Assessment #6

At Rhode Island College, we strive to make sure that our teacher candidates know and use safe practices at all times. This process begins with the teacher candidate's content classes, where they first learn the characteristics of a safe laboratory setting. Because all science classes in both the Biology and Physical Science departments have a lab component, our students receive ample opportunity to participate responsibly in science. Because unsafe practices are required in all science classes, successful completion of a science major is used as evidence that teacher candidates are familiar with safe practice of science. Representative safety documents are provided at the end of this assessment.

The process of safety education continues throughout the teacher candidate' methods classes, and finishes with the student teaching experience. The safety and welfare standards of the NSTA are assessed throughout, as seen below in Table 13: Safety. The careful reader will notice that safety information from the student teaching semester was reported in Assessment #4, so it will not be repeated here.

Table 13

Safety Alignment

	Science Content classes	Practicum safety assignment	Observations of Practicum Teaching	Student Teaching safety assignment	Observations of student teaching
Legal/ethical NSTA 9a		X	X	X	X
Maintenance/disposal NSTA 9b	X	X	X	X	X
Know/follow emergency procedures NSTA 9c	X	X	X	X	X
Care and use of animals NSTA 9d	X*	X	X	X	X

Note: some science classes, like Astronomy, do not use animals.

Our students complete a safety exercise in both SED 410: Practicum in Secondary Science Teaching and SED 422: Student Teaching. During Practicum, science education students complete two three-week rotations in a local high school and a local middle school. If a student is in need of remediation, the second Practicum location is used as an additional opportunity to show mastery of safe practice. This has not been necessary in the last three years.

Table 14

Safety data

	2007-2008	2008-2009	2009-2010
Successful completion of science classes	100%	100%	100%
Practicum safety assignment	100%	100%	100%
Observations of Practicum Teaching (6 pt scale)	90%	95%	85%

Analysis of Data

Teacher candidates at Rhode Island College have a strong record with regard to safety, which we are pleased with. The emphasis on laboratory science gives our students a strong foundation in good safety practices upon which we are able to build. While the data may imply that students have relatively more trouble with safety during their first teaching experience, it is important to keep in mind that scores are still very good. Post-observation reflection shows that the teacher candidates understand safe practice, but have difficulty monitoring safety, classroom management, time management, and student learning at the same time, an understandable problem among teacher candidates. By giving our teacher candidates the opportunity to teach two units before student teaching begins, we feel they are more able to focus on safety as teacher candidates, when they may be the only adult in the room.

Attachment: Safety observation rubric

PRACTICUM OBSERVATION - SAFETY

Standard	Emerging (1-2 points)	Basic (3-4 points)	Professional (5-6 points)
The candidate practices legal and ethical responsibilities of science teachers for the welfare of their students. (NSTA 9a)	Has not responsibly followed the legal and ethical precedents for the welfare of students in the science classroom.	Generally follows the legal and ethical precedents for the welfare of students in the science classroom.	Consistently follows the legal and ethical precedents for the welfare of students in the science classroom and discusses reasons for such rules with students.
The candidate practices safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction. (NSTA 9b)	Does not responsibly establish and follow procedures for the safe labeling, handling, storage and disposal of chemicals, and other materials. OR MSDS file is not kept, readily available or currently maintained.	Establishes and follows procedures for the safe labeling, handling, storage and disposal of chemicals, and other materials. AND Maintains an up-to-date and readily available MSDS file for all materials used in the classroom.	Establishes and follows procedures for the safe labeling, handling, storage and disposal of chemicals, and other materials. AND Maintains an up-to-date and readily available MSDS file for all materials used in the classroom. AND Stays informed of potential hazards and legal concerns. Communicates them to other teachers to maintain a school environment free of potential problems.
Candidate follows emergency procedures, maintain safety equipment, and ensure safety procedures appropriate for the activities and the abilities of students. (NSTA 9c)	Does not responsibly plan, practice or enforce safety procedures in all activities in the classroom. OR Is unaware of actions to take during an emergency and to prevent or report an emergency. OR Fails to appropriately respond to hazardous situations once identified.	Plans, practices and enforces safety procedures in all activities in the classroom. AND Knows actions to take during an emergency and to prevent or report an emergency. AND Appropriately responds hazardous situations once identified.	Consistently plans, practices and enforces safety procedures in all activities in the classroom. AND Demonstrates in the classroom that safety is a priority in science. AND Takes action to prevent hazards and communicates needs and potential problems to administrators.
Treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restrictions on their collection, keeping, and use. (NSTA 9d)	Does not responsibly attend to, obey or enforce rules for the safe, proper and ethical treatment of animals.	Attends to, obeys and enforces rules for the safe, proper and ethical treatment of animals.	Consistently attends to, obeys and enforces rules for the safe, proper and ethical treatment of animals. AND Discusses reasons for such rules with students.

Attachment: Safety Assignment and Rubric

Laboratory Safety Assignment

A key aspect of safety is knowing and respecting the hazards inherent to a particular chemical, reaction, or technique. Information pertaining to the hazards of a particular reaction or technique is typically included in the experimental procedures, textbooks, or handouts which discuss the technique or reaction. Rarely do these sources touch on the specific hazards of a particular chemical such as toxicity, flammability, the appropriate protective equipment and handling of the chemical, or emergency responses.

This information is, of course, extremely important to know before beginning any laboratory experiment. Thus, the chemical community has created a database (paper and electronic) of Material Safety Data Sheets (MSDS) which codifies this information for every chemical. MSDS are catalogued alphabetically by the chemical's IUPAC name. MSDS are a crucial source of chemical safety information. All science teachers should know how to find and use the MSDS database and be familiar with the MSDS information for all chemicals in the laboratory. By law, the science department in any school must have the MSDS for every chemical in the building. MSDS for certain chemicals may also be found **on-line** from Flinn Scientific at http://www.flinnsci.com. Follow the Safety link.

1) For the four chemicals listed below look up their MSDS's on the webpage.

This will provide an extensive search page. All you need to do is fill in the chemical name in the correct place. Note that pages like this one are a good resource for you later in your career when you need to find information!

Concentrated sulfuric acid methyl alcohol 30% hydrogen peroxide Iodine crystals

2) Examine the hazard information for each chemical listed above and (a) identify the most significant hazard for each (i.e. flammable, toxic, corrosive) and (b) the type of injury it could cause.

3) What first aid measures would you take if you...

(a) accidentally splashed sulfuric acid in your eyes?

(b) inhaled excessive methanol vapors and began to feel sick.

(c) spilled 30% hydrogen peroxide on your skin.

(d) spill iodine crystals on the floor of the classroom.

4) Summarize the information provided for hydrogen peroxide in the reactivity, toxicology, and safety portions of the MSDS for 30% hydrogen peroxide.

How might this information be useful in preparing for a safe laboratory experiment?

Hydrogen peroxide is available without a prescription from your local pharmacy or food store. What is different about store bought hydrogen peroxide and the hydrogen peroxide described in the MSDS that would allow any person to access it?

5) What guidelines regarding clothing should students be aware of in the laboratory?

6) What type of goggles should students wear and when should they wear them?

7) In what cases might students be asked to leave the laboratory?

8) Can students wear contact lenses? Why?

9) What should you do if:

A) a student broke a beaker and cut their finger.
B) chemicals have splashed on a student's face.
C) the fire alarm sounds.
D) a student's lab manual has caught on fire.
E) a student's shirt has caught on fire.
F) chemicals have spilled on your pants.

10) Make a drawing of the laboratory or classroom where students conduct experiments and note the location (or absence) of the following safety items:

- Mercury Spill Kit
- Fire Alarm
- Fire Blanket
- Eye Wash Station (is it full?) What's in it?
- Fire Extinguisher (is it full?) What's in it? When was the last inspection date?
- Emergency electricity shut-down switch
- Are the electrical outlets fused? (Ground Fault Circuit Interrupted) GFCI
- Paper towel dispenser for spilled chemicals
- Acid or Base Neutralization Kit
- Receptacle for broken glass
- Receptacle for biological waste
- Receptacle chemical waste
- MSDS Sheets

11) Discuss with your cooperating teacher and determine the appropriate procedures in your school for the following:

- Should you need to contact the administration in the event of an emergency situation.
- How are materials properly labeled, handled, stored that constitute potential safety hazards?
- What are the procedures to clean up and dispose of hazardous materials?
- How are students informed of safe procedures and potential hazards?
- What plans do you have for handling student misbehaviors as they relate to safety?
- How will you ensure the safety of students with known allergies, disabilities, and medical conditions?
- Assuming you will use them, how will you ensure proper and ethical treatment and care of animals?
- Assuming that you will use them, how will you ensure compliance with laws related to collection of natural materials?

LABORATORY & CLASSROOM SAFETY ASSIGNMENT
STUDENT TEACHING SEMINAR
EVALUATION RUBRIC

NAME_____
SCHOOL_____
COOPERATING TEACHER_____
DATE_____

NOTE: ALL COMPONENTS MUST BE MET FULLY AND COMPLETELY DURING THE FIRST WEEK OF STUDENT TEACHING. THIS IS MET BY MASTERY OF ALL COMPONENTS AND ANYTHING LESS IS NEGLIGENCE ON THE PART OF THE COOPERATING TEACHER AND STUDENT TEACHER.

COMPONENT	COMPETENCY MET
Interactive Incident Despite your careful lab supervision, one of your students has his/her arm badly cut. The injured student screams and rushes up to you followed by several others. What action do you take? You believe the student is in need of immediate medical attention. Do you leave the rest of the class? What do you do?	_____
Cooperating Teacher Attestation Signed and dated attestation by the cooperating teacher verifying that the location and use of all departmental safety equipment and regulations have been discussed with the student teacher.	_____
Departmental – School Policies What are the policies in place that are to be followed for the above laboratory incident?	_____
MSDS Sheets Identification of safety, usage, and disposal information for the chemicals listed. Location of MSDS sheets in the science department.	_____
First Aid Measures Identification of first-aid procedures identified on MSDS sheets.	_____
Definitions Corrosive, irritant, toxic, sensitizer, carcinogen, teratogen, oxidizer.	_____
Safety Precautions Measures / precautions for students using chemicals and equipment in the laboratory.	_____
Safety – First Aid Precautions Safety and first-aid measures for students using chemical and equipment in the laboratory.	_____
Class – Laboratory Map Identification and location of all safety and first-aid equipment in laboratory and classroom.	_____
School Supply – Chemical Storage Description and location of chemical and equipment storage facilities.	_____

08-2005

SAFETY RULES FOR THE CHEMISTRY LABORATORY

1. Safety goggles that meet ANSI Z87.1 standards must be worn in the lab at all times. You must supply your own goggles. You may purchase these through The Physical Science Club or some other source. A few loaner pairs will be available in lab for use in unusual circumstances.

2. Notify your instructor immediately if an accident occurs, no matter how minor it appears.

3. Treat all chemicals with respect. Certain chemicals should be handled only in the hood because of toxicity or noxious odors. Assume that all chemicals are toxic; do not get them on your skin and avoid breathing vapors. NEVER taste any lab chemicals.

4. Dispose of all chemicals in a safe and responsible manner as described in your laboratory directions or by your instructor.

5. Be neat at all times. When pouring reagents from a bottle, grasp the bottle on the side covered by the label and pour out the side opposite the label. Do not contaminate reagent bottles. NEVER return unused reagents to the bottle. Avoid a cluttered work area; you will avoid most accidents and finish your experiments more quickly and with better results.

6. If a chemical is spilled, ask your instructor how to clean it up immediately. IF YOU SPILL ANY CHEMICAL ON YOURSELF, WASH THE AREA IMMEDIATELY WITH LOTS OF COLD WATER, THEN CHECK WITH THE INSTRUCTOR FOR THE APPROPRIATE ACTION.

7. Know the location and operation of the EYE WASH, SAFETY SHOWER, FIRE BLANKET, FIRE EXTINGUISHER, and FIRST AID KIT. If you splash chemicals in your eyes, use the emergency eye wash immediately. In the case of a large spill, use the emergency safety showers.

8. Never use a flame to heat flammable materials or when anyone in your vicinity is using a flammable material. Check with people around you before you light a burner.
9. When heating a substance in a test tube or flask, be sure the open end is not pointing at you or anyone else.

10. Avoid touching hot objects such as the barrel of a Bunsen burner, a wire gauze, or hot glassware.

11. When using glass tubing or thermometers, be very careful. Avoid breaking them. Use a towel when inserting them through a rubber stopper.

12. When attempting to detect chemical odors, exercise extreme caution. NEVER put your nose over the open end of the container. Wave the vapors toward your nose with your hand.

13. Never make changes in a procedure or in the use of a chemical without the permission of your instructor.

14. When you obtain a chemical for an experiment, READ THE LABEL CAREFULLY, MAKING CERTAIN OF BOTH THE FORMULA AND CONCENTRATION.

15. Shoes must be worn at all times. Dress for safety, not fashion. Clothing must protect your skin from spills, splashes, and eruptions of hot or dangerous materials—no sleeveless shirts, low necklines, bare midriffs. Skirts or pants must come to just above the knee or below. No sandals or open shoes If you have long hair, keep it tied back out of the way.

16. NO FOOD, BEVERAGES, or GUM PERMITTED IN THE LABORATORY. No smoking anywhere in the building. Wash your hands after lab, especially before you handle food, gum, or cigarettes.

17. Be constantly aware of potential hazards in the laboratory. Be on guard not only to avoid accidents yourself, but to prevent or protect yourself from accidents caused by your neighbor. Make sure you are not performing incompatible operations. If you are unsure exactly which chemical to use or how to do a particular procedure, ASK YOUR INSTRUCTOR BEFORE YOU PROCEED.

18. Never work in the laboratory unless an instructor is present, unless your instructor gives you specific permission to do so for certain low hazard operations such as melting points or spectra. There should never be fewer than two persons in the laboratory.

I have read and understand the SAFETY RULES FOR THE CHEMISTRY LABORATORY and agree to work in the laboratory according to these rules.

Course_____ Section_____

Printed Name_____

Signature:_____Date:_____

Sample Biology Safety Handout, from Biology 335 Human Physiology

Laboratory #1

Safety in the Laboratory

The keys to working safely in any laboratory are organization, neatness and being prepared!

The laboratory is a safe place to work and study. It remains safe, when the individuals working there practice the conventional rules of laboratory safety. Laboratory work frequently requires the use of reagents, equipment, and organisms that are potentially dangerous for all personnel in the laboratory. On entering the laboratory, you assume responsibility for your own safety and the safety of your neighbors. The ad-vice that follows represents accepted procedure and describes the behaviors assumed to be characteristic of anyone working in a laboratory.

Good laboratory work requires advanced preparation on the part of all that are present. The instructions and directions for a specific activity require careful study beforehand. You need to know: 1) What to do, 2) How to do it, and 3) Why it is to be done in the prescribed manner. Thorough preparation improves the quality, efficiency, and safety of your work. Prepare a set of notes for the materials and procedures organized in the form of a flow chart. Highlight notes that describe safety procedures.

Instructors usually provide a briefing before the start of a laboratory exercise. Unless the instructor tells you otherwise, it is advisable to wait for that commentary before beginning your work. The briefing provides the opportunity for: describing changes in instructions,

demonstrating techniques, explaining the procedures for the proper use of instruments, and highlighting safety precautions. Be sure that you understand, and follow exactly, the special procedures for the correct disposal of hazardous materials, biological wastes, and body fluids. The briefing is a chance for you to ask questions about equipment and procedures that you don't under-stand. Making changes in the procedures and using materials other than those described in the instructions can be disastrous. On the other hand, changes based on new in-sights can be very valuable because they may increase the effectiveness of an exercise. Therefore, be sure to discuss your ideas with the instructor at the time they occur to you or before leaving the laboratory.

The laboratory bench must be clean and organized, and other extraneous items are a safety hazard when stacked on the surface of the bench. Remove unnecessary items from the bench top and place them in a secure storage area. The cabinet in the bench pedestal is a good place to store calculators, purses and other valuables.

The laboratory in which you will be working is a general purpose teaching laboratory. Instructors and students from different courses make use of the room. As a result, a wide variety of substances and equipment is constantly being moved into and out of the laboratory. Materials remain and form residue that is potentially pathogenic, capable of causing personal injury, and likely to soil or damage your belongings. Check the bench top as a precautionary measure before assembling the materials needed for the laboratory activity. **Keep your hands away from your mouth. Do not eat or drink in the laboratory, and never pipette by mouth suction.**

When gathering materials from central supply areas, label the containers for their transport beforehand. Read the labels on the stock containers TWICE before taking what you need. Immediately replace caps, stop-pers, and covers for all containers. The stock is to re-main

in the supply area. Excess amounts of media and reagents are not to be returned to stock supplies because contamination of the stock supply may result from this process. Materials and equipment are to remain in the laboratory at all times.

A general knowledge of safety procedures is inadequate. You must know what to do in a particular set of circumstances. Quick action is vital when accidents occur that result in materials entering the eyes, fire, broken glass, chemical spills, or injuries to the skin. Therefore, thoroughly study the procedures that are to be followed for each of the conditions listed below.

Eye Injury. Go immediately to the eye wash station and flush the material from the eyes. When one eye is affected, tilt the head to prevent the stream of water from introducing the material into the other eye. Continue the procedure until directed to stop. Individuals in the immediate area are to clear a path to the eye wash station and take the initiative to lead the injured person to the wash station. NOTE: If you wear contact lenses and also have a framed set of lenses, it is advisable to wear the framed lenses in the laboratory.

Fire. When entering the laboratory for the first time, determine the shortest exit routes from your laboratory station to the adjoining hallways. Locate the exits leading from the hallways to the outside of the building. If the laboratory has fire extinguish-ers and fire blankets, the instructor will explain their proper use and show you their locations.

Broken glass. To pick up broken glass use a dust pan and brush. Gather together small slivers and chips by using a crumbled wad of wet paper toweling or wet cotton and labo-ratory tongs. Discard the glass into the special container designated by the instructor.

Chemical spills. Clear the area immediately and tell the instructor. Promptly flush the area with water when spilled material con-tacts your personal belong-ings, clothing or skin. **CAUTION!**

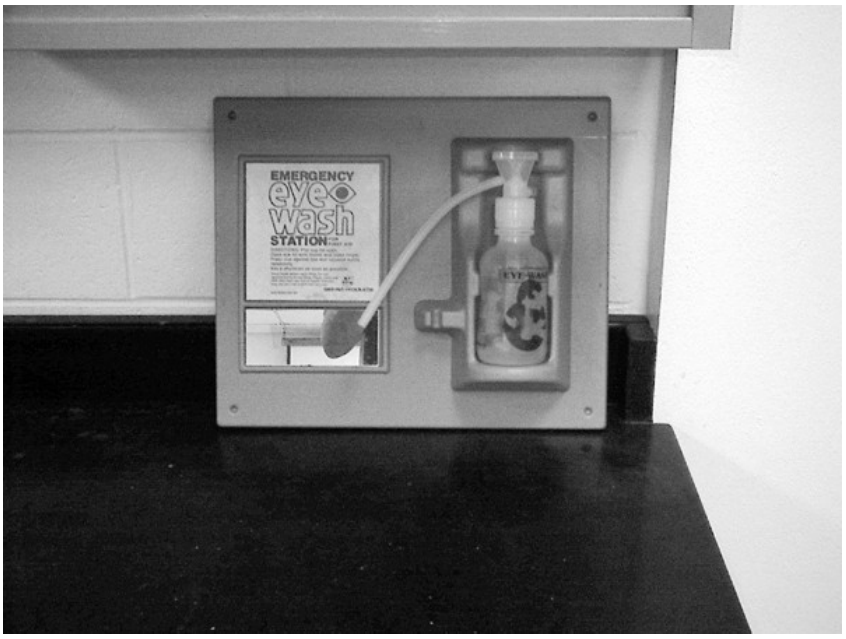
Sometimes alternative procedures are required, and the instructor will describe them during the laboratory briefing.

Skin injuries. Immediately report accidents that puncture, cut, abrade or burn the skin. In each laboratory, there is a first aid kit for the immediate treatment of minor injuries. Any occurrence is significant, and the injured person should consult the college Health Service.

Long hair, long or baggy sleeves, large bracelets, and long dangling necklaces are safety hazards. When necessary, tie back long hair and roll up long baggy sleeves. Store jewelry and other personal items in a secure area. Sandals should not be worn in the laboratory. They do not provide adequate protection against sharp objects or chemical spills.

Before leaving the laboratory, be sure to clean and re-stock the individual bench area. Arrange the materials and equipment as they were initially, and discard wastes into the proper containers for disposal. **CAUTION!** Disposal of reagents, biological wastes and body fluids in a casual manner endangers yourself and those around you. Unless told to do otherwise, solid waste is not discarded into the sink or solution poured down the drain. You should strive to leave the laboratory state as you would like to find it. Your colleagues and instructors appreciate your cooperation. Thank you!

Please note that the material in this manual is a compendium of exercises originating from multiple sources. The computer simula-tion laboratories are modifications of exercises contained within the PhysioEx Laboratory Manual. Contributors to this manual in-clude Frank Dolyak, Kenneth Kinsey, Edythe Anthony, Jerome Montvilo, Eric Hall and others



Eye Wash Station

First Aid Kit and Fire Blanket