

# **John Jay College of Criminal Justice**

The City University of New York  
524 West 59<sup>th</sup> Street, NY, NY 10019

## **Forensic Science**

### **Advanced Criminalistics II**

**FOS 416-01**

**Spring 2013**

### **Course Syllabus and Lab Manual**

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**Forensic Science**  
**Advanced Criminalistics II**  
**FOS 416-01**  
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# **FORENSIC SCIENCE -- CRIMINALISTICS**

## **Introduction**

Criminalistics is a branch of forensic science that involves the recognition, identification, individualization, evaluation, and reconstruction of "physical evidence." The purpose of this two-semester course is to acquaint the student with the philosophy and methodology of dealing with physical evidence in a general way. No attempt will be made to provide the student with all the techniques he or she will need to know to work in a forensic science laboratory. Instead, the general approach is designed to give the student a sound, fundamental base upon which to build. The laboratory aspect of this course will consist mainly of work on unknowns designed to simulate physical evidence problems and to stimulate thinking about them. The lecture part of the course will provide much of the theoretical knowledge required to complete the exercises.

Work on the unknowns will normally proceed in the order in which the exercises are presented in this syllabus. However, because certain exercises require fairly complex equipment of limited availability, the student may find it desirable to undertake some of the exercises out of sequence. This out of sequence system should not be overused. Never attempt an unknown prior to the time that the theoretical foundation for the techniques used has been laid in lecture or through independent study. Plan to work on Exercises VI and VIII throughout the semester.

Useful preparatory work should be done for most of the exercises long before the unknown for the exercise is requested. In fact, this is essential to successfully complete all of the exercises. This will be clear when the syllabus is read. (The entire syllabus should have been thoroughly read before the end of the second week of the semester. Students will be responsible for some of the material interspersed throughout the syllabus on exams.)

Since the laboratory exercises in this course cannot realistically hope to acquaint the student with anything but a small portion of the techniques he or she may encounter in an operating criminalistics laboratory, every student is encouraged to experiment with techniques and methods not covered.

Good laboratory procedure should be practiced as an integral part of each and every experiment and will incorporate the concepts of quality assurance and quality control. Care should be exercised to avoid contamination problems. For example, pipettes should never be placed in a stock reagent bottle and aliquots of reagents should not be returned to stock bottles. Some methods found in the literature will call for the use of toxic chemicals. Where possible, substitutes for these should be found. In cases where suitable substitutes cannot be found, extreme care should be exercised in the use of the chemical called for. In fact, each chemical used should be handled as though it is hazardous, whether or not it is known to have any risk associated with its use. Students engaging in unsafe practices will receive very low "performance factors." Standard lab safety rules will be enforced. Proper attire is mandatory for a healthy work environment.

## **Learning outcomes**

### *Reasoning*

- Learn to develop controlled laboratory procedures in the analysis of physical evidence such as blood, other physiological fluids, hair, and wood.
- Understand how the nature of the evidence and its context and analytical results must be considered in formulating appropriate scientific conclusions.
- Acquire problem-solving skills by applying their foundation knowledge to situations of forensic complexity.

### *Knowledge*

- Learn about the material nature of physical evidence such as blood, other physiological fluids, human hair, and wood.
- Acquire knowledge about the chemistry and physical properties of several types of biological evidence and the scope and limitations of the methods used to analyze them.
- Learn to appreciate the importance of accreditation of certification in forensic science, and ethical issues in scientific testimony.

### *Practical skills*

- Develop mastery in techniques such as: identification of physiological fluid stains such as blood and semen; human hair comparisons; polarized light microscopical analysis of mineral samples; scientific photography.
- Develop skill in the handling of trace evidence by working with minute quantities of materials.
- Learn to treat laboratory samples as actual evidence
- Learn to analyze samples alongside controls and to properly document the experimental process from data acquisition and interpretation to the reporting of results and conclusions

### *Communication*

- Document laboratory work in a manner which ensures both legal and scientific integrity in the handling of evidence.
- Learn to prepare professional quality laboratory reports.

## **Prerequisites:**

Material presented in this course will depend and build upon several prerequisite science courses (which have been successfully completed) as indicated in the John Jay College bulletin.

### **FOS 416:**

- English 102 or 201
- Chemistry: 103-104, 201-202, 220, 315, 320-321
- Physics: 203-204
- Forensic Science: 313, 415

The tables that follow summarize the lecture topics and laboratory exercises for this semester. (Minor changes may be made to accommodate other topics of interest.)

<b>Meeting</b>	<b>Lecture Topics</b>
1	<b>Introduction to Course</b> <b>Introduction to Forensic Serology</b> A. Composition of Blood B. ABO System/Agglutinins and Agglutinogens C. Elementary Genetics of the ABO System D. Subgroups of the ABO System
2	<b>Identification of Dried Bloodstains</b> A. Porphyrins and Heme B. Hemoglobins C. Heme/Hemoglobin Derivatives D. Catalytic Tests for Blood 1. False Positives and Negatives/Controls
3	<b>Identification of Dried Bloodstains (continued)</b> 2. Plant Peroxidase Activity 3. Importance of Interpretation 4. Laboratory vs. Field Testing E. Crystal Tests for Blood F. Spectrophotometric Tests for Blood G. Immunological Tests for Blood
4	<b>Species Determination with Dried Bloodstains</b> A. Immunological Testing B. Ulenhuth Precipitin Reaction C. Modified Ulenhuth Methods
5	<b>Species Determination with Dried Bloodstains (continued)</b> D. Oudin Immunodiffusion E. Ouchterlony Immunodiffusion F. Crossed Over Electrophoresis G. Antiglobulin Serum Inhibition Test H. Passive Hemagglutination Method I. Rate of Alkali Denaturation of Hemoglobin J. Formed Element Morphology
6	<b>Lattes Method for ABO Agglutinins in Dried Bloodstains</b> A. Lability of Agglutinins B. Sensitivity C. Wiener's Modification D. Potentially More Sensitive Agglutinin Assays
7	<b>Absorption-Inhibition Method for Agglutinogens</b> A. Holzer's Method/Titration-Absorption B. Modified Method/Absorption-Titration C. Comparison of Sensitivities

**Table i-1: Lecture Schedule**

<b>Meeting</b>	<b>Lecture Topics</b>
8	<b>Absorption-Elution and Mixed Agglutination Methods for Agglutinogens</b> A. Absorption-Elution B. Mixed Agglutination C. Importance of Washing Bound Complex D. Caveats in Interpretation of the Results E. Tagged Antibody Methods
9	<b>Other Physiological Fluids</b> A. Forensic importance of Physiological Fluids B. State of the Art with Testing Techniques C. Secretion of ABO Agglutinogens D. Inhibition Testing and Typing of Stains E. Secretor Status and Lewis Typing F. Seminal Fluid Stains 1. Significance and Interpretation of Crystal Tests
10	<b>Other Physiological Fluids (continued)</b> 2. Significance and Interpretation of SAP 3. Morphology of Spermatozoa 4. Species Testing 5. Prospects for Individualization G. Urine Stains H. Saliva Stains I. Perspiration Stains J. Other Less Commonly Encountered Stains
11	<b>Isoenzymes and Other Polymorphic Proteins</b> A. Introduction B. Protein Polymorphisms Demonstrated Electrophoretically C. Protein Polymorphisms Demonstrated Immunologically
12	<b>Hair</b> A. The Chemistry of Hair B. Hair Structure and Microscopic Morphology C. Forensic Importance of Hair Growth Phases D. Forensic Examination of Hair 1. Identification of Species 2. Individualization of Human Hair E. Other Potentially Useful Approaches and the Future
13	<b>Biological Individuality Overview</b> A. Genetic Factors B. Non-genetic Factors
14	<b>Blood Pattern Investigation and Interpretation</b>

**Table i-1 (continued)**



#	Laboratory Exercises	Points 416
I	Characterization of Whole Blood	100
II	Identification of Dried Bloodstains	100
III	Dried Bloodstains - Species of Origin	100
IV	Physiological Fluids - General Unknown	100
V	Wood Identification	100
VI	Forensic Comparison of Human Hair	100
VII	Soil Analysis	100
VIII	Scientific Photography – Contrast, Latitude & Court Exhibits	150
IX	Case Simulation - Trace Evidence	150
X	Special Project	Extra Credit

**Table i-2: Laboratory Schedule**

**Extra Credit:** PLM microscopy of general unknown (100 points) and beta testing of explosives exercise.

## **Notebook Guidelines**

The laboratory grade will be calculated based on the data and conclusions recorded in the laboratory notebooks (for exercises I through X), and two submitted typewritten reports (for exercises VIII and IX) based on the data contained therein. Consequently, the contents of the notebooks become a crucial part of the laboratory grade. For uniformity and to maintain the integrity of the data, each laboratory notebook must comply with the following guidelines:

1. The book must be bound so that the pages are not removable. Two three-hundred page (150 sheet), approximately 7½" x 10" "marble" composition books with sewn bindings are ideal for exercises I, II, III, IV, V, VI, and VII. A sixty sheet book is sufficient for exercise IX. **Exercise VIII must be completed in a college blue book.** Notebook FOUR from the Fall semester can be reused. Choose notebooks that have a wide (approximately one inch) top and left margin on each page. Black notebook covers are preferred. To ease transport, notebooks larger than 8½" x 11" will not be permitted.
2. The outer front cover must contain the student's name (first name, middle initial, last name), the course (FOS 416), the semester (i.e., Spring 2012), and the book number (i.e., BOOK "ONE", BOOK "TWO", etc.).
3. Blue or black non-water soluble and non-erasable ink must be used for all entries.
4. All pages must be numbered consecutively prior to the notebook's use. Place the page number in the extreme upper right corner on odd-numbered pages (starting with the table of contents) and in the extreme upper left corner on even-numbered pages, as illustrated in Figures i-2 and i-3. The last page number should be twice the number of sheets in the notebook. If it is not, carefully recheck the numbering, page by page. If the notebook does not contain the advertised number of sheets, an initialed and dated explanation to that effect should appear on the last page of the book. If pages were accidentally skipped during the numbering process, simply number the skipped pages A, B, etc. (i.e., 111, 111A, 111B, 112), and note the error on the last page of the book.
5. The table of contents (page 1) should be formatted as illustrated in Figure i-1. Photocopies of Figure i-1 may be taped into the book using the taping procedure explained later. The lines at the bottom of the table will be used, if necessary, for listing exercises that are repeated.
6. All exercises should begin on an odd-numbered page and contain the date on the top line in the left margin, the title of the exercise on the second line and a blank (lined-out) third line, as illustrated in Figure i-2. Do not rewrite the title of the exercise each day.
7. Unused pages between exercises should be labeled "Intentionally Left Blank" half-way down the page. Draw a diagonal line (top left to bottom right) across the page above and below (not through) the line with the writing. Initial and date both lines.

8. Students must be signed into the lab at the beginning of each lab session by the instructor or the lab technician after the student has documented the time that he/she entered the lab. (See Figure i-2).
9. The data for each exercise must be entered contiguously, line-by-line, without gaps, as illustrated in Figures i-2 and i-3. Do not leave lines (or portions of lines) blank. If a line is not used completely, draw a horizontal line across the unused space. If several lines will not be used-- for example, because there is insufficient space remaining at the bottom of a page to fit a sketch, draw a diagonal line (top left to bottom right) across the lines. Diagonal lines must be initialed and dated. Line-outs must be done before continuing. An explanation must be provided for lengthy line outs. Do not write in any space to the left or right of sketches (an exception is a lettering system to label details) - line out the area and continue the documentation on the next available unused line. Non-contiguous data entry will result in very severe penalties. (Note: It is permissible to skip pages between different exercises when working on more than one exercise at a time, but the data for each of the 9 exercises must be documented contiguously from the title page to the end of the exercise. It is important that this distinction is understood.)
10. Document your work in present or past tense. Do not document what you intend to do, just what you did or observed.
11. If a spelling error is made in the book, put one continuous line through it, insert the correction above or to the right of the error, and draw a circle around the abbreviation "sp" near the correction. Inserting data corrections above an error is not permitted.
12. If a data error is made and noticed before any additional entry is made, simply put one continuous line through it, and write the correction to the right of the error-*i.e.*, ~~132.45 g~~ 123.45 g. Initial and date the line-out. If the data error is not noticed immediately, the format is slightly more involved: First, initial, date, and line out the error. Second, place an asterisk above the error and indicate where (page #) the corrected data has been documented. In the latter case (when the error is discovered at a later time), you must document the correction contiguously on the next available unused line of the exercise, even if it is many pages later. Use an underlined heading such as "\* Correction of data on page #", where # is the page with the error. Explain the reason for the error if it is not obvious. Use multiple asterisks ("\*\*\*", "\*\*\*\*", etc.) if more than one error is made on a page. This procedure is followed for all corrections. If an error is made writing the date, line out the incorrect date, write the correct date, and initial and date the correction. The reader cannot assume the corrected date is the date the correction was made.
13. All observations must be recorded directly in the lab book at the time they are made. There are no exceptions to this rule. Do not continue collecting additional data until previously acquired data have been recorded. Document observations, then conclusions. It is not acceptable to write "it is not a match because . . .", unless the observations leading to the conclusion were documented previously. An inspection of the notebook should reveal the last observation made. Never

use scrap paper (including bench paper). The lab book is a work book. Its contents need not be aesthetically pleasing- penmanship, spelling, grammar, and punctuation do not affect the grade (unless the documentation is ambiguous, misleading, or illegible).

14. Use sketches where appropriate to illustrate text (**but not in place of text**). Artistic talent is not required. Sketches should be large enough to illustrate appropriate detail. Sketching does not, however, negate the need to document observations in text form. Unlike contiguous text that cannot be altered without detection, sketches tend to have blank areas that an unethical person could fill in at a later date. Consequently, data documented in sketch form is somewhat less credible than contiguous text. Sketches are excellent for documenting minutiae. Do not write next to sketch other than letters used as labels, which are explained in text preceding or following the sketch. Note the scale and magnification directly above or below the sketch. Multiple sketches cannot be drawn next to one another.
15. Never conceal a page by taping something into the book such that the underlying page cannot be viewed. When taping something into the notebook, place it on an unused page, write "RESERVED FOR .... (whatever is being inserted)" half-way down the page, and draw a diagonal line (top left to bottom right) across the page above and below (not through) the line with the writing. Initial and date both lines. Items smaller than the page should be taped on the left margin of the reserved notebook page, flipped over, and taped on the underside of the same edge. To insert material which is larger than the notebook page (such as an 8½" x 11" evidence receipt form, chart, or graph), turn the material horizontally, and tape the top edge of the inserted page along the left margin of the unused notebook page, flip the inserted page over, and tape the underside of the top edge to the notebook. Fold the inserted page so that it does not protrude from the notebook. Use a separate page for each insert. Anything taped into lab notebooks must have student's name and date. Use a good quality transparent tape, which students are expected to supply.
16. A signed copy of the laboratory safety rules must be taped to the inside rear cover of each notebook. Read and understand every safety rule. Ask lab staff for clarification, if necessary. Lab work may not begin until a signed copy of the safety rules has been submitted to the staff. In notebook III a copy of the "Perils of Plagiarism" form must be taped to the inside front cover. (Use the technique described above to tape the forms in place.)
17. The only acceptable date format is dd-mmm-yyyy-- *i.e.*, 09-Sep-2006 or 13-Oct-2006. Note that single digit dates (1-9) must be preceded with a zero to prevent the possibility of alteration (*i.e.*, converting 8 to 18 or 28). This date format is to be used whenever a date is required. However, do not convert dates in other formats when documenting observations. Document exactly what you see. For example, 8/3/06 could mean March 8, 2006, or August 3, 2006, or a date in a different century. Never make assumptions when documenting observations.

18. The only accepted time format is military time, *i.e.*, 0100 (1:00 AM), 0959 (9:59 AM), and 1758 (5:58 PM). Note that the time between 1:00 AM and 9:59 AM, inclusive, must have leading zeroes (*i.e.*, 0100 to 0959 hours).
19. All entries must be dated, as illustrated in Figures i-2 and i-3. It is not necessary to start a new page each day. Simply write the date in the left margin and "Entered lab at xxxx hrs" (where xxxx is the time in military format) starting on the next available line. When continuing the documentation to a subsequent page, write the date in the top left margin on the new page, followed by the word "(continued)" in parentheses and the current time. (Note: Do not write the word "continued" the first time a date is written.)
20. The last entry each day should be the exit/stop time. Line out any unused space at the end of the line. Do not sign out on the last usable line of a page, as two lines are required for correct sign-out procedure. Students must also be signed out of the lab at this point by the instructor or the lab technician. If work on the exercise is to be interrupted during the day, document the break. Use a separate line for an entry such as "Break, xxxx hrs" and "Returned, xxxx hrs", where xxxx is the time in military format. There is no need to be signed in or signed out by the instructor or lab technician when the student is taking a short break. Please note that the security of unknowns, standards and your notebook must be maintained during any break (as well as at all times while conducting laboratory work). A simple solution to this is to lock all related items in your lab drawer during the break and when not in use. Periodic inspections will be conducted by the lab staff.
21. With the exception of the table of contents page, the top and left margins of each page are to be used solely for the date and/or time. No other entries should be made in these margins.
22. Do not use the bottom margin (the space below the last line) for data. Its use is limited to noting a "continuation page". When working on more than two exercises, it will be necessary to estimate how many pages an exercise will require and then skip that number of pages before writing the title page of the next exercise (on an odd-numbered page). Many times the number of pages skipped is insufficient and the first exercise must be continued after the second exercise, after estimating the number of pages that the second exercise will require. If this happens, write "continued on page #" in the bottom margin, where # is the page number where the exercise is continued. On the continuation page, write the date in the top left margin, rewrite the title of the exercise on the second line, and write "continued from page #" on the third line, where # is the page number from where the exercise is continued. (Obviously it is much better to avoid this procedure by overestimating the number of pages to skip when beginning another exercise. Fortunately, this procedure is not necessary when working on two exercises simultaneously because each exercise should be documented in separate notebooks, as described later in this section.)
23. Students will be required to have their lab books in their possession at all times when working in the lab. Lab books must remain in students' drawers when not in use. At no time can a student be in possession of another student's notebook

or a notebook from a previous semester. This is considered cheating. Drawers will be subject to unannounced periodic inspections by lab staff.

24. The standards, equipment and unknowns issued must be documented in the notebook as described in the next section. Each student is responsible for the equipment and standards issued to them, making sure the return of the item is documented in the notebook by the lab staff.
25. The last entry for each exercise should be the report (i.e., the result of the analysis). It should begin at the top of a new page, so line out unused lines on the previous page if necessary. Be succinct and unambiguous. "Report: F.S.III-03A contains cocaine, F.S.III-03B contains ephedrine", for example, would be an acceptable report for exercise III of FOS 415. Sign (initials are unacceptable) and date the report and submit the notebook to the instructor for evaluation. Do not write or line out the area below the report; the space will be used by the instructor. (Since the report should be the last entry for the exercise, transfer possession of the evidence and answer any required questions prior to writing the report.)
26. Notebooks must be submitted to an instructor upon request and **immediately** after reporting each lab. At the conclusion of the semester, all notebooks, graded or un-graded, must be submitted. The notebooks constitute original work and are the only acceptable form of documentation.
27. Students must learn to critically evaluate what is relevant data and **avoid documenting irrelevant information**. Devise protocols and refer to the protocol each time instead of tediously rewriting information that is documented in an earlier portion of the lab exercise or in Book IV, Appendix D. The notebook of a forensic scientist may be scrutinized by a lawyer, a judge, a jury, and other scientists. **Put yourself in the position of the opposing team and think about how your documentation may be attacked.**
28. Any special instructions provided by a staff member should be written in the lab book and signed and dated by that staff member.

Two notebooks are used for the majority of the exercises (except VIII and IX) to insure optimum use of laboratory time. Book 1 will be used for exercise I and book 2 will be used for exercise II. Unless directed otherwise by the laboratory instructor, alternate subsequent exercises between the two books. By starting the next exercise in the other book, work can continue on the next exercise while the first is being evaluated by the instructor. Once an exercise is started in a notebook, all data related to that exercise must be contiguously documented in that notebook. When possible, complete and submit one exercise before moving on to the next, since you will be responsible for errors repeated in subsequent exercises. The table of contents in each notebook must always be kept up-to-date.

Use book IV to document abbreviations used in the other notebooks (appendix A, see figure i-4), custody of the other notebooks and reports (appendix B, see figure i-5), laboratory attendance (appendix C, see figure i-6), and commonly used

recipes/procedures (appendix D). Document recipes/procedures using the page format used in Books I and II. Although appendix D is optional, its use is strongly encouraged since the appendix may be used as a concise resource of information, decreasing the need for repeated library searches. Tape copies of recipes/procedures into the appendix using the procedure previously described (Guideline #15). This will reduce the amount of writing in Books I and II. This section is not to be used for documenting observations or note taking, but only for describing procedures used multiple times i.e. setting up Kohler Illumination. When using a recipe/procedure from Appendix D, you must state in your documentation the page where the procedure may be found in Book IV.

Spring 2012	Name: _____			
<b>Exercise #</b>	<b>Table of Contents</b>	<b>Book/Pages</b>	<b>Report Page</b>	<b>Grade</b>
I	Characterization of Whole Blood	1/3-		
II	Identification of Dried Bloodstains	2/3-		
III	Dried Bloodstains - Species of Origin			
IV	Physiological Fluids - General Unknown			
V	Wood Identification			
VI	Forensic Comparison of Human Hair			
VII	Soil Analysis			
VIII	Scientific Photography	3/3-		
IX	Case Simulation - Trace Evidence	5/3-		
X	Special Project			
	Appendix A - Abbreviations	4/		
	Appendix B - Notebook Custody Log	4/		
	Appendix C - Laboratory Attendance Log	4/		
	Appendix D - Recipes/Common Procedures	4/		
	Orthoscopic Checkout			
	Photographic Equipment Checkout	3/		
	Performance Factor			

**FIGURE i-1: Table of Contents**

A photocopy or handwritten replica of this boilerplate should appear on the first page of each notebook submitted. Write your last name on the line in the top margin. Use the left margin for the exercise # column. Complete the "book/page" column when an exercise is undertaken and the "report page" when it is completed. Books 1 and 2 will be used for the majority of the exercises, book 3 for the photography project, book 4 for appendices, and book 5 for the case simulation. Keep each table of contents in each notebook up to date. If a photocopy of this table will be taped into the notebook, do not completely cover the first column with tape.





4	
08-Feb-2004	(continued) 1315 hours
	<u>Presumptive Tests: Limits of Sensitivity</u> _____
	8 test tubes were labeled with the follow dilutions: neat, 1:10, 1:100,
	1:1,000, 1:10,000, 1:100,000, 1:1,000,000, 1: 10,000,000. Using a
	Pipetman 1000, 900ul of d/d water was transferred to each of the
	tubes. Using sterile technique, I drew several drops of blood and
	collected it in the test tube labeled "neat". Using a Pipetman 100,
	100ul of whole blood was added to tube "1:10", and the contents
	mixed. The pipet tip was rinsed with the contents of tube "1:10".
	Then, using the same tip, 100ul of the "1:10" was transferred to tube
	"1:100" and mixed. Similarly, 100ul of "1:100" was transferred to tube
	"1:1,000" and mixed, then 100ul of "1:1,000" was transferred to tube
	"1:10,000" and mixed, then 100ul of "1:10,000" was transferred to
	tube "1:100,000" and mixed, and then 100ul of "1:100,000" was
	transferred to tube "1:1,000,000" and mixed, and finally 100ul of
	"1:1,000,000" was added to the tube labeled "1:10,000,000". The
	tubes were covered and stored in my locked lab drawer. _____
	Phenolphthalin (FK 30-Jan-2004), LMG (JB 05-Feb-2004), luminal (FK
	30-Jan-2004), and H <sub>2</sub> O <sub>2</sub> were removed form the refrigerator. They
	were clear in color. The wells of a porcelain spot plate were cleaned
	and labeled with the dilutions prepared. To the well labeled "neat",
	50ul of whole blood was added. Similarly, 50ul of the dilutions were
	added to appropriately labeled wells. Phenolphthalin (Phen) will be
	tested first. To do so, 50ul of Phen will be added to all the wells in
	rapid succession, observed, followed by the addition of 3% H <sub>2</sub> O <sub>2</sub> , then
	observed again. The follow ing 8 lines will be used in colummar format
	to document the eight simultaneous reactions: _____
	neat → + 1dPhen → 30 sec → NVR → + 1d H <sub>2</sub> O <sub>2</sub> → immed → intense pink —

**FIGURE i-3: Page Format, Example 2**

When data collection is continued on the same date as that on the previous page, the date in the top margin is followed by the word "continued" (in parentheses) and the time. Note that the top and left margins are used solely for the date and the bottom margin is left blank. Use each line completely or line it out before proceeding to the next line. (Do not write "continued" after the date if the last entry on the previous page is from an earlier date.)







## **Unknowns and Controls**

Unknowns will be issued to test your ability to perform the exercises assigned this semester. Every unknown should be treated as if it were evidence. An unknown should never be left unattended. The student should be able to state that the "evidence" was under his or her direct control during the entire time that he or she had custody of it. "Known controls" may be issued with the unknown for comparison. In a hit-and-run automobile accident involving a pedestrian, for example, the known control might be paint taken from a suspect's car and the unknown would be the paint on the victim's clothing. A documented "chain of custody" must be maintained for unknowns, as well as known controls issued for comparison.

Students often find the distinction between positive controls, known controls, negative controls and blank controls confusing. Often a control is both a positive and a known control. A negative control is sometimes analogous to a blank or a substrate control. The ultimate goal of controls and blanks is both the validation of reagents and techniques, as well as the contemporaneous validation of unknown reaction results. Keeping these objectives in mind can help steer your course of action.

Positive controls contain the questioned substance, while negative controls do not contain the questioned substance. Such controls must be used to test the reagents and/or techniques that will be used to evaluate unknowns. For example, if an unknown is to be tested for the presence of sodium ions using a crystal test, an aqueous solution of sodium chloride (a positive control) and a sodium-free aliquot of water (a negative control) should be tested to ensure that the reagent and technique actually work.

To clarify the distinction between a known control and a positive control, consider the sodium ion example cited above. Here, the positive control is also a known control because the morphology of the crystals formed with the aqueous sodium chloride solution can be compared with the crystals formed with the unknown. On the other hand, when the sodium chloride solution is used to test the reagent and technique prior to analyzing the unknown, it is a positive control. Any confusion regarding the distinction between positive controls and known controls should be resolved before proceeding with the exercises.

Do not attempt to analyze an unknown until you have thoroughly familiarized yourself with the method and have run a sufficient number of appropriate controls to demonstrate mastery of the required technique(s). It is important to understand the limitations of a technique and learn the interpretation and significance of experimental results. A student who gets the "right" answer but whose notes do not demonstrate mastery and thorough knowledge of the technique will not receive credit. If an unknown is incorrectly reported, the exercise may be repeated for a maximum of half credit if additional unknowns are still available (check availability before beginning); however, it is not sufficient to just "try again." The technique must be re-mastered, including repeating practice standards or controls. Each exercise may be repeated only once, provided additional unknowns remain. The additional unknowns will be available first come, first served.

When issued, the unknowns will be sealed in envelopes, which will bear the initials of the person who sealed the envelope and the date on which it was sealed. The label will also contain other pertinent information. Since the unknown simulates evidence, to maintain the "chain of custody", the integrity of the seal(s) on the envelope must be maintained. Do not alter the appearance of any seals. In effect, the envelope used to seal evidence becomes documentary evidence because it indicates who had possession of the unknown and the dates of possession. Consequently, **as soon as the unknown is received, its envelope should be initialed, dated, and marked "received". (Mark the envelope immediately after signing a receipt for it. This serves to individualize the unknown. Do not forget to document this.)**

**The evidence must be in your immediate possession or locked in your drawer at all times.** Your locked lab drawer will be considered adequate security for the evidence when it is not in a sealed envelope or in your immediate possession. The term "immediate possession" means that the evidence is either being carried by you or visible to you and that there is no possibility of someone removing or tampering with the evidence without your knowledge. Whenever the evidence is not in your possession, **an entry to that effect must be made in your notebook and the means of securing the unknown noted-** *i.e.*, "At 2055 hrs I locked unknown F.S. III-03 in my lab drawer." Once an unknown is transferred to your possession, it is your responsibility to secure it until it is properly transferred from your possession. All evidence received must be properly transferred from your possession, even if it is damaged, incorrectly reported, etc. If the unknown is removed from the room for any reason (e.g. photocopying), this must be documented.

When unknowns and known controls are issued, the laboratory technician or laboratory instructor will time/date stamp the notebook on the next available unused line using red ink. Confirm that the information written in red is correct before continuing with your documentation. Any data written in red will be considered administrative and cannot be used to fulfill transfer of custody requirements.

A notebook entry including all the information necessary to properly document the transfer of possession of the unknown need not be wordy. For example:

*On this date, at 1508 hours, in room 4514N, at John Jay College, Craig Huemmer handed me a sealed manila envelope marked "F.S. VI-07". The seals are intact and do not appear to have been tampered with. After signing a receipt for it, I immediately initialed, dated, and marked the envelope "received".*

concisely documents the following information:

1. Who received the unknown?

There is no need to include your name in the statement written in the notebook since your name appears on the front of the book. (If the issuer requested a handwritten receipt on a separate piece of paper then your signature at the bottom of the page would suffice to identify the pronoun "me" reference.)

2. How was the unknown received?

Statements such as "I was handed" or "I received via Federal Express Mail" are unambiguous as to the means used to transfer the evidence. A statement such

as "I received an unknown from Jane Doe" is ambiguous in this respect and should not be used without further clarification.

3. What was received?

At this point, the contents of the envelope are not known so the description is limited to appearance of the external packaging (i.e., a sealed manila envelope marked F.S. VI-07). Do not assume what is in the envelope until you open it and personally see the contents.

4. When (date and time) was the envelope received?

Note that the date need not be repeated in the statement because it appears on each page in the lab notebook. The time is formatted using military time format (1508 is 3:08 PM).

5. Where was the envelope received (i.e., room 4514N at John Jay College)? In this course, most of the unknowns will be issued by the laboratory technicians, either in the office (4515N) or in the laboratory (4514N). The location noted in your notebook should be accurate and unambiguous. The statement "room 4514N at JJC" is unambiguous because it mentions the facility (John Jay College), the room (4514), and the building (room suffix "N").

6. Who issued the unknown?

Use full names (i.e., Craig Huemmer)- not initials- and spell the name correctly. (see posted staff schedule). Normally, the issuer's affiliation and title (or shield number) is also noted, but it is not necessary for unknowns issued in this course.

7. Are the seals intact and appear untampered with?

The word "sealed" in the statement "I was handed a sealed . . . envelope" could mean, by consuetude, that the seals are intact and that they do not appear to have been tampered with. However, explicitly noting the condition of the seals helps to place the proper emphasis on their importance in the maintenance of the chain of possession. Do not accept an unknown unless all the seals are intact and appear untampered with.

8. Was a receipt signed?

Always sign a receipt when evidence is received and document the action in the notebook. The receipt should include enough information to answer parts 1-7 listed above. If a pre-printed form is not available, a signed photocopy of the page in your notebook containing a written evidence transfer statement similar to the example offered would suffice.

9. Did you initial, date, and mark the envelope "received"?

Once the envelope is initialed, dated, and marked "received", the possibility of someone substituting a similar looking (marked) envelope is greatly diminished. Any marking placed on the envelope or the evidence must be documented in the notebook because when the evidence - and consequently the envelope - is transferred from your possession, your notes become your sole means of refreshing your recollection regarding your handling/analysis of the evidence.



The next entry in the notebook regarding the unknown must be a rough sketch of the front and back of the envelope, including all markings and seals (If you trace the envelope, clearly indicate that the outer dimensions of the sketch are a tracing. If free-hand sketched, clearly indicate that the dimensions are not to scale. Always provide a measure of the length and width of the packaging and note the measuring implement). This is the most expedient means of documenting the markings and seals, and should never be omitted. Do not attempt to identify the person who initialed the seals. Document your observations, not assumptions. For small items, such as the envelopes issued in this course, it may be convenient to trace the outline of the envelope in the notebook and then freehand sketch the flaps, seals, and markings. DOCUMENTING THE RECEIPT OF THE EVIDENCE AND ITS PACKAGING SHOULD NOT TAKE LONGER THAN 5 MINUTES. If time does not permit opening the evidence, the unopened envelope may now be secured in a lab drawer without compromising its integrity.

Do not open the evidence envelope until the required techniques have been mastered to analyze its contents. Since all previous seals must be preserved intact, the envelope should be opened at a different location than the seal by carefully cutting a new opening with clean scissors. Do not sever the envelope-- cut only enough to remove the contents. Observe the contents through the opening. Immediately after opening the envelope, it must be initialed, dated, and marked "opened" near the area where the opening was made, and the action noted in the notebook. When the opening is large enough to remove the contents, do so, and store the empty envelope in your lab drawer. Repeat this procedure for any additional envelopes contained inside the outer envelope already documented. Initial and date the evidence in an area which will not destroy its evidential value. Carefully describe/sketch the contents of the unknown envelope. For items too small to be initialed, a sketch will serve to individualize the unknown upon receipt. In addition, any evidence altered during its analysis must be documented before its return.

Do not reseal the evidence envelope until you have completed the required analysis and are ready to transfer possession of the unknown and any known controls issued. If the evidence must be refrigerated after the evidence envelope has been opened, it should be sealed in another envelope. The fact that the evidence was stored in the refrigerator in a sealed storage envelope must be noted. In addition, after retrieving the evidence from the refrigerator, the condition of the seals must be noted with a short statement such as, "the seals on the storage envelope removed from the refrigerator are intact and appear untampered with." You need not sketch or describe a storage envelope when sealing it or describe the contents when it is opened, provided the seals were intact when the envelope was removed from the refrigerator. Retain all storage envelopes for submission upon request.

Perform the analysis of the unknown alongside proper controls. As always, all observations related to the analysis of the unknown, known controls, and positive and negative controls must be noted in the lab notebook at the time the observations are made. There are no exceptions to this rule. Do not pool data-- record each observation separately.

Many of the samples received as unknowns will be rather small and, consequently, should be handled with the utmost care. All work with an unknown should be carried out over a large, clean surface so that the unknown can be recovered if it is dropped. If an unknown is lost, a new unknown will be issued upon request for half credit. This may seem like a harsh policy, but it must be borne in mind that lost evidence in an operating forensic science laboratory cannot be "reissued". It is believed that this policy will encourage each student to exercise the appropriate degree of care in handling the unknowns.

All evidence that has not been destroyed during analysis must be returned - - powders, glass, mounted and un-mounted hairs and fibers, etc. Every attempt should be made to avoid consuming the entire sample issued as an unknown with destructive testing. Prior written permission for such testing is required. Enter an explanation for consuming the sample in the notebook and have it signed by the laboratory instructor. In general, an explanation such as "I didn't get much to begin with" will not be sufficient cause for depriving another expert (for the opposing counsel) the possibility of analyzing the evidence. Remember, the unknowns issued in this course are treated as evidence.

The evidence must be transferred to the custody of the laboratory staff when the analysis has been completed. Before transferring the evidence, it should be placed in an envelope along with the original container or envelope. (The original envelope may also be used if it is in good condition.) A piece of tape must be placed over the opening, and then the tape/seal should be dated, labeled "sealed", and bear the sealer's initials across the seal. A receipt should be obtained for the evidence when it is transferred to the lab staff. Document the transfer in the lab notebook using a statement similar to the one used when the evidence was received- where, when, how, etc. Tape the receipt into the laboratory notebook using the taping procedure previously described.

#### Resolution of disputes

Great care has been taken in the preparation of student unknowns and controls. If, however, a student reports a result which has been graded as "incorrect", but the student firmly believes that the result is "correct", it may be contested. Obviously, a sufficient amount of unknown must remain to be analyzed by Staff. If the student is proved correct, credit will be restored for that lab. If proved incorrect, 50% will be deducted from the entire semester's lab grade.

\*All work must be performed in the Criminalistics Laboratory.

\*Only students currently registered in FOS 416, 711, or 841 may be in the laboratory.

## Preparation for Each Exercise

Carefully re-read the introduction section of this manual prior to the first few exercises. Crucial preparatory work for each exercise begins before you even step into the lab! **Make use of the references cited at the end of each exercise** and those mentioned by Peter Diaczuk and Frani Kammerman as "Book of the Week" at the beginning of each lecture. Most of the lab references are available at the John Jay College Library. These will supplement the lecture discussions in providing a foundation for the specific types of analyses that will be explored in each exercise. In some cases, the references will suggest various protocols, the advantages and disadvantages of each, as well as useful reference data that can be used to design better experiments. Note that rote recipe-type steps are NOT included with every exercise. The student will take it upon him/herself to evaluate the available methods critically and to decide which method (or methods) would be most suitable for his/her analysis. Careful preparation prior to entering the lab will help to ensure that you make the most of the time available to you.

This course encourages independent thinking. The role of the staff is to provide guidance and answer questions about techniques and laboratory procedures, not to think for the students. **Group work is not permitted and is considered cheating.**

LAB STAFF WILL NOT OBSERVE OR OPINE ON THE ANALYSIS OF STUDENT UNKNOWNNS.

## Equipment, Reagents and Supplies

Most of the equipment and supplies you will need for each lab exercise will be available, either in the general supply area or as an item to be signed out from the lab technician. Bear in mind that resources are limited, so students will have to share equipment and supplies and should be as frugal as possible. **Students will be responsible for preparing their own reagents after the general stock has run out.** Use appropriate care and caution by wearing protective gloves, eyewear and a lab coat, and using the chemical fume hood when necessary. Any unlabeled items found in the fume hood will be removed and disposed of immediately and without warning by lab staff. The fume hood is not for overnight storage. Any labeled items left in the fume hood at the end of the day will result in a penalty for the party responsible. Each student is responsible for the maintenance of the laboratory! **Students are expected to wash their own glassware, return equipment, reagents and supplies to the appropriate storage area and maintain a clean and safe bench area. Do not put solids or hazardous waste down the sink!** Use the appropriately marked containers for waste disposal (paper/glass/biohazard). The safety rules that must be taped into each lab notebook provide the general safety guidelines. However, additional safety instructions regarding proper disposal, care and clean-up will be provided at the start of the semester. Any student not adhering to these guidelines will be severely penalized.

## Grading Procedure

A grade for the course is computed by adding the points earned on exam I (200 points), exam II (200 points), exam III (200 points), and the final exam (600 points), and the nine laboratory exercises (1000 points), with each being weighted appropriately. A "performance factor" will also be assigned to each student, which is a number between 0.00 and 1.00. The performance factor will be 1.00, unless safety rules have been repeatedly violated or laboratory equipment is lost, broken, or treated carelessly. See table i-2 for the maximum points assigned to each laboratory exercise.

Exams I, II and III will be given on Fridays (dates TBA) at 1300 hrs. YOU MUST BE PROMPT! The final exam will be scheduled by the department and posted. Plan your vacation and work schedules accordingly. **There will be no make-up exams.**

To compute the grade for a laboratory exercise, multiply the maximum points by the "notebook factor" assigned by the laboratory instructor - a number between 0.00 and 1.00, inclusive. The factor is based on the evaluation of the data in the notebook, compliance with the safety rules during the exercise, and the typewritten reports for exercises VIII and IX. Notebooks are graded based on their compliance with the rules in this syllabus and documentation demonstrating a mastery of the required techniques. The signed report must be correct and be based on objective data; it will be interpreted as testimony presented at trial, so do not write the report unless sufficient data has been acquired to support the conclusion. Errors, even transpositional errors, will be severely penalized. Notebook penalties are summarized in table i-3. Questions about a specific laboratory notebook grade must first be addressed to the instructor whose initials appear next to the grade in the notebook.

Except for exercise VIII there are no due dates or deadlines for submitting exercises, **however only two exercises may be submitted for grading each week without penalty.** Since there are nine exercises due in fifteen weeks, it is important that a sufficient amount of time be devoted so that one exercise is submitted per week. (If, for any reason, the semester is terminated early, one completed exercise per week will become the standard used to determine your lab grade.) You may find that some exercises require a longer period to develop the required technique. Since it is more important that the required technique is mastered than it is to submit a report because a deadline is approaching, a penalty is not imposed for failure to comply with this one exercise per week guideline. However, **there will be a 20% penalty imposed on each submitted exercise which exceeds the maximum of two per week. For any exercise submitted after the last day of classes, there will be a deduction of 20% per week.** This procedure is designed to give maximum latitude to develop proper technique while encouraging satisfactory progress. **Exercise VIII (and the report) must be submitted by Tuesday, 01May2012 to avoid penalty.**

<b>Point Penalty</b>	<b>Notebook Infraction</b>
-0.25+	Writing notes outside of lab notebook (e.g. scrap paper, bench paper, lab manual).
-0.15+	Nonspecific reporting of an unknown, including insufficient or liberal reporting beyond the capabilities of the technique. The deduction will take into account the extent of observations found throughout the notebook, prior to the report section.
-0.05	Student did not sign in or sign out.
-0.05	Student did not secure the unknown or lab notebook in locked drawer (multiple penalties).
-0.05	Student did not return the unknown prior to reporting.
-0.05	Student did not master technique prior to working on unknown.
-0.05	Incontiguous documentation.
-0.05	Backdating (corrections, information, etc.)
-0.04	Student did not individualize the unknown –verbally <b>and</b> through a sketch. You must include a <b>complete</b> description of the unknown, including packaging.
-0.04	Student did not perform a portion of the exercise, or perform a portion correctly.
-0.02	Student did not properly line out a blank portion of the line or page, including the proper format for date, time and initials.
-0.02	Overwriting to correct a mistake or obliterating information.
-0.02	Student did not mark the evidence "received" upon receipt, "opened" upon opening, "sealed" upon sealing, etc. This applies to coin envelopes, glassine envelopes, vials ampules, etc.
-0.02	Student did not initial and date the unknown envelope or the unknown itself.
-0.02	Student did not document an item of chain of custody information (who, what, etc.)
-0.02+	Student did not perform proper controls with the unknown.
-0.02	Improper error correction or inserting data.
-0.02	Summarizing data.
-0.02	Sketch did not include scale or indication that the item has not been drawn to scale.
-0.02	Erroneous information (e.g. 10X vs. 100X)
-0.02	Table of Contents not kept up-to-date.
-0.01	Improper taping procedure.

### **Table i-3: Notebook Penalties**

This previous table lists the **most common notebook infractions** and is designed to stress the importance of the documentation guidelines. Multiple infractions within a lab exercise shall incur multiple penalties. Students are strongly advised to hand in their completed exercises in a timely manner and to examine an exercise thoroughly as soon as their notebook is returned. This will help students to avoid repeating notebook infractions in subsequent exercises.

## **Report for Exercise VIII**

Student reports are expected to be original with correct citations where necessary (refer to the *Perils of Plagiarism* for clarification). Uniqueness will be verified using [www.turnitin.com](http://www.turnitin.com), a web-based program for report screening. Students are required to submit both paper and electronic copies of their reports.

### **Attendance Policy**

Students are responsible for any material presented during the lectures. Attendance, which is taken from the roll sheets distributed during lecture and those posted daily near the front of the laboratory, is not considered in the computation of the grade for the course. The grade is based solely on performance. However, careful attendance records are maintained and submitted to the registrar's office during the semester and when the final grades are submitted. The college uses the submitted records as official instruments when determining financial aid compliance, and/or when attendance records are requested by outside agencies, such as employers and review boards.

### **Office Hours**

The Criminalistics laboratory is open every day from Monday through Saturday. Lab instructors are available during lab hours and appointments can be scheduled at the mutual convenience of student and instructor. Students enrolled in this course are strongly encouraged to come to the office and speak to the professor or the instructors when necessary.

### **College Wide Policies for Undergraduate Courses**

(see the John Jay College of Criminal Justice Undergraduate Bulletin, <http://www.jjay.cuny.edu/academics/654.php>, see Chapter IV Academic Standards).

- The college's Grade of Incomplete (INC) policy and Extra Work During the Semester policy, as detailed in the undergraduate bulletin, will be followed for this course.
- Americans with Disabilities Act (ADA) Policies: Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Accessibility Services (OAS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility from the OAS. It is the student's responsibility to initiate contact with the office and to follow the established procedures for having the accommodation notice sent to the instructor.

## **Statement of College Policy on Plagiarism**

Plagiarism is the presentation of someone else's ideas, words, or artistic, scientific, or technical work as one's own creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. It is the student's responsibility to recognize the difference between statements that are common knowledge (which do not require documentation) and restatements of the ideas of others. Paraphrase, summary, and direct quotation are acceptable forms of restatement, as long as the source is cited. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has free guides designed to help students with problems of documentation (John Jay College of Criminal Justice Undergraduate Bulletin, <http://www.jjay.cuny.edu/academics/654.php>, see Chapter IV Academic Standards).

## **Biohazard Disposal**

**Strict adherence to the use of correct disposal containers is mandatory this semester. Severe penalties will be imposed for incorrect disposal of biohazards. Read the labels on the container before discarding any waste. Anyone caught incorrectly discarding biohazardous materials will receive an immediate "zero" for the lab they are currently working on. No exceptions.**

**White Glass Containers: Glass w/o biohazardous materials (no plastic)**  
**Red Biohazard Bags: Biohazardous materials that will not puncture bag**  
**Red Sharps Containers: Glass w/ biohazardous materials**  
**Pipette tips w/ biohazardous materials**  
**Metal blades w/ biohazardous materials**  
**Transfer pipettes w/ biohazardous materials**

Note: Kimwipes and paper towels are not to be discarded in the sharps containers!

## **Summary**

This introduction contains the lecture schedule, and the rules under which the laboratory will be operated. The lab manual is not comprehensive and thus does not obviate the need for using other resources and texts. All observations that are made during the course of the examination and analysis of standards and unknowns are to be recorded contiguously in the laboratory notebook using the format prescribed in this introduction. Nothing should be entrusted to memory. Once again, the goal of documentation is to record all relevant data and procedures.

\*This updated lab manual supercedes all prior lab manuals.