AMERICAN BOARD OF FORENSIC TOXICOLOGY

FELLOWSHIP EXAMINATION

Study Guide for Examination Preparation

Fellow in Forensic Toxicology (F-ABFT)

Examination Content Areas

Recommended References

Sample Questions

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STUDY GUIDE FOR EXAMINATION PREPARATION

Introduction

The ABFT Fellow Examination is designed to challenge the candidate’s mastery of fundamental concepts applied to the practice of forensic toxicology. It is recommended that the Candidate successfully complete an in-house training program prior to sitting for the examination.

Postmortem toxicology, human performance toxicology, and workplace drug testing form the basis of this examination. Questions include driving-under-the-influence of alcohol and drugs; drug overdose and other poisonings; testing in sports; alternate matrices; case interpretation and expert opinion, as well as other forensic toxicology issues. Concepts from analytical chemistry, human physiology and pathology, pharmacology, and laboratory practice and management are addressed, as these relate to the practice of forensic toxicology.

The Fellow Examination consists of 130 single answer, multiple-choice questions, distributed over the content areas as shown below. Note that examples are provided for illustration only and should not be considered exhaustive.

Candidates will be given three hours to complete the examination.

Content Areas: Fellow in Forensic Toxicology (F-ABFT)

Laboratory Practice

Laboratory organization, policy, and management; regulatory issues and guidelines; laboratory accreditation; expert testimony; laboratory procedures and calculations; statistics; quality control and quality assurance

- Management
  - Responsibilities
  - Legal matters
    - Rules of Evidence (Frye, Daubert, Melendez-Diaz)
    - DUI / DUID laws
  - Laboratory security
  - Chain of custody
- Quality Assurance/Quality Control
  - Basic concepts
  - Statistics
  - Calculations
  - Corrective action
  - Documentation
  - Method validation
  - Control charts
- Regulatory Oversight
  - Standards/practice guidelines
  - Accreditation
• ABFT
• ISO 17025/15189
• SAMHSA
  o Privacy/Confidentiality
  o HIPAA
• Expert Testimony

Basic Analytical Chemistry and Procedures

Basic principles and theory; separations; laboratory techniques and instrumentation; standardization; interferences; method development and validation

• Spectroscopy – Theory and Application
  o Colorimetry
  o Micro-diffusion
  o UV/VIS
  o IR/FTIR
  o Fluorescence
• Extractions – Theory and Application
  o SPE/SSE
  o Liquid/Liquid
  o pH/pKa
• Immunoassays – Theory and Application
  o General
    ▪ Homogeneous
    ▪ Heterogeneous
  o Cross-reactivity/sensitivity/specificity
• Chromatography – Theory and Application
  o TLC
  o GC
  o LC
  o Detectors (Non-MS)
• Mass Spectrometry – Theory and Application
  o Ionization techniques (EI, CI, ICP, Electrospray)
  o Mass discrimination (Tandem MS, TOF, Quadrupole, Ion Trap)
  o Interferences, suppression, and enhancement
• Other – Theory and Application
  o Capillary electrophoresis
  o AAS/OES
  o Breath alcohol testing

Drugs, Xenobiotics, and Other Toxicants – Foundational

Nomenclature, chemical structure, classification of drugs and poisons; pharmacology; pharmacokinetics and pharmacodynamics

• Ethanol/ Other Volatiles
- Pharmacokinetics
- Pharmacodynamics
- Carboxyhemoglobin/Methemoglobin
- Cyanide
- Commonly Encountered Drugs
  - Opiates/Opioids
  - Cannabinoids
  - Stimulants
    - Cocaine
    - Amphetamines
  - Hallucinogens
  - Sedative/Hypnotics
    - Barbiturates
    - Benzodiazepines
    - “Z” Drugs
  - Psychotherapeutics
  - Novel Psychoactive Substances
- Metals – Organic and Inorganic
- Environmental and Natural Toxicants
  - Pesticides
  - Noxious Gases
  - Venoms/Antivenins

Drugs, Xenobiotics and Other Toxicants – Interpretative

Interpretation of therapeutic/toxic/lethal concentrations in body fluids and tissues; postmortem changes; mechanisms of toxicity, target organs, disposition of poisons, and systemic effects; effects of underlying disease; pharmacogenomics and drug interactions; toxidromes

- Ethanol/Other Volatiles
  - Pharmacodynamics
  - Disease states
  - Post-mortem generation
- Commonly Encountered Drugs
  - Post-mortem redistribution
  - In-vitro and in-vivo stability
- Metals-Organic and Inorganic
- Clinical Toxicology
  - Treatment of Common Poisonings
    - Antidotes
  - Therapeutic drug monitoring
  - Drug intoxication

Forensic Pathology/Toxicology Specimens

Pathological findings related to poisonings and drug overdose deaths; toxicology specimen procedures and practices
• Autopsy Findings
  o Pulmonary edema
  o Hepatic necrosis
  o Cardiac pathology
  o Postmortem chemistries

• Specimens
  o Blood
  o Urine
  o Bile
  o Vitreous humor
  o Tissues
  o Hair/nails
  o Gastric contents
  o Decomposition

Regulated Drug Testing

• HHS/NLCP
  o Cut-offs
  o Specimen validity testing
  o Security
  o Sample handling
  o Screening and confirmation
  o Interpretation/MRO

• DUI/DUID Testing

History

• Poisoners and pioneers
• Postmortem detection of poisons
• Separation and detection methods
• Instrumentation

Preparation for the Fellow Examination in Forensic Toxicology should include review of the content areas cited above. Numerous toxicology references and resources are available, to include general laboratory practice and methods, commonly encountered drugs and poisons, regulatory issues, et al. The most current information is found in peer-reviewed journals, workshops, and meetings. Table 1 illustrates the percent contribution of examination content areas.

Table 1: Percent Contribution of Content Areas

<table>
<thead>
<tr>
<th>Certificant Category</th>
<th>Laboratory Practice</th>
<th>Analytical Procedures: Basic Chemistry</th>
<th>Drugs, Xenobiotics and Toxicants: Foundational</th>
<th>Drugs, Xenobiotics and Toxicants: Interpretation</th>
<th>Pathology and Specimens</th>
<th>Regulatory Issues</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-ABFT</td>
<td>10%</td>
<td>30%</td>
<td>20%</td>
<td>25%</td>
<td>10%</td>
<td>3%</td>
<td>2%</td>
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</tbody>
</table>
Recommended References

The references provided below are intended to serve as a guide for examination preparation and are not exhaustive. Information may be common to several sources. Candidates are encouraged to access the most recent edition of each book cited. Books and journals should be used in conjunction with the Candidate’s training and practical experience.

Books


Mandatory guidelines for federal workplace drug testing programs, Federal Register. Substance Abuse and Mental Health Services Administration, Department of Health and Human Services

General Chemistry: Any introductory college/university text intended for science majors.


Laboratory Safety and Chemical Hygiene: Any manual appropriate for a toxicology laboratory.

Journals

Forensic Toxicology

Journal of Forensic Sciences

Forensic Science International

Journal of Analytical Toxicology
Sample Questions – Fellow Examination

Multiple Choice. Choose the best answer.

1. Morphine is/has:
   A. metabolized to codeine
   B. readily extracted from a strong alkaline solution
   * C. urinary metabolites to include morphine-3-glucuronide
   D. bio-transformed to 6-acetylmorphine
   E. readily extracted from a strong acid solution

2. What enzyme is responsible for the detoxification of cyanide?
   * A. rhodanese
   B. creatine kinase
   C. acid phosphatase
   D. alkaline phosphatase
   E. cyano chelatase

3. Which of the following has the longest retention time on a 50% phenylmethyl or HP-17 liquid phase chromatography column?
   A. nicotine
   B. meperidine
   * C. strychnine
   D. diazepam
   E. phentermine

4. You have been hired to review a toxicology report in which an employee has been accused of urinating into the water bottle of a 2nd employee. Which of the following suggest the presence of urine?
   A. Calcium perchlorate
   * B. Creatinine
   C. Chloride
   D. Chlorate
   E. Chloroform

5. A 200-pound male consumes six 12-ounce beers and two 1-ounce shots of whiskey (100 proof) between 9:00 pm and 11:00 pm. A breath alcohol test performed at 1:00 am would be expected to give an ethanol concentration range of (g/210 L):
   A. 0.04-0.06
   B. 0.07-0.09
   * C. 0.10-0.12
   D. 0.13-0.15
   E. 0.16-0.18