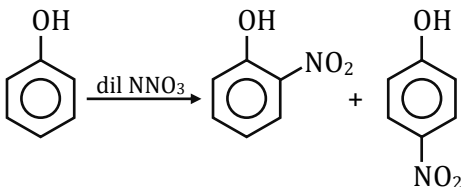


Purification, Quantitative and Qualitative Analysis

SOLUTIONS

Exercise-I (Conceptual Questions)

- Ans. (2)**
B.P. of Benzene = 353 K
B.P. of Ether = 308 K
Difference of B.P. = 353 – 308 = 45 K
Since the difference in B.P. is greater than 40, these can be separated by simple distillation.
- Ans. (3)**
Steam distillation is used for separation and purification of organic compounds which are steam volatile and are insoluble in water.

- Ans. (2)**
Chloroform and aniline = Distillation
Glycerol and spentlye = Distillation under Reduced pressure
Aniline and water = steam distillation
Amino acid = chromatography
- Ans. (3)**
The most commonly used adsorbent in column chromatography is Al_2O_3 and silica gel because they have high surface area and are porous in nature such that they absorb substances on to the surface by intermolecular forces.
- Ans. (1)**
The process of conversion of a sublimable solid to vapour state directly by heating without passing through liquid state is called sublimation.
- Ans. (2)**
Mixture of chloroform and aniline can be separated by simple distillation as the two liquids have sufficient difference in boiling point.
- Ans. (3)**
Both statement I and II are true.

- Ans. (3)**
When both nitrogen and sulphur are present in an organic compound sodium thiocyanate is formed, which gives blood red colour with Fe^{+3}
 $\text{Na} + \text{C} + \text{N} + \text{S} \rightarrow \text{NaCNS}$
 $\text{Fe}^{+3} + \text{SCN}^- \rightarrow [\text{Fe}(\text{SCN})]^{+2}$
(blood red)
- Ans. (4)**
Sodium fusion extract is treated with freshly prepared sodium nitroprusside, appearance of violet colour (purple) indicates presence of sulphur.
- Ans. (2)**
Mass of bromine = 80 u
Mass of Ag Br = 188 u
Weight of Ag Br = 0.12 g
Weight of organic compounds = 0.15 g
Percentage of Bromine
$$= \frac{\text{Molar mass of bromine} \times \text{weight of Ag Br}}{\text{Molar mass of Ag Br} \times \text{weight of O.C.}}$$
$$= \frac{80 \times 0.12}{188 \times 0.15} \times 100$$

Percentage of bromine = 34.04%

Exercise-II (Previous Year Questions)

- Ans. (1)**
 $W = 0.75\text{g}$
10 mol of 1M H_2SO_4
 $\therefore$ Valency Factor of $\text{H}_2\text{SO}_4 = 2$
 $1\text{M} \longrightarrow 2 \times \text{N}$
 $\Rightarrow$ milli eq. of $\text{NH}_3 = 2 \times 10$
 $= 20 \text{ millimoles}$
$$\text{Moles of } \text{NH}_3 = \frac{20}{1000}$$

Now % N $= \frac{14}{0.75} \times \frac{20}{1000} \times 100$
 $= 37.33\%$
- Ans. (2)**
 $w = 0.25 \text{ g}$
 $V_1 = 40 \text{ ml}, T_1 = 300\text{K}$
725mm aq. Tension = 25 mm

Act. pr. = 725 - 25 = 700 mm

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \Rightarrow V_2 = \frac{700 \times 40}{300} \times \frac{273}{760} = 33.526 \text{ ml}$$

Now

$\therefore 22400 \text{ ml} \longrightarrow 28 \text{ g}$

$$1 \text{ ml} \longrightarrow \frac{28}{22400}$$

$$33.526 \text{ ml} \longrightarrow \frac{28}{22400} \times 33.526$$

= 0.0419 weight of N_2

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

3. **Ans. (3)**

The most suitable method of separation of 1 : 1 mixture of ortho and para nitrophenols is steam distillation because ortho nitrophenol is steam volatile and para nitrophenol is steam non-volatile.

4. **Ans. (3)**

Paper chromatography is an example of partition chromatography.

5. **Ans. (1)**

A liquid compound (x) can be purified by steam distillation only if it is $\rightarrow$
 $\rightarrow$ Steam volatile and immiscible with water.

6. **Ans. (2)**

This method is not applicable to compounds containing nitro ($-\text{NO}_2$), Nitroso (NO), Azo

group ($-\text{N}=\text{N}-$), azoxy compounds ($-\text{N}=\text{N}-\overset{\text{O}}{\uparrow}$)
 And nitrogen present in the ring.

7. **Ans. (1)**

- (A) Glycerol from spent lye $\rightarrow$ (iii) Distillation under reduced pressure
 (B) Chloroform + aniline $\rightarrow$ (iv) distillation
 (C) Fractions of crude oil $\rightarrow$ (ii) fractional distillation
 (D) Aniline + water $\rightarrow$ (i) steam distillation

8. **Ans. (2)**

Sublimation

9. **Ans. (4)**

If one of the substances in the mixture is water and the other, a water insoluble substance, then the mixture will boil close to but below 373K.

10. **Ans. (2)**

$$\text{C}\% = \frac{12}{44} \times \frac{0.2}{0.3} \times 100 = 18.18\%$$

$$\text{H}\% = \frac{2}{18} \times \frac{0.1}{0.3} \times 100 = 3.70\%$$

Exercise-III (Analytical Questions)

1. **Ans. (3)**

- (a) Liquids having sufficient difference in boiling point $\rightarrow$ (q) Distillation
 (b) Difference of boiling points of liquids is not much. $\rightarrow$ (p) Fractional distillation
 (c) Compounds which decompose at or below their boiling point
 $\rightarrow$ (s) Distillation under reduced pressure
 (d) Substances which are steam volatile and are immiscible with water
 $\rightarrow$ (r) Steam distillation

2. **Ans. (2)**

Kjeldahl method is not applicable to compounds containing nitrogen in nitro and azo groups and nitrogen present in the ring (eg. Pyridine) as nitrogen of these compounds does not change to ammonium sulphate under these conditions.

3. **Ans. (4)**

- (a) $[\text{Fe}(\text{CN})_5\text{NOS}]^{4-} \rightarrow$ (r) Violet
 (b) $[\text{Fe}(\text{SCN})]^{2+} \rightarrow$ (q) Blood red
 (c) $(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3 \rightarrow$ (s) yellow
 (d) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3 \cdot x\text{H}_2\text{O} \rightarrow$ (p) Prussian blue

4. **Ans. (2)**

- (a) For N present in compound
 $\rightarrow$ (s) Na fusion extract gives blue colour
 (b) For N & S present in compound
 $\rightarrow$ (q) Na fusion extract gives blood red colour
 (c) For P present in compound
 $\rightarrow$ (p) Oxidised product gives yellow PPT with HNO_3 followed by $(\text{NH}_4)_2\text{MoO}_4$
 (d) For s present in compound
 $\rightarrow$ (r) Na fusion extract gives black ppt with $(\text{CH}_3\text{COO})_2\text{Pb}$.

5. **Ans. (3)**

- (a) Kjeldahl's method $\rightarrow$ (p) NH_3
 (b) Carius method $\rightarrow$ (s) AgCl
 (c) Dumas method $\rightarrow$ (r) N_2
 (d) Lassaigne's Test $\rightarrow$ (q) NaCN