

NAME: _____

CPO: _____

Chemistry Portfolio

(Revised January 2017)

Welcome to the Chemistry Program at Berea College! We are delighted to have the opportunity to work with you as you learn more about chemistry. To complete your chemistry major, you must meet acceptable levels of performance in the classroom and in the laboratory. In addition, you must be able to communicate scientific ideas to others. We'll provide you with opportunities to learn the basics of chemistry, use state-of-the-art instrumentation, do research, and attend scientific meetings to present the results of your research.

We have many requirements to help shape you into good chemists. To help you keep track of (and on track meeting) these requirements, we have assembled this "Chemistry Portfolio." You will use it to ensure that your requirements are met. Faculty will check your progress each semester in the Advanced Laboratory sequence. Poor progress in meeting portfolio requirements will result in a grade of "I" being assigned for the particular advanced laboratory course in which you are enrolled.

Keep your portfolio up to date!

Laboratory Proficiencies

Your progress in the ADVANCED LABORATORY and ADVANCED SYNTHESIS courses will be monitored using your laboratory notebooks and your portfolio. Each student is required to successfully complete 18 experiments spread over three chemistry disciplines (physical, analytical, and biochemistry) and using a variety of instrumental techniques in the advanced laboratory. There will be 6 additional experiments in the advanced synthesis course that cover inorganic and organic synthesis. You will decide 6 experiments each semester from the approved list. The portfolio guidelines will assist you in choosing each semester's work. For an experiment to be used in meeting a portfolio requirement it must be adequately documented in your laboratory notebook and the write-up for the laboratory must receive a grade of "C" or higher.

In addition to completing 24 experiments, students must demonstrate an understanding of the various types of instrumentation within the Program. Students will also take standardized examinations relating to overarching concepts of instrumentation (chromatography, spectroscopy, NMR, and mass spectrometry) and must achieve a specified score. Also, students must demonstrate a practical working knowledge of the instrument in question.

Approval:

_____, **Chair of the Chemistry Program, finds that**

_____ **has met the requirements of the Chemistry Portfolio**

required for graduation.

Date: _____.

Seminar Checklist

A minimum of 12 Advanced Lab (or other approved) seminars attended. These seminars should be spread out over the last four semesters of work at Berea.

Speaker	Title	Date/ Faculty Signature
1) _____	_____	_____
2) _____	_____	_____
3) _____	_____	_____
4) _____	_____	_____
5) _____	_____	_____
6) _____	_____	_____
7) _____	_____	_____
8) _____	_____	_____
9) _____	_____	_____
10) _____	_____	_____
11) _____	_____	_____
12) _____	_____	_____

DIAGNOSTIC UNDERGRADUATE CHEMISTRY KNOWLEDGE (DUCK) EXAM – All chemistry majors must take a proficiency exam during their senior year. This exam is used to assess the overall knowledge of a given student and evaluate the performance of our majors as a whole over time.

Date _____ Title _____ Examination _____ Faculty Signature _____

Oral Presentations

You must give a minimum of two formal presentations on your undergraduate research project. One presentation must occur at a meeting outside of Berea. Examples of suitable venues include, but are not limited to, meetings of the Kentucky Academy of Sciences, the American Chemical Society, or the National Council of Undergraduate Research. You also need a minimum of four additional presentations in conjunction with advanced chemistry courses. Poor presentations will not be awarded credit- see the evaluation sheet for details of proficiency levels.

Date/Venue (formal)**Title****Faculty Signature**

_____	_____	_____
_____	_____	_____

Date/Venue (Advanced LAB/Biochem)**Title****Faculty Signature**

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Faculty comments on oral presentations:

Important Papers in Chemistry

You must read and discuss with your advanced laboratory instructor a minimum of 4 key papers from a list of recent highly-cited papers in chemistry. Normally you should read/discuss one per advanced laboratory / advanced synthesis course.

Author	Title	Date/Faculty Signature
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Faculty comments on discussions:

1)

2)

3)

4)

Laboratory Experiments/Proficiency Index Instrumentation Checklist

CHROMATOGRAPHY (competence shown in two of three areas)

- 1) Gas Chromatography GC/MS _____ FID GC _____
- 2) Low Pressure Liquid Ion-Exchange Column _____ Flash Column _____ Electrophoresis _____
- 3) High Performance Liquid Size Exclusion _____ Ion Exchange _____ Reverse Phase _____

CHROMATOGRAPHY WRITTEN EXAMINATION:

Date _____ Score _____ Faculty _____ Proficiency achieved _____

SPECTROSCOPY & MASS SPECTROMETRY (competence in four of six areas, one area must be mass spectrometry)

SPECTROSCOPY

- 1) Fourier Transform IR Spectroscopy: ATR _____ High Resolution Gas Cell _____
- 2) UV/Visible Spectroscopy: Frequency Resolved _____ Time Resolved _____
- 3) Flame Atomic Absorption Spectroscopy: Air/Acetylene Flame _____ Nitrous Oxide Flame _____
- 4) Fluorescence: Excitation Resolved _____ Emission Resolved _____
- 5) X-Ray Diffraction: Powder _____

MASS SPECTROMETRY

- 6) GC-MS: Electron-Ionization (EI) _____ Chemical Ionization (CI) _____
- 7) LC-MS: Atmospheric-Pressure Chemical Ionization (APCI) _____ Electrospray Ionization (ESI) _____
- 8) MALDI_TOF: _____

SPECTROSCOPY & MASS SPECTROMETRY WRITTEN EXAMINATION:

Date _____ Score _____ Faculty _____ Proficiency achieved _____

NUCLEAR MAGNETIC RESONANCE (competence shown in six areas)

- One-Dimensional Experiments: ^1H _____ ^{13}C _____ APT _____
- Two-Dimensional Experiments: COSY _____ HSQC _____ HMBC _____
- Multi-Nuclear Experiments: ^{31}P _____ $^{11}\text{B}/^2\text{H}/^{27}\text{Al}$ _____ Other _____

NMR WRITTEN EXAMINATION:

Date _____ Score _____ Faculty _____ Proficiency achieved _____

SYNTHETIC METHODS (competence shown in three areas)

- Schlenk line/Vacuum line transfers _____ Fractional/vacuum distillation _____
- Rotoevaporation/solvent removal _____ Solvent-free/green synthetic method _____
- Crystallization, cosolvent & thermal _____ Heterogeneous catalysis _____
- Cannula transfer _____ Inert/air-free atmosphere reaction _____

SYNTHETIC METHODS WRITTEN EXAMINATION:

Date _____ Score _____ Faculty _____ Proficiency achieved _____

Advanced Laboratory Experiment Checklist (18 experiments are required)**Physical Chemistry (two in each of the following areas plus one more)***Kinetics*

Introductory _____ Course _____ Faculty Signature _____

Advanced _____ Course _____ Faculty Signature _____

Thermodynamics

Introductory _____ Course _____ Faculty Signature _____

Advanced _____ Course _____ Faculty Signature _____

Quantum Chemistry

Introductory _____ Course _____ Faculty Signature _____

Advanced _____ Course _____ Faculty Signature _____

One Other Physical Chemistry Experiment:

Advanced _____ Course _____ Faculty Signature _____

Biochemistry (at least two advanced)

Introductory _____ Course _____ Faculty Signature _____

Introductory _____ Course _____ Faculty Signature _____

Introductory _____ Course _____ Faculty Signature _____

Introductory _____ Course _____ Faculty Signature _____

Advanced _____ Course _____ Faculty Signature _____

Advanced _____ Course _____ Faculty Signature _____

Analytical Chemistry (at least three advanced)

Introductory _____ Course _____ Faculty Signature _____

Introductory _____ Course _____ Faculty Signature _____

Advanced _____ Course _____ Faculty Signature _____

Advanced _____ Course _____ Faculty Signature _____

Advanced _____ Course _____ Faculty Signature _____

Advanced Synthesis Experiment Checklist (6 experiments are required)**Organic Chemistry (must perform two of these experiments, at least one advanced)**

Introductory _____ Faculty Signature _____

Advanced _____ Faculty Signature _____

Inorganic Chemistry (must perform two of these experiments, at least one advanced)

Introductory _____ Faculty Signature _____

Advanced _____ Faculty Signature _____

Organometallic Chemistry (must perform two of these experiments, at least one advanced)

Introductory _____ Faculty Signature _____

Advanced _____ Faculty Signature _____