Chapter 21

Organic Chemistry: Some Basic Principles and Techniques

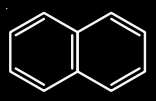
1. The IUPAC name of neopentane is **[AIEEE-2009]**
   (1) 2, 2-dimethylpropane
   (2) 2-methylpropane
   (3) 2, 2-dimethylbutane
   (4) 2-methylbutane

2. Arrange the carbanions, $(CH_3)_3\bar{C}$, $\bar{C}Cl_3$, $(CH_3)_2\bar{C}H$, $C_6H_5\bar{C}H_2$, in order of their decreasing stability **[AIEEE-2009]**
   (1) $(CH_3)_2\bar{C}H > \bar{C}Cl_3 > C_6H_5\bar{C}H_2 > (CH_3)_3\bar{C}$
   (2) $\bar{C}Cl_3 > C_6H_5\bar{C}H_2 > (CH_3)_2\bar{C}H > (CH_3)_3\bar{C}$
   (3) $(CH_3)_3\bar{C} > (CH_3)_2\bar{C}H > C_6H_5\bar{C}H_2 > \bar{C}Cl_3$
   (4) $C_6H_5\bar{C}H_2 > \bar{C}Cl_3 > (CH_3)_3\bar{C} > (CH_3)_2\bar{C}H$

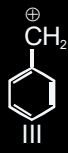
3. The alkene that exhibits geometrical isomerism is **[AIEEE-2009]**
   (1) 2 - methyl propene
   (2) 2 - butene
   (3) 2 - methyl - 2 - butene
   (4) Propene

4. The correct order of increasing basicity of the given conjugate bases (R = CH_3) is **[AIEEE-2010]**
   (1) $R\bar{C}OO < HC\equiv\bar{C} < \bar{N}H_2 < \bar{R}$
   (2) $R\bar{C}OO < HC\equiv\bar{C} < \bar{R} < \bar{N}H_2$
   (3) $\bar{R} < HC\equiv\bar{C} < R\bar{C}OO < \bar{N}H_2$
   (4) $R\bar{C}OO < \bar{N}H_2 < HC\equiv\bar{C} < \bar{R}$

5. 29.5 mg of an organic compound containing nitrogen was digested according to Kjeldahl's method and the evolved ammonia was absorbed in 20 mL of 0.1 M HCl solution. The excess of the acid required 15 mL of 0.1 M NaOH solution for complete neutralisation. The percentage of nitrogen in the compound is **[AIEEE-2010]**
   (1) 29.5 (2) 59.0
   (3) 47.4 (4) 23.7

6. The non-aromatic compound among the following is **[AIEEE-2011]**
   (1) 
   (2) 
   (3) 
   (4) 

7. The order of stability of the following carbocations

   $CH_2 = CH - \overset{\oplus}{C}H_2$; $CH_3 - CH_2 - \overset{\oplus}{C}H_2$;  is

   I II III

   [JEE (Main)-2013]
   (1) III > II > I (2) II > III > I
   (3) I > II > III (4) III > I > II

8. A gaseous hydrocarbon gives upon combustion 0.72 g of water and 3.08 g of CO_2. The empirical formula of the hydrocarbon is **[JEE (Main)-2013]**
   (1) C_2H_4 (2) C_3H_4
   (3) C_6H_5 (4) C_7H_8

9. For the estimation of nitrogen, 1.4 g of an organic compound was digested by Kjeldahl method and the evolved ammonia was absorbed in 60 mL of $\frac{M}{10}$ sulphuric acid. The unreacted acid required 20 mL of $\frac{M}{10}$ sodium hydroxide for complete neutralization. The percentage of nitrogen in the compound is **[JEE (Main)-2014]**
   (1) 6% (2) 10%
   (3) 3% (4) 5%

10. In Carius method of estimation of halogens, 250 mg of an organic compound gave 141 mg of AgBr. The percentage of bromine in the compound is (At. mass Ag = 108; Br = 80) **[JEE (Main)-2015]**

(1) 24 (2) 36

(3) 48 (4) 60

11. The distillation technique most suited for separating glycerol from spent-lye in the soap industry is **[JEE (Main)-2016]**

(1) Fractional distillation

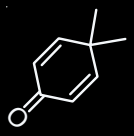
(2) Steam distillation

(3) Distillation under reduced pressure

(4) Simple distillation

12. Which of the following molecules is least resonance stabilized? **[JEE (Main)-2017]**

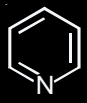
(1) 

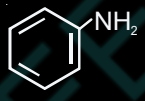
(2) 

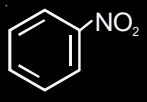
(3) 

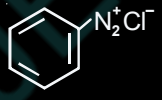
(4) 

13. Which of the following compounds will be suitable for Kjeldahl's method for nitrogen estimation? **[JEE (Main)-2018]**

(1) 

(2) 

(3) 

(4) 

14. Which amongst the following is the strongest acid? **[JEE (Main)-2019]**

(1) $CHBr_3$ (2) $CH(CN)_3$

(3) CHI_3 (4) $CHCl_3$

15. The correct decreasing order for acid strength is **[JEE (Main)-2019]**

(1) $FCH_2COOH > NCCH_2COOH > NO_2CH_2COOH > ClCH_2COOH$

(2) $CNCH_2COOH > O_2NCH_2COOH > FCH_2COOH > ClCH_2COOH$

(3) $NO_2CH_2COOH > NCCH_2COOH > FCH_2COOH > ClCH_2COOH$

(4) $NO_2CH_2COOH > FCH_2COOH > CNCH_2COOH > ClCH_2COOH$

16. The increasing basicity order of the following compounds is **[JEE (Main)-2019]**

(A) $CH_3CH_2NH_2$ (B) $CH_3CH_2\underset{\displaystyle CH_2CH_3}{\underset{|}{N}}H$

(C) $H_3C-\underset{\displaystyle CH_3}{\underset{|}{N}}-CH_3$ (D) $Ph-\underset{\displaystyle CH_3}{\underset{|}{N}}-H$

(1) (D) < (C) < (B) < (A)

(2) (A) < (B) < (C) < (D)

(3) (A) < (B) < (D) < (C)

(4) (D) < (C) < (A) < (B)

17. If dichloromethane (DCM) and water (H_2O) are used for differential extraction, which one of the following statements is correct? **[JEE (Main)-2019]**

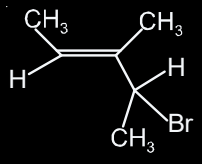
(1) DCM and H_2O will make turbid/colloidal mixture

(2) DCM and H_2O will be miscible clearly

(3) DCM and H_2O would stay as upper and lower layer respectively in the separating funnel (S.F.)

(4) DCM and H_2O would stay as lower and upper layer respectively in the S.F.

18. What is the IUPAC name of the following compound?



[JEE (Main)-2019]

(1) 3-Bromo-1, 2-dimethylbut-1-ene

(2) 4-Bromo-3-methylpent-2-ene

(3) 3-Bromo-3-methyl-1, 2- dimethylprop-1-ene

(4) 2-Bromo-3-methylpent-3-ene

19. The correct match between items I and II is

Item-I (Mixture)	**Item-II (Separation method)**
(A) H_2O : Sugar	(P) Sublimation
(B) H_2O : Aniline	(Q) Recrystallization
(C) H_2O : Toluene	(R) Steam distillation
	(S) Differential extraction

[JEE (Main)-2019]

(1) (A) → (R), (B) → (P), (C) → (S)

(2) (A) → (S), (B) → (R), (C) → (P)

(3) (A) → (Q), (B) → (R), (C) → (P)

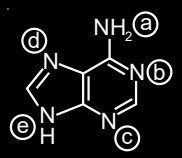
(4) (A) → (Q), (B) → (R), (C) → (S)

20. 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 **[JEE (Main)-2019]**

(1) $C_6H_8N_2$ (2) $C_{12}H_8N$

(3) C_6H_8N (4) $C_{12}H_8N_2$

21. In the following compound,



the favourable site/s for protonation is/are

[JEE (Main)-2019]

(1) (a) (2) (b), (c) and (d)

(3) (a) and (d) (4) (a) and (e)

22. The correct order for acid strength of compounds

$CH \equiv CH$, $CH_3 - C \equiv CH$ and $CH_2 = CH_2$

is as follows **[JEE (Main)-2019]**

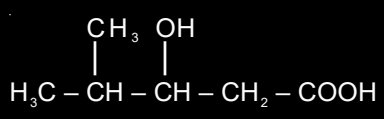
(1) $CH_3 - C \equiv CH > CH \equiv CH > CH_2 = CH_2$

(2) $CH_3 - C \equiv CH > CH_2 = CH_2 > HC \equiv CH$

(3) $CH \equiv CH > CH_2 = CH_2 > CH_3 - C \equiv CH$

(4) $HC \equiv CH > CH_3 - C \equiv CH > CH_2 = CH_2$

23. The IUPAC name of the following compound is



[JEE (Main)-2019]

(1) 3-Hydroxy-4-methylpentanoic acid

(2) 4-Methyl-3-hydroxypentanoic acid

(3) 2-Methyl-3-hydroxypentan-5-oic acid

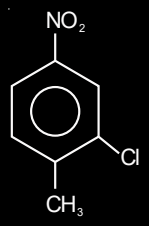
(4) 4,4-Dimethyl-3-hydroxybutanoic acid

24. Which of the following compounds will show the maximum 'enol' content? **[JEE (Main)-2019]**

(1) $CH_3COCH_2COOC_2H_5$ (2) CH_3COCH_3

(3) $CH_3COCH_2COCH_3$ (4) $CH_3COCH_2CONH_2$

25. The correct IUPAC name of the following compound is **[JEE (Main)-2019]**



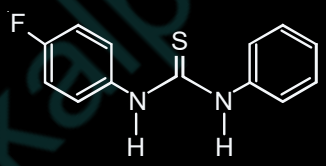
(1) 3-chloro-4-methyl-1-nitrobenzene

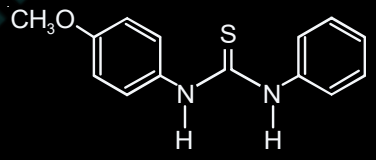
(2) 5-chloro-4-methyl-1-nitrobenzene

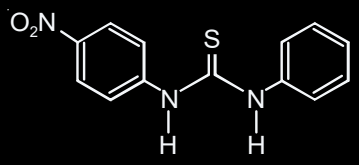
(3) 2-methyl-5-nitro-1-chlorobenzene

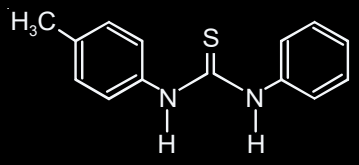
(4) 2-chloro-1-methyl-4-nitrobenzene

26. The increasing order of the pK_b of the following compound is

(A) 

(B) 

(C) 

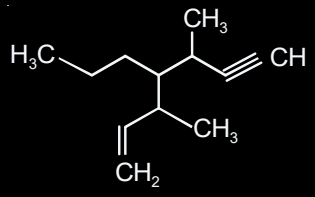
(D) 

[JEE (Main)-2019]

(1) (B) < (D) < (A) < (C) (2) (A) < (C) < (D) < (B)

(3) (B) < (D) < (C) < (A) (4) (C) < (A) < (D) < (B)

27. The IUPAC name for the following compound is



[JEE (Main)-2019]

(1) 3-methyl-4-(1-methylprop-2-ynyl)-1-heptene

(2) 3-methyl-4-(3-methylprop-1-enyl)-1-heptyne

(3) 3,5-dimethyl-4-propylhept-1-en-6-yne

(4) 3,5-dimethyl-4-propylhept-6-en-1-yne

28. In chromatography, which of the following statements is INCORRECT for R_f ?

[JEE (Main)-2019]

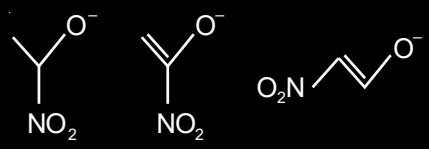
(1) The value of R_f cannot be more than one.

(2) Higher R_f value means higher adsorption.

(3) R_f value is dependent on the mobile phase.

(4) R_f value depends on the type of chromatography.

29. The correct order of stability for the following alkoxides is



(A) (B) (C)

[JEE (Main)-2020]

(1) (B) > (A) > (C) (2) (C) > (B) > (A)

(3) (B) > (C) > (A) (4) (C) > (A) > (B)

30. Arrange the following compounds in increasing order of C – OH bond length **[JEE (Main)-2020]**

methanol, phenol, p-ethoxyphenol

(1) phenol < p-ethoxyphenol < methanol

(2) methanol < phenol < p-ethoxyphenol

(3) methanol < p-ethoxyphenol < phenol

(4) phenol < methanol < p-ethoxyphenol

31. A flask contains a mixture of isohexane and 3-methylpentane. One of the liquids boils at 63°C while the other boils at 60°C. What is the best way to separate the two liquids and which one will be distilled out first? **[JEE (Main)-2020]**

(1) Simple distillation, isohexane

(2) Fractional distillation, isohexane

(3) Simple distillation, 3-methylpentane

(4) Fractional distillation, 3-methylpentane

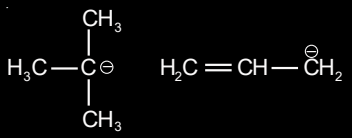
32. Kjeldahl's method cannot be used to estimate nitrogen for which of the following compounds?

[JEE (Main)-2020]

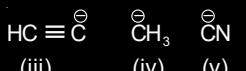
(1) $CH_3CH_2–C\equiv N$ (2) $NH_2–\overset{\overset{O}{\|}}{C}–NH_2$

(3) $C_6H_5NO_2$ (4) $C_6H_5NH_2$

33. The increasing order of basicity for the following intermediates is (from weak to strong)



(i) (ii)



(iii) (iv) (v)

[JEE (Main)-2020]

(1) (v) < (i) < (iv) < (ii) < (iii)

(2) (iii) < (iv) < (ii) < (i) < (v)

(3) (v) < (iii) < (ii) < (iv) < (i)

(4) (iii) < (i) < (ii) < (iv) < (v)

34. Which of the following has the shortest C – Cl bond? **[JEE (Main)-2020]**

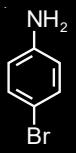
(1) Cl – CH = CH – NO_2

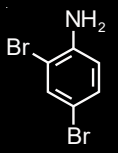
(2) Cl – CH = CH_2

(3) Cl – CH = CH – CH_3

(4) Cl – CH = CH – OCH_3

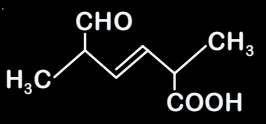
35. In Carius method of estimation of halogen, 0.172 g of an organic compound showed presence of 0.08 g of bromine. Which of these is the correct structure of the compound? **[JEE (Main)-2020]**

(1) 

(2) 

(3) H_3C – Br (4) H_3C – CH_2 – Br

36. The IUPAC name for the following compound is



[JEE (Main)-2020]

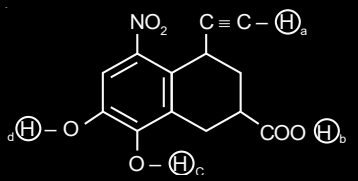
(1) 6-formyl-2-methyl-hex-3-enoic acid

(2) 2, 5-dimethyl-6-carboxy-hex-3-enal

(3) 2, 5-dimethyl-5-carboxy-hex-3-enal

(4) 2, 5-dimethyl-6-oxo-hex-3-enoic acid

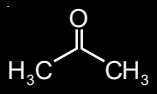
37. Arrange the following labelled hydrogens in decreasing order of acidity



(1) b > c > d > a (2) b > a > c > d

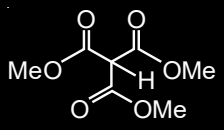
(3) c > b > d > a (4) c > b > a > d

38. Which one of the following compounds possesses the most acidic hydrogen? **[JEE (Main)-2020]**

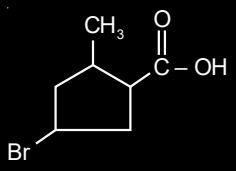
(1) 

(2) $H_3C - C \equiv C - H$

(3) 

(4) 

39. The IUPAC name of the following compound is



[JEE (Main)-2020]

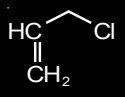
(1) 3-Bromo-5-methylcyclopentane carboxylic acid

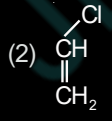
(2) 3-Bromo-5-methylcyclopentanoic acid

(3) 5-Bromo-3-methylcyclopentanoic acid

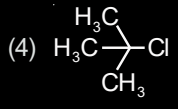
(4) 4-Bromo-2-methylcyclopentane carboxylic acid

40. Among the following compounds, which one has the shortest C – Cl bond? **[JEE (Main)-2020]**

(1) 

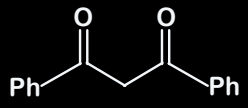
(2) 

(3) $H_3C - Cl$

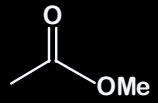
(4) 

41. The increasing order of the acidity of the α-hydrogen of the following compounds is

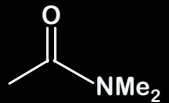
(A)



(B)



(C)



(D)

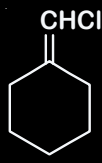
(1) (C) < (A) < (B) < (D)

(2) (B) < (C) < (A) < (D)

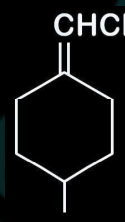
(3) (A) < (C) < (D) < (B)

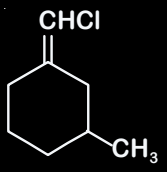
(4) (D) < (C) < (A) < (B)

42. Among the following compounds geometrical isomerism is exhibited by **[JEE (Main)-2020]**

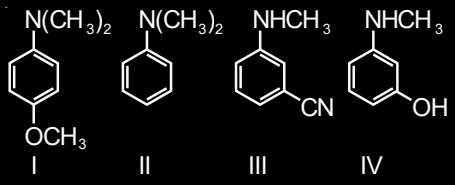
(1) 

(2) 

(3) 

(4) 

43. The increasing order of pK_b values of the following compounds is



I II III IV

[JEE (Main)-2020]

(1) I < II < IV < III (2) I < II < III < IV

(3) II < I < III < IV (4) II < IV < III < I

44. Which of the following compounds shows geometrical isomerism? **[JEE (Main)-2020]**

(1) 2-methylpent-1-ene

(2) 4-methylpent-1-ene

(3) 2-methylpent-2-ene

(4) 4-methylpent-2-ene

45. The IUPAC name of the following compound is

[JEE (Main)-2020]

(1) 4-amino-2-formyl-5-hydroxymethyl nitrobenzene

(2) 5-amino-4-hydroxymethyl-2-nitrobenzaldehyde

(3) 3-amino-4-hydroxymethyl-5-nitrobenzaldehyde

(4) 2-nitro-4-hydroxymethyl-5-amino benzaldehyde

46. In an estimation of bromine by Carius method, 1.6 g of an organic compound gave 1.88 g of AgBr. The mass percentage of bromine in the compound is _____.

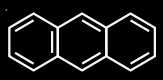
(Atomic mass, Ag = 108, Br = 80 g mol^{-1})

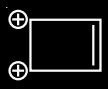
[JEE (Main)-2020]

47. Which one of the following compounds is non-aromatic? **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

48. Using the provided information in the following paper chromatogram :

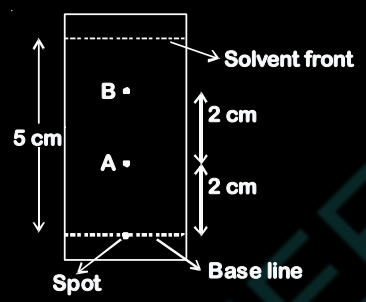


Fig : Paper chromatography for compounds A and B.

The calculated R_f value of A _____ $\times 10^{-1}$.

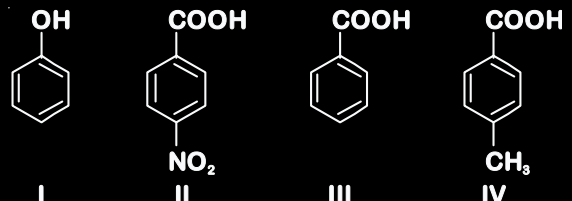
[JEE (Main)-2021]

49. Which of the following compound is added to the sodium extract before addition of silver nitrate for testing of halogens? **[JEE (Main)-2021]**

(1) Hydrochloric acid (2) Sodium hydroxide

(3) Ammonia (4) Nitric acid

50. The correct order of acid character of the following compounds is : **[JEE (Main)-2021]**



(1) IV > III > II > I

(2) II > III > IV > I

(3) I > II > III > IV

(4) III > II > I > IV

51. Given below are two statements:

Statement I : o-Nitrophenol is steam volatile due to intramolecular hydrogen bonding.

Statement II : o-Nitrophenol has high melting due to hydrogen bonding.

In the light of the above statements, choose the most appropriate answer from the options given below: **[JEE (Main)-2021]**

(1) Both statement I and statement II are true

(2) Statement I is false but statement II is true

(3) Statement I is true but statement II is false

(4) Both statement I and statement II are false

52. Which of the following is 'a' FALSE statement?

[JEE (Main)-2021]

(1) Carius method is used for the estimation of nitrogen in an organic compound

(2) Phosphoric acid produced on oxidation of phosphorus present in an organic compound is precipitated as $Mg_2P_2O_7$ by adding magnesia mixture

(3) Kjeldahl's method is used for the estimation of nitrogen in an organic compound

(4) Carius tube is used in the estimation of sulphur in an organic compound

53. Given below are two statements:

Statement I : A mixture of chloroform and aniline can be separated by simple distillation.

Statement II : When separating aniline from a mixture of aniline and water by steam distillation aniline boils below its boiling point.

In the light of the above statements, choose the most appropriate answer from the options given below : **[JEE (Main)-2021]**

(1) Both statement I and statement II are false

(2) Both statement I and statement II are true

(3) Statement I is true but statement II is false

(4) Statement I is false but statement II is true

54. In chromatography technique, the purification of compound is independent of **[JEE (Main)-2021]**

(1) Solubility of the compound

(2) Mobility or flow of solvent system

(3) Length of the column or TLC plate

(4) Physical state of the pure compound

55. **Assertion A :** Enol form of acetone [CH_3COCH_3] exists in < 0.1% quantity. However, the enol form of acetyl acetone [$CH_3COCH_2OCCH_3$] exists in approximately 15% quantity.

Reason R : Enol form of acetyl acetone is stabilized by intramolecular hydrogen bonding, which is not possible in enol form of acetone.

Choose the correct statement : **[JEE (Main)-2021]**

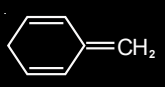
(1) **A** is false but **R** is true

(2) Both **A** and **R** are true and **R** is the correct explanation of **A**

(3) **A** is true but **R** is false

(4) Both **A** and **R** are true but **R** is not the correct explanation of **A**

56. Among the following, the aromatic compounds are:

(A) 

(B) 

(C) 

(D) 

Choose the correct answer from the following options : **[JEE (Main)-2021]**

(1) (A), (B) and (C) only

(2) (B), (C) and (D) only

(3) (B) and (C) only

(4) (A) and (B) only

57. **Statement I** : Sodium hydride can be used as an oxidising agent.

Statement II : The lone pair of electrons on nitrogen in pyridine makes it basic.

Choose the **CORRECT** answer from the options given below: **[JEE (Main)-2021]**

(1) Both statement I and statement II are true

(2) Both statement I and statement II are false

(3) Statement I is false but statement II is true

(4) Statement I is true but statement II is false

58. Match List-I with List-II :

List-I **Test/Reagents/ Observation(s)**	**List-II** **Species detected**
(a) Lassaigne's Test	(i) Carbon
(b) Cu(II) oxide	(ii) Sulphur
(c) Silver nitrate	(iii) N, S, P, and halogen
(d) The sodium fusion extract gives black precipitate with acetic acid and lead acetate	(iv) Halogen Specifically

The correct match is: **[JEE (Main)-2021]**

(1) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

(2) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

(3) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

(4) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

59. In Duma's method of estimation of nitrogen, 0.1840 g of an organic compound gave 30 mL of nitrogen collected at 287 K and 758 mm of Hg pressure. The percentage composition of nitrogen in the compound is _____.

(Round off to the nearest Integer).

[Given : Aqueous tension at 287 K = 14 mm of Hg]

[JEE (Main)-2021]

60. Given below are two statements :

Statement I : Retardation factor (R_f) can be measured in meter/centimeter.

Statement II : R_f value of a compound remains constant in all solvents.

Choose the **most appropriate** answer from the options given below : **[JEE (Main)-2021]**

(1) Statement I is true but statement II is false

(2) Both statement I and statement II are true

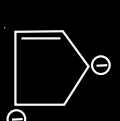
(3) Both statement I and statement II are false

(4) Statement I is false but statement II is true

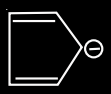
61. Which of the following is an aromatic compound?

[JEE (Main)-2021]

(1) 

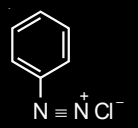
(2) 

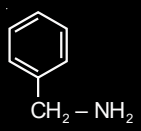
(3) 

(4) 

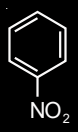
62. Nitrogen can be estimated by Kjeldahl's method for which of the following compound?

[JEE (Main)-2021]

(1) 

(2) 

(3) 

(4) 

63. The total number of C – C sigma bond/s in mesityl oxide ($C_6H_{10}O$) is _____. (Round off to the Nearest Integer). **[JEE (Main)-2021]**

64. Compound with molecular formula C_3H_6O can show

[JEE (Main)-2021]

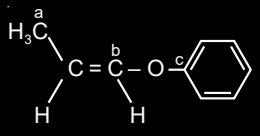
(1) Positional isomerism

(2) Both positional isomerism and metamerism

(3) Metamerism

(4) Functional group isomerism

65. In the following molecule,

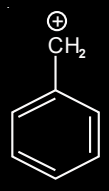


Hybridisation of Carbon a, b and c respectively are :

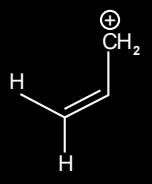
[JEE (Main)-2021]

(1) sp^3, sp, sp (2) sp^3, sp^2, sp^2

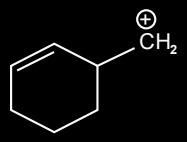
(3) sp^3, sp, sp^2 (4) sp^3, sp^2, sp

66. 

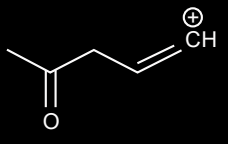
(A)



(B)



(C)



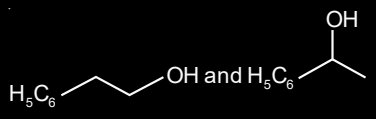
(D)

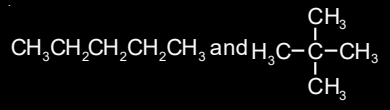
Among the given species the Resonance stabilised carbocations are : **[JEE (Main)-2021]**

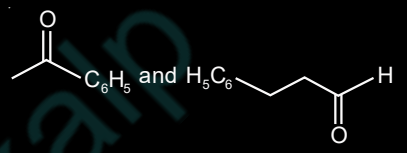
(1) (C) and (D) only (2) (A), (B) and (C) only

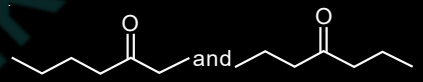
(3) (A) and (B) only (4) (A), (B) and (D) only

67. Which one of the following pairs of isomers is an example of metamerism? **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

68. In Carius method, halogen containing organic compound is heated with fuming nitric acid in the presence of **[JEE (Main)-2021]**

(1) HNO_3 (2) $CuSO_4$

(3) $BaSO_4$ (4) $AgNO_3$

69. When 0.15 g of an organic compound was analyzed using Carius method for estimation of bromine, 0.2397 g of AgBr was obtained. The percentage of bromine in the organic compound is _____. (Nearest integer) **[JEE (Main)-2021]**

[Atomic mass :
Silver = 108
Bromine = 80]

70. Which purification technique is used for high boiling organic liquid compound (decomposes near its boiling point)? **[JEE (Main)-2021]**

(1) Reduced pressure distillation

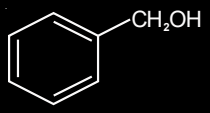
(2) Simple distillation

(3) Steam distillation

(4) Fractional distillation

71. Which one of the following compounds does not exhibit resonance? **[JEE (Main)-2021]**

(1) $CH_3CH_2OCH = CH_2$

(2) 

(3) $CH_3CH_2CH_2CONH_2$

(4) $CH_3CH_2CH = CHCH_2NH_2$

72. Which one of the following molecules does not show stereo isomerism? **[JEE (Main)-2021]**

(1) 4-Methylhex-1-ene

(2) 3-Ethylhex-3-ene

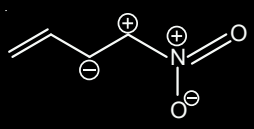
(3) 3,4-Dimethylhex-3-ene

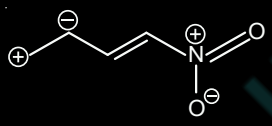
(4) 3-Methylhex-1-ene

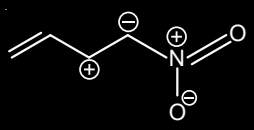
73. The number of acyclic structural isomers (including geometrical isomers) for pentene are _____.

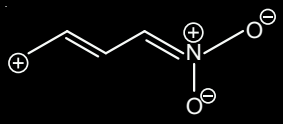
[JEE (Main)-2021]

74. Which one among the following resonating structures is **not** correct? **[JEE (Main)-2021]**

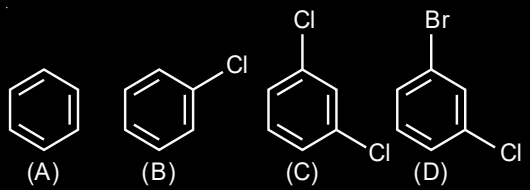
(1) 

(2) 

(3) 

(4) 

75. The correct decreasing order of densities of the following compounds is : **[JEE (Main)-2021]**



(1) (D) > (C) > (B) > (A)

(2) (C) > (B) > (A) > (D)

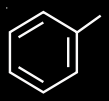
(3) (A) > (B) > (C) > (D)

(4) (C) > (D) > (A) > (B)

76. Which among the following is the strongest acid ?

[JEE (Main)-2021]

(1) 

(2) 

(3) $CH_3CH_2CH_2CH_3$

(4) 

77. 0.8 g of an organic compound was analysed by Kjeldahl's method for the estimation of nitrogen. If the percentage of nitrogen in the compound was found to be 42%, then _____ mL of 1 M H_2SO_4 would have been neutralized by the ammonia evolved during the analysis. **[JEE (Main)-2021]**

78. Given below are two statements

Statement I : Aniline is less basic than acetamide.

Statement II : In aniline, the lone pair of electrons on nitrogen atom is delocalised over benzene ring due to resonance and hence less available to a proton

Choose the **most appropriate** option

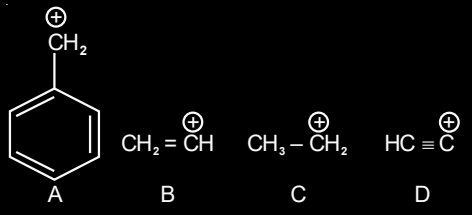
[JEE (Main)-2021]

(1) **Statement I** is false but **statement II** is true.

(2) Both **statement I** and **statement II** are false.

(3) **Statement I** is true but **statement II** is false.

(4) Both **statement I** and **statement II** are true.

79. 

The correct order of stability of given carbocation is

[JEE (Main)-2021]

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

(3) A > C > B > D (4) D > B > A > C

80. Staggered and eclipsed conformers of ethane are

[JEE (Main)-2021]

(1) Rotamers (2) Mirror images

(3) Polymers (4) Enantiomers

81. An organic compound is subjected to chlorination to get compound A using 5.0 g of chlorine. When 0.5 g of compound A is reacted with $AgNO_3$ [Carius Method], the percentage of chlorine in compound A is _____ when it forms 0.3849 g of AgCl. (Round off to the Nearest Integer)

(Atomic masses of Ag and Cl are 107.87 and 35.5 respectively)

[JEE (Main)-2021]

82. Given below are two statements :

Statement I : Hyperconjugation is a permanent effect.

Statement II : Hyperconjugation in ethyl cation $\left(CH_3 - \overset{+}{C}H_2\right)$ involves the overlapping of $C_{sp^2} - H_{1s}$ bond with empty 2p orbital of other carbon.

Choose the correct option: **[JEE (Main)-2021]**

(1) Both statement I and statement II are true

(2) Statement I is incorrect but statement II is true

(3) Statement I is correct but statement II is false

(4) Both statement I and statement II are false

83. Which one of the following set of elements can be detected using sodium fusion extract?

[JEE (Main)-2021]

(1) Phosphorous, Oxygen, Nitrogen, Halogens

(2) Nitrogen, Phosphorous, Carbon, Sulfur

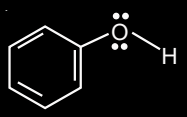
(3) Sulfur, Nitrogen, Phosphorous, Halogens

(4) Halogens, Nitrogen, Oxygen, Sulfur

84. The dihedral angle in staggered form of Newman projection of 1, 1, 1-Trichloro ethane is _____ degree. (Round off to the Nearest Integer).

[JEE (Main)-2021]

85. Which one of the following compounds is not aromatic? **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

86. In the sulphur estimation, 0.471 g of an organic compound gave 1.44 g of barium sulfate. The percentage of sulphur in the compound is _____%. (Nearest integer)

(Atomic Mass of B = 137 u) **[JEE (Main)-2021]**

87. The number of moles of CuO, that will be utilized in Dumas method for estimating nitrogen in a sample of 57.5 g of N,N-dimethylaminopentane is _____ $\times 10^{-2}$. (Nearest integer)

[JEE (Main)-2021]

88. In Carius method for estimation of halogens, 0.2 g 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]

[JEE (Main)-2021]

89. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : A simple distillation can be used to separate a mixture of propanol and propanone.

Reason (R) : Two liquids with a difference of more than 20°C in their boiling points can be separated by simple distillations.

In the light of the above statements, choose the **most appropriate** answer from the options given below : **[JEE (Main)-2021]**

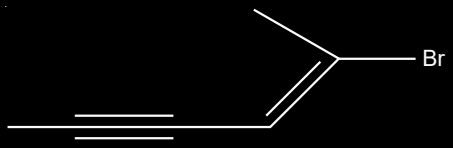
(1) (A) is false but (R) is true

(2) (A) is true but (R) is false

(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

90. Choose the **correct** name for compound given below: **[JEE (Main)-2021]**



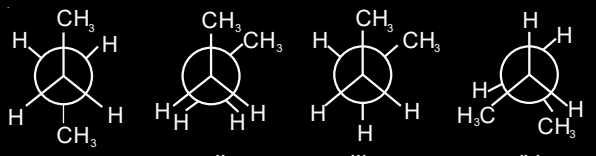
(1) (4E)-5-Bromo-hex-2-en-4-yne

(2) (2E)-2-Bromo-hex-4-yn-2-ene

(3) (2E)-2-Bromo-hex-2-en-4-yne

(4) (4E)-5-Bromo-hex-4-en-2-yne

91. Arrange the following conformational isomers of n-butane in order of their increasing potential energy **[JEE (Main)-2021]**



(1) II < IV < III < I

(2) I < III < IV < II

(3) II < III < IV < I

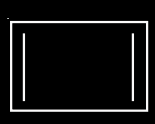
(4) I < IV < III < II

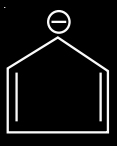
92. The transformation occurring in Duma's method is given below **[JEE (Main)-2021]**

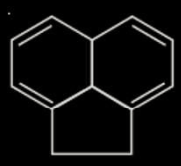
$$C_2H_7N + \left(2x + \frac{y}{2}\right)CuO \longrightarrow xCO_2 + \frac{y}{2}H_2O + \frac{z}{2}N_2 + \left(2x + \frac{y}{2}\right)Cu$$

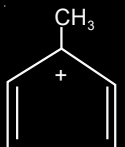
The value of y is _____. (Integer answer)

93. Which one of the following compounds is aromatic in nature? **[JEE (Main)-2021]**

(1) 

(2) 

(3) 

(4) 

94. A 0.166 g sample of an organic compound was digested with conc. H_2SO_4 and then distilled with NaOH. The ammonia gas evolved was passed through 50.0 mL of 0.5 N H_2SO_4. The used acid required 30.0 mL of 0.25 N NaOH for complete neutralisation. The mass percentage of nitrogen in the organic compound is _____.

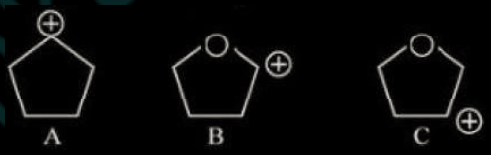
[JEE (Main)-2022]

95. 120 g of an organic compound that contains only carbon and hydrogen gives 330 g of CO_2 and 270 g of water on complete combustion. The percentage of carbon and hydrogen, respectively are **[JEE (Main)-2022]**

(1) 25 and 75 (2) 40 and 60

(3) 60 and 40 (4) 75 and 25

96. Arrange the following carbocations in decreasing order of stability. **[JEE (Main)-2022]**



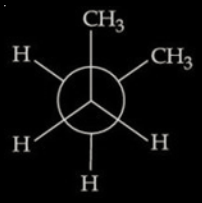
(1) A > C > B (2) A > B > C

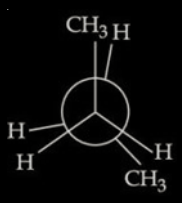
(3) C > B > A (4) C > A > B

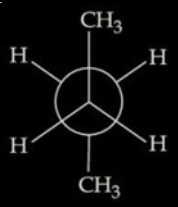
97. 0.2 g of an organic compound was subjected to estimation of nitrogen by Duma's method in which volume of N_2 evolved (at STP) was found to be 22.400 mL. The percentage of nitrogen in the compound is _____. [nearest integer]

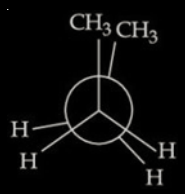
(Given : Molar mass of N_2 is 28 g mol^{-1}, Molar volume of N_2 at STP : 22.4L) **[JEE (Main)-2022]**

98. In the following structures, which one is having staggered conformation with maximum dihedral angle? **[JEE (Main)-2022]**

(1) 

(2) 

(3) 

(4) 

99. The IUPAC name of ethylidene chloride is:

[JEE (Main)-2022]

(1) 1-Chloroethene (2) 1-Chloroethyne

(3) 1, 2-Dichloroethane (4) 1, 1-Dichloroethane

100. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: A mixture contains benzoic acid and naphthalene. The pure benzoic acid can be separated out by the use of benzene.

Reason R: Benzoic acid is soluble in hot water.

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

[JEE (Main)-2022]

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.

(2) Both A and R are true but R is NOT the correct explanation of A.

(3) **A** is true but **R** is false.

(4) **A** is false but **R** is true.

101. During halogen test, sodium fusion extract is boiled with concentrated HNO_3 to

[JEE (Main)-2022]

(1) remove unreacted sodium

(2) decompose cyanide or sulphide of sodium

(3) extract halogen from organic compound

(4) maintain the pH of extract.

102. 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 Na_2S.

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

[JEE (Main)-2022]

(1) Both **Statement I** and **Statement II** are correct.

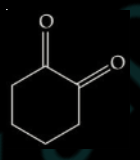
(2) Both **Statement I** and **Statement II** are incorrect.

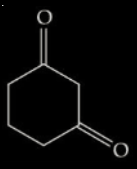
(3) **Statement I** is correct but **Statement II** is incorrect.

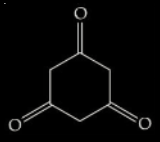
(4) **Statement I** is incorrect but **Statement II** is correct.

103. Which will have the highest enol content?

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

104. On complete combustion 0.30 g of an organic compound gave 0.20 g of carbon dioxide and 0.10 g of water. The percentage of carbon in the given organic compound is _____.

(Nearest Integer) **[JEE (Main)-2022]**

105. Which of the following is structure of a separating funnel? **[JEE (Main)-2022]**

(1) 

(2) 

(3) 

(4) 

106. Which of the following is most stable?

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

107. 116 g of a substance upon dissociation reaction, yields 7.5 g of hydrogen, 60 g of oxygen and 48.5 g of carbon. Given that the atomic masses of H, O and C are 1, 16 and 12, respectively. The data agrees with how many formulae of the following? _____.

[JEE (Main)-2022]

(1) CH_3COOH (2) HCHO

(3) CH_3OOCH_3 (4) CH_3CHO

108. 0.25 g of an organic compound containing chlorine gave 0.40 g of silver chloride in Carius estimation. The percentage of chlorine present in the compound is _____. [in nearest integer]

(Given : Molar mass of Ag is 108 g mol^{-1} and that of Cl is 35.5 g mol^{-1})

[JEE (Main)-2022]

109. Which one of the following techniques is not used to spot components of a mixture separated on thin layer chromatographic plate? **[JEE (Main)-2022]**

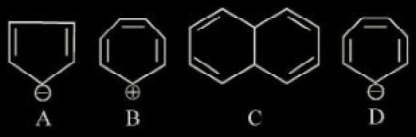
(1) I_2 (Solid)

(2) U.V. Light

(3) Visualisation agent as a component of mobile phase

(4) Spraying of an appropriate reagent

110. Which of the following structures are aromatic in nature? **[JEE (Main)-2022]**



(1) A, B, C and D (2) Only A and B

(3) Only A and C (4) Only B, C and D

111. The formula of the purple colour formed in Laissaigne's test for sulphur using sodium nitroprusside is **[JEE (Main)-2022]**

(1) $NaFe[Fe(CN)_6]$ (2) $Na[Cr(NH_3)_2(NCS)_4]$

(3) $Na_2[Fe(CN)_5(NO)]$ (4) $Na_4[Fe(CN)_5(NOS)]$

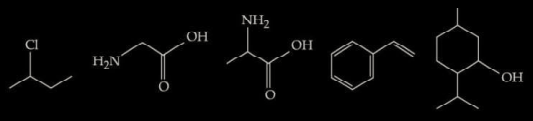
112. In the estimation of bromine, 0.5 g of an organic compound gave 0.40 g of silver bromide. The percentage of bromine in the given compound is _____% (nearest integer)

(Relative atomic masses of Ag and Br are 108 u and 80 u, respectively). **[JEE (Main)-2022]**

113. The complete combustion of 0.492 g of an organic compound containing 'C', 'H' and 'O' gives 0.793 g of CO_2 and 0.442 g of H_2O. The percentage of oxygen composition in the organic compound is_____.[nearest integer] **[JEE (Main)-2022]**

114. Kjeldahl's method was used for the estimation of nitrogen in an organic compound. The ammonia evolved from 0.55 g of the compound neutralised 12.5 mL of 1 M H_2SO_4 solution. The percentage of nitrogen in the compound is _____. (Nearest integer) **[JEE (Main)-2022]**

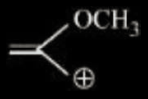
115. Observe structures of the following compounds

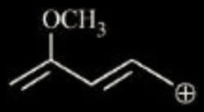


The total number of structures/compounds which possess asymmetric carbon atoms is _____.

[JEE (Main)-2022]

116. Which of the following carbocations is most stable? **[JEE (Main)-2022]**

(1) 

(2) 

(3) 

(4) 

117. While estimating the nitrogen present in an organic compound by Kjeldahl's method, the ammonia evolved from 0.25 g of the compound neutralized 2.5 mL of 2 M H_2SO_4. The percentage of nitrogen present in organic compound is _____.

[JEE (Main)-2022]

118. The number of sp^3 hybridised carbons in an acyclic neutral compound with molecular formula C_4H_5N is _____.

[JEE (Main)-2022]

119. The separation of two coloured substances was done by paper chromatography. The distances travelled by solvent front, substance A and substance B from the base line are 3.25 cm, 2.08 cm and 1.05 cm, respectively. The ratio of R_f values of A to B is_____.

[JEE (Main)-2022]

120. Which technique among the following, is most appropriate in separation of a mixture of 100 mg of *p*-nitrophenol and picric acid?

[JEE (Main)-2022]

(1) Steam distillation

(2) 2-5 ft long column of silica gel

(3) Sublimation

(4) Preparative TLC (Thin Layer Chromatography)

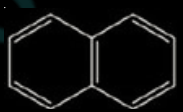
121. Which of the following compounds is **not** aromatic?

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

122. The correct decreasing order of priority of functional groups in naming an organic compound as per IUPAC system of nomenclature is

[JEE (Main)-2022]

(1) $-COOH > -CONH_2 > -COCl > -CHO$

(2) $-SO_3H > -COCl > -CONH_2 > -CN$

(3) $-COOR > -COCl > -NH_2 > C=O$

(4) $-COOH > -COOR > -CONH_2 > -COCl$

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

Assertion A: [6] Annulene, [8] Annulene and cis-[10] Annulene, are respectively aromatic, not-aromatic and aromatic.

Reason R: Planarity is one, of the requirements of aromatic systems.

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

[JEE (Main)-2022]

(1) Both **A** and **R** are correct and **R** is the correct explanation of **A**

(2) Both **A** and **R** are correct but **R** is NOT the correct explanation of **A**

(3) **A** is correct but **R** is not correct

(4) **A** is not correct but **R** is correct

124. In Carius method of estimation of halogen, 0.45 g of an organic compound gave 0.36 g of AgBr. Find out the percentage of bromine in the compound.

(Molar masses: AgBr = 188 g mol^{-1}; Br = 80 g mol^{-1})

[JEE (Main)-2022]

(1) 34.04% (2) 40.04%

(3) 36.03% (4) 38.04%

125. Match List-I with List-II

List-I (Mixture)	**List-II (Purification Process)**
(A) Chloroform & Aniline	(I) Steam distillation
(B) Benzoic acid & Napthalene	(II) Sublimation
(C) Water & Aniline	(III) Distillation
(D) Napthalene & Sodium chloride	(IV) Crystallisation

Choose the correct answer from the options given below:

[JEE (Main)-2022]

(1) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)

(2) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

(3) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

126. Match List - I with List - II

List-I	List-II
(A) 	(i) Spiro compound
(B) 	(ii) Aromatic compound
(C) 	(iii) Non-planar Heterocyclic compound
(D) 	(iv) Bicyclo compound

[JEE (Main)-2022]

(1) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

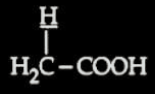
(2) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

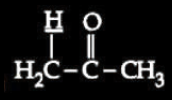
(3) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

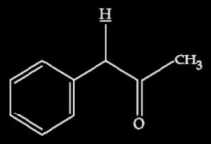
(4) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

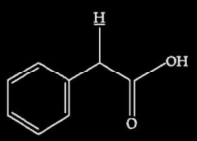
127. Among the following marked proton of which compound shows lowest pK_a value

[JEE (Main)-2022]

(1) 

(2) 

(3) 

(4) 

128. 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 R: 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

[JEE (Main)-2022]

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.

(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

(3) **A** is true but **R** is false

(4) **A** is false but **R** is true

129. A sample of 0.125 g of an organic compound when analysed by Duma's method yields 22.78 mL of nitrogen gas collected over KOH solution at 280 K and 759 mm Hg. The percentage of nitrogen in the given organic compound is____.(Nearest integer)

Given :

(a) The vapour pressure of water of 280 K is 14.2 mm Hg.

(b) R = 0.082 L atm K^{-1} mol^{-1}

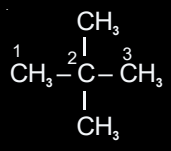
[JEE (Main)-2022]

❑ ❑ ❑

Chapter 21

Organic Chemistry: Some Basic Principles and Techniques

1. Answer (1)

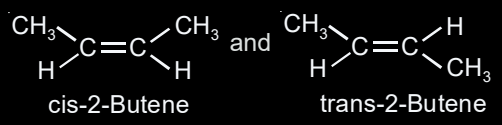


IUPAC name : 2, 2-dimethylpropane

2. Answer (2)

$CCl_3^{\ominus} > C_6H_5CH_2^{\ominus} > (CH_3)_2\overset{\ominus}{C}H > (CH_3)_3\overset{\ominus}{C}$

3. Answer (2)



cis-2-Butene trans-2-Butene

4. Answer (1)

$$\xrightarrow[\text{increasing basic strength}]{R-C\bar{O}O < HC\equiv C^{\ominus} < \overset{\ominus}{N}H_2 < \bar{R}}$$

As sp^3 C is less electronegative than sp^3 N alkyl carbanion $(\bar{R})$ is more basic than $\overset{\ominus}{N}H_2$. However *sp* hybridized carbon is more electronegative than sp^3 N. Hence $\overset{\ominus}{N}H_2$ is more basic than $HC\equiv\overset{\ominus}{C}$

5. Answer (4)

$$\%N = \frac{1.4NV}{W}$$

$$= \frac{1.4\times0.1\times(20-15)}{29.5\times10^{-3}}$$

$$= \frac{700}{29.5} = 23.7$$

6. Answer (2)

 = $4\pi e^-$, non-planar = non-aromatic

7. Answer (4)

Benzyl carbocation (III) is more stable than allyl carbocation (I) as it has more number of resonating structures. n-propyl carbocation (II) is least stable as it is stabilised by +I and +H effects of ethyl group.

8. Answer (4)

$$C_xH_y + \left(x+\frac{y}{4}\right)O_2 \rightarrow xCO_2 + \frac{y}{2}H_2O$$

Number of moles of $CO_2 = \frac{3.08}{44} = 0.07; x = 0.07$

Number of moles of $H_2O = \frac{0.72}{18} = 0.04; y = 0.08$

x : y = 7 : 8.

Therefore, empirical formula of hydrocarbon is C_7H_8

9. Answer (2)

As per question

	Normality	Volume
H_2SO_4	$\frac{N}{5}$	60mL
NaOH	$\frac{N}{10}$	20mL

$$(n_{geq})_{H_2SO_4} = (n_{geq})_{NaOH} + (n_{geq})_{NH_3}$$

$$\frac{1}{5}\times\frac{60}{1000} = \frac{1}{10}\times\frac{20}{1000} + (n_{geq})_{NH_3}$$

$$\frac{6}{500} = \frac{1}{500} + (n_{geq})_{NH_3}$$

$$(n_{geq})_{NH_3} = \frac{5}{500} = \frac{1}{100}$$

$$(n_{mol})_N = (n_{mol})_{NH_3} = (n_{geq})_{NH_3} = \frac{1}{100}$$

$$(Mass)_N = \frac{14}{100} = 0.14\ g$$

Percentage of "N" $= \frac{0.14}{1.4}\times100 = 10\%$

10. Answer (1)

Percentage of Br

$$= \frac{\text{Weight of AgBr}}{\text{Mol. mass of AgBr}} \times \frac{\text{Mol. mass of Br}}{\text{Weight of O.C.}} \times 100$$

$$= \frac{141}{188} \times \frac{80}{250} \times 100$$

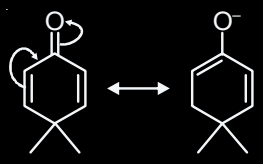
= 24%

11. Answer (3)

As glycerol decomposes before reaching its boiling point under 1 atm pressure. So, in order to prevent its deomposition, it is distilled under reduced pressure.

12. Answer (2)

However, all molecules given in options are stabilised by resonance but compound given in option (2) is least resonance stabilised (other three are aromatic)



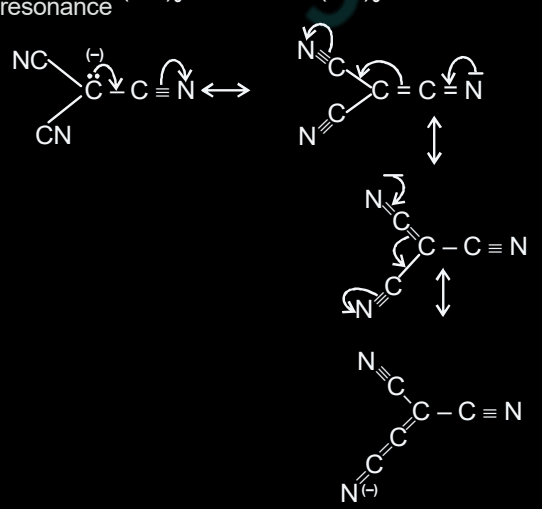
13. Answer (2)

Kjeldahl method is not applicable for compounds containing nitrogen in nitro, and azo groups and nitrogen in ring, as N of these compounds does not change to ammonium sulphate under these conditions. Hence only aniline can be used for estimation of nitrogen by Kjeldahl's method.

14. Answer (2)

Of the given compounds $CH(CN)_3$ is strongest acid because its conjugate base is stabilised by resonance

$$CH(CN)_3 \rightleftharpoons H^+ + C(CN)_3^-$$



$CHBr_3$ and CHI_3 are less stable as their conjugate bases are stabilised by inductive effect of halogens. Conjugate base of $CHCl_3$ involves back bonding between 2*p* and 3*p* orbitals.

15. Answer (3)

The acidic strength of the given compounds is decided on the basis of (–I) effect of the substituents of carboxylic acids. Higher the (–I) effect of substituent, higher will be the acidic strength. The decreasing order of (–I) effect of the given substituents is NO_2 > CN > F > Cl.

Therefore, correct decreasing order of acidic strength

$O_2NCH_2COOH > NCCH_2COOH > FCH_2COOH > ClCH_2COOH$

16. Answer (4)

pK_b values from NCERT

(A) $EtNH_2$	3.29
(B) $(Et_2)NH$	3.00
(C) Me_3N	4.22
(D) Ph – NH – Me	4.7

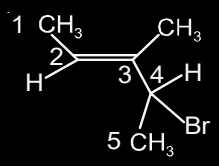
So, order of basic strength

(B) > (A) > (C) > (D)

17. Answer (4)

Density of dichloromethane is greater than water. So, DCM would be the lower layer and water will form the upper layer in the separating funnel.

18. Answer (2)



4-Bromo-3-methylpent-2-ene

19. Answer (4)

H_2O : Sugar – Recrystallisation.

Sugar is purified by this method.

H_2O : Aniline – Separation by steam distillation.

20. Answer (1)

Mol of CO_2 = 6 so mol of C is = 6

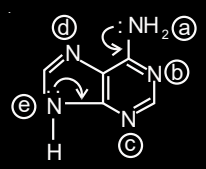
Mol of H_2O = 4 so mol of H is = 8

Mol of N_2 = 1 so mol of N is = 2

Formula $C_6H_8N_2$

21. Answer (2)

The lone pair which is participating in resonance and aromaticity will not be a favourable site for protonation.



lone pair of N atom b, c and d is not the part of aromaticity.

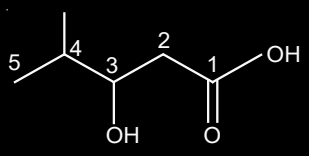
22. Answer (4)

Order of acidic strength is

$CH \equiv CH$	$>$ $CH_3 - C \equiv CH$	$>$ $CH_2 = CH_2$
sp hybridised carbon (more electronegative)	*sp* hybridised carbon and + I effect of $-CH_3$	sp^2 hybridised carbon (less electronegative)

23. Answer (1)

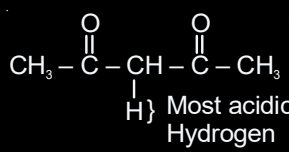
IUPAC name



3-Hydroxy-4-methyl pentanoic acid

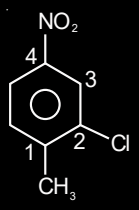
24. Answer (3)

Enol content $\propto$ acidity of active methelene hydrogens.



Maximum enol content

25. Answer (4)



All Groups attached are to be treated as substituents and lowest set of locant rule is followed.

2-Chloro-1-methyl-4-nitrobenzene

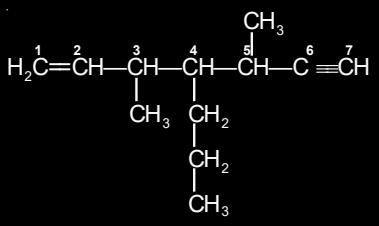
26. Answer (1)

EWG attached to benzene ring will reduce the basic strength and increase pK_b while EDG decreases pK_b.

Correct order of pK_b

(C) > (A) > (D) > (B)

27. Answer (3)

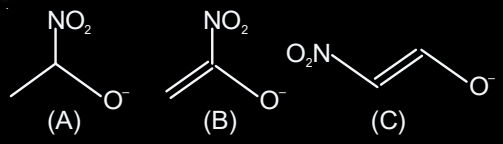


3, 5-dimethyl-4-propylhept-1-en-6-yne

28. Answer (2)

Froth floatation is a method of concentration and it was discovered by a washer women.

29. Answer (2)



Stability order C > B > A

30. Answer (1)

C-OH bond length in methanol, phenol and p-ethoxyphenol is least in phenol due to resonance and maximum in methanol due to lack of resonance whereas it will have some intermediate value in p-ethoxyphenol.

$\therefore$ correct increasing order is

phenol < p-ethoxyphenol < methanol

31. Answer (2)

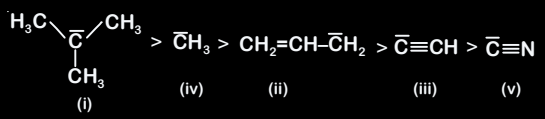
Two volatile liquids having their boiling points close to each other can be separated by fractional distillation. Out of the two given liquids, isohexane has lower boiling point and hence will distill out first.

32. Answer (3)

Kjeldahl's method is not applicable to compounds containing nitrogen in nitro, azo groups and nitrogen present in ring (pyridine).

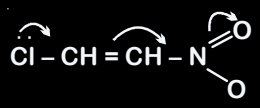
33. Answer (3)

Order of basic strength



∴ Order of basicity is : i > iv > ii > iii > v

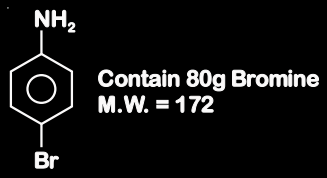
34. Answer (1)



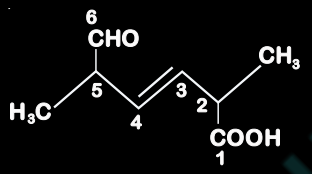
due to strong – R effect of – NO_2 group, partial double bond character between C and Cl increases.

35. Answer (1)

Given 0.172 g organic compound showed presence of 0.08g Bromine or 172 g organic compound will show 80 g Bromine which matches, exactly with option (1)



36. Answer (4)



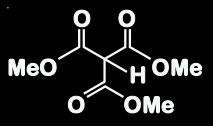
2, 5-dimethyl-6-oxo-hex-3-enoic acid.

37. Answer (1)

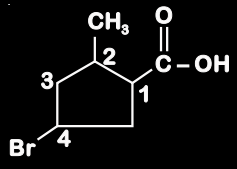
b > c > d > a

38. Answer (4)

Compound with most acidic hydrogen among the given compounds is

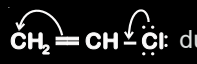


39. Answer (4)

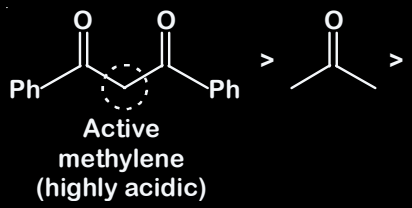


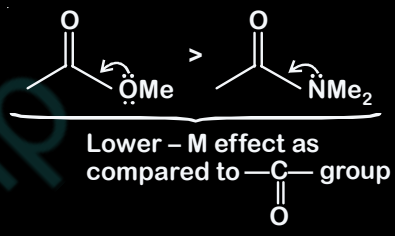
4-Bromo-2-methylcyclopentane carboxylic acid.

40. Answer (2)

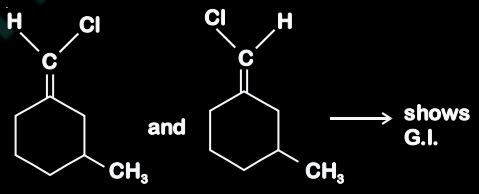
In  due to resonance, C – Cl bond acquires partial double bond character and has shortest bond length among given species.

41. Answer (4)

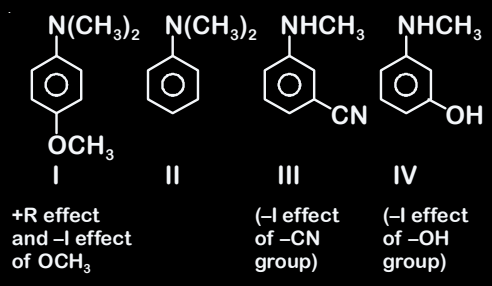




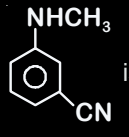
42. Answer (4)



43. Answer (1)



– OCH_3 group increases electron density of ring at O and P position making (I) most basic.



is least basic due to – I effect of – CN group at meta position.

Since – I effect of – CN > – I effect of – OH group

Hence correct basic strength will follow the order

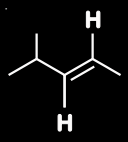
I > II > IV > III

$$\text{Basic strength} \propto \frac{1}{pK_b \text{ value}}$$

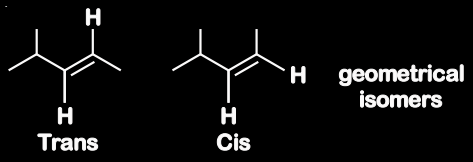
Order of K_b value

I < II < IV < III

44. Answer (4)

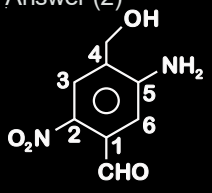


4-methylpent-2-ene



geometrical isomers

45. Answer (2)



5-amino-4-hydroxymethyl-2-nitrobenzaldehyde

46. Answer (50)

Mass of organic compound = 1.6 gm

Mass of AgBr = 1.88 gm

$$\text{Moles of Br} = \text{Moles of AgBr} = \frac{1.88}{188} = 0.01$$

Mass of Br = 0.01 × 80 = 0.80 gm

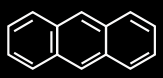
$$\% \text{ of Br} = \frac{0.80 \times 100}{1.60} = 50\%$$

47. Answer (2)

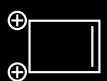
Aromatic

Non-aromatic

sp^3 hybridized



Aromatic



Aromatic

48. Answer (4)

Retardation factor (R_f)

$$= \frac{\text{Distance moved by the substance from base line}}{\text{Distance moved by the solvent from base line}}$$

$$= \frac{2}{5}$$

$$= 0.4$$

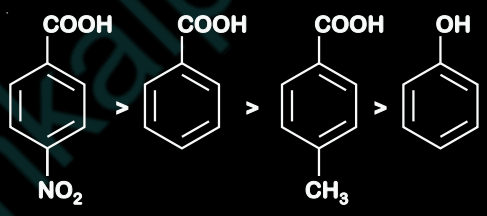
$$= 4 \times 10^{-1}$$

49. Answer (4)

The sodium fusion extract is acidified with nitric acid and then treated with silver nitrate.

50. Answer (2)

Acidic strength

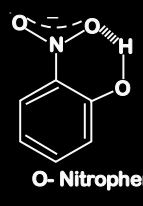


–I, –R +I, +R

Since carboxylic acids are more acidic than phenols.

–I and – R effect increase the acidic strength where as +I and +R effect decrease the acidic strength of carboxylic acids.

51. Answer (3)



O- Nitrophenol

- Has intramolecular hydrogen bonding and steam volatile
- Melting point is not affected by intramolecular hydrogen bonding

So the correct option should be (3)

52. Answer (1)

Carius method is used for the estimation for halogens and sulphur in organic compound.

53. Answer (2)

- Mixture of chloroform and aniline can be separated by simple distillation as these two liquids have sufficient difference in boiling point.

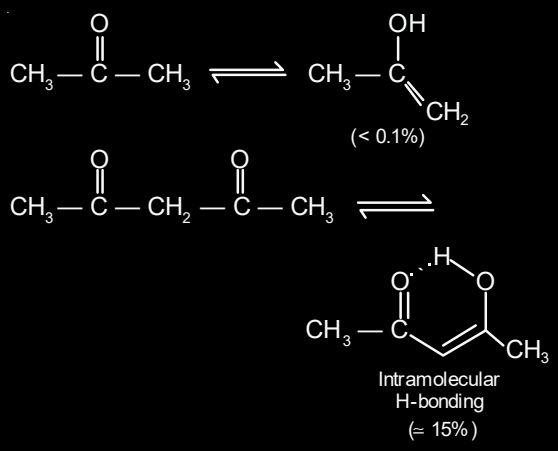
  Chloroform (b.p. 334 K), aniline (b.p. 457 K)

- In steam distillation, if one of the substances is water and the other, a water insoluble substance (like aniline) then the mixture will boil close to but below 373 K.

54. Answer (4)

In chromatography technique, the purification of compound is independent of physical state of the pure compound.

55. Answer (2)



Acetyl acetone in enol form have intramolecular H-bonding, which is absent in acetone.

56. Answer (3)

Conditions for aromaticity are

(i) Planarity

(ii) Complete delocalisation of the π electrons in the ring

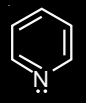
(iii) Presence of $(4n + 2)\pi$ electrons in the ring where n is an integer (n = 0, 1, 2....).

Compounds B and C are aromatic

Compound A is non-aromatic

Compound D is anti-aromatic

57. Answer (3)

- NaH is a strong H^- (hydride) donor. Hence cannot be used as an oxidising agent.
-  Pyridine

In Pyridine, lone pair of 'N' is localised, makes it basic.

58. Answer (1)

Lassaigne's test is used in qualitative detection of N, S, P and halogens.

(a) $\rightarrow$ (iii)

Cu(II) oxide is used for the estimation of carbon.

(b) $\rightarrow$ (i)

Silver nitrate is used for detecting halogens in organic compounds (Carius Method)

(c) $\rightarrow$ (iv)

Sodium fusion extract when treated with acetic acid and lead acetate gives black precipitate if sulphur is present.

$$S^{2-} + Pb^{2+} \rightarrow \underset{\text{(black)}}{PbS}$$

(d) $\rightarrow$ (ii)

59. Answer (19)

Pressure due to nitrogen = 758 – 14 = 744 mm Hg

Using ideal gas equation : PV = nRT

$$n_{N_2} = \frac{744 \times 30}{760 \times 1000 \times 0.082 \times 287}$$

$$\% \text{ of nitrogen} = \frac{n_{N_2} \times 28}{0.184} \times 100$$

$$= \frac{744 \times 30 \times 28 \times 100}{760 \times 1000 \times 0.082 \times 287 \times 0.184}$$

= 18.99 %

$\approx 19\%$

60. Answer (3)

Retardation factor (R_f) is the ratio of distance moved by the substance from the base line to the distance moved by the solvent from the base line. So, it is dimensionless. The distance moved by the substance is due to adsorption of the substance on the stationary phase. It does not depend on the nature of solvent. But the distance moved by the solvent will change with the nature of solvent. Therefore, R_f will vary with the change in solvent.

So, both the statements are false.

61. Answer (4)

A compound which has $(4n + 2)\pi$ electrons completely delocalised over the cyclic ring is aromatic.

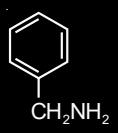
n = 1 (Aromatic)

62. Answer (2)

Kjeldahl's method can't be used for compounds containing nitro or azo groups.

Also for compounds containing nitrogen in ring, Kjeldahl's method can't be used.

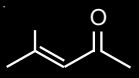
(e.g. for pyridine or quinoline)

$\therefore$  Compound gives nitrogen estimation

through Kjeldahl's method.

63. Answer (5)

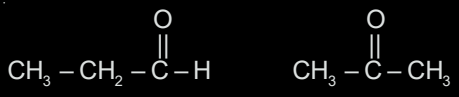
Structure of mesityl oxide is



Number of C–C sigma bonds = 5

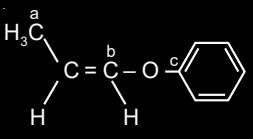
64. Answer (4)

C_3H_6O (degree of unsaturation = 1)



Functional group isomerism.

65. Answer (2)

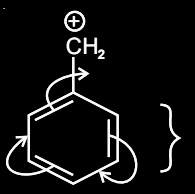


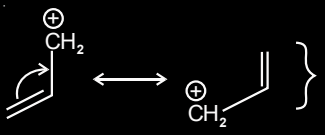
a – sp^3

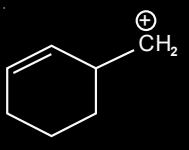
b – sp^2

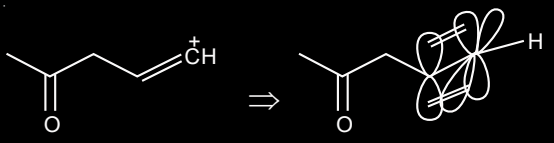
c – sp^2

66. Answer (3)

 Resonance possible

 Resonance possible

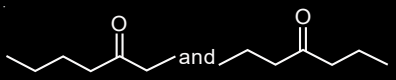
 No Resonance



Empty P-orbital and π bond P-orbital are not in same phase to overlap. Hence no conjugation

67. Answer (4)

Metamers have a common functional group and differ in the type of alkyl groups attached to the functional group

 are metamers

68. Answer (4)

Halide ion reacts with silver nitrate to give silver halide precipitate.

69. Answer (68)

$$\% \text{ of Br} = \frac{\text{Atomic mass of Br} \times m_1}{\text{molecular mass of AgBr} \times m} \times 100$$

m = mass of organic compound taken

m_1 = mass of AgBr obtained.

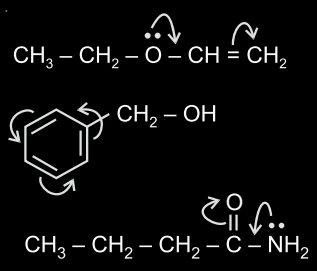
$$\therefore \% \text{ of Br} = \frac{80 \times 0.2397}{188 \times 0.15} \times 100$$

$$= 68$$

70. Answer (1)

Reduced pressure distillation technique is used to purify the liquid which decomposes near its boiling point.

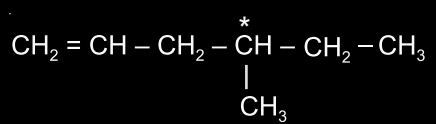
71. Answer (4)



$CH_3 - CH_2 - CH = CH - CH_2 - NH_2$

(Resonance is not possible in this compound)

72. Answer (2)

(i) 

4-methylhex-1-ene has chiral centre

(ii) $CH_3 - CH_2 - \underset{\underset{CH_2\,CH_3}{|}}{C} = CH - CH_2 - CH_3$

3-ethylhex-3-ene cannot show geometerical isomerism

(iii) $CH_3 - CH_2 - \underset{\underset{CH_3}{|}}{C} = \underset{\underset{CH_3}{|}}{C} - CH_2 - CH_3$

3, 4–dimethylhex –3-ene can show geometerical isomerism

(iv) $CH_2 = CH - \overset{*}{\underset{\underset{CH_3}{|}}{CH}} - CH_2 - CH_2 - CH_3$

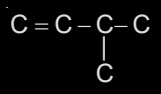
3-methylhex-1-ene has Chiral centre

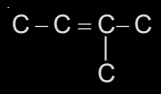
73. Answer (6)

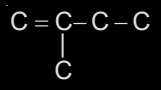
C_5H_{10}

C = C – C – C – C

C – C = C – C – C + geometrical isomer

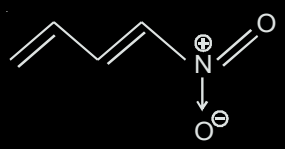


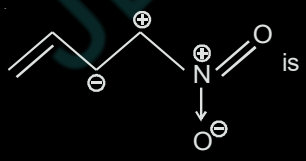




Total 6 isomers are possible

74. Answer (1)

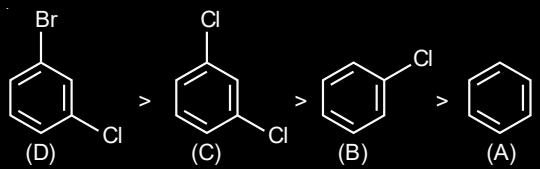


C – C double bond π electrons move towards $-NO_2$ group, so the structure  is incorrect.

75. Answer (1)

The density of the given organic compounds is decided by their molecular mass and polarity. Higher the molecular mass and higher the polarity, higher will be the density.

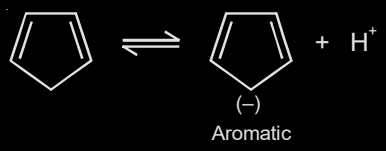
∴ Correct order of densities is



(D) > (C) > (B) > (A)

76. Answer (1)

Cyclopentadiene is the strongest acid as its conjugate base is aromatic.



Aromatic

77. Answer (12)

wt of N in given organic compound

$$= \frac{0.8 \times 42}{100} = 0.336 \text{ g}$$

moles of N = moles of NH_3

= 0.024

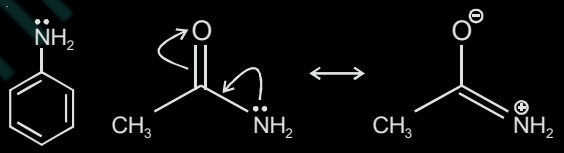
$\because$ N_1V_1 = N_2V_2

(NH_3) (H_2SO_4)

$$0.024 = 2 \times 1 \times \frac{V}{1000}$$

V = 12

78. Answer (1)



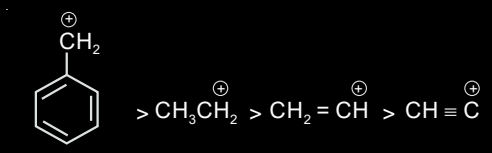
As lone pair of 'N' in amide is in conjugation with carbonyl that is strong electron.

Withdrawing group, so aniline is more basic than acetamide.

In aniline, lone pair is less available for protonation.

79. Answer (3)

Order of stability of carbocation is



A > C > B > D

Resonance; +ve charge on sp^3 hybridized carbon; +ve charge on sp^2 hybridized carbon; +ve charge on sp hybridized carbon

80. Answer (1)

Staggered and eclipsed conformers are formed because of C–C bond rotation. So they are known as Rotamers.

81. Answer (19)

Number of moles of AgCl = $\frac{0.3849}{143.37}$

$= 2.684 \times 10^{-3}$ mol

% of chlorine in the compound A is

$= \frac{2.684 \times 10^{-3} \times 35.5}{0.5} \times 100$

= 19.0564%

82. Answer (3)

Hyperconjugation, inductive and mesomeric effect are permanent electronic effect.

In $CH_3 - \overset{\oplus}{C}H_2$

Overlapping of $C_{sp^3} - H_{1s}$ bond with empty 2*p* orbital of other carbon takes place.

83. Answer (3)

Lassaigne's test – Sodium fusion extract

↓

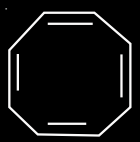
Used for detection of N, S, X, P

X = halogen

84. Answer (60)

dihedral angle is 60°

85. Answer (3)



Non planar and number of π electrons are not equal to Huckel's rule [(4n + 2)π electrons]. Hence it is non-aromatic

86. Answer (42)

Organic compound $\xrightarrow[\text{Heat}]{Na_2O_2} SO_4^{2-} \xrightarrow{BaCl_2} BaSO_4 \downarrow$

(containing sulphur)

233 gram of $BaSO_4$ contains 32 gram of sulphur

1.44 gram of $BaSO_4$ contains $\frac{1.44 \times 32}{233}$ gram of sulphur

Percentage of sulphur in the organic compound

$= \frac{\text{weight of sulphur}}{\text{weight of organic compound}} \times 100$

$= \frac{1.44 \times 32}{233 \times 0.471} \times 100 \approx 42\%$

87. Answer (1125)

The chemical formula of N,N-dimethylaminopentane is $C_7H_{17}N$ (Molar mass = 115)

Number of moles of $C_7H_{17}N$ taken = $\frac{57.5}{115} = 0.5$

$C_7H_{17}N + \left(14 + \frac{17}{2}\right)CuO$

$\rightarrow 7CO_2 + \frac{17}{2}H_2O + \frac{1}{2}N_2 + \left(14 + \frac{17}{2}\right)Cu$

For 0.5 moles of $C_7H_{17}N$, number of moles of CuO required = $\frac{1}{2}\left(14 + \frac{17}{2}\right) = \frac{45}{4} = 1125 \times 10^{-2}$

88. Answer (40)

Mass of organic compound = 0.2 gm

Mass of AgBr = 0.188

Mass of Br = $\frac{0.188 \times 80}{188}$ = 0.08 gm

Percentage of Br in the compound = $\frac{0.08 \times 100}{0.2}$

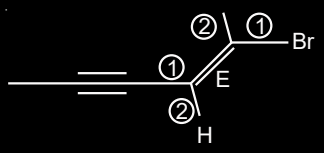
= 40%

89. Answer (3)

- Simple distillation can be used to separate a mixture of propanol and propanone.
- Two liquid with difference in B.P. around 20°C can be separated by simple distillation.
- B.P. of propanol is 370 K.

  B.P. of acetone is 329 K.

90. Answer (3)



First prioritise the groups according to CIP rule

It is (2E)-2-Bromo-hex-2-en-4-yne

91. Answer (2)

Energy in increasing order is,

Anti < Gauche < Partially Eclipsed < Eclipsed

I < III < IV < II

92. Answer (7)

$$C_2H_7N + \left(2x + \frac{y}{2}\right)CuO \longrightarrow$$

$$xCO_2 + \frac{y}{2}H_2O + \frac{z}{2}N_2 + \left(2x + \frac{y}{2}\right)Cu \quad ...(i)$$

$$C_xH_yN_z + \left(2x + \frac{y}{2}\right)CuO \longrightarrow$$

$$xCO_2 + \frac{y}{2}H_2O + \frac{z}{2}N_2 + \left(2x + \frac{y}{2}\right)Cu \quad ...(ii)$$

Comparing (i) and (ii) we get,

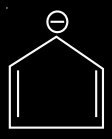
x = 2

y = 7

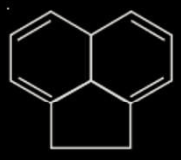
z = 1

93. Answer (2)

Compounds that are planar and that have (4n + 2) π e^- are aromatic.



π e^- = 6 follows Huckel's rule = aromatic



is non-aromatic in nature

94. Answer (63)

Millimoles of used acid = $\frac{30 \times 0.25}{2}$

Millimoles of NH_3 = 30 × 0.25 = 7.5

Mass% of nitrogen =

$$\frac{7.5}{0.166} \times 10^{-3} \times 14 \times 100 \simeq 63\%$$

95. Answer (4)

Mass of organic compound = 120 g

Mass of CO_2 = 330 g

Moles of CO_2 = $\frac{330}{44}$ = 7.5

Mass of carbon = 7.5 × 12 = 90 gm

Percentage of C = $\frac{90 \times 100}{120}$ = 75%

Mass of H_2O = 270 g

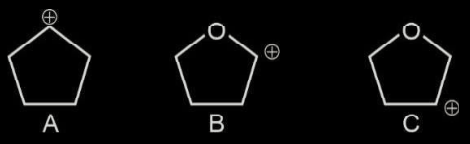
Moles of H_2O = $\frac{270}{18}$ = 15

Mass of hydrogen = 15 × 2 = 30 gm

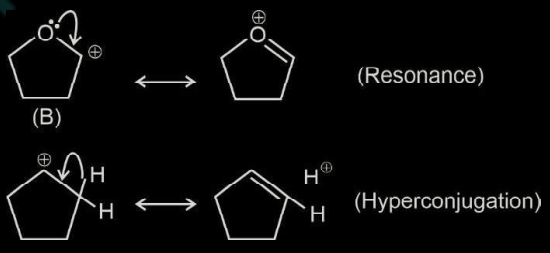
Percentage of H = $\frac{30 \times 100}{120}$ = 25%

96. Answer (Bonus)

The given carbocations are



Carbocation (A) is stabilised by hyperconjugation due to 4 α hydrogen atoms. Carbocation (C) is also stabilised by hyperconjugation due to 4 α hydrogen atoms but destabilised by –I effect of O-atom. Carbocation (B) is most stable as it is stabilised by resonance.



$\therefore$ Correct decreasing order of stability is

B > A > C

None of the given options is correct.

97. Answer (14)

Mass of organic compound = 0.2 g

Volume of N_2 gas evolved at STP = 22.4 mL

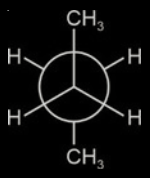
Mass of N_2 gas evolved = $\frac{22.4 \times 10^{-3} \times 28}{22.4}$

= 0.028 g

Percentage of nitrogen in the compound

$= \frac{0.028 \times 100}{0.2} = 14\%$

98. Answer (3)



It is the staggered conformation with maximum dihedral angle.

99. Answer (4)

Ethylidene chloride is $CH_3 - CHCl_2$, its IUPAC name is 1,1-Dichloromethane.

100. Answer (4)

Since, both benzoic acid and naphthalene will dissolve in benzene. Hence assertion is wrong.

Benzoic acid is almost insoluble in cold water but soluble in hot water. Hence Reason is true

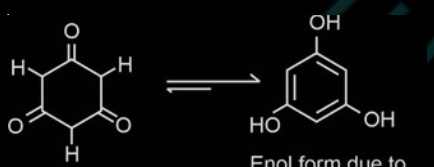
101. Answer (2)

During test for halogen, if nitrogen or sulphur is also present in the compound, then sodium fusion extract is first boiled with concentrated nitric acid to decompose cyanide or sulphide of sodium formed during Lassaigne's test.

102. Answer (1)

$NaSCN + 2Na \rightarrow NaCN + Na_2S$

103. Answer (3)



Enol form due to aromaticity is more stable

104. Answer (18)

$$C\% = \frac{12}{44} \times \frac{0.20}{0.30} \times 100$$

$$= \frac{200}{11} = 18.18 \approx 18$$

105. Answer (1)

The diagram in option (1) clearly represents separating funnel which is used to separate two immiscible liquids.

106. Answer (4)

 — Aromatic compound ($2\pi e^-$)

 — Carbene (electron deficient)

 — Anti Aromatic compound ($4\pi e^-$)

 — Non-aromatic conjugated diene

1,3-cyclohexadiene is most stable because it is a neutral molecule. All others are intermediates and hence less stable.

107. Answer (2)

Element	Mass%	Moles%	Relative moles
H	6.46	6.46	2
O	51.72	3.23	1
C	41.81	3.48	1

$\therefore$ Empirical formula = COH_2

The empirical formula goes with acetic acid CH_3COOH and formaldehyde HCHO.

Thus data agrees with 2 formulae.

108. Answer (40)

Mass of organic compound = 0.25 g

Mass of AgCl = 0.40 g

$$\% \text{ Cl} = \frac{35.5 \times (\text{mass of AgCl})}{143.5 \times (\text{mass of organic compound})} \times 100$$

$$= \frac{35.5 \times 0.40 \times 100}{143.5 \times 0.25}$$

$$= 39.581$$

$$\simeq 40$$

% Cl = 40 %

109. Answer (3)

The function of mobile phase is to carry the components present on TLC.

110. Answer (2)

 and  are aromatic as they are cyclic, planar and has $4n + 2\ \pi\ e^-$ (n = 1)

111. Answer (4)

$S^{2-} + [Fe(CN)_5NO)]^{2-} \rightarrow [Fe(CN)_5(NOS)]^{4-}$

Purple

112. Answer (34)

188 g AgBr has 80 g of Br

$\therefore$ 0.4 g AgBr $= \frac{80}{188} \times 0.4$

% of Br in given organic compound

$= \frac{80 \times 0.4}{188 \times 0.5} \times 100$

$\approx 34\%$

113. Answer (46)

$C_xH_yO_z + O_2 \longrightarrow CO_2 + H_2O$

weight of carbon $= \frac{0.793}{44} \times 12 = 0.216$ g

weight of hydrogen $= \frac{0.442}{18} \times 2 = 0.05$ g

weight of oxygen = 0.492 – (0.216 + 0.05)

= 0.226 g

% by mass of oxygen in compound $= \frac{0.226}{0.492} \times 100$

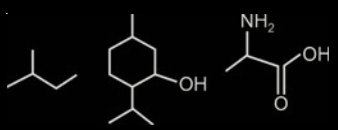
$\simeq 46\%$

114. Answer (64)

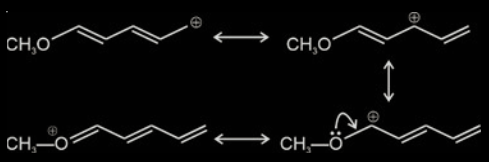
$\% N = \frac{1.4 \times N \times V}{\text{Mass of organic compound}}$

$= \frac{1.4 \times 2 \times 12.5}{0.55} = 63.63\% \simeq 64$

115. Answer (3)



116. Answer (4)



117. Answer (56)

NH_3 gas is neutralized by 2.5 mL of 2 M H_2SO_4

$\therefore$ Moles of NH_3 neutralized = 2.5 × 2 × 2 millimole

$= 10 \times 10^{-3}$ moles

$\therefore$ Weight of N present in compound will be

$= 10 \times 10^{-3} \times 14$

= 0.14 g

$\therefore$ % of 'N' in compound

$= \frac{0.14}{0.25} \times 100$

= 56%

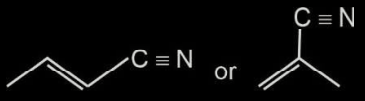
118. Answer (1)

C_4H_5N

DBE $= (C+1) - \left(\frac{H + X - N}{2}\right)$

$= 4 + 1 - \left(\frac{5-1}{2}\right) = 5 - 2 = 3$

3 double bond equivalent are present in compound



Only 1 sp^3 hybridised carbon is there

(Keeping compound as acyclic)

119. Answer (2)

$R_f = \frac{\text{Distance travelled by the substance}}{\text{Distance travelled by the solvent front}}$

$(R_f)_A = \frac{2.08}{3.25}$

$(R_f)_B = \frac{1.05}{3.25}$

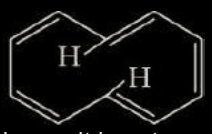
$\frac{(R_f)_A}{(R_f)_B} \simeq 2$

120. Answer (4)

Thin layer chromatography is a technique used to isolate non-volatile mixtures.

Hence, mixture of p-nitrophenol and Picric acid is separated by TLC.

121. Answer (3)



is a non-planar compound, hence it is not aromatic.

122. Answer (2)

The order of decreasing priority for functional group is

$-COOH > -SO_3H > -COOR > -COCl > -CONH_2 > -CN > -CHO > \diagdown C=O > -NH_2$

Hence correct order is

$-SO_3H > -COCl > -CONH_2 > -CN$

123. Answer (4)

[6] Annulene is aromatic because it is planar.

[8] Annulene and [10] Annulene are both not aromatic because they are not planar. So, Assertion (A) is not correct.

Reason (R) is correct because planarity is one of the requirements of aromatic system.

124. Answer (1)

188 g of AgBr = 80 g of Br

0.36 g of AgBr = $\frac{80}{188} \times 0.36$

% of Br in given organic compound

$$= \frac{80 \times 0.36}{188 \times 0.45} \times 100$$

$$= 34.04\ \%$$

125. Answer (4)

The correct match is

(A) Chloroform & Aniline	(III) Simple distillation
(B) Benzoic acid & Napthalene	(IV) Crystallisation (Sublimation is not used as both sublime heating)
(C) Water & Aniline	(I) Steam distillation
(D) Napthalene & Sodium chloride	(II) Sublimation (only naphthalene has the tendency for sublimation)

126. Answer (3)

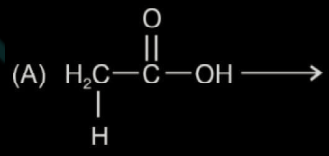
(A)  = Non-planar Heterocyclic compound

(B)  = Bicyclo compound

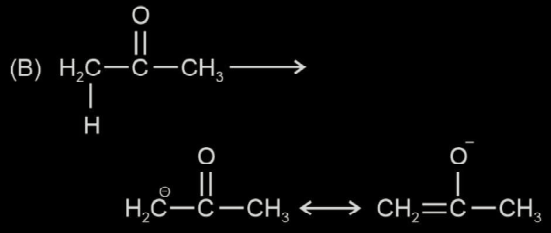
(C)  = Spiro compound

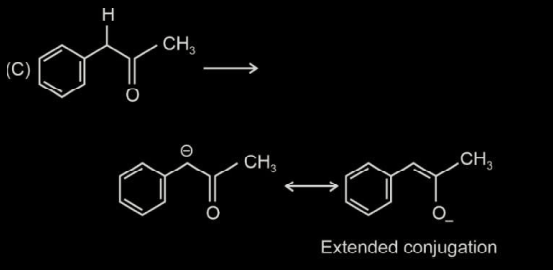
(D)  = Aromatic compound

127. Answer (3)

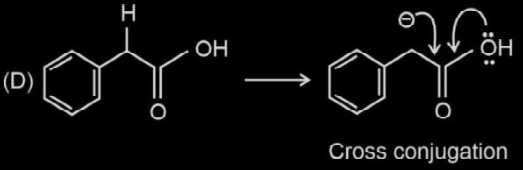
(A) 

Cross conjugation

(B) 

(C) 

Extended conjugation

(D) 

Cross conjugation

The conjugate base of compound (C) is stabilized by extended conjugation. Hence the indicated proton of compound C is most acidic i.e. will have lowest pK_a.

128. Answer (1)

Thin layer chromatography is an adsorption chromatography. A thin layer of silica gel is spread over a glass plate of suitable size and act as an adsorbent.

129. Answer (22)

$P_{actual} = 759 - 14.2 = 744.8$ mmHg

$$n_{N_2} = \frac{744.8 \times 22.78}{760 \times 0.0821 \times 280 \times 1000}$$

$= 0.000971$ mol

Mass of $N_2 = 0.02719$ gm

Percentage of nitrogen

$$= \frac{0.0271}{0.125} \times 100 = 21.75 \simeq 22$$

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