The Chartered Society of Forensic Sciences

Component Standard

Laboratory Analysis

Purpose

To equip students with an understanding of the theory and application of the principal laboratory methods routinely used in forensic science whilst operating within a quality management system.

General Outcomes

The location and analysis of macro and micro amounts of chemical and biological material lies at the heart of laboratory-based forensic science. Given the nature of contact trace material, it is essential to employ analytical methods that provide sufficient discrimination commensurate with sample size and purity whilst at the same time negating contamination.

The course should be designed to enable the student to:

1. explain and demonstrate competence in the range of methods used for the location and recovery/extraction of the commonly encountered physical, chemical and biological trace materials including statistical sampling methods and their limitations;
   Extra information[1]: practical opportunities for search using various lighting and chemical screening methods, recovery via shaking/brushing/taping/swabbing and physical extraction. Statistical sampling expected for analysis of bulk drugs; students should appreciate the role and value of the Standard Operating Procedure (SOP), Quality Assurance (QA) and Quality Control (QC). Case studies may be helpful here;

2. explain the relevance of contamination avoidance procedures and give examples in relation to the location, extraction and analysis of contact trace material;
   Extra information: elements of laboratory design should be considered, recording of location, time and PPE on examination paperwork, utilisation of clean consumables and experimental controls (negatives and positives as appropriate). Understand the need to avoid contamination especially within a range of analytical techniques and as sensitivity increases;

3. explain the range of analytical techniques that are available to the forensic scientist, understand the parameters involved in method selection and be able to provide a forensic strategy and an analytical strategy for a given scenario;
   Extra information: ideally students should have a good theoretical understanding and hands on experience of a range of analytical equipment – not only within their final project but across all years; there are a number of basic laboratory processes of which pipetting would be considered an essential skill;

4. demonstrate competence in operating a range of modern analytical instruments and be conversant with the use of related computer software;
   Extra information: for principal laboratory equipment used in forensic science explain in reasonable detail and usually from a comparative perspective, the principles of operation, calibration (incl. controls and reference standards), specificity, sensitivity, precision and accuracy. In addition utility, effectiveness and efficiency in terms of materials, time, and cost when applied in a forensic context. It may be helpful to include practicals with deliberate errors to further challenge the student;

[1]Extra information: This represents further suggestions and clarification of the component standard - it is anticipated that this may be changed from time-to-time to reflect developments in forensic practice. The material provided in black can only be changed by the Society's Accreditation Sub-committee.

5. explain the range of techniques used for the analysis of DNA;
   Extra information: this is important for all forensic science courses where an awareness is required but for a forensic biology course this would be expected to be in detail and include emerging technologies;

6. describe the setting up of and demonstrate competent use of microscopes used for locating, identifying and comparing commonly encountered contact trace material;
   Extra information: familiarity with the integral components of low / high power, blue / UV light on a range of materials such as fibres, paint etc. including comparison microscopes and their limitations, aware of application of SEM/ SEM-EDX;

7. demonstrate competence in the correct interpretation of analytical results using statistical methods;
   Extra information: show an understanding of various statistical approaches to data analysis, must include the Bayes approach and theorem to support evaluation, interpretation of results in a range of contact trace materials. Within DNA analysis familiarity with the product rule, Nichols and Balding Size bias correction and Fst and agreed limits for court purposes (1 in more than 1 billion – 1000million);

8. describe and demonstrate adherence to safe laboratory working procedures;
   Extra information: ability to develop risk assessments and COSHH documents as appropriate to discipline areas including scene and laboratory, obviously PPE is critical here.

It is appreciated that some specialist postgraduate courses include depth of analysis rather than breadth therefore all laboratory component standards may not be full incorporated for all students