ACS DIVISION OF CHEMICAL EDUCATION EXAMINATION

ANALYTICAL CHEMISTRY

Score = Number of right answers
50-55 items — 100-110 minutes

TO THE STUDENT:
All electronic devices with photo-taking capability are prohibited.
Only non-programmable calculators are permitted.
All answers are to be marked on this answer sheet, not in the test booklet.
DO NOT WRITE ANYTHING IN THE BOOKLET!
Do not open the exam paper until your instructor gives you the signal to begin.
The periodic table and other useful information will be provided along with the test paper.

Sections:
(1) Data Evaluation and Error Analysis—6-7 questions
(2) Solutions and Volumetric Analysis—9-10 questions
(3) Gravimetry and Solubility—4-5 questions
(4) Acid-Base Chemistry (Chemical equilibria)—8-9 questions
(5) Electrochemistry—6-7 Questions
(6) Spectroscopy (Beer’s law, UV-Vis, atomic adsorption/emission)—10-11 Questions
(7) Separation (Chromatography)—5-6 Questions

You need to review all aspects of analytical chemistry, including errors, significant figures, statistical analysis (e.g., degrees of freedom, probability, t-test, Q-test, confidence intervals), calibration (working) curves (equation, slope, intercept), internal standard addition methods, concentration units conversion (ppm, ppt, mM, M…%), basic lab equipment (flask, balance…titrations), standard solutions, buffers, all types of titrations, equilibrium, mass and charge balances, pH of weak acid/base, slat and buffer calculations, \(pK_a/pK_b\), titration curve and derivative titration curve, selection of indicators, solubility product and its calculation for insoluble compounds, common ions effect, electrochemistry (redox potential, oxidation, reduction, anode, cathode, electrodes, salt bridge, balance equations, galvanic cell, electrolytic cell, pH electrode, Nernst equation, ion selective electrodes), Beer’s law, spectroscopic techniques (atomic and molecular adsorption/emission), instruments, gas and liquid chromatography (principle, basic theory, capacity factors, elution time/solvent, plate number, reversed/normal HPLC).

The test combines fundamental analytical chemistry and instrumental analysis.