*** Chemistry** **[600]**

1. On heating, some solid substances change from solid to vapour state without passing through liquid state. The technique used for the purification of such solid substances based on the above principle is known as

   (A) Sublimation (B) Distillation (C) Chromatography (D) Crystallization

   Ans. : a

   (1) Sublimation : It is the purification technique based on principle that on heating, some solid substances change from solid to vapour state without passing through liquid state.

   (2) Distillation : It is used to separate volatile liquids from non-volatile impurities and the liquids having sufficient difference in their boiling point.

   (3) Chromatography : It is based on separation by using stationary and mobile phase.

   (4) Crystallization : It is based on difference in the solubilities of the compound and impurities in a suitable solvent.

2. In Lassaigne's extract of an organic compound, both nitrogen and sulphur are present, which gives blood red colour with Fe^{3+} due to the formation of-

   (A) $[Fe(SCN)]^{2+}$ (B) $Fe_4[Fe(CN_6)]_3 xH_2O$

   (C) $NaSCN$

   (D) $[Fe(CN)_5NOS]^{4-}$

   Ans. : c

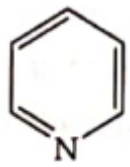
   In case nitrogen and sulphur both are present in an organic compound, sodium thiocyanate is formed, it give blood red colour and no prussian blue since there are no free cyanide Ions

   $Na + C + N + S \rightarrow NaSCN$

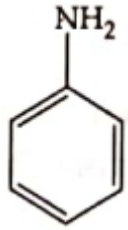
   $Fe^{+3} + SCN^{\ominus} \longrightarrow [Fe(SCN)]^{2+}$

3. The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds?

   (A)

(B)



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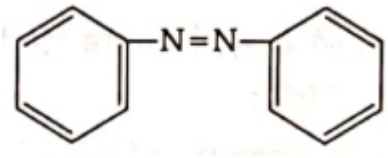
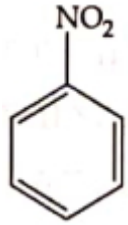
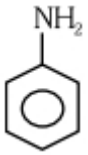


(D)



Ans. : b

Kjeldahl's method is not applicable to the compounds containing nitrogen having nitro and azo group and nitrogen present in the ring (pyridine), as nitrogen of these compounds does not change to ammonium sulphate under these conditions.



4. A liquid compound (x) can be purified by steam distillation only if it is

(A) Not steam volatile, immiscible with water

(B) Steam volatile, immiscible with water

(C) Not steam volatile, miscible with water

(D) Steam volatile, miscible with water

Ans. : b

Steam distillation technique is applied to separate the substances which are steam volatile and immiscible with water.

5. Paper chromatography is an example of

(A) Column chromatography

(B) Adsorption chromatography

(C) Partition chromatography

(D) Thin layer chromatography

Ans. : c

Paper chromatography: The principle involved is partition chromatography wherein the substances are distributed or partitioned between liquid phases. One phase is the water, which is held in the pores of the filter paper used; and other is the mobile phase which moves over the paper.

6. In Duma's method for estimation of nitrogen, $0.25\,g$ of an organic compound gave $40\,mL$ of nitrogen collected at $300\,K$ temperature and $725\,mm$ pressure. If the aqueous tension at $300\,K$ is $25\,mm$, the percentage of nitrogen in the compound is

(A) 16.76 (B) 15.76 (C) 17.36 (D) 18.20

Ans. : a

Mass of organic compound $= 0.25\,\text{g}$

Experimental values, At STP.

$V_1 = 40\,\text{mL}$

$V_2 = ?$

$T_1 = 300\,\text{K}$

$T_2 = 273\,\text{K}$

$P_1^2 = 725 - 25 = 700\,\text{mm}$

$P_2 = 760\,\text{mm}$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$V_2 = \frac{P_1V_1T_2}{T_1P_2} = \frac{700\times40\times273}{300\times760} = 33.52\,\text{mL}$

$22400\,\text{mL}$ of N_2 at STP weighs $= 28\,\text{g}$

$\therefore 33.52\,\text{mL}$ of N_2 at STP weighs $= \frac{28\times33.52}{22400}$

$= 0.0419\ \text{g}$

$\%$ of $\text{N} = \frac{\text{Mass of nitrogen at STP}}{\text{Mass of organic compound taken}} \times 100$

$= \frac{0.0419}{0.25} \times 100 = 16.76\%$

7. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from $0.75\,g$ of sample neutralized $10\,mL$ of $1\,M\,H_2SO_4$. The percentage of nitrogen in the soil is

(A) 37.33 (B) 45.33 (C) 35.33 (D) 43.33

Ans. : a

$\because M \times V(ml) = m\,mol$

$10\,\text{m mol}\,\text{H}_2\text{SO}_4 = 20\,\text{m mol}$ of NH_3

$[\text{H}_2\text{SO}_4 + 2\text{NH}_3 \longrightarrow (\text{NH}_4)_2\text{SO}_4]$

$1\,\text{mol}\,\text{NH}_3$ contains $14\,\text{g}$ nitrogen $20\times10^{-3}\,\text{mol}\,\text{NH}_3$ contains $14\times20\times10^{-3}$ nitrogen

$0.75\,\text{g}$ of sample contains

$\%$ Nitrogen $= \frac{14\times20\times10^{-3}}{0.75} \times 100 = 37.33\%$

8. Nitrogen detection in an organic compound is carried out by Lassaigne's test. The blue colour formed corresponds to which of the following formulae ?

(A) $Fe_3[Fe(CN)_6]_2$ (B) $Fe_4[Fe(CN)_6]_3$ (C) $Fe_4[Fe(CN)_6]_2$ (D) $Fe_3[Fe(CN)_6]_3$

Ans. : b

$Na + C + N \xrightarrow{\Delta} NaCN$

$2\mathrm{NaCN} + \mathrm{FeSO_4} \longrightarrow \mathrm{Fe(CN)_2} + \mathrm{Na_2SO_4}$

$Fe(CN)_2 + 4NaCN \longrightarrow Na_4[Fe(CN)_6]$

$3Na_4[Fe(CN)_6] + 4Fe^{3+} \longrightarrow Fe_4[Fe(CN)_6]_3 + 12Na^+$

It is ferri-ferrocyanide

9. In the estimation of nitrogen by KJeldahl's method, $2.8\,g$ of an organic compound required 20 milli mol of H_2SO_4 for the complete neutralisation of NH_3 gas evolved. The percentage of nitrogen in the sample is?.....%

(A) 20 (B) 10 (C) 40 (D) 30

Ans. : a

Percentage of $\mathrm{N} = \frac{1.4 \times \text{mEq. of } \mathrm{H_2SO_4} \text{ used to neutralise } \mathrm{NH_3}}{\text{Weight of compound}}$

millimoles of $\mathrm{H_2SO_4} = 20$

milliequivalent of $\mathrm{H_4SO_4} = 20 \times 2 = 40$

Percentage of N in the sample $= \frac{1.4 \times 40}{2.8} = 20\%$

10. In carius method of estimation of halogen $0.15\,g$ of an organic compound gave $0.12\,g$ of $AgBr$. Find out the percentage.....% of bromine in the compound

(A) 34.04 (B) 58.20 (C) 9.24 (D) 0.12

Ans. : a

Use given formula $\%\mathrm{Br} = \frac{80 \times \mathrm{W_{AgBr}} \times 100}{188 \times \mathrm{W_{org.compd.}}}$

11. $2.18\,gm$ of an organic compound containg sulphur produces $0.12\,g$ of $BaSO_4$. The percentage.....% of sulphur in the compound is ?

(A) 7.26 (B) 8.98 (C) 10 (D) 6.42

Ans. : d

$\mathrm{MM\ of\ AgBr} = 108 + 80 = 188\,\mathrm{gmol^{-1}}$

$\%\mathrm{S} = \frac{32}{233} \times \frac{1.02}{2.18} \times 100 = 6.42\%$

12. $58\ ml$ of $\frac{N}{5} H_2SO_4$ are used to neutralize ammonia given by $1\ g$ of organic compound. Percentage of nitrogen in the compound is

(A) 34.3 (B) 82.7 (C) 16.2 (D) 21.6

Ans. : c

(c) $\%$ of $N = \frac{1.4 \times \text{Normality of acid} \times \text{Volume of acid}}{\text{Mass of substance}}$

$= \frac{1.4 \times 1 \times 58}{1 \times 5} = 16.2.$

13. In Kjeldahl's method, the nitrogen present in the organic compound is quantitatively converted into

(A) Gaseous ammonia

(B) Ammonium sulphate

(C) Ammonium phosphate

(D) Ammonia

Ans. : d

(d) In Kjeldahl's method, the nitrogen is estimated in the form of ammonia, which is obtained by heating compounds with $NaOH$.

$CH_3CONH_2 + NaOHC \xrightarrow{\Delta} H_3COONa + H_2O + NH_3$

14. $0.5\,g$ of hydrocarbon gave $0.9\,g$ water on combustion. The percentage of carbon in hydrocarbon is

(A) 75.8 (B) 80 (C) 56.6 (D) 28.6

Ans. : b

(b) % of $H = \frac{2}{18} \times \frac{\text{wt .of } H_2O}{\text{wt .of organic compound}} \times 100$

$= \frac{2}{18} \times \frac{0.9}{0.5} \times 100 = 20\,\%$

Since percentage of hydrogen is 20. Therefore, remaining is carbon i.e. 80%.

15. A gas mixture contains 50% helium and 50% methane by volume. What is the percent by weight of methane in the mixture.....%

(A) 19.97 (B) 0.05 (C) 50 (D) 80

Ans. : d

(d) Solution contain $He + CH_4$

Their mol. wt = $4 + 16 = 20$

% wt of $CH_4 = \frac{\text{wt of } CH_4}{\text{Total wt}} \times 100 = \frac{16}{20} \times 100 = 80.0\%$

16. When $32.25\,gm$ ethyl chloride dehydro halogenated, if gives 50%. Alkene, what is the mass of product.....gm (atomic mass of chlorine = 35.5)

(A) 14 (B) 28 (C) 64.5 (D) 7

Ans. : d

(d) $C_2H_5Cl \xrightarrow{-HCl} C_2H_4$

64.5 28

32.25 28

$64.5\,gm$ C_2H_5Cl gives $28\,gm$ of C_2H_4

$32.25\,gm$ C_2H_5Cl gives $= \frac{28 \times 32.25}{64.5}$ = $14\,gm$ of C_2H_4

Obtained product is 50% so mass of obtained alkene $= \frac{14}{2} = 7\,gm$

17. In Kjeldahl's method of estimation of N, $CuSO_4$ acts as

(A) Oxidising agent (B) Reducing agent (C) Catalytic agent (D) Hydrolysis agent

Ans. : c

Kjeldahl's method depends upon the fact that most of the organic compounds containing nitrogen are quantitatively decomposed to give $(NH_4)_2SO_4$ when heated strongly with conc. H_2SO_4. In this method $CuSO_4$ acts as catalytic agent.

18. Which of the following pair of the species has the same percentage of carbon

(A) CH_3COOH and C_2H_5OH

(B) $C_6H_{12}O_6$ and $C_{12}H_{22}O_{11}$

(C) $HCOOCH_3$ and $C_{12}O_{22}H_{11}$

(D) CH_3COOH and $C_6H_{12}O_6$

Ans. : d

(d) CH_3COOH and $C_6H_{12}O_6$ both have same percentage of carbon i.e. 40%.

19. An organic compound has an empirical formula CH_2O, its vapour density is 45. The molecular formula of the compounds is

(A) CH_2O (B) C_2H_5O (C) C_2H_2O (D) $C_3H_6O_3$

Ans. : d

(d)Mol. wt = $2\times$ Vap. Density $= 2 \times 45 = 90$

Empirical formula weight $= 12 + 2 + 16 = 30$

$\therefore \quad n = \frac{\text{mol.wt.}}{\text{empirical formula wt.}}$

$= \frac{90}{30} = 3$

$\therefore$ Molecular formula of the compounds

$= (CH_2O)_3 = C_3H_6O_3$

20. A compound has an empirical formula C_2H_4O. An independent analysis gave a value of 132.16 for its molecular mass. What is the correct molecular formula

(A) $C_4H_4O_5$ (B) $C_{10}H_{12}$ (C) C_7O_3 (D) $C_6H_{12}O_3$

Ans. : d

(d)Empirical formula weight C_2H_4O

$= (12 \times 2 + 4 + 16) = 44$

Molecular formula $= \frac{\text{mol.wt}}{\text{eq.formulawt.}} \times Emp.Formula$

$= \frac{132.1}{44} \times \text{Emperical formula}$

$= 3 \times C_2H_4O = C_6H_{12}O_3$

21. The Empirical formula of a compound is CH_2O and its molecular weight is 120. The molecular formula of the compound is

(A) $C_2H_4O_2$ (B) $C_3H_6O_3$ (C) $C_4H_8O_4$ (D) CH_2O

Ans. : c

(c)Molecular weight of $C_4H_8O_4$ is 120.

22. An organic compound containing carbon hydrogen and oxygen contains 52.20% carbon and 13.04% hydrogen. Vapour density of the compound is 23. Its molecular formula will be

(A) C_2H_6O (B) C_3H_8O (C) C_4H_8O (D) $C_5H_{10}O$

Ans. : a

(a)Molecular weight = V.D. $\times 2 = 23 \times 2 = 46$

Molecular weight of $C_2H_6O = 46$

23. The percentage of N_2 in urea is about

(A) 18.05 (B) 28.29 (C) 46.66 (D) 85.56

Ans. : c

(c) Urea (NH_2CONH_2) has molecular wt. 60 and wt. of Nitrogen is 28

In $60\,gm$ of urea nitrogen present =$28\,gm$

In $100\,gm$ of urea nitrogen present = $2800/60 = 46.66\%$

24. $0.2595\,g$ of an organic substance in a quantitative analysis yielded $0.35\,g$ of the barium sulphate. The percentage of sulphur in the substance is.....g

(A) 18.52 (B) 182.2 (C) 17.5 (D) 175.2

Ans. : a

(a) $\%$ of S $= \frac{32}{233} \times \frac{\text{wt. of } BaSO_4}{\text{wt. of organic compound}} \times 100$

$= \frac{32}{233} \times \frac{0.35}{0.2595} \times 100 = 18.52\%\ gm$.

25. An organic compound with $C = 40\%$ and $H = 6.7\%$ will have the empirical formula

(A) CH_2 (B) CH_2O (C) $C_3H_6O_3$ (D) $C_2H_4O_2$

Ans. : b

(b)

Elements No. of moles Simple ratio

$C = 40\%$	$40/12$	3.33	1
$H = 6.7\%$	$6.7/1$	6.7	2
$O = 53.3\%$	$5.33/16$	3.33	1

Thus, Empirical formula =CH_2O

26. $64\,gm$ of an organic compound contains $24\,gm$ of carbon, $8\,gm$ of hydrogen and the rest oxygen. The empirical formula of the compound is

(A) CH_2O (B) C_2H_4O (C) CH_4O (D) $C_2H_8O_2$

Ans. : c

(c)

Elements No. of moles Simple ratio

C	$(24\ gm)$	$24/12=2$	1
H	$(8\,gm)$	$8/1=8$	4
O	$(32\ gm)$	$32/16=2$	1

Empirical formula = CH_4O

27. A hydrocarbon has $C=85.72\%$ and remaining H. The hydrocarbon is

(A) C_2H_4 (B) C_2H_6 (C) C_2H_2 (D) CH_4

Ans. : a

(a)

Element % No. of moles Simple ratio

C	85.72%	$85.72/12$	$7.14=1$
H	14.18%	$14.18/1$	$14.18=2$

Empirical formula =C_2H_4 .

28. An organic compound has $C=60\%$, $H=13.3\%$ and $O=26.7\%$. Its empirical formula will be

(A) C_3H_6O (B) $C_2H_6O_2$ (C) $C_4H_8O_2$ (D) C_3H_8O

Ans. : d

(d)

Elements % No. of moles Simple ratio

C	60%	$60/12=5$	3.01
H	13.3%	$13.3/1=13.3$	8.01
O	26.7%	$26.7/16=1.66$	1

Empirical formula =C_3H_8O .

29. On analysis, a saturated hydrocarbon is found to contain 83.70 percent carbon and 16.30% hydrogen. The empirical formula will be (at. wt. of $C=12$, at. wt. of $H=1$)

(A) C_3H_6 (B) C_3H_8 (C) C_3H_7 (D) C_6H_{12}

Ans. : c

(c)

Element	No. of moles	Simple ratio
$C=83.7\%$	$83.7/12=6.9$	$6.9/6.9=1\times3=3$

$H = 16.3\%$	$16.3/1 = 16.3$	$16.3/0.9 = 2.3 \times 3 = 7$

Empirical formula =C_3H_7 .

30. A compound has 50% carbon, 50% oxygen and approximate molecular weight is 290. Its molecular formula is

(A) CO (B) C_4O_3 (C) $C_{12}O_9$ (D) C_3O_3

Ans. : c

(c)

Elements	simple ratio
$C = 50$	$50/12 = 4$
$0 = 50$	$50/16 = 3$

Empirical formula mass = 96 Empirical formula = C_4O_3

$n = \frac{290}{96} = 3$

Molecular formula = $(C_4O_3)_3 = C_{12}O_9$

31. An organic compound gave the following results $C = 53.3\%, H = 15.6, N = 31.1\%$, mol. wt. = 45, What is molecular formula of the compound ?

(A) $C_2H_5N_2$ (B) C_2H_5N (C) C_2H_7N (D) C_2H_6N

Ans. : c

(c)

Element No. of Moles Simple Ratio

$C = 53.3$	$53.3/12 = 4.44$	2
$H = 15.6$	$15.6/1 = 15.6$	7
$N = 31.1$	$31.1/14 = 2.22$	1

Hence, formula = C_2H_7N or $(CH_3CH_2NH_2)$

32. An organic compound gave $C = 92.31\%$ and $H = 7.69\%$. If molecular weight of the compound is 78, its molecular formula is

(A) C_6H_6 (B) C_7H_7 (C) C_6H_{18} (D) C_8H_{20}

Ans. : a

(a)

Elements	No. of Moles	Simple ratio
$C = 92.31$	$92.31/12 = 7.96$	1
$H = 7.69$	$7.69/1 = 7.69$	1

Hence, CH

Empirical formula mass of $CH = 13$

$n = \frac{\text{Mol.mass}}{\text{Emp. mass}} = \frac{78}{13} = 6$

Molecular formula = $(CH)_6 = C_6H_6$.

33. In Kjeldahl's method for the estimation of nitrogen, the formula used is

(A) $\%N = \frac{1.4\,VW}{N}$ (B) $\%N = \frac{1.4\,NW}{V}$ (C) $\%N = \frac{VNW}{1.8}$ (D) $\%N = \frac{1.4VN}{W}$

Ans. : d

(d) % of $N = \frac{1.4 \times V \times N}{W}$

where V = Volume of acid used

N = Normality of acid, W = Weight of substance

34. Empirical formula of a compound is C_2H_5O and its molecular weight is 90. Molecular formula of the compound is

(A) C_2H_5O (B) $C_3H_6O_3$ (C) $C_4H_{10}O_2$ (D) $C_5H_{14}O$

Ans. : c

(c)Empirical formula mass =$C_2H_5O = 24 + 5 + 16 = 45$.

$n = \frac{\text{Mol.mass}}{\text{Emp.mass}} = \frac{90}{45} = 2$

Mol. formula = $(C_2H_5O)_2 = C_4H_{10}O_2$.

35. An organic compound contains $C = 74.0\%$, $H = 8.65\%$ and $N = 17.3\%$. Its Empirical formula is

(A) C_5H_8N (B) $C_{10}H_{12}N$ (C) C_5H_7N (D) $C_{10}H_{14}N$

Ans. : c

(b)

Element No. of Moles Simple Ratio

$C = 74$	$74/12 = 6.1$	$6.1/1.2 = 5.08$ or 5
$H = 8.65$	$8.65/1 = 8.65$	$8.6/1.2 = 7.16$ or 7

N $= 17.3$	$17.3/14$ $= 1.2$	$1.2/1.2 = 1$ or 1

Therefore Empirical formula $= C_5H_7N$.

36. $0.24\,g$ of an organic compound gave $0.22\,g$ CO_2 on complete combustion. If it contains 1.66% hydrogen, then the percentage of C and O will be

(A) 12.5 and 36.6 (B) 25 and 75 (C) 25 and 36.6 (D) 25 and 80

Ans. : b

(b) % of C = $\frac{12}{44} \times \frac{\text{Mass of } CO_2}{\text{Mass of substance}} \times 100$

= $\frac{12 \times 0.22}{44 \times 0.24} \times 100 = 25$; $C = 25$, $H = 1.66$

Total = $26.6 = 100 - 26.6 = 73.4$.

37. In the estimation of sulphur organic compound on treating with conc. HNO_3 is converted to

(A) SO_2 (B) H_2S (C) H_2SO_4 (D) SO_3

Ans. : c

(c)In carius method sulphur of organic compound is converted in to H_2SO_4

$$S + H_2O + 3O \xrightarrow[HNO_3]{\Delta} H_2SO_4$$

38. An organic compound contains $C = 36\%$ $H = 6\%$ and rest oxygen. Its Empirical formula is

(A) CH_2O (B) $C_2H_3O_3$ (C) CH_2O_2 (D) $C_2H_2O_2$

Ans. : a

Element % No. of Moles Simple Ratio

C	36	$36/12 = 3$	$3/3 = 1$
H	6	$6/1 = 6$	$6/3 = 2$
O	58	$58/16$ $= 3.62$	$3.62/3 = 1$

Therefore, Empirical formula =CH_2O

39. In Lassaigne's test the organic compound is fused with Na followed by extraction with distilled water. Which of the following is not the product of this fusion reaction

(A) NaX (B) $NaCN$ (C) $NaNC$ (D) Na_2S

Ans. : (C) $NaNC$

40. Copper (II) ions gives reddish brown precipitate with potassium ferrocyanide. The formula of the precipitate is

(A) $Cu_4[Fe(CN)_6]$ (B) $Cu_2[Fe(CN)_6]$ (C) $Cu_3[Fe(CN)_6]$ (D) $Cu_3[Fe(CN)_6]_2$

Ans. : b

41. In a Lassaignes's test for sulphur in the organic compound with sodium nitroprusside solution the purple colour formed is due to

(A) $[Fe(CN)_5NOS]^{4-}$ (B) $[Fe(CN)_5S]^{2-}$ (C) $[Fe(CN)_5NOS]^{2-}$ (D) $[Fe(CN)_6]^{4-}$

Ans. : a

During the preparation of Lassaigne's extract, sulphur from the organic compound reacts with sodium to form sodium sulphide. It gives a purple colour with sodium nitroprusside due to the formation of sodium thionitroprusside.

42. If on adding $FeCl_3$ solution to acidified Lassaigne solution, of organic compound a blood redcolouration is producted, it indicates the presence of

(A) S (B) N (C) N and S (D) S and Cl

Ans. : c

$\mathrm{Na + S + C + N \rightarrow NaSCN} \xrightarrow{\mathrm{Fe^{+3}}}$ Blood red colouration $[NCERT\ XI\ pg.\#355]$

43. In organic compounds, nitrogen is tested in Lassaigne's test as

(A) $NaNH_2$ (B) $NaCN$ (C) $NaNO_2$ (D) $NaNO_3$

Ans. : b

It's obvious.

44. In the qualitative analysis of nitrate a brown ring is formed due to the formation of

(A) NO_2 (B) $FeSO_4NO_2$ (C) $N_2O.FeSO_4$ (D) $FeSO_4.NO$

Ans. : d

(d)Nitrates on reaction with conc. H_2SO_4 and $FeSO_4$ give a brown ring due to formation of $FeSO_4.NO$ or $[Fe(H_2O)_5NO]SO_4$.

45. In Carius method $0.099\,g$ organic compound gave $0.287\,g$ $AgCl$. The percentage of chlorine in the compound will be

(A) 28.6 (B) 71.7 (C) 35.4 (D) 64.2

Ans. : b

(b) % of chlorine = $\frac{35.5}{143.5} \times \frac{\text{Mass of } AgCl}{\text{Mass of substance}} \times 100$

= $\frac{35.5}{143.5} \times \frac{0.287}{0.099} \times 100 = 71.71\%$.

46. In Aniline & water mixture, Aniline can be seperate by

(A) Steam distillation

(B) Fractional distillation

(C) Simple distillation

(D) Distillation under reduced pressure

Ans. : a

Steam distillation is a separation process which consists in distilling water together with other volatile and non-volatile components.

The steam distillation process works on the principle that when a mixture of two or more undissolved liquids are heated, while ensuring that the surfaces of both liquids are in contact with the atmosphere, the vapor pressure exerted by the system increases.

This is because it now becomes the sum of the vapor pressures of all of the components of the mixture combined together.

This allows for evaporation of elements with high boiling points at much lower temperatures merely by allowing them to form a mixture with water.

Aniline is separated from a mixture by using this method.

47. A mixture of sand and iodine can be separated by

(A) Crystallisation

(B) Sublimation

(C) Distillation

(D) Fractional distillation

Ans. : b

(b) Iodine shows sublimation and hence volatalizes on heating, the vapour condenses on cooling to give pure iodine.

48. A mixture of camphor and benzoic acid can be separated by

(A) Sublimation

(B) Chemical method

(C) Fractional distillation

(D) Extraction with a solvent

Ans. : a

Aqueous solution of $NaHCO_3$ can be used to separate benzoic acid from its mixture with camphor. Benzoic acid forms water soluble sodium benzoate with $NaHCO_3$. So, A mixture of camphor and benzoic acid can be easily separated by Chemical method.

49. $p-$ nitrophenol and $o-$ nitrophenol are separated by

(A) Crystallisation

(B) Fractional crystallisation

(C) Distillation

(D) Steam distillation

Ans. : d

(d) $o-$ nitro phenol has intra molecular hydrogen bonding, while $p-$ nitrophenol has intermolecular hydrogen bonding (comparitively stronger). Due to this reason, the boiling point of $o-$ nitrophenol is found quite less than that of $p-$ nitrophenol. Hence, $o-$ nitrophenol is steam volatile and can be separated from $p-$ nitrophenol by steam distillation.

50. To differentiate between carbon-12, carbon- 13 and carbon- 14, the instrument that you would use in

(A) Infra-red spectrometer

(B) Atomic absorption spectrometer

(C) Mass spectrometer

(D) Ultraviolet spectrometer

Ans. : c

It's obvious.

51. A mixture of methyl alcohol and acetone can be separated by

(A) Distillation

(B) Fractional distillation

(C) Steam distillation

(D) Distillation under reduced pressure

Ans. : b

Fractional distillation

$B.P.$ of methanol and acetone are $338\,K$ and $330\,K$ which have boiling points very close to each other and hence they are separated by fractional distillation method.

52. Given below are two statements :

Statement (I) : Kjeldahl method is applicable to estimate nitrogen in pyridine.

Statement (II) : The nitrogen present in pyridine can easily be converted into ammonium sulphate in Kjeldahl method.

In the light of the above statements, choose the correct answer from the options given below.

(A) Both Statement I and Statement II is false

(B) Statement I is false but Statement II is true

(C) Both Statement I and Statement II is true

(D) Statement I is true but Statement II is false

Ans. : a

Nitrogen present in pyridine can not be estimated by Kjeldahl method as the nitrogen present in pyridine can not be easily converted into ammonium sulphate.

53. Match List I with List II

List-I (Compound)	List-II (Colour)
A $Fe_4[Fe(CN)_6]_3 \cdot xH_2O$	I Violet
B $[Fe(CN)_5NOS]^{4-}$	II Blood Red
C $[Fe(SCN)]^{2+}$	III Prussian Blue

$D\ (NH_4)_3PO_4 \cdot 12MoO_3$	IV Yellow

Choose the correct answer from the options given below :

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

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

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

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

Ans. : a

$Fe_4[Fe(CN)_6]_3 \cdot xH_2O \rightarrow$ Prussian Blue

$[Fe(CN)_5NOS]^{4-} \rightarrow$ Violet

$[Fe(SCN)]^{2+} \rightarrow$ Blood Red

$(NH_4)_3PO_4 \cdot 12MoO_3 \rightarrow$ Yellow

54. Methods used for purification of organic compounds are based on:

(A) neither on nature of compound nor on the impurity present.

(B) nature of compound only.

(C) nature of compound and presence of impurity.

(D) presence of impurity only.

Ans. : c

Organic compounds are purified based on their nature and impruity present in it.

55. The correct statements among the following, for a "chromatography" purification method is:

(A) Organic compounds run faster than solvent in the thin layer chromatographic plate.

(B) Non-polar compounds are retained at top and polar compounds come down in column chromatography.

(C) R_f of a polar compound is smaller than that of a non-polar compound.

(D) R_f is an integral value.

Ans. : c

Non polar compounds are having higher value of R_f than polar compound.

56. Which of the following statements are correct?

A. Glycerol is purified by vacuum distillation because it decomposes at its normal boiling point.

B. Aniline can be purified by steam distillation as aniline is miscible in water.

C. Ethanol can be separated from ethanol water mixture by azeotropic distillation because it forms azeotrope.

D. An organic compound is pure, if mixed $M.P.$ is remained same.

Choose the most appropriate answer from the options given below :

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

Ans. : b

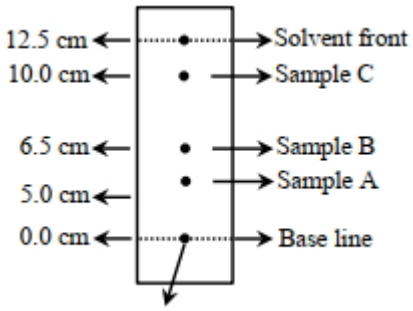
Option (B) is incorrect because aniline is immisible in water.

57. Using the given figure, the ratio of R_t values of sample A and sample C is $\mathrm{x} \times 10^{-2}$. Value of x is . . . . . .

(Image)

Samples (A, B, C)

Fig : Paper chromatography of Samples



(A) 50 (B) 40 (C) 30 (D) 20

Ans. : a

R_f of $A = \frac{5}{12.5}$ R_f of $C = \frac{10}{12.5}$

$\text{Ratio } = \frac{R_{f(A)}}{R_{f(C)}} = \frac{1}{2} = 0.5 \text{ or } 50 \times 10^{-2}$

58. The adsorbent used in adsorption chromatography 1s/are

A. silica gel B. alumina C. quick lime D. magnesia

Choose the most appropriate answer from the options given below :

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

Ans. : c

The most common polar and acidic support used is adsorption chromatography is silica. The surface silanol groups on their supported to adsorb polar compound and work particularly well for basic substances. Alumina is the example of polar and basic adsorbent that is used in adsorption chromatography.

59. Following Kjeldahl's method, $1\ \mathrm{g}$ of organic compound released ammonia, that neutralised $10\ \mathrm{mL}$ of $2\mathrm{M}\ \mathrm{H_2SO_4}$. The percentage of nitrogen in the compound is_____ %.

(A) 50 (B) 56 (C) 70 (D) 80

Ans. : b

$\mathrm{H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2SO_4}$

Millimole of $\mathrm{H_2SO_4} \rightarrow 10 \times 2$

So Millimole of $\mathrm{NH_3} = 20 \times 2 = 40$

Organic $\rightarrow$ $\mathrm{NH_3}$

Compound 40 Millimole

$\therefore$ Mole of $N = \frac{40}{1000}$

wt. of $N = \frac{40}{1000} \times 14$

$\%$ composition of N in organic compound

$= \frac{40 \times 14}{1000 \times 1} \times 100$

$= 56\%$

60. In Kjeldahl's method for estimation of nitrogen, $CuSO_4$ acts as :

(A) Reducing agent (B) Catalytic agent (C) Hydrolysis agent (D) Oxidising agent

Ans. : b

Kjeldahl's method is used for estimation of N_1 trogen where $CuSO_4$ acts as a catalyst.

61. Lassaigne's test is used for detection of :

(A) Nitrogen and Sulphur only

(B) Nitrogen, Sulphur and Phosphorous Only

(C) Phosphorous and halogens only

(D) Nitrogen, Sulphur, phosphorous and halogens

Ans. : d

Lassaigne's test is used for detection of all element N, S, P, X

62. The Lassiagne's extract is boiled with dil HNO_3 before testing for halogens because,

(A) $AgCN$ is soluble in HNO_3

(B) Silver halides are soluble in HNO_3

(C) Ag_2S is soluble in HNO_3

(D) Na_2S and $NaCN$ are decomposed by HNO_3

Ans. : d

If nitrogen or sulphur is also present in the compound, the sodium fusion extract is first boiled with concentrated nitric acid to decompose cyanide or sulphide of sodium during Lassaigne's test

63. Appearance of blood red colour, on treatment of the sodium fusion extract of an organic compound with $FeSO_4$ in presence of concentrated H_2SO_4 indicates the presence of element/s

(A) Br (B) N (C) N and S (D) S

Ans. : c

$$Fe^{2+} \xrightarrow[\text{Conc. } H_2SO_4]{H^+} Fe^{+3}$$

$$Fe^{+3} \xrightarrow{-SCN} Fe(SCN)_3 (\text{ blood red colour })$$

Appearance of blood red colour indicates presence of both nitrogen and sulphur.

64. The fragrance of flowers is due to the presence of some steam volatile organic compounds called essential oils. These are generally insoluble in water at room temperature but are miscible with water vapour in vapour phase. A suitable method for the extraction of these oils from the flowers is

(A) crystallisation

(B) distillation under reduced pressure

(C) distillation

(D) steam distillation

Ans. : d

Steam distillation technique is applied to separate substances which are steam volatile and are immiscible with water.

65. Match List I with List II

LIST I (Technique)	LIST II (Application)
A. Distillation	I. Separation of glycerol from spent-lye
B. Fractional distillation	IIAniline - Water mixture
C. Steam distillation	IIISeparation of crude oil fractions
D. Distillation under reduced pressure	IV.Chloroform Aniline

Choose the correct answer from the options given below:

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

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

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

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

Ans. : b

Fact $(NCERT)$

66. 'Adsorption' principle is used for which of the following purification method?

(A) Extractiondd manage bookmarks

(B) Chromatography

(C) Distillatio

(D) Sublimation

Ans. : b

Principle used in chromotography is adsorption.

67. Which among the following purification methods is based on the principle of "Solubility" in two different solvents?

(A) Column Chromatography

(B) Sublimation

(C) Distillation

(D) Differential Extraction

Ans. : d

Different Extraction

Different layers are formed which can be separated in funnel. (Theory based).

68. On a thin layer chromatographic plate, an organic compound moved by $3.5\ \text{cm}$, while the solvent moved by $5\ \text{cm}$. The retardation factor of the organic compound is____ $\times 10^{-1}$

(A) 06 (B) 07 (C) 8 (D) 5

Ans. : b

Retardation factor $= \frac{\text{Distance travelled by sample/organic compound}}{\text{Distance travelled by solvent}} = \frac{3.5}{5} = 7 \times 10^{-1}$

69. Chromatographic technique/s based on the principle of differential adsorption is/are

A. Column chromatography

B. Thin layer chromatography

C. Paper chromatography

Choose the most appropriate answer from the options given below:

(A) B only (B) A only (C) A & B only (D) C only

Ans. : c

Memory Based

70. The technique used for purification of steam volatile water immiscible substance is:

(A) Fractional distillation

(B) Fractional distillation under reduced pressure

(C) Distillation

(D) Steam distillation

Ans. : d

Steam distillation is used for those liquids which are insoluble in water, containing non-volatile impurities and are steam volatile.

71. $0.400\,g$ of an organic compound (X) gave $0.376\,g$ of $AgBr$ in Carius method for estimation of bromine. % of bromine in the compound (X) is ..... .(Given: Molar mass $AgBr = 188\,g\,mol^{-1} Br = 80\,g\ mol^{-I}$)

(A) 20 (B) 30 (C) 50 (D) 40

Ans. : d

mole of $AgBr = \frac{0.376}{188}$

mole of Br^- =mole of $AgBr = \frac{0.376}{188}$

mass of $Br^- = \frac{0.376}{188} \times 80$

% of $Br^- = \frac{0.376 \times 80}{188 \times 0.4} \times 100 = 40\%$

72. $0.5\,g$ of an organic compound (X) with 60% carbon will produce .....$\times 10^{-1}\,g$ of CO_2 on complete combustion.

(A) 10 (B) 11 (C) 12 (D) 13

Ans. : b

Percentage of Carbon

$= \frac{12}{44} \times \frac{\text{mass of } CO_2 \text{ formed}}{\text{mass of compound taken}} \times 100$

$60 = \frac{12}{44} \times \frac{\text{mass of } CO_2 \text{ formed}}{0.5} \times 100$

Mass of CO_2 formed $= \frac{60 \times 44 \times 0.5}{12 \times 100}\,g$

$= 1.1$ gram

$= 11 \times 10^{-1}$ gram

73. On complete combustion, $0.492\,g$ of an organic compound gave $0.792\,g$ of CO_2.The % of carbon in the organic compound is ..... (Nearest integer)

(A) 42 (B) 43 (C) 48 (D) 44

Ans. : d

weight of C in $0.792\,gm CO_2$

$= \frac{12}{44} \times 0.792 = 0.216$

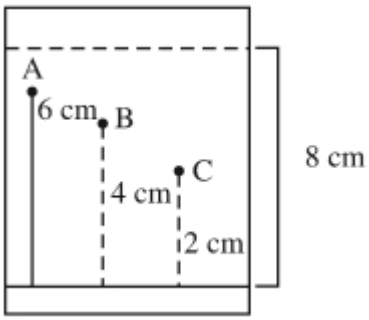
% of C in compound $= \frac{0.216}{0.492} \times 100$

$= 43.90\%$

Ans:44

74. Three organic compounds A, B and C were allowed to run in thin layer chromatography using hexane and gave the following result (see figure). The R_f

value of the most polar compound is ..... $\times 10^{-2}$



(A) 24 (B) 25 (C) 23 (D) 22

Ans. : b

More R_f, less its polarity

$$R_f = \frac{\text{Distance travelled by compound '}X\text{'}}{\text{Distance travelled by solvent '}Y'}$$

$= \frac{2}{8} = 0.25 = 25 \times 10^{-2}$

75. Match List I with List II

List I Element detected	List II Reagent used/Product formed
A Nitrogen	$I.\ Na_2[Fe(CN)_5NO]$
B Sulphur	$II.\ AgNO_3$
C Phosphorous	$III.\ Fe_4[Fe(CN)_6]_3$
D Halogen	$IV.\ (NH_4)_2MoO_4$

Choose the correct answer from the options given below:

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

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

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

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

Ans. : d

Nitrogen detection by lassaigne's method

$Na + C + N \rightarrow NaCN$

$6NaCN + FeSO_4 \rightarrow Na_4[Fe(CN)_6] + Na_2SO_4$

$Na_4[Fe(CN)_6] + Fe^{3+} \rightarrow Fe_4[Fe(CN)_6]_3$

(Prussian blue)

Sulphur detection by Sodium nitroprusside

$Na_2[Fe(CN)_5NO] + Na_2S \rightarrow Na4[Fe(CN)_5NOS]$

[Purple]

Phosphorus detection by ammonium molybdate

$Na_3PO_4 + 3HNO_3 \rightarrow H_3PO_4 + 3NaNO_3$

$H_3PO_4 + 12(NH_4)_2MoO_4 + 21HNO_3 \rightarrow$

$(NH_4)_3PO_4.12MoO_3 + 21NH_4NO_3 + 12H_2O$

(canary yellow)

Halogen give specific coloured ppt with

$AgNO_3(aq)$

$NaCl + AgNO_3(aq) \rightarrow AgCl + NaNO_3$

(White)

$NaBr + AgNO_3(aq) \rightarrow AgBr + NaNO_3$

(Pale yellow)

$NaI + AgNO_3(aq) \rightarrow AgI + NaNO_3$

(Yellow)

76. In sulphur estimation. $0.471\,g$ of an organic compound gave $1.4439\,g$ of barium sulphate.The percentage of sulphur in the compound is ..... (Nearest Integer)(Given: Atomic mass Ba: $137u : S : 32u, O : 16u$)

(A) 41 (B) 42 (C) 40 (D) 38

Ans. : b

$$\% \text{ sulphur} = \frac{32}{233} \times \frac{\text{weight of } BaSO_4 \text{ formed}}{\text{weight of organic compound}} \times 100$$

$$= \frac{32}{233} \times \frac{1.4439}{0.471} \times 100$$

$$= 42.10$$

Nearest integer 42

77. Prolonged heating is avoided during the preparation of ferrous ammonium sulphate to

(A) prevent oxidation (B) prevent reduction

(C) prevent hydrolysis (D) prevent breaking

Ans. : a

Prolonged heating will cause oxidation of Fe^{+2} to Fe^{+3}.

78. Which of the following statement is correct for paper chromatography ?

(A) Water present in the mobile phase gets absorbed by the paper which then forms the stationary phase.

(B) Water present in the pores of the paper forms the stationary phase.

(C) Paper sheet forms the stationary phase.

(D) Paper and water present in its pores together form the stationary phase.

Ans. : b

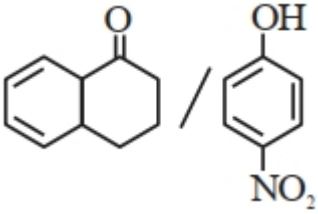
In paper chromatography, a special quality paper known as chromatography paper is used. Paper contains water trapped in it, which acts as the stationary phase.

79. Match items of column I and II

Column I (Mixture of compounds)	Column II (Separation Technique)
A H_2O/CH_2Cl_2	I Crystallization

B $Image$	II Differential solvent extraction
C Kerosene/Naphthalene	III Column chromatography
D $C_6H_{12}O_6/NaCl$	IV Fractional Distillation

Correct match is :



(A) $A-(iii), B-(iv), C-(ii), D-(i)$

(B) $A-(i), B-(iii), C-(ii), D-(iv)$

(C) $A-(ii), B-(iii), C-(iv), D-(i)$

(D) $A-(ii), B-(iv), C-(i), D-(iii)$

Ans. : c

A. $H_2O/CH_2Cl_2 \rightarrow ii$, $CH_2Cl_2 > H_2O$ (density) so they can be separated by differential solvent extraction.B.

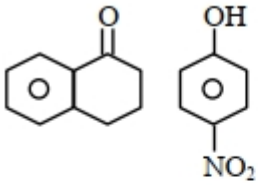
C. Kerosene / Naphthalene $\rightarrow$ iv. Fractional distillation.

Due to different B.P. of kerosene and Naphthalene it can be separated by fractional distillation.

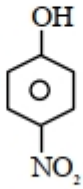
D. $C_6H_{12}O_6/NaCl \rightarrow$ i. Crystallization.

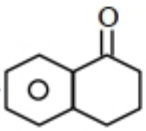
$NaCl$ (ionic compound) can be crystallized.

B.



iii. column chromatography

Due to H-bonding in  it can be separated

from  by column chromatography.

80. Match List I with List II:

List I (Mixture)	List II (Separation Technique)
A $CHCl_3 + C_6H_5NH_2$	I Steam distillation

$B\ C_6H_{14}+C_5H_{12}$	II Differential extraction
$C\ C_6H_5NH_2+H_2O$	III Distillation
D Organic compound in H_2O	IV Fractional distillation

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

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

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

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

Ans. : b

List I (Mixture)	List II (Separation Technique)
$A\ CHCl_3+C_6H_5NH_2$	I Distillation
$B\ C_6H_{14}+C_5H_{12}$	II Fractional distillation
$C\ C_6H_5NH_2+H_2O$	III Steam distillation
D Organic compound in H_2O	IV Differential extraction

NCERT (XI) Vol. 2 Page No. $359, 360$.

81. 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).

(a) The vapour pressure of water at $280K$ is $14.2\,mmHg$

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

(A) 22 (B) 23 (C) 21 (D) 20

Ans. : a

$V=22.78\,ml, T=280\,K$

$P_{\text{total}}=759\,mmHg$

$P_{N_2}=759-14.2=744.8\,mmHg$

$n_{N_2}=\frac{744.8\times22.78}{760\times1000\times0.082\times280}=0.00097$

$W_{\text{Nitrogen}}=0.02716$

$\%N=\frac{0.02716}{0.125}\times1000=21.728$

82. On complete combustion of $0.492\,g$ of an organic compound containing C, H and $O, 0.7938\,g$ of CO_2 and $0.4428\,g$ of H_2O was produced. The $\%$ composition of oxygen in the compound is .....

(A) 46 (B) 44 (C) 43 (D) 42

Ans. : a

$0.492\,g$ of $C_xH_yO_z$

Gives $0.7938\,g\,CO_2=0.018$ moles

$0.4428\,g\,H_2O=0.0246$ moles

So moles of $C = 0.018 \Rightarrow 0.216\,g$

Moles of $H = 0.049 \Rightarrow 0.049\,g$

$\therefore$ wt. of Oxygen $= 0.492 - 0.216 - 0.049$

$\%$ of Oxygen $= \frac{0.227}{0.492} \times 10046$ (approx.)

83. 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).

(A) 340 (B) 90 (C) 188 (D) 34

Ans. : d

$O.C \longrightarrow AgBr$

$0.5\,g \quad 0.4\,g$

mol of $Br = mol$ of $AgBr = \frac{0.4}{188}$

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

$= 34.04\,\%$

84. 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)

(A) 64 (B) 92 (C) 50 (D) 46

Ans. : d

Mole of CO_2 = Moles of $C = \frac{0.793}{44}$

Weight of ' C ' $= \frac{0.793}{44} \times 12 = 0.216\,gm$

Moles of ' $H' = \frac{0.442}{18} \times 2$

Weight of ' $H' = \frac{0.442}{18} \times 2 \times 1 = 0.049\,gm$

$\therefore$ Weight of ' O ' $= 0.492 - 0.216 - 0.049 = 0.227\,gm$ $\%$ of ' $''$ $= \frac{0.227}{0.492} \times 100 = 46.13\,\%$

85. $0.25\,g$ 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 $35.5\,g\,mol^{-1}$)

(A) 40 (B) 140 (C) 80 (D) 143

Ans. : a

wt. of organic compound $= 0.25\,g$

mass of $Cl = \frac{35.5}{143.5} \times 0.4\,g$

mass $\%$ of Cl in the organic compound

$= \frac{35.5 \times 0.4}{143.5 \times 0.25} \times 100$

$= 39.58\,\%$

86. 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)

(A) 18 (B) 180 (C) 65 (D) 74

Ans. : a

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

$0.3g \qquad 0.2g \qquad 0.1g$

$\frac{n_{CO_2}}{n_{H_2O}} = \frac{x}{y/2} = \frac{0.2/44}{.1/18}$

$\frac{2x}{y} = \frac{36}{44} = \frac{9}{11}$

$x = \frac{9y}{22}$

$\frac{n_{C_xH_yO_z}}{nCO_2} = \frac{1}{x}$

$\frac{0.3}{12x+y+16z} \times \frac{44}{0.2} = \frac{1}{x}$

$66x = 12x + y + 16z$

$54x = y + 16z$

$\frac{54 \times 9y}{22} - y = 16z$

$\frac{464y}{22} = 16z$

$z = \frac{29y}{22}$

$C_xH_yO_z = C_xH_yO_z$

$C_{\frac{9y}{22}} H_y O_{\frac{29y}{22}}^{22}$

$C_9H_{22}O_{29}$

$\%$ of $C = \frac{12 \times 9}{(12 \times 9 + 22 + 29 \times 16)} \times 100 = \frac{108}{594} \times 100$

$18.18\,\%$

87. $0.2\,g$ of an organic compound was subjected to estimation of nitrogen by Dumas 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 $28\,mol^{-1}$. Molar volume of N_2 at STP : $22.4\,L$)

(A) 14 (B) 21 (C) 18 (D) 56

Ans. : a

weight of organic compound $= 0.2\,g$

mass of $N_2(g)$ evolved $= \frac{22.4 \times 10^{-3}}{22.4} \times 28$

$= 28 \times 10^{-3}\,g$

$\%$ of $N = \frac{28 \times 10^{-3}}{0.2} \times 100 = 14$

88. 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.....

(A) 5 (B) 3 (C) 8 (D) 2

Ans. : d

$$\frac{R_{F_A}}{R_{F_B}} = \frac{\frac{2.08}{3.25}}{\frac{1.05}{3.25}} = \frac{2.08}{1.05} \simeq 2$$

89. The formula of the purple colour formed in Laissaigne's test for sulphur using sodium nitroprusside is .....

(A) $NaFe[Fe(CN)_6]$ (B) $Na[Cr(NH_3)_2(NCS_4]$

(C) $Na_2[Fe(CN)_5(NO)]$ (D) $Na_4[Fe(CN)_5(NOS)]$

Ans. : d

$Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5NO_5]$

90. During the qualitative analysis of salt with cation y^{2+}, addition of a reagent (X) to alkaline solution of the salt gives a bright red precipitate. The reagent (X) and the cation (y^{2+}) present respectively are .... .

(A) Dimethylglyoxime and Ni^{2+}

(B) Dimethylglyoxime and Co^{2+}

(C) Nessler's reagent and Hg^{2+}

(D) Nessler's reagent and Ni^{2+}

Ans. : a

$Ni^{2+} + DMG^- \rightarrow [Ni(DMG)_2]\downarrow$

(Bright red precipitate)

91. Match List$-I$ with List$-II$

List$-I$	List$-II$
(A) Chloroform and Aniline	(I) Steam distillation
(B) Benzoic acid and Napthalene	(II) Sublimation
(C) Water and Aniline	(III) Distillation
(D) Napthalene and Sodium chloride	(IV) Crystallisation

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

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

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

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

Ans. : d

(A) Chloroform + Aniline $\rightarrow$ (III) Distillation

(B) Benzoic acid + Napthalene $\rightarrow$ (IV) Crystallisation

(C) Water + Aniline $\rightarrow$ (I) Steam distillation

(D) Napthalene + Sodium chloride $\rightarrow$ (II) Sublimation

92. 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)

(A) 1 (B) 84 (C) 32 (D) 64

Ans. : d

Meq of H_2SO_4 used by $NH_3 = 12.5 \times 1 \times 2 = 25$

$\%$ of N in the compound $= \frac{25 \times 10^{-3} \times 14 \times 100}{0.55} = 63.6$

93. Which of the following is structure of a separating finnel?

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

Ans. : a

It is used to separate liquid-liquid mixture which is immiscible with different densities.

94. 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: $Ag = 108$, $Br = 80$]

(A) 4 (B) 400 (C) 40 (D) 0.40

Ans. : c

$\mathrm{n_{AgBr}} = \frac{0.188\ \mathrm{g}}{188\ \mathrm{g/mol}} = 10^{-3}\ \mathrm{mol}$

$\Rightarrow \mathrm{n_{Br}} = \mathrm{n_{\lambda_{kBt}}} = 0.001\ \mathrm{mol}$

$\Rightarrow\ \mathrm{mass}_{\ \mathrm{Bz}} = (0.001 \times 80)\,\mathrm{gm} = 0.08\,\mathrm{gm}$

$\Rightarrow\ \mathrm{mass}\ \% = \frac{0.08 \times 100}{0.2} = 40\,\%$

95. In the sulphur estimation, 0.471 g of an organic compound gave 1.44 g of barium sulphate. The percentage of sulphur in the compound is $\ldots\ldots\%$. (Nearest integer)

(Atomic Mass of $\mathrm{Ba} = 137\,\mathrm{u}$)

(A) 142 (B) 42 (C) 471 (D) 233

Ans. : b

Molecular mass of $\mathrm{BaSO_4} = 233$ g

$\because 233\,g\,\mathrm{BaSO_4}$ contain $\rightarrow 32$ g sulphur

$\therefore 1.44$ g $\mathrm{BaSO_4}$ contain $\rightarrow \frac{32}{233} \times 1.44$ g sulphur

given : 0.471 g of organic compound

$\%$ of S $= \frac{32\times1.44}{233\times0.471} \times 100 = 41.98\,\% \approx 42\,\%$

96. Complete combustion of $750\,g$ of an organic compound provides $420\,g$ of CO_2 and $210\,g$ of H_2O. The percentage composition of carbon and hydrogen in organic compound is 15.3 and ..... respectively. (Round off to the Nearest Integer)

(A) 1 (B) 6 (C) 3 (D) 8

Ans. : c

$44gmCO_2$, have $12gm$ carbon

So, $420gmCO_2 \Rightarrow \frac{12}{44} \times 420$

$\Rightarrow \frac{1260}{11}gm$ carbon

$\Rightarrow 114.545$ gram carbon

So, $\%$ of carbon $= \frac{114.545}{750} \times 100$

$= 15.3\%$

$18gmH_2O \Rightarrow 2gmH_2$

$210gm \Rightarrow \frac{2}{18} \times 210$

$= 23.33gmH_2$

$So, \%H_2 \Rightarrow \frac{23.33}{750} \times 100 = 3.11\%$

$\approx 3\%$

97. 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

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

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

(C) $(a)-(iii),(b)-(i),(c)-(ii),(d)-(ii)$

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

Ans. : c

Match List :-

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

98. Using the provided information in the following paper chromatogram the calculate R_f value of A ..... $\times 10^{-1}$

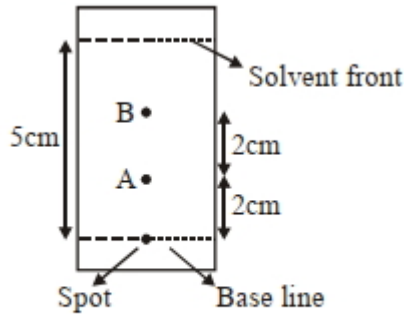


Figure : Paper chromatography for compounds A and B.

(A) 2 (B) 1 (C) 4 (D) 3

Ans. : c

$R_f = \frac{\text{Distance travelled by compound}}{\text{Distance travelled by solvent}}$

on chromatogram distance travelled by cmopound is $\rightarrow 2\,cm$

Distance travelled by solvent $= 5\,cm$

So $R_f = \frac{2}{5} = 4 \times 10^{-1} = 0.4$

99. In chromotography technique, the purification of compound is independent of

(A) Mobility or flow of solvent system

(B) Solubility of the compound

(C) Length of the column or TLC Plate

(D) Physical state of the pure compound

Ans. : d

In chromotography technique, the purification of a compound is independent of the physical

100. Acidic ferric chloride solution on treatment with excess of potassium ferrocyanide gives a Prussian blue coloured colloidal species. It is :

(A) $Fe_4[Fe(CN)_6]_3$ (B) $K_5Fe[Fe(CN)_6]_2$ (C) $HFe[Fe(CN)_6]$ (D) $KFe[Fe(CN)_6]$

Ans. : d

$FeCl_3 + K_4[Fe(CN)_6]$ (excess)

$\downarrow$

$KFe[Fe(CN)_6]$

Colloidal species

101. Which of the following compound is added to the sodium extract before addition of silver nitrate for testing of halogens?

(A) Nitric acid (B) Ammonia

(C) Hydrochloric acid (D) Sodium hydroxide

Ans. : a

For testing of halogens, Nitric acid is added to the sodium extract because if CN^- or S^{2-} are present then they will be oxidised and removed before the test of halides.

102. Which of the following is $'a'$ $FALSE$ statement ?

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

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

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

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

Ans. : b

Carius method is used in the estimation of halogen in organic compounds.

103. 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.

(A) 8 (B) 9 (C) 41 (D) 12

Ans. : d

Organic compound : $0.8\,\text{gm}$

wt. of $\text{N} = \left(\frac{42}{100} \times 0.8\right)$ gm

mole of $N = \frac{42 \times 0.8}{100 \times 14} = \frac{2.4}{100}$ mol

moles of $\text{NH}_3 = \frac{2.4}{100}$

$2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$

$\downarrow$ $\downarrow$

$\frac{2.4}{100}$ $mole$ $\frac{1.2}{100}$ $mole$

For H_2SO_4 $\frac{1.2}{100} = 1 \times \text{V}(\ell)$

$\Rightarrow \text{V}_{\text{H}_2\text{SO}_4} = \frac{1.2}{100}\,\ell = 12$ mℓ

104. 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)

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

(A) 96 (B) 12 (C) 85 (D) 68

Ans. : d

Moles of Br = Moles of AgBr obtained

$\Rightarrow$ Mass of $\mathrm{Br} = \frac{0.2397}{188} \times 80$ g

therefore % Br in the organic compound

$= \frac{W_{\mathrm{Br}}}{W_T} \times 100$

$= \frac{0.2397 \times 80}{188 \times 0.15} \times 100 = 0.85 \times 80$

$= 68$

$\Rightarrow$ Nearest integer is $'68'$

105. The transformation occurring in Duma's method is given below :

$\mathrm{C_2H_7\,N} + \left(2\mathrm{x} + \frac{\mathrm{y}}{2}\right)\mathrm{CuO} \rightarrow \mathrm{x\,CO_2} + \frac{y}{2}\mathrm{H_2O} + \frac{z}{2}\,\mathrm{N_2} + \left(2\,\mathrm{x} + \frac{\mathrm{y}}{2}\right)\mathrm{Cu}$

The value of y is ..... .(Integer answer)

(A) 2 (B) 7 (C) 1 (D) 15

Ans. : b

$\mathrm{C_2H_7\,N} + \left(2\mathrm{x} + \frac{\mathrm{y}}{2}\right)\mathrm{CuO} \rightarrow \mathrm{xCO_2} + \frac{\mathrm{y}}{2}\mathrm{H_2O} + \frac{\mathrm{z}}{2}\mathrm{N_2} + \left(2\mathrm{x} + \frac{\mathrm{y}}{2}\right)\mathrm{Cu}$

On balancing

$\mathrm{C_2H_7\,N} + \frac{15}{2}\mathrm{CuO} \rightarrow 2\mathrm{CO_2} + \frac{7}{2}\mathrm{H_2O} + \frac{1}{2}\,\mathrm{N_2} + \frac{15}{2}\mathrm{Cu}$

On comparing

$\mathrm{y} = 7$

106. 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]

(A) 25 (B) 19 (C) 32 (D) 16

Ans. : b

In Duma's method of estimation of Nitrogen.

$0.1840\,gm$ of organic compound gave $30\,mL$ of nitrogen which is collected at $287\,K$ And $758\,mm$ of Hg.

Given ; Aqueous tension at $287\,K = 14\,mm$ of Hg. Hence actual pressure $= (758 - 14)$ $= 744\,mm$ of Hg .

Volume of nitrogen at $STP = \frac{273 \times 744 \times 30}{287 \times 760}$

$V = 27.935\,mL$

$\because 22400mL$ of N_2 at STP weighs $= 28\,gm.$

$\therefore 27.94mL$ of N_2 at STP weighs $=$

$\left(\frac{28}{22400} \times 27.94\right)\,gm$

$= 0.0349\,gm$

Hence $= \left(\frac{0.0349}{0.1840} \times 100\right)$

$= 18.97\,\%$

Rond off. Answer $= 19\,\%$

107. In Carius method, halogen containing organic compound is heated with fuming nitric acid in the presence of :

(A) $AgNO_3$ (B) HNO_3 (C) $BaSO_4$ (D) $CuSO_4$

Ans. : a

Organic compound is heated with fuming nitric acid in the presence of silver nitrate in carius method.

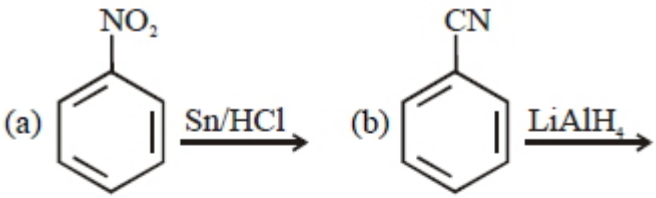
Lunar caustic $(AgNO_3)$ is used as reagent hare to distinguish Cl^-, Br and I^- respectively as follows.

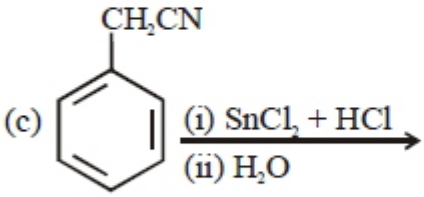
$Cl^-(aq) \xrightarrow{AgNO_3} AgCl\downarrow_{ppt}$ white

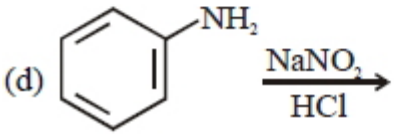
$Br^-(aq) \xrightarrow{AgNO_3} AgBr\downarrow_{ppt}$ pale yellow

$I^-(aq) \xrightarrow{AgNO_3} AgNO_3AgI\downarrow_{ppt}$ Dark yellow

108. The Kjeldahl method of Nitrogen estimation fails for which of the following reaction products ?



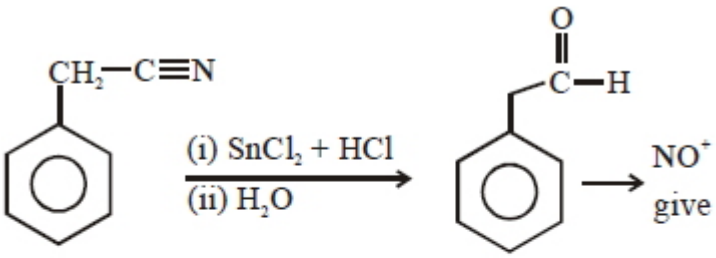


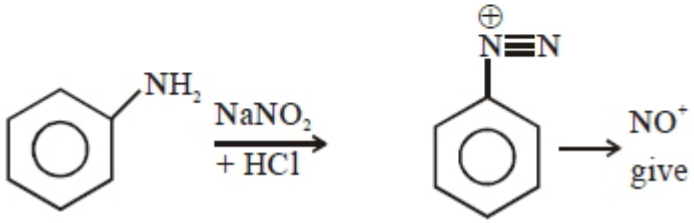


(A) a and d (B) c and d (C) a, c and d (D) b and c

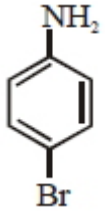
Ans. : b

Kjeldahl method is used for N estimation But not given by 'Diazo' compounds

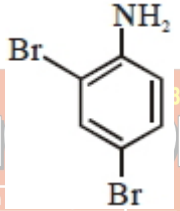




109. In Carius method of estimation of halogen, $0.172\,g$ of an organic compound showed presence of $0.08\,g$ of bromine. Which of these is the correct structure of the compound:

(A) 

(B) $H_3C - CH_2 - Br$

(C) 

(D) $H_3C - Br$

Ans. : a

In Carius method

mass of organic compound $= 0.172gm$ mass of Bromine $= 0.08gm$

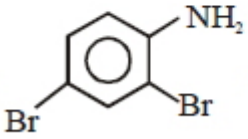
Hence % of Bromine $= \frac{0.08}{0.172} \times 100$

$= 46.51\%$

(1) 

C_6H_6NBr $\left[\%Br = \frac{80}{172} \times 100\right] = 46.51\%$

(2) CH_3CH_2Br C_2H_5Br $\%Br = \frac{80}{109} \times 100 = 73.33\%$

(3) 

$C_6H_5NBr_2$

(4) CH_3Br

110. Glycerol is separated in soap industries by

(A) Steam distillation

(B) Differential extraction

(C) Distillation under reduced pressure

(D) Fractional distillation

Ans. : c

Glycerol is separated by reduced pressure distillation in soap industries.

111. 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, $Ag = 108, Br = 80\,g\,mol^{-1}$)

(A) 50 (B) 55 (C) 45 (D) 40

Ans. : a

Carius method

$$\% \text{ of } Br = \frac{\text{wt of } AgBr}{\text{wt. of organic compound}} \times 100 \times \frac{\text{molar mass of Br}}{\text{AgBr}}$$

$$= \frac{1.88}{1.6} \times \frac{80}{188} \times 100 = \frac{15040}{300.8} = 50\%$$

112. $25\,g$ of an unknown hydrocarbon upon burning produces $88\,g$ of CO_2 and $9\,g$ of H_2O. This unknown hydrocarbon contains.

(A) $24\,g$ of carbon and $1\,g$ of hydrogen

(B) $22\,g$ of carbon and $3\,g$ of hydrogen

(C) $18\,g$ of carbon and $7\,g$ of hydrogen

(D) $20\,g$ of carbon and $5\,g$ of hydrogen

Ans. : a

$$\underset{\left(\frac{25}{M}\right)}{C_xH_y} + \left(x + \frac{y}{4}\right) O_2 \rightarrow \underset{x \times \frac{25}{M} = 2}{xCO_2} + \underset{\frac{y}{2} \times \frac{25}{M} = 0.5}{\frac{y}{2}H_2O}$$

$C \quad x \times \frac{25}{M} = 2$

$H \quad y \times \frac{25}{M} = 1$

$C_{2y}H_y \equiv 24\,y\,gm\,C + y\,gm\,H$

or

$24 : 1$ ratio by mass

113. 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. Stem distillation

	s. Differential extraction

(A) $a-d, b-r, c-p$

(B) $a-q, b-r, c-s$

(C) $a-r, b-p, c-s$

(D) $a-q, b-r, c-p$

Ans. : b

(mixture) (seperation method)

H_2O : Sugar $\Rightarrow$ Recrystallization

H_2O : Aniline $\Rightarrow$ Steam distillation

H_2O : Toluene $\Rightarrow$ Differential extraction

114. The correct match between item I and item II is

Item I	Item II
(a) Benzaldehyde	(p) Mobile phase
(b) Alumina	(q) Adsorbent
(c) Acetonitrile	(r) Adsorbate

(A) $a \rightarrow q,\ b \rightarrow p,\ c \rightarrow r$

(B) $a \rightarrow r,\ b \rightarrow q,\ c \rightarrow p$

(C) $a \rightarrow q,\ b \rightarrow r,\ c \rightarrow p$

(D) $a \rightarrow p,\ b \rightarrow r,\ c \rightarrow q$

Ans. : b

Acetonitrile is used as mobile phase for most of the reverse chromatography. Benzaldehyde is adsorbed on alumina.

115. Two compounds I and II are eluted by column chromato-graphy(adsorption of $I > II$). Which one of the following is a correct statement?

(A) II moves slower and has higher R_f value than I

(B) II moves faster and has higher R_f value than I

(C) I moves faster and has higher R_f value than II

(D) I moves slower and has higher R_f value than I

Ans. : b

Since, adsorption of $I > II$, I is firmly attached to column (stationary phase). Hence, it will move slowly and will move little distance. Also II is loosely attached to column (stationary phase). Hence, it will move faster and will move large distance

116. An organic compound contains C, H and S. The minimum molecular weight of the compound containing 8% sulphur is.....$g\,mol^{-1}$ (atomic weight of $S = 32\,amu$)

(A) 600 (B) 200 (C) 400 (D) 300

Ans. : c

% of Sulphur

$= \frac{wt.\ of\ Sulphur}{wt.\ of\ Organic\ Compound} \times 100$

$8 = \frac{32}{Wt.\ of\ compound} \times 100$

$\therefore\ Wt.\ of\ compound = \frac{32}{8} \times 100 = 400\ g\ mol^{-1}$

117. $1.4\,kg$ of an organic compound was digested according to Kjeldahl 's method and the ammonia evolved was absorbed in $60\,mL$ of $M/10$ H_2SO_4 solution. The excess sulphuric acid required $20\,mL$ of $M/10$ $NaOH$ solution for neutralization. The percentage of nitrogen in the compound is

(A) 10 (B) 3 (C) 24 (D) 5

Ans. : a

Mili equivalents of H_2SO_4

$= 60 \times \frac{M \times 2}{10} = 12$

Mili equivalents of $NaOH = 20 \times \frac{M}{10} = 2$

Mili equivalents of $NH_3 = 12 - 2 = 10$

$\%$ of nitrogen $= \frac{1.4 \times (N \times V)NH_3}{(Wt.\ of\ organic\ compound)}$

$\frac{1.4 \times 10}{1.4} = 10$

118. Match the organic compounds in column $-I$ with the Lassaigne's test results in column $-II$ appropriately

Column $-I$	Column $-II$
(A) Aniline	(i) Red colour with $FeCl_3$
(B) Benzene sulfonic acid	(ii) Violet colour with sodium nitroprusside
(C) Thiourea	(iii) Blue colour with hot and acidic solution of $FeSO_4$

(A) $A-(ii); B-(iii); C-(i)$ (B) $A-(iii); B-(i); C-(ii)$

(C) $A-(iii); B-(ii); C-(i)$ (D) $A-(ii); B-(i); C-(iii)$

Ans. : c

(c) In Lassaigne's test, fusion with sodium take place and following species formed respectively.

(a) Aniline $\rightarrow CN^-$

(b) Benzene sulfonic acid $\rightarrow$ (figure)

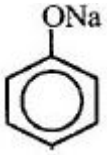
(c) Thiourea $\rightarrow S^{2-}$

Reaction of CN^- with hot and acidic solution of $FeSO_4$ lead to formation of $Fe_4[Fe(CN)_6]_3$ which is blue in colour. It contains iron in both II and III oxidation state.

Reaction of S^{2-} with sodium nitroprusside

$$Na_2S + Na_2[Fe(CN)_5NO] \rightarrow \underset{(violet\ in\ colour)}{Na_4[Fe(CN)_5NOS]}$$

Phenoxide ion on reacting with $FeCl_3$ give red colour with $FeCl_3$.



119. 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 $Ag = 108; Br = 80$)

(A) 48 (B) 60 (C) 24 (D) 36

Ans. : c

Mass of substance $= 250\text{mg} = 0.250\text{g}$

Mass of $AgBr = 141\text{mg} = 0.141\text{g}$

$1\ mole$ of $AgBr = 1\ g$ atom of Br

$188g$ of $AgBr = 80g$ of Br

$188g$ of $AgBr$ contain bromine $= 80g$

$0.141g$ of $AgBr$ contain bromine $= \frac{80}{188} \times 0.141$

This much amount of bromine present in 0.250g of organic compound

$\because \%$ of bromine $= \frac{80}{188} \times \frac{0.414}{0.250} \times 100 = 24\%$

120. 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 .....%

(A) 6 (B) 10 (C) 3 (D) 5

Ans. : b

$\%$ of $N = \frac{1.4 \times \text{ meq.of acid}}{\text{mass of organic compound}}$

meq. of $H_2SO_4 = 60 \times \frac{M}{10} \times 2 = 12$

meq. of $NaOH = 20 \times \frac{M}{10} = 2$

meq. of acid consumed $= 12 - 2 = 10$

$\therefore \%\quad N = \frac{1.4 \times 10}{1.4} = 10\%$

121. For which of the following compounds Kjeldahl method can be used to determine the percentage of Nitrogen ?

(A) Nitrobenzene (B) Pyridine (C) Alanine (D) Diazomethane

Ans. : c

Kjeldahl's method is not applicable for cpmpounds containing nitrogen in nitro and azo groups and nitrogen present in the ring. Because nitrogen of these compounds does not change to ammonium sulphate under these conditions.
Hence only Alanine can be used to determine percentage of nitrogen.

$$H_2N-CH-COOH$$
$$|$$
$$CH(CH_3)_2$$
$$Alanine$$

122. Which of the following statements is incorrect ?

(A) Fe^{3+} ion also gives blood red colour with SCN^- ion.

(B) Fe^{2+} ion also gives blood red colour with SCN^- ion.

(C) On passing H_2S into Na_2ZnO_2 solution a white ppt of ZnS is formed.

(D) Cupric ion reacts with excess of ammonia solution to give deep blue colour of $[Cu(NH_3)_4]^{2+}$ ion

Ans. : a

Only Fe^{3+} ion gives blood red colouration with SCN^- ion.

$$Fe^{3+} + SCN^- \rightarrow \underset{\text{(dark red)}}{[Fe(SCN)]^{2+}}$$

123. Which of the following compounds is not expected to show Lassaignes' test for nitrogen ?

(A) Propanenitrile

(B) Hydroxylamine hydrochloride

(C) Nitromethane

(D) Ethanamine

Ans. : b

Lassaigne's test is used for the detection of nitrogen and given by all nitrogenous compound except diazo $(-N=N-)$ compounds.

This test is shown only by the compounds containing C and N both hence hydroxyl amine hydrochloride $(H_2NOH.HCl)$ will not perform this test

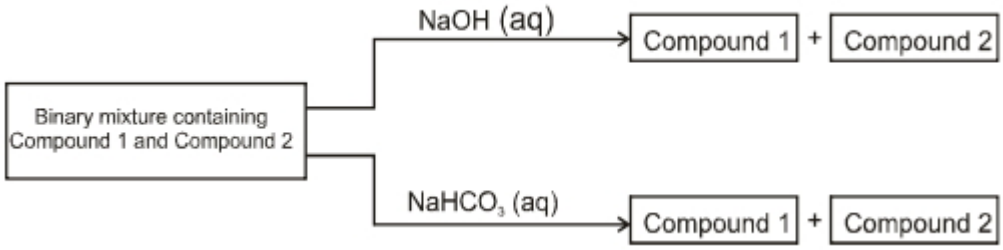
124. Identify the binary mixture(s) that can be separated into individual compounds, by differential extraction, as shown in the given scheme.

(A) C_6H_5OH and C_6H_5COOH

(B) C_6H_5COOH and $C_6H_5CH_2OH$

(C) $C_6H_5CH_2OH$ and C_6H_5OH

(D) $C_6H_5CH_2OH$ and $C_6H_5CH_2COOH$



(A) (B,D) (B) (B,C) (C) (A,D) (D) (C,D)

Ans. : a

(B) $C_6H_5COOH + C_6H_5CH_2OH \xrightarrow{\text{aq. NaOH}}$ 1(soluble) + 2 (insoluble)

1 2

$\downarrow$ aq. $NaHCO_3$

1 (soluble) + 2 (insoluble)

(D) $C_3H_5CH_2OH + C_6H_5CH_2COOH \xrightarrow{\text{aq.NaOH}}$ 1 (insoluble) + 2(soluble)

1 2

$\downarrow$ aq. $NaHCO_3$

(1) (insoluble) + 2 (soluble).

125. An organic compound on analysis gave the following results : $C = 54.5\%$, $O = 36.4\%$, $H = 9.1\%$. The Empirical formula of the compound is

(A) CH_3O (B) C_2H_4O (C) C_3H_4O (D) C_4H_8O

Ans. : b

(b)

Element	No. of Moles	Simple Ratio
$C = 54.5$	$54.5/12 = 4.54$	2
$H = 9.1$	$9.1/1 = 9.1$	4
$O = 36.4$	$36.4/16 = 2.27$	1

Hence, C_2H_4O.

126. Dumas method involves the determination of nitrogen content in the organic compound in the form of

(A) NH_3 (B) N_2 (C) $NaCN$ (D) $(NH_4)_2SO_4$

Ans. : b

Dumas' method involves the determination of nitrogen content in the organic compound in the form of nitrogen (N_2). Organic compound is oxidized with cupric oxide in an atmosphere of carbon dioxide which gives free nitrogen along-with carbon dioxide and water.

127. Quantitative measurement of nitrogen in an organic compounds is done by the method

(A) Berthelot method (B) Belstein method

(C) Lassaigne test (D) Kjheldahl's method

Ans. : d

(d)Kjeldahl's and Duma's methods are used for the quantitative estimation of nitrogen in an organic compound. In the Kjeldahl method, the nitrogen element of organic compound is changed to the ammonia.

128. Empirical formula of a hydrocarbon containing 80% carbon and 20% hydrogen is

(A) CH (B) CH_2 (C) CH_3 (D) CH_4

Ans. : c

(c)

Elements	No.of moles	Simple ratio
$C = 80\%$	$80/12 = 6.66$	1
$H = 20\%$	$20/1 = 20$	3

ence, Empirical Formula = CH_3.

129. The vapour density of the methyl ester of an organic monocarboxylic acid is 37. What is the molecular weight of the acid

(A) 46 (B) 60 (C) 70 (D) 74

Ans. : d

(d) Molecular mass = $2 \times V.D. = 2 \times 37 = 74$.

130. $60\,g$ of a compound on analysis gave $C = 24\,g$, $H = 4\,g$ and $O = 32\,g$. Its Empirical formula is

(A) $C_2H_4O_2$ (B) C_2H_2O (C) CH_2O_2 (D) CH_2O

Ans. : d

(d)

Element	No. of Moles	Simple Ratio
$C = 24$	$24/12 = 2$	1
$H = 4$	$4/1 = 4$	2
$O = 32$	$32/16 = 2$	1

Therefore CH_2O.

131. An appropriate method for molecular weight determination of chloroform is

(A) Regnault's method

(B) Diffusion method

(C) Vapour pressure method

(D) Victor Meyer's method

Ans. : d

(c) It's obvious.

132. On complete combustion $1.4\,gm$ hydrocarbon gave $1.8\,gm$ water. Empirical formula of the hydrocarbon is

(A) CH (B) CH_2 (C) CH_3 (D) CH_4

Ans. : b

(b) $1.8\,gm$ water obtained from $1.4\,gm$ hydrocarbon

$\therefore$ $18\,gm$ water obtained from -$\frac{1.4}{1.8} \times 18 = 14\ gm$.

Empirical formula Mass = 14

$\therefore$ Empirical formula = CH_2.

133. Lassaigne's test is not used for the detection of the element_____in the organic compound

(A) N (B) S (C) Cl (D) O

Ans. : (D) O

134. Lassaigne's test is not used for the detection of which element?

(A) Boron (B) Halogens (C) Nitrogen (D) Sulphur

Ans.: (A) Boron

135. In Lassaigne's test the organic compound is fused with Na followed by extraction with distilled water. Which of the following is not the possible product of this fusion reaction

(A) NaX (B) $NaCN$ (C) $NaNC$ (D) Na_2S

Ans. : c

It's obvious.

136. Lassaigne's test is used to detect

(A) Nitrogen and halogens

(B) Sodium and halogens

(C) Halogens and sulphur

(D) All of the above

Ans. : d

It's obvious.

137. Which of the following is the best scientific method to test the presence of water in a liquid

(A) Use of anhydrous copper sulphate

(B) Use of litmus paper

(C) Taste

(D) Smell

Ans. : a

(a)Anhydrous $CuSO_4$ is used to test presence of water in any liquid because it changes its colour white to blue.

138. Which element is estimated by Carius method

(A) Carbon (B) Hydrogen (C) Halogen (D) Nitrogen

Ans. : c

(c)Halogen is estimated by carius method.

139. Aniline-water mixture can be separated by

(A) Steam distillation (B) Extraction (C) Chromatography (D) Sublimation

Ans. : a

Steam distillation is a separation process which consists in distilling water together with other volatile and non-volatile components. The steam distillation process works on the principle that when a mixture of two or more undissolved liquids are heated, while ensuring that the surfaces of both liquids are in contact with the atmosphere, the vapor pressure exerted by the system increases. This is because it now becomes the sum of the vapor pressures of all of the components of the mixture combined together. This allows for evaporation of elements with high boiling points at much lower temperatures merely by allowing them to form a mixture with water. Aniline is separated from a mixture by using this method.

140. Glycerol is purified by

(A) Steam distillation (B) Vacum distillation

(C) Sublimation (D) Simple distillation

Ans. : b

The liquids which decompose at its boiling point can be purified by vacuum distillation. Glycerol decomposes at its boiling point $(563\,K)$. It can be distilled by vacuum distillation without decomposition at $453\,K$ and under $12\,mm\,Hg$ pressure.

141. Aniline-water mixture can be separated by

(A) Steam distillation (B) Extraction (C) Chromatography (D) Sublimation

Ans. : a

Steam distillation is a separation process which consists in distilling water together with other volatile and non-volatile components.

The steam distillation process works on the principle that when a mixture of two or more undissolved liquids are heated, while ensuring that the surfaces of both liquids are in contact with the atmosphere, the vapor pressure exerted by the system increases.

This is because it now becomes the sum of the vapor pressures of all of the components of the mixture combined together.

This allows for evaporation of elements with high boiling points at much lower temperatures merely by allowing them to form a mixture with water.

Aniline is separated from a mixture by using this method.

142. To seprate different fractions of crude oil in petroleum industry, the method used is

(A) Fractional distrillation

(B) Steam distillation

(C) Reduced pressure distillation

(D) Simple distillation

Ans. : (C) Reduced pressure distillation

143. Nitrating mixture is

(A) Fuming nitric acid

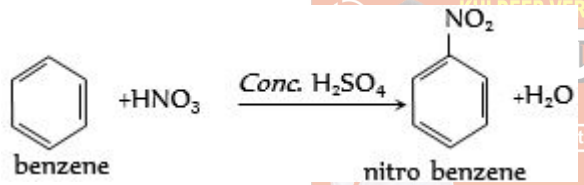
(B) Mixture of conc. H_2SO_4 and conc. HNO_3

(C) Mixture of nitric acid and anhydrous zinc chloride

(D) None of these

Ans. : b

(b) The mixture of conc. H_2SO_4 and conc. HNO_3 is called nitrating mixture. It is used in the nitration of aryl compounds.



144. Chromatography is used for the purification of

(A) Solids (B) liquids (C) Gases (D) All of these

Ans. : d

Chromatography can be used for the purification of organic compound whose phase is either solid, or liquid or gas. Usually the organic compound (solid or liquid) is dissolved in appropriate solvent and is purified by column chromatography. Gaseous compounds can be purified by gas chromatography.

145. Chromatography is a valuable method for the separation, isolation, purification and identification of the constituents of a mixture and it is based on general principle of

(A) Phase rule (B) Phase distribution

(C) Interphase separation (D) Phase operation

Ans. : a

It's obvious.

146. In Victor Mayer's method $0.2\,gm$ of an organic substance displaced $56\,ml$ of air at STP the molecular weight of the compound

(A) 56 (B) 112 (C) 80 (D) 28

Ans. : c

(c) Molecular mass

$n = \frac{M.wt}{E.F.wt} = \frac{146}{73} \times 22400$

$= \frac{0.2}{56} \times 22400 = 80$.

147. A compound of carbon hydrogen and nitrogen contains three elements in the respective ratio of $9:1:35$ grams. The Empirical formula for the compound is

(A) C_2H_4N (B) C_3H_4N (C) C_3H_6N (D) C_2H_6N

Ans. : b

In a certain compound, the ratio of $C:H:N = 9:1:35$

Molar ratio of $C:H:N = \frac{9}{12}:\frac{1}{1}:\frac{3.5}{14} = 0.75:1:0.25$

$= \frac{0.75}{0.25}:\frac{1}{0.25}:\frac{0.25}{0.25}$

$= 3:4:1$

Thesefore, the empirical formula is C_3H_4N

148. If N and S are present in an organic compound during Lassaigne test, then both changes into

(A) Na_2S and $NaCN$ (B) $NaSCN$

(C) Na_2SO_3 and $NaCN$ (D) Na_2S and $NaCNO$

Ans. : b

(b) When sulphur and nitrogen both are present in organic compound during Lassaigne's Test, both changes into "sodium thiocyanate". $(NaSCN)$ which gives a blood red colouration with Ferric ion.

$3NaCNS + FeCl_3 \rightarrow \underset{\text{Ferricsulphocyanide}}{Fe(CNS)_3} + 3NaCl$

(Bloodredcolour)

149. Which of the following compound can be separated by steam distillation method

(A) Steam volatile but insoluble in water

(B) Steam volatile but soluble in water

(C) Steam non volatile but sparingly soluble in water

(D) Lquid in steam but solid in water

Ans. : a

Steam distillation is employed for those liquids which are insoluble in water, containing non-volatile impurities and are steam volatile.

150. How will you separate a solution (miscible) of benzene $+CHCl_3$

(A) Sublimation (B) Filtration (C) Distillation (D) Crystallisation

Ans. : c

(c)Distillation particularly fractional distillation because the boiling point of

benzene $(80^{o}C)$ and chloroform $(61.5^{o}C)$ are close.

Fractional distillation involves repeated distillations and condensations, in a fractionating column. As a result of distillation and condensation at each point of the fractionating column, the vapours rising up become richer in more volatile component and the liquid falling back into the flask becomes richer in less volatile component. Thus, the low boiling liquid distils first while the higher boiling liquid distils afterwards.

----- Nothing is impossible, the word itself says 'I'm possible'! -----