

# 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  $\text{Na}^+$  (22.99 g/mol) in 25.0 g of  $\text{Na}_2\text{SO}_4$  (142.0 g/mol)?

$$\begin{aligned} \text{mass}_{\text{Na}^+} &= 25.0 \text{ g}_{\text{Na}_2\text{SO}_4} \times \frac{1 \text{ mol}_{\text{Na}_2\text{SO}_4}}{142.0 \text{ g}_{\text{Na}_2\text{SO}_4}} \times \frac{2 \text{ mol}_{\text{Na}^+}}{1 \text{ mol}_{\text{Na}_2\text{SO}_4}} \times \frac{22.99 \text{ g}_{\text{Na}^+}}{1 \text{ mol}_{\text{Na}^+}} \\ \text{mass}_{\text{Na}^+} &= 8.10 \text{ g}_{\text{Na}^+} \end{aligned}$$

# Analytical Chemistry Calculation Questions And Answers

**Ferenc Szabadváry**



## **Analytical Chemistry Calculation Questions And Answers:**

*Analytical Chemistry for Technicians* John Kenkel, 2002-10-29 Surpassing its bestselling predecessors this thoroughly updated third edition is designed to be a powerful training tool for entry level chemistry technicians *Analytical Chemistry for Technicians Third Edition* explains analytical chemistry and instrumental analysis principles and how to apply them in the real world A unique feature of this edition is that it brings the workplace of the chemical technician into the classroom With over 50 workplace scene sidebars it offers stories and photographs of technicians and chemists working with the equipment or performing the techniques discussed in the text It includes a supplemental CD that enhances training activities The author incorporates knowledge gained from a number of American Chemical Society and PITTCON short courses and from personal visits to several laboratories at major chemical plants where he determined firsthand what is important in the modern analytical laboratory The book includes more than sixty experiments specifically relevant to the laboratory technician along with a Questions and Problems section in each chapter *Analytical Chemistry for Technicians Third Edition* continues to offer the nuts and bolts of analytical chemistry while focusing on the practical aspects of training

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*Analytical Chemistry* Gary D. Christian,Purnendu K. Dasgupta,Kevin A. Schug,2013-10-07 With the 7th Edition of Analytical Chemistry renowned chemists Purnendu Sandy Dasgupta and Kevin Schug both of the University of Texas Arlington join the author team The new edition focuses on more in depth coverage of the principles and techniques of quantitative analysis and instrumental analysis aka Analytical Chemistry The goal of the text is to provide a foundation of the analytical process tools and computational methods and resources and to illustrate with problems that bring realism to the practice and importance of analytical chemistry It is designed for undergraduate college students majoring in chemistry and in fields related to chemistry

*Fundamentals of Biochemical Calculations* Krish Moorthy,2007-11-30 Fundamentals of Biochemical Calculations Second Edition demystifies the fundamental calculations used in modern biochemistry cell biology and allied biomedical sciences The book encouragesbothundergraduates and scientists to develop an understanding of the processes involved in performing biochemical calculations rather than rely on mem

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the fundamentals of analytical chemistry It summarizes 250 basic concepts of the field on the basis of slides Each of the nine chapters offers the following features Introduction Summary General scheme Teaching objectives Text containing the explanation of each slide Recommended and commented bibliography Questions to be answered Slides A distinct feature of this novel book is its focus on the fundamental concepts and essential principles of analytical chemistry which sets it apart from other books presenting descriptive overviews of methods and techniques **Report** Great Britain. Dept. of Science and Art, 1869 Statistical Methods in Analytical Chemistry Peter C. Meier, Richard E. Zünd, 2005-02-18 This new edition of a successful bestselling book continues to provide you with practical information on the use of statistical methods for solving real world problems in complex industrial environments Complete with examples from the chemical and pharmaceutical laboratory and manufacturing areas this thoroughly updated book clearly demonstrates how to obtain reliable results by choosing the most appropriate experimental design and data evaluation methods Unlike other books on the subject Statistical Methods in Analytical Chemistry Second Edition presents and solves problems in the context of a comprehensive decision making process under GMP rules Would you recommend the destruction of a 100 000 batch of product if one of four repeat determinations barely fails the specification limit How would you prevent this from happening in the first place Are you sure the calculator you are using is telling the truth To help you control these situations the new edition Covers univariate bivariate and multivariate data Features case studies from the pharmaceutical and chemical industries demonstrating typical problems analysts encounter and the techniques used to solve them Offers information on ancillary techniques including a short introduction to optimization exploratory data analysis smoothing and computer simulation and recapitulation of error propagation Boasts numerous Excel files and compiled Visual Basic programs no statistical table lookups required Uses Monte Carlo simulation to illustrate the variability inherent in statistically indistinguishable data sets Statistical Methods in Analytical Chemistry Second Edition is an excellent one of a kind resource for laboratory scientists and engineers and project managers who need to assess data reliability QC staff regulators and customers who want to frame realistic requirements and specifications as well as educators looking for real life experiments and advanced students in chemistry and pharmaceutical science From the reviews of Statistical Methods in Analytical Chemistry First Edition This book is extremely valuable The authors supply many very useful programs along with their source code Thus the user can check the authenticity of the result and gain a greater understanding of the algorithm from the code It should be on the bookshelf of every analytical chemist Applied Spectroscopy The authors have compiled an interesting collection of data to illustrate the application of statistical methods including calibrating setting detection limits analyzing ANOVA data analyzing stability data and determining the influence of error propagation Clinical Chemistry The examples are taken from a chemical pharmaceutical environment but serve as convenient vehicles for the discussion of when to use which test and how to make sense out of the results While practical use of statistics is the major concern it is put into perspective and the reader is urged

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Chemistry is a systematic account of the historical development of analytical chemistry spanning about 4 000 years Many scientists who have helped to develop the methods of analytical chemistry are mentioned Various methods of analysis are discussed including electrogravimetry optical methods electrometric analysis radiochemical analysis and chromatography This volume is comprised of 14 chapters and begins with an overview of analytical chemistry in ancient Greece the origin of chemistry and the earliest knowledge of analysis The next chapter focuses on analytical chemistry during the Middle Ages with emphasis on alchemy Analytical knowledge during the period of iatrochemistry and the development of analytical chemistry during the phlogiston period are then examined Subsequent chapters deal with the development of the fundamental laws of chemistry including the principle of the indestructibility of matter analytical chemistry during the period of Berzelius and developments in qualitative and gravimetric analysis Elementary organic analysis is also considered along with the development of the theory of analytical chemistry This book will be helpful to chemists as well as students and researchers in the field of analytical chemistry

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