

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:

$$HBz_{mol} = 2.00 \cancel{g_{HBz}} \times \frac{1 \cancel{mol_{HBz}}}{122.1 \cancel{g_{HBz}}} = 0.0164 \cancel{mol_{HBz}}$$

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

$$HBz_{mol} = 2.00 \cancel{g_{HBz}} \times \frac{1 \cancel{mmol_{HBz}}}{0.1221 \cancel{g_{HBz}}} = 16.4 \cancel{mmol_{HBz}}$$

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)?

$$mass_{Na^+} = 25.0 \cancel{g_{Na_2SO_4}} \times \frac{1 \cancel{mol_{Na_2SO_4}}}{142.0 \cancel{g_{Na_2SO_4}}} \times \frac{2 \cancel{mol_{Na^+}}}{1 \cancel{mol_{Na_2SO_4}}} \times \frac{22.99 \cancel{g_{Na^+}}}{1 \cancel{mol_{Na^+}}}$$

$$mass_{Na^+} = 8.10 g_{Na^+}$$

Analytical Chemistry Calculation Questions And Answers

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Basic Analytical Chemistry Mr. Rohit Manglik, 2024-05-18 EduGorilla Publication is a trusted name in the education sector committed to empowering learners with high quality study materials and resources Specializing in competitive exams and academic support EduGorilla provides comprehensive and well structured content tailored to meet the needs of students across various streams and levels

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Analytical Chemistry for Technicians, Second Edition John Kenkel, 1994-07-22 The second edition of Analytical Chemistry for Technicians provides the nuts and bolts of analytical chemistry and focuses on the practical aspects for training a technician level laboratory worker This edition presents new and expanded chapters innumerable questions and problems and modified experiments that present a fresh and challenging approach Some of the topics that have been expanded include chemical equilibrium chromatography Kjeldahl method and molarity and moles where EDTA and water hardness calculations are concerned New discussions of the Ag AgCl and combination pH electrodes have been added while the discussion of ion selective electrodes has been expanded The chapter introducing instrumental analysis and computers now includes discussions of $y = mx + b$ and the method of least squares The book also includes discussions of FTIR topics of NMR and mass spectrometry which are found in the new

infrared spectrometry chapter **Analytical Chemistry for Technicians, Fourth Edition** John Kenkel, 2013-08-13 Written as a training manual for chemistry based laboratory technicians this thoroughly updated fourth edition of the bestselling Analytical Chemistry for Technicians emphasizes the applied aspects rather than the theoretical ones The book begins with classical quantitative analysis and follows with a practical approach to the complex world of sophisticated electronic instrumentation commonly used in real world laboratories Providing a foundation for the two key qualities the analytical mindset and a basic understanding of the analytical instrumentation this book helps prepare individuals for success on the job Chapters cover sample preparation gravimetric analysis titrimetric analysis instrumental analysis spectrochemical methods such as atomic spectroscopy and UV Vis and IR molecular spectrometry chromatographic techniques including gas chromatography and high performance liquid chromatography electroanalytical methods and more Incorporating an additional ten years of teaching experience since the publication of the third edition the author has made significant updates and enhancements to the fourth edition More than 150 new photographs and either new or reworked drawings spanning every chapter to assist the visual learner A new chapter on mass spectrometry covering GC MS LC MS LC MS MS and ICP MS Thirteen new laboratory experiments An introductory section before chapter 1 to give students a preview of general laboratory considerations safety laboratory notebooks and instrumental analysis Additional end of chapter problems expanded report type questions and inclusion of relevant section headings in the Questions and Problems sections Application Notes in each chapter An appendix providing a glossary of quality assurance and good laboratory practice GLP terms *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

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