# DPP - Daily Practice Problems

## Chapter-wise Sheets

Date : Start Time : End Time :

# CHEMISTRY CC12

**SYLLABUS :** Organic chemistry - Some basic principles and Techniques

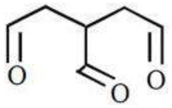
**Max. Marks : 180** **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

**INSTRUCTIONS :** This Daily Practice Problem Sheet contains 45 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

**1.** The correct decreasing order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is

(a) $-COOH, -SO_3H, -CONH_2, -CHO$
(b) $-SO_3H, -COOH, -CONH_2, -CHO$
(c) $-CHO, -COOH, -SO_3H, -CONH_2$
(d) $-CONH_2, -CHO, -SO_3H, -COOH$

**2.** The IUPAC name of the compound



(a) 1, 2, 3 – triformyl propane
(b) Propane– 1, 2, 3 – tricarbaldehyde
(c) 3 – formyl – 1, 5 – pentanedial
(d) Propane– 1, 2, 3 – trial

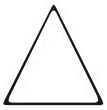
**3.** Vinylcarbinol is

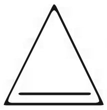
(a) $HO-CH_2-CH=CH_2$
(b) $CH_3C(OH)=CH_2$
(c) $CH_3-CH=CH-OH$
(d) $CH_3-C(CH_2OH)=CH_2$

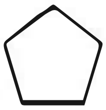
**4.** The compound  is known by which of the following names ?

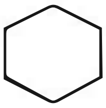
(a) Bicyclo [2.2.2] octane
(b) Bicyclo [2.2.1] octane
(c) Bicyclo [1.2.1] octane
(d) Bicyclo [1.1.1] octane

**5.** The stability of the compounds


(i)


(ii)


(iii)


(iv)

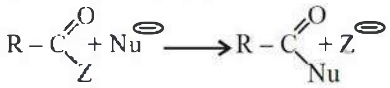
(a) (iv) > (iii) > (i) > (ii) (b) (i)> (iii)> (ii)> (iv)
(c) (ii)> (iii)>(i)> (iv) (d) (iv) > (i)> (iii)>(ii)

**RESPONSE GRID** 1. ⓐⓑⓒⓓ 2. ⓐⓑⓒⓓ 3. ⓐⓑⓒⓓ 4. ⓐⓑⓒⓓ 5. ⓐⓑⓒⓓ

*Space for Rough Work*

6. Fractional distillation is used when
(a) there is a large difference in the boiling point of liquids
(b) there is a small difference in the boiling points of liquids
(c) boiling points of liquids are same
(d) liquids form a constant boiling mixture

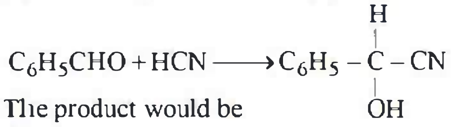
7. Rate of the reaction



is fastest when Z is
(a) $OC_2H_5$ (b) $NH_3$ (c) $Cl^-$ (d) $OCOCH_3$

8. The order of activity of the various o- and p-director is
(a) $-O^- > -OH > -OCOCH_3 > -COCH_3$
(b) $-OH > -O^- > -OCOCH_3 > -COCH_3$
(c) $-OH > -O^- > -COCH_3 > -OCOCH_3$
(d) $-O^- > -COCH_3 > -OCOCH_3 > -OH$

9. The general formula $C_nH_{2n}O_2$ could be for open chain
(a) carboxylic acids (b) diols
(c) dialdehydes (d) diketones

10. 

$$C_6H_5CHO + HCN \longrightarrow C_6H_5-\overset{\overset{\large H}{|}}{\underset{\underset{\large OH}{|}}{C}}-CN$$

The product would be
(a) a racemate
(b) optically active
(c) a meso compound
(d) a mixture of diastereomers

11. The number of possible open chain (acyclic) isomeric compounds for molecular formula $C_5H_{10}$ would be
(a) 8 (b) 7 (c) 6 (d) 5

12. Which one of the following is the stablest structure of cyclohexatriene?
(a) Chair form (b) Boat form
(c) Half chair form (d) Planar form

13. The compound formed in the positive test for nitrogen with the Lassaigne solution of an organic compound is
(a) $Fe_4[Fe(CN)_6]_3$ (b) $Na_3[Fe(CN)_6]$
(c) $Fe(CN)_3$ (d) $Na_4[Fe(CN)_5NOS]$

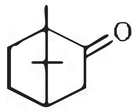
14. 2.79 g of an organic compound when heated in Carius tube with conc. $HNO_3$ and $H_3PO_4$ formed converted into $MgNH_4.PO_4$ ppt. The ppt. on heating gave 1.332 g of $Mg_2P_2O_7$. The percentage of P in the compound is
(a) 23.33% (b) 13.33% (c) 33.33% (d) 26.66%

15. Match the columns

| | **Column-I** | | **Column-II** |
|---|---|---|---|
| A. | $CH_3COOH$ & $HCOOCH_3$ | I. | Functional isomers |
| B. | 1-butene & 2-butene | II. | Metamers |
| C. | diethyl ether & methyl propyl ether | III. | Position isomers |
| D. | dimethyl ether and ethanol | IV. | Chain isomers |

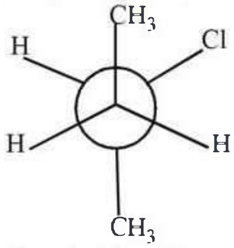
(a) A – I; B – III; C – II; D – IV
(b) A – II; B – III; C – IV; D – I
(c) A – II; B – IV; C – I; D – III
(d) A – II; B – I; C – IV; D – III

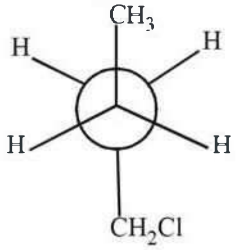
16. The accepted IUPAC name of the camphor is



(a) 1, 7, 7 – trimethyl bicyclo [2. 2. 1] heptan– 2 – one
(b) 1, 7, 7, –trimethyl bicyclo [2. 1. 2] heptan – 2 – one
(c) 1, 2, 2 – trimethyl bicyclo [2. 2. 1] heptan– 6 – one
(d) None of these

17. The pair of structures given below represent





(a) enantiomers
(b) diastereomers
(c) structural isomers
(d) two molecules of the same compound.

18. Which of the following compounds exhibits geometrical isomerism?
(a) $C_2H_5Br$ (b) $(CH)_2(COOH)_2$
(c) $CH_3CHO$ (d) $(CH_2)_2(COOH)_2$

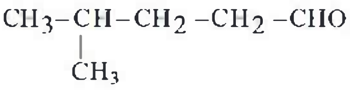
19. Chlorine in vinyl chloride is less reactive because
(a) $sp^2$ - hybridised carbon bas more acidic character than $sp^3$ - hybridised carbon
(b) C - Cl bond develops partial double bond character
(c) of resonance
(d) All are correct

20. The best method for the separation of naphthalene and benzoic acid from their mixture is:
(a) distillation (b) sublimation
(c) chromatography (d) crystallisation

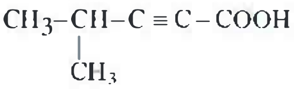
21. The percentage of sulphur in an organic compound whose 0.32 g produces 0.233 g of $BaSO_4$ [At. wt. Ba = 137, S = 32] is
(a) 1.0 (b) 10.0 (c) 23.5 (d) 32.1

| | | | | | |
|---|---|---|---|---|---|
| **RESPONSE GRID** | 6. ⓐⓑⓒⓓ | 7 ⓐⓑⓒⓓ | 8. ⓐⓑⓒⓓ | 9. ⓐⓑⓒⓓ | 10. ⓐⓑⓒⓓ |
| | 11. ⓐⓑⓒⓓ | 12. ⓐⓑⓒⓓ | 13. ⓐⓑⓒⓓ | 14. ⓐⓑⓒⓓ | 15. ⓐⓑⓒⓓ |
| | 16. ⓐⓑⓒⓓ | 17. ⓐⓑⓒⓓ | 18. ⓐⓑⓒⓓ | 19. ⓐⓑⓒⓓ | 20. ⓐⓑⓒⓓ |
| | 21. ⓐⓑⓒⓓ | | | | |

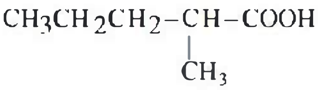
**22.** Indicate the wrongly named compound

(a) 
$CH_3-\underset{\overset{|}{CH_3}}{CH}-CH_2-CH_2-CHO$

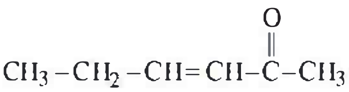
(4-methyl -1- pentanal)

(b) 
$CH_3-\underset{\overset{|}{CH_3}}{CH}-C\equiv C-COOH$

(4- methyl -2- pentyne -1- oic acid)

(c) 
$CH_3CH_2CH_2-\underset{\overset{|}{CH_3}}{CH}-COOH$

(2- methyl -1- pentanoic acid)

(d) 
$CH_3-CH_2-CH=CH-\overset{\overset{O}{\|}}{C}-CH_3$

(3- hexen -5- one)

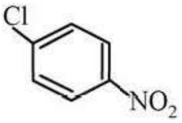
**23.** The (R)- and (S)- enantiomers of an optically active compound differ in

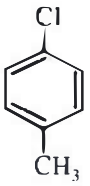
(a) their reactivity with achiral reagents
(b) their optical rotation of plane polarized light
(c) their melting points
(d) None of these

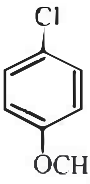
**24.** But-2-ene exhibits cis-trans-isomerism due to

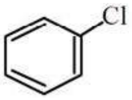
(a) rotation around $C_3-C_4$ sigma bond
(b) restricted rotation around $C=C$ bond
(c) rotation around $C_1-C_2$ bond
(d) rotation around $C_2-C_3$ double bond

**25.** Which of the following compounds undergoes nucleophilic substitution reaction most easily ?

(a) 

(b) 

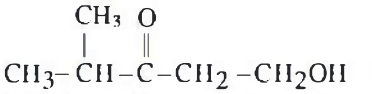
(c) 

(d) 

**26.** An organic compound contains $C=40\%$, $H=13.33\%$ and $N=46.67\%$. Its empirical formula would be

(a) CHN (b) $C_2H_2N$ (c) $CH_4N$ (d) $C_3H_2N$

**27.** The IUPAC name of


$CH_3-\overset{\overset{CH_3}{|}}{CH}-\overset{\overset{O}{\|}}{C}-CH_2-CH_2OH$ is

(a) 1- Hydroxy -4- methyl -3- pentanone
(b) 2- Methyl -5- hydroxy -3- pentanone
(c) 4- Methyl -3- oxo -1- pentanol
(d) Hexanol -1 - one -3

**28.** An important chemical method to resolve a racemic mixture makes use of the formation of

(a) a meso compound (b) enantiomers
(c) diastereomers (d) racemate

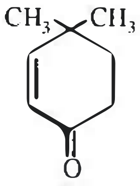
**29.** The Lassaigne's extract is boiled with dil. $HNO_3$ before testing for halogens because

(a) Silver halides are soluble in $HNO_3$
(b) $Na_2S$ and NaCN are decomposed by $HNO_3$
(c) $Ag_2S$ is soluble in $HNO_3$
(d) AgCN is soluble is $HNO_3$

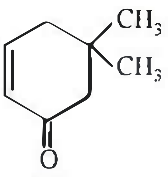
**30.** What is the decreasing order of strength of the bases $OH^-, NH_2^-, HC\equiv C^-$ and $CH_3CH_2^-$ ?

(a) $CH_3CH_2^- > HC\equiv C^- > NH_2^- > OH^-$
(b) $HC\equiv C^- > CH_3CH_2^- > NH_2^- > OH^-$
(c) $OH^- > NH_2^- > HC\equiv C^- > CH_3CH_2^-$
(d) $NH_2^- > HC\equiv C^- > OH^- > CH_3CH_2^-$

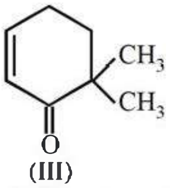
**31.** Given



(I)



(II)



(III)

Which of the given compounds can exhibit tautomerism?

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

**32.** Cyclohexanol (I), acetic acid (II), 2, 4, 6-trinitrophenol (III) and phenol (IV) are given. In these the order of decreasing acidic character will be:

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

**33.** Some *meta*-directing substituents in aromatic substitution are given. Which one is most deactivating?

(a) $-SO_3H$ (b) $-COOH$ (c) $-NO_2$ (d) $-C\equiv N$

**34.** Consider thiol anion ($RS^-$) and alkoxy anion ($RO^-$). Which of the following statements is correct ?

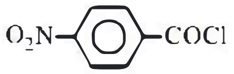
(a) $RS^-$ is less basic but more nucleophilic than $RO^-$
(b) $RS^-$ is more basic and more nucleophilic than $RO^-$
(c) $RS^-$ is more basic but less nucleophilic than $RO^-$
(d) $RS^-$ is less basic and less nucleophilic than $RO^-$

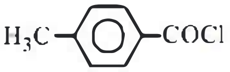
| | | | | | |
|---|---|---|---|---|---|
| **RESPONSE GRID** | **22.** ⓐⓑⓒⓓ | **23.** ⓐⓑⓒⓓ | **24.** ⓐⓑⓒⓓ | **25.** ⓐⓑⓒⓓ | **26.** ⓐⓑⓒⓓ |
| | **27.** ⓐⓑⓒⓓ | **28.** ⓐⓑⓒⓓ | **29.** ⓐⓑⓒⓓ | **30.** ⓐⓑⓒⓓ | **31.** ⓐⓑⓒⓓ |
| | **32.** ⓐⓑⓒⓓ | **33.** ⓐⓑⓒⓓ | **34.** ⓐⓑⓒⓓ | | |

*Space for Rough Work*

**35.** Consider the following compounds.

(i) $C_6H_5COCl$

(ii) 
$O_2N-C_6H_4-COCl$

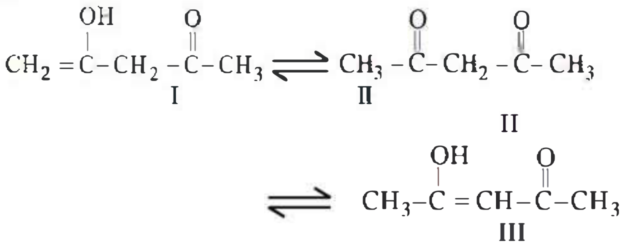
(iii) 
$H_3C-C_6H_4-COCl$

(iv) 
$OHC-C_6H_4-COCl$

The correct decreasing order of their reactivity towards hydrolysis is

(a) (i) > (ii) > (iii) > (iv) (b) (iv) > (ii) > (i) > (iii)
(c) (ii) > (iv) > (i) > (iii) (d) (ii) > (iv) > (iii) > (i)

**36.** The order of stability of the following tautomeric compounds is:


$$CH_2=\overset{OH}{\overset{|}{C}}-CH_2-\overset{O}{\overset{||}{C}}-CH_3 \rightleftharpoons CH_3-\overset{O}{\overset{||}{C}}-CH_2-\overset{O}{\overset{||}{C}}-CH_3 \rightleftharpoons CH_3-\overset{OH}{\overset{|}{C}}=CH-\overset{O}{\overset{||}{C}}-CH_3$$

I II III

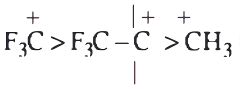
(a) III > II > I (b) II > I > III
(c) II > III > I (d) I > II > III

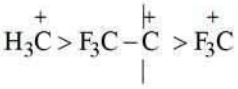
**37.** Match the columns

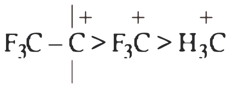
| | **Column - I** | | **Column - II** |
|---|---|---|---|
| A. | Duma's method | I. | $\frac{80\times m_1\times 100}{188\times m}$ |
| B. | Kjeldahl's method | II. | $\frac{31\times m_1\times 100}{1877\times m}\%$ |
| C. | Carius method for bromine | III. | $\frac{1.4\times M\times 2\left(V-\frac{V_1}{2}\right)}{m}\%$ |
| D. | Percentage of phosphorus | IV. | $\frac{28\times V\times 100}{22400\times m}\%$ |

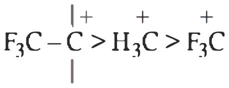
(a) A – IV; B – III; C – I; D – II
(b) A – III; B – IV; C – II; D – I
(c) A – IV; B – I; C – II; D – III
(d) A – I; B – III; C – II; D – IV

**38.** Which of the following represents the correct order of stability of the given carbocations ?

(a) 
$F_3\overset{+}{C} > F_3C-\overset{|}{\underset{|}{\overset{+}{C}}} > \overset{+}{C}H_3$

(b) 
$H_3\overset{+}{C} > F_3C-\overset{|}{\underset{|}{\overset{+}{C}}} > F_3\overset{+}{C}$

(c) 
$F_3C-\overset{|}{\underset{|}{\overset{+}{C}}} > F_3\overset{+}{C} > H_3\overset{+}{C}$

(d) 
$F_3C-\overset{|}{\underset{|}{\overset{+}{C}}} > H_3\overset{+}{C} > F_3\overset{+}{C}$

**39.** $(CH_3)_4N^+$ is neither an electrophile, nor a nucleophile because it

(a) does not have electron pair for donation as well as can not attract electron pair
(b) neither has electron pair available for donation nor can accommodate electron since all shells of N are fully occupied
(c) can act as Lewis acid and base
(d) None of these

**40.** In Kjeldahl's method for the estimation of $N_2$, potassium sulphate and copper sulphate are used. On the basis of their functions which of the following statement(s) is/are correct?

(i) Potassium sulphate raises the b.pt. and ensures complete reaction.
(ii) Copper sulphate acts as catalyst.
(iii) Potassium sulphate acts as catalyst and copper sulphate raises the b.pt.

(a) Only (iii) is correct (b) (i) and (ii) are correct
(c) Only (ii)is correct (d) Noneis correct

**41.** What is the relationship between open chain forms of D-glucose and D-altrose ?

(a) enantiomers
(b) constitutional isomers
(c) diastereomers
(d) different conformations of the same compound

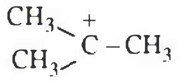
**42.** The production of an optically active compound from a symmetric molecule without resolution is termed

(a) Walden inversion (b) Partial racemisation
(c) Asymmetric synthesis (d) Partial resolution

**43.** The number of asymmetric C-atom created and number of possible stereoisomers when benzil (Ph CO CO Ph) is reduced with $LiAlH_4$.

(a) 2,3 (b) 2,2 (c) 2,4 (d) 3,2

**44.** Among the following, the true property about


$(CH_3)_2\overset{+}{C}-CH_3$ is

(a) it is non-planar
(b) its $C^+$ is $sp^2$-hybridized
(c) an electrophile can attack on its $C^+$
(d) it does not undergo hydrolysis

**45.** The compound which contains all the four 1°, 2°, 3° and 4° carbon atoms is

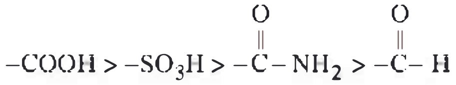
(a) 2, 3-dimethylpentane
(b) 3-chloro-2, 3-dimethylpentane
(c) 2, 3, 4-trimethylpentane
(d) 3, 3- dimethylpentane

| | | | | | |
|---|---|---|---|---|---|
| **RESPONSE GRID** | 35 ⓐⓑⓒⓓ | 36.ⓐⓑⓒⓓ | 37.ⓐⓑⓒⓓ | 38.ⓐⓑⓒⓓ | 39. ⓐⓑⓒⓓ |
| | 40.ⓐⓑⓒⓓ | 41.ⓐⓑⓒⓓ | 42.ⓐⓑⓒⓓ | 43.ⓐⓑⓒⓓ | 44. ⓐⓑⓒⓓ |
| | 45.ⓐⓑⓒⓓ | | | | |

*Space for Rough Work*

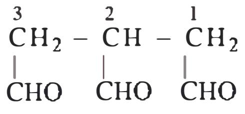
# CHEMISTRY SOLUTIONS

1. **(a)** The correct order of priority for the given functional group is



$$-COOH > -SO_3H > -\overset{\overset{O}{\|}}{C}-NH_2 > -\overset{\overset{O}{\|}}{C}-H$$

2. **(b)** When – CHO is treated as side chain, its name is carbaldehyde.



Hence $\underset{\underset{CHO}{|}}{\overset{3}{C}H_2} - \underset{\underset{CHO}{|}}{\overset{2}{C}H} - \underset{\underset{CHO}{|}}{\overset{1}{C}H_2}$ is propane–1, 2, 3-tri carbaldehyde.

3. **(a)** Carbinol is methyl alcohol ($CH_3OH$), hence vinylcarbinol should be $\overset{3}{C}H_2=\overset{2}{C}H\overset{1}{C}H_2OH$ (prop-2-enol)

4. **(a)**

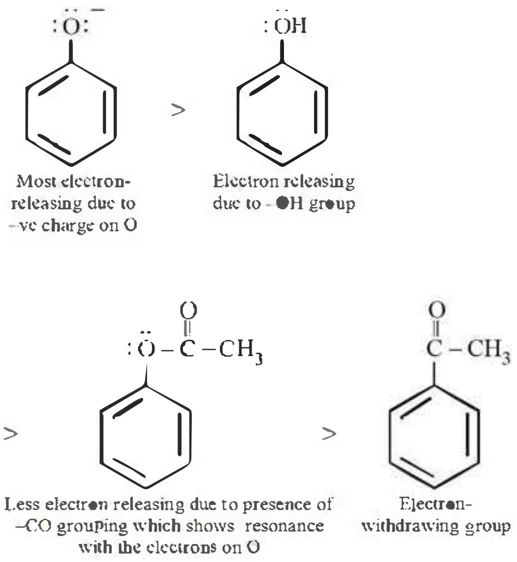
5. **(a)** Cyclohexane (iv) is non-planar and has chair conformation. In this conformation, the bond angle is the normal tetrahedral angle (109°, 28') and thus has no angle strain and hence is most stable. The rest of the molecules are nearly planar and hence their stability depends upon the angle strain in accordance with *Baeyer's strain theory*. Since cyclopropane has higher angle strain $\left(\frac{109°28'-60°}{2}=24°,44'\right)$ than cyclopentane $\left(\frac{109°\ 28'-108°}{2}=0°,44'\right)$.

Therefore cyclopentane (iii) is more stable than cyclopropane (i). Further, because of the presence of a double bond in a three membered ring, cyclopropene (ii) is the least stable. Thus the order of stability is (iv) > (iii) > (i) > (ii).

6. **(b)** If there is a small difference (10 or less) in the boiling points of liquids fractional distillation is used e.g. acetone b.p. 333 K and methanol b.p. 338 K.

7. **(c)** $Cl^-$ is the best leaving group among the given option. As it has high electronegativity thereby generating positive charge on carbonyl carbon atom.

8. **(a)**



Most electron-releasing due to –ve charge on O

Electron releasing due to –OH group

Less electron releasing due to presence of –CO grouping which shows resonance with the electrons on O

Electron-withdrawing group

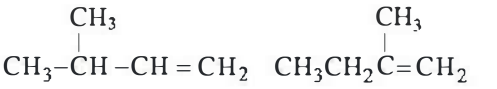
9. **(a)** $C_nH_{2n}O_2$ is general formula for carboxylic acid.

10. **(a)** Since during the reaction, a chiral carbon is created and further since the $CN^-$ ion can attack the planar aldehyde group both from the top and the bottom face of the aldehyde group with equal ease, therefore, a 50:50 mixture of the two enantiomers, i.e. a racemic mixture is obtained.

11. **(c)** $C_5H_{10}$ has 1° degree of unsaturation since the isomers are acyclic, all of these are alkenes. For writing the isomers, first introduce the double bond at different possible positions, and then consider the possibility of branching in the alkyl group.

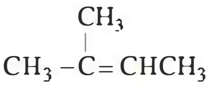
$CH_3CH_2CH_2CH=CH_2$ 1-pentene (*i*)

$CH_3CH_2CH=CHCH_3$ 2- pentene, (*cis,- trans*) (*ii*), (*iii*)



$CH_3-\overset{\overset{CH_3}{|}}{C}H-CH=CH_2$ 3-methyl-1-butene, (*iv*)

$CH_3CH_2\overset{\overset{CH_3}{|}}{C}=CH_2$ 2-methyl-1-butene, (*v*)



$CH_3-\overset{\overset{CH_3}{|}}{C}=CHCH_3$

2-methyl-2-butene, (*vi*)

12. **(d)** Since all the six carbon atoms of cyclohexatriene (benzene) are $sp^2$ hybridized, therefore its stablest structure is planar form.

**13.** **(a)** Prussian blue $Fe_4[Fe(CN)_6]_3$ is formed in lassaigne test for nitrogen.

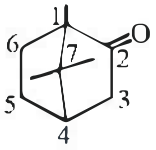
$$3Na_4[Fe(CN)_6]+2Fe^{3+}\longrightarrow \underset{\text{Prussian blue}}{Fe_4[Fe(CN)_6]_3}+12Na^+$$

**14.** **(b)** $\text{Percentage of P}=\frac{62}{222}\times\frac{\text{wt.of }Mg_2P_2O_7}{\text{wt.of compound}}\times 100$

$=\frac{62}{222}\times\frac{1.332}{2.79}\times 100=13.33\%$

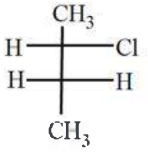
**15.** **(a)**

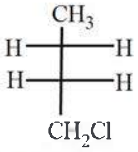
**16.** **(a)** It is a bridge compound



1, 7, 7-trimethyl bicyclo [2. 2. 1] heptan-2-one

**17.** **(c)** Convert these Newmann projections into open chain structures.





Both structures have same molecular formula $C_4H_9Cl$, thus these are isomers. However, the two have different groups, viz $CH_3$ and $CH_2Cl$, so these are neither enantiomers nor diastereomers. Hence these are structural isomers.

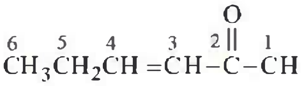
**18.** **(b)** $(CH)_2(COOH)_2$ is $HOOCCH=CHCOOH$, hence here geometrical isomerism is possible.

**19.** **(c)** $CH_2=CH-\ddot{\underset{..}{Cl}}: \leftrightarrow \overset{-}{C}H_2-CH=\overset{+}{\underset{..}{Cl}}:$ a double bond is formed between C and Cl. Hence it is less reactive due to resonance

**20.** **(b)** Among the given compounds naphthelene is volatile but benzoic acid is non-volatile (it forms a dimer). So, the best method for their separation is sublimation, which is applicable to compounds which can be converted directly into the vapour phase from its solid state on heating and back to the solid state on cooling. Hence it is the most appropriate method.

**21.** **(b)** $\%\text{ of S}=\frac{32}{233}\times\frac{0.233}{0.32}\times 100=10\%$

**22.** **(d)**



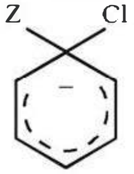
$$\overset{6}{C}H_3\overset{5}{C}H_2\overset{4}{C}H=\overset{3}{C}H-\overset{\overset{O}{\|}}{\underset{2}{C}}-\overset{1}{C}H$$

(hex – 3 – en – 2 – one)

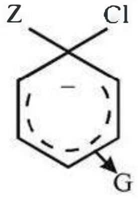
**23.** **(b)**

**24.** **(b)**

**25.** **(a)** In $S_N$ Ar reactions, a carbanion is formed as an intermediate, so any substituent that increases the stability of carbanion and hence the transition state leading to its formation will enhance the $S_N$Ar reactions. To compare the rates of substitution in chlorobenzene, chlorobenzene having electron-withdrawing group, and chlorobenzene having electron-releasing group, we compare the structures carbanion I (from chlorobenzene), II (from chlorobenzene containing electron-withdrawing group) and III (from chlorobenzene containing electron-releasing group).

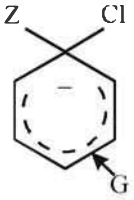


I



II

G withdraws electrons, neutralises (disperses) –ve charge of the ring, stabilises carbanion, facilitates $S_N$ reaction **(activation effect)**

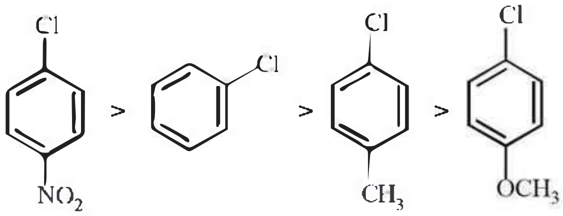


III

G releases electrons, intensifics –ve charge, destabilizes carbanion, retards $S_N$ reaction **(deactivation)**

$NO_2$ is activating group and $CH_3$ and $OCH_3$ are deactivating group towards nucleophilic aromatic substitution reactions.

Hence, the correct order of nucleophilic substitution reactions



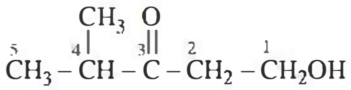
**26.** **(c)** As in above question,

$$C=\frac{40}{12}=3.33;\ H=\frac{13.33}{1}=13.33;\ N=\frac{46.67}{14}=3.34$$

Relative No. of atoms,

$$C=\frac{3.33}{3.33}=1;\ H=\frac{13.33}{3.33}=4;\ N=\frac{3.34}{3.33}=1$$

$\therefore$ Empirical formula$=CH_4N$

**27.** **(a)** 
$$\overset{5}{CH_3}-\overset{\overset{CH_3}{|}}{\overset{4}{C}H}-\overset{\overset{O}{||}}{\overset{3}{C}}-\overset{2}{C}H_2-\overset{1}{C}H_2OH$$

1-Hydroxy-4-methyl-3-pentanone

**28.** **(c)** Diastereomers have different solubility, m.p. and b.p., hence they can be separated by fractional crystallisation.

**29.** **(b)** $Na_2S$ and NaCN, formed during fusion with metallic sodium, must be removed before adding $AgNO_3$, otherwise black ppt. due to $Na_2S$ or white precipitate due to AgCN will be formed and thus white precipitate of AgCl will not be identified easily.

$$Na_2S + 2AgNO_3 \longrightarrow 2NaNO_3 + \underset{\text{Black}}{Ag_2S\downarrow}$$

$$NaCN + AgNO_3 \longrightarrow NaNO_3 + \underset{\text{White}}{AgCN\downarrow}$$

$$NaCl + AgNO_3 \longrightarrow NaNO_3 + \underset{\text{White}}{AgCl\downarrow}$$

$$Na_2S + 2HNO_3 \xrightarrow{\text{boil}} 2NaNO_3 + H_2S\uparrow$$

$$NaCN + HNO_3 \xrightarrow{\text{boil}} NaNO_3 + HCN\uparrow$$

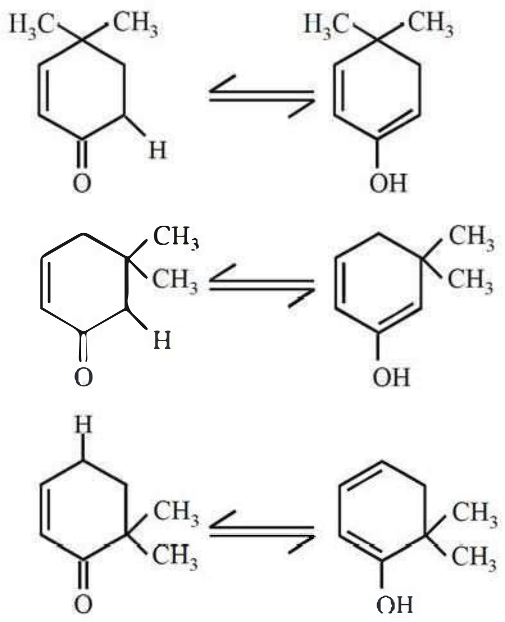
**30.** **(a)** Stronger the acid, weaker the conjugate base. Since acidic character follows the order

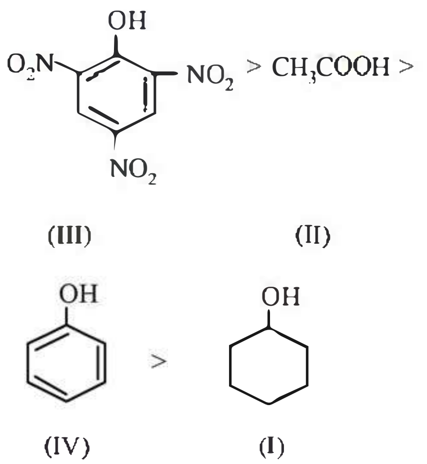
$$H_2O > NH_3 > HC\equiv CH > CH_3-CH_3$$

the basic character of their conjugate bases decreases in the reverse order, i.e.,

$$CH_3CH_2^- > HC\equiv C^- > NH_2^- > OH^-$$

**31.** **(c)** All of these compounds show tautomerism



**32.** **(a)** 

> $CH_3COOH$ > ; >

(III) (II)

(IV) (I)

**Explanation** : Presence of three $—NO_2$ groups in $o-$, $p-$ positions to phenolic groups (in III) makes phenol strongly acidic because its corresponding conjugate base is highly stabilised due to resonance.

Conjugate base of $CH_3COOH$, II (*i.e.* $CH_3COO^-$) is resonance hybrid of two equivalent structures. The conjugate base of phenol, IV is stabilized due to resonance (note that here all resonating structures are not equivalent). The conjugate base of cyclohexanol, I does not exhibit resonance, hence not formed.

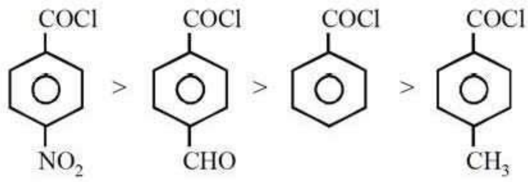
**33.** **(c)** Decreasing order of deactivating effect of the given *m*-directing group is

$$-NO_2 > -CN > -SO_3H > -COOH$$

$-NO_2$ group is most deactivating group due to strong $-E$, $-I$ and $-M$ effects.

**34.** **(a)** On moving down a group, the basicity and nucleophilicity are inversely related, i.e. nucleophilicity increases while basicity decreases. i.e $RS^-$ is more nucleophilic but less basic than $RO^-$. This opposite behaviour is because of the fact that basicity and nucleophilicity depends upon different factors. Basicity is directly related to the strength of the H-element bond, while nucleophilicity is indirectly related to the electronegativity of the atom to which proton is attached.

**35.** **(c)** The degree of hydrolysis increases as the magnitude of positive charge on carbonyl group increases. Electron withdrawing group increases the positive charge and electron releasing group decreases the positive charge. Among these $NO_2$ & CHO are electron withdrawing group from which $NO_2$ has more –I effect than –CHO. On the other band $CH_3$ is a electron releasing group therefore the order of reactivity towards hydrolysis is



**36.** **(a)** Enolic form predominates in compounds containing two carbonyl groups separated by a $-CH_2$ group. This is due to following two factors.

(i) Presence of conjugation which increases stability.

(ii) Formation of intramolecular hydrogen bond between enolic hydroxyl group and second carbonyl group which leads to stablisation of the molecule. Hence the correct answer is III > II > I.

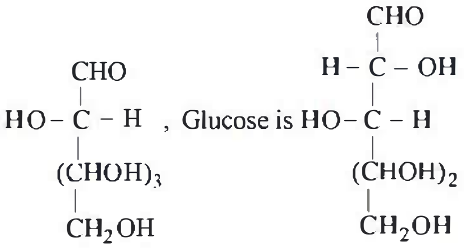
**37.** **(a)**

**38.** **(b)** – I group destablises carbocation and since inductive effect decreases with increasing length of carbon chain. Therefore (b) is the correct option.

**39.** **(b)** The octet around N is complete, hence it has no electrophilic character. N has no unshared pair of electrons to act as nucleophile.

**40.** **(b)** $K_2SO_4$ raises b.pt. and $CuSO_4$ acts as catalyst.

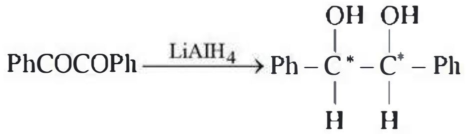
**41.** **(b)** Constitutional isomers



Altrose is $\begin{array}{c} CHO \\ | \\ HO-C-H \\ | \\ (CHOH)_3 \\ | \\ CH_2OH \end{array}$ , Glucose is $\begin{array}{c} CHO \\ | \\ H-C-OH \\ | \\ HO-C-H \\ | \\ (CHOH)_2 \\ | \\ CH_2OH \end{array}$

**42.** **(c)** It is definition of asymmetric synthesis.

**43.** **(a)**

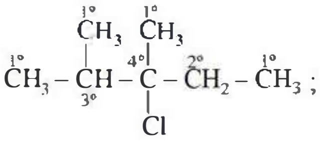


$PhCOCOPh \xrightarrow{LiAlH_4} Ph-\overset{\displaystyle OH}{\underset{\displaystyle H}{C^*}}-\overset{\displaystyle OH}{\underset{\displaystyle H}{C^*}}-Ph$

The product contains two similar asymmetric carbon atoms and two optically active and one optically inactive meso form.

**44.** **(b)** In carbocations, carbon bearing positive charge is always $sp^2$-hybridised

**45.** **(b)**



$\overset{1^\circ}{C}H_3-\underset{3^\circ}{\overset{\overset{1^\circ}{C}H_3}{CH}}-\overset{\overset{1^\circ}{C}H_3}{\underset{Cl}{\overset{4^\circ}{C}}}-\overset{2^\circ}{C}H_2-\overset{1^\circ}{C}H_3$ ;

Thus all the four types of carbon atoms are present in this compound.