

QUESTION BANK

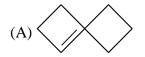
GOC



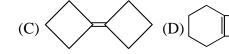
EXERCISE-I

(Choose the correct option. Only one is correct)

Q.1 $\xrightarrow{OH} \xrightarrow{H^+} A$, the product A is:







Q.2 Which carbocation is least likely to form as intermediate?

(A)
$$(C_6H_5)_5\overset{+}{C}$$





(D)
$$CH_2 = \overset{+}{C}H$$

Q.3 2-chloropentane on halogenation with chlorine gives 2,3, dichloropentane. What will be the structure of free radical species form in the reaction?

- (A) Planar
- (B) Trigonal planar
- (C) Square planar
- (D) Pyramidal

Q.4 What will be major product, when 2-methyl butane undergoes bromination in presence of light?

- (A) 1-bromo-2-methyl butane
- (B) 2-bromo-2-methyl butane
- (C) 2-bromo-3-methyl butane
- (D) 1-bromo-3-methyl butane

Q.5 The smallest compound, which on photochlorination produces diastereomers is

- (A) 3-methyl, 3-chloro hexane
- (B) 2-chloro butane

(C) 1-bromo propane

(D) 1-bromo-3-methyl butane

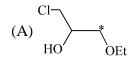
Q.6 Which of the following will give two isomeric monochloro derivatives?

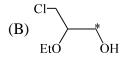
- (A) 2,3-dimethyl butane (B) n-hexane
- (C) Isopentane
- (D) Butane

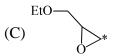
Q.7 How many isomers can be produced from the molecular formula $C_4H_{10}O$?

- (A) 8
- (B) 7
- (C) 6
- (D) 5

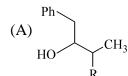
Q.8 $\xrightarrow{\text{Cl}}$ The major product is

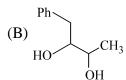


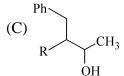




Q.9 $O \rightarrow CH_3 \xrightarrow{RMgX} H_3O^+$







(D) None of these



Q.10
$$\xrightarrow{\text{OH}}$$
 P. The product P is:

Q.11 Among the given compounds, the correct dehydration order is:

$$\text{(I)} \bigcirc \hspace{-0.5em} \longrightarrow \hspace{-0.5em} \hspace{-0.5em} \text{OH}$$

$$(II)$$
 OH

$$(A)\ I < II < III < IV$$

(B)
$$II < III < IV < I$$

$$(C) I < III < IV < II$$

(D)
$$I < II < III = IV$$

Q.12 Identify Z in the following series of reaction:

$$H_3C \xrightarrow{OH \xrightarrow{conc.H_2SO_4}} X \xrightarrow{Br_2} Y \xrightarrow{alc.KOH} Z$$

(A)
$$H_3C$$
 H_3C H_3C CH_2 H_3C CH_3C

Q.13 In the reaction sequence

$$C_{6}H_{5}-CH-CH_{2}-C-CH_{3} \xrightarrow[(ii)]{(ii)} H_{2}O/H^{+}} produc$$

product will be

$$\begin{array}{c} \text{OH} \\ \mid \\ \text{(A) C}_6\text{H}_5-\text{CH}-\text{CH}_2-\text{COOH} \end{array}$$

(B) C₆H₅–COOH, COOH–COOH and CHBr₃

(C)
$$C_6H_5 - C - CH_3$$
, CO_2 and $CHBr_3$ (D) $Only CHBr_3$

Q.14
$$CIF_2C$$
 Ph
 $C=C$
 F
 $Ieq. OEt$
 $A \text{ (major product), A is}$

Q.15
$$CH_3 \xrightarrow{H^+}$$
 major product is

$$(A) \overset{CH_3}{\longleftarrow} (B) \overset{CH_3}{\longleftarrow} (CH_3) (CH_3) (D) \overset{CH_3}{\longleftarrow} (D) \overset$$



- Q.16 HBr reacts fastest with
 - (A) 2-methyl butane-2-ol
 - (C) Butane-1-ol

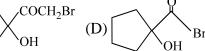
- (B) 3-methyl butane-2-ol
- (D) 2-methyl butane-1-ol
- Q.17 $\underbrace{\begin{array}{c} \text{COCH}_3 \\ \text{OH} \end{array}}_{\text{NaOBr}} \text{Product}$

The product is

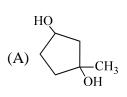


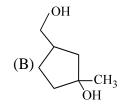
(B) COOH

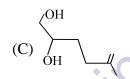


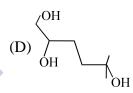


Q.18 $CH_2 \xrightarrow{H_3O^+} A, Ai$









- Q.19 Which one of the following alcohol will undergo acid catalysed dehydration with greatest ease by E_1 mechanism?
 - $(A) CH_2 = CH-OH$





- (D) Me_2 CHOH
- Q.20 (A) $C_3H_6O \xrightarrow{NaCN} cyanohydrin of (A)$. If the cyanohydrin is optically active, then the possible structure of (A) is
 - (A)
- (B) 0
- (C) OH
- (D) O
- Q.21 Which of the following has minimum reactivity towards nucleophiles?
 - (A) CH₂O
- (B) CH₃CHO
- (C) $CH_3 C CH_2$
- (D) $CH_3 C CH_2 CH_3$

Q.22 $\xrightarrow{\text{ROH/H}^+}$ P (major org. product)

The product P is











Q.23
$$Cl_3^{3}C - CH = CH_2$$

$$H_3^{3}C - CH = CH_2$$

(I)

(II)

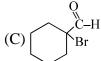
In addition of HOBr to (I) and (II)

(A) Br is at C_2 in both cases

- (B) Br is at C_2 in II and at C_1 in I
- (C) Br is at C_1 in II and C_2 in I
- (D) Br is at C_1 in both cases
- Q.24 Greatest amount of hydration is in

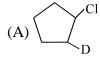






(D) All are equal

Q.25
$$\stackrel{\text{Cl}}{\longrightarrow}$$
 $\frac{1 \text{ equivalent Mg}}{\text{ether}} \rightarrow X \stackrel{D_2O}{\longrightarrow} Y; Y \text{ is}$







(D) none of these

- Q.26 How many number of optically active isomers are possible for 2,3-dibromo butane 1,4-dioic acid?
 - (A)2
- (B)3

- (C) 4
- (D) 1

Q.27
$$\rightarrow$$
 n- and $\stackrel{N}{\longrightarrow}$

Are which type of isomers

- (A) Chain
- (B) Position
- (C) Metamerism
- (D) functional

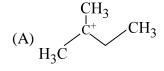
- Q.28 Most stable conformation of ethylene glycol
 - (A) Eclipsed form
- (B) Staggered form
- (C) Skew form
- (D) None of these

Q.29 Which has maximum B.P.?

$$(B)$$
 H_3C
 CH_3
 CH_3

(D)
$$H_3C$$
 CH_3

Q.30 Which of the following carbocation is most stable?



(B)
$$H_3C$$
 CH_3 CH_3

(C)
$$CH_3$$
 CH_3

www.studysteps.in

GOC



Q.31 Which of the following alcohol shows fastest reaction with HI?

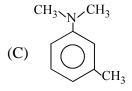




Q.32 Which of the following is strongest base.

$$(A) \qquad \bigcirc$$

$$(B) \qquad CH_3$$



$$(D) \qquad \begin{array}{c} CH_3 \\ \\ CH_3 \end{array}$$

Q.33 In which of the following molecule all the effect namely inductive, mesomeric & hyperconjugation operate

$$(A)$$
 C

(B)
$$CH_3$$

(C)
$$CH_3$$
 COCH₃

Q.34 For the reactions

$$(I) \bigcirc -CI \longrightarrow \bigcirc \oplus + CI^r, \Delta H_1^c$$

$$(II) \left\langle \longrightarrow -Cl \longrightarrow \left\langle \longrightarrow \right\rangle \oplus + Cl^{r}, \Delta H_{2}^{c}$$

(III)
$$\leftarrow$$
 $CH_2CI \longrightarrow \leftarrow$ $CH_2 + \overrightarrow{Cl}, \Delta H_3^o$

$$(IV) \bigcirc -Cl \longrightarrow \bigcirc +Cl^{\oplus}, \Delta H_4^{o}$$

The correct decreasing order of enthalpies of reaction for producing carbocation is

(A)
$$\Delta H_1^o > \Delta H_2^o > \Delta H_3^o > \Delta H_4^o$$

(B)
$$\Delta H_4^o > \Delta H_1^o > \Delta H_2^o > \Delta H_3^o$$

(C)
$$\Delta H_3^o > \Delta H_2^o > \Delta H_1^o > \Delta H_4^o$$

(D)
$$\Delta H_2^o > \Delta H_1^o > \Delta H_4^o > \Delta H_3^o$$

Q.35 Correct order of basicity of various nitrogen in LSD is

- (A) 1>2>3
- (B) 2 > 1 > 3
- (C) 2>3>1
- (D) 3>2>1



C₂–C₃ bond by 120° will lead to

(A) gauche

(B) staggerred

(C) partially eclipsed (D) fully eclipsed

Q.37 Which of following is correctly matched.

(A)
$$CH_3 - C - CH_3$$
, E_1 reaction CH_3

(B) CH₃-CH₂-CH₂OH, E₁cb reaction

OH
$$|$$
 (C) $\mathrm{CH_3-C-CH_3}$, thermal reaction $|$ $\mathrm{CH_3}$

OH $CH_3 - C - CH_3$, thermal reaction $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$, $CH_3 - CH_3 - CH_3 - CH_3 - CH_3$

Q.38 Arrange reactivity of given alcohol in increasing order of elimination reaction

$$\begin{array}{c} \text{(I) } \operatorname{CH}_2 - \operatorname{CH}_2 - \operatorname{CH}_2 - \operatorname{CH}_2 \operatorname{OH} \\ | \\ \operatorname{NO}_2 \end{array}$$

(II)
$$\operatorname{CH_3-CH_2-CH-CH_2OH}$$
 $\operatorname{NO_2}$

(III)
$$CH_3 - CH - CH_2 - CH_2OH$$
 NO_2

Select answer from codes given below:

(A) I, II, IV, III

(B) I, II, III, IV

(C) II, III, I, IV

(D) II, III, IV, I

Arrange leaving power of Nur group in decreasing order Q.39

$$(I) \stackrel{O}{\overset{O}{\overset{}{\underset{}{\text{-}}}}} \stackrel{O}{\overset{}{\underset{}{\text{-}}}} \stackrel{O}{\underset{}{\text{-}}} \stackrel{O}{\underset{}} \stackrel{O}$$

(A) II. I. III. IV

(B) II, I, IV, III

(C) I, II, IV, III

(D) I, II, III, IV

Arrange decreasing order of reactivity of these compounds for nucleophilic substitution reaction 0.40

(I)
$$CH_3 - CH_2 - O - S - CF_3$$

(III)
$$\operatorname{CH_3} - \operatorname{CH} - \operatorname{CH_3}$$
 OH

(IV) CH₃ - CH - OH

(A) III, IV, I, II

(B) III, IV, II, I

(C) I, II, III, IV

(D) I, II, IV, III

www.studysteps.in

GOC



Q.41
$$\xrightarrow{Br}$$
 $\xrightarrow{CH_3}$ + OH $\xrightarrow{S_N^2}$ A, A is

(A)
$$\stackrel{\text{HO}}{\longrightarrow} \stackrel{\text{CH}_3}{\longrightarrow}$$

$$(B) \xrightarrow{\text{OH}} \text{CH}$$

- (C) Both are correct (D) None is correct

Q.42
$$CH_3$$
 H A , A is

(A)
$$\begin{array}{c} CH_3 \\ C\\ H \end{array}$$

$$(B) \begin{array}{c} CH_3 \\ C\\ C\\ C\\ H \end{array}$$

- (D) None is correct
- Major product obtained in reaction of 1-phenyl-2-bromo butane with NaOMe. Q.43
 - (A)(E)-1-phenyl but-1-ene

- (B)(E)-1-phenyl but-2-ene
- (C) 1-phenyl-1-ethoxy butane
- (D) (Z)-1-phenyl but-2-ene
- Q.44 2-Aminocyclohexane-1-ol on treatment with HNO₂ produces
 - (A) Cyclopentane carboxaldehyde
- (B) Cyclo hexane-1,2-diol

(C) 2-amino cyclohexene

- (D) Cyclohex-2-enol
- Arrange the following in order of C–Br bond strength in polar solvent. Q.45

$$(I) \left\langle \begin{array}{c} \\ \\ \\ \end{array} \right\rangle^{Br}$$

$$(II) \left\langle \begin{array}{c} \\ \\ \\ \end{array} \right\rangle_{H}^{Bi}$$

$$(IV) {\color{red} \bigcirc} ^{Bi}_H$$

$$(A) I < II < III < IV$$

$$(B) III < IV < I < II$$

(C)
$$IV < III < II < I$$

(D)
$$II < I < III < IV$$

Q.46
$$\xrightarrow{\text{Cl}} \xrightarrow{\text{EtOH}} \xrightarrow{\text{OEt}} \text{Rate R}_1$$

$$CH_3$$
 EtOH OEt

Rate R₂

$$Cl$$
 EtOH OEt

Rate R₃

Which of following is correct:

$$(A) R_1 > R_2 > R_3$$

(B)
$$R_3 > R_2 > R_1$$

(C)
$$R_2 > R_1 > R_3$$
 (D) $R_2 > R_3 > R_1$

(D)
$$R_2 > R_3 > R$$

- Q.47 Among the following pairs in which case the second compound has higher heat of hydrogenation.

- (B) Cis-2-butene, trans-2-butene
- (D) 1-butene, 2-butene



- Q.48 (I) Br, which is not correct about (I)
 - (A) I is more soluble than bromocyclopropane
 - (B) I gives pale yellow ppt. on addition with AgNO₃
 - (C) I is having lower dipole moment than bromocyclo propane
 - (D) I have more ionic character than $\sqrt{}$

Q.49
$$C(CH_3)_3 + CH_3SNa \xrightarrow{C_2H_5OH} ?$$

The product formed is

- (A) $CH_3SCH_2 CH C(CH_3)_3$
- (B) (CH₃)₃C-CH-CH₂OH | | SCH₃
- (C) $\text{CH}_3\text{SCH}_2\text{CH} \text{C(CH}_3)_3$ \mid OH
- (D) (CH₃)₃C-CH₂CH-SCH₃ OH

Q.50
$$CH_3-N$$
 O (2) NH_2 (3) NH_2 (2) NH_3 (2) (3) (2) (3) (2) (3) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4) $($

Correct order of basicity is

- (A) 3>1>2>4
- (B) 3<1<2<4
- (C) 3<4<1<2
- (D) 3>4>1>2
- Q.51 Which of the following statement about the reactivity of 1-chloro apocamphane toward AgNO₃ is true.
 - (A) React by S_N1 mechanism
- (B) React by S_N^2 mechanism

(C) React by S_Ni mechanism

(D) Does not react



- Q.52 The resonance energy of following heterocycles is in the order
 - (A) pyrole > furan > pyridine
- (B) furan > pyrole > pyridine
- (C) pyridine > pyrole > furan
- (D) pyridine > furan > pyrole
- Q.53 Arrange the following halide in decreasing order of $S_N 1$ reactivity.
 - (I) CH₃CH₂CH₂Cl
- (II) $CH_2 = CHCHCH_3$

Ċl

(III) CH₃CH₂CH CH₃

Cl

- (A) I > II > III
- (B) II > I > III
- (C) II > III > I
- (D) II > I > I



EXERCISE-II

(Choose the correct option. One or more than one are correct)

- Q.1 $\frac{}{P}$ which is/are incorrect statements?
 - (A) P is cis—and Q is trans—

(B) P is Z and Q is E

(C) P is R and Q is S

- (D) P and Q are having same structural formula
- Q.2 CH₃CH₂NO₂ will not show..... isomerism:
 - (A) Chain
- (B) functional
- (C) tautomerism
- (D) geometrical

Q.3 CHCOOH (maleic acid) can form:

CHCOOH

- (A) stereoisomer
- (B) geometrical isomer (C) position isomer
- (D) functional isomer

Q.4 Which can show tautomerism?

$$(A) \bigcup_{\substack{N \\ H}}^{O}$$

(B) Ph–CH₂–NC

(C)
$$C$$
 C CH_3 (D) CH_3 C NH_2

Q.5
$$\stackrel{\text{H}}{\underset{\text{CH}_3}{\bigvee}} \stackrel{\text{CH}_3}{\underset{\text{H}}{\bigvee}} \stackrel{\text{CH}_3}{\underset{\text{CH}_3}{\bigvee}} \stackrel{\text{H}}{\underset{\text{CH}_3}{\bigvee}}$$

I and II are not

- (A) achiral-identical mirror images
- (B) chiral-enantiomers
- (C) geometrical isomers of each other
- (D) racemic mixture
- Q.6 In which of following compound chiral center is not affected on heating.

(A)
$$CH_3 - CH - COOH$$

 OH

(C)
$$CH_3 - CH - CH_2 - COOH$$

 OH

- Q.7 Which are correct statements?
 - (A) methyl malonic acid is converted into propanoic acid on heating
 - (B) succinic acid forms succinic anhydride on heating
 - (C) 3-hydroxy propanoic acid forms Lactide on heating
 - O \parallel (D) $CH_3 C CH_2COOH$ forms acetone on heating
- Q.8 Select incorrect statements:
 - (A) \bigcirc OH and \bigcirc OH both give colour with neutral FeCl $_3$ solution
 - (B) 2-pentanone and 3-pentanone are metamers
 - (C) product formed when benzaldehyde reacts with hydroxylamine shows optical isomerism
 - (D) 1,2-dibromocyclohexane shows geometrical and optical isomerism.



Q.9
$$C_5H_8O_4(A) \xrightarrow{\Delta} C_4H_8O_2(B) \xrightarrow{\text{Soda lime}} (C)$$

C is hydrocarbon occupying 0.509 litre per g approximately. Hence A and B are:

- (A) methyl malonic acid, propanoic acid
- (B) succinic acid, succinic anhydride
- (C) Dimethylmalonic acid, 2-Methylpropanoic acid
- (D) Ethyl Malonic acid, Butanoic acid

products can be: (Both stable & unstable form)

- (A) CH₃CH(OH)₂, CH₃CH(OH)COOH
- (B) CH₃CHO, CH₃CH(OH)COOH
- (C) CH₃CH₂COOH, CH₃CH₂OH
- (D) CH₃CH(OH)COOH, CH₃CH₂OH

Q.11 Which are incorrect statements:

(A)
$$\bigcirc$$
 =0 and 0= \bigcirc are enantiomers

(B)
$$CH_3$$
 – C – CH_2 CH_3 and Cl – C – H are enantiomers CH_2 CH_3

- (C) Argol (sodium potassium tartarate) will show optical isomerism.
- (D) CH₃CHO on reaction with HCN gives racemic mixture.

Q.12 Which is/are less acidic than Benzoic acid?

Q.13 Which have active methylene group?

(C)
$$CH_3 - C - CH_2 - C - O - Et$$

$$(D) \left\langle \bigcirc \right\rangle - C - CH_2 - CN$$

Q.14 Which of the following are not resonating structures of each other:

$$(D)$$
 \bigcirc \bigcirc \bigcirc \bigcirc



The unshared electron on the oxygen atom of an ether (basic centre) account for all the following except:

(A) Combination
$$C_2H_5$$
 $\ddot{O}: \longrightarrow \begin{matrix} F \\ | B - F \\ | F \end{matrix}$

- (B) Formation of oxonium salt with acids such as $\begin{bmatrix}
 C_2H_5 O C_2H_5 \\
 \downarrow \\
 H
 \end{bmatrix}^+ Cl^-$ (C) Formation of peroxides (explosive)
- (D) Chemical inactivity of ether

Which of the following compounds yield most stable carbanion after rupture of (C_1-C_2) bond:

O O O
$$\parallel$$
 (A) CH_3 $-\text{C}$ $-\text{CCl}_3$ (B) CH_3 $-\text{C}$ $-\text{CBr}_3$ (C) CH_3 $-\text{CH}_2$ $-\text{C}$ $-\text{CI}_3$ (D) none of these 1 2

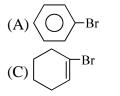
Q.17 NH_2 pyrrole (I) pyridine (II) aniline (III) which is/are correct statements?

- (A) I is more basic than II
- (C) III is more basic than II

- (B) II is more basic than I and III
- (D) all are aromatic bases
- 0.18Which is/are untrue statement(s)?
 - (A) Protonation increases electrophilic nature of carbonyl group
 - (B) CF₃SO₃⁻ is better leaving group than CH₃SO₃⁻
 - (C) Benzyl carbonium ion is stabilised by resonance

(D)
$$CCl_3CH \underbrace{OH}_{OH}$$
 is unstable.

Which reacts with AgNO₃ to give ppt.? Q.19



(B)
$$\sim$$
 CH=CH-CH₂Br

Q.20 Identify the correct statment(s).



- Π
- Ш

- (A) I & III are antiaromatic
- (C) II alone is aromatic

- (B) III & IV are non-aromatic
- (D) II & IV are non-aromatic
- Q.21Which have acidic hydrogen?
 - (A) CH₃COOH

- (D) NaNH₂

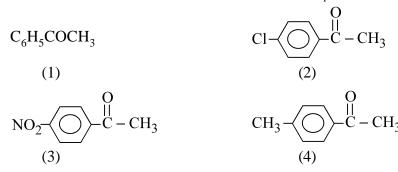


Q.22	C–C and C=C bond lengths are unequal in: (A) benzene (C) 1,3 cyclohexa-di-ene	(B) 1,3 buta-di-ene (D) None						
Q.23	Products formed when HCl adds to 2,4- hexac (A) 4-chloro-2-hexene (C) 2-chloro-4-hexene	diene is: (B) 2-chloro-3-hexene (D) 1-chloro-2-hexene						
Q.24	Which of the following may be classed as an el	lectrophilic reagent?						
	(A) BCl3 (B) NH4+	(C) $\overset{\oplus}{\text{CH}}_3$ (D) AlCl_4^-						
Q.25	The acid strength of substituted carboxylic acids is known to be dependent on the nature and position of the substituent. In the following examples, an attempt has been made to arrange the acids in order of acid strength, the strongest first. One of the series is incorrect—which one? (A) CH ₃ ·CH ₂ CH(Cl)·COOH > CH ₃ ·CH(Cl)·CH ₂ COOH > CH ₃ ·CH ₂ ·COOH (B) NO ₂ ·CH ₂ ·COOH > HOCH ₂ ·COOH > CH ₃ ·COOH (C) Cl ₃ C·COOH > BrCH ₂ ·COOH > FCH ₂ ·COOH (D) CH ₃ ·COOH > CH ₃ ·CH ₂ ·COOH > (CH ₃) ₃ C·COOH							
Q.26	Which of the following would not have a dipol (A) CCl ₄ (B) CH ₂ Cl ₂	e moment? (C) trans-1,2-dichloroethene (D) ClC≡CCl						
Q.27	Which of the following structures represent the	e less stable tautomeric form?						
	(A) CH ₃ CH ₂ O C C OCH ₂ .CH ₃ H (C) H	(B) $\stackrel{\text{N}}{\stackrel{\text{O}}{\stackrel{\text{H}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}{\stackrel{\text{O}}}{\stackrel{\text{O}}{\stackrel{\text{O}}}{\stackrel{\text{O}}{\stackrel{\text{O}}}{\stackrel{\text{O}}{\stackrel{\text{O}}}{\stackrel{\text{O}}{\stackrel{\text{O}}}}{\stackrel{\text{O}}{\stackrel{\text{O}}}}{\stackrel{\text{O}}{\stackrel{\text{O}}}}}{\stackrel{\text{O}}}}}{\stackrel{\text{O}}{\stackrel{\text{O}}}}}}}}}}$						
Q.28	Which of the following compounds cannot exh	ibit keto-enol tautomerism?						
	(A) H_3C CH_3 CH_3	$(B) \xrightarrow{H_3C} \xrightarrow{O} CH_3$						
	(C) H_3C C=O	$(D) \underset{H_3C}{\overset{O}{\underset{CH_3}{\longleftarrow}}} CH_3$						
Q.29	In tautomerism (A) a proton is moved around the molecule (C) no actual movement occurs	(B) electrons are moved around the molecule (D) shift of double bond occurs						
Q.30	Which species is not aromatic?							
	$(A) \bigcup_{N} (B) \bigcup$	(C) NH (D) NH						
Q.31	Aromatic character is possible only when (A) six electrons are delocalized (B) the molecule is cyclic and planar having d (C) alternate sigma (σ) & pie (π) bond are pro (D) None is true	elocalized $(4n + 2)\pi$ electrons where $n = 1,2,3$ esent.						



EXERCISE-III

Q.1 Arrange the following compounds in decreasing order of K_{eq} for hydrate formation.



 $Q.2 \qquad \text{Arrange the following } compounds \text{ in order of :} \\$

Decreasing S_N1 reaction rate:

Q.3(a)Decreasing S_N 2 reaction rate :

(b) Explain which of these reactions would have the faster rate?

(i)
$$CH_3CH_2CH_2 + CH_3N^{\bullet} \longrightarrow Or$$
 (ii) $CH_3CH_2CH_2 + CH_3N^{\bullet}H_2 \longrightarrow Cl$ Cl

Q.4 Which compound is more stable explain

(a)
$$CH_3 - C - CH = N = N$$

(b)
$$CH_3 - CH = \overset{\oplus}{N} = \overset{\Theta}{N} \longrightarrow$$

- Q.5 Arrange the isomers of molecular formula C_4H_9Cl in order of decreasing rate of reaction with sodium iodide in acetone.
- Q.6 Explain in which solvents these reactions are faster:

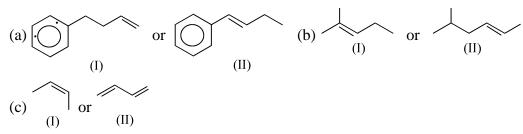
(a)
$$E = \frac{\text{CH}_3 \text{ Br}}{\text{H}_3 \text{OH}} + \text{KOH in CH}_3 \text{OH or CH}_3 \text{CH}_2 \text{OH}$$

(b) $CH_3CH_2CH_2CH_2 + \overset{\Theta}{O}H \text{ in } CH_3OH \text{ or } 50\% \text{ } CH_3OH, 50\% \text{ } H_2O$

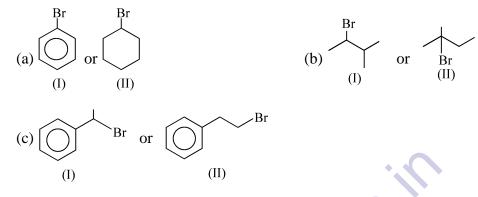
(c)
$$CH_3CH_2CH_2 + {}^{\bullet}C = N^{\bullet}$$
 in CH_3CH_2OH or DMSO.



Q.7(i)Choose the member of the following pairs of unsaturated hydrocarbons that is more reactive towards acid-catalysed hydration and predict the regiochemistry of the alcohols formed from this compound.



(ii) Predict on the basis of cabocation stability, which member of each of the following pairs hydrolyses at the faster rate.



Q.8 Assuming that cation stability governs the barrier for protonation in H-X additions, predict which compound in each of the pairs in parts (a) to (b) will be more rapidly hydrochlorinated in a polar solvent.

(a)
$$CH_2 = CH_2$$
 or (II)
(b) or

Q.9 Select the member of each pair that shows faster rate of S_N^2 reaction with KI in acetone.

(a)
$$CH_3 - CH_2 - CH_2 - CH_2 - CI$$
 or $CH_3 - CH - CH_2 - CI$ CH_3

(b)
$$CH_3 - CH_2 - CH_2 - C1$$
 or $CH_3 - CH_2 - CH_2 - CH_2 - Br$ (II)

(c)
$$CH_3 - CH - CH_2 - CH_2 - CI$$
 or $CH_3 - C - CH_2 CI$ $CH_3 - CH_3$ CH_3 (II)

(d)
$$CH_3 - CH_2 - CH_2 - CH - CH_3$$
 or $CH_3 - CH - CH - CH - CH_3$ (I) (II)



Select the member of each pair that undergoes $S_N 1$ solvoys is in aqueous ethanol more rapidly.

(a)
$$CH_3 - CH_2 - CH_2 - CH_2 - CI$$
 or $CH_3 - C - CI$ $CH_3 - C - CI$ $CH_3 - C - CI$

(b)
$$CH_2 = CH - CH_2 - Cl$$
 or $CH_3 - CH_2 - CH_2 - Cl$

(c)
$$CH_3$$
 CH_3 CH_3

- In each of the following indicate which reaction will occur faster. Explain your reasoning. Q.11
- CH₃CH₂CH₂CH₂CH₂CH₂CH₂CH₂I with sodium cyanide in dimethyl sulfoxide. (a)
- 1-chloro-2-methylbutane or 1-chloropentane with sodium iodide in acetone. (b)
- Hexyl chloride or cyclohexyl chloride with sodium azide in DMF. (c)
- (d) Solvolysis of 1-bromo-2,2-dimethylpropane or tert-butyl bromide in ethanol.
- Reaction of 1-chlorobutane with sodium acetate in acetic acid or with sodium methoxide in methanol. (e)
- Reaction of 1-chlorobutane with sodium azide or sodium p-toluenesulfonate in aqueous ethanol. (f)
- Q.12 Classify each of the following species as electrophile or nucleophile & explain your choice.

- (f):CCl₂

- (a) $CH_3CO_2^-$ (b) CH_3O^- (c) BF_3 (d) $CH_3O_2^-$ (e) $CH_3O_3^-$ (f) $CH_3O_2^-$ (g) $CH_3O_3^-$ (i) $CH_3O_3^-$ (j) $CH_3O_3^-$ (k) $CH_3O_3^-$ (l) $CH_3O_3^-$ (l)

Q.13 Propene
$$\xrightarrow{\text{Cl}_2/\text{hv}}$$
 H $\xrightarrow{\text{OH}^-}$ I $\xrightarrow{\text{Cl}_2/\text{H}_2\text{O}}$ J $\xrightarrow{\text{Ca(OH)}_2}$ K $\xrightarrow{\text{H}_3\text{O}^{\oplus}}$ L (glycerol)

- Q.14 Of the following statements, which are true for $S_N 2$ reaction.
- Tertiary alkyl halides reacts faster than secondary. (a)
- The absolute configuration of product is opposite to that of the reactant when an optically active substrate is used. (b)
- The reaction shows first order kinetics. (c)
- The rate of the reaction depends markedly on the nucleophilicity of the attacking reagent. (d)
- (e) The mechanism is one step.
- Carbocations are intermediate. (f)
- Rate ∝ [Alkyl halides] (g)
- The rate of the reaction depends on the nature of the leaving group. (h)
- Q.15 Of the following statements which are true for $S_N 1$ reaction.
- Tertiary alkyl halides react faster than secondary. (a)
- (b) The absolute configuration of the product is opposite to that of the reactant when an optical active substrate is used.
- (c) The reaction shows first order kinetics.
- The rate of reaction depends markedly on the nucleophilicity of the nucleophile. (d)
- (e) The mechanism is two step.
- Carbocations are intermediate. (f)
- Rate ∝ [Alkyl halides] (g)
- The rate of the reaction depends on the nature of the leaving group. (h)



- Q.16 Explain why $Cl CH_2 O CH_2 CH_3$ is hydrolysed more rapidly than $CH_3 O CH_2 CH_2 CI$
- 0.17If the temperature is not kept below 25°C during the reaction of primary alcohols with p-toluenesulfonyl chloride in pyridine, it is sometimes observed that the isolated product is not the desired alkyl p-toluenesulfonate but is instead the corresponding alkyl chloride. Suggest a mechanistic explanation for this observation.
- Q.18 Because the $S_N 1$ reaction goes though a flat carbocation, we might except an optically active starting material to give a completely racemized. In most cases, however, $S_N 1$ reactions actually give more of the inversion product. In general, as the stability of the carbocation increases, the excess inversion product decreases. Extremely stable carbocations give completely racemic products. Explain these observation.
- cis-1-Bromo-2-tert-butylcyclohexane and trans-1-bromo-2-tert-butylcyclohexane both react with sodium Q.19 ethoxide in ethanol to give 1-tert-butylcyclohexene. The cis isomer reacts much more rapidly than the trans isomer. Explain.
- The reaction of an amine with an alkyl halide gives an ammonium salt. Q.20

$$R_3N^{\bullet}$$
 + R'-X \longrightarrow $R_3\stackrel{+}{N} - R'X^{-}$ amine alkyl halide ammonium salt

The rate of this S_N^2 reaction is sensitive to the polarity of the solvent. Draw an energy diagram for this reaction in a nonpolar solvent and another in a polar solvent. Consider the nature of the transition state, and explain why this reaction should be sensitive to the polarity of the solvent. Predict whether it will be faster or slower in a more polar solvent.

- There is an overall 29-fold difference in reactivity of 1-chlorohexane, 2-chlorohexane towards potassium Q.21iodide in acetone.
- Which one is the most reactive? Why? (a)
- Two of the isomers differ by only a factor of 2 in reactivity. Which two are these? Which one is the more (b) reactive? Why?
- The compound KSCN is a source of thiocyanate ion. Q.22 Write the two most stable Lewis structures for thiocyanate ion and identify the atom in each that bears a formal charge of -1.
- Q.23 With the help of following data show HBr exhibits the peroxide effect.

With the help of following data show HB1 exhibits the peroxide effect:
$$\Delta H_1^{\ 0} \qquad \qquad \Delta H_2^{\ 0}$$
 H–X $\stackrel{\bullet}{X} + CH_2 = CH_2 \rightarrow X \ CH_2 - \stackrel{\bullet}{C} \ H_2 \qquad XCH_2 - \stackrel{\bullet}{C} \ H_2 + H-X \rightarrow XCH_2 CH_3 + \stackrel{\bullet}{X}$ HCl
$$-67 \qquad \qquad +12.6 \qquad \qquad$$

- Q.24 CHCl₂F is found to react more slowly than CHCl₃ in alkaline hydrolysis with plausible mechanism. Illustrate this phenomenon.
- Q.25 Formulate the reactions between but–1–ene in presence of small amount of benzoyl peroxide & (ii) CBrCl₂ (i) CCl₄ Give your reasons.
- p-Amino benzaldehyde behaves like an amide as is evident by the fact that it is not readily attacked by the nucleophile at the carbonyl carbon. Explain.
- Q.27 When CH₃MgBr react with 5-chloro-2-pentanone, cyclic ether is formed instead of alocohol. Explain.
- Q.28 The dichlorocarbene reacts with electron rich species like phenol where as it doesn't reacts with benzene explain.

www.studysteps.in

GOC



- Q.29 Explain the following:
- (a) 3-pentanol reacts with HBr to give a mixture of 3 & 2- bromopentane. The exact composition of the mixture depends upon whether gaseous or aqueous HBr is used.
- (b) Hydration of 3-phenyl-1-butene in dil $\rm H_2SO_4$ is not a satisfactory method for preparing 3-phenyl-2-butanol
- Q.30 Why is elimination preferred to hemiacetal formation in the acid catalysed cyclisation of this ketone?

Q.31
$$CH_2 = CH - CH_2CH_2 - C - OH \xrightarrow{Br_2} O$$
 (Cyclic ester)

This type of reaction is called "bromolactonistaion". Suggest a mechanism.

Q.32 Draw mechanisms for these reactions, explaining why these particular products are formed.

$$Cl$$
 Cl
 $MeOH$
 O
 OMe

Q.33 Write a reasonable and detailed mechanism for the following transformation.

$$\begin{array}{c}
 & \text{conc.} \\
 & \text{OH} \\
\end{array}$$

$$\begin{array}{c}
 & \text{H}_2\text{SO}_4
\end{array}$$

Q.34 The reaction of cyclopentyl bromide with sodium cyanide to give cyclopentyl cyanide

$$\begin{array}{c|c} H & \xrightarrow{NaCN} & H \\ Br & \xrightarrow{ethanol-water} & CN \end{array}$$

Cyclopentyl bromide

Cyclopentyl cyanide

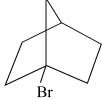
proceeds faster if a small amount of sodium iodide is added to the reaction mixture. Can you suggest a reasonable mechanism to explain the catalytic function of sodium iodide?

Q.35 The reaction of 2,2-dimethyl-1-propanol with HBr is very slow and gives 2-bromo-2-methyl-propane as the major product.

$$\begin{array}{c} \text{CH}_3 & \text{CH}_3 \\ | & | \\ \text{CH}_3\text{CCH}_2\text{OH} \xrightarrow{\text{HBr}} & \text{CH}_3\text{CCH}_2\text{CH}_3 \\ | & | \\ \text{CH}_3 & \text{Br} \end{array}$$

Give a mechanistic explanation for these observations.

Q.36 1-Bromobicyclo [2.2.1] heptane (the structure of which is shown) is exceedingly unreactive towards nucleophilic substitution by either the $S_N 1$ or $S_N 2$ mechanism.



1-Bromobicyclo [2.2.1] heptane



Q.37 We saw that acid-catalyzed dehydration of 2,2-dimethyl-cyclohexanol afforded 1,2-dimethylcyclohexene. To explain this product we must write a mechanism for the reaction in which a methyl shift transforms a secondary carbocation to a tertiary one. Another product of the dehydration of 2,2-dimethylcyclohexanol is isopropylidencyclopentane. Write a mechanism to rationalize its formation.

$$\begin{array}{cccc}
 & H \\
 & OH \\
 & CH_3 \\
 & CH_3
\end{array}$$

$$\begin{array}{cccc}
 & H^+ \\
 & \text{heat}
\end{array}$$

$$\begin{array}{cccc}
 & CH_3 \\
 & CH_3
\end{array}$$

$$\begin{array}{cccc}
 & + & \\
 & CH_3
\end{array}$$

- 2,2-Dimethylcyclohexanol
- 1,2-Dimethylcyclohexene

Isopropylidenecyclopentane

- Q.38 When 2-bromo-2,3-dimethylbutane reacts with a base under E2 conditions, two alkenes (2,3-dimethyl-1-butene and 2,3-dimethyl-2-butene) are formed.
- (a) Which of the following bases would give the highest percentage of the 1-alkene?
- (b) Which would give the highest percentage of the 2-alkene "

- Q.39 Dr. Don T. Doit wanted to synthesize the anesthetic 2-ethoxy-2-methylpropane. He used ethoxide ion and 2-chloro-2-methylpropane for his synthesis and ended up with very little ether. What was the predominant product of his synthesis? What reagent should he have used?
- Q.40 The following reaction takes place under second-order conditions (strong nucleophile), yet the structure of the product shows rearrangement. Also, the rate of this reaction is several thousand times faster than the rate of substitution of hydroxide ion on 2-chlorobutane under similar conditions. Propose a mechanism to explain the enhanced rate and rearragement observed in this unusual reaction. ("Et" is the abbreviation for ethyl.)

- Q.41 When ethyl bromide is added to potassium t-butoxide, the product is ethyl t-butyl ether. $CH_3CH_2 Br + (CH_3)_3C O^{-+}K \longrightarrow (CH_3)_3C O CH_2CH_3$ ethyl bromide potassium t-butoxide ethyl t-butyl ether
- (a) What happens to the reaction rate if the concentration of ethyl bromide is doubled?
- (b) What happens to the rate if the concentration of potassium t-butoxide id tripled and the concentration of ethyl bromide is doubled?
- (c) What happens to the rate if the temperature is raised?
- Q.42 Give a mechanism to explain the two products formed in the following reaction.



- Q.43 Give the structures of all possible products when 2-chloro-2-methylbutane reacts by the E1 mechanism.
- Q.44 Solvolysis of 1,2-dimethylpropyl p-toluenesulfonate in acetic acid (75°C) yields five different products: three are alkenes and two are substitution products. Suggest reasonable structures for these five products.
- Q.45 Solution A was prepared by dissolving potassium acetate in methanol Solution B was prepared by adding potassium methoxide to acetic acid. Reaction of methyl iodide either with solution A or with solution B gave the same major product. Why? What was this product?
- Q.46 Solvolysis of 2-bromo-2-methylbutane in acetic acid containing potassium acetate gave three products. Identify them.

Q.47

- (a) Write the structures or build molecular models of all the isomeric alkyl bromides having the molecular formula $C_5H_{11}Br$.
- (b) Which one undergoes E1 elimination at the fastest rate?
- (c) Which one is incapable of reacting by the E2 mechanism?
- (d) Which one can yield only a single alkene on E2 elimination?
- (e) For which isomers does E2 elimination give two alkenes that are not constitutional isomers?
- (f) Which one yields the most complex mixture of alkenes on E2 elimination?
- Q.48 Evidence has been reported in the chemical literature that the reaction $(CH_3CH_2)_2CHCH_2Br + KNH_2 \longrightarrow (CH_3CH_2)_2C = CH_2 + NH_3 + KBr$ proceeds by the E2 mechanism. Use curved arrow notation to represent the flow of electrons for this process.
- Q.49 The given compound give mixture of six products on treatment with CH₃OH. Write structures of all five products and give mechanism of the reaction.

$$\begin{array}{c}
CH_2 - Br \\
\hline
 & CH_3OH \\
\hline
 & A + B + C + D + E + F
\end{array}$$

Q.50 Comment on the selectivity, (that is, say what else might have happened & why it didn't) shown in this grignard addition reaction used in the manufacture of an antihistamine drug, A.

$$Cl$$
 Br
 $(i) Mg, H_2O$
 (ii)
 CHO
 N

- Q.51 Outline an efficient synthesis of each of the following compounds from the indicated starting material and any necessary organic or inorganic reagents:
- (a) Cyclopentyl cyanide from cyclopentane.
- (b) Cyclopentyl cyanide from cyclopentene.
- (c) Cyclopentyl cyanide from cyclopentanol.
- (d) Isobutyl iodide from isobutyl chloride.
- (e) Isobutyl iodide from tert-butyl chloride.
- (f) Isobutyl azide from isopropyl alcohol
- Q.52 Select the combination of alkyl bromide and potassium alkoxide that would be the most effective in the synthesis of the following ethers:

(a)
$$CH_3OC(CH_3)_3$$
 (b) OCH_3 (c) $(CH_3)_3CCH_2OCH_2CH_3$



Indicate the major alkene produced by each of the following

(a)
$$CH_3 - CH_2 - CH_2 - C - CH_3 \xrightarrow{CH_3 - \overset{\Theta}{O}\overset{\oplus}{K}/\Delta} \longrightarrow CH_3$$

$$CH_3$$

$$CH_2$$

(b)
$$CH_3 - CH_2 - CH_2 - C - N(CH_3)_3 \stackrel{\Theta}{O}H \xrightarrow{\Delta}$$
 CH_3
 CH_3

(c)
$$(CH_{3})_{3} \overset{CH_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})}{\overset{(CH_{3})_{3}}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset{(CH_{3})}{\overset$$

(d)
$$CH_3 - CH_2 - CH_2 - CH - CH_3 \xrightarrow{(CH_3)_3 COK}$$

Choose the compound of molecular formula C₇H₁₃Br that gives each alkene shown as the exclusive product of E2 elimination.

$$(c)$$
 \sim $-CH_3$

$$(d) \begin{array}{|c|} \hline \\ CH_3 \\ \hline \end{array}$$

(e)
$$\sim$$
 CH = CH₂

$$(g)$$
 $C(CH_3)_3$

Q.55 Select the alkyl halide and a nucleophile that will give each of the following products.

(a)
$$CH_3 - CH_2 - CH_2 - NH_2$$

(b)
$$CH_3 - CH_2 - O - CH_2 - CH_3$$

(a)
$$CH_3 - CH_2 - CH_2 - NH_2$$

(c) $CH \equiv C - CH_2 - CH_2 - CH_3$

$$(d) (CH3)2CHS(CH3)2$$

(e)
$$C_6H_5 - O - \tilde{CH}_2 - \tilde{CH}_3$$

Identify the product in each of the following reactions: Q.56

(a)
$$CICH_2CH_2CHCH_2CH_3 \xrightarrow{\text{NaI (1mole)}} C_5H_{10}CII$$

 CI

(b) BrCH₂CH₂Br + NaSCH₂CH₂SNa
$$\longrightarrow$$
 C₄H₈S₂

(b)
$$BrCH_2CH_2Br + NaSCH_2CH_2SNa \longrightarrow C_4H_8S_2$$

(c) $ClCH_2CH_2CH_2CH_2Cl + Na_2S \longrightarrow C_4H_8S$

- Write the structure of the principal organic product to be expected from the reaction of 1-bromopropane Q.57 with each of the following:
 - (a) Sodium iodide in acetone.



- (b) Sodium acetate (CH₃CON_a) in acetic acid.
- (c) Sodium ethoxide in ethanol.
- (d) Sodium cyanide in dimethyl sulfoxide.
- (e) Sodium azide in aqueous ethanol
- (f) Sodium hydrogen sulfide in ethanol
- (g) Sodium methanethiolate (NaSCH₃) in ethanol.



Predict the products of the following S_N^2 reaction:

(a)
$$C_6H_5 - CH_2 - CH_2 - Br \xrightarrow{NaCN}$$

(b)
$$\sim$$
 Cl $\frac{\text{NaSCH}_3}{}$

(c)
$$CH_3 - (CH_2)_8 - CH_2 - Cl \xrightarrow{\text{NaI}}$$

(d)
$$N + CH_3I$$

(e)
$$HO - CH_2 - CH_2 - CH_2 - CH_2 - CI \xrightarrow{NaOH}$$

Q.59 Draw each of the following reaction in a way that clearly show the stereoisomerism of the products.

(a)
$$CH_3 - C - Br + CH_3ONa \xrightarrow{\text{methanol} \atop S_N 2}$$

$$CH_2 - CH_3$$

$$CH_{3} - C - Br + CH_{3}ONa \xrightarrow{\text{methanol} \atop S_{N}2}$$

$$CH_{3} - CH_{2} - CH_{2} - C - Br + CH_{3}OH \xrightarrow{S_{N}1}$$

$$CH_{3} - CH_{2} - CH_{3} - CH_{3}OH \xrightarrow{S_{N}1}$$

$$CH_{3} - CH_{2} - CH_{3}OH \xrightarrow{S_{N}1}$$

$$CH_{3} - CH_{2} - CH_{3}OH \xrightarrow{S_{N}1}$$

(c)
$$H_3C$$
 \xrightarrow{NaSH} $\xrightarrow{SN1}$

What will be the products (A, B, C) in the following reaction? Q.60

$$RCH = CH_{2} \xrightarrow{RSH} A$$

$$CCl_{4} h\nu \xrightarrow{BrCCl_{3}} B$$

Give a mechanism for each of the reactions.

Q.61 Complete the following reactions. Give all possible products in each case. Give mechanism of the reactions.

(b)
$$CH_2 - C1 \frac{HOH/\Delta}{}$$

Identify (A) to (D) in the given reaction sequence. 0.62

$$CH_3 - CH_2 - CH_3 \xrightarrow{Br_2/hv} (A) \xrightarrow{alc \ KOH} (B) \xrightarrow{Peroxide} (C) \xrightarrow{LiF} (D)$$

Identify (A) to (E) in the given reaction sequence

$$CH_3-CH_2-Br \xrightarrow{\text{Li }/\text{CuX}} (A) \xrightarrow{\text{CH}_3-\text{CH}_2-\text{Br}} (B) \xrightarrow{\text{Cl}_2/\text{hv}} (C)+(D)+(E) \xrightarrow{\text{(CH}_3)_3 \overset{\odot}{\text{COK}}} (F)+(G)+(H).$$

Complete the following reactions:

(a)
$$CH_3 - C - (CH_2)_4 - C - CH_3 \xrightarrow{(i) I_2/NaOH/\Delta} (A) + (B)$$

(b)
$$C - CH_3 \xrightarrow{(i) Br_2/NaOH \\ (ii) H} (C) + (D)$$

(c)
$$CHOH - CH_3 \xrightarrow{(i) CaOCl_2/HOH \atop (ii) H} (E) + (F)$$

(d)
$$CH_3 - CH - CH_2 - CH_3 \xrightarrow{NaOH/F_2} G + H$$

 Cl



Q.65 Complete the following reactions

(a)
$$C_6H_5 - CH - CH_3 + NaCl + HOH \xrightarrow{Electrolysis} A$$
 sweet smelling liquid Br

(b)
$$C_6H_5 - CH \xrightarrow{Cl} \xrightarrow{\text{aq. NaOH}}$$

Q.66(i)What are the products of the following reactions?

(a) PhCH = CHCH₃ + HBr
$$\longrightarrow$$
 A

(b)
$$H_3C$$
 $C = C$ H CH_3 $HI \longrightarrow B$

$$(d) \underbrace{ \begin{array}{c} CH_3 \\ CH_2CH_3 \end{array}} + HCl \longrightarrow D$$

(ii) What are the products of the following reactions?

(a)
$$PhC \equiv CH + Br_2 \longrightarrow$$

(b)
$$CH_3CH_2CH = CH_2 \xrightarrow{Cl_2} H_2O$$

(c)
$$CH_3 \xrightarrow{Br_2} H_2O$$

(d)
$$H_3C$$
 $C = CH_2 \xrightarrow{Br_2} \xrightarrow{NaOH} \xrightarrow{H_2O}$

Q.67 What products would be formed in these reactions?

(a)
$$Ph - C \equiv CH \xrightarrow{(i) EtMgBr} A$$

$$\xrightarrow{(ii) Ph_2CO} (iii) NH_4Cl$$

(b)
$$Cl \xrightarrow{(i) PhLi} B$$
 $B \xrightarrow{(ii) CO_2, (iii) H^{\oplus}/H_2O}$

$$Q.68 \quad CH_{3}CH_{2}CH_{2}CI \xrightarrow{\text{alc.KOH}} A \xrightarrow{\text{SO}_{2}Cl_{2}} B \xrightarrow{\text{Mg/Et}_{2}O} C \xrightarrow{\text{(i)}CH_{3}-C-CH_{3}} D \xrightarrow{\text{H}_{2}SO_{4}/\Delta} E.$$

Q.69
$$Cl_3C - C - OH + Na \longrightarrow A \xrightarrow{\Delta} B$$
. Find out A & B.

Q.70 Give product and suggest mechanism for these reactions.

(i)
$$? \xleftarrow{\text{MeOCH}_2\text{Cl}} \underbrace{\text{CHBr}_3}_{\text{tBuOK}} ?$$

(ii)
$$N_2 \longrightarrow CO_2Et \xrightarrow{\Delta} ?$$

$$Ph - CH = CH_2$$

Q.71 Propose a mechanism for the following reaction

$$\begin{array}{c} \text{CH}_3\text{-CH-CH} - \text{CH}_2 \\ | \\ \text{Cl} \end{array} \xrightarrow{CH_3 O / CH_3 O H} \text{CH}_3\text{-CH-CH} - \text{CH}_2\text{OCH}_3\text{H} + \text{Cl}^{\circ}$$



Propose a mechanism for the following reaction

$$HO-CH_2-CH_2-CH_2-OH \xrightarrow{\stackrel{\circ}{H}} \bigcirc + HOH$$

- Q.73 Compound (A) C₆H₁₄O is insoluble in water and gives negative Lucaus test. On treatment with concentrated H₂SO₄ followed by hydrolysis it gives only one compound (B), C₃H₈O. Compound (B) is insoluble in water and gives red colour with cerricammoniumnitrate. (B) gives yellow precipitate (C) and compound (D) on treatment with L/Na₂CO₃/ Δ followed by acidification. What are structures of (A), (B), (C) and (D) and give synthesis of (A)?
- Q.74 Give the product of reaction of each of the following with excess phenylmagnesium bromide followed by acid hydrolysis:

Complete the reaction given below: Q.75

$$\begin{array}{c}
CH_{3} \\
CH_{3}CH_{2}-C-OH \xrightarrow{PBr_{3}} Pyridine
\end{array}$$
(E) \xrightarrow{NaCN} (F) $\xrightarrow{H_{2}O/H_{2}SO_{4}}$ (G)

Which among the following is most reactive for aliphatic nucleophilic substitution reaction? 0.76

$$(A) \, CH_{3} - CH_{2} - Br \qquad (B) \, C_{6}H_{5} - CH_{2} - Br \qquad (C) \, CH_{3} - C - CH_{2} - Br \qquad (D) \, CH_{2} = CH - Br \\ CH_{3} \\ CH_{3}$$

- Q.77(a) Which compound will give Walden Inversion in SN2 reaction?
 - $(A) CH_3-CH_2-Br$ $(B) Ch_3-CHD-Br$
- $(C) CH_2-Br$
- $\mathrm{(D)}\,\mathrm{C_6H_5}\mathrm{-CH_2}\mathrm{-CH_2}\mathrm{Cl}$
- (b) Which among the following will give SN1 reaction?

- Q.78 Consider the following statements:
 - (1) CH₃ group is o, p-directing group due to hyperconjugation
 - (2) CCl₃ is meta directing group due to reverse hyperconjugation
 - (3) CCl₃ group is meta directing group due to mesomaric effect.
 - (4) –CH=CH, is group is o, p–directing group.
 - of these statements:
 - (A) 1 and 2 are correct

(B) 1 and 3 are correct

(C) 1, 2 and 4 are correct

(D) 3 and 4 correct



Q.79 Consider the following reaction

$$CH_{3}$$

$$|$$

$$CH_{3}-C-CH_{2}Br+NaOH \longrightarrow [X]$$

$$|$$

$$CH_{3}$$

[X] as major product will be

Q.80 Indicate the products which are expected from the following elimination reactions. If several alkanes will be formed then indicate which will be the major product.

(a)
$$CH_3$$
- CH_2 - CH - N - CH_3 OH CH_3 CH_3

(b)
$$CH_3$$
- CH_2 - CH_3
 CH_3
 CH_3
 CH_3
 CH_3

(c)
$$CH_3$$
- CH - CH_2 - CH_3 OH CH_3

$$CH_3$$

$$CH_3$$

(d)
$$CH_3$$
- CH - CH_2 - CH_2 - CH_3 OH

$$CH_3$$

$$CH_3$$

Q.81 Give major product in each of the following reactions:

(a)
$$CH_3 \longrightarrow CH-CH_3 \longrightarrow OH$$

(b)
$$CH_{3}-CH-CH-CH_{2}-CH_{3} \xrightarrow{Alc. KOH} CH_{3}$$



Identify A to H in the given reaction sequence:

$$\begin{array}{c}
\stackrel{N}{\longrightarrow} \xrightarrow{CH_3I} (A) \xrightarrow{AgOH} (B) \xrightarrow{\Delta} (C) \\
H & \downarrow CH_3I \\
G + H \xleftarrow{(i) O_3} (F) \xleftarrow{\Delta} (E) \xleftarrow{AgOH} (D)
\end{array}$$

Assign A to (D) in the given reaction sequence:

$$\begin{array}{ccc}
& \xrightarrow{(i)CH_3I(excess)} & (A) \xrightarrow{\Delta} & (B) \\
& & \xrightarrow{(i)} & (CH_3I) \\
& & & (ii) & AgOH
\end{array}$$

$$\begin{array}{ccc}
& & (D) & \xrightarrow{(i)} & CH_3I \\
& & & (iii) & AgOH
\end{array}$$

$$\begin{array}{cccc}
& & (C) & (CH_3I) & (C) & (CI) &$$

In which reaction formation takes place by Hoffmann rule? Q.84

$$(1) \underset{CH_{3}-CH_{2}-CH-CH_{3}}{\overset{(CH_{3})_{3}COK/\Delta}{\longrightarrow}} \qquad (2) \underset{CH_{3}-CH_{2}-CH-CH_{3}}{\overset{(CH_{3})_{3}COK/\Delta}{\longrightarrow}} \qquad (3) \underset{CH_{3}-CH_{2}-CH-N-O^{\Theta}}{\overset{(CH_{3})_{3}COK/\Delta}{\longrightarrow}} \qquad (4) \underset{CH_{3}-CH_{2}-CH-CH_{3}}{\overset{(CH_{3})_{3}COK/\Delta}{\longrightarrow}} \qquad (4) \underset{CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{3}-CH_{$$

Select the correct answer from the codes given below:

$$(D)$$
 1 3 and 4

- Consider the following statements: Q.85
 - (1) Pyrolytic elimination is always syn elemination
 - (2) In pyrolytic elimination product formation takes place by most stable eclipsed.
 - (3) In pyrolytic elimination product formation takes place by Hoffmann rule.
 - (4) In pyrolytic elimination product formation takes place by Saytzeff rule.

Of these statements



EXERCISE-IV (A)

- Q.1 Reaction of R-CO-NH₂ with a mixture of Br₂ and KOH gives R-NH₂ as the main product. The intemediates involved in this reaction are: [JEE 1992]
 - (A) R-CO-NHBr

(B) RNHBr

(C) R-N=C=O

- (D) R.CO.NBr₂
- Which one of the following has the smallest heat of hydrogenation per mole? Q.2

[JEE 1993]

(A) 1-Butene

(B) trans-2-Butene

(C) cis-2-Butene

(D) 1,3-Butadiene

Q.3 In the following compounds: [JEE 1996]



- (II)
- OH

(III)

OH (IV)

The order of acidity is:

(I)

- (A) III > IV > I > II
- (B) I > IV > III > II
- (C) II > I > III > IV (D) IV > III > I > II
- The reaction of CH₃-CH=CH OH with HBr gives: Q.4

[JEE 1998]

- (A) CH₃CHBrCH₂
- (C) CH₃CHBrCH₂
- (D) CH₃CH₂CHBr
- A solution of (+) 1-chloro-1-phenylethane in toluene racemizes slowly in the presence of small amount Q.5 of SbCl₅ due to formation of: [JEE 1999]
 - (A) carbanion
- (B) carbene
- (C) free radical
- (D) carbocation

Q.6 An aromatic molecule will: [JEE 1999]

(A) have $4n \pi$ electrons

(B) have $(4n+2) \pi$ electrons

(C) be planar

- (D) be cyclic
- **Q**.7 The enol form of acetone, after Prolonged treatment with D₂O, gives:
- [JEE 1999]

- OD (A) $CH_3 - C = CH_2$ (B) $CH_3 - C - CH_3$ (C) $CH_2 = C - CH_2D$ (D) $CD_2 = C - CD_3$
- Q.8 Amongst the following, the most basic compound is:

[JEE 2000]

- $(A) C_6 H_5 NH_2$
- (B) $p-NO_2-C_6H_4NH_2$ (C) $m-NO_2-C_6H_4NH_2$ (D) $C_6H_5CH_2NH_2$
 - [JEE 2001]
- Q.9 ² reaction at an assymetrical carbon of a compound always gives: (A) enantiomer of the substrate
 - (B) a product with opposite optical rotation
 - (C) a mixture of diastereomeres
- (D) a single stero isomers



The correct order of basicities of the following compounds is:

[JEE 2001]



 $CH_3CH_2NH_2$ $(CH_3)_2NH$

Q.11 Identify the correct order of reactivity in electrophilic substitution reaction of the following compounds:



(3)



(A) 1>2>3>4

(B) 4>3>2>1

(C) 2>1>3>4

(D) 2>3>1>4 **[JEE 2002]**

Left to right sp^2 , sp^2 , sp, sp hybridization is present in:

(A) $H_2C = CH - C \equiv N$ (B) $H_2C = C = CH - CH_3$ (C) $HC \equiv C - C \equiv CH$

[JEE 2003] (D) $HC \equiv C - CH = CH_2$

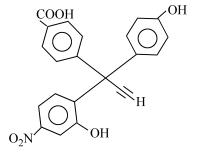
Q.13 Maximum dipole moment will be of:

 $(A) CCl_4$

(B) CHCl₃

(D) CH₃Cl

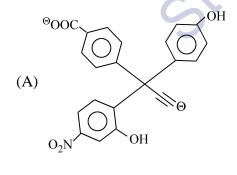
Q.14

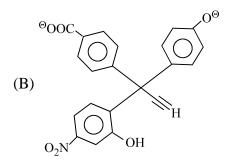


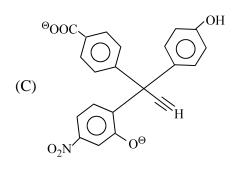
when X is made to react with 2 eq. of NaNH₂ the product formed will be:

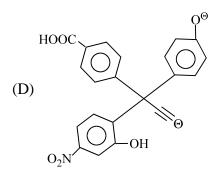
[JEE 2003]

[JEE 2003]











Q.15 Order of rate of reaction of following compound with phenyl magnesium bromide is: [JEE 2004]

$$\begin{array}{ccc} Ph-C-Ph & & Me-C-H \\ \parallel & & \parallel \\ O & O \\ (I) & (II) \end{array}$$

(B)
$$II > III > I$$

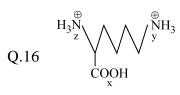
(C)
$$III > I > II$$

Me-C-Me

O

(III)

(D)
$$II > I > III$$



[JEE 2004]

Correct order of acidic strength is:

(B)
$$z > y > x$$

(C)
$$y > z > x$$

(D)
$$x > z > y$$

Q.17 1-Bromo-3-chloro cyclobutene on reaction with 2-equivalent of sodium in ether gives [JEE 2005]

Q.18
$$\xrightarrow{\text{CH}_3\text{COONa(excess)}}$$
 $\xrightarrow{\text{(aq.solution)}}$

[JEE 2005]

D)
$$H_2SO_3$$

Q.19 Conversion of cyclohexanol into cyclohexene is most effective in

[JEE 2005]

(A) concentrated H₃PO₄

- (B) concentrated HCl
- (C) concentrated HCl / ZnCl₂
- (D) concentrated HBr

Q.20
$$Ph - MgBr + CH_3 - C - OH \longrightarrow A$$

$$CH_3$$

$$C - CH_3$$

[**JEE 2005**]

(D)
$$CH_3 - C - Ph$$

 CH_3



Q.21For 1-methoxy-1,3-butadiene, which of the following resonating structure is the least stable?

(A)
$$H_2 \overset{\Theta}{C} - \overset{\oplus}{C} H - CH = CH - O - CH_3$$

(B)
$$H_2 \overset{\Theta}{C} - CH = CH - CH = \overset{\oplus}{O} - CH_3$$

(C)
$$H_2C = CH - \overset{\oplus}{C}H - \overset{\ominus}{C}H - O - CH_3$$
 (D) $H_2C = CH - \overset{\ominus}{C}H - CH = \overset{\ominus}{O} - CH_3$

(D)
$$H_2C = CH - \overset{\Theta}{C}H - CH = \overset{\oplus}{O} - CH_2$$

[JEE 2005]

[JEE 2005]

on hydrolysis in presence of acetone

(L) MeO
$$\longrightarrow$$
 CH₃ H CH₃ \longrightarrow NO₂

(M) MeO
$$\longrightarrow$$
 H CH₃ OH

(A) K & L

(B) only

(C) Monly

(D) K & M

When benzene sulfonic acid and p-nitrophenol are treated with NaHCO₃, the gases released respectively Q.23 [JEE 2006]

- (A) SO₂, NO₂
- (B) SO₂, NO
- (C) SO₂, CO₂ (D) CO₂, CO₂

 $CH_3NH_2 + CHCl_3 + KOH \rightarrow Nitrogen containing compound + KCl + H_2O.$ Nitrogen containing Q.24 compound is [JEE 2006]

- (A) CH_3 - $C \equiv N$
- (B) CH_3 -NH- CH_3 (C) $CH_3 \overline{N} \equiv \overline{C}$ (D) $CH_3 \stackrel{+}{N} \equiv \overline{C}$

Q.25 (I) 1,2-dihydroxy benzene (II) 1,3-dihydroxy benzene

[JEE 2006]

(III) 1,4-dihydroxy benzene

(IV) Hydroxy benzene

The increasing order of boiling points of above mentioned alcohols is

(A) I < II < III < IV

(B) I < II < IV < III

(C) IV < I < II < III

(D) IV < II < I < III



Question No. 26 to 28 (3 questions)

Comprehension I

RCONH₂ is converted into RNH₂ by means of Hofmann bromamide degradation.

$$Cl \xrightarrow{O} Cl \xrightarrow{O} Cl \xrightarrow{O} Cl \xrightarrow{NH-Br} Cl \xrightarrow{N} Cl \xrightarrow{N}$$

In this reaction, RCONHBr is formed from which this reaction has derived its name. Electron donating group at phenyl activates the reaction. Hofmann degradation reaction is an intramolecular reaction.

Q.26 How can the conversion of (i) to (ii) be brought about?

[JEE 2006]

- (A) KBr
- (B) KBr + CH₃ONa
- (C) KBr + KOH
- (D) $Br_2 + KOH$
- Q.27 Which is the rate determining step in Hofmann bromamide degradation?

[JEE 2006]

[JEE 2006]

- (A) Formation of (i)
- (B) Formation of (ii)
- (C) Formation of (iii)
- (D) Formation of (iv)
- Q.28 What are the constituent amines formed when the mixture of (i) and (ii) undergoes Hofmann bromamide degradation?

$$(A) \longrightarrow NH_2, \longrightarrow NH_2, \longrightarrow NH_2, \longrightarrow NH_2, \longrightarrow NH_2$$

$$(B) \longrightarrow NH_2, \longrightarrow NH_2$$

$$(C) \longrightarrow NH_2, \longrightarrow NH_2$$

$$(C) \longrightarrow NH_2$$



Q29. Which of the following reactants on reaction with conc. NaOH followed by acidification gives the following lactone as the only product?

$$(A) \begin{array}{c} O \\ COOCH_3 \\ COOOH \\ COOH \end{array} \qquad (B) \begin{array}{c} COOOH \\ CHO \\ CHO \end{array} \qquad (C) \begin{array}{c} CHO \\ CHO \\ CHO \end{array} \qquad (D) \begin{array}{c} COOH \\ COOH \\ COOH \\ \end{array}$$

- Q30. The smallest ketone and its next homologue are reacted with NH₂OH to form oxime.
 - (A) Two different oximes are formed
- (B) Three different oximes are formed
- (C) Two oximes are optically active
- (D) All oximes are optically active

[JEE 2006]

Q31. Match the following:

Column II (A) CH₃-CHBr-CD₃ on treatment with alc. KOH gives CH₂=CH-CD₃ as a major product. (B) Ph - CHBr - CH₃ reacts faster than Ph-CHBr-CD₃. (C) Ph-CH₂-CH₂Br on treatment with C₂H₅OD/C₂H₅O. gives Ph-CD=CH₂ as the major product. (D) PhCH₂CH₂Br and PhCD₂CH₂Br react with same rate. (S) First order reaction [JEE 2006]

EXERCISE-IV (B)

Q.1
$$CH_3CH_2CHCl_2 \xrightarrow{aq.KOH}$$
? [JEE 1991]

Q.2
$$C_6H_6+(CH_3)_2CHCH_2Cl \xrightarrow{AlCl_3}$$
? [JEE 1992]

Q.3
$$\langle \bigcirc \rangle$$
 COO $\langle \bigcirc \rangle$ $\xrightarrow{\text{HNO}_3/\text{H}_2\text{SO}_4}$? [JEE 1993]

Q.4 Draw the stereochemical structure of the products in the following reaction: [JEE 1994]

$$Br \xrightarrow{C_2H_5} H \xrightarrow{NaOH} ?$$

$$CH_3$$

Q.5 Complete the following, giving the structures of the principal organic products: [JEE 1997]

(a)
$$\stackrel{\text{Ph}}{\longrightarrow} = \stackrel{\text{H}}{\longrightarrow} + \text{KNH}_2 \longrightarrow A$$

(c)
$$ClCH_2CH_2COPh + KOH + MeOH \longrightarrow C$$

- Q.6 Write the intermediate steps for each of the following reaction. [JEE 1998]
- (i) $C_6H_5CH(OH) C \equiv CH \xrightarrow{H_3O^{\oplus}} C_6H_5CH = CH-CHO$



$$(ii) \qquad \overbrace{\qquad \qquad \qquad }^{OH} \xrightarrow{\qquad \qquad H^{\oplus} \qquad \qquad } \bigcirc_{CH}$$

- Q.7 Each of the following reaction gives two products. Write the structure of the products. [JEE 1998]
- (a) $C_6H_5CH_2CHClC_6H_5 \xrightarrow{Alc.KOH,\Delta}$
- (b) $CH_3CONHC_6H_5 \xrightarrow{Br_2,Fe}$
- Q.8 Out of anhydrous AlCl₃ and hydrous AlCl₃ which is more soluble in diethyl ether? Explain with reason. [**JEE 2003**]

Q.9 Match K_a values with suitable acid:

[JEE 2003]

Ka

а

 3.3×10^{-5}

Acid

(ii)
$$4.2 \times 10^{-5}$$

(i)

(b)
$$Me - \langle \rangle$$

(iii)
$$6.3 \times 10^{-5}$$

СООН

(iv)
$$6.4 \times 10^{-5}$$

(d)
$$MeO-\langle \bigcirc \rangle$$
-COOH

(v)
$$30.6 \times 10^{-5}$$

(e)
$$O_2N - \langle O \rangle - COOH$$

Q.10 Give resonating structures of following compound.

[JEE 2003]



Q.11 Which of the following is more acidic and why?

[JEE 2004]

- Q.12 Predict whether the following molecules are iso structural or not. Justify your answer. [**JEE 2005**] (i) NMe₃ (ii) N(SiMe₃)₃
- Q.13 Give reasons: [JEE 2005]

(a) (i)
$$\xrightarrow{\text{H}_3\text{C}} \xrightarrow{\text{Br}} \xrightarrow{\text{C}_2\text{H}_5\text{OH(aq.)}} \text{acidic solution}$$

(ii)
$$Br \xrightarrow{CH_3} \xrightarrow{C_2H_5OH(aq.)} neutral$$

(b) (i)
$$O_{2N} \xrightarrow{F} \xrightarrow{NaOH(aq.)} F$$
 (liberated)



(ii)
$$H_3C$$
 $\xrightarrow{\text{NaOH(aq.)}}$ F is not liberated

(c) (i)
$$Conc.HNO_3$$
 NO_2 + NO_2 NO_2

(ii)
$$\stackrel{\text{NO}_2}{\longrightarrow}$$
 $\stackrel{\text{Conc.HNO}_3}{\longrightarrow}$ $\stackrel{\text{NO}_2}{\longrightarrow}$ $\stackrel{\text{NO}_2}{\longrightarrow}$ $\stackrel{\text{NO}_2}{\longrightarrow}$

(d)
$$\frac{Pd/C}{3 \text{ moles of } H_2}$$
 is formed but not

Q.14 $\left(\begin{array}{c} \text{Brown fumes and} \\ \text{pungent smell} \end{array}\right)$ B \leftarrow $\stackrel{\text{NaBr+MnO}_2}{\longrightarrow}$ A $\stackrel{\text{Conc.HNO}_3}{\longrightarrow}$ C(intermediate) $\stackrel{\text{CH}_3}{\longrightarrow}$ D(Explosive product) Find A, B, C and D. Also write equations A to B and A to C. [**JEE 2005**]

Q.15 $\mu_{obs} = \sum \mu_i x_i$ [**JEE 2005**]

where μ_i is the dipole moment of stable conformer and x_i is the fraction of that conformer.

- (a) Write stable conformer for Z– CH_2 CH_2 Z in Newman's projection. If $\mu_{\text{solution}} = 1.0 \text{ D}$ and mole fraction of anti form = 0.82, find μ_{Gauche} .
- (b) Write most stable meso conformer of CHDY

If (i) $Y = CH_3$ about $C_2 - C_3$ rotation and (ii) Y = OH about $C_1 - C_2$ rotation.



ANSWER KEY

EXERCISE-I

Q.1	D	Q.2	C	Q.3	В	Q.4	В	Q.5	В	Q.6	A	Q.7	A
Q.8	D	Q.9	A	Q.10	В	Q.11	A	Q.12	C	Q.13	C	Q.14	C
Q.15	C	Q.16	A	Q.17	В	Q.18	В	Q.19	C	Q.20	A	Q.21	D
Q.22	A	Q.23	C	Q.24	C	Q.25	D	Q.26	A	Q.27	D	Q.28	C
Q.29	A	Q.30	C	Q.31	В	Q.32	В	Q.33	C	Q.34	В	Q.35	В
Q.36	A	Q.37	A	Q.38	C	Q.39	В	Q.40	D	Q.41	В	Q.42	A
Q.43	A	Q.44	A	Q.45	A	Q.46	C	Q.47	C	Q.48	C	Q.49	A
0.50	D	0.51	D	0.52	\boldsymbol{C}	0.53	C						

EXERCISE-II

Q.1	C	Q.2	A,D	Q.3	A,B,C,D	Q.4	A,B,C,D
Q.5	B,C,D	Q.6	A,B,D	Q.7	A,B,D	Q.8	C
Q.9	C,D	Q.10	A,B	Q.11	A,B	Q.12	A,D
Q.13	A,C,D	Q.14	C,D	Q.15	D	Q.16	A
Q.17	B,D	Q.18	D	Q.19	B,D	Q.20	A,C
Q.21	A,B,C	Q.22	B,C	Q.23	A,B	Q.24	A,C
Q.25	C	Q.26	A,C,D	Q.27	A,B,C	Q.28	D
Q.29	A,D	Q.30	В	Q.31	D		

EXERCISE-III

Q.1
$$3 > 2 > 1 > 4$$
 Q.2 $IV > I > II > III$ Q.3 (a) $II > I > III > IV$; (b) (ii)

- $Q.6 \qquad (a) \; II, \; (b) \; I, \; (c) \; II \qquad \qquad Q.7 \qquad \textbf{(i)} \quad (a) \; II, \; (b) \; I, \; (c) \; II \; \; ; \; \textbf{(ii)} \quad (a) \; II, \; (b) \; II, \; (c) \; II$
- Q.8 (a) II, (b) I Q.9 (a) I, (b) II, (c) I, (d) I Q.10 (a) II, (b) I, (c) II, (d) II
- $Q.11 \quad (a) \; II \; ; \; (b) \; II \; ; \; (c) \; I \; ; \; (e) \; II \qquad \qquad Q.14 \quad b, d, e, g, h \qquad Q.15 \quad a, c, e, f, g, h$
- Q.27 Q.38 (a) $\text{Et}_3\text{CO}^{\Theta}$; (b) EtO^{Θ} Q.45 MeCOOMe



$$\begin{array}{c} \text{(f) } C-C-C-C-C\\ |\\ Br \end{array}$$

Q.53 (a)
$$C-C-C=C-C$$
; (b) $C-C-C-C=C$; (c) $C=C-C-C$; (d) $C-C-C-C=C$

Q.54 (a)
$$(c)$$
 (c) $($

Q.55 (a) $CH_3CH_2CI_2CI + NH_3$; (b) $CH_3CH_2ONa + CH_3CH_2CI$; (c) $HC^{\circ}C^{\Theta}Na^{\oplus} + CH_3CH_2CH_2-CI$ (d) $Me_2CH-CI + Me_2S$; (e) $C_6H_5ONa + CH_3CH_2-CI$

Q.56 (a)
$$ICH_2CH_2 - CH - CH_2CH_3$$
; (b) S ; (c) S ; (c) S

Q.57 (a)
$$\sim$$
 I; (b) \sim O ; (c) \sim CN; (e) \sim N₃; (f) \sim SH; (g) \sim S

Q.58 (a)
$$C_6H_5-CH_2-CH_3-CN$$
, (b) \bigcirc $-SCH_3$, (c) $CH_3-(CH_2)_9-I$, (d) \bigcirc $N^{\oplus}-CH_3I^{\Theta}$, (e) \bigcirc

Q.59 a)
$$CH_3O - C - CH_3$$
; (b) $Et - C - OMe + MeO - C - Et$, (c) CH_3 $SH + CH_2CH_3$

- $Q.60 \quad (A) \, RCH_2CH_2SR \qquad (B) \, RCHBrCH_2CCl_3 \quad (C) \, RCHClCH_2CCl_3$
- Q.62 CH₃-CH₂-CH₂-F
- Q.64 (a) $\text{CHI}_3 + (\text{CH}_2)_4 (\text{COOH})_2$, (b) $\text{CHBr}_3 + \bigcirc -\text{COOH}$, (c) $\text{CHCl}_3 + \bigcirc -\text{COOH}$, (d) $\text{CHF}_3 + \text{EtCOONa}$
- Q.65 (a) CHCl₃, (b) PhCHO

www.studysteps.in

GOC

Q.66 (i) (a)
$$Ph-CH-Et$$
, (b) $Me_2C(I)-Et$, (c) Br , (d) Et

(ii) (a)
$$_{Br}^{Ph}$$
 C=C $_{H}^{Sr}$, (b) Et-CH-CH₂-Cl, (c) $_{Br}^{OH}$, (df) $_{OH}^{OH}$

Q.67 (a)
$$Ph - C \equiv C - C - Ph$$
; (b) $COOH$

- Q.68 Me₂C=CH-CH=CH₂
- Q.69 A: **:**CCl₂ B:

Q.70 (i)
$$\stackrel{Br}{\underset{Br}{\triangleright}}$$
 & $\stackrel{OMe}{\underset{Ph}{\longleftarrow}}$ COOEt

EXERCISE-IV (A)

Q.1	A, C	Q.2	D	Q.3	D	Q.4	В	Q.5	D
Q.6	B, C, D	Q.7	D	Q.8	D	Q.9	D	Q.10	В
Q.11	C	Q.12	A	Q.13	D	Q.14	C	Q.15	В
Q.16	D	Q.17	C	Q.18	C	Q.19	A	Q.20	A
Q.21	C	Q.22	A	Q.23	D	Q.24	D	Q.25	C
Q.26	D	Q.27	D	Q.28	В	Q.29	C	Q.30	В
Q.32	A-Q; B-Q;	C-R	S; D-P,S						

EXERCISE-IV (B)

Q.1
$$CH_3CH_2CHO$$
 Q.2 $Q.3$ $Q.3$ $Q.3$

Q.4
$$C_6H_5 - C - CH_3$$
 Q.5 (A) PhC=CPh, (B) R Br, (C) R Ph-C-CH—CH₂ CH_3

Q.6
$$C_6H_5 - CH - C \equiv CH \xrightarrow{H^{\oplus}} C_6H_5 - CH - C \equiv CH \xrightarrow{-H_2O} C_6H_5 - CH - C \equiv CH$$

OH $^{\oplus}OH$

$$C_6H_5 - CH = C = CH \xrightarrow{H_2O} C_6H_5 - CH = C = CH$$
 $^+OH_2$

$$C_6H_5 - CH = C = CH$$

$$C_6H_5 - CH = CH - CHO$$

$$OH_2$$

$$C_6H_5 - CH = CH - CHO$$

$$(ii) \longrightarrow OH \longrightarrow OH$$

$$H^+ \longrightarrow OH$$

$$CH_3 \longrightarrow CH_3$$

$$CH_3 \longrightarrow CH_3$$

Q.7 (a)
$$C_6H_5 > C = C < C_6H_5 = C < C_6H$$

- Q.8 Anhydrous AlCl₃ is more stable then hydrous AlCl₃ because it is having vacant 3p orbital of Al which can accept lone pair of electrons from oxygen of diethylether.
- Q.9 (i)–(d), (ii)–(b), (iii)–(a), (iv)–(c), (v)–(e) Q.10
- Q.11 is more acidic as overall effect of –F is electron withdrawing, so loss of portion is easier from this compound.
- Q.12 Not. NMe₃ is trigonal pyramidal while N(SiMe₃)₃ is trigonal planar due to back bonding.
- Q.13 (a) (i) $H_5C_6 C OC_2H_5 + HBr(acid)$; (ii) no reaction due to partial double bond character CH_3
 - (b) (i) O₂N + F⁻ is liberated; (ii) Bimomecular mechanism is not possible in (ii) case



- (c) (i) due to presence of lone pair of nitrogen atom NO group is electron denating and ortho, para directing
 - (ii) NO₂ group is electron withdrawing and meta directing
- (d) Due to reduction of central ring, three four membered antiaromatic rings become stable while on recuction of terminal ring only one antiaromatic ring can be stabilized.

Q.14 (A)
$$H_2SO_4$$
, (B) Br_2 , (C) NO_2^{\oplus} , (D) O_2N NO_2 NO_2

Q.15 (a)
$$\mu_{Gauche} = 5.55 \, D$$
; (b) (i) $\mu_{CH_3} = 0.00 \, H_{CH_3} = 0.00 \, H_{C$