Course Format: Course time will be split approximately evenly between the classroom and the lab. Classroom activities will include guest lectures from leading faculty in the department, library research, large- and small-group discussion, and collaborative activities dealing with the background material related to the topics being presented. Laboratory activities will include instruction on the use of various instruments and learning and practice of specific research skills within the presented topics. Students will also have the opportunity to visit research labs and facilities in the department, and elsewhere on campus.

Daily Schedule:

Monday – Friday 9 am – 4:00* pm
1-hour Lunch Break every day
(actual time will vary each day according to scheduled activities)

CLASSROOMS/LABS
- Main Classroom = David Rittenhouse Laboratory Building, Room A1
- Lab Area: General Chemistry Labs (Chem ’73 Bldg)

*Most days will end around 4pm, but labs will often run a bit later.
Entire schedule may be shifted ½ hour earlier if student breakfast access is acceptable.
Course Syllabus:
There are two tables below. The first provides a general outline of what will be accomplished throughout the 3-week program (though not necessarily in the order provided). The second is a tentative schedule of research lectures and lab tours for your information.

### Topics & Activities

#### Background and introductory topics

1. Review of various chemistry topics as needed.
   a. Atomic Structure
   b. Bonding: Structure and Properties
   c. Basic Organic Chemistry
2. Introduction to department computing including networking, software, security, etc.
3. Laboratory safety in chemistry
4. Library research in chemistry using various databases

#### Chemistry Topics

The major focus this year will be on the
- Structures of substances
- How we know what we know about substances
- Why we care about knowing the structure of substances

Specific topics to be explored within this focus are:
- Spectroscopy – absorption and fluorescence
- Molecular Orbital Theory
- Nanoparticles
- Transition metal chemistry
- Coordination complexes
- Crystal Field Theory

#### Focus Questions throughout program

- What is "Research"?
- Do real scientists use the same scientific methods as you learn in high school?
- How do you find a topic that you want to research?
- What is the role of scientific literature in research?
- What types of instruments are used in chemistry research?
- What are some areas of current research in chemistry?
- How is a scientific experiment designed?
- How much can you trust experimental results?
Schedule of Research Talks and Lab Tours

Below is a tentative schedule of topics, tours, and research talks. Some of the timing is not yet confirmed. Each session is 3 hours long. When there is not a research talk or a lab tour, students will be involved in learning activities related to the topics in the table above.

<table>
<thead>
<tr>
<th>DAY</th>
<th>MORNING SESSION</th>
<th>AFTERNOON SESSION</th>
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<tbody>
<tr>
<td>Tues 7/5</td>
<td>Dr. Eric Schelter</td>
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<tr>
<td>Wed 7/6</td>
<td>Dr. Ana Mayol</td>
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<tr>
<td>Thurs 7/7</td>
<td>Mrs. Judith Currano, Head of the Penn Chemistry Library Making your searches useful and helping to narrow a topic</td>
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<td>Fri 7/8</td>
<td>Chemical Heritage Foundation Museum tours</td>
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<tr>
<td>Mon 7/11</td>
<td>Dr. Ana Mayol What are nanoparticles and why are they interesting?</td>
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<tr>
<td>Tues 7/12</td>
<td>Dr. Ana Mayol Laboratory: Synthesis of Gold Nanoparticles</td>
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<tr>
<td>Wed 7/13</td>
<td>Ms. Katie Pulsipher (of the Dr. Ivan Dmochowski group) Research on Nanoparticles in Biology</td>
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<tr>
<td>Thurs 7/14</td>
<td>Singh Center for Nanotechnology Tours of instrumentation for fabrication and characterization of nanoparticles</td>
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<tr>
<td>Fri 7/15</td>
<td>Dr. James Petersson and his research group Lecture, lab tour, and learning activities</td>
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<tr>
<td>Mon 7/18</td>
<td>Ms. Teresa Rapp (of the Dr. Ivan Dmochowski group) Research on Ruthenium complexes and their various uses.</td>
<td>Ms. Teresa Rapp Lab: Kinetic Considerations of Ligand-Exchange Reactions of Ruthenium Complexes</td>
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<tr>
<td>Tues 7/19</td>
<td>Ms. Teresa Rapp Lab: Kinetic Considerations of Ligand-Exchange Reactions of Ruthenium Complexes (Part II)</td>
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<tr>
<td>Wed 7/20</td>
<td>Ms. Teresa Rapp Lab: Kinetic Considerations of Ligand-Exchange Reactions of Ruthenium Complexes (Part II)</td>
<td></td>
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<tr>
<td>Thurs 7/21</td>
<td>Ms. Teresa Rapp Lab: Kinetic Considerations of Ligand-Exchange Reactions of Ruthenium Complexes (Part II)</td>
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<tr>
<td>Fri 7/22</td>
<td>Presentation of Projects. (Half day today)</td>
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**Up to 2 additional research talks are also in the works!