Research Methodology in Chemistry

Edited by
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CHAPTER – 1

INTRODUCTION

Jamaluddin Bin Mohd Daud

The field of analytical chemistry can be considered amongst the widest of any technological discipline. Any one performing research in analytical chemistry must be able to design, carry out, and interpret measurements within the context of the fundamental technological problem with which he or she is presented. The selection and utilization of such chemical procedures requires a wide knowledge of chemistry, whilst familiarity with and the ability to operate a varied range of instruments is essential. Finally, a researcher must have a sound knowledge of the statistical treatment of experimental data to enable him/her to gauge the meaning and reliability of the results that he/she obtain.

When a research work is restricted to the identification of one or more constituents of a sample, it is known as qualitative analysis, while an examination to determine how much of a particular species is present constitutes a quantitative analysis. Sometimes information concerning the spatial arrangement of atoms in a molecule or crystalline compound is required or confirmation of the presence or position of certain organic functional groups is sought. Such examinations are described as structural analysis and they may be considered as more detailed forms of analysis. Any species that are the subjects of either qualitative or quantitative analysis are known as analytes. There is much in common between the techniques and methods used in qualitative and quantitative analysis. In both cases, a sample is prepared for analysis by physical and chemical 'conditioning', and then a measurement of some property related to the analyte is made.

For a qualitative analysis it is sufficient to be able to apply a test which has a known sensitivity limit so that negative and positive results may be seen in the right perspective. Where a quantitative analysis is made, however, the relation between measurement and analyte must obey a strict and measurable proportionality; only then can the amount of analyte in the sample be derived from the measurement. To maintain this proportionality it is generally essential that all reactions used in the preparation of a sample for measurement are controlled and reproducible