

Ministry Of Higher Education And Scientific Research

University of Babylon / College of Pharmacy

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Department of Pharmaceutical Chemistry

Title of the course: Analytical Chemistry,

Course number: 113

Level: first Class, first Semester

Credit hours/week: theory 3 + 1.30 . Laboratory 1

Reference text: fundamentals of Analytical Chemistry by stoek and west.

Objectives: To provide students with a sound theoretical back ground in chemical principles that is essential to practice chemical analysis. It enables student to understand the importance of judging the accuracy and precision of experimental data and techniques of quantitative analysis, and also to show that theory frequently serves as a useful guide to the solution of analytical problems.

Lecture number 1

Wednesday – 23/11/2016

Analytical Chemistry:

Review of elementary concept important to analytical chemistry: Strong and weak electrolytes; important weight and concentration units.

Introduction :-

Is a measurement science consisting of a set of powerful ideas and methods that are useful in all fields of science and medicine. Or

The kind of chemistry which answers the questions what, and how much it is divided in:

Qualitative analytical chemistry; reveals the identity of the elements and compounds in a sample.

Quantitative analytical chemistry; indicates the amount of each substance in a sample.

1 A- THE ROLE OF ANALYTICAL CHEMISTRY: -

Analytical Chemistry Is applied throughout industry, medicine, all the sciences. Consider a few examples...

1B- CLASSIFICATION OF QUANTITATIVE METHODS OF ANALYSIS

CHEMISTS: - classify analytical methods according to the nature of this final measurement.

1- Gravimetric method; determine the mass of the analyte or some compound chemically related to it.

2- Volumetric method; the volume a solution containing sufficient reagent to react completely with the analyte is measured.

3- Electroanalytical methods; involve the measurement of such electrical properties as potential, current, resistance and quantity of electrical charge.

4- Spectroscopic methods are based on measurement of the interaction between electromagnetic radiation and analyte atoms or molecules or on the production of such radiation by analytes.

1C- STEPS IN A TYPICAL QUANTITATIVE ANALYSIS : -

1C-1 SELECTING (Choosing) a method; The essential first step in any quantitative analysis Is the selection of a method.

1C-2 Acquiring the sample; the next step in a quantitative analysis is to acquire the sample.

1C-3 Processing the Sample;

A-Preparing Laboratory Samples; a solid laboratory sample is ground to decrease particle size, mixed to ensure homogeneity, and stored for various lengths of time before analysis begins.

B-Defining Replicate Samples; most chemical analyses are performed on replicate samples whose masses or volumes have been determined by careful measurements with an analytical balance or with a precise volumetric device.

C-Preparing Solutions: physical and chemical changes; most analyses are performed on solutions of the sample made with a suitable solvent.

Ideally, the solvent should dissolve the entire sample, including the analyte, rapidly and completely.

4- Eliminating Interferences; once we have the sample in solution and have converted the analyte to an appropriate form for measurement, the next step is to eliminate substances from the sample that may interfere with measurement.

5- Calibrating and Measuring Concentration; all analytical results depend on a final measurement X of a physical or chemical property of the analyte.

6- calculating Results; computing analyte concentrations from experimental data is usually relatively easy, particularly with modern calculators or computers.

7- Evaluating Results by Estimating Their Reliability; analytical results are incomplete without an estimate of their reliability.

This experimenter must provide some measure of the uncertainties associated with computed results if the data are to have any value.

Chemicals , Apparatus, Operations of Analytical Chemistry.

A- SELECTING AND HANDLING REAGENTS AND OTHER CHEMICALS:-The purity of reagents has an important bearing on the accuracy attained in

any analysis. It is therefore essential that the quality of a reagent be consistent with intended use.

A- 1 Classifying Chemicals: Reagent Grade

Reagent-grade chemicals conform to the minimum standards set forth by the Reagent Chemical Committee of the American Chemical Society (ACS) and are used wherever possible in analytical work.

Primary-Standard Grade: The qualities required of a **primary standard**, in addition to extraordinary purity.

The National Institute of Standards and Technology (NIST) is an excellent source for primary standards.

Special-Purpose Reagent Chemicals

Chemicals that have been prepared for a specific application are also available. Included among these are solvents for spectrophotometry and high-performance liquid chromatography.

To serve as a primary standard are:

1-Highest purity. 2-Stability. 3-Absence of water of hydration. 4- Non hygroscopic. 5- Non expensive. 6- High equivalent mass.

A-2 Rules for Handling Reagents and Solutions

A High-quality chemical analysis requires reagents and solutions of known purity.

1. Select the best grade of chemical available for analytical work. Whenever possible, pick the smallest bottle that will supply the desired quantity.
2. Replace the top of every container immediately after removal of the reagent; do not rely on someone else to do this.
3. Hold the stoppers of reagent bottles between your fingers; never set a stopper on a desk top.

4. Unless specifically directed otherwise, never return any excess reagent to a bottle. The money saved by returning excesses is seldom worth the risk of contaminating the entire bottle.
5. Unless directed otherwise, never insert spatulas, spoons, or knives into a bottle that contains a solid chemical.
6. Keep the reagent shelf and the laboratory balance clean and neat. Clean up any spills immediately. even though someone else is waiting to use the same chemical or reagent.
7. Observe local regulations concerning the disposal of surplus reagents and solutions

B- MEASURING MASS:- In most analyses, an analytical balance must be used to obtain highly accurate masses.

B-1 Types of Analytical Balances:- A macrobalances-it has a maximum load of 160g to 200g and a precision of 0.1 mg.

Semimicroanalytical balances a maximum load of 10g to 30 g and a precision of 0.01 mg.

A microanalytical balance has a maximum load of 1g to 3 g and a precision of 0.001 mg, 1 micro gram.

C- MEASURING VOLUME:- The precise measurement of volume is as important to many analytical methods as the precise measurement of mass.

C- 1 Units of VOLUME: is the liter (L).

The milliliter (mL) is one one-thousandth of a liter (0.001L).

The microliter (ML), 0.000001 L , 0.001mL

C-2 Apparatus for Precisely measuring Volume.

Thank you