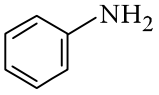
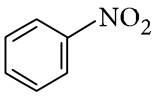
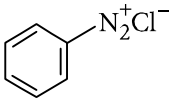
CHAPTER

20

Purification and Characterisation of Organic Compounds

1. Which of the following compounds will be suitable for Kjeldahl's method for nitrogen estimation?

(a) 
(b) 
(c) 
(d)  *(2018)*

2. The correct match between items of List-I and List-II is

List-I		List-II
A. Coloured impurity	P.	Steam distillation
B. Mixture of *o*-nitrophenol and *p*-nitrophenol	Q.	Fractional distillation
C. Crude Naphtha	R.	Charcoal treatment
D. Mixture of glycerol and sugars	S.	Distillation under reduced pressure

(a) (A)-(R), (B)-(S), (C)-(P), (D)-(Q)
(b) (A)-(R), (B)-(P), (C)-(Q), (D)-(S)
(c) (A)-(P), (B)-(S), (C)-(R), (D)-(Q)
(d) (A)-(R), (B)-(P), (C)-(S), (D)-(Q) *(Online 2018)*

3. Two compounds I and II are eluted by column chromatography (adsorption of I > II). Which one of the following is a correct statement?
(a) II moves faster and has higher R_f value than I.
(b) I moves faster and has higher R_f value than II.
(c) II moves slower and has higher R_f value than I.
(d) I moves slower and has higher R_f value than II.
(Online 2018)

4. Which of the following statements is not true about partition chromatography?
(a) Mobile phase can be a gas.
(b) Separation depends upon equilibration of solute between a mobile and a stationary phase.
(c) Paper chromatography is an example of partition chromatography.
(d) Stationary phase is a finely divided solid adsorbent.
(Online 2017)

5. The distillation technique most suited for separating glycerol from spent-lye in the soap industry is
(a) simple distillation (b) fractional distillation
(c) steam distillation
(d) distillation under reduced pressure. *(2016)*

6. 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 *(2016)*

7. 1.4 g 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 neutralisation. The percentage of nitrogen in the compound is
(a) 3 (b) 5
(c) 10 (d) 24 *(Online 2016)*

8. 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) 5% (b) 6%
(c) 10% (d) 3% *(2014)*

9. 29.5 mg of an organic compound containing nitrogen was digested according to Kjeldahl's method and the evolved ammonia was absorbed in 20 mL of 0.1 M HCl solution. The excess of the acid required 15 mL of 0.1 M NaOH solution for complete neutralization. The percentage of nitrogen in the compound is
(a) 29.5 (b) 59.0
(c) 47.4 (d) 23.7 *(2010)*

10. The ammonia evolved from the treatment of 0.30 g of an organic compound for the estimation of nitrogen was passed in 100 mL of 0.1 M sulphuric acid. The excess of acid required 20 mL of 0.5 M sodium hydroxide solution for complete neutralization. The organic compound is
(a) acetamide (b) benzamide
(c) urea (d) thiourea. *(2004)*

11. In a compound C, H and N atoms are present in 9 : 1 : 3.5 by weight. Molecular weight of compound is 108. Molecular formula of compound is
(a) $C_2H_6N_2$ (b) C_3H_4N
(c) $C_6H_8N_2$ (d) $C_9H_{12}N_3$. *(2002)*

ANSWER KEY

1. (b) **2.** (b) **3.** (a) **4.** (None) **5.** (d) **6.** (c) **7.** (c) **8.** (c) **9.** (d) **10.** (c) **11.** (c)

Explanations

1. (b) : Kjeldahl's method is very convenient method. This method is suitable for estimating nitrogen in those organic compounds in which nitrogen is linked to carbon and hydrogen. This method is not used in case of nitro, azo and azoxy compounds and for the compound containing nitrogen in the ring (*e.g.*, pyridine, quinoline, isoquinoline, etc.)

2. (b)

3. (a) : I is strongly adsorbed than II, I moves slower than II or II moves faster than I.

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

Thus, R_f of I < R_f of II

4. (None) : None of the given option is correct.

5. (d) : Glycerol is separated from spent-lye by distillation under reduced pressure because under normal distillation glycerol having boiling point of 290°C may decompose.

6. (c) : % of Br = $\frac{=5}{6==} \times \frac{\text{T m-\{r HsI ~r\{ ~y qp}}{\text{T m-\{r -×n-µnz oq µnwqz}} \times 655$

$= \frac{=5}{6==} \times \frac{696}{7:5} \times 655 = 79$

7. (c) : Milliequivalents of H_2SO_4 = ; $5 \times \frac{6 \times 7}{65} = 67$

Milliequivalents of NaOH $= 75 \times \frac{6}{65} = 7$

Milliequivalents of NH_3 = 12 – 2 = 10

% of nitrogen = $\frac{63 \times \text{-}k \times s \cdot \text{VO}_8}{t} = \frac{63 \times 65}{63} = 65$

8. (c) : Mass of organic compound = 1.4 g

$$\% \text{ of N} = \frac{1.4 \times \text{Meq. of acid consumed}}{\text{Mass of compound taken}}$$

Meq. of acid consumed $= \left(60 \times \frac{1}{10} \times 2\right) - \left(20 \times \frac{1}{10} \times 1\right)$

= 10 [Basicity of acid = 2]

$$\% \text{ of N} = \frac{1.4 \times 10}{1.4} = 10\%$$

9. (d) : The % of N according to Kjeldahl's method $= \frac{1.4 \times N_1 \times V}{w}$

N_1 = Normality of the standard acid = 0.1 N

w = Mass of the organic compound taken

= 29.5 mg = 29.5 × 10^{-3} g

V = Volume of N_1 acid neutralised by ammonia

= (20 – 15) = 5 mL.

$$\Rightarrow \quad \%\text{N} = \frac{1.4 \times 0.1 \times 5}{29.5 \times 10^{-3}} = 23.7$$

10. (c) : Equivalents of NH_3 evolved

$$= \frac{100 \times 0.1 \times 2}{1000} - \frac{20 \times 0.5}{1000} = \frac{1}{100}$$

Percent of nitrogen in the unknown organic compound =

$$\frac{1}{100} \times \frac{14}{0.3} \times 100 = 46.6$$

Percentage of nitrogen in urea $(NH_2)_2CO$ = $\frac{14 \times 2}{60} \times 100 = 46.6$

∴ The compound must be urea.

11. (c) :

C		H		N
9	:	1	:	3.5
$\frac{9}{12}$	:	$\frac{1}{1}$	:	$\frac{3.5}{14}$
$\frac{3}{4}$	:	$\frac{1}{1}$	:	$\frac{1}{4}$
3	:	4	:	1

Empirical formula = C_3H_4N

$(C_3H_4N)_n = 108$

$(12 \times 3 + 1 \times 4 + 14)_n = 108$

$54n = 108 \Rightarrow n = 108/54 = 2$

Molecular formula = $(C_3H_4N) \times 2 = C_6H_8N_2$