

# PRACTICAL ORGANIC CHEMISTRY

## PURIFICATION METHODS DISTILLATION TECHNIQUES

Type :

### (A) SIMPLE DISTILLATION

#### Conditions

- (i) When liquid sample has non-volatile impurities
- (ii) When boiling point difference is 30 K or more.

#### Examples

- (i) Mixture of chloroform (BP = 334K) and Aniline (BP = 457K)
- (ii) Mixture of Ether (b.p. = 308K) & Toluene (b.p. = 384K)
- (iii) Hexane (342K) and Toluene (384K)

### (B) FRACTIONAL DISTILLATION

When b.p. difference is 10K

#### Examples

- (i) Crude oil in petroleum industry
- (ii) Acetone (329 K) and Methyl alcohol (338K)

### (C) DISTILLATION UNDER REDUCED PRESSURE

(Vacuum distillation)

When liquid boils at higher temperature and it may decompose before b.p. is attained.

#### Example

- (i) Concentration of sugar juice
- (ii) Recovery of glycerol from spent lye.
- (iii) Glycerol

### (D) STEAM DISTILLATION

When the substance is immiscible with water and steam volatile.

#### Example :

- (i) Aniline is separated from water
- (ii) Turpentine oil
- (iii) Nitro Benzene
- (iv) Bromo Benzene
- (v) Naphthalene
- (vi) o-Nitrophenol

$$P = P_1 + P_2$$

Vapour pressure of Organic liquid

Vapour pressure of water

## LASSAIGNE'S METHOD (detection of elements)

Element	Sodium extract	Confirmed test
Nitrogen	$\text{Na} + \text{C} + \text{N} \xrightarrow{\Delta} \text{NaCN}$	$(\text{NaCN} + \text{FeSO}_4 + \text{NaOH}) \xrightarrow{\text{boil and cool}} \text{Fe}_3(\text{Fe}(\text{CN})_6)_4$ <p>Prussian blue colour</p>
Sulphur	$2\text{Na} + \text{S} \xrightarrow{\Delta} \text{Na}_2\text{S}$	$(i) \text{Na}_2\text{S} + \text{Na}_2(\text{Fe}(\text{CN})_6)\text{NO} \xrightarrow{\text{Boil in HCl}} \text{Na}_2(\text{Fe}(\text{CN})_6)\text{NO} \cdot \text{S}$ <p>a deep red colour</p> $(ii) \text{Na}_2\text{S} + \text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{S} \uparrow$ <p>A black ppt. (PbS)</p>
Halogen	$\text{Na} + \text{X} \xrightarrow{\Delta} \text{NaX}$	$\text{NaX} + \text{HNO}_3 \rightarrow \text{AgNO}_3$ <ul style="list-style-type: none"> <li>(i) White ppt. soluble in aq. <math>\text{NH}_3</math>, confirms Cl.</li> <li>(ii) Yellow ppt. partially soluble in aq. <math>\text{NH}_3</math>, confirms Br.</li> <li>(iii) Yellow ppt. insoluble in aq. <math>\text{NH}_3</math>, confirms I.</li> </ul>
Nitrogen and sulphur together	$\text{Na} + \text{C} + \text{N} + \text{S} \xrightarrow{\Delta} \text{NaCNS}$ <p>Sodium thiocyanate (Blood red colour)</p>	As in test for nitrogen; instead of green or blue colour, blood red colouration confirms presence of N and S both.

## QUANTITATIVE ANALYSIS OF ORGANIC COMPOUNDS

### Estimation of carbon and hydrogen - Liebig's method



$$\% \text{ of C} = \frac{12}{44} \times \frac{\text{wt. of CO}_2}{\text{wt. of org. compd.}} \times 100$$

$$\% \text{ of H} = \frac{2}{18} \times \frac{\text{wt. of H}_2\text{O}}{\text{wt. of org. compd.}} \times 100$$

**Note :** This method is suitable for estimation if organic compound contains C and H only. In case if other elements e.g., N, S, halogens are also present the organic compound will also give their oxides which is being absorbed in KOH and will increase the percentage of carbon and therefore following modification should be made.

### ESTIMATION OF NITROGEN

#### Duma's method :

The nitrogen containing organic compound yields nitrogen gas on heating it with copper (II) oxide in the presence of  $\text{CO}_2$  gas. The mixture of gases is collected over potassium hydroxide solution in which  $\text{CO}_2$  is absorbed and volume of nitrogen gas is determined.

$$\% \text{ of N} = \frac{28}{22400} \times \left( \frac{\text{Vol. of N}_2 \text{ collected at N.T.P.}}{\text{Vol. of organic compound}} \right) \times 100$$

**Note :** This method can be used to estimate nitrogen in all types of organic compounds

#### Kjeldahl's method :

In this method nitrogen containing compound is heated with conc.  $\text{H}_2\text{SO}_4$  in presence of copper sulphate to convert nitrogen into ammonium sulphate which is decomposed with excess of alkali to liberate ammonia. The ammonia evolved is

$$\% \text{ of N} = \frac{1.4 \times \text{volume of acid (ml)} \times \text{normality of acid}}{\text{wt of organic compound}}$$

**Note :** This method is simpler and more convenient and is mainly used for finding out the percentage of nitrogen in food stuffs, soil, fertilizers and various agricultural products. This method cannot be used for compound having nitro groups, azo group ( $-\text{N}=\text{N}-$ ) and nitrogen in the ring (pyridine, quinoline etc.) Since nitrogen in these compounds is not quantitatively converted in to ammonium sulphate.

# Msc Organic Chemistry Practical Manual

**M Tight**



## Msc Organic Chemistry Practical Manual:

**ORGANIC MEDICINAL CHEMISTRY PRACTICAL MANUAL FOR PHARMACY AND SCIENCE STUDENTS** Anees Ahmad Siddiqui, The manual illustrates the concept of basic techniques in practical organic medicinal chemistry It aims to meet the requirements of B Pharmacy students under the new syllabus prescribed by Pharmacy Council of India It will also be useful to BSc BSc Hons and MSc medicinal chemistry students      **A Systematic Course of Practical Organic Chemistry** Lionel Guy Radcliffe, 1905      *Classified Guide to Technical and Commercial Books*, 1904      *Laboratory Manual of Organic Chemistry* Raj K. Bansal, 2009 About the Book The manual has been thoroughly revised several new experiments and tests have been added while some redundant material has been deleted Chapter 2 has been completely rewritten An obvious change of this edition constitutes the splitting of Chapter 7 into two separate Chapters Tables on derivatives of organic compounds have been expended Also included are 20 estimations 75 preparations and isolation experiments and approximately 135 in text questions related to the experiments The approximation of modern spectroscopic techniques to structure determination have been discussed in the last Chapter This book is designed both for undergraduate and postgraduate level students with its enhanced and comprehensive presentation This is an indispensable book for organic chemistry practicals About the Author Dr Raj K Bansal received his M S from the University of California Davis Calif U S A and Ph D from Calgary University Calgary Alberta Canada He was a postdoctoral fellow at the National Research Council N R C of Canada in Halifax N S Canada followed by a Research Associateship at the Mellon Institute of Science Carnegie Mellon University Pittsburgh Pa U S A Dr Bansal has published a number of research papers in various foreign and Indian scientific journals He is the author of six books on chemistry including this work A Textbook of Organic Chemistry 5th ed 2007 Organic Chemistry Problems and Solutions 2nd edn 2006 and Heterocyclic Chemistry 4th edn 2005 One of his books Synthetic Approaches in Organic Chemistry has been reprinted by Jones and Bartlett Publishers Sudbury Massachusetts U S A Dr Bansal was a former Professor Department of Chemistry Indian Institute of Technology Delhi Hauz Khas New Delhi      A Manual of Machine Drawing and Design David Allan Low, Alfred William Bevis, 1898      **A Text-book of Physics** William Watson, 1904      Laboratory Studies for Brewing Students Adrian John Brown, 1904      **The Steam Turbine** Robert Morrison Neilson, 1902      The Structure and Classification of Birds Frank Evers Beddard, 1898      Machine Tools and Workshop Practice for Engineering Students and Apprentices Alfred Parr, 1905      *Elementary treatise on physics, experimental and applied, tr. and ed. by E. Atkinson* Adolphe Ganot, 1898      **A Text-book on Ceramic Calculations** Willie Jackson, 1904      *Calculations in Hydraulic Engineering: Fluid pressure, and the calculations of its effects in engineering structures* Thomas Claxton Fidler, 1898      *Lab Sparks: Amazing Physics - Complete Edition for Classes 6-12: The Ultimate Practical Manual | You Can See, Feel & Explore! | 70+ Experiments from Kitchen Science to Electromagnetism | Aligned with NCERT, CBSE & NEP 2020* KUNDAN KUMAR, 2025-10-13 The Ultimate Science Adventure Awaits Discover the Magic of

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