH_3CH = CHC(Br)(CH_3)_2$ can be classified as________.

(a) Allyl (b) Ary (c) Vinyl (d) Secondary

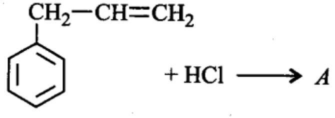
24. Chlorobenzene is formed by reaction of chlorine with benzene in the presence of $AlCl_3$. Which of the following species attacks the benzene ring in this reaction.

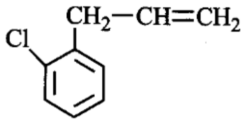
(a) Cl^- (b) Cl^+ (c) $AlCl_3$ (d) $[AlCl_4]^-$

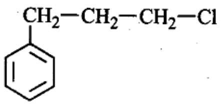
25. Ethylidene chloride is a/an___________

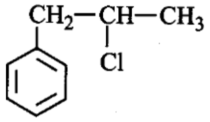
(a) Vic - dihalide (b) Gem-dihalide
(c) Allylic halide (d) Vinylic halide

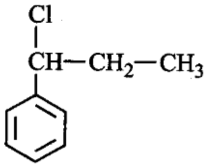
26. What is 'A' in the following reaction



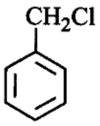
(a)


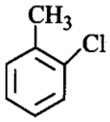
(b)


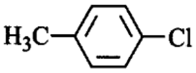
(c)


(d)


27. The reaction of toluene with chlorine in the presence of iron and in the absence of light yield_______

(a)


(b)


(c)


(d) Mixture of (b) and (c)

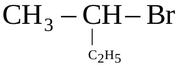
28. Molecules whose mirror image is non- superimposable over them are known as chiral. Which of the following molecules is chiral in nature.

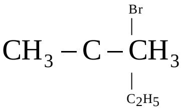
(a) 2-Bromobutane
(b) 1-Bromobutane
(c) 2-Bromoopropane
(d) 2-bromopropan-2-ol

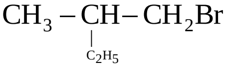
29. Reaction of $C_6H_5CH_2Br$ with aqueous sodium hydroxide follows._______

(a) $S_N1$mechanism
(b) S_{N2} mechanism
(c) Any of the above two depending upon the temperature of reaction
(d) Saytzeff rule

30. Which of the following compounds will give racemic mixture on nucleophilic substitution by OH^- ion?

(I)

$\underset{\substack{|\\ C_2H_5}}{CH_3-CH-Br}$

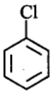
(II)

$CH_3-\overset{\substack{Br\\ |}}{\underset{\substack{|\\ C_2H_5}}{C}}-CH_3$

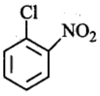
(III)

$CH_3-\underset{\substack{|\\ C_2H_5}}{CH}-CH_2Br$

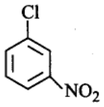
(a) (I) (b) (I), (II), (III) (c) (II), (III) (d) (I), (III)

31. Direction: in the question arrange the compounds n increasing ordre of rate of reaction towards nucleophilic substitution.

(i)

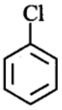
(I)


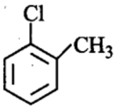
(II)


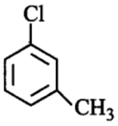
(III)


(a) (I)< (II)< (III)
(b) (III)< (II)< (I)
(c) (I)< (III)< (II)
(d) (III) < (I) <(II)

(ii)

(I)


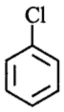
(II)


(III)


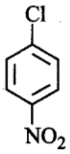
(a) (I)< (II)< (III)
(b) (I)< (III)< (II)
(c) (III)< (II)< (I)
(d) (II) < (III) <(I)

(iii)

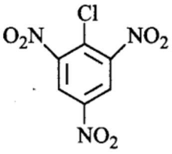
(I)



(II)



(III)

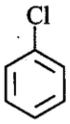


(a) (III)< (II)< (I)   (b) (II)< (III)< (I)

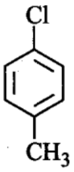
(c) (I)< (III)< (II)   (d) (I) < (II) <(III)

(iv)

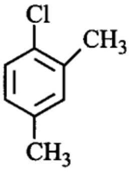
(I)



(II)



(III)

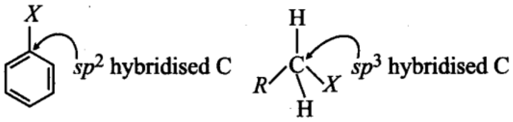


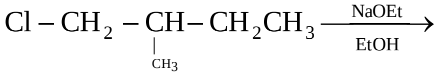
(a) (I)< (II)< (III)   (b) (II)< (I)< (III)

(c) (III)< (II)< (I)   (d) (I) < (III) <(II)

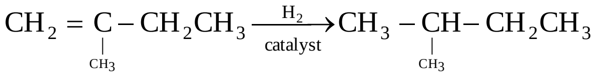
1. (c): The tertiary carbocation formed in the reaction is most stable.

2. (b): in haloarenes, carbon of C-X is sp^2 hybridized while in haloalkanes it is sp^3 hybridized.





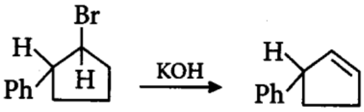
$$Cl-CH_2-\underset{CH_3}{\underset{|}{C}}H-CH_2CH_3\xrightarrow[EtOH]{NaOEt}$$



3. (c): $CH_2=\underset{CH_3}{\underset{|}{C}}-CH_2CH_3\xrightarrow[catalyst]{H_2}CH_3-\underset{CH_3}{\underset{|}{C}}H-CH_2CH_3$

$$2-\text{methylbutane}$$

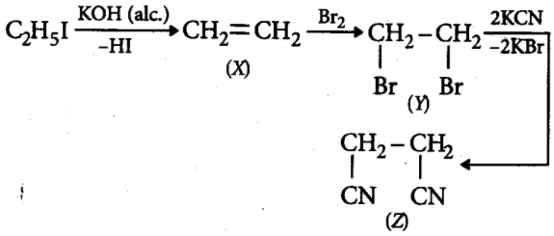
4. (d):



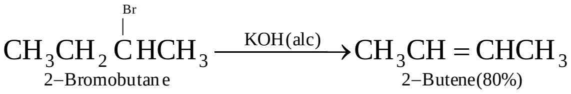
3-Phenylcyclopentene

It follows E2 mechanism.
Hughes and In gold proposed that bimolecular elimination reaction take place when the two groups to be eliminated are trans i.e. E2 reaction are stereoselectively trans

5. (b):



6. (b): The ease of dehydrohalogenation of alkyl halides with alcoholic KOH is 3° > 2° > 1°,
This order of alkyl halides can be explained on the basis of the stability of the alkene formed after dehydrohalogenation of haloalkanes. 3° alkyl halides on dehydrohalogenation forms more substituted alkenes, which is more stable (and formed at faster rate), while primary alkyl halides yield least substituted alkenes, which is less stable (and formed at slower rate.)



$$\underset{\text{2–Bromobutane}}{CH_3CH_2\overset{\overset{Br}{|}}{C}HCH_3}\xrightarrow{KOH(alc)}\underset{\text{2–Butene(80\%)}}{CH_3CH=CHCH_3}$$

7. (b): $CH_3CH_2\overset{+}{C}H=CH_2$

$$1-\text{Butene }(20\%)$$

In elimination reaction of alkyl halide major product is obtained according to Saytzeff's rule, which states that when tow alkenes may be formed, the alkene which is most substituted one predominates.

8. (d): The alkyl halides are highly reactive, the ordr of reactivity is
Iodide > Bromide > Chloride (nature of the halogen atom.
Tertiary > secondary> primary
Thus 2- bromopropane is the most reactive.

9. (b): when two molecules of the same alkyl halide react with Na in dry ether, an alkane with double the numbr of carbon atoms is formed. This is known as Wurtz reaction.

$$\underset{\text{Alkyl halid}}{R-\boxed{X+2Na+X-}R}\xrightarrow{\text{dry ether}}\underset{\text{Alkane}}{R-R}+\underset{\text{sodium halide}}{2Na-X}$$

10. (a): S_N1 mechanism

(i) $$(CH_3)_3C-Cl \longrightarrow \underset{3^\circ \text{carbocation}}{(CH_3)_3C^+} + Cl^-$$

(ii) $(CH_3)_3C^+ \xrightarrow[{}^-OH]{} (CH_3)_3C-OH$

For S_N1 mechanism the reactivity of carbocaiton are $3^\circ > 2^\circ > 1^\circ$

11. (a): it act as a stronger nucleophile from the carbon end because it will lead to the formation of C-C bond which is more stable than C –N bond

12. (c): Chlorofluorocarbons (CFC’s) or freons are used as refrigerant in refrigerators and air conditioners.

13. (c): Chloroform gets oxidized by air in sunlight to poisonous phosgene gas.

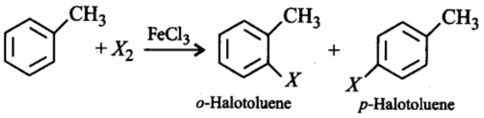
$$2CHCl_3 + O_2 \xrightarrow{hv} \underset{\text{phosgene}}{2CoCl_2} + 2HCl$$

14. (d): All the given points about freons are correct.

15. (b): The reactivity of alcohols towards halogen acids decreases in the order : 3°>2°>1°

16. (a): This is Sandmeyer’s reaction and the product Y is chlorobenzene.

17. (b): The reaction is electrophilic substitution reaction



18. (a)

19. (a): Direct chlorination of alkanes takes place in presence of sunlight (UV light)

20. (a): Density increases at the molecular mass increases.

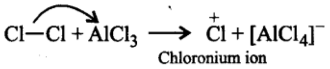
21. (c): Boiling point increases as the branching decreases.

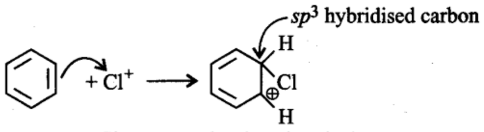
22. (b): In molecule IV the asterisk carbon has two hydrogen atoms attached to it, hence is not asymmetric.

23. (a): Allylic halides are the compounds in which the halogen atoms is bonded to an sp^3-hybridised carbon atom next to carbon – carbon double bond (C=C) i.e. to an allylic carbon.

24. (b): During chlorination of benzene, anhydrous $AlCl_3$ being a Lewis acid helps in generation of the elecetrophile Cl^+ by combining with the attacking reagent.

The electrophile Cl^+ attacks the benzene ring in this reaction.

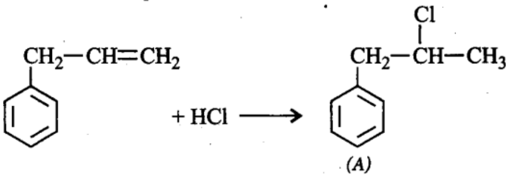




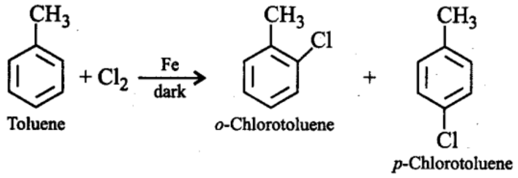
Sigma complex (arenium ion)

25. (b): gem-dihalides are named as alkylidene halides having halogen atoms on the same carbon atom.

26. (c): According the Markovnikov's rule.

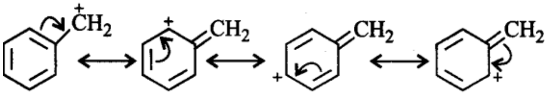


27. (d):



28. (a): $CH_3CH_2-CH(Br)-CH_3$ $2-$Bromobutane

29. (a): Benzylic halides show high reactivity towards the S_N1 reaction
The carbocation thus formed gets stabilized through resonance as shown in the figure.



30. (a): In compound (I), Br is directly attached to chiral C atom thus, will give recemic mixture on nucleophilic substitution (S_N1) by OH^- ion.

31. **Ans.**
(i) (c): Presence of electron withdrawing group $(-NO_2)$ increases the reactivity towards nucleophilic substitution and the effect at o-position is greater than at m-position.

(ii) (d): presence of electron donating group $(-CH_3)$ decreases the reactivity towards nucleophilic substitution and the effect at o-position is greater than at m- position.

(iii) (d): More the number of electron withdrawing groups, more will be the reactivity.

(iv) (c); more the number of electron donating groups, lesser will be the reactivity.