

Calculations in Analytical Chemistry

The Mole

The mole is the SI unit for amount of substance. It corresponds to the amount of a chemical substance that contains the same number of particles present in 12 grams of C-12 which is equivalent to Avogadro's number, that is, $N_A = 6.022 \times 10^{23}$.

The molar mass is given as the mass of a compound in grams per mole of that substance. It is calculated by adding the molar masses of all the component elements in the compound. Take glucose for example:

Element	Molar mass per element	Number of atoms	Mass
C	12 g/mol	6	72 g/mol
H	1 g/mol	12	12 g/mol
O	16 g/mol	6	96 g/mol
Molar Mass			180 g/mol

Mole and Millimole Calculations

The millimole is simply 1/1000 of a mole. It is sometimes used in calculations because of its convenience.

Example (Skoog, et al., 2014):

1. Find the number of moles and millimoles of benzoic acid (122.1 g/mol) that are contained in 2.00 g of pure acid.

If we use HBz to represent benzoic acid:

$$HBz_{mol} = 2.00 \text{ g}_{HBz} \times \frac{1 \text{ mol}_{HBz}}{122.1 \text{ g}_{HBz}} = 0.0164 \text{ mol}_{HBz}$$

To obtain the number of millimoles, the millimolar mass of benzoic acid will be used:

$$HBz_{mol} = 2.00 \text{ g}_{HBz} \times \frac{1 \text{ mmol}_{HBz}}{0.1221 \text{ g}_{HBz}} = 16.4 \text{ mmol}_{HBz}$$

2. What is the mass in grams of Na^+ (22.99 g/mol) in 25.0 g of Na_2SO_4 (142.0 g/mol)?

$$mass_{Na^+} = 25.0 \text{ g}_{Na_2SO_4} \times \frac{1 \text{ mol}_{Na_2SO_4}}{142.0 \text{ g}_{Na_2SO_4}} \times \frac{2 \text{ mol}_{Na^+}}{1 \text{ mol}_{Na_2SO_4}} \times \frac{22.99 \text{ g}_{Na^+}}{1 \text{ mol}_{Na^+}}$$

$$mass_{Na^+} = 8.10 \text{ g}_{Na^+}$$

Analytical Chemistry 3

P. Gh. Zugrăvescu



Analytical Chemistry 3:

Analytical Chemistry—3 P. Gh. Zugrăvescu, 2013-10-22 Analytical Chemistry 3 provides information pertinent to the development of analytical chemistry This book discusses the significant role of analytical chemistry in the progress of the chemical industry Organized into nine chapters this book begins with an overview of the contribution of analytical chemistry in the development as well as in process control of the industrial chemistry This text then presents a brief history concerning the development of analytical chemistry in Romania Other chapters consider the general problem of utilizing gradients in chromatography This book discusses as well the developments in the determination of some common anions and describes the separation of anions of the same species The final chapter deals with the classification of enrichment methods according to the type of sample for which they are to be used This book is a valuable resource for chemists analytical chemists and pharmaceutical chemists Teachers scientists researchers and specialists in Romanian school of chemistry will also find this book useful

Chemometrics in Analytical Chemistry 3 3. International conference on chemometrics in analytical chemistry, 1986

Treatise on Analytical Chemistry Philip J. Elving, Izaak Maurits Kolthoff, Fred H. Stross, 1977

New Advances in Analytical Chemistry Atta-ur Rahman, 2002-04-11 New Advances in Analytical Chemistry Volume 3 presents recent developments in various spectroscopic techniques such as NMR spectroscopy and mass spectroscopy in the form of comprehensive reviews written by leading authorities in the field With new and updated information the book is invaluable to both research students and postdoctoral workers who wish to keep abreast of frontiers in analytical techniques Each chapter provides a broad overall account of recent developments so that the readers can stay current not only with the authors own contributions but also with contributions of other eminent scientists working in this area

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much more Current Topics in Analytical Chemistry ,2002 **Treatise on Analytical Chemistry** I. M Kolthoff,1976
 Analytical chemistry in industry Thermal and chemical testing Evaluation of surface properties Evaluation of particle properties Mechanical and electrical testing TRAC: Trends in Analytical Chemistry Susan E. Lord,2013-09-17 Trends in Analytical Chemistry Volume 3 focuses on developments in analytical chemistry including the adoption of automation in laboratory processes chromatography and flow analysis The selection first underscores the effect of automation on the operations of analytical laboratories and techniques for the automated optimization of HPLC separations Topics include initial requirements window diagrams and chemometric approaches The text then ponders on generation of statistical tables by microcomputer enzyme electrodes for continuous in vivo monitoring and enantiomeric analysis of the common protein amino acids by liquid chromatography The publication takes a look at sample preparation for the analysis of heavy metals in foods and application of ion selective electrodes in flow analysis including dry ashing acid extraction and ion selective electrodes in flowing systems The text then examines trends in laboratory information management systems zone electrophoresis in open tubular capillaries and using computers to interpret IR spectra of complex molecules The selection is a valuable source of data for readers interested in the developments in analytical chemistry **Treatise on Analytical**

Chemistry. Pt. 3. Analytical Chemistry in Industry Izaak Maurits Kolthoff, Philip J. Elving, Fred H. Ross, 1967

Treatise on Analytical Chemistry Izaak Maurits Kolthoff, 1961 **Recent Advances in Analytical Techniques** Atta-ur-Rahman, Sibel A. Ozkan, 2019-01-12 Recent Advances in Analytical Techniques is a series of updates in techniques used in chemical analysis Each volume presents a selection of chapters that explain different analytical techniques and their use in applied research Readers will find updated information about developments in analytical methods such as chromatography electrochemistry optical sensor arrays for pharmaceutical and biomedical analysis The third volume of the series features seven reviews on a variety of techniques Chiral Analysis of Methamphetamine and Related Controlled Substances in Forensic Science Low cost feedstocks for biofuels and high value added products production Using multi parameter flow cytometry as a tool to enhance the process efficiency Recent Trends in the Application of Ionic Liquids for Micro Extraction Techniques Electrospun Nanofibers Functional and Attractive Materials for the Sensing and Separation Approaches in Analytical Chemistry Neutron Activation Analysis An Overview Non commercial Polysaccharides based Chiral Selectors in Enantioselective Chromatography Ru II polypyridyl Complexes as Potential Sensing Agents for Cations and Anions **Theory and Practice of Analytical Chemistry** I. M. Kolthoff, P. J. Elving, 1961 **Treatise on Analytical Chemistry** Izaak M. Kolthoff, 1961 Analytical chemistry of the elements Systematic analytical chemistry of the elements Magnesium Zinc Cadmium Mercury *Analytical Chemistry* Ira S. Krull, 2012-11-07 The current text deals with several very important topics of modern Analytical Chemistry such as analytical method validation in biotechnology today principal component analysis kinetic methods of analysis using potentiometric and spectrophotometric detectors the current status of

Analytical Chemistry and where it may move in the future peptide and amino acid separations and identification and several other related topics in this growing and increasingly important area of Chemistry in general Analytical Chemistry has come to assume an incredibly important role in most if not all areas of scientific research today from the current Mars lander rover to underwater explorations to forensic science to DNA characterization for dedicated medicine treatments to climate change and others just as important areas of modern scientific research and development Its usage in modern omics R

Comprehensive Analytical Chemistry: Classical analysis. 3 v Cecil Leeburn Wilson, David Woodburn Wilson, 1959

Treatise on Analytical Chemistry Part II Izaak Maurits Kolthoff, Philip J. Elving, Ernest B. Sandell, 1961

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