

General information:

Forensic Chemistry
JOHN ABBOTT COLLEGE

Program:	Science	Semester:	Fall 2015
Discipline:	Chemistry	Instructor:	
Course Code:	202-DDP-05	Office:	
Objectives:	00UV, 00UU	Tel:	
Ponderation:	3-2-3	Office Hours:	
Credits:	2.67	Lectures:	
Pre-requisite:	202-NYB-05 & 202-NYA-05		
Email:			

Introduction:

Forensic Chemistry is an option course in the science program, specifically designed to partially fulfill the requirements of objective **00UV**. As such it is normally taken by science students after they have completed at least two semesters of the program.

Forensic Chemistry is essentially the application of chemistry to all matters of law. The California Association of Criminalists describes the criminalist profession as “That profession and scientific discipline directed to the recognition, identification, individualisation and evaluation of physical evidence by the *application of natural sciences* to law science matters”. This course provides students with an excellent opportunity to apply what they have learned in their studies in the natural sciences. Centered on the discipline of chemistry, the course nevertheless makes use of the principles of physics, appeals to the logic of mathematical analysis and involves reflection on issues that often include biological and biochemical puzzles. Presented largely in the form of case studies, students are able to follow the methods used in actual situations and test their ability to apply what they have learned.

Comprehensive Assessment and Integration in the Science Program

The Ministry of Education requires every student to pass a program comprehensive assessment and a program integrating activity (Exit Profile Competency 14: “to apply what has been learned to new situations” and Ministry objective 00UU: “to apply acquired knowledge to one or more subjects in the sciences”). The Ministry introduced these requirements because it recognized the importance of connecting the various components within each program.

The various competencies to be addressed in the Science Program are outlined in the outcomes and standards of the Science Program Exit Profile and are listed below. They are divided into two groups: those competencies that are taught and assessed in virtually every course in the program, and those that will be the primary focus of the option courses

The following competencies are taught and assessed in most courses of the program:

3. *To apply the scientific method.*
4. *To apply a systematic approach to problem solving.*
5. *To use appropriate data processing techniques.*
6. *To reason with rigour, i.e. with precision.*
8. *To learn in an autonomous manner.*
13. *To display attitudes and behavior compatible with the scientific spirit and method.*
14. *To apply what has been learned to new situations.*

The following competencies will be the special focus of the option courses of the program:

7. *To communicate effectively.*
9. *To work as a member of a team.*
10. *To recognize the links between science, technology and the evolution of society.*
11. *To develop a personal system of values.*
12. *To put into context the emergence and development of scientific concepts.*

Rather than impose a major exam or paper at the end of the Science Program, or requiring a single course to fulfill these requirements, John Abbott College has integrated the fulfillment of these requirements into the option courses taken late in the program. These courses have been designed so that by passing any three option courses a student will have met the above requirements of the program.

OBJECTIVES

STANDARDS

Statement of the Competency:

To apply the scientific method to criminal investigations and proceedings.
(00UV)

General Performance Criteria:

- Appropriate choice of concepts, laws and principles
 - Rigorous application of the concepts, laws and principles
 - Appropriate use of terminology
 - Adequate mathematical or graphical representation
 - Coherence, rigour and justification of the problem-solving methods
 - Respect for the scientific method and experimental protocol
 - Justification of the method
 - Critique of the credibility of the results
- Use of an interdisciplinary approach (00UU)

Elements of the Competency:

1. To apply the laws and principles of natural sciences to law sciences.
2. To recognise and evaluate physical evidence from crime scenes using methods of natural sciences.
3. To investigate the balance between the neurological and social factors in determining the workings of the criminal mind.
4. To apply experimental techniques of the natural sciences to crime solving.
5. To undertake an interdisciplinary project that integrates current learning and which demonstrates competence in three specific goals of the exit profile at the advanced level (00UU).

Specific Performance Criteria:

*Specific performance criteria for each of the elements of the competency are shown below along with the corresponding **Intermediate Learning Objectives**. For the items in the list of learning objectives it is understood that each is preceded by:*

‘The student is expected to’

Evaluation Plan:

Two (2) term tests	20%
Tentative dates:	
Test 1: Week 7	
Test 2: Week 14	
Laboratory work	20%
Comprehensive Projects	15%
Term Paper (Due October 13)	
Presentation (Last 3 weeks of term in lab)	
Quizzes/assignments.	15%
Final Exam (Between Dec 10-21)	30%

Please Note:

- If a student fails to write one of the term tests (with a valid reason), then the student must write the final exam worth 40% (10% for missed test and 30% for final). No make-up tests will be scheduled. This is not available for a student assigned a grade of zero on a unit test because of cheating.
- To pass the laboratory portion of the course, a minimum of 60% of the total laboratory grade must be obtained. Failing this, a laboratory grade of **zero** will be given and a maximum grade of 55E will be allowed for the course.
- If a student passes the laboratory portion of the course, a grade of 60% or more on the final exam will guarantee a pass in the course.
- Late work will be marked as a zero unless otherwise specified in the assessment instructions, or prior arrangements have been made with the instructor.

Course Content**1. Forensic Science**

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| 1.1 Discussion of the scope, history and development of forensic science. | 1.1.1 Gain an understanding of the historical development of criminalistics. |
| | 1.1.2 Describe the general workings of a crime lab (fingerprinting, forensic toxicology, microscopy, serology, and explosives). |
| | 1.1.3 Outline the role of the forensic scientist in the recognition, collection, preservation, and analysis of physical evidence. |
| | 1.1.4 Discuss the validity of the scientific evidence. |
| 1.2 Description of what is done at a crime scene. | 1.2.1 Observe, sketch, and measure evidence at the crime scene. |

2. Physical Evidence

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| 2.1. Description of the common types of physical evidence. | 2.1.1 Describe the chemical and physical properties of glass as related to the crime scene. |
| | 2.1.2 Summarise the analytical techniques used to characterise glasses. |
| | 2.1.3 Describe the physical and chemical properties of polymer fibres. |
| | 2.1.4 Summarise the analytical techniques used to characterise polymer fibres. |
| | 2.1.5 Describe the chemical constituents of gunshot residues. |
| | 2.1.6 Summarise the analytical techniques used to analyse gun shot residues. |
| | 2.1.7 Describe the chemistry and detection of arson accelerants and explosives. |
| | 2.1.8 Describe the chemistry of blood and other bodily fluids. |
| | 2.1.9 Outline the role of DNA typing in forensic science. |

3. Brain Chemistry

- 3.1 Interpretation of the relationship between the biochemistry of the brain and the criminal mind.
 - 3.1.1 Describe the important neurotransmitters responsible for emotional well-being.
 - 3.1.2 Describe the specific biochemical activity of the neurotransmitters.
 - 3.1.3 Outline the relationships between brain chemistry and the criminal mind.

- 3.2 Discussion of toxicology in forensic science
 - 3.2.1 Identify common recreational narcotics and stimulants such as heroine, cocaine, amphetamines, marijuana, alcohol...
 - 3.2.2 Explain structure and activity relationships of the drugs.
 - 3.2.3 Understand the function of neurotransmitters.
 - 3.2.4 Discuss addiction and tolerance.
 - 3.2.5 Describe analytical techniques and instrumentation used to identify drugs.
 - 3.2.6 Identify various poisons, such as cyanide, mercury, nerve poisons, etc.

4. Experimental Work

- 4.1 Observation and measurement.
 - 4.1.1 Discuss significant figures as applied to scientific calculations.
 - 4.1.2 Perform logical and deductive analysis.

- 4.2 The use of instrumentation to study fingerprints, gunshot residues, drugs, poisons, and aerosols.
- 4.2.1 Use a microscope to characterise solid substances such as fibres.
 - 4.2.2 Use of physical tests such as solubility and/or density to identify and/or characterise substances.
 - 4.2.3 Use of chemical tests to identify and/or characterise substances such as latent or invisible fingerprints (techniques like iodine fuming, cyanoacrylate fuming, and dusting powders).
 - 4.2.4 Characterise gunshot residues using the azodye and other tests.
 - 4.2.5 Perform paper chromatography for ink analysis in document examination.
 - 4.2.6 Understand the principle behind the breath analyser using UV/VIS spectroscopy.
 - 4.2.7 Perform thin layer chromatography on substances such as analgesics and lipsticks.
 - 4.2.8 Characterise organic compounds using infrared spectroscopy.
 - 4.2.9 Perform gas chromatography of common household aerosols.
 - 4.2.10 Perform blood typing and detection.
 - 4.2.11 Detection of salicylates in simulated blood using UV/VIS spectroscopy.

5.Integration, Comprehensive Assessment and Exit Profile Goals

- 5.1 Recognition of the links between science, technology and the evolution of society.
- 5.2 Development of a personal system of values.
- 5.3 Application of acquired knowledge to a new situation.

The Module

- 5.1.1 Discuss the power and the limits of science and technology in solving crimes.
- 5.1.2 Discuss the implications of science and technology for the evolution of society.
- 5.2.1 Clearly identify and summarize two sides of an issue.
- 5.2.2 Develop an opinion on an issue and the arguments to defend the position.
- 5.2.3 Be aware of and understand the social and ethical implications of scientific work.
- 5.3.1 Demonstrate clearly the application of the natural sciences to forensic science.

Required text & Course cost:

There is no formal text book for this course, however, course notes and worksheets will either be handed out in class or made available on Omnivox Lea CMS.

A laboratory notebook is NOT required for completed laboratory reports. Instructions concerning individual laboratory experiments will be given by the instructor. *Safety glasses must be worn at all times in the laboratory.* Good quality safety glasses are available from the bookstore or from most hardware stores (approx. \$15). Normal prescription glasses may be worn, but *for safety reasons, the use of contact lenses is not permitted.* A sturdy cotton lab coat is required (approx. \$20).

Bibliography:

Students who wish to do additional reading may find the following books rewarding, all of which are available at the John Abbott Library (at the Front Desk).

1. Chemistry for Changing times, 6th edition., John W. Hill, MacMillan, New York, 1996.
2. Criminalistics: An introduction to Forensic Science, 5th ed., Richard Saferstein, Prentice Hall, New Jersey, 1996.
3. Introduction to Forensic Sciences, William G. Eckert, Elsevier, New York, 1992.
4. Unsolved Great Mysteries of the 20th century, Kirk Wilson, Carroll & Graf Pub, , 1990.
5. Casebook of Forensic Detection, Colin Evans, Berkley Trade, Updated edition, New York, 2007
6. Forensics for Dummies, D.P. Lyle, Wiley, 2004
7. Forensic Science: An Introduction to Scientific and Investigative Techniques, James and Nordby, Ed., CRC Press, 2003.

Videos available at John Abbott College.

1. Post Mortem with David Suzuki - HV 8079 .H6 P6 1991
2. Forensic Science: A Shred of Evidence - HV 8079.H6 F6 1991
3. The Bombing of America - HV6640. B65 1996
4. Anastasia, Dead or Alive - DK 254. A7 A62 1995
5. The Turin Shroud –BT 587 .S4 T87 1996

Teaching Methods:

The course will be 75 hours, divided into lecture and laboratory periods. Assignments will be mostly administered through the Lea Omnivox site for the course. Students will be directed to various websites for supplemental information as needed. The lecture and laboratory sessions are described below:

Lectures: (45 hours)

Varying 1.5-hour periods per week (depending on number of days in week and number of lab sessions per week), consisting of the introduction of new material and revision of previously learned material. In addition, preparation for upcoming laboratory sessions may be discussed during lecture time. Cooperative learning techniques such as group work, paired interview and peer evaluation will form an integral part of the lecture period. Disruptive behavior to either the teacher or students **may** also result in the student being asked to leave the classroom.

Laboratory sessions: (30 hours)

In general, there will be one two-hour laboratory session per week. These sessions will apply the scientific method to some simple “crimes”. Periodically, laboratory sessions will be used for workshops that will help the student cope with the course material.

Departmental Policies

- a) Regular attendance is expected. If lectures are missed, it is the responsibility of the student to cover the material missed and to be aware of any announcements made concerning assignments, quizzes, tests or changes to the laboratory schedule.
- b) Students must attend the laboratory session in which they are officially registered.
- c) There will be no make-up tests, quizzes or laboratory periods. If you miss an evaluation session or deadline due to illness, you must notify your instructor as soon as possible. A valid medical note is required to prove absence for a medical reason. If a test is missed for a valid reason, then the final exam mark will be used as a basis for a substitute for the missed test mark.
- d) Periodically there will be workshops held during the laboratory period. Attendance is required. Quizzes or assignments may be given during these workshops.
- e) **A special note concerning the use of chemicals:** this course uses chemicals as part of its normal teaching practices. If a student has experienced allergic reactions in the past due to any particular chemical or chemicals he or she must inform the instructor. In the event that an allergic reaction is experienced at the college, the student should report to Campus Security immediately (local 5226, 5231, or 9-514-398-7770).
- f) Cell phones and computers may only be used during class for pedagogical purposes at the discretion of the instructor.

College Policies

IPESA, Institutional Policy on the Evaluation of Student Achievement:

<http://www.johnabbott.qc.ca/wp-content/uploads/2014/12/2011-IPESA-FINAL-website-JAN-2013-re>

v-Dec-102014.pdf

Changes to Evaluation Plan in Course Outline (Article 4.3) Changes to the evaluation plan, during the semester, requires unanimous consent.

Mid-Semester Assessment MSA (Article 3.3) Sstudents will receive an MSA in accordance with College procedures.

Religious Holidays (Article 3.2) Students who wish to observe religious holidays must inform their teacher in writing within the first two weeks of the semester of their intent.

Student Rights and Responsibilities (Article 3.2, item 19.) It is the responsibility of students to keep all assessed material returned to them in the event of a grade review. (The deadline for a Grade Review is 4 weeks after the start of the next regular semester.)

(Article 3.3, item 7.) Students have the right to receive the results of evaluation, for regular day division courses, within two weeks. For evaluations at the end of the semester/course, the results must be given to the student by the grade submission deadline. Where applicable: for intensive courses (i.e.: intersession, abridged courses), timely feedback must be adjusted accordingly.

Cheating and Plagiarism (Article 8.1 & 8.2) Cheating and plagiarism are serious infractions against academic integrity which is highly valued at the College; they are unacceptable at John Abbott College. Students are expected to conduct themselves accordingly and must be responsible for all of their actions.

Cheating

Cheating means any dishonest or deceptive practice relative to examinations, tests, quizzes, lab assignments, research papers or other forms of evaluation tasks. Cheating includes, but is not restricted to, making use of or being in possession of, unauthorized material or devices and/or obtaining or providing unauthorized assistance in writing examinations, papers or any other evaluation task and submitting the same work in more than one course without the teacher's permission. It is incumbent upon the Department through the teacher to ensure students are forewarned about unauthorized material, devices or practices that are not permitted.

Plagiarism

Plagiarism is a form of cheating. It includes the intentional copying or paraphrasing (expressing the ideas of someone else in one's own words), of another person's work or the use of another person's work or ideas without acknowledgement of its source. Plagiarism can be from any source including books, magazines, electronic or photographic media or another student's paper or work.