

Purification and Characterisation of Organic Compounds

After extracting organic compounds from natural sources or synthesizing in laboratory it is essential to purify them.

● General Methods of Purification of Organic Compounds

Various methods of purification of organic compounds are employed based on nature of compound and impurities present in it. Generally, following purification methods are used :

Sublimation : Certain substances when heated directly converts into vapour state without changing into liquid state and when these vapours are cooled they convert directly into solid state.

Substances like camphor, naphthalene, anthracene, ammonium chloride and iodine can be purified by this method.

Crystallisation : This method is useful for the purification of organic compounds in solid state. This method is based on the difference in the solubilities of the compound and the impurities in a suitable solvent.

Simple Distillation : This method is used to separate non-volatile impurities from volatile liquids. This method is also used when there is sufficient difference (30 K-50 K) in the boiling points of two liquids.

For example, separation of a mixture of aniline (boiling point 457 K) and chloroform (boiling point 334 K) can be carried out by distillation.

Fractional Distillation : This method is useful for separation when there is a very small difference in boiling points (10 K - 15 K) of two volatile liquids.

For example, separation of a mixture of acetone (boiling point 329 K) and methanol (boiling point 338 K) is done by fractional distillation.

Distillation Under Reduced Pressure : This method is useful for purification of liquids having very high boiling points and those, which decompose at or below their boiling points. For example, glycerol is separated from spent lye in soap industry by this method.

Steam Distillation : This method is useful for substances which are immiscible with water and steam volatile.

For example, Aniline is separated by this method from mixture of aniline and water.

Differential Extraction : A process of separating organic compound present in an aqueous medium by shaking it with an organic solvent in which it is more soluble than in water is called differential extraction.

For example, benzoic acid can be extracted from its aqueous solution using a solvent like benzene.

Chromatography : This method is useful to separate mixtures into their components, purify compounds and to test the purity of compounds.

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1. Spectroscopy method is used for which of the following ?
(A) For purification of substance
(B) To detect purity of substance
(C) Both (A) and (B)
(D) Neither (A) nor (B)
 2. Which method is used for the separation of a mixture of iodine and salt into its components ?
(A) Sublimation
(B) Crystallisation
(C) Both (A) and (B)
(D) None of the (A) and (B)

3. Suitable solvent in crystallisation means.
 - (A) cheap and easily available solvent.
 - (B) a solvent in which a substance is fairly soluble at room temperature.
 - (C) a solvent in which a substance is insoluble at low temperature.
 - (D) a solvent in which a substance is sparingly soluble at room temperature but fairly soluble at high temperature.
4. Which method is used for separation of volatile liquids and non volatile impurities ?
 - (A) Crystallisation (B) Distillation (C) Solvent extraction (D) All of the given
5. Which method is used for the separation of a mixture of sodium sulphate and sodium dichromate ?
 - (A) Fractional crystallisation (B) Sublimation
 - (C) Simple distillation (D) Steam distillation
6. Which method will be used for the separation of a mixture of hexane (boiling point 342 K) and toluene (boiling point 384 K) ?
 - (A) Simple distillation (B) Fractional distillation
 - (C) Steam distillation (D) Distillation under reduced pressure
7. Which method is useful for the purification of essential oils obtained from plants ?
 - (A) Simple distillation (B) Fractional distillation
 - (C) Steam distillation (D) Distillation under reduced pressure
8. In which method oil bath is used ?
 - (A) Simple distillation (B) Fractional distillation
 - (C) Steam distillation (D) Distillation under reduced pressure
9. Which one is the use of chromatography ?
 - (A) In separation (B) In purification (C) To test purity (D) All the given
10. Which method will be used for separation of a mixture of acetone and ethanol ?
 - (A) Simple distillation (B) Fractional distillation (C) Crystallisation (D) Sublimation
11. Which method is used to separate a mixture of ortho and para anilines ?
 - (A) Simple distillation (B) Chromatography
 - (C) Fractional Crystallisation (D) None of the given
12. Which of the following substance is used as adsorbent in adsorption chromatography ?
 - (A) Alumina (B) Silica-gel
 - (C) Both (A) and (B) (D) None of the (A) and (B)
13. To which the terms stationary phase and mobile phase are associated ?
 - (A) Distillation under reduced pressure (B) Chromatography
 - (C) Spectroscopy (D) Differential Extraction
14. Which substance is used to detect amino acid adsorbed on chromatographic plate ?
 - (A) Ethanol (B) Schiff-reagent (C) Ninhydrin solution (D) Osazone
15. In gas chromatography,
 - (A) Solid and liquid is stationary phase and gas is mobile phase.
 - (B) Only solid is stationary phase and gas is mobile phase.
 - (C) Only solid is stationary phase and liquid is mobile phase.
 - (D) Gas is stationary phase and gas is also a mobile phase.

16. Which of the following method can be used to purify impure glycerine ?
 (A) Steam distillation (B) Simple distillation
 (C) Distillation under reduced pressure (D) Solvent extraction
17. Which method is used for the purification of aniline ?
 (A) Steam distillation (B) Simple distillation
 (C) Distillation under reduced pressure (D) Solvent extraction
18. Azeotropic mixture means
 (A) mixture boiling at different temperatures (B) mixture of solid substances
 (C) Constant boiling mixture (D) None of the given
19. In which of the following aqueous solution a mixture of benzoic acid and phenol will be completely soluble ?
 (A) HCl (B) NaOH (C) NaCl (D) NaHCO₃
20. Which solution is used for the separation of a mixture of phenol and aromatic carboxylic acid ?
 (A) NaOH (B) Na₂CO₃ (C) CaO (D) NaHCO₃
21. Which method will be useful for the separation of a mixture of benzene and chloro benzene ?
 (A) Sublimation (B) Separatory funnel (C) Crystallisation (D) Distillation
22. Which method is the most suitable for the detection of cyclohexanone from a mixture containing benzoic acid, iso amyl alcohol, cyclohexane and cyclohexanone ?
 (A) Crystallisation (B) IR Spectroscopy (C) Sublimation (D) Evaporation

Answers : 1. (B), 2. (C), 3. (D), 4. (B), 5. (A), 6. (A), 7. (D), 8. (B), 9. (D), 10. (B), 11. (B), 12. (C), 13. (B), 14. (C), 15. (A), 16. (C), 17. (A), 18. (C), 19. (B), 20. (D), 21. (D), 22. (B)

• Qualitative Analysis of Organic Compounds

Mainly elements like carbon and hydrogen are present in organic compounds. In addition to this, they also contain elements like N, S, P and X. A Lassaigne test is used for the detection of these elements.

No.	Test	Observation	Inference
(1)	L.S. + FeSO ₄ + Conc. H ₂ SO ₄	Prussian blue ppt	N - Present
(2)	L.S. + Sodium nitroprusside	Violet colour	S - Present
(3)	L.S. + CH ₃ COOH + (CH ₃ COO) ₂ Pb	Black ppt	S - Present
(4)	L.S. + HNO ₃ + AgNO ₃	White ppt Soluble in NH ₄ OH	Cl - Present
		Yellow ppt Sparingly soluble in NH ₄ OH	Br - Present
		Yellow ppt Insoluble in NH ₄ OH	I - Present
(5)	L.S. + Conc. HNO ₃ + Ammonium molybdate	Yellow ppt	P - Present

23. An organic substance was heated with Cu(II)O and the gaseous mixture obtained when passed through anhydrous copper sulphate is turned blue in colour. Which of the following element is definitely present in this organic substance ?
 (A) Br (B) F (C) N (D) H

24. With which substance organic compound is heated to detect C and H present in it ?
 (A) Ca(OH)_2 (B) KOH (C) Sodalime (D) CuO
25. Due to the formation of which substance lime water turns milky during the detection of carbon in organic compound ?
 (A) CaO (B) CaCO_3
 (C) Ca(OH)_2 (D) None of the given
26. Why is fusion of organic compound is carried out with Sodium in Lassaigne test ?
 (A) To increase ionization of compound (B) To increase volume of compound
 (C) To increase reactivity of compound
 (D) To convert covalent compound into ionic compound
27. For which substance a Lassaigne test will fail to detect nitrogen ?
 (A) $\text{H}_2\text{NCONHNH}_2 \cdot \text{HCl}$ (B) $\text{H}_2\text{N NH}_2 \cdot \text{HCl}$
 (C) H_2NCONH_2 (D) $\text{C}_6\text{H}_5\text{NHNH}_2 \cdot \text{HCl}$
28. Into which substance nitrogen of organic compound is converted during preparation of Lassaigne solution ?
 (A) Sodamide (B) Sodium nitrite (C) Sodium cyanide (D) Sodium nitrate
29. Which substance does not give positive test of nitrogen ?
 (A) urea (B) azobenzene (C) glycine (D) phenyl hydrazine
30. Due to which substance blue colour is formed in Lassaigne test of nitrogen ?
 (A) Ferric ferrocyanide (B) Potassium ferrocyanide
 (C) Sodium ferrocyanide (D) Sodium cyanide

Answers : 23. (D), 24. (D), 25. (B), 26. (D), 27. (B), 28. (C), 29. (B), 30. (A)

• Quantitative Analysis and Molecular weight of organic compounds

The percentage amount of the elements present in organic compounds is determined as follows :

- (1) Percentage amount or proportion of carbon and hydrogen is determined by Leibig's method.

$$\% \text{ C} = \frac{12 \times \text{mass of CO}_2 \times 100}{44 \times \text{mass of O.C}}$$

$$\% \text{ H} = \frac{2 \times \text{mass of H}_2\text{O} \times 100}{18 \times \text{mass of O.C}}$$

- (2) Dumas and Kjeldahl methods are used to determine percentage proportion of nitrogen

$$\% \text{ N} = \frac{28 \times \text{Vol of N}_2 \text{ at STP (mL)}}{224 \times \text{mass of O. C}} \quad (\text{Duma's method})$$

$$\% \text{ N} = \frac{1.4 \times \text{N} \times \text{V}}{\text{mass of O. C}} \quad (\text{Kjeldahl's method})$$

Where, N = Normality of acid

V = Volume of acid consumed

- (3) Estimation of percentage of X (halogen), S and P in organic compound is done by Carius method.

$$\% X = \frac{\text{At mass of X} \times \text{mass of AgX} \times 100}{\text{Molar mass of AgX} \times \text{mass of O. C}}$$

$$\% S = \frac{32 \times \text{mass of BaSO}_4 \times 100}{233 \times \text{mass of O. C}}$$

$$\% P = \frac{62 \times \text{mass of Mg}_2\text{P}_2\text{O}_7 \times 100}{222 \times \text{mass of O. C}}$$

- (4) Generally percentage proportion of oxygen present in organic compound is obtained by subtracting total percentage of other elements from 100. However percentage of oxygen can also be obtained directly as follows :

$$\% O = \frac{32 \times \text{mass of CO}_2 \times 100}{44 \times \text{mass of O. C}}$$

Note : O.C = Organic compound

Methods of determining Molecular weights of organic compounds

$$(1) \text{ Molecular weight of carboxylic acid} = n \left[\left(\frac{108 \times \text{mass of silver salt of acid}}{\text{mass of silver}} \right) - 107 \right]$$

where, n = Basicity of acid

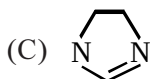
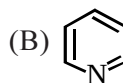
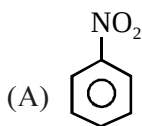
$$(2) \text{ Molecular weight of organic base} = \frac{n}{2} \left[\left(\frac{195 \times \text{mass of platonic chloride}}{\text{mass of platinum}} \right) - 410 \right]$$

where, n = acidity of base

31. $C_X H_Y + X O_2 \rightarrow X CO_2 + Y H_2O$ what is the value of X and Y ?
 (A) $X = 2Y, Y = \frac{X}{4}$ (B) $X = 4X, Y = 2Y$
 (C) $X = X + \frac{Y}{4}, Y = \frac{Y}{2}$ (D) $X = X + \frac{Y}{4}, Y = \frac{X}{2}$
32. Which substance is used to determine the mass of water produced in Leibig's method ?
 (A) $CaCO_3$ (B) Anyhyd $CaCl_2$ (C) $Ca(OH)_2$ (D) All of the given
33. What is the use of KOH solution in Leibig's method ?
 (A) to absorb nitrogen (B) to reduce carbon
 (C) to oxidise hydrogen (D) to absorb CO_2
34. In the presence of which substance combustion of organic compound is done in Leibig's method ?
 (A) copper (II) oxide (B) manganese dioxide (C) sodalime (D) Copper sulphate
35. In which method nitrometer is used ?
 (A) Dumas method (B) Kjeldahl method
 (C) Both (A) and (B) (D) None of the (A) and (B)
36. In which method nitrogen present in organic compound is converted into ammonium sulphate ?
 (A) Dumas method (B) Kjeldahl method
 (C) Both (A) and (B) (D) None of the (A) and (B)

37. For which of the following substance Kjeldahl's method is not useful ?
 (A) Pyridine (B) Aniline (C) Benzamide (D) None of the given
38. Under which circumstances Kjeldahl's method is non useful ?
 (A) when nitrogen is present in nitro group
 (B) when nitrogen is present in azo group
 (C) when nitrogen is present in cyclic structure
 (D) All of the given
39. Estimation of which element is possible by carius method ?
 (A) Halogen (B) Sulphur (C) Phosphorous (D) All of the given
40. With which substance organic compound is heated in carius method ?
 (A) conc. HCl (B) fuming HNO_3 (C) fuming H_2SO_4 (D) conc. NaOH
41. When is Prussian blue precipitates formed ?
 (A) when ferrous sulphate reacts with FeCl_3 .
 (B) when ferrous sulphate reacts with $\text{Na}_4[\text{Fe}(\text{CN})_6]$.
 (C) when ferrous ammonium sulphate reacts with FeCl_3 .
 (D) when ammonium sulphate reacts with FeCl_3 .
42. For detection of which element Lassaigne test is used ?
 (A) Nitrogen (B) Sulphur (C) Chlorine (D) All of the given
43. For estimation of which element Kjeldahl method is used ?
 (A) Nitrogen (B) Halogen (C) Sulphur (D) Oxygen
44. In organic compound C = 40 %, O = 53.34 % and H = 6.60 % . Find empirical formula of this compound.
 (A) CH_2O (B) CHO (C) CH_4O_2 (D) $\text{C}_2\text{H}_2\text{O}$
45. The percentages of C, H and N in organic compound is 40, 13.33 and 46.67 respectively. What will be its empirical formula ?
 (A) $\text{C}_2\text{H}_7\text{N}_2$ (B) CH_5N (C) CH_4N (D) $\text{C}_2\text{H}_7\text{N}$
46. The pressure of toluene in vapour in steam distillation of toluene is
 (A) equal to the pressure of barometer.
 (B) less than pressure of barometer.
 (C) equal to vapour pressure of toluene in simple distillation.
 (D) more than vapour pressure of toluene in simple distillation.
47. In order to determine molecular weights, camphor is used many times because,
 (A) it is easily available. (B) its molal elevation constant is very high.
 (C) it is volatile. (D) it is a solvent for organic substances.
48. Which is the best method for the separation of a mixture of naphthalene and benzoic acid ?
 (A) Chromatography (B) Crystallisation (C) Distillation (D) Sublimation

49. In organic substance carbon, hydrogen and oxygen is there. On estimation of elements it was found that carbon was 38.71 % and hydrogen was 9.67 % Find empirical formula of this compound.
 (A) CH_3O (B) CH_2O (C) CHO (D) CH_4O
50. Due to which substance Violet colour is obtained in Lassaigntest for detection of sulphur ?
 (A) $\text{Fe}_2(\text{SO}_4)_3$ (B) $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$ (C) $\text{Na}_4[\text{Fe}(\text{CN})_5\text{NOS}]$ (D) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$
51. Which of the following substance Possess prussian blue colour ?
 (A) $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$ (B) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$ (C) $\text{Na}_4[\text{Fe}(\text{CN})_6]$ (D) $(\text{NH}_4)_2[\text{MoO}_4]$
52. The red colour observed on addition of FeCl_3 in Lassaigntest solution indicates presence of which element ?
 (A) Nitrogen (B) Sulphur
 (C) Both (A) and (B) (D) None of the (A) and (B)
53. The presence of which elements hinders detection of halogens in Lassaigntest ?
 (A) Nitrogen (B) Sulphur
 (C) Both (A) and (B) (D) None of the (A) and (B)
54. Which test is used for the detection of halogens ?
 (A) Leibig's test (B) Kjeldahl method
 (C) Sodalime test (D) Beilstein test
55. Which of the following compound will not give Lassaigntest for detection of nitrogen ?
 (A) Hydrazine (B) urea (C) Ethyl amine (D) Nitroethane
56. 0.285 gram AgCl is obtained from 0.088 gram organic compound in Carius method. Calculate the proportion of chlorine in organic compound.
 (A) 82.6 % (B) 80.11 % (C) 70.7 % (D) 63.84 %
57. The black precipitates obtained during detection of sulphur in organic compound is due to which substance ?
 (A) CH_3COOH (B) PbS (C) $(\text{CH}_3\text{COO})_2\text{Pb}$ (D) Na_2S
58. The proportion of carbon, hydrogen and oxygen in organic compound is 6:1:8 by mass. If vapour density of this compound is 30, then determine its molecular formula.
 (A) CH_4O (B) $\text{C}_2\text{H}_4\text{O}_2$ (C) CH_3O (D) $\text{C}_2\text{H}_3\text{O}_4$
59. For which of the following substance Kjeldahl's method cannot be used ?



(D) None of the given

60. 0.36 gram BaSO_4 is obtained from 0.26 gram organic compound. Find percentage of sulphur in organic compound.
 (A) 19.0 % (B) 26 % (C) 9.9 % (D) 31 %
61. 198 mg CO_2 and 101.4 mg H_2O is obtained by complete combustion of 246 mg organic compound. Calculate percentage of C and H in this compound.
 (A) 45.8, 21.9 (B) 21.9, 43.0 (C) 21.95, 4.58 (D) 4.58, 24.6

62. 40 mL nitrogen gas was collected at 300 K temperature and 715 mm pressure while estimating nitrogen by Duma's method from 0.2 gram organic compound. Calculate percentage proportion of nitrogen in organic compound. (Surface tension of water of 300 K = 15 mm)
 (A) 17.5 % (B) 20.95 % (C) 33.5 % (D) 42 %
63. The ammonia gas obtained from 0.5 gram organic compound during estimation of nitrogen by Kjeldahl method neutralise 10 ml of 1 M H_2SO_4 . Calculate percentage of nitrogen in organic compound.
 (A) 14 % (B) 28 % (C) 56 % (D) 64 %
64. Estimation of halogen by Carius method gave 0.16 gram AgBr from 0.20 gram organic compound. Calculate percentage of bromine in organic compound.
 (A) 34.04 % (B) 32 % (C) 17.5 % (D) 38 %
65. Into which substance the halogen of organic compound is transformed during estimation of halogen by carius method ?
 (A) Silver nitrate (B) Silver halide (C) Silver oxide (D) Silver sulphate
66. 0.27 gram Silver was obtained on combustion of 0.38 gram Silver salt of dibasic acid. Calculate molecular weight of acid.
 (A) 45 (B) 60 (C) 90 (D) 120
67. In the estimation of which element I_2O_5 is used ?
 (A) nitrogen (B) halogen (C) phosphorous (D) oxygen
68. With reference to which substance estimation of phosphorous in organic compound is done using carius method ?
 (A) ortho phosphoric acid (B) magnesium pyrophosphate
 (C) ammonium molybdate (D) phosphorous pentoxide
69. If 0.20 gram $\text{Mg}_2\text{P}_2\text{O}_7$ is obtained during estimation of 0.5 gram organic compound by carius method, then calculate percentage of phosphorous.
 (A) 13.96 % (B) 15.75 % (C) 11.17 % (D) 23 %
70. In which of the following pair percentage proportion of carbon is the same ?
 (A) glucose and acetic acid (B) glucose and sucrose
 (C) ethanol and acetic acid (D) methyl formate and sugar
71. 0.39 gram platinum was obtained on heating 0.984 gram chloroplatinate salt of diacidic base. Calculate molecular weight of base.
 (A) 90 (B) 65 (C) 40 (D) 82
72. The ammonia produced from 0.3 gram organic substance taken for estimation of nitrogen was passed through 100 ml solution of 0.2 N H_2SO_4 . If 20 ml 0.5 N sodium hydroxide is required for complete neutralisation of excess acid, calculate percentage of nitrogen in organic substance.
 (A) 50 % (B) 36.5 % (C) 46.6 % (D) 27.3 %
73. A non volatile hydrocarbon contains 5.6% hydrogen. When 3.0 grams of this hydro carbon was dissolved in 100 gram benzene the relative lowering in vapour pressure of solution was found to be 1.306×10^{-2} Nm². Find molecular formula of hydrocarbon.
 (A) C_4H_{10} (B) $\text{C}_{14}\text{H}_{10}$ (C) C_{10}H_8 (D) C_7H_{16}
74. In a mono basic aromatic acid there is 68.87% carbon and 4.9% hydrogen. To neutralise 0.305 gram acid, 25 ml of 0.05 M diacidic base is required. Find molecular formula of acid.
 (A) $\text{C}_6\text{H}_5\text{O}_2$ (B) $\text{C}_6\text{H}_6\text{O}_2$ (C) $\text{C}_7\text{H}_6\text{O}_2$ (D) $\text{C}_7\text{H}_8\text{O}_2$

75. Nitrobenzene is formed as the major product along with a minor product in the reaction of benzene with a hot mixture of nitric acid and sulphuric acid. The minor product consists of carbon : 42.86%, hydrogen : 2.40%, nitrogen : 16.67%, and oxygen : 38.07%. When 5.5 gram of minor product is dissolved in 45 gram benzene, the boiling point of the solution is 1.84 °C higher than that of pure benzene. Find the molecular formula of the minor product.
- (A) $C_6H_4N_2O_4$ (B) $C_3H_2NO_2$ (C) $C_6H_5N_2O$ (D) $C_6H_3NO_3$
76. Find the values of x and y in :
- $$C_xH_yN_z + \left(2X + \frac{Y}{2}\right) CuO \xrightarrow{\Delta} X CO_2 + \frac{Y}{2} H_2O + XN_2 + YCu.$$
- (A) $X = 2X + Y, Y = 2z$ (B) $X = 2X + \frac{Y}{2}, Y = \frac{z}{2}$
- (C) $X = \frac{z}{2}, Y = 2X + \frac{Y}{2}$ (D) $X = 2z, Y = 2X + \frac{Y}{2}$
77. The CO_2 gas produced during the estimation of carbon present in organic compound is absorbed in the solution of potassium hydroxide because,
- (A) KOH is very good adsorbent (B) KOH is basic
- (C) Rate of reaction increases (D) All of the given above
78. A hydrocarbon contains 10.5 gram carbon per 1 gram of hydrogen. The mass of 1 litre vapours of this hydrocarbon at 127 °C temperature and 1 atmospheric pressure is 2.8 gram. Find molecular formula of hydrocarbon.
- (A) CH (B) CH_2 (C) C_7H_8 (D) C_5H_6
79. In a dibasic organic acid there is C = 34.62 %, H = 3.84 %. 0.1075 gram of this acid uses 20 ml of 0.1 N NaOH for complete neutralisation. Find molecular formula of the acid.
- (A) $C_4H_4O_3$ (B) $C_3H_4O_3$ (C) $C_4H_3O_4$ (D) $C_3H_4O_4$
80. The proportion of elements in a compound containing carbon, hydrogen and nitrogen is 18 : 2 : 7. If molecular weight of compound is 108, find its molecular formula.
- (A) C_3H_4N (B) $C_6H_8N_2$ (C) $C_3H_4N_2$ (D) C_6H_5N

Answers : 31. (C), 32. (B), 33. (D), 34. (A), 35. (A), 36. (B), 37. (A), 38. (D), 39. (D), 40. (B), 41. (B), 42. (D), 43. (A), 44. (A), 45. (C), 46. (B), 47. (C), 48. (D), 49. (A), 50. (C), 51. (B), 52. (C), 53. (C), 54. (D), 55. (A), 56. (B), 57. (B), 58. (B), 59. (D), 60. (A), 61. (C), 62. (B), 63. (C), 64. (A), 65. (B), 66. (C), 67. (D), 68. (B), 69. (C), 70. (A), 71. (D), 72. (C), 73. (B), 74. (C), 75. (A), 76. (C), 77. (B), 78. (C), 79. (D), 80. (B)

- Two statements are given in each of the following questions. In that one is assertion (A) and another is reason (R). Study every statement carefully and choose proper option as per instructions give below :
- (A) Assertion (A) and reason (R) both are correct and (R) is correct explanation of A.
- (B) Assertion (A) and reason (R) both are correct but (R) is not correct explanation of (A)
- (C) Assertion (A) is correct and reason (R) is incorrect
- (D) Assertion (A) is correct and reason (R) is correct
- (E) Assertion (A) and reason (R) both are incorrect.
81. **Assertion (A) :** Purification of essential oils is done by distillation.
- Reason (R) :** essential oils are non-volatile.

82. **Assertion (A)** : Prussian blue colour is seen on performing Lassaigne test of hydroxyl amine (NH_2OH)
Reason (R) : Hydroxyl amine does not form sodium cyanide with sodium.
83. **Assertion (A)** : Separation of a mixture of acetone and methanol can be done by simple distillation.
Reason (R) : Difference in boiling points of acetone and methanol is noticeable.
84. **Assertion (A)** : Kjeldahl method is more useful than Dumas method for estimation of nitrogen.
Reason (R) : Kjeldahl method can also be used when nitrogen atom is directly bonded with oxygen atom
85. **Assertion (A)** : Freshly prepared ferrous sulphate solution is used in Lassaigne test.
Reason (R) : On standing of ferrous sulphate solution, Fe^{2+} ion oxidise into Fe^{3+} ions.
86. **Assertion (A)** : Estimation of nitrogen present in DNA and RNA cannot be done using Kjeldahl method.
Reason (R) : Nitrogen atom is present in cyclic structure in DNA and RNA.
87. **Assertion (A)** : Though chlorine is present in methyl chloride (CH_3Cl) it does not give white precipitates with AgNO_3 .
Reason (R) : Methyl chloride is a covalent compound and hence not ionised into Cl^- .
88. **Assertion (A)** : The pressure of nitrogen gas produced in Dumas method is measured by nitrometer.
Reason (R) : Nitrometer is modern instrument for measuring pressure of gases.
89. **Assertion (A)** : Separation of a mixture of aniline and chloroform is done using simple distillation.
Reason (R) : There is not much difference in boiling points of aniline and chloroform.
90. **Assertion (A)** : Lassaigne solution is heated with HNO_3 prior to in detection of halogen by AgNO_3
Reason (R) : Presence of cyanide and sulphide ions interfere in test.

Answers : 81. (C), 82. (D), 83. (E), 84. (E), 85. (A), 86. (A), 87. (A), 88. (E), 89. (C), 90. (A).

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