

**CENTER FOR ADVANCED PROFESSIONAL STUDIES**  
**BIOSCIENCE SAFETY MANUAL**

January 2012

Prepared and reviewed by the

CAPS Bioscience Faculty

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Special acknowledgement and thanks are made to those institutions that developed the documents that are referenced at the end of this manual, and that provided the content combined and organized in this manual.

## **Objective**

The overall objective of the Bioscience Safety Manual is to provide the basic framework for creating, maintaining, teaching, and reinforcing a safe educational environment for protecting the health of students, bioscience and CAPS faculty, and community guests in the laboratory, field, community institutions, and during personal transport between these sites.

## **Personnel Responsibilities**

### Bioscience Faculty

- Develop specific safety policies and procedures with reference to existing national, state, and local standards and with guidance from the Blue Valley School District's safety and security, and to review and revise such guidelines on an annual basis, or as unforeseen safety arise.
- Develop and maintain a plan for the procurement and ultimate disposition of animals, and maintain appropriate care for animals being housed including weekends, holidays, and other times when the program is not in session. Appropriate care includes access to nutritious food and clean, fresh water, clean housing with space and enrichment suitable for normal species behavior, and temperature and lighting appropriate for the species. If and when euthanasia is necessary, it will be performed in accordance with the most recent recommendations of the American Veterinary Medical Association, and only performed by individuals trained in the appropriate techniques. Develop and maintain a committee to evaluate and approve or disapprove of particular experiments involving animals composed of at least three individuals including a science teacher, a teacher of a non-science subject, and a scientist or veterinarian who had expertise in the subject matter involved. Member should not have conflicts of interest.
- Develop and maintain a plan for the disposal of hazardous chemicals and biohazardous material.
- Develop and provide specific safety training to students, and to supervise the use of safe procedures during subsequent laboratory and field activities. A teacher or mentor must be present during all potentially hazardous laboratory experiences.
- Develop and provide specific training to students regarding the health, husbandry, care, and handling of animals species used in the program, that follows applicable local, state, federal, and international laws, regulations, and policies.
- Lead corrective actions to mitigate hazardous situations as they arise, and to implement disciplinary actions against those students who do not adhere to safety guidelines.
- When appropriate and necessary, report incidence of serious and/or concealed hazards, and assist safety investigations.

## Introduction to Students

When working the Bioscience Laboratory on laboratory exercises and experiments, or when working in the field, you have certain important responsibilities that do not apply to other classrooms or in other situations in our laboratory (lecture, guest speakers, etc...). You will be working with materials and equipment which, if handled carelessly or improperly, have the potential to injure or cause discomfort to someone else as well as yourself. Many laboratory accidents result from students not taking the appropriate time to consider the situation(s) they are in. Please take the time and re-read appropriate safety guidelines if necessary.

To provide a safe working environment the following guidelines will be followed. Although we will read through a number of these guidelines in class, it is your duty to read all of them with a parent and sign off on those that you understand and are prepared to abide by.

## Safety Guidelines

	Student	Parent
A. <u>General Safety</u>		
1. Follow all written and verbal instructions from your instructor, and know proper fire and tornado drill procedures.	_____	_____
2. Prepare for laboratory activities by actively reading all instructions before arriving to class, and asking questions regarding those aspects of procedures that are not understood. Make a note of any modifications in the procedure as directed by your instructor. Use only those materials and equipment authorized by the instructor.	_____	_____
3. Unauthorized experiments are prohibited. Independent projects must be approved by the instructor prior to being initiated.	_____	_____
4. Never work on experiments alone in the laboratory.		
5. Always approach laboratory experiences in a serious manner. Know the location and proper use of the first aid kit, fire blanket, fire extinguisher, fire alarm box, and eyewash fountain. Never run, push, or engage in horseplay or practical jokes of any kind during laboratory exercises.	_____	_____
6. When working in a laboratory or field group, know your work partners, look out for each other, and work as a team to provide the safest of environments.	_____	_____
7. Maintain a clean laboratory bench top that contains your laboratory protocols and notebook. Place other texts and items in designated storage areas. Always reorganize and clean your workspace(s) before dismissal from the laboratory.	_____	_____
8. Dispose of laboratory waste as directed by your instructor, and use a separate designated container for the for disposing of matches, paper, wood splints, toothpicks, broken and waste glass, paper towels of other absorbent materials used in cleaning up flammable solids or liquids, or hazardous/toxic liquids and solids.	_____	_____

9. Never dispose of solid (matches, paper, etc...) or slightly soluble materials down the sink. \_\_\_\_\_
10. Never sit on the laboratory tables or place undue pressure on the laboratory seems. \_\_\_\_\_
11. Maintain clear floors and aisles between laboratory stations and materials and equipment stations, and if you spill something on the floor clean it up immediately. \_\_\_\_\_
12. Never eat, drink, or chew gum in the laboratory environment. Remove yourself to the Bioscience innovation area if you are in need of a drink, and to a similar area if dismissed for to snack. \_\_\_\_\_
13. Keep your hands at a safe distance from your face, eyes, and body while using chemicals solutions, specimens, and other materials and equipment in the laboratory. \_\_\_\_\_
14. Never carry hot or hazardous materials or equipment through a group of people. \_\_\_\_\_
15. Never reach over an exposed flame of place flammable material near a flame. \_\_\_\_\_
16. When heating a substance, never use a closed container (including a thermometer), and always point the open end of a heated container away from your person and others working in the laboratory. \_\_\_\_\_
17. Never taste anything or touch chemicals using your exposed hands unless specifically informed to do so by your instructor. \_\_\_\_\_
18. Operate electrical equipment only in a dry area and with dry hands, and when removing an electrical plug from its socket, pull the plug, not the electrical cord. \_\_\_\_\_
19. Students are not permitted in the laboratory storage areas or teacher/guest work spaces without expressed approval or direction from the instructor. \_\_\_\_\_
20. Keep this laboratory manual in your possession for reference prior to and during laboratory exercises. \_\_\_\_\_
21. Consult your instructor regarding potentially unsafe situations that are not detailed in this list of instructions and precautions. \_\_\_\_\_

**B. Student Dress Code and Hygiene**

1. Wash your hands before and after leaving the laboratory environment, and after the cleanup of laboratory spills. \_\_\_\_\_
2. Dress in close-toed shoes, clothing that permits movement, roll long sleeved shirts above the wrist, and tie back long hair and remove dangling jewelry, \_\_\_\_\_

scarves, and ties.

3. Bring goggles to class every day and wear them when working in the laboratory, especially when we are working with caustic or corrosive chemicals, during the heating of liquids, and other activities that may potentially injure the eye. Chemical hazards present a special danger to students who need corrective lenses for their vision. If something gets in your eye, take your contacts out immediately. It is preferable that contact wears have a pair of glasses handy and that they are worn inside their goggles during hazardous laboratory activities. \_\_\_\_\_
4. Wear a laboratory coat during experimental activities, and as directed by your instructor. \_\_\_\_\_

### C. Chemical Safety

1. Be aware if chemicals being used are hazardous, and know where the material safety data sheets (MSDS) are located and what is indicated for each of the hazardous chemical you are using. \_\_\_\_\_
2. Never position your face directly above an open container of chemicals. \_\_\_\_\_
3. When directed to observe the odor of a substance, waft the vapor toward you by sweeping your hand over the top of the container. \_\_\_\_\_
4. When pouring chemicals from one container to another never hold the pouring container from a high level and pour into a container that is held stationary on the laboratory surface. \_\_\_\_\_
5. When diluting an acid, always add the acid to the water not the other way around, and do so inside the chemical fume hood. \_\_\_\_\_
6. Combine liquids slowly while swirling or stirring to distribute potential heat buildup during mixing. \_\_\_\_\_
7. Read labeled items carefully to make sure you are using the product called for in the laboratory procedure. \_\_\_\_\_
8. Unless otherwise directed, never return chemicals to their original container. Furthermore, do not lay stoppers or bottle caps on the laboratory table, or exchange them between different contained substances. \_\_\_\_\_
9. When appropriate and instructed to do so, you will use the chemical fume hood to minimize your exposure to the fumes, vapors, and dust associated with hazardous or noxious chemicals. \_\_\_\_\_

### D. Glassware and Equipment Safety

1. Be certain that all glassware is clean before use and thoroughly clean glassware after use in the manner given by your instructor. \_\_\_\_\_

2. Never use broken, chipped, or cracked glassware. \_\_\_\_\_
3. Keep chemicals, glassware, and other equipment away from the edge of the laboratory table. \_\_\_\_\_
4. Match hole sizes and tubing when inserting glass into a stopper. Lubricate the stopper and glass tubing with water or glycerin to ease insertion, carefully using a twisting motion (never push directly), and towels to protect your hand in case of break. \_\_\_\_\_
5. Exercise caution when using sharp edged or pointed instruments including pipettes, scissors, scalpels, and needles, and if washing such instruments clean them individually and separately from other non-hazardous instruments. \_\_\_\_\_
6. Do not operate equipment unless you have received appropriate training and permission. Use equipment only in the intended manner and for the intended purpose. Inform the instructor immediately if you believe that equipment is not working in the appropriate manner. \_\_\_\_\_
7. Light gas burners only in the manner taught by your instructor, and be certain that no flammable materials are nearby (alcohols, etc...). \_\_\_\_\_
8. Use appropriate laboratory equipment (tongs, test tube holders, insulated gloves, etc...) to handle hot laboratory equipment. \_\_\_\_\_
9. When preparing to heat glassware make sure that it is either Pyrex, otherwise, the glassware may be stressed and break during heating. \_\_\_\_\_
10. Allow time for hot glassware to cool, remembering that hot glass appears the same as cool glass. You can judge glass temperature by slowly bringing the back of your hand close to the side of the object. \_\_\_\_\_
11. Never leave a heat source unattended, and turn off equipment when not in use. \_\_\_\_\_
12. Never eat or drink from laboratory glassware or equipment. \_\_\_\_\_
13. When preparing to light a burner, light the match or position the striker before turning on the gas. \_\_\_\_\_
14. Dispose of sharps including razors, scalpel blades, needles, pins, microscope cover slips, and broken glass, in separate sharps containers. In general inform your instructor of broken glass so that they can dispose of it safely. \_\_\_\_\_

#### E. Laboratory Microbiological Safety

Our laboratory facilities are categorized under Biosafety Level 1 (BSL-1). As such, practices, safety equipment, and facility design and construction are appropriate for undergraduate and secondary educational training and teaching laboratories, in which work is done with defined and characterized strains of viable microorganisms not known to consistently cause disease in

immunocompetent adult humans, and present minimal potential hazard to laboratory personnel and the environment. BSL-1 laboratories are not necessarily separated from the general traffic patterns in the building. Work is typically conducted on open bench tops using standard microbiological practices. Special containment equipment or facility design is not required, but may be used. Such laboratories have a basic level of containment that relies on standard microbiological practices with no special primary or secondary barriers recommended, other than a sink for hand washing. As you will learn, we have access and will be using some specialized equipment not actually necessary for safe use in a laboratory Biosafety Level 1. The use of such equipment will provide you with good working habits that may be necessary in future laboratory environments with a higher level of containment.

1. Although we will be working with bacterial strains and other microbes not known to cause disease in humans, you should treat all microbes as if they are pathogenic, and treat laboratory equipment as if it may have been exposed to pathogenic microorganisms. \_\_\_\_\_
2. Always wash your hands after working with microbes and their associated materials and equipment. \_\_\_\_\_
3. Eating, drinking, handling contact lenses, applying cosmetics, and storing food for human consumption are not permitted. \_\_\_\_\_
4. Mouth pipetting is prohibited; mechanical pipetting devices must be used. \_\_\_\_\_
5. Perform all procedures to minimize the creation of splashes and/or aerosols. \_\_\_\_\_
6. Decontaminate work space before and after work with microbes as directed by your instructor. \_\_\_\_\_
7. Decontaminate all cultures, stocks, and potentially infectious material after use by sterilizing with a bleach solution and/or autoclaved. \_\_\_\_\_
8. Microbial materials leaving the laboratory space must be placed in durable, leak proof containers. \_\_\_\_\_
9. As when working with chemical, goggle, gloves, and a laboratory coat should be worn when working with microbes. Students entering the laboratory with open wounds on their hands should wear gloves during any laboratory activity. \_\_\_\_\_
10. Do not reuse disposable gloves, and dispose used gloves with other contaminated laboratory waste. \_\_\_\_\_
11. Never open a Petri dish unless directed to do so by your instructor. \_\_\_\_\_
12. Avoid cross contamination when working with microbes by not touching yourself, faucets, doorknobs, computers, notebooks, pens, etc.. when you have gloves on. \_\_\_\_\_

13. When appropriate and instructed to do so, you will use the biological safety cabinet in the performance of aseptic technique to minimize your and the laboratory environments exposure to the non-harmful microbes we are working with. \_\_\_\_\_

F. Live Organisms and Safety and Respect in the Field

1. Treat all animals in the laboratory and field humanely and with respect and consideration for their care. \_\_\_\_\_

2. No experiments that cause pain, discomfort, or interfere with an animal's health or well-being, induce nutritional deficiencies or toxicities, or expose animals to microorganisms, ionizing radiation, cancer producing agents, or any other harmful drugs or chemicals capable of causing disease, injury, or birth defects should be done in the classroom or at home. In general, procedures that cause pain in humans are considered to cause pain in other vertebrates. \_\_\_\_\_

3. Behavioral conditioning studies may not involve aversive stimuli. \_\_\_\_\_

4. Experiments on avian embryos must be terminated 72 hours prior to the expected date of hatching. \_\_\_\_\_

5. Never attempt to handle animals in the laboratory or field environment unless you have received instructions regarding appropriate handling and have been directed to do so by the instructor. \_\_\_\_\_

6. Before and after handling of animals, under the direction of the instructor, you must wash your hands with soap and water. \_\_\_\_\_

7. In the event of an animal bite notify the instructor immediately, who depending on the severity of the situation may report immediately to the programs health authority. \_\_\_\_\_

8. Never intentionally harass an animal in the laboratory or field environments. \_\_\_\_\_

9. Never bring organisms to school without prior consultation and permission from the instructor. \_\_\_\_\_

10. Never collect wild organisms from the environment unless instructed or directed by your instructor. Depending on the type of organism, the collection of particular wild plants, animals, and other organisms may require special permission from the state or federal government. \_\_\_\_\_

11. Some fungi and plants can be harmful or deadly if touched or eaten. Pay attention to instructions regarding the identification and mishandling of these organisms, and treat them with appropriate respect. \_\_\_\_\_

12. Be aware of the potential negative impact your presence may have on particular organisms or the habitats of these organisms. Stay on trails unless otherwise instructed. Do not litter and pick up litter that you find. \_\_\_\_\_



13. Observational and natural history studies that are not considered intrusive are permitted. \_\_\_\_\_
14. Observations or studies that may have an intrusive element must be reviewed by your instructor. When such studies are initially conceived considerations should be given to minimizing negative effects to an organism's health or well-being. Thus, one should consider their model organisms carefully. In general, working with plants instead of animals, unicellular organisms instead of multicellular organisms, and invertebrates instead of vertebrates is suggested. Vertebrate animals should only be used when other model organisms are not suitable for the variables being studied. \_\_\_\_\_
15. Never trespass on private property. Only enter private property without permission from your instructor who will have previously acquired permissions from the landowner. \_\_\_\_\_
16. Remain on task during any field trip. Know your purpose for being there and what needs to be accomplished. Budget your time wisely since you may be limited for time. \_\_\_\_\_
17. Allergies and other physical limitations that you may have may be challenged during a field trip. Please inform your instructor about any such situation prior to the trip. Such information will be kept in confidence. \_\_\_\_\_
18. Because of their high incidence of rabies bats, raccoons, skunks, and wild carnivores will not be brought into the classroom, and our contact with them in the field will be minimized. \_\_\_\_\_
19. Any spiders, venomous insects, poisonous reptiles may only be displayed and/or presented by bioscience faculty who have had appropriate experiences handling such animals. Venomous snakes will not be handled and displayed in a locked and labeled container that provides an appropriate physical barrier between students and the animal. \_\_\_\_\_
20. Because of the risk of contracting salmonellosis from amphibians and reptiles, these animals will be maintained in an appropriate container with access directed by the instructor. Children under the age of 12 who handle these animals will be under the direct supervision of an instructor and be observed washing their hands using the appropriate technique (wet hands, soap hands, rub to make a lather, scrub vigorously for 15 seconds, rinse soap off, and dry). \_\_\_\_\_
21. When cleaning fish aquariums disposable gloves must be worn, and used water should be disposed of into a sink or drain. \_\_\_\_\_
22. Laboratory dissection activities must be based on carefully planned objectives, conducted with appreciation for the animal, and in a clean and organized work pace with care and laboratory precision. \_\_\_\_\_
23. Students should be prepared for field exercises as instructed and be appropriately dressed for those environments and for variability in weather \_\_\_\_\_

conditions.

### G. Accidents and Injuries

1. Do not hesitate in using safety equipment (eye wash, etc...) for fear of embarrassment or discipline from something that was most likely an accident. Accidents happen in safe environments too. Your safety is our greatest concern. \_\_\_\_\_
2. Use a fire blanket to extinguish a flame on a person (stop, drop, and roll). \_\_\_\_\_
3. Report any accident to the instructor immediately no matter how minor the incident seems, including burns, scratches, cuts, or spills of corrosive liquid on skin or clothing. \_\_\_\_\_
4. If something is spilled on a on the floor or laboratory bench top, consult your teacher to determine the best manner in which to clean it up. \_\_\_\_\_
5. If a chemical spills on your skin or clothing, wash it off immediately with plenty of water as directed by your instructor. Wash burns from an acid or alkali with running water. \_\_\_\_\_
6. If a chemical gets in your eyes or one your face, have someone help you in using the eyewash fountain and wash with plenty of water as directed by your instructor. If wearing contacts, remove them immediately. \_\_\_\_\_
7. Never use your hands, bare or gloved, to pick up broken glass. Consult your instructor and if advised, use the appropriate brush and dustpan. \_\_\_\_\_
8. Smother small fires with a towel, use a fire blanket to extinguish clothing fires (stop, drop, and roll), and only use a fire extinguisher on larger fires that do not involve people. \_\_\_\_\_
9. Use the retractable eyewash fountain/safety shower for full body chemical spills or fires. \_\_\_\_\_
10. For small burns, immediately flush with cold water until the burning sensation is lessened. \_\_\_\_\_

## Consequences for Non-Compliance

The safety program that the CAPS Bioscience faculty has developed has been motivated by concern for your safety. We hope that minor safety hazards are minimized and that serious hazards are never experienced. However, in the event that you are found to be in violation of the guidelines set forth by this safety manual, the following actions will be taken.

- Verbal warning and potential communication to CAPS administration and parents.
- Written warning and communication to CAPS administration and parents.
- Sanctions from particular potentially hazardous activities.
- Termination from all potential hazardous activities.

## References

1. Bruin Safety Training, Department of Biological Chemistry
2. Biological Science Laboratory Regulations, Los Angeles Unified School District
3. Biology Lab-Classroom Safety, by Mr. Blankenship at [www.rock-hill.k12.sc.us/teachers/rhhs/jblankenship/Biology/Unit1Intro.htm](http://www.rock-hill.k12.sc.us/teachers/rhhs/jblankenship/Biology/Unit1Intro.htm)
4. Principles and Guidelines for the Use of Animals in Precollege Education, Institute of Laboratory Animal Resources of the National Research Council.
5. Animals in Kansas Schools: Guidelines for Visiting and Resident Pets, Kansas Department of Health and Environment.
6. Biosafety in Microbiological and Biomedical Laboratories, 5<sup>th</sup> Edition, U.S. Department of Health and Human Services with direction from PHS, CDC, and NIH, December 2009.



# CAPS Bioscience Laboratory and Field Safety Contract

I, \_\_\_\_\_ am fully aware that a laboratory environment is a safe place when others and I exhibit conduct that exemplifies proper responsibility and attitude toward safety. I agree to assume responsibility for my safety and my classmates' safety. I understand that my actions not only affect me, but others around me. I agree that I have read, understand, and will follow the safety guidelines in the CAPS Bioscience Safety Manual, and will follow supplementary information from my instructor and in my specific laboratory protocols. Similarly, I will respect the consequences of misbehavior if found not to be following these guidelines.

## STUDENT

\_\_\_\_\_  
Student's name (printed)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Student's name (signed)

\_\_\_\_\_  
Course Title

## PARENT

I have read and initialed the CAPS Bioscience Safety Guidelines and have discussed them with my child and understand that he/she must obey them.

\_\_\_\_\_  
Parent's name (printed)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Parent's name (signed)

\_\_\_\_\_  
E-mail address(es)

\_\_\_\_\_  
Daytime home phone number

\_\_\_\_\_  
Cell phone number

Please list any known allergies that your student has:

_____	_____
_____	_____
_____	_____
_____	_____