PROGRAM RULES

Note that All undergraduate laboratory and youth program rules apply to Summer Youth Programs. A copy of the SYP handbook will be distributed to you as soon as it is available. Some specific rules:

♦ Name tags (students’ and instructors’) must be worn at all times and should remain unobstructed. You will find important contact information on the back, e.g. the SYP office number.
♦ Roll (by name not just "heads"!) must be called at the beginning of each AM and PM session. Head counts should be repeated (often) during field trips. The SYP office should be notified at once if a student can not be accounted for.
♦ All students are required to participate. Students should not be allowed to sleep or wear head phones during the sessions. The supervisor should be notified if there are any students unwilling to participate. The SYP office will be notified and the student will be returned to the dormitory if necessary.
♦ Two 15-minute breaks should be scheduled approximately mid-morning and mid afternoon. This is a good opportunity to make sure the last experiment is removed and the next one is set up. Students are free to roam the building, so long as they do not get into any trouble and return at the designated time. Students who do not obey these rules will not be allowed off of the lab floor except for rest privileges.
♦ Follow the itinerary. It is very important to the SYP office that you can be readily found. You must call and report to the SYP office if you are not at the location specified on the itinerary. It is especially important that students are not allowed to leave the program earlier than the specified times. There are no counselors available for their supervision other than the scheduled dismissal times (lunch and at the end of day).
♦ The students enrolled in the program are a diverse group. Prepare yourself well by reading through the materials and completing the necessary preliminary work. Preparation of some time fillers are a good idea.
♦ ALWAYS PRACTICE SAFETY! Remedy anything unsafe or potentially unsafe or bring it to the attention of the lab supervise immediately. All accidents must be reported.

INTRODUCTIONS

Lectures/Exercises

AM and PM lectures/exercises should generally be 60 minutes or less in length. Lectures (AM & PM) should include the following:

1) some type of warm-up exercise, energizer/team-building exercise (supervisor has books on these)
2) a summary of the preceding day’s activities
3) a preview of the upcoming agenda and/or an overview/introduction of a chemistry topic
4) homework assignment expectations/due dates.

**Experiments**

An introduction should also be presented before each experiment. These introductions should include safety concerns and lab techniques along with a discussion of the background and theory. Remember that students do not always read the materials before they perform an experiment, so “coaching” on even the most basic procedures may be necessary. Also, plan to summarize each experiment. Draw a table on the board and ask students to record their results. Discuss/help students make conclusions based on the results and go over postlab questions as a class. Award raffle tickets to outstanding results or otherwise in order to encourage students to apply themselves.

**DEMONSTRATIONS**

The demonstrations that are scheduled may be performed at the beginning, middle, or end of the lab periods and/or lecture/discussions (if CLC-appropriate). If you are not comfortable with performing a demonstration, please practice it. Suggestions for alternate demonstrations are always welcome; but check with the supervisor before you perform it. NOTE: The most important criteria for a good demonstration is the performer’s enthusiasm!

**OTHER**

Prepare some time-fillers! Be ready to present them whenever they are needed. Students may not be dismissed early for lunch or at the end of the day. The supervisor has ideas, games, books, and ideas if you need some assistance.

**SYP STAFF AND THEIR RESPONSIBILITIES**

<table>
<thead>
<tr>
<th>ROLE</th>
<th>RESPONSIBILITIES</th>
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<tbody>
<tr>
<td>Supervisor/Coordinator</td>
<td>Select experiments, supervise the preparations staff, and students. Completes program preparations/clean-ups, monitor students, assist instructor</td>
</tr>
<tr>
<td>Instructors</td>
<td>Lectures, experiment introductions/summaries, practice and perform demonstrations, monitor students, assists with some preparations and clean-up.</td>
</tr>
<tr>
<td>Prep Assistant</td>
<td>Prepare reagents, equipment, and supplies in advance for the program. Be present during experiments in order to assist students and instructors and insure that the program runs smoothly.</td>
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**SUGGESTED PROGRAM**

You may or may not wish to incorporate the items that follow. However, reading them should give you a good understanding of the week's events. By all means, feel free to present a program that suits you!

**NOTE:** Please let students know that they are expected to help with the clean-up of the lab, lab equipment (especially balances), supplies, etc.!

**MONDAY**

**AM  8:00 – 8:30 MANDATORY INSTRUCTOR MEETING: M&M U113.**

A Continental breakfast will be served. Rosters will be distributed.

**9:00 - ~10:00: Lecture**

Take a deep breath (everyone)

As students enter:
- Call roll as student
- Pass out handbook, intro quiz, and any other materials.

**Introductions (use ice breaker?)**
- The staff (self intros?)
- The students? - a good student self-intro is to have them select an adjective which describes them and begins with the 1st letter of their name, ask the class for help if they can't think of one
- Definitions of chemistry/introduction to chemistry - see Monday support materials
- A fun energizer/ice breaker?
- Overview of the week (syllabus, handbook), importance of safety and eye protection, meeting routine (morning vs. afternoon) tour of building.

**Building Tour**
- Start from sub basement & explain what each floor is used for
  * SB: Polymer and ECM labs
  * B. Chem. Stores, machine shop
  * 2nd Floor: computer labs, the CLC
  * 5th floor: Gen. Chem. Labs, Women's rest room, Pushpa's research lab (or Pat Heiden's?)
  * 6th floor: Chemistry department, Men's (& Women's restrooms).
  * 7th floor: Kelley Smith's office, Analytical and Physical Chem labs
- Lab Tour: Balance room, hoods, where reagents will be placed.
Lab Introduction (go through this s-l-o-w-l-y)

- Safety, safety quiz - let students know your expectations.
- Locked boxes (Kelley Roth), then 15min. break (OK to leave 6th floor, but no trouble or privilege to roam will be lost!)
- Matter and how it is studied, the importance of observation and communication.
- 1st A.M. BREAK: "LOCKED BOXES" - get from 607C

Demonstration: A Simulated "Acid in Your Eye" Accident

Experiment(s): Observation of a Density Column

- Place density column on light table & turn down lights.
- Have students record their observations on a sheet of paper, then solicit observations from them. (Try to get at least 1 observation from each student.) Make sure observations are factual, not assumptions. Give students w/ most observations a lottery ticket.
- Have prep assistant tell students what each of the substances are, then explain why one floats above another.

PM Experiments/Lab Introduction

- Scientific Method (A Mystery Substance)
  - scientific method, methods used to learn/understand matter (observation, measurement, experiments, etc.), physical properties, safety.
  - Go over safety rules, especially "no eating in lab (no matter how tasty-looking)", proper disposal, etc.
  - Pull out marshmallow bunnies last (the mystery substance they must learn about).
  - Award a ticket to student(s) who determine the most information about the bunnies (or the most creative or...)
  - DEMO (Following this experiment): Bunny Meets Vacuum

NOTE: The bunnies tend to get hard quickly after the package is open (and there are few "extra" bunnies), so please open the minimum no. of packages. Please try to save a few bunnies for the "Bunny Meets Vacuum" demo

- Measurement: Penney Density
  - Explain physical properties, the importance of measurement, and the experiment objective.

LECTURE/DISCUSSION: Observation exercise (scene of an accident), modeling, Nuts and bolt exercise (elements/atoms, compounds/molecules, and mixtures), bonding structures (gum drop exercise), and the following assignments:

- Element adoption - application form must be completed by 4:30 Thursday afternoon. Finalization/approval during farewell ceremony.
- Student demonstration (practiced & performed on Friday - must be selected by Wednesday PM).

NOTE: OBTAIN ALL EDIBLE ITEMS (INCLUDING GUM DROPS AND TOOTHPICKS) FROM
THE SUPERVISOR’S OFFICE.

TUESDAY AM

AM: LECTURE: Chromatography Introduction

Properties of matter (physical vs. chemical), relationship between structure and properties, immiscible liquids (polar vs. non-polar), chemical bonding. Demo: Mystic Sand

INTRODUCTION: Chromatography (mobile phase, stationary phase, different types, usefulness, etc.), colors/dyes (structure, etc.), experiment objectives, experiment techniques, safety.

PM: EXPERIMENT: Radial Chromatography, T-Shirt Design

• Importance of creativity in science
• Separation of mixed colors

EXPERIMENT: Reaction in a bag, Copper Reaction

• Chemical vs. Physical Properties
• Chemical Reactions: Signs, formation of new compounds
  * Rxn in a bag - younger group
  * Copper Rxn - older group will determine reaction which occurs between Cu & Fe. You should discuss moles/stoichiometry prior to this experiment.

PM DISCUSSION: Properties of matter (physical vs. chemical), relationship between structure and properties, immiscible liquids (polar vs. non-polar), chemical bonding. Demo: Mystic Sand

• Remind students you will be going on a field trip Wednesday morning and they should dress appropriately (jackets, rain gear?) They may wish to bring money to spend at the museum gift shop (cool rocks, jewelry, and other souvenirs).
• Remind students of the assignments (demo selection due Wednesday, element adoption Thursday).

Consider “acting out/animating” the principles of chromatography as a group.

WEDNESDAY

AM: LECTURE: The periodic table, types of chemistry, organic vs. inorganic, metals and minerals (properties of) vs. nonmetals, overview of the museum and field trip.

NOTE: Be sure to bring small zip-loc bags, labels to lecture for stamp sand samples. There are also some copper compound samples for you to pass around.

TOUR (9:35): Seaman Mineralogical Museum - a guide may or may not be available that morning. Please point out the Copper Country panorama picture showing students where PCI,
Lake Linden park, and McLain State park are on the peninsula. You should mention that Calumet was once the largest city in Mi and almost became the state capital! The museum mentioned that they have a short video for the students to watch.

FIELD TRIP: (~30min. or less) Collection of Stamp Sand Samples (Lake Linden), Peninsula Copper Industries (now OSMOSE) (11:10, Hubbell - see itinerary for exact times.

PM: COPPER LEACHING: instructors should add the concentrated (6M) ammonia and place on stir plates in 501 or 601 hoods. Check later for presence of Cu²⁺ (blue solution). You may wish to measure the NH₃ for the older group so the stamp sand can be analyzed quantitatively using spectrometers (substitute for food dye analysis?).

Remind students they must choose their demos before leaving on this day! Element adoption applications are due Thursday P.M.

EXPERIMENT #1: Reaction in a Bag. Discuss physical vs. chemical properties and the signs of a reaction.

EXPERIMENT #2: A Copper Reaction. Please read through this experiment and prepare an introduction. Students will need assistance with the stoichiometry of the reaction.

LECTURE/WRAP-UP: Chemical bonding and animation activities (skits) (Inter- and Intramolecular Bonding, phase changes, etc.). Paper, tape, and markers available in 501S bench. You may wish to work in one large group (entire class) for younger students (try to act out several of the concepts), smaller groups for older students (1 concept per group).

NOTE: Please remind students that their element adoption applications are due THURSDAY P.M. You may wish to complete the adoption certificates (partially) ahead of time. Demonstrations must also be picked before students leave. Remind them to become as familiar as possible with the concepts involved in the demonstration.

THURSDAY

AM LECTURE AND/OR VIDEO (no Dr. John Williams): Polymers, approximately 1hr in length

Experiment: Cross-linking, Silly Putty, Guar Gum Slime, Dilatency (use Corn Starch) - at least one GTA.

PM See SYP Chemistry HomePage for information.
NOTE: ELEMENT ADOPTION APPLICATIONS DUE! Also: Remind students to review their demos, bring in a puzzle to A.M. They should also bring $ & a jacket Friday morning for their Field trip.

ACTIVITY: Freezing Point Depression/Colligative Properties (Ice Cream!). Prepare on lawn between EERC and ChemSci. Ice cream will be pre-mixed and available in small jars to place into a 3lb coffee can. Add ice and 1-2 cups of salt, then mix well. (This activity is scheduled on the lawn between the ChemSci & EERC.) Spoons, napkins, & ice cream toppings (peanuts & chocolate chips) are available w/ other food items in 607C. Spoons can be discarded. Please have students return lids to small jars (tightly, please). They do not need to rinse out the jars, but PLEASE have them rinse out the coffee cans and lids with warm water, then place upside down to dry on lab bench(es). ALL SPILLED SALT MUST BE CLEANED UP: DO NOT LEAVE ON SIDEWALKS OR LAWN!

FRIDAY

** REMINDER: Bring jacket and state park fee $

AM 8:00 – 8:30 MANDATORY INSTRUCTOR MEETING: M&M U113.

A Continental breakfast will be served. Completion certificates and evaluation forms will be distributed.

LECTURE/INTRODUCTION: Demonstration expectations, safety, overview of day’s activities. Puzzles?

EXPERIMENT (ALL GTA’s): Demonstration practice - divide students into groups. Please try to separate unruly combinations of students!

LUNCH: PICNIC AT McCLAIN STATE PARK: 11:00 (bus, van, or car(s) leave DHH) - 1:15PM.
- Ask (at DHH) if students can get their jackets & $ for ice cream/treats (if they forgot). McLain Park is almost always chilly!
- Lunches should be in bus - you may wish to count. I requested 1/student + (2) for the instructors.
- Students must remain w/in your sight at all times and are NOT allowed to swim or go onto the breakwater.
PM

INTRODUCTION: Discuss demonstrations that don’t work, good manners, clean-up and check-out expectations.

EXPERIMENT: Student Demonstrations: Please ask students to introduce themselves, where they are from, the demo they selected and why they selected it. Clean-up and Check-out: The more clean-up completed, the less you’ll have to do!

DISCUSSION: End of Day/Week Summary, Adoption Applications/certificates, Evaluations, and Certificates, Lottery Drawings.

NOTE: Be sure to report missing students to the SYP office (7-2219). If they show up, be sure to call and let them know.

HELPFUL TIPS FOR YOUTH PROGRAM INSTRUCTORS

1. Focus on projects or a particular activity in which all students can be involved. This is their chance for breadth of exposure to something new.
2. Think and talk about the implications and applications of the topic. Where is the “cutting edge?”
3. Offer incentives: a chance to try something (experience a CAT scan, make some paper from wild-flowers, role play attitudes towards different cultures, do a learning style inventory). The experience can be real. For example, a market and bargaining session worked beautifully when each student actually earned money through cooperative negotiation techniques.
4. Relate to real-world applications.
5. Demonstrate, experience. Limit (or delete) lectures.
6. Use visuals. Try to address a variety of learning styles. Appeal to ALL the senses.
7. If appropriate, give them stuff to take home, such as lists of contact people, resources and products in addition to ideas.
8. Heads-on/hands-on involvement is the key. How can you make your presentation alive?
9. Think of less teacher-directed teaching, more mutual exploration.
10. Explore the common ground between the arts and sciences in you topic.
11. Alternate demonstration and dialogue. Let the students perform the demos.
12. Have handouts.

1 Excerpt found, author and date unkown. From an MTU Summer Youth Program Instructor Manual?