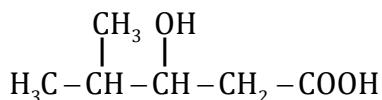


1. The IUPAC name of the following compound is:



- (A) 4,4-Dimethyl-3-hydroxybutanoic acid (B) 2-methyl-3-hydroxypentan-5-oic acid  
(C) 3-Hydroxy-4-methylpentanoic acid (D) 4-methyl-3-hydroxypentanoic acid

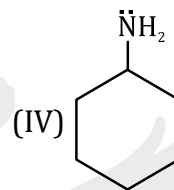
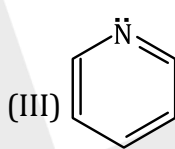
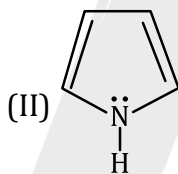
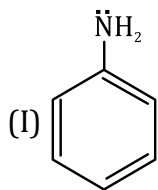
2. Which of the following compounds will show the maximum 'enol' content?

- (A)  $\text{CH}_3\text{COCH}_2\text{COOC}_2\text{H}_5$  (B)  $\text{CH}_3\text{COCH}_2\text{COCH}_3$   
(C)  $\text{CH}_3\text{COCH}_3$  (D)  $\text{CH}_3\text{COCH}_2\text{CONH}_2$

3. In which compound C-Cl bond length is shortest?

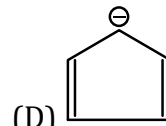
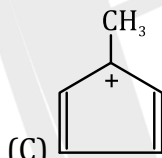
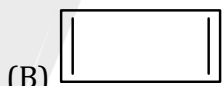
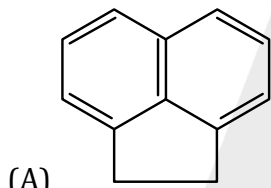
- (A)  $\text{Cl}-\text{CH}=\text{CH}_2$  (B)  $\text{Cl}-\text{CH}=\text{CH}-\text{CH}_3$  (C)  $\text{Cl}-\text{CH}=\text{CH}-\text{OCH}_3$  (D)  $\text{Cl}-\text{CH}=\text{CH}-\text{NO}_2$

4. The order of basic character is:

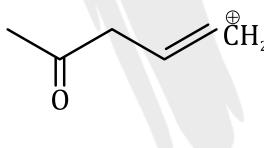
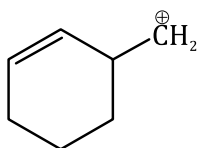
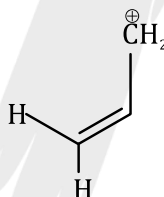
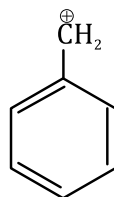


- (A)  $\text{I} > \text{II} > \text{III} > \text{IV}$  (B)  $\text{IV} > \text{III} > \text{I} > \text{II}$  (C)  $\text{II} > \text{I} > \text{III} > \text{IV}$  (D)  $\text{IV} > \text{I} > \text{II} > \text{III}$

5. Which one of the following compounds is aromatic in nature?



- 6.



Among the given species the Resonance stabilized carbocations are:

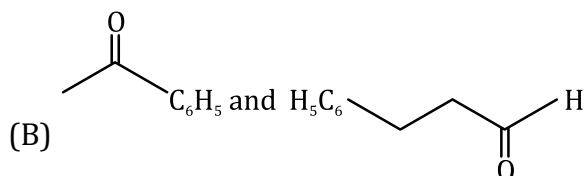
- (A) (C) and (D) only (B) (A), (B) and (D) only  
(C) (A) and (B) only (D) (A), (B) and (C) only

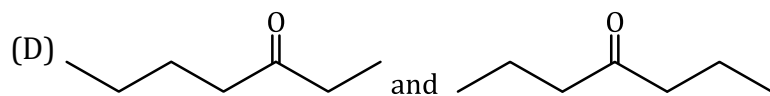
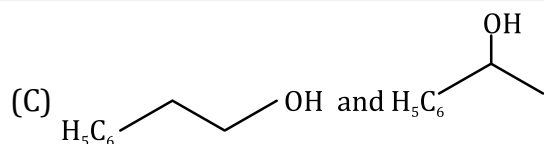
[20 July 2021]

7. Which one of the following pairs of isomers is an example of metamerism?

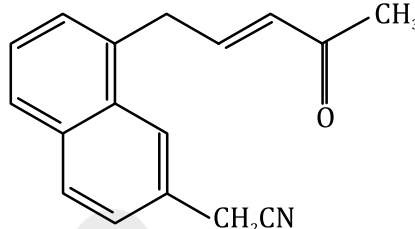
[20 July 2021]

- (A)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{H}_3\text{C}-\text{C}(\text{CH}_3)_2-\text{CH}_3$

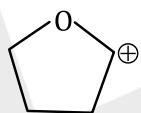
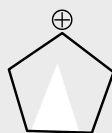




8. Number of electrophilic centre in the given compound is \_\_\_\_\_



9. Arrange the following carbocations in decreasing order of stability.



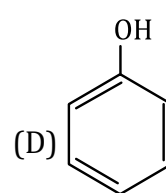
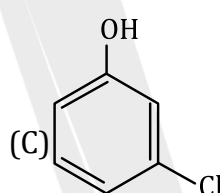
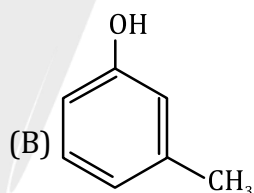
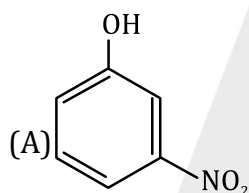
(A)  $A > C > B$

(B)  $A > B > C$

(C)  $C > B > A$

(D)  $C > A > B$

10. The strongest acid from the following is



11. The descending order of acidity for the following carboxylic acid is-

(A)  $\text{CH}_3\text{COOH}$

(B)  $\text{F}_3\text{C}-\text{COOH}$

(C)  $\text{ClCH}_2-\text{COOH}$

(D)  $\text{FCH}_2-\text{COOH}$

(E)  $\text{BrCH}_2-\text{COOH}$

Choose the correct answer from the options given below:

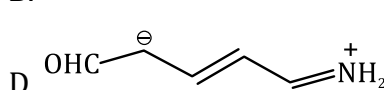
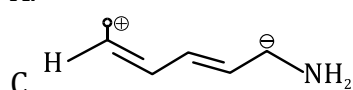
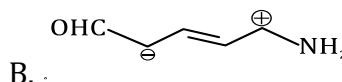
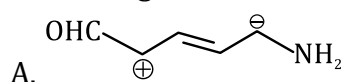
(A)  $B > C > D > E > A$

(B)  $E > D > B > A > C$

(C)  $B > D > C > E > A$

(D)  $D > B > A > E > C$

12. Increasing order of stability of the resonance structure is:



(A) C, D, B, A

(B) C, D, A, B

(C) D, C, A, B

(D) D, C, B, A

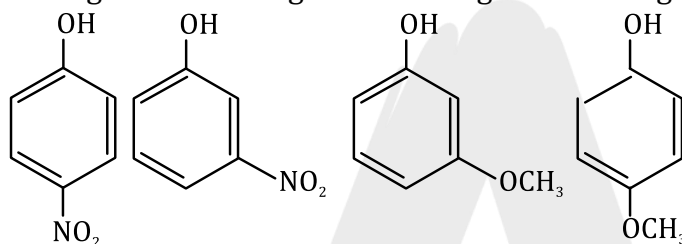
13. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

**Assertion A:** Benzene is more stable than hypothetical cyclohexatriene.

**Reason R:** The delocalized p electron cloud is attracted more strongly by nuclei of carbon atoms. In the light of the above statements, choose the correct answer from the options given below:

- (A) A is true but R is false.  
 (B) A is false but R is true.  
 (C) Both A and R are correct and R is the correct explanation of A.  
 (D) Both A and R are correct but R is NOT the correct explanation of A.
14. The number of  $sp^3$  hybridised carbons in a acyclic neutral compound with molecular formula  $C_4H_5N$  is:

15. Arrange the following in decreasing acidic strength.



- (A)  $A > B > C > D$       (B)  $B > A > C > D$       (C)  $D > C > A > B$       (D)  $D > C > B > A$

16. The correct match between Item I and Item II is:

**Item I**

- (A) Benzaldehyde  
 (B) Alumina  
 (C) Acetonitrile

**Item II**

- (P) Mobile phase  
 (Q) Adsorbent  
 (R) Adsorbate

- (A) (A)  $\rightarrow$  (Q) ; (B)  $\rightarrow$  (P) ; (C)  $\rightarrow$  (R)  
 (C) (A)  $\rightarrow$  (Q) ; (B)  $\rightarrow$  (R) ; (C)  $\rightarrow$  (P)

- (B) (A)  $\rightarrow$  (R) ; (B)  $\rightarrow$  (Q) ; (C)  $\rightarrow$  (P)  
 (D) (A)  $\rightarrow$  (P) ; (B)  $\rightarrow$  (R) ; (C)  $\rightarrow$  (Q)

17. If dichloromethane (DCM) and water ( $H_2O$ ) are used for differential extraction, which one of the following statements is correct?

- (A) DCM and  $H_2O$  would stay as lower and upper layer respectively in the S.F.  
 (B) DCM and  $H_2O$  will make turbid/colloidal mixture  
 (C) DCM and  $H_2O$  would stay as upper and lower layer respectively in the separating funnel (S.F.)  
 (D) DCM and  $H_2O$  will be miscible clearly

18. An organic compound is estimated through Dumas method and was found to evolve 6 moles of  $CO_2$ , 4 moles of  $H_2O$  and 1 mole of nitrogen gas. The formula of the compound is:

- (A)  $C_{12}H_8N$       (B)  $C_{12}H_8N_2$       (C)  $C_6H_8N_2$       (D)  $C_6H_8N$

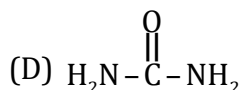
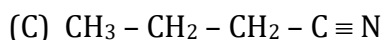
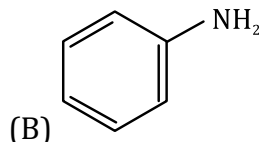
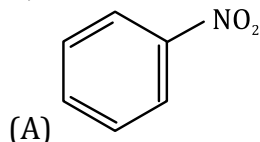
19. An organic compound 'X' showing the following solubility profile is:

water	→ insoluble
5% HCl	→ insoluble
'X'	
10% NaOH	→ soluble
10% $NaHCO_3$	→ insoluble

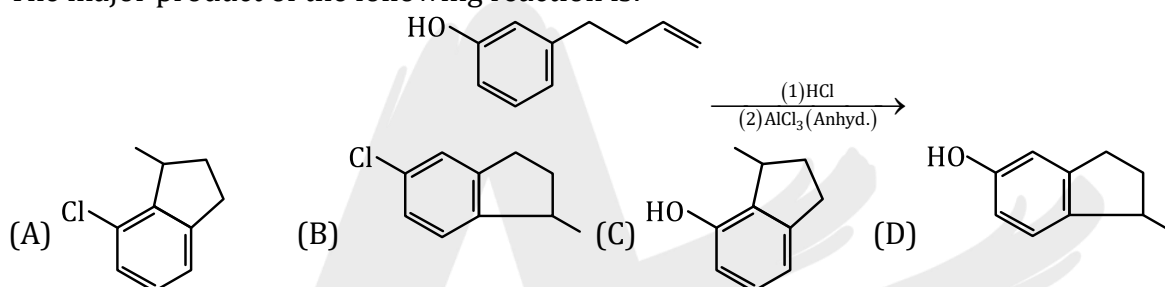
- (A) o-Toluidine      (B) Oleic acid      (C) m-Cresol      (D) Benzamide

20. Metal with low melting point containing impurities of high melting point can be purified by  
 (A) Zone refining (B) Vapor phase refining  
 (C) Distillation (D) Liquation

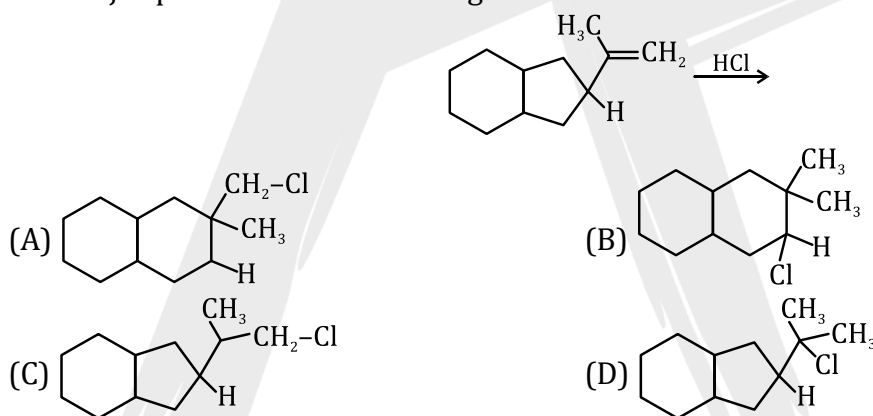
21. Kjeldahl method cannot be used for:



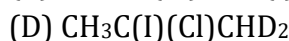
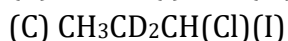
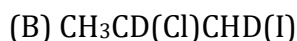
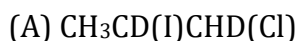
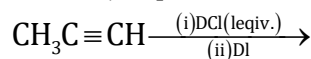
22. The major product of the following reaction is:



23. The major product of the following reaction is:

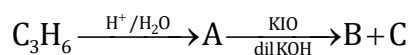


24. The major product of the following reaction is;

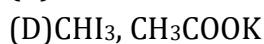
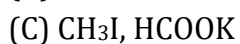


Both additions follow Markovnikov's rule.

25. In the following sequence of reactions,

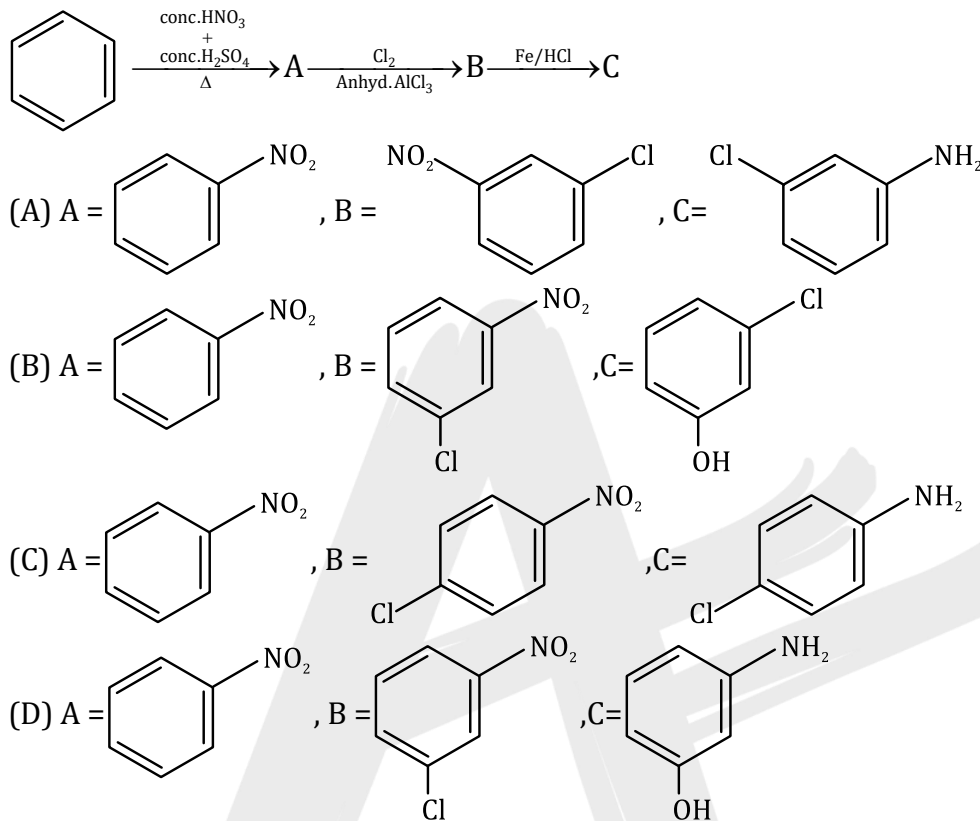


The compounds B and C respectively are:

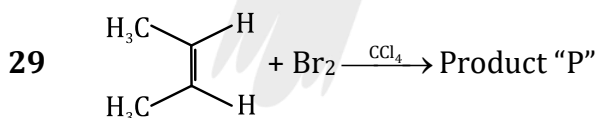


26. The stereoisomers that are formed by electrophilic addition of bromine to trans-but-2-ene is/are:  
 (A) 2 enantiomers and 2 mesomers (B) 2 identical mesomers  
 (C) 2 enantiomers (D) 1 racemic and 2 enantiomers

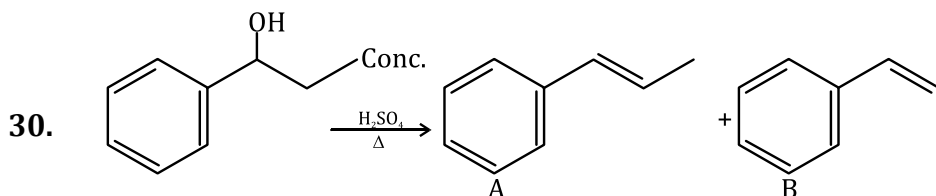
27. Identify correct A, B and C in the reaction sequence given below:



28. Benzene on nitration gives nitrobenzene in presence of  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$  mixture, where:  
 (A) both  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  act as a bases  
 (B)  $\text{HNO}_3$  acts as an acid and  $\text{H}_2\text{SO}_4$  acts as a base  
 (C) Both  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  act as an acids  
 (D)  $\text{HNO}_3$  acts as a base and  $\text{H}_2\text{SO}_4$  acts as an acid.



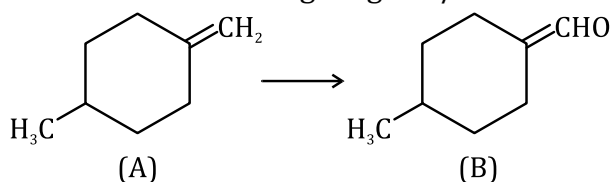
Consider the above chemical reaction. The total number of stereoisomers possible for Product 'P' is



consider the above reaction, and choose the correct statement:

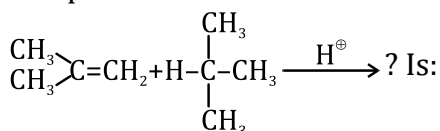
- (A) The reaction is not possible in acidic medium  
 (B) Both compounds A and B are formed equally  
 (C) Compound A will be the major product  
 (D) Compound B will be the major product

31. Which of the following reagents/ reactions will convert 'A' to 'B'?



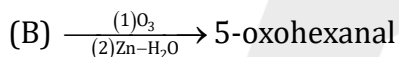
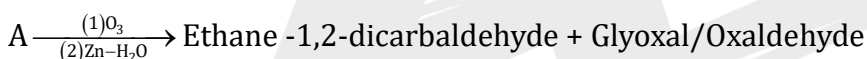
- (A) PCC oxidation (B) Ozonolysis  
 (C)  $\text{BH}_3$ ,  $\text{H}_2\text{O}_2$ /-OH followed by PCC oxidation  
 (D) HBr, hydrolysis followed by oxidation by  $\text{K}_2\text{Cr}_2\text{O}_7$ .

32. The products formed in the following reaction.



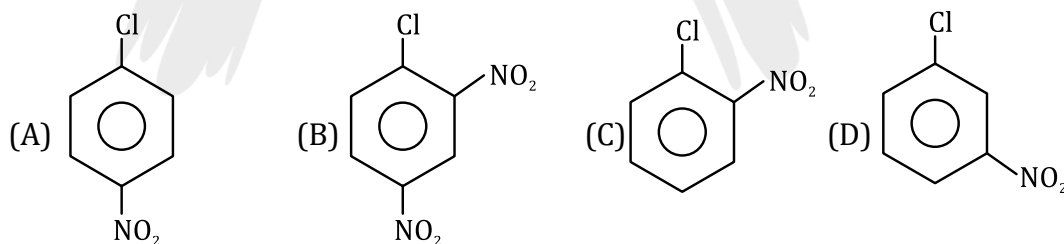
- (A)  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH} \\ | \quad \quad \quad | \\ \text{CH}_3 \quad \quad \quad \text{CH}_3 \end{array}$  (B)  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{CH}_2-\text{C}-\text{CH}_3 \\ | \quad \quad \quad | \\ \text{H} \quad \quad \quad \text{CH}_3 \end{array}$   
 (C)  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{CH}-\text{CH}-\text{CH} \\ | \quad \quad | \\ \text{CH}_3 \quad \quad \text{CH}_3 \end{array}$  (D)  $\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \\ | \quad \quad | \\ \text{CH}_3-\text{C}-\text{C}-\text{CH}_3 \\ | \quad \quad | \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$

33. 'A' and 'B' respectively are:

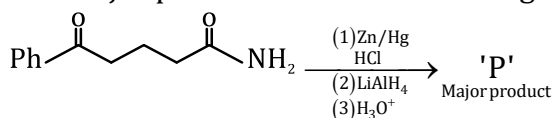


- (A) 1- methylcyclohex-1, 3-diene & cyclopentene  
 (B) Cyclohex-1, 3-diene & cyclopentene  
 (C) 1-methylcyclohex-1,4 diene & 1-methylcyclopent-1-ene  
 (D) Cyclohex-1,3-diene & 1-methylcyclopent-1-ene

34. The compound which will have the lowest rate towards nucleophilic aromatic substitution on treatment with  $\text{OH}^-$  is

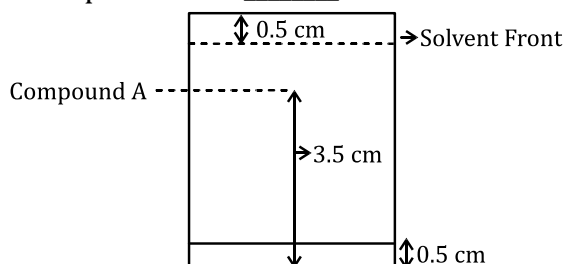


35. The major product 'P' for the following sequence of reactions is:



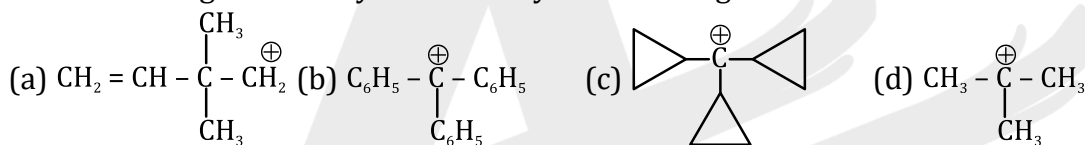
- (A)  $\text{Ph}-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$  (B)  $\text{Ph}-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2$   
 (C)  $\text{Ph}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2$  (D)  $\text{Ph}-\text{CH}(\text{OH})-\text{CH}_2-\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{NH}_2$

36. Compound that will give positive Lassaigne's test for both nitrogen and halogen is  
 (A)  $\text{N}_2\text{H}_4 \cdot \text{HCl}$  (B)  $\text{CH}_3\text{NH}_2 \cdot \text{HCl}$  (C)  $\text{NH}_4\text{Cl}$  (D)  $\text{NH}_2\text{OH} \cdot \text{HCl}$
37. Following chromatogram was developed by adsorption of compound 'A' on a 6 cm TLC glass plate. Retardation factor of the compound 'A' is  $\text{_____} \times 10^{-1}$



38. Using column chromatography, mixture of two compounds 'A' and 'B' was separated. 'A' eluted first, this indicates 'B' has  
 (A) low  $R_f$ , stronger adsorption (B) High  $R_f$ , weaker adsorption  
 (C) high  $R_f$ , stronger adsorption (D) low  $R_f$ , weaker adsorption

39. The decreasing order of hydride affinity for following carbocations is:



- (A) (c) < (b) < (d) < (a) (B) (b) < (d) < (c) < (a)  
 (C) (a) < (d) < (b) < (c) (D) (c) < (a) < (d) < (b)

40. Given below are two statements:

Statement I: In 'Lassaigne's Test, when both nitrogen and sulphur are present in an organic compound, sodium thiocyanate is formed.

Statement II: If both nitrogen and sulphur are present in an organic compound, then the excess of sodium used in sodium fusion will decompose the sodium thiocyanate formed to give NaCN and  $\text{Na}_2\text{S}$ .

In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) Both Statement I and Statement II are correct.  
 (B) Both Statement I and Statement II are incorrect.  
 (C) Statement I is correct but Statement II is incorrect.  
 (D) Statement I is incorrect but Statement II is correct.

41. When 0.15g of an organic compound was analyzed using Carius method for estimation of bromine, 0.2397g of AgBr was obtained. The percentage of bromine in the organic compound is  $\text{_____}$  (Nearest integer)

[Atomic mass: Silver = 108, Bromine = 80]

42. Which purification technique is used for high boiling organic liquid compound (decomposes near its boiling point)?  
 (A) Simple distillation (B) Steam distillation  
 (C) Fractional distillation (D) Reduced pressure distillation

43. The number of moles of CuO, that will be utilized in Dumas method for estimation nitrogen in a sample of 57.5g of N,N-dimethylaminopentane is  $\_\_\_ \times 10^{-2}$ . (Nearest integer)
44. In Carius method for estimation of halogens, 0.2g of an organic compound gave 0.188 g of AgBr. The percentage of bromine in the compound is  $\_\_\_\_\_\_$ . (Nearest integer)  
Atomic mass : Ag = 108, Br = 80]

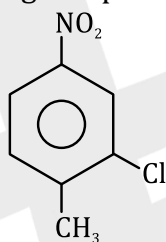
45. Arrange the order of C—OH bond length of the following compounds.

Methanol	Phenol	p-Ethoxyphenol
(A)	(B)	(C)
(A) $A > B > C$	(B) $A > C > B$	(C) $C > B > A$
		(D) $B > C > A$

46. Write the correct order of basicity.

$\text{CH}_3\text{—}\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}}\text{—CH}_3$	$\text{CH}_3\text{—}\bar{\text{C}}\text{—H}$	$\text{:}\bar{\text{C}}\equiv\text{N:}$	$\text{CH}_2\text{CH—}\bar{\text{C}}\text{H}_2$	$\bar{\text{C}}\equiv\text{CH}$
(a)	(b)	(c)	(d)	(e)
(A) $a > b > d > e > c$	(B) $a > b > e > d > c$	(C) $b > a > d > c > e$	(D) $c > e > d > b > a$	

47. The correct IUPAC name of the following compound is:



- (A) 5-chloro-4-methyl-1-nitrobenzene (B) 2-chloro-1-methyl-4-nitrobenzene  
(C) 3-chloro-4-methyl-1-nitrobenzene (D) 2-methyl-5-nitro-1-chlorobenzene
48. The increasing order of nucleophilicity of the following nucleophiles is:  
(A)  $\text{CH}_3\text{CO}_2^-$  (B)  $\text{H}_2\text{O}$  (C)  $\text{CH}_3\text{SO}_3^-$  (D)  $\bar{\text{O}}\text{H}$   
(A)  $(a) < (d) < (c) < (b)$  (B)  $(b) < (c) < (d) < (a)$   
(C)  $(d) < (a) < (c) < (b)$  (D)  $(b) < (c) < (a) < (d)$
49. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R  
**Assertion A:** Thin layer chromatography is an adsorption chromatography.  
**Reason: A** thin layer of silica gel is spread over a glass plate of suitable size in thin layer chromatography which acts as an adsorbent.  
In the light of the above statements, choose the correct answer from the options given below  
(A) Both A and R are true and R is the correct explanation of A  
(B) Both A and R are true but R is NOT the correct explanation of A  
(C) A is true but R is false  
(D) A is false but R is true
50. A Sample of 0.125g of an organic compound when analysed by Duma's method yields 22.78 mL of nitrogen gas collected over KOH solution at 280K and 759mm Hg. The percentage of nitrogen in the given organic compound is  $\_\_\_\_\_\_$ . (Nearest integer).  
(A) The vapour pressure of water at 280 K is 14.2 mm Hg  
(B)  $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$



Answer key

- |     |        |     |      |     |     |     |     |     |     |     |      |     |     |
|-----|--------|-----|------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|
| 1.  | (C)    | 2.  | (B)  | 3.  | (D) | 4.  | (B) | 5.  | (D) | 6.  | (C)  | 7.  | (D) |
| 8.  | (3)    | 9.  | (A)  | 10. | (A) | 11. | (C) | 12. | (B) | 13. | (C)  | 14. | (1) |
| 15. | (A)    | 16. | (B)  | 17. | (A) | 18. | (C) | 19. | (C) | 20. | (D)  | 21. | (A) |
| 22. | (D)    | 23. | (D)  | 24. | (C) | 25. | (D) | 26. | (B) | 27. | (A)  | 28. | (D) |
| 29. | (2)    | 30. | (C)  | 31. | (C) | 32. | (B) | 33. | (D) | 34. | (D)  | 35. | (C) |
| 36. | (B)    | 37. | (6)  | 38. | (A) | 39. | (A) | 40. | (A) | 41. | (68) | 42. | (D) |
| 43. | (1125) | 44. | (40) | 45. | (B) | 46. | (A) | 47. | (B) | 48. | (D)  | 49. | (A) |
| 50. | (22)   |     |      |     |     |     |     |     |     |     |      |     |     |

**A**