ANALYTICAL QUALIFIER EXAMINATION STUDY GUIDE

The analytical qualifier consists of the ACS exam in Instrumental Methods. This test examines material that is typically covered in an undergraduate course in Instrumental Analysis or Chemical Analysis. A good text for review is FJ Holler, TA Nieman, DA Skoog, Principles of Instrumental Analysis, 5th Ed.; Harcourt Brace & Co., 1998, or DA Skoog, DM West, FJ Holler, Fundamentals of Analytical Chemistry, 8th Ed., Thomas (Brookes/Cole), 2004 (or any recent text on the same subject).

In your review, the most important topics to cover are:

I. General Principles of Analytical Chemistry

A. Quantitation methods:	calibration curves, internal standardization, standard addition method, signal vs. noise
B. Simple electronics:	operational amplifiers, electrical components and circuits in chemical instrumentation
C. Chemometrics:	use of linear relationships, curve fitting methods simplex optimization

II. Spectrochemical Analysis: know the terminology, basic instrumental components, advantages, disadvantages, and applications (qualitative or quantitative technique, useful concentration range, etc.) of the following techniques:

A. Molecular spectroscopy:	uv/visible absorption, IR absorption, Raman scattering, fluorescence, phosphorescence, NMR, mass spectrometry, surface characterization
B. Atomic spectroscopy:	AAS (flame and furnace), ICP, neutron activation, X-ray and particle techniques (ESCA, SEM)

III. Electroanalytical Chemistry: know the terminology, electrochemical cells, cell potentials, types of electrodes, basic instrumental components, advantages, disadvantages, and applications of the following techniques:

A. Potentiometric methods (pH, ISE)
B. Voltammetry (DC Polarography, Pulsed polarography, Stripping analysis)
C. Coulometry

IV. Chemical Separations: know the terminology, basic instrumental components, advantages, disadvantages, applications, and be able to predict elution characteristics for the following techniques:

A. HPLC
B. GC
C. TLC (or planar chromatography)
D. CE and CEC
E. Extraction

V. Miscellaneous:

A. Thermal analysis (TG, DTA, DSC, etc.)
B. Radiochemical methods

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