

PRACTICAL ORGANIC CHEMISTRY

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

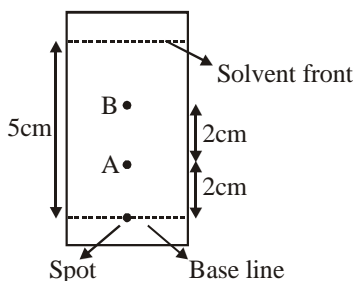


Figure : Paper chromatography for compounds A and B.

the calculate R_f value of A _____ $\times 10^{-1}$.

2. Given below are two statements :

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

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

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

- (1) **Statement-I** is false but **Statement II** is true
- (2) **Both Statement-I** and **Statement II** are false
- (3) **Statement-I** is true but **Statement II** is false
- (4) **Both Statement-I** and **Statement II** are true

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

- (1) Carius tube is used in the estimation of sulphur in an organic compound
- (2) Carius method is used for the estimation of nitrogen in an organic compound
- (3) Phosphoric acid produced on oxidation of phosphorus present in an organic compound is precipitated as $Mg_2P_2O_7$ by adding magnesia mixture.
- (4) Kjeldahl's method is used for the estimation of nitrogen in an organic compound

4. In chromatography technique, the purification of compound is independent of :

- (1) Mobility or flow of solvent system
- (2) Solubility of the compound
- (3) Length of the column or TLC Plate
- (4) Physical state of the pure compound

5. Given below are two statements :

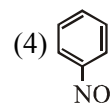
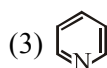
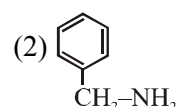
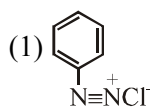
Statement-I : Retardation factor (R_f) can be measured in meter/centimeter.

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

Choose the most appropriate answer from the options given below:

- (1) Statement-I is true but statement-II is false
- (2) Both statement-I and statement-II are true
- (3) Both statement-I and statement-II are false
- (4) Statement-I is false but statement-II is true

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



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

- (1) HNO_3
- (2) $AgNO_3$
- (3) $CuSO_4$
- (4) $BaSO_4$

8. Which purification technique is used for high boiling organic liquid compound (decomposes near its boiling point)?

- (1) Simple distillation
- (2) Steam distillation
- (3) Fractional distillation
- (4) Reduced pressure distillation

9. 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 _____%. (Nearest integer)

(Atomic Mass of Ba = 137 u)

10. 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]

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

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

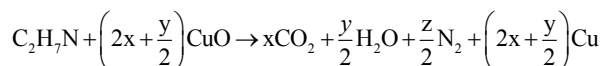
Assertion (A) : A simple distillation can be used to separate a mixture of propanol and propanone.

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

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

- (1) **(A)** is false but **(R)** is true.
- (2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
- (3) **(A)** is true but **(R)** is false
- (4) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

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



The value of y is _____. (Integer answer)

SOLUTION

1. Official Ans. by NTA (4)

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

on chromatogram distance travelled by compound is $\rightarrow 2$ cm

Distance travelled by solvent = 5 cm

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

2. Official Ans. by NTA (4)

Sol. Statement 1 : B.P. of chloroform = 334 K

B.P. of aniline = 457 K

thus can be separated of simple distillation.

Statement 2 : Mixture of aniline and water separated by simple distillation.

3. Official Ans. by NTA (2)

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

4. Official Ans. by NTA (4)

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

5. Official Ans. by NTA (2)

Sol. Let the final temperature of the mixture be T. Since, there is no loss in energy.

$$\Delta U = 0$$

$$\Rightarrow \frac{F_1}{2} n_1 R \Delta T + \frac{F_2}{2} n_2 R \Delta T = 0$$

$$\Rightarrow \frac{F_1}{2} n_1 R (T_1 - T) + \frac{F_2}{2} n_2 R (T_2 - T) = 0$$

$$\Rightarrow T = \frac{F_1 n_1 R T_1 + F_2 n_2 R T_2}{F_1 n_1 R + F_2 n_2 R} \Rightarrow \frac{F_1 n_1 T_1 + F_2 n_2 T_2}{F_1 n_1 + F_2 n_2}$$

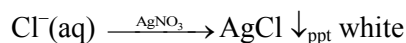
6. Official Ans. by NTA (2)

Sol. Kjeldahl method is not applicable to compounds containing nitrogen in nitrogroup, Azo groups and nitrogen present in the ring (e.g Pyridine) as nitrogen of these compounds does not change to Ammonium sulphate under these conditions.

7. Official Ans. by NTA (2)

Sol. 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 here to distinguish Cl^- , Br^- and I^- respectively as follows.



8. Official Ans. by NTA (4)

Sol. Reduced pressure distillation or vacuum distillation is used for the purification of high boiling organic liquids which decomposes at or below their boiling point.

9. Official Ans. by NTA (42)

Sol. Molecular mass of $\text{BaSO}_4 = 233$ g

$\therefore 233$ BaSO_4 contain $\rightarrow 32$ g sulphur

$$\therefore 1.44 \text{ g } \text{BaSO}_4 \text{ contain } \rightarrow \frac{32}{233} \times 1.44 \text{ g}$$

sulphur

given : 0.471 g of organic compound

$$\% \text{ of S} = \frac{32 \times 1.44}{233 \times 0.471} \times 100 = 41.98\% \approx 42\%$$

OR



$$\Rightarrow n_s = n_{\text{BaSO}_4} = \frac{1.44}{233}$$

$$\Rightarrow w_s = \frac{1.44}{233} \times 32 \text{ g}$$

$$\text{therefore } \% \text{S} = \frac{W_s}{W_{\text{O.C.}}} \times 100 = \frac{1.44 \times 32}{233 \times 0.471} \times 100$$

$$= \frac{46.08}{109.743} \times 100 = 41.98 \approx 42$$

10. Official Ans. by NTA (40)

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

$$\Rightarrow n_{\text{Br}} = n_{\text{AgBr}} = 0.001\text{ mol}$$

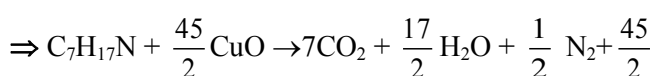
$$\Rightarrow \text{mass}_{\text{Br}} = (0.001 \times 80)\text{ gm} = 0.08\text{ gm}$$

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

11. Official Ans. by NTA (1125)

Sol. Moles of N in N,N - dimethylaminopentane

$$= \left(\frac{57.5}{115} \right) = 0.5\text{mol}$$



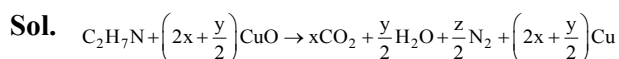
Cu

$$\frac{n_{\text{CuO reacted}}}{\left(\frac{45}{2} \right)} = \frac{n_{\text{C}_7\text{H}_{17}\text{N reacted}}}{1}$$

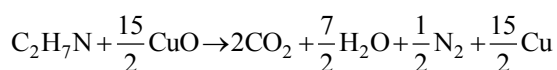
$$\Rightarrow n_{\text{CuO reacted}} = \left(\frac{45}{2} \right) \times 0.5 = 11.25$$

12. Official Ans. by NTA (4)

Sol. Both assertion & reason are correct & (R) is the correct explanation of (A)

13. Official Ans. by NTA (7)

On balancing



On comparing

$$y = 7$$