

**KNOWLEDGE, SKILLS AND ABILITIES**  
**ABC TECHNICAL SPECIALIST EXAMINATION –**  
**DRUG ANALYSIS**

**I. Basic terminology of analytical chemistry – to include, but not limited to, the following concepts:**

Solubility, adsorption, volatility, resolution, emulsion, extraction, amphoteric pH, weight, molecular mass, chromatography, isomers, stereoisomers (enantiomers and diastereomers), structural isomers, polarized light, optical activity, racemic mixture, derivative, polarity.

**II. Separation Techniques.**

- A. Preparation of samples from common dosage forms.
- B. Theory and practice – basic separation techniques.
  - 1. Simple “dry” extraction (non-aqueous).
  - 2. Immiscible solvent extraction (liquid/liquid), to include acid/base and ion pair.
  - 3. Preparative TLC.
  - 4. Effects of pH and solvent polarity.
  - 5. Common diluents/adulterants and how to remove them.
  - 6. Solid phase extractions, to include column chromatography and SPME.

**III. Non-instrument Methods – Specificity/limitations.**

- A. Microcrystalline reagents and tests.
- B. Color (spot) tests.
  - 1. Marquis.
  - 2. Mecke.
  - 3. Cobalt thiocyanate.
  - 4. Dille Koppányi.
  - 5. P-DAB (Ehrlich's).
  - 6. Color tests for other specific drug groups, e.g., tests for GHB, benzodiazepines.
- C. Thin-layer chromatography.

**IV. Instrumental Methods – to include: theory and basic design of instrument; physical phenomenon being measured; sensitivity, specificity and limitations; care and maintenance; calibration.**

- A. Ultraviolet-visible spectrometry.
- B. Dispersive infrared spectrometry.
- C. FT-IR spectrometry.
- D. Gas chromatography.

- E. Gas chromatography/mass spectrometry.
- F. High-pressure liquid chromatography.
- G. Use of standard libraries and computer data systems in conjunction with instrumental methods and their limitations.
- H. Electromagnetic spectrum and basic spectroscopy principles (absorbance vs. concentration, scanning, etc.).

**V. Knowledge of Major Drug Classes Subject to Abuse.**

- A. Basic structure, chemistry and relationship to method of analysis.
- B. Physical properties which facilitate separation from commonly combined drugs and excipients.
- C. Theory of optical, positional and geometric isomers.
- D. Separation procedures to isolate the classes.
- E. Application of screening tests.
- F. Application of confirmatory tests.

**VI. Identification of Cannabis.**

- A. Macroscopic and microscopic morphology.
- B. Duguenois-Levine test.
- C. Botanical characteristics of Cannabis (annual plant, two sexes, existence of several agronomic varieties of monospecific genera, etc.).
- D. Hashish and hash oil.
- E. Major cannabinoid chemical components of the plant (two types of THC, multiple nomenclature systems, other psychoactive and non-psychoactive components).
- F. TLC of cannabinoids.

**VII. General Qualitative Analysis Skills.**

- A. Selection of appropriate method relative to drug type.
- B. Selection, procurement, preparation, storage and use of reagents, standards and controls.
- C. Interpretation of analytical data.
- D. Means of tentative identification of commercially prepared pharmaceuticals from physical appearance and markings.
- E. Distinguishing between closely related compounds (e.g. psilocin/psilocybin, methamphetamine/phentermine, LSD/LAMPA, etc.).

**VIII. Quantitative Analysis.**

- A. Spectrophotometric – UV (including calibration, theory and use of molar absorptivities).

- B. Chromatographic (including calibration).
  - 1. GC.
  - 2. HPLC.
- C. Normalization, internal and external standard methods.
- D. Selection and preparation of standards; methods of sampling.

**IX. Clandestine Laboratories.**

- A. Basic knowledge of precursors, intermediates, by-products and reagents in manufacture of common clandestine drugs.
- B. Commonly used synthetic routes for clandestine manufacture.
- C. Dangers inherent in investigation of clandestine laboratories and the limitations of forensic laboratory personnel not specifically trained in clandestine laboratory seizure procedures.
- D. Identification of precursors, intermediates, reagents, reaction mixtures and products.

**X. Legal Aspects of Drug Analysis.\***

- A. Requirements of conduct of a drug chemist.
- B. Requirements for legally sufficient analysis, to include interpretation and drawing of conclusions based upon the analysis.\*
- C. Basis for various drug control schedules.\*
- D. Basic understanding of what is and is not controlled/restricted, to include the significance of various isomers, salts and other forms.\*

**XI. Miscellaneous Forensic Chemistry.**

- A. Use of appropriate reference materials and literature.
- B. Use of calibrated volumetric laboratory equipment (glassware, pipettes and pipettors, etc.).
- C. Theory and practice of serial dilutions.
- D. Use and calibration of balances.
- E. Knowledge of the metric system.
- F. Use and documentation of quality control and quality assurance procedures, including laboratory audits, proficiency testing, method validation, laboratory accreditation and individual certification programs.
- G. Generic, trade and brand names of commonly encountered controlled\* and related substances, as identified in the Federal Controlled Substances Act, manufacturer's literature and standard references (e.g. Merck Index).
- H. Selection and verification of primary and secondary standards.
- I. Statistically valid ("representative") sampling.

**XII. General Evidence Handling and Preservation.**

- A. Selection and use of appropriate tools for recording and recovering evidence without loss, contamination or deleterious changes.
- B. Documentation of relevant crime scene data and information.
- C. Recognition and safeguarding of the evidence potential of various items by proper sampling and collection of controls.
- D. Proper marking, packaging and storage of evidence.
- E. Preservation of evidence using appropriate legal\* decisions.
- F. Application of measures to retard or prevent changes to evidence caused by time, temperature or biological agents.

**XIII. General Evidence Examination and Data Interpretation in Forensic Science.**

- A. Measurements and procedures, commonly used in the examination of physical evidence and the nature and significance of the information derived from these.
- B. Testing protocols that will provide the most useful information while avoiding procedures that are redundant, unnecessarily consumptive or will interfere with subsequent tests which may be performed by specialists in other disciplines.
- C. Properties of commonly encountered evidence materials that allow their characterization.
- D. Limitations in personal skills and laboratory resources and the potential contributions of other expertise.
- E. Scientific method and general chemical, physical and biological bases for examinations, evaluations and interpretations.
- F. Logical thinking, using inductive and deductive reasoning.
- G. Recognition of discrepancies or inconsistencies in analytical findings and determination of their cause and significance.

**XIV. Laboratory Safety.**

- A. General laboratory safety.
- B. Hazards associated with firearms, explosives, biological materials and chemical substances and the proper methods for safe handling of all evidence types.

**XV. Communication – Report Writing.**

- A. Composition of clear, grammatically correct and concise reports on analyses, results and conclusions.
- B. Proper maintenance and recording of examination information.

**XVI. Communication – Legal Aspects and Court Testimony.**

- A. Court decisions\*, procedures and associated legal terms applying to expert witnesses.
- B. Comprehension of and appropriate response to, questions from counsel and/or the court.

**XVII. Rules of Professional Conduct.**

*The Rules of Professional Conduct as drafted by the American Board of Criminalistics, their interpretation and their application to occupational situations.*

**XVIII. Forensic Science and Other Applicable Literature.**

- A. Current criminalistics information (journals, books and newsletter).
- B. Critical evaluation of written and oral information.
- C. Foundational basis of criminalistics.

\*Note: While the technical aspects of ABC Examinations are applicable to members of the profession world-wide, this examination was designed primarily for forensic drug chemists in the United States of America and legal questions are therefore based on American law. References to controlled substances and schedules refer primarily to the organization and basis of the schedules, not to specific content in specific jurisdictions. However, any references made to specific schedule content are necessarily limited to the Federal Controlled Substances Act of the U.S.A., as no attempt to address differences between the schedules of specific local or foreign jurisdictions is practical.