

This Science Safety Plan is a final draft document for review and approval by Boston Public School Administration.

To obtain an electronic copy of this plan or to submit comments or questions please email Jessica Cajigas-Smith of EnviroTrac, Ltd. at jessicac@envirotrac.com.

Boston Public Schools

Science Safety Plan

This plan has been developed through a joint effort of the BPS Science Department and Staff, BPS Facilities Management and EnviroTrac, Ltd., environmental consultant for BPS Facilities Management.



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LIST OF REVISIONS TO SCIENCE SAFETY PLAN

- 12/22/14 Original draft document
- 12/3/15 EnviroTrac revisions to draft for BPS review and comment
- 1/19/16 EnviroTrac reformatting and revisions based on 1/15/16 meeting
- 2/5/16 EnviroTrac and BPS revisions based on 2/4/16 meeting
- 2/26/16 EnviroTrac and BPS revisions based on 2/10/16 meeting
- 3/21/16 EnviroTrac formatting and proof-reading
- 6/30/16 EnviroTrac revisions based on 6/13/16 meeting
- 12/19/16 EnviroTrac revisions based on BPS Legal Dept review from 9/29/16
- 5/8/17 EnviroTrac revisions based on all teacher comments and revisions
- 8/18/17 EnviroTrac revisions to BPS Logo and comments on appendices
- 6/1/18 EnviroTrac revisions to inspection schedules and deadlines based on 5/31/18 meeting
- 5/19/21 EnviroTrac revisions to plan based on BPS review, confirmation of links, formatting, and proof-reading
- 5/25/21 EnviroTrac added Appendix B and Appendix M into text of document
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I. INTRODUCTION

Between 2014 and 2021, the Boston Public Schools (BPS) Science Department, in conjunction with BPS Facilities Management, its consultant EnviroTrac Ltd., and BPS Science Teachers, developed this Science Safety Plan to promote a safer and more effective learning environment for students and a healthier workplace for teachers and other employees within science classrooms and laboratories in Boston Public Schools. The Science Safety Plan is a comprehensive effort to address chemical use, storage and disposal procedures, as well as the prevention and/or minimization of, and response to, chemical spills and other accidents.

This district-wide plan is responsive to the needs of all BPS science classes and is consistent with the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration's (OSHA) 29 CFR 1910.1450 Occupational Exposures to Hazardous Chemicals in Laboratories for the protection of our students and employees, as well as guidance materials from the National Fire Protection Association (NFPA), the National Institute for Occupational Safety and Health (NIOSH), and the Boston Fire Department. This Science Safety Plan promotes a culture of safety in science and the safe operation of all science laboratories for students, faculty, and staff.

As part of this effort, BPS Science and Facilities Management Departments are responsible for coordinating a volunteer committee made up of representatives from the Science Department, BPS Science Teachers and School Leadership, Facilities Management and, when available/needed, the Boston Fire Department. The committee will be known as the Science Safety Advisory Group (SSAG). Once established, the list of SSAG members will be available at the beginning of each school year at the BPS Science Department and the BPS Facilities Management Department. The SSAG will participate in the discussion and review of science safety issues three times per year (once every 4 months) and will update this Science Safety Plan annually, or as necessary (Refer to **Section II.B.**).

This document applies to all classroom areas/spaces in which science is taught, experiments are conducted, and where chemicals, specimens, cultures, and live or preserved animals are used at any time. A "science room" or "science area" is defined as any space that is used for science instruction and shall include but not be limited to the classroom, the laboratory, the preparation area or prep room, outdoor experiment areas, and associated chemical storage areas. "Chemicals" are defined as non-edible substances, not on the U.S. Food and Drug Administration's (FDA's) "Generally Recognized as Safe (GRAS)" List available at: <http://www.fda.gov/Food/IngredientsPackagingLabeling/GRAS/>.

SCIENCE SAFETY PLAN OVERVIEW

This Science Safety Plan has been developed to promote the safe instruction of science. Included within this plan are work practices, procedures and policies developed to ensure that teachers, students, and other BPS personnel are protected from the adverse effects of potentially hazardous chemicals. It is intended that this will be an evolving document with reviews and alterations made as needed, but no less than annually. Revisions and reviews are to be documented under the "List of Revisions" following the Table of Contents. Sections of this document have been developed to identify standard operating procedures, laboratory protective equipment, personal protective equipment, safe storage of chemicals, and waste management procedures.

II. RESPONSIBILITIES

A. BPS Science Department and BPS Facilities Management

The BPS Science Department and BPS Facilities Management have primary responsibility for the implementation and enforcement of the Science Safety Plan. These departments will jointly:

1. Review requests for approvals as identified in this Science Safety Plan including approvals for the use of Class 1A flammables, compressed gasses, donated chemicals, and experiments that are more hazardous than those in the district-identified curriculum (*i.e.*, Living by Chemistry). The Science Department and Facilities Management will consult the Science Safety Advisory Group (see **Section II.B.**) as needed when reviewing requested approvals.
2. Review and/or investigate any incident or accident related to science safety and/or chemical use.
3. Review chemical inventories and share with the Boston Fire Department annually.
4. Encourage and support school leaders in their submission of the Application for Annual Hazardous Materials Permit to the Boston Fire Department annually.
5. Provide initial distribution of safety equipment including fire extinguishers, fire blankets, first aid kits, and spill kits to Science Areas. After initial distribution, equipment is to be maintained by the individual schools.

B. Science Safety Advisory Group (SSAG)

The SSAG will review the Science Safety Plan annually or as needed and make recommendations to the Science Department and Facilities Management regarding any updates or revisions. The SSAG will also meet three times per year to review and revise as needed:

1. Chemical inventories (including inventory completeness and frequency of updates);
2. Safety of new and existing laboratory procedures used in science courses;
3. Personal protective equipment requirements;
4. Professional development content for students and employees;
5. Standard operating procedures (SOPs) and control measures including chemical safety and handling, housekeeping, chemical storage and disposal, safety and emergency equipment, and training; and
6. Science Area (laboratory and classroom) renovation and assignments.

C. Chemical Hygiene Officer (CHO) [Position to be Created]

The Chemical Hygiene Officer (CHO) will work in collaboration with the BPS Science and Facilities Management Departments. The CHO shall be qualified by training and experience to provide technical guidance as part of the SSAG and in the development, review and implementation of the Science Safety Plan. The CHO has the responsibility to:

1. Work with BPS administrators and teachers to implement the Science Safety Plan.
2. Assure that assessments in the laboratory are performed when appropriate and that records of assessments are maintained.
3. Provide technical assistance to employees and laboratory supervisors on the Science Safety Plan.

[Until this position is established, an Environmental Specialist from Facilities Management and a Science Department designee will share these responsibilities].

D. Science Safety Coordinator (SSC) [Coordinators to be Appointed]

Each high school shall identify one knowledgeable and experienced member of the science teaching staff to serve as the Science Safety Coordinator (SSC). The SSC will support and inform colleagues regarding the safe use, storage and disposal of chemicals, the maintenance of the annual chemical inventory, and the training of school staff on the subject of chemical safety. The SSC will:

1. Ensure the chemical inventory is updated with each chemical purchase/receipt.
2. Provide a copy of the chemical inventory to the Science Department and Facilities Management annually by October 1st.
3. Provide the necessary information and chemical inventory to the Headmaster/Principal for completion of the Application for Annual Hazardous Materials Permit for the Boston Fire Department and provide a copy of the completed form to the Science Department and Facilities Management annually by October 1st.
4. Ensure that weekly checks of safety showers and eyewash stations, and monthly checks of fire extinguishers are being conducted.
5. Provide technical assistance/training to employees and laboratory supervisors on the Science Safety Plan during science department meetings.
6. Advise school leaders and the CHO in writing regarding recommendations for improvements or concerns about school science safety and related equipment.
7. Maintain copies of Incident Reports.

E. School Leadership (Headmasters/Principals)

Headmasters and Principals are responsible to:

1. Ensure science teachers review this Science Safety Plan and participate in required safety training programs provided by BPS.
2. Ensure all science classes and laboratories are conducted in appropriate Science Areas with all required safety equipment available.
3. Ensure safety equipment is maintained in appropriate Science Areas including fire extinguishers, fire blankets, first aid kits, safety showers, emergency eyewashes and spill kits.
4. Maintain an awareness of health and safety hazards and report unsafe practices and conditions to the Chemical Hygiene Officer (CHO).
5. Sign and submit the Application for Annual Hazardous Materials Permit to the Boston Fire Department by October 1st each year.
6. Post the current year's Hazardous Material Permit in the Main Office of the school.
7. Ensure any accidents or injuries are reported to the CHO in addition to others as noted in **Section VII. d. 5.**
8. Appoint a Science Safety Coordinator annually and facilitate his or her participation in PL/meetings.

F. Employees and Teachers

Employees and Teachers who normally work in a Science Area (classroom, laboratory, and/or storage or prep area) are responsible to:

1. Review this Science Safety Plan and participate in required, district-provided training programs.
2. Ensure students are following the appropriate chemical hygiene habits.
3. Maintain an awareness of health and safety hazards and report unsafe practices and conditions to the Headmaster/Principal.
4. Plan and conduct classes and laboratories in accordance with the Science Safety Plan and its SOPs.

5. Consult reference materials, including safety data sheets (SDSs), related to chemical safety where appropriate.
6. Use and model good personal chemical hygiene habits.
7. Assist the SSC with the chemical inventory and checks/inspections of all safety equipment.
8. Report all accidents and injuries and maintain copies of reports submitted. (Refer to **Section III.A.13.**)
9. Keep inventory of all hazardous materials in their possession.

G. Students

Students, while in a Science Area (classroom, laboratory, and/or storage or prep area), are responsible to:

1. Practice good chemical hygiene habits.
2. Maintain an awareness of health and safety hazards and report unsafe practices and conditions to the teacher.
3. Report all accidents and injuries to the teacher immediately.
4. Know and follow emergency procedures.
5. Notify the teacher of any sensitivity or allergy to chemicals.
6. Wear appropriate apparel and personal protective equipment, including goggles, during laboratory activities.
7. Conduct all activities according to teacher instructions to ensure the Science Safety Plan is followed.

III. GENERAL SCIENCE SAFETY RULES AND PROCEDURES

The rules and procedures in this Section are applicable to all BPS Science Areas.

Duty of Care of Adults Teaching Science

As professionals, teachers of science have a duty or standard of care to ensure the safety of students, teachers, and staff. (“Duty of care” is defined as an obligation, recognized by law, requiring conformance to a certain standard of conduct to protect others against unreasonable risk.) As such, science educators must act as a reasonably prudent person would in providing and maintaining a learning and working environment for their students and staff that is as safe as possible.¹

A. Employee and Teacher Rules and Procedures

1. At the beginning of each school year, inspect science areas and notify the Headmaster or Principal, the Science Department and Facilities Management of any hazards.
2. Identify students with medical conditions such as allergies, epilepsy, etc. as it relates to student work in the laboratory setting.
3. Be familiar with the Right-To-Know laws and know where the SDSs are located.
4. Attend/participate in district-provided annual safety trainings (PL) including science safety and first aid.
5. Establish a Safety Contract with the students. An example Safety Contract is included as **Appendix A**. This contract must be signed by the student, parent/guardian, and the teacher. Students must sign a safety contract before conducting any laboratory work. Safety contracts must be renewed each academic year and both teacher and student should retain a copy.
6. Know where and how to use master utility controls to shut off gas, electrical, and water supplies.
7. Know the location for all personal safety and emergency equipment, including eye wash, shower, fire extinguisher, and spill control materials, and report absent equipment to the SSC.
8. Use protective safety equipment to reduce potential exposure (gloves, fume hoods, etc.).
9. Post and practice evacuation procedures. Post emergency telephone numbers in the classroom, chemical storage areas and laboratory. Ensure that a phone or some means of emergency communication (intercom) is available in the laboratory, chemical storage area, and preparation area before beginning any work.
10. Implement the appropriate emergency procedure, waste disposal, spill cleanup, evacuation routes, and fire emergency notification when needed.
11. Teach safety all year including:
 - a) Safety standards and procedures
 - b) Where to find and how to use all safety devices in the laboratory
 - c) A review of safety concerns and precautions at the beginning of each laboratory
12. Do not rely solely on textbooks, laboratory manuals, and other instructional materials for safety precautions needed for a particular laboratory activity. Consult SDSs and confer with the SSC, CHO, Science or Facilities Management Department staff as needed.
13. Report all accidents and injuries to the Principal or Headmaster and direct supervisor. All accidents must be documented on the accident report forms included as **Appendix B**.
14. Report lighting, ventilation, safety equipment, and laboratory disrepair to Principal or Headmaster and the SSC for the building.
15. Know and implement the laboratory safety portion of the School Site Safety Plan for your individual school.

¹ National Science Teachers Association (NSTA). (2007, revised 2017). *NSTA position statement: Liability of science educators for laboratory safety*. Retrieved from www.nsta.org/nstas-official-positions/liability-science-educators-laboratory-safety

B. General Laboratory Rules and Procedures

1. All persons will conduct themselves in a responsible manner at all times in the laboratory (no running, horseplay, etc.), and follow the teacher directions.
2. Laboratory activities involving the use of hazardous chemicals (based on SDS) should be conducted in a designated laboratory room. This space must include chemical resistant, non-porous laboratory tables and countertops, an eye wash, a deluge shower, laboratory hood, fire extinguisher, fire blanket, chemical resistant drain lines with waste neutralization system, and, as appropriate, adequate personal safety equipment, such as goggles, gloves, aprons/coats, etc.
3. Only persons with proper qualifications and training may use laboratory facilities.
4. In accordance with the National Science Teacher Association, the recommended number of students assigned to a laboratory shall not exceed 24.
5. Do not work alone in the laboratory or chemical storage area unless other employees are in the vicinity and are aware that someone is in the laboratory. No BPS student is allowed to undertake a laboratory investigation or experiment without a BPS science teacher present. Students must be supervised during laboratory work.
6. Be familiar with hazards and safety precautions before using chemicals or handling specimens.
7. Food and drink, gum chewing, application of cosmetics or lip balm, or manipulation of contact lenses is not permitted in any Science Areas. Do not drink or eat from laboratory glassware.
8. Dress appropriately. Loose or baggy clothing and dangling jewelry or other accessories are not permitted. Long hair is to be restrained or tied back. Sandals or any open toed shoes are not permitted.
9. Never use flammable liquids near any source of ignition, spark, or open flame.
10. Never touch, directly smell, or taste chemicals, biological specimens or any products found in a science area, unless it is a component of the laboratory exercise.
11. Do not return surplus chemicals to their original container.
12. Use a pipetting device whenever necessary per laboratory protocol. Never pipette by mouth.
13. Students may not heat glass for bending. Only a teacher using appropriate eye and hand protections should heat glass to soften or bend it.
14. Proper procedures for Bunsen burners or other sources of flame shall be followed. Never leave a flame unattended. Any open flame science activity shall be done under the supervision of the science instructor. Glass alcohol burners shall not be used in any BPS classroom.
15. Do not use chipped/broken glassware. It poses a risk when heated or handled and must be disposed of properly. Careful storage and handling procedures shall be used to avoid glassware breakage. In the event of breakage of glass not containing hazardous chemicals or biological materials, protection for the hands shall be worn when picking up the broken pieces. Small pieces shall be swept up with a brush and pan. Broken glass shall be separated by placing it in a special container marked "Broken Glass". Broken glass contaminated with hazardous chemicals must be treated and disposed of as hazardous waste.
16. Never use a dull cutting tool. It may slip and cause serious injury. Cut away from yourself when using any sharp instrument. Cut sheet metal only with sharp shears.
17. Do not operate electrical equipment with wet hands.
18. Never bypass protective devices such as fuses and circuit breakers. When replacing a fuse, never substitute a fuse with a higher current rating than the original fuse.
19. When several outlets on the same line are used, the total power should not exceed 1500 watts.
20. No foreign objects should be pushed into any piece of electric equipment.
21. Use or retention of laboratory supplies or equipment is prohibited unless specifically authorized by a supervisor or instructor.
22. Wash hands thoroughly after laboratory investigations.
23. Should a fire alarm or any other evacuation occur during a laboratory activity, turn off all Bunsen burners and electrical equipment. Leave the room as directed.
24. All accidents, injuries (e.g., cuts or burns), chemical spills, glass breakage, or equipment malfunctions must be reported to the teacher immediately, no matter how trivial they may seem.

C. Chemical Storage and Use Rules and Procedures

1. Only authorized personnel are allowed access to the chemical and science material storerooms. **No students are permitted in chemical storerooms under any conditions.**
2. Chemical storage rooms and/or chemical cabinets must be locked at all times. If locks are needed, contact Facilities Management at (617) 635-8300.
3. All SDSs must be accessible to employees at all times and hardcopies of such must be kept and readily available in the chemical storage room or school's Science Department and in the administrative main office, as part of the BPS Hazard Communication program.
4. An approved emergency shower, eyewash, fire extinguisher and fire blanket should be within 100 feet of chemical storage areas and any other Science Areas where chemicals are used.
5. Neutralizing chemicals (spill kit, dry sand, or cat litter) must be available in chemical storage areas where acids and bases are stored.
6. Establish a separate and secure storage area for chemicals. Store all chemicals in their compatible chemical families.
 - a) Segregate Organics from Inorganics
 - b) Segregate Reactives from Flammables
 - c) Segregate Corrosives from Flammables
 - d) Segregate Acids from Caustics
7. Storage areas and cabinets must be labeled to identify the hazardous nature of the stored products. This allows the fire department to immediately identify a potentially hazardous area. The required chemical storage room door and classroom door identification is the National Fire Protection Association's 704 Diamond (NFPA Diamond).
8. An up-to-date inventory of all chemicals must be maintained per **Section VII.D**.
9. Stored chemicals must be inspected annually for expiration, deterioration, and chemical and container integrity.
10. All chemical containers including original, secondary, immediate use, and those containing solutions should be labelled according to **Section VI.B**. No unlabeled products should be stored anywhere in the Science Areas.
11. Household products such as baking soda, sugar, sodium chloride, corn syrup, etc. should be labeled "not for human consumption" or "for lab use only".
12. All chemicals shall be in tightly closed, sturdy, leak-proof, and chemically compatible containers.
13. Large containers and containers with reactive chemicals, such as acids and bases, shall be stored on low shelves.
14. Chemical and biological materials shall be stored only in the appropriate preparation and storage areas. ONLY quantities necessary for the current laboratory investigation are permitted in instructional areas when properly labeled. **Appendix C** provides the policy for the storage of Flinn Scientific Chemical Kits and/or kits provided by other manufacturers.
15. Chemicals of any nature are not to be stored in fume hoods, in aisles, on the floor, in stairwells, on desks, on top of storage shelves, or on laboratory tables.
16. Store flammable chemicals in approved storage containers and in approved flammable chemical storage cabinets in accordance with Boston Fire Department Storage Requirements for Flammable Materials included as **Appendix D**.
 - a) Keep cool, between 55 °F and 80 °F at all times.
 - b) Store away from sources of ignition.
 - c) Store away from oxidizers.
 - d) Do not store flammable chemicals in refrigerators unless it is explosion proof or of laboratory safe design and labelled.
 - e) Do not store in direct sunlight.
17. Store corrosives in appropriate corrosive cabinets.
 - a) If possible, keep items in their original shipping package.
 - b) Wear chemical goggles and gloves when handling corrosive material.
 - c) Check shelf clips for possible corrosion at least every three months.

- d) Nitric acid should be stored alone unless cabinet provides a separate compartment for nitric acid storage.
18. No trash/recycling receptacles, nor combustible materials such as paper products, shall be stored or kept in any chemical storage room.
 19. Shelving sections should be secured to the walls or floor to prevent tipping and should be equipped with lips to prevent containers from rolling off.
 20. Never store food in a laboratory or chemical storage refrigerator.
 21. Glass bottles containing highly flammable liquids (Class 1A) shall not exceed 500 ml. For larger volumes, metal or approved plastic may not exceed 1 gallon, and safety cans shall not exceed 2 gallons. Use of Class 1A Flammables will need the prior approval of the Science Department and Facilities Management.
 22. Chemicals shall not be used for purposes other than instruction within the Science Department.
 23. Chemicals transported in elevators, stairwells and hallways shall be protected from breakage and carried in secondary containers that will contain spills, such as unbreakable tubs. All chemicals transported in elevators and hallways shall be carried by cart, not by hand. When available, the elevator should be used to transport materials between floors. The elevator shall not be used by the public during transportation of chemicals.
 24. Compressed Gases
 - a) A compressed gas is defined as any material or mixture having in the container either an absolute pressure greater than 276 kPa (40 lb/in²) at 21 °C, or an absolute pressure greater than 717 kPa (104 lb/in²) at 54 °C or both, or any liquid flammable material having a Reid vapor pressure greater than 276 kPa (40 lb/in²) at 38 °C. The use of any compressed gases will require the prior approval of the Science Department and Facilities Management and will need to follow procedures outlined below.
 - b) Gas cylinders shall only be moved from one location to another with the protective cap securely in place. A wheeled gas cylinder carrier will be used when moving a cylinder. Moving cylinders by rolling is prohibited.
 - c) Both full and empty cylinders shall only be stored where they may be securely restrained by straps, chains, or a suitable stand. They should not be exposed to heat or stored in direct sunlight.
 - d) A cylinder shall be considered empty when there is still a slight positive pressure and an "EMPTY" label placed on it.
 - e) An empty cylinder shall be returned to the supplier as soon as possible after having been emptied or when it is no longer needed.
 - f) Cylinders shall not be exposed to temperatures above 50 °C (122 °F).
 - g) Store flammable gases separately from oxidizer gases.

D. Housekeeping Practices

1. All Science Areas should be well-lit and ventilated.
2. All Science Areas must be kept clean and orderly.
3. Aisles and doorways shall be kept clear. Never block access to emergency equipment or fire exits.
4. Safety showers and eyewashes are to be inspected weekly by the teacher or SSC using a bucket under drain lines if necessary, to test their function. They will be tested annually by Facilities Management.
5. All chemical and solution containers must be labeled properly as discussed in **Section VI.B**.
6. Place all chemical and biological wastes in appropriate, segregated receptacles that are properly labeled. Refer to **Section VI.B**.
7. Sinks are to be used only for disposal of water and those solutions designated to be appropriate for disposal in this manner. Other solutions must be placed in an appropriately labeled waste container. Any questions regarding appropriate disposal should be directed to the Environmental Section of Facilities Management at 617-635-8300.
8. Tabletops are to be cleaned before and after laboratory activities. After any laboratory activity that utilizes biological materials, tabletops should be disinfected using a 0.5% sodium hypochlorite solution or approved solution with an EPA Registered Disinfectant.
9. Clean up all chemical spills as soon as they occur as outlined in **Section V.D**. Chemicals and cleanup materials shall be disposed of according to **Section VIII**.
10. All chemicals and equipment shall be stored properly. Chemicals shall not be stored in the fume hood, in aisles, on the floor, in stairwells, on desks, on top of storage shelves, in workspaces within prep areas or on laboratory tables.
11. Operating hotplates, running water, and open flames shall not be left unattended.
12. Keep all cabinets and drawers closed when not in use to avoid tripping, catching, and bumping hazards.
13. All Science Areas should be secured at the end of each class or laboratory session including the return of all equipment, chemicals and other materials to their designated storage areas. All science materials should be properly secured whenever the Science Areas are unattended.

IV. SPECIFIC STANDARD OPERATING PROCEDURES (SOPS)

A. Chemistry Laboratory SOPs

1. Assess the chemical hazards and risk of exposure when planning and implementing laboratory activities and investigations. Exposure to hazardous substances shall be minimized. Specific guidelines found in the appropriate Safety Data Sheet (SDS) and those outlined on labels and in instructional material must be followed. The decision to use a particular substance will be based on the best available knowledge of each chemical's particular hazard, the availability of safety equipment, and laboratory setting. Substitutions, either of chemicals or experiments, will be made where appropriate to reduce hazards without sacrificing instructional objectives.
2. Never perform a hazardous chemical demonstration for the first time in front of a class. Always perform a demonstration in front of other instructors first to evaluate the safety of the demonstration and/or consult with the SSC, CHO, or Science Department.
3. Practice proper transportation and disposal procedures for chemicals.
 - a) Chemicals transported in elevators, stairwells and hallways shall be protected from breakage and carried in secondary containers that will contain spills, such as unbreakable tubs. All chemicals transported in elevators and hallways shall be carried by cart, not by hand. When available, the elevator should be used to transport materials between floors. The elevator shall not be used by the public during transportation of chemicals.
 - b) Refer to **Section VIII** for waste accumulation and waste disposal procedures. Contact Facilities Management for waste containers and for waste pick-up.
4. Wash hands thoroughly after any chemical exposure and before leaving the laboratory.
5. Never smell chemicals directly; always waft the odors using your hand.
6. Students should never insert glass tubing into rubber stoppers.
7. Compressed Gases
 - a) Cylinders of toxic, flammable, or reactive gas should only be used under a fume hood.
 - b) Do not extinguish a flame involving a combustible gas until the gas is shut off, otherwise it can reignite, possibly causing an explosion.
 - c) Cylinders shall not be exposed to temperatures above 50 °C (122°F).
8. The use of Particularly Hazardous Substances (PHSs) including highly toxic, reactive, and carcinogenic chemicals is not permitted in any BPS. Refer to **Appendix E** for the definition and examples of PHSs.
9. Refer to **Appendix F** for BPS policy for transporting chemicals in the case of closing or moving schools.
10. The "Rainbow Test" using **methanol** should not be carried out in any BPS Science Area under any circumstances. The BPS curriculum or the "New and Improved Flame Test Demonstration" by Jillian Emerson of University of California, Davis are recommended which do not use alcohol and involves the burning of wooden splints soaked in salt solutions. The Jillian Emerson demonstration can be found on the American Chemical Society (ACS) website (<https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/safetypractices/flame-tests-demonstration.pdf>) and in **Appendix G**. Refer to the ACS website for further information regarding the hazards to the methanol rainbow test demonstration: <http://www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/safety-alert-rainbow-demonstration.html>

B. Biology Laboratory SOPs

Practice recommendations for having live animals in the classroom according to the Massachusetts Department of Public Health: *Animals in the Classroom: Recommendations for Schools*.

1. Schools should develop standard procedures for bringing animals into classrooms, fostering classroom pets, and responding to bites, other exposures, and reports of illness following contact with an animal.
2. In order to prevent the transmission of enteric disease-causing organisms, students should receive very clear instructions on how to wash their hands thoroughly after handling animals, their cages, or surfaces animals have come into contact with, and always before eating. Wild mammals should never be brought into schools or handled by children as they pose a risk for transmitting rabies. Bats, skunks, raccoons, groundhogs (woodchucks) and wild carnivores (e.g. coyotes and foxes) are not permitted unless under the control of a licensed professional responsible for preventing exposure to students and staff.
3. Because psittacine birds (i.e. hooked bill birds such as parrots, parakeets, budgies, and cockatiels) can carry psittacosis, an infectious disease caused by bacteria that can be transferred to humans without showing any signs of the illness, these birds should not be handled by children without education on safe and proper handling procedures. Birds showing any signs of illness should not be brought into school. If psittacine birds are brought to school, they should be kept caged, their cages kept clean, and the bird's wastes frequently and safely removed and discarded.
4. Because of the high risk of salmonellosis and campylobacteriosis from baby chicks and ducks, these animals should not be in schools without education on safe and proper handling procedures.
5. Because of the risk of contracting salmonellosis from reptiles (including non-poisonous snakes, lizards, iguanas, turtles, etc.) and amphibians, even when reared in captivity, special precautions are necessary when handling them. Because salmonellosis can be more severe in young children and because their hygiene practices are less than thorough, handling of reptiles and amphibians by young children is not recommended.
6. Stray domestic animals should never be brought into schools or handled by children.
7. As a general rule, only domesticated mammals with current rabies vaccinations and for which USDA-approved vaccines exist should be permitted to have contact with students. Currently, USDA-approved vaccines exist for the following domesticated animals only: dogs, cats, ferrets, cattle, horses, and sheep. Students should be educated on safe and proper handling procedures before handling or touching these animals.

Implement proper procedures for the transfer, disposition or fate of live organisms. No organisms should be released into the wild. No animals found dead should be brought into the classroom.

1. Handle living organisms humanely. No experimental procedures that cause pain or discomfort are allowed on any vertebrates (mammals, birds, reptiles, amphibians, or fish).
2. Preserved biological material should be handled with respect and disposed of appropriately.
 - a) Biological preserved specimens are not considered hazardous waste and can normally be disposed of as regular solid waste.
 - b) Double bag the preserved material before placing them in the regular trash. Ensure that students cannot easily access this waste.
 - c) No specimens should be used or stored that are preserved in formaldehyde. If formaldehyde-preserved specimens are present, contact Facilities Management for disposal.
3. Bacterial culture handling:
 - a) Obtain microorganisms only from a known source (biological supply company). Organisms need to be identified by genus and species name.
 - b) Always wear gloves when handling bacterial cultures
 - c) Treat all microorganisms as potential pathogens.
 - d) Notify the teacher if a culture has been spilled.
 - e) Cultures are never to leave the laboratory.
 - f) Students should never culture microorganisms from their own bodies, from surfaces around the building or any other location/site.
 - g) Disinfect or autoclave all waste material including culture tubes, culture plates, swabs, toothpicks, plastic pipettes and gloves. For disinfection: materials should be covered in a 10% bleach solution for 1-2 hours before being discarded. If an autoclave is available, all items should be placed in an autoclaveable biohazard bag. The bag should be autoclaved at 121 °C at 20 pounds of pressure for 30 to 40 minutes.
4. Mold: When agar plates/petri dishes are inoculated with soil or plant material or exposed to the air, there is a strong possibility that fungi (molds) will grow on the surface of the plates and form aerial hyphae. At the tips of hyphae, chains of conidia (spores) will form, and these spores can be easily dislodged by air currents and rapidly spread through a room when the lid of the plate is removed. Therefore:
 - a) Always wear gloves when handling agar plates/petri dishes.
 - b) Once plates are inoculated, tape the lids on with two pieces of tape opposite each other.
 - c) Only manipulate the fungal growth in a fume hood to draw the spores out of the room.
 - d) Label/identify plates/petri dishes
5. When using plants in the classroom or encountering them on a field trip:
 - a) Be able to identify toxic or poisonous plants.
 - b) Ascertain if students have allergies (consult with school nurse if needed).
 - c) Toxic plants should not be touched or brought into the classroom.
 - d) Never eat any part of an unknown plant.
 - e) Avoid touching all mushrooms found outdoors.
 - f) Plant food, etc., should be labeled and appropriately handled and stored.
 - g) Always wash hands thoroughly after handling plants.
 - h) Know and post the nearest poison control center contact information/telephone number (1-800-222-2222).
 - i) Obtain plant specimens and sterilized soil from a known scientific supplier.
 - j) If working with aquatic plants (marshes or ponds), minimize direct contact with water or mud. Wash hands thoroughly after handling.

- k) If studying soil outdoors, use proper digging tools to dig up and study samples. Do not handle soil that is potentially contaminated.

Implement proper procedures for the safe use of equipment:

1. High Speed Rotating Apparatus

High speed rotating apparatus should be used only by teachers for the purpose of demonstration. Observe caution when using any apparatus that rotates at high speed including centrifuges. Make certain that the safety nut is securely fastened and operate the apparatus at moderate speeds. If students are permitted to use the centrifuge, instruct them on its proper and safe operation and monitor the student's use.

2. Tools

Never use dull cutting tools such as scalpels or scissors. They may slip and cause serious injury. Cut away from yourself when using any sharp instrument.

C. Physics Laboratory SOPs

1. Masses and Weights

Masses or weights of no more than 500 grams (g) should be given to students. If heavier masses are required, then two or more masses of 500 g each can be used. A combination of masses like 50, 100 or 200 g is suggested.

When teachers or students are demonstrating Hooke's Law or Newton's Law, pieces of foam should be used to cushion the fall of masses or weights and to help avoid damage to the masses, floor and/or tables, and prevent them from rolling away.

2. Projectile Motion (marble launcher)

Wear safety goggles while anyone in the room is launching a projectile. Clamp the launcher to a sturdy table. Use only the short range position on the launcher. Do not use the medium or long range positions. Do not stand in front of or look into the muzzle of the launcher. Be sure the line of fire is clear of people and any breakable objects.

3. Jet Action

Gas from carbon dioxide cartridges should be carefully released. Ensure that the cartridge is under control and will not fly away and strike someone. If wire guides are used for cartridge propulsion demonstrations, they should be securely fastened and pre-tested before use in the classroom.

4. Vacuum Experiments

Use heavy walled, round-bottom flasks or apparatus especially designed for vacuum work to prevent implosions. Use a safety shield. This is especially important when demonstrating low pressure boiling of water, at room temperatures, in a stoppered Florence flask.

5. Steam

Check the steam generating apparatus to assure that excessive pressures cannot develop before the steam is emitted. Before each use, check safety valves on commercial apparatus such as pressure cookers and model steam engines in accordance with the manufacturers' instructions. When generating steam in a test tube or flask, do not insert the stopper tightly or wire it down. Students shall direct steam outlets away from anyone's face. In set-ups involving the use of two or more valves, one must always be kept open.

6. Electricity

- a) Check all circuits before students power them. Take all necessary precautions to avoid accidental short circuits. Inspect all electric cords and extensions regularly for worn insulation and broken connectors. In schools where there is a main keyed switch, it should be used in the same manner as the gas key switch for the power supply or electrical outlets in the lab. This will ensure student safety and reduction of electrical equipment repair costs.
- b) All power supplies or outlets located at a teacher's desk or students' tables must have an on/off switch. There should also be an LCD indicator to show if the power is on or off. All electrical equipment used in physics must have an on/off switch. There should also be an external, replaceable fuse. Before plugging in or unplugging any equipment, outlet switches as well as equipment must be in the off position.

- c) Do not use the heavy old type of lead acid batteries in labs. Use the smaller and lightweight lead acid batteries. Use only leak proof or sealed lead acid batteries. Most lead acid batteries made today are sealed.
- d) A battery eliminator or adaptor is recommended in place of a dry cell. The use of an adaptor or eliminator with multi-voltage, a switch, and external fuse is less expensive and safer. If you must use dry cells, make sure they do not ooze and if they do, properly dispose of them using the chemical removal procedures. If students have touched the chemicals, make sure they wash their hands thoroughly.
- e) Make sure that all appliances that connect to wall outlets have either polarized two-prong plugs or grounded three-prong plugs. When removing a plug from a wall socket, always grasp the plug, not the wire.
- f) Whenever several outlets on the same line are used, the total power should not exceed 1500 watts.
- g) Limit the line voltage in student experiments to a maximum of 30 volts. (This does not apply to electrical laboratories or shops where students have special training and background.)
- h) Cover exposed water faucets and other grounded fixtures with an insulating material whenever there is a likelihood of contact with exposed parts of an operating electric circuit.
- i) Make changes only on non-powered (power cord removed) circuits. When working on electrical devices such as radios, televisions, and computer monitors, make certain that the current is off. Wait a few minutes, and then, discharge large capacitors to chassis ground using a low-resistance insulated shorting wire before touching any internal components. Caution students about the high voltage STATIC charges that exist in these and many other electronic appliances even after the current has been turned off. Severe burns and shock can result from contact with high voltages.
- j) Clearly mark the high voltage terminals of induction coils and caution students against touching these terminals when the induction coil is operating.
- k) No foreign objects should be pushed into any piece of electric equipment, especially when it is connected to a source of current.
- l) Never bypass protective devices such as fuses and circuit breakers. When replacing a fuse, never substitute a fuse with a higher current rating than the original fuse.

7. Magnetism

- a) Avoid heavy and very powerful magnets. A powerful magnet can attract any loose steel object or fly to any stationary steel object hurting anyone in its path.
- b) Avoid the use of iron filings that contain black iron powder. Black iron powder coming into contact with cuts can act as an irritant. Use instead magnetic chips or iron chips which are polished and free of dust. They can be purchased from science supply companies.
- c) Safety goggles and disposable gloves should be worn while working with magnets and iron filings or chips.
- d) Students should use long handled brushes to collect the iron filings or chips from the working area or lab bench. All equipment should be brushed until iron free.

8. Sound

Caution students to cover their ears before high intensity sounds are generated in the classroom or laboratory. This precaution will help avoid hearing loss resulting from high-pitched sounds.

9. Light

a) Optics

Do not use broken glass slabs, mirrors or lenses. Avoid the use of burning candles to obtain the image produced by mirrors and lenses. Use low wattage bulbs instead of burning candles.

b) Ultra-Violet Light (UV)

Prolonged exposure to UV light can cause serious burns to the retina. Make sure that no one looks directly into the source of UV radiations. However, students may be momentarily exposed to this radiation as they observe the effects on minerals, ores, teeth, and paints. For activities requiring more prolonged exposure, such as the observation of UV fluorescence and charged electroscope phenomena, supply students with goggles which are appropriate for the wavelength of UV light being used. Ordinary eyeglasses, polycarbonate plastic lenses, and glass shields between the demonstrator and the students will also provide a large measure of protection from UV light damage to the eye.

10. Laser Safety

All lasers used in schools must comply with the Laser Performance Standard of the U.S. Department of Health and Human Resources and with Title 21, Part 1040 of the Code of Federal Regulations (<https://www.ecfr.gov/cgi-bin/ECFR?page=browse>). These regulations specify safety features and classify lasers into four classes. The least dangerous is Class 1, the most dangerous is Class 4.

Educational scientific supply houses sell both Class 2 and Class 3(a & b) lasers for school use. Students should not be allowed to operate any lasers above Class 1. It is strongly recommended that any lasers above Class 2 be removed from the schools. Emissions from Class 2 lasers can cause eye damage after direct, long term exposure while Class 3 lasers will cause eye damage in a shorter interval of exposure.

Keep the room well illuminated when using lasers. The pupils of the eyes will dilate if the amount of light in the room is low. This will increase the chances of damage from the laser beam.

11. Apparatus

a) High Speed Rotating Apparatus

High speed rotating apparatus should be used only by teachers for the purpose of demonstration. Observe caution when using any apparatus that rotates at high speed including the Savart tooth wheel, siren disk, centrifugal hoop, and grindstones. Make certain that the safety nut is securely fastened and operate the apparatus at moderate speeds.

b) Tools

Never use a dull cutting tool. It may slip and cause serious injury. Cut away from yourself when using any sharp instrument. Cut sheet metal only with sharp shears. File the edges smooth using a file or emery cloth.

Rest hot soldering irons on metal stands to avoid burns and prevent fires. Use pliers or clamps to hold wires and metals for soldering. Do not inhale fumes from soldering paste.

12. Electromagnetic Applications

a) Cathode-Ray Tube

Because cathode ray tubes are fragile and will implode when stressed, only competent personnel should attempt to repair computer monitors, oscilloscopes, and TV equipment. Before making repairs, the equipment must first be disconnected from the 120-volt line and all high voltage capacitors. The picture tube shield must be discharged.

b) X-ray Tubes

X-ray tubes may be displayed but not used to generate X-rays. Crookes' tubes should never be connected to voltages that are so high that the tubes produce X-rays. In case of doubt, always check with the tube's manufacturer.

c) Infrared Apparatus

When transmitting infrared radiation with parabolic reflectors or other focusing devices, caution students to avoid areas where concentrated beams can cause severe burns.

13. Rockets

a) Rockets containing combustible chemicals are both illegal and dangerous and should not be used by students or staff in BPS Schools. Rockets that use compressed air and/or water pressure must be used with caution.

b) Students must wear eye protection when working with pressurized water or air. Air/water pressure should not exceed 100 lbs/inch². Rockets must not be pressurized until the area around the rocket is clear and the rocket is aimed away from students.

c) The launching mechanism must allow students to be a minimum of ten feet from the rocket. If this minimum distance cannot be achieved in an interior Science Area, the rocket should be launched in an exterior science area.

d) Any rockets that do not launch must be carefully handled (only by the teacher) while determining the reason for launch failure. Be sure the faulty rocket is pointed away from both students and the teacher when it is being checked.

V. CONTROL MEASURES

A. Personal Protective Equipment

It is the responsibility of each BPS school or program to provide appropriate safety and emergency equipment for employees and students per the BPS Science Safety Plan. **Appendix H** provides a list of the High School Chemistry Laboratory Minimum Safety Equipment to be provided for each science laboratory and classroom where chemicals are used.

1. Laboratory aprons or coats, eye protection, and non-permeable gloves are considered standard equipment for BPS laboratory programs. Each school's science department shall annually review protective equipment requirements for all laboratory activities as specified in instruction materials. The SDS shall be consulted for information regarding the proper type of personal protective equipment including gloves, safety goggles/glasses, etc. The appropriate equipment as specified in the SDS shall be used.
2. Protective apparel shall be compatible with the required degree of exposure and protection for the substances being handled. For example, laboratory coats or aprons and safety goggles should be worn when working with microorganisms and/or biological specimens; chemical resistant protective gloves and safety goggles should be worn to protect against chemical hazards.
3. Inspect all protective safety equipment before use. Do not use if defective.
4. Reusable protective apparel shall be maintained, cleaned, and stored properly. **Appendix I** provides procedures for selecting and cleaning safety goggles and glasses.
5. All eye protection devices shall conform to ANSI Standard Z87.1-2003. Eyeglasses or sunglasses (not rated Z87), even with side shields, are not acceptable protection against chemical splashes.
6. Any experiment that involves the risk of a chemical splash or spray and/or the heating of glassware shall require the use of chemical splash safety goggles. Working with microorganisms and/or biological specimens also requires the use of chemical splash safety goggles.
7. Wearing contact lenses is acceptable and is not an additional hazard. In June of 1998, ACS's Council Committee on Chemical Safety published its new policy on contact lenses in *Chemical Health and Safety*, stating the use of contact lenses in labs is acceptable as long as all appropriate eye and face protection devices are worn. Do not touch eyes or adjust contact lenses with potentially contaminated gloves or hands.
8. Wear appropriate clothing. Recommendations to minimize the potential for accidental contact with chemicals include low-heeled shoes (no open-toed shoes or sandals), long pants, and socks. Long hair should be restrained or tied back and no hanging jewelry or long/loose neckties.
9. Proper disposal of gloves should be demonstrated to students and adhered to by all. As the glove is removed, you should avoid allowing the outside of the glove to come in contact with skin. Also avoid letting the glove snap as contamination may fly into your eye or mouth or onto skin, or onto another person.

Step 1: With your right hand, pinch the palm of the glove on the left hand and pull left glove down and off fingers. Form left glove into a ball and hold in the fist of the right hand.

Step 2: Insert one or two fingers of left ungloved hand under inside rim of right glove on palm side; push glove inside out and down onto fingers and over balled left glove.

Step 3: Grasp gloves, which are now together and inside out, with left hand and remove from right hand.

Step 4: Discard gloves in appropriate waste container.

Step 5: Wash hands thoroughly with soap and water.



Photograph Source: Your Glove Source website: <http://www.yourglovesource.com/blogs/glove-knowledgebase/43943233-how-to-put-on-nitrile-and-latex-gloves>

B. Laboratory Protective Equipment

1. Chemical Fume Hood and Ventilation Systems

Laboratory activities that produce potentially hazardous vapors or gaseous substances or may release airborne contaminants above the Permissible Exposure Limit (PEL) or Thresholds Limit Value (TLV) concentrations per the SDS, must be carried out in a fume hood. Fume hoods are not to be used for either storage or disposal of chemicals.

All fume hood ventilation systems shall be constructed and maintained to comply with ACGIH (American Conference of Governmental Industrial Hygienists) guidelines or other applicable standards. Annual inspection and certification of hood ventilation systems will be carried out by BPS Facilities Management. Any hood not passing inspection must be taken out of service immediately and not be used until such time as the hood has passed inspection. Teachers should check the inspection sticker to be sure the hood has passed and is working properly.

2. Flammable/Corrosive Storage Cabinets

Chemicals designated as flammable in the SDS and/or chemicals with a flash point below 93.3 °C (200 °F) shall be considered flammable and shall be stored in a flammable storage cabinet. Chemicals designated as corrosive in the SDS and/or chemicals with a pH less than or equal to 2 or a pH greater than or equal to 12.5 shall be considered corrosive and shall be stored in a corrosive storage cabinet.

- a) Keep the flammable storage area cool, between 55 °F and 80 °F.
- b) Keep flammable materials away from sources of ignition and away from oxidizers.
- c) When transferring flammable liquids from one container to another, it is particularly important that they be properly grounded (by touching hand to work surface prior to

pouring) to prevent accidental ignition of flammable vapors and liquids from static electricity or other sources of ignition.

- d) Flammable storage cabinets shall be limited to a 30-gallon capacity and 44 inches in height and should be smaller if possible.

3. Electrical Systems

All building electrical systems shall be constructed and maintained in accordance with state and local applicable standards. In the event that power needs to be immediately turned off at the circuit breaker, contact Facilities Management.

C. Emergency Response Equipment

Each school shall ensure that adequate emergency equipment is available in Science Areas and inspected periodically to ensure that it is functioning properly within the guidelines of this BPS Science Safety Plan. Records of these inspections will be held at each school, the Science Department and/or Facilities Management.

The Science Department and/or Facilities Management will provide the initial distribution/installation of safety equipment including safety showers, eyewash stations, fire extinguishers, fire blankets, first aid kits and spill kits to the appropriate Science Area (refer to **Appendix H**). Schools will be responsible for the provision/installation of emergency equipment items including telephone/intercom for emergencies, safety goggles, and identification signs, as well as the continued maintenance of all equipment. Know where the nearest fire alarm pull is located and how to use the intercom to contact the main office. **Appendix J** provides a checklist for teachers to use for the required weekly, monthly or annual inspections of safety equipment.

1. Each school shall have and maintain a standard first aid kit for each Science Area. **Appendix K** provides a list of items that should be included in each first aid kit.
2. Each school shall have and maintain a fire blanket for each Science Area. Fire blankets shall be visually checked annually by the teacher or SSC and should not be given to students.
3. Each school shall have and maintain an ABC-type fire extinguisher for each Science Area. Fire extinguishers shall be visually checked monthly by the teacher or SSC and inspected/tested annually by Facilities Management. The teacher performing the visual check must initial and date the rear of the inspection tag to document the monthly inspection.
4. Every eye wash station will be capable of supplying a continuous flow of aerated, tepid, potable water to both eyes for at least 20 minutes. The valve shall remain in the open position without the need to hold the valve. Eyewashes shall be inspected and operated at least weekly by the teacher or SSC to verify flow and to flush potential bacterial growth and inspected by BPS Facilities Management once per year. The teacher performing the visual check must initial and date the rear of the inspection tag to document the weekly inspection. Access to eyewash should be provided and maintained free and clear. Hand-held eyewash bottles are not acceptable as an emergency eyewash because they do not provide a continuous flow of aerated, tepid, potable water to both eyes for at least 20 minutes. Contact Facilities Management if an adequate eyewash is not available.
5. Safety showers shall be capable of supplying a continuous flow of tepid potable water for at least 20 minutes. The shower shall have a quick-opening valve requiring manual closing (ANSI Z358.1-1990). The valve shall remain in the open position without the need to hold the valve. Safety showers shall be inspected and operated at least weekly by the teacher or SSC and inspected by Facilities Management once per year. The teacher performing the visual check must

initial and date the rear of the inspection tag to document the weekly inspection. A bucket should be placed under the showerhead during testing if the shower discharges directly to the floor.

6. Laboratories where hazardous substances are used shall have spill control kits. Initial kits will be supplied by Facilities Management. Replacement materials will be supplied by each school.
7. All science teachers shall be properly trained in the use of emergency response equipment. It is recommended that all science teachers view the Flinn Scientific High School Laboratory Safety Course videos related to emergency equipment including Chapter 11 Five-Minute Safety Inspection; Chapter 12 Emergency Alert and First Aid; Chapter 17 Goggle Safety; Chapter 18 Aprons, Gloves and Other PPE; Chapter 23 Fire Blankets; Chapter 24 Fire Extinguisher Basics and Training; Chapter 25 Eyewash Requirements; Chapter 26 Safety Showers; and Chapter 37 Chemical Spill Control. In addition, use of emergency response equipment will be reviewed during the basic chemical management and safety training to be provided each fall for new science teachers (refer to **Section IX. A.**).

D. Spills

A spill kit shall be provided by the school and maintained in each chemical storage room and/or in any laboratory where chemicals are used. Spill kits for Science Areas will include absorbent (kitty litter-type), gloves, good quality absorbent paper towels, broom, dustpan and bucket. It will be clearly marked "For Safety Emergency Only". Kits shall be inspected before the beginning of each semester by the teacher or SSC.

If a spill occurs, assess the spill situation and know your limits. There are three categories of spills:

1. Spills that may be picked up and disposed of by the teacher or other trained members of the school staff;
2. Spills that can be cleaned by in-school personnel (Facilities Management), but are too large to be disposed of by school resources; or
3. Spills that are so large or so toxic that help must be called in to clean up and dispose of them.

If there is NO immediate danger (flammability, corrosivity, reactivity or toxicity) to students and staff and the spill can be contained, cleanup procedures listed on the SDS shall be followed. Appropriate personal protective equipment shall be used, and containment shall be accomplished by use of spill kit materials, spill pillows, towels, rolls, or other devices that will keep the spill from spreading.

If a major spill occurs (cannot be cleaned-up safely by yourself), contact the Headmaster or Principal, SSC and Facilities Management. **Appendix L** includes a sheet to post for emergency numbers.

In case of a spill that is an immediate hazard, know the school's evacuation plan and be ready to carry it out if necessary. In general, if evacuation is necessary, proceed as you would in a fire drill evacuation. Send everyone to a pre-designated area and then count heads to make sure everyone is out of the building.

1. If the chemical involved in the spill is judged to present an immediate hazard (*i.e.*, hazardous vapors, caustic liquids, flammable liquids, etc.), then evacuate. The teacher shall immediately contact 911 and the main office.
2. If a volatile, flammable material is spilled, immediately extinguish flames such as Bunsen burners and evacuate the area and contact 911 and the main office.
3. If the spill material is a hazardous chemical, all of the materials involved in the cleanup will be considered to be hazardous waste and must be containerized, stored, and disposed of as such.

Facilities Management and/or Science Department personnel will investigate each spill or other incident that occurs in a science area that is reported. Investigations will be completed within 48 hours of the incident using the form included in **Appendix M** and will include suggestions to prevent or reduce the likelihood of the incident occurring again.

All incidents that result in a response from any outside agencies such as Boston Fire Department and Boston EMS or cause any injuries or illness to students or staff will be considered a "significant incident" requiring copies of the incident report be sent immediately to the BPS Chief Operating Officer, the Deputy Superintendent of Curriculum & Instruction and the Superintendent's Office.

BPS Facilities Management and BPS Science Department personnel will meet with the school's headmaster and SSC or lead science teacher to review all findings, recommendations and suggestions.

VI. HAZARD COMMUNICATION PROGRAM

A. Access to Information

Employees shall be informed of the location, availability, content and use of the Science Safety Plan.

B. Hazard Identification and Labels

Laboratory chemicals shall be properly labeled to identify any hazards associated with them for the teacher and students' information and protection.

1. Labels on incoming containers of hazardous chemicals are not to be removed or defaced.
2. If a chemical is stored in its original bottle, it shall have the manufacturer's original label identifying the chemical name and potential hazards, and the date of purchase, the date opened, and the initials of the person who opened the container.
3. If a chemical has been transferred to a secondary container, the new container shall be appropriately labeled with the chemical name, concentration (if in solution), potential hazards, solvent (if in solution other than water), date, and initials of the person responsible for the transfer.
4. If a chemical is transferred to a container for immediate use within a laboratory session, the container shall be appropriately labeled with the chemical name and potential hazards. The container should be emptied at the end of the session and the label removed.
5. Waste containers should be labeled with the words "hazardous waste", the name of the waste(s), and the hazards (*i.e.*, flammability, corrosivity, reactivity, and/or toxicity).
6. Unlabeled bottles shall not be opened, and such materials shall be disposed of promptly, as outlined in **Section VIII.A**.

C. Signs and Posters

The following shall be posted in all appropriate Science Areas or as specified:

1. Emergency telephone contact list shall be posted in all chemical storage areas. The contact list is included as **Appendix L**.
2. Evacuation instructions and/or evacuation route(s) shall be posted in all classrooms and laboratories.
3. Chemical Right-To-Know posters shall be posted in Chemical Storage Rooms/Areas. Posters can be found in **Appendix N** or obtained from the Massachusetts Department of Labor Standards website at: <http://www.mass.gov/lwd/docs/dol/rtk-poster-update-sept-2013.pdf>
4. NFPA Diamonds shall be posted on Science Room doors where chemicals are stored, and on doors to storage rooms and on cabinets in which chemicals are stored.
5. Signs to indicate the location of exits, evacuation routes, safety showers, eyewash stations, fire extinguishers, fire blankets, first aid kits, fume hoods, and other safety equipment shall be posted wherever these items are located.

D. Safety Data Sheets (SDS)

SDSs for all chemicals shall be maintained and made readily available in the school's main office and any chemical storage area. This shall be in paper form. The laboratory guidelines contained in the SDSs shall be used in determining the safety precautions, control measures, and personal protective equipment that apply when working with the chemicals. The SSC will ensure the binders of SDSs at each school are maintained and kept up-to-date.

VII. ADMINISTRATIVE CONTROLS

A. Inventory Control

An up-to-date Chemical Inventory shall be maintained using Flinn Scientific's online ChemVentory System. The online inventory should be updated to reflect all chemical use and chemical purchases. The list shall be audited for accuracy, per the BPS Hazard Communication program. The person(s) responsible for updating and maintaining this ChemVentory shall be the SSC, or one of the school's chemistry teachers unless otherwise designated by the school's Headmaster or Principal and approved by the Science Department.

The chemical inventory list shall contain the following information about each chemical found in storage: the chemical name, physical state, CAS#, supplier, amount, type, RCRA hazardous waste or not, health, flammability, reactivity codes, personal protective equipment necessary, date of purchase, and physical location of chemical.

B. Chemical Procurement

Efforts should be made to order chemicals in quantities that are likely to be consumed in one year and shall be purchased only in the quantity sufficient for the declared use. It is recommended that school staff consult with the Science Department and Facilities Management prior to ordering chemicals. Over the counter materials will need prior approval from the Science Department and Facilities Management unless it is on the FDA's "Generally Recognized as Safe (GRAS)" List. (<http://www.fda.gov/Food/food-ingredients-packaging/generally-recognized-safe-gras>)

Before ordering new chemicals, the teacher(s), in conjunction with the SSC, should know the health and safety concerns of each chemical and make efforts to minimize the use of hazardous chemicals and prepare for how the chemical must be handled and disposed:

1. Assess all the hazards and physical properties of the chemical using the SDS,
2. Determine whether a safer, less hazardous chemical can be used, and
3. Establish whether the chemical or its end products will require disposal as a hazardous waste, and if so, ensure appropriate arrangements are made to prepare for disposal

At receipt of chemicals:

1. Do not accept chemicals from a supplier unless it is accompanied by the corresponding SDS, or an SDS from that supplier for that chemical is already on file.
2. Confirm the chemical has an adequate identifying label.
3. Mark the container with the full level and date(s) it is received and opened.
4. Add the chemical to your school's inventory (ChemVentory) listing and immediately store it in the appropriate chemical storage area and/or cabinet.
5. Do not accept donated chemicals unless the written approval of the Science Department, Facilities Management and the school's Headmaster, Principal or building administrator has been received.

C. Approval of Experimental Design

BPS has an established district-identified science curriculum (*i.e.*, Living by Chemistry). Approval by the Science Department and Facilities Management shall be required for laboratory experiments if:

1. There is a significant change in an existing experiment, such as the amounts or identities of materials being used or the conditions under which the experiment will be conducted become more hazardous, or

2. A new laboratory experiment is to be implemented that is not already contained in the current district-identified instructional material and/or it uses materials different from and deemed more hazardous than the district-identified materials.

To determine if a new laboratory experiment is more hazardous, the teacher shall consult the SDS(s) for the new material(s) and compare them with the SDSs for the materials used in the district-identified curriculum. If the new lesson is more hazardous, approval shall be obtained from the Science Department and Facilities Management. The request must be made in writing at least 4 weeks prior to its use and include: an explanation of the enhanced educational value of the replacement activity justifying its inclusion; a list of chemicals and amounts required; a copy of the SDSs; and an explanation of waste disposal procedures.

Existing laboratory experiments/laboratory activities will be reviewed by the Science Department and Facilities Management, with guidance from the SSAG, on an on-going basis. The criteria for approval of laboratory experiments will be based on the best available knowledge of the hazards of the substance and the availability of proper handling facilities and equipment. Important factors to consider when reviewing should include:

1. Is use of the chemical pedagogically sound?
2. Are adequate safeguards in place to assure proper use of the substance?
3. Is the exposure time of the employees and students to the substance minimal and acceptable?

D. Recordkeeping and Reporting

1. Chemical Inventory and SDSs

A hardcopy of the chemical inventory list and each corresponding SDS shall be maintained in the school's main administrative office and any chemical storage area. Electronic copies of the up-to-date chemical inventory list shall be emailed to the Science Department (bps.science@gmail.com) and the Facilities Management Environmental Specialist by October 1st of each school year.

2. Assessment/Inspection Reports

All reports of assessments or inspections must be completed and retained by the Science and Facilities Management Departments. A copy of a Chemical Laboratory Safety Checklist is included as **Appendix O**.

3. Safety Equipment

Safety equipment including fire extinguishers, safety showers and eyewash stations shall be marked to indicate the date and the results of the last inspection conducted by the teacher or SSC and/or Facilities Management. Records indicating the dates of repairs and regular maintenance of safety equipment shall be retained by Facilities Management.

4. Training Records

Each school shall maintain records of employee safety training and records of completed training will be made available to the Science Department.

The teacher will keep the original signed Student Safety Contract on file and the student will retain a copy.

5. Accident Reports

All science/laboratory-related incidents will be reported according to Superintendent's Circular #FSE-6:

- a) Instructor, nurse and/or witness will fill out or assist in filling out two separate accident reports: Occupational Education Accident Report Form EE 111 and Pupil Accident Report Form 201 (forms are included as **Appendix B**).
- b) Headmaster/Principal will retain original Form EE 111 in school file and send copy to the Director of Career and Technical Education, 75 Malcolm X Blvd, Boston, MA 02119.
- c) Headmaster/Principal will retain Form 201 in school file and send a copy to the Department of Safety Services, 213 Townsend Street, Dorchester, MA 02121. In cases of science laboratory accidents or injuries, a copy of Form 201 will also be sent to the Science Department, 1216 Dorchester Avenue, Dorchester, MA 02125.

6. Waste Disposal Records

Facilities Management shall retain records of disposal of hazardous waste. The records shall conform to the requirements of the Massachusetts Department of Environmental Protection Hazardous Waste Rules. Each school will be provided copies of these records and shall be maintained at the main administrative offices of each school.

VIII. WASTE MANAGEMENT

A. Waste Disposal

Facilities Management shall ensure that the disposal of laboratory chemicals complies with applicable federal, state and local regulations.

1. All hazardous materials shall be disposed of in accordance with federal and Massachusetts Hazardous Waste Management rules. Each Boston Public School is considered a Very Small Quantity Generator (VSQG) according to the Massachusetts Hazardous Waste Rules.
2. Only non-hazardous aqueous solutions between pH 3 and pH 9 may be poured down the drain. See **Appendix P** for a list of chemicals prohibited from being poured down the drain per Massachusetts Water Resource Authority regulations.
3. BPS Facilities Management has established a Satellite Waste Accumulation Area near each Chemical Storage or Preparation Area. Upon completion of a laboratory activity cycle, the waste containers shall be returned to this designated area. Waste materials shall not be stored in the laboratory.
4. As needed, separate hazardous waste containers shall be provided by Facilities Management for heavy metal compounds, chlorinated hydrocarbons, and non-chlorinated hydrocarbons or other categories as recommended by the Department of Public Safety.
5. When the waste containers become full the teacher shall contact Facilities Management for disposal. As a VSQG, the maximum 90-day storage rule does not apply; however, the waste containers must be picked up when full and must not be left over summer break. The SSC or another teacher must contact the Environmental Specialist at Facilities Management by June 1st to schedule a pickup for disposal.
6. There should be no unlabeled containers of chemicals in the laboratory or prep areas. Any unlabeled containers apparently containing liquid and/or solid chemicals shall be treated as hazardous waste and disposed of using the procedures described above. Unlabeled containers may have to be tested to characterize the waste, at an additional cost to the school.

B. Satellite Waste Accumulation Areas

All waste containers must be stored in the designated Satellite Waste Accumulation Area according to the following requirements:

1. Waste chemicals shall be stored in appropriately labeled containers, inside secondary containment (refer to **Section VI.B.**).
2. Hazardous wastes shall only be placed in leak-proof US Department of Transportation (DOT) approved containers. Hazardous wastes must never be placed in any common solid trash container.
3. All hazardous waste containers shall remain closed when not actively adding waste to the container.
4. All hazardous waste containers shall have an up-to-date log of the material that is in the container.
 - a) When any material is added to the container, the chemical name, the amount of the chemical, the date, and the initials of the individual adding the hazardous chemical, shall be recorded in the log for that container.
 - b) This recording task is the responsibility of the laboratory instructor. See **Appendix Q** for sample log.

C. Waste Minimization

Employees shall minimize the generation of hazardous wastes by:

1. Using microscale labs and/or substituting less hazardous materials;
2. Avoiding the accumulation of hazardous waste;
3. Ordering chemicals in quantities that are likely to be consumed in one year or less; and
4. Determining if the material will need to be treated as hazardous waste by referring to the SDS prior to ordering new chemicals.

When possible, employees will minimize the generation of hazardous waste by:

1. Recycling chemicals by performing cyclic experiments where one product of a reaction becomes the starting material of the following experiment;
2. Using interactive teaching software and demonstration videos in lieu of experiments that generate large amounts of chemical waste; and/or
3. Using pre-weighed or pre-measured chemical packets to reduce bulk chemical disposal.

IX. TRAINING AND INFORMATION

A. Training for Employees

BPS shall provide employees with information and training to ensure that they are aware of the hazards of chemicals present in their work area. Basic chemical management and safety training is available each fall semester. Additional in-person, online, and/or screen-cast trainings may be available/offered throughout the year as needed.

1. All new science teachers (teachers new to the district or current teachers new to teaching science) must attend the first available chemical management and safety training. (Check the Science Department website for training calendar. The Headmaster or Principal should provide a list of new science teachers to the Science Department each school year.)
2. BPS shall provide access to an online science safety refresher training for all science teachers every year, to include: Right-To-Know training as part of the unit trainings, per the BPS Hazard Communication program, and coverage of the Science Safety Plan, responsibilities of science teachers/teachers of science and other employees, SDSs and standard operating procedures.
3. Employees shall be trained on the potential chemical hazards in the employees' work areas and on appropriate sections of the Science Safety Plan. This training shall be provided to all employees who actually work in the laboratory, as well as to other employees whose assignments may require that they enter a laboratory where exposure to hazardous chemicals might occur. Employees who are responsible for receiving and handling shipments of new chemicals or chemical wastes shall also be informed of the potential hazards and appropriate protective measures for chemicals they may receive or handle.
4. Employees shall be trained on the applicable details of the safety plan, including a review of the general rules of laboratory safety. The training shall describe appropriate sections of the standard operating procedures, particularly those procedures that require prior approval of the Science Department and/or Facilities Management. The training an employee receives shall be determined by the nature of the work assignment in the laboratory.
5. Laboratory employees shall be trained in measures they may take to protect themselves from exposure to hazardous chemicals, including the location and proper use of protective equipment and emergency response equipment. In addition, the training must also include a discussion of inventory procedures to be followed, proper storage and ordering rules, and district hazardous waste disposal procedures.

B. Training for Students

Instruction in laboratory safety shall be provided to all students enrolled in laboratory classes. Students enrolling after safety instruction has taken place shall receive instruction prior to being permitted to engage in laboratory activities.

1. As stated in **Section III.A.**, Students must sign a safety contract before conducting any laboratory work. This contract must be signed by the student, parent/guardian, and the teacher. Safety contracts must be renewed each academic year.
2. At the beginning of the course and prior to laboratory activities, class time shall be devoted to safe laboratory practices and to the student safety contract.
3. The extent of student training shall be based on their course of study, the laboratory facility, BPS policies, the Science Safety Plan, and the level of chemical handling and potential exposure to hazardous chemicals.
4. Safety training shall include the importance and the content of the label, how to handle chemicals, use of personnel protective and safety equipment, and student applicable sections of the Science Safety Plan. As appropriate, the student shall also be introduced to other sources of chemical safety information as well as any necessary information regarding microorganisms and/or other specimens.

X. SUMMARY CHECKLISTS OF RESPONSIBILITIES**A. Headmasters and Principals**

1. Ensure that all science classes and laboratories are assigned to and conducted in appropriately equipped Science Rooms.
2. Provide a list of all science teachers/teachers of science to the Science Department by October 1st each year using the form provided in **Appendix R**.
3. Appoint a Science Safety Coordinator (SSC) and ensure they complete an annual chemical inventory and complete required safety checks as stated in **Section X.B**.
4. Inform the staff and students in writing of the safety standards and procedures, including the need to wear eye protection devices.
5. Ensure that workable fire extinguishers, blankets, safety showers and eye wash equipment are readily available and that appropriate personnel receive training in the use of each.
6. Ensure staff review and implement the Science Safety Plan.
7. Ensure that staff has instructed all students in safety standards and procedures, including the Science Safety Plan and the School Safety Plan.
8. Post building evacuation procedures in classrooms, laboratories and chemical storage rooms.
9. Conduct quarterly fire drills.
10. Maintain adequate lighting and proper ventilation in laboratories and classrooms, and report problems to Facilities Management immediately.
11. Be sure that teacher evaluations reflect the implementation of safety standards and procedures.
12. Ensure that a "Right to Know" workplace notice is posted in the school's Science Rooms pursuant to Mass. Gen. Laws c. 111F, § 7(a).
13. Ensure a copy of all safety data sheets (SDSs) is maintained in the Main Office and chemical storage areas.
14. Ensure that all instructors working with toxic or hazardous substances receive training as specified in Chapter 111F of the Massachusetts General Laws through the Science Department.
15. Notify the Science Department of any accident or injury in a Science Area.
16. Submit the Annual Hazardous Material Permit Application to Boston Fire Department and post the current permit in the Main Office.

B. Teachers and/or Science Safety Coordinator (SSC)

1. Review and implement the Science Safety Plan including SOPs for general laboratories, chemical use and storage, chemistry laboratories, biology laboratories, physics laboratories and waste management.
2. Attend annual safety trainings including science safety and first aid.
3. Practice safety procedures and serve as the model for good safety conduct for students.
4. Establish a Student Safety Contract with each student prior to any laboratory activities.
5. Require the use of appropriate personal protective equipment.
6. Avoid accidents by insisting that students dress properly for the laboratory.
7. Supervise students at all times. Under no circumstances shall a teacher leave students unsupervised in a laboratory or chemical storage room. If an instructor must leave the laboratory in an emergency, he or she must:
 - a) Arrange for a qualified teacher as a replacement, OR
 - b) Relocate students to a properly supervised area,
 - c) Lock the laboratory, and
 - d) Shut off equipment.
8. Inspect fire extinguishers monthly and safety showers and eyewash stations weekly. (SSC or science teacher in charge)
9. Maintain first aid kit in an easily accessible area. (SSC or science teacher in charge)
10. Maintain a chemical inventory using the online ChemVentory system, update at least annually and submit an electronic copy to the Science Department and Facilities Management by October 1st each year. (SSC or science teacher in charge)
11. Ensure SDSs for all chemicals are accessible and copies are kept in the chemical storage room or school's Science Department and in the administrative main office. (SSC or science teacher in charge)
12. Store all chemicals in their compatible chemical families.
13. Keep all chemical storage rooms or cabinets locked at all times when not in use.
14. Label all chemical storage rooms/cabinets and laboratory doors with the appropriate NFPA Diamond. (SSC or science teacher in charge)
15. Ensure all chemical and waste containers are labeled appropriately and stored safely until they can be removed. Contact Facilities Management for removal.
16. Implement the appropriate emergency procedure, waste disposal, spill cleanup, evacuation routes, and fire emergency notification when needed.
17. Consult with the Science and/or Facilities Management Department staff as appropriate regarding the use of Class 1A flammables, compressed gasses, donated chemicals, and the implementation of any laboratory experiment that may be more hazardous than those contained in the district-identified curriculum.
18. Report all accidents and injuries to the Principal or Headmaster and Direct Supervisor.
19. Report lighting, ventilation, safety equipment, and laboratory disrepair to Principal or Headmaster, Direct Supervisor, and Facilities Management.

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APPENDIX A

School Name _____

Teacher _____

PURPOSE

Science is a hands-on laboratory class. You will be doing many laboratory activities which require the use of hazardous chemicals. Safety in the science classroom is the #1 priority for students, teachers, and parents. To ensure a safe science classroom, a list of rules has been developed and provided to you in this student safety contract. These rules must be followed at all times. Two copies of the contract are provided. One copy must be signed by both you and a parent or guardian before you can participate in the laboratory. The second copy is to be kept in your science notebook as a constant reminder of the safety rules.

GENERAL RULES

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask the instructor before proceeding.
3. Never work alone. No student may work in the laboratory without an instructor present.
4. When first entering a science room, do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
5. Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
6. Perform only those experiments authorized by the instructor. Never do anything in the laboratory that is not called for in the laboratory procedures or by your instructor. Carefully follow all instructions, both written and oral. Unauthorized experiments are prohibited.
7. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory.
8. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
9. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, backpacks, etc.) should be stored in the classroom area.
10. Keep aisles clear. Push your chair under the desk when not in use.
11. Know the locations and operating procedures of all safety equipment including the first aid kit, eyewash station, safety shower, fire extinguisher, and fire blanket. Know where the fire alarm and the exits are located.
12. Always work in a well-ventilated area. Use the fume hood when working with volatile substances or poisonous vapors. Never place your head into the fume hood.
13. Be alert and proceed with caution at all times in the laboratory. Notify the instructor immediately of any unsafe conditions you observe.
14. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water and those solutions designated by the instructor. Solid chemicals, metals, matches, filter paper, and all other insoluble materials are to be disposed of in the proper waste containers, not in the sink. Check the label of all waste containers twice before adding your chemical waste to the container.
15. Labels and equipment instructions must be read carefully before use. Set up and use the prescribed apparatus as directed in the laboratory instructions or by your instructor.
16. Keep hands away from face, eyes, mouth and body while using chemicals or preserved specimens. Wash your hands with soap and water after performing all experiments. Clean all work surfaces and apparatus at the end of the experiment. Return all equipment clean and in working order to the proper storage area.
17. Experiments must be personally monitored at all times. You will be assigned a laboratory station at which to work. Do not wander around the room, distract other students, or interfere with the laboratory experiments of others.
18. Students are never permitted in the science storage rooms or preparation areas unless given specific permission by their instructor.
19. Know what to do if there is a fire drill during a laboratory period; containers must be closed, gas valves turned off, fume hoods turned off, and any electrical equipment turned off.
20. Handle all living organisms used in a laboratory activity in a humane manner. Preserved biological materials are to be treated with respect and disposed of properly.
21. When using knives and other sharp instruments, always carry with tips and points pointing down and away. Always cut away from your body. Never try to catch falling sharp instruments. Grasp sharp instruments only by the handles.
22. If you have a medical condition (e.g., allergies, pregnancy, etc.), check with your physician prior to working in lab.

CLOTHING

23. Any time chemicals, heat, or glassware are used, students will wear laboratory goggles. There will be no exceptions to this rule!
24. Contact lenses should not be worn in the laboratory unless you have permission from your instructor.
25. Dress properly during a laboratory activity. Long hair, dangling jewelry, and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured. Shoes must completely cover the foot. No sandals allowed.
26. Lab aprons have been provided for your use and should be worn during laboratory activities.

ACCIDENTS AND INJURIES

27. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the instructor immediately, no matter how trivial it may appear.
28. If you or your lab partner are hurt, immediately yell out "Code one, Code one" to get the instructor's attention.
29. If a chemical splashes in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 20 minutes. Notify the instructor immediately.
30. When mercury thermometers are broken, mercury must not be touched. Notify the instructor immediately.

HANDLING CHEMICALS

31. All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemicals unless specifically instructed to do so. The proper technique for smelling chemical fumes will be demonstrated to you.
32. Check the label on chemical bottles twice before removing any of the contents. Take only as much chemical as you need.
33. Never return unused chemicals to their original containers.

34. Never use mouth suction to fill a pipet. Use a rubber bulb or pipet pump.
35. When transferring reagents from one container to another, hold the containers away from your body.
36. Acids must be handled with extreme care. You will be shown the proper method for diluting strong acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.
37. Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.
38. Never remove chemicals or other materials from the laboratory area.
39. Take great care when transporting acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.

HANDLING GLASSWARE AND EQUIPMENT

40. Carry glass tubing, especially long pieces, in a vertical position to minimize the likelihood of breakage and injury.
41. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.
42. Inserting and removing glass tubing from rubber stoppers can be dangerous. Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper. Always protect your hands with towels or cotton gloves when inserting glass tubing into, or removing it from, a rubber stopper. If a piece of glassware becomes "frozen" in a stopper, take it to your instructor for removal.
43. Fill wash bottles only with distilled water and use only as intended, e.g., rinsing glassware and equipment, or adding water to a container.
44. When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Hands must be completely dry before touching an electrical switch, plug, or outlet.
45. Examine glassware before each use. Never use chipped or cracked glassware. Never use dirty glassware.
46. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.
47. If you do not understand how to use a piece of equipment, ask the instructor for help.
48. Do not immerse hot glassware in cold water; it may shatter.

HEATING SUBSTANCES

49. Exercise extreme caution when using a gas burner. Take care that hair, clothing and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light gas (or alcohol) burners only as instructed by the teacher.
50. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended. Always turn the burner or hot plate off when not in use.
51. You will be instructed in the proper method of heating and boiling liquids in test tubes. Do not point the open end of a test tube being heated at yourself or anyone else.
52. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.
53. Never look into a container that is being heated.
54. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for hot apparatus to cool before touching it.
55. When bending glass, allow time for the glass to cool before further handling. Hot and cold glass have the same visual appearance. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.

QUESTIONS

56. Do you wear contact lenses?
 YES NO
57. Are you color blind?
 YES NO
58. Do you have allergies?
 YES NO
If so, list specific allergies _____

AGREEMENT

I, _____
, _____ (student's name)
have read and agree to follow all of the safety rules set forth in this contract. I realize that I must obey these rules to ensure my own safety, and that of my fellow students and instructors. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe lab environment. I will also closely follow the oral and written instructions provided by the instructor. I am aware that any violation of this safety contract that results in unsafe conduct in the laboratory or misbehavior on my part, may result in being removed from the laboratory, detention, receiving a failing grade, and/or dismissal from the course.

Student Signature

Date

Dear Parent or Guardian:

We feel that you should be informed regarding the school's effort to create and maintain a safe science classroom/laboratory environment.

With the cooperation of the instructors, parents, and students, a safety instruction program can eliminate, prevent, and correct possible hazards.

You should be aware of the safety instructions your son/daughter will receive before engaging in any laboratory work. Please read the list of safety rules above. No student will be permitted to perform laboratory activities unless this contract is signed by both the student and parent/guardian and is on file with the teacher.

Your signature on this contract indicates that you have read this Student Safety Contract, are aware of the measures taken to ensure the safety of your son/daughter in the science laboratory, and will instruct your son/daughter to uphold his/her agreement to follow these rules and procedures in the laboratory.

Parent/Guardian Signature

Date

APPENDIX B

Superintendent's Circular #FSE-6

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OCCUPATIONAL EDUCATION ACCIDENT REPORT

Name of injured: _____ Grade: _____ Age: _____

Parent's/Guardian's name: _____

Address: _____

Date of accident: _____ Time of accident: _____

Definite location of accident: _____

Description of accident: _____

State exact part of person injured and extent of injury _____

Emergency care was given by: _____

Follow-up (check statements which apply):

Pupil remained in school

Parent/Guardian notified

Taken to nurse's office by _____

Taken to hospital by _____

Name of doctor, if any _____

Witness to accident: _____

Person reporting accident: _____

Signatures:

Person making this report

Person supervising activity or program

School Nurse

Principal/Headmaster

Report #: _____ (to be filled in by the Principal/Headmaster)

Reviewed by: _____

Director of Career and Technical Education

N.B. Retain original in Headmaster's/Principal's office. Send copy to the Director of Career and Technical Education, 75 Malcolm X Blvd., Boston, MA 02120

Superintendent's Circular #FSE-6

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FORM 201

PUPIL ACCIDENT REPORT
(Section 225 of the Rules and Regulations)

All accidents involving injury to pupils on school premises or while going to or from school must be reported on Form 201 to the Department of School Safety Services, 213 Townsend Street, Dorchester, MA 02121 no later than the day following the day of the accident. This report is to be filled out in its entirety. A duplicate copy of the Pupil Accident Report is to be retained by the school principal. If possible, this report should be typewritten.

1. Name _____

Last Name	First Name	Middle Initial
-----------	------------	----------------
2. Address _____
3. School _____ Age ____ Sex ____ Grade ____ Room ____
4. Name of Parent or Guardian (in full) _____
5. Date of accident _____ Time _____ A.M. ____ P.M. ____
6. Nature and extent of injury _____
7. In case of dog bite, has report been made to Boston Health Department? _____
8. Specific place of accident _____
9. Teacher(s) in charge of location when accident occurred _____
10. Teacher(s) in charge present at scene of accident: Yes _____ No _____
11. Description of accident, including cause _____

12. In case of shop accident, were all guards required by law in use? _____
 If not, why not? + _____
13. In case of shop or laboratory accident, is the statement required by Section 225 of the Rules and Regulations attached? _____ If answer is No, state reason

14. To whom was accident first reported? _____ What action was taken by this person? _____

15. Were first-aid supplies available? (Yes or No) _____
16. Was any treatment administered? _____ Where? _____
17. Did pupil leave school (or place of accident)? _____ If so, to what destination? _____
18. If transported by ambulance, attendant names _____ and unit # _____
19. Escorted to destination by whom? (An injured pupil should be escorted by a responsible person) _____
20. Names and addresses of witnesses _____

The accident report has been investigated and will be carefully followed up.

 Signature of Safety Counselor

 Signature of Principal

 Date of Report

 School

APPENDIX C

POLICY FOR STORAGE OF FLINN SCIENTIFIC CHEMICAL KITS OR SIMILAR KITS BY OTHER MANUFACTURERS

Upon receiving packaged Flinn Scientific kits/kits by other manufactures containing chemicals for lab use, the following procedure should be followed:

1. While wearing nitrile gloves and appropriate eye protection, open the package. Inspect the kit for evidence of spills, leaks, damage, etc.
2. If any components appear faulty and/or unsafe, store in a secure hazardous waste accumulation area for disposal.
3. If there is no evidence of spills or damage, the kits may be stored in an area designated **solely** for storage of the kits. The kits may be stored in the condition in which they were received. Segregation of individual components (*i.e.*, acids, bases, etc.) is **not** required, per consultation with Meg Krotz of Flinn Scientific, Inc. on May 12, 2015.

APPENDIX D

BOSTON FIRE DEPARTMENT STORAGE REQUIREMENTS

MAXIMUM QUANTITIES (GALLONS) OF FLAMMABLE & COMBUSTIBLE LIQUIDS FOR CLASS C (LOW HAZARD) LABORATORIES

Square Feet of Laboratory	<u>Sprinklered</u> Flammable or Combustible Liquid Class		<u>Un-Sprinklered</u> Flammable or Combustible Liquid Class	
	I	I+II+IIIA-3	I	I+II+IIIA-3
100	2	4	1	2
200	4	8	2	4
300	6	12	3	6
400	8	16	4	8
500&larger	10=max	20=max	5=max	10=max

EXCLUDING quantities in storage cabinets and safety cans
(amount permitted out in open lab)

Square Feet of Laboratory	<u>Sprinklered</u> Flammable or Combustible Liquid Class		<u>Un-Sprinklered</u> Flammable or Combustible Liquid Class	
	I	I+II+IIIA-3	I	I+II+IIIA-3
100	4	8	2	4
200	8	16	4	8
300	12	24	6	12
400	16	32	8	16
500	20	40	10	20
600	24	48	12	24
700	28	56	14	28
800	32	64	16	32
900	36	72	18	36
1000	40	80	20	40
1500&larger	60=max	120=max	30=max	60=max

INCLUDING quantities in storage cabinets, safety cans, and out in the open lab.
(total quantity allowed in laboratory)

Footnotes:

1. For maximum container sizes see NFPA 45.
2. The area of offices, lavatories, and other contiguous areas of a laboratory unit are to be included when determining square footage of the laboratory unit.
3. The maximum quantities of Class I liquids shall not exceed the quantities specified for Class I liquids alone.

APPENDIX E

DEFINITIONS OF PARTICULARLY HAZARDOUS SUBSTANCES (PHS)**A. General**

In order to reduce the exposure of teachers, aides, students, and other employees to especially hazardous substances, using particularly hazardous substances (PHSs) is not permitted in any Boston Public School. PHSs include highly toxic chemicals, reproductive toxins, and select carcinogens. In addition, the Science Department includes highly flammable chemicals, highly reactive chemicals, and highly corrosive chemicals in this designation.

B. Highly Toxic Chemicals

Examples of highly toxic chemicals (acute or chronic) that were commonly used in the past are benzene, chloroform, formaldehyde, bromine, carbon disulfide, carbon tetrachloride, cyanide salts, and hydrofluoric acid.

C. Highly Flammable Chemicals

The Science Department will define Class 1A liquids as highly flammable chemicals. Class 1A liquids have a flashpoint of less than 73 °F (23 °C) and a boiling point of less than 100 °F (38 °C).

Examples of highly flammable chemicals are diethyl ether, acetone, pentane, petroleum ether, acetaldehyde, and ligroines.

D. Highly Reactive Chemicals

Reactivity information may be given in the SDSs and on labels. The most complete and reliable reference on chemical reactivity is the current edition of Bretherick's Handbook of Reactive Chemical Hazards.

A reactive chemical is one that:

- a) Is described as such on the label, in the MSDS, or by Bretherick.
- b) Is ranked by the NFPA as 3 or 4 for reactivity.
- c) Is identified by the Department of Transportation (DOT) as an oxidizer, an organic peroxide, or an explosive (Class A, B, or C).
- d) Fits the Environmental Protection Agency definition of reactive in 40 CFR 261.23.
- e) Is known or found to be reactive with other substances.

Examples of commonly encountered highly reactive chemicals are ammonium dichromate, nitric acid, perchloric acid, hydrogen peroxide, potassium chlorate, azides, organic nitrates, and acetylides.

E. Highly Corrosive Chemicals and Contact Hazard Chemicals

Corrosivity, allergen, and sensitizer information is provided in manufacturers' MSDSs and on labels.

A corrosive chemical is one that:

- a) Fits the EPA definition of corrosive in 40 CFR 261.22 (has a pH greater than or equal to 12.5 or a pH less than or equal to 2)
- b) Is known to be reactive to living tissue, causing visible destruction, or irreversible alterations of the tissue at the site of contact.

A contact hazard chemical is an allergen or sensitizer that:

- a) Is so identified or described in the SDS or on the label.
- b) Is so identified or described in medical or industrial hygiene literature.

- c) Is known to be an allergen or sensitizer.

Corrosive and contact hazard chemicals will be handled with all proper safety precautions, including wearing safety goggles, using gloves tested for the absence of pinholes and known to be resistant to permeation or penetration by the chemical, and wearing a laboratory apron or laboratory coat.

Examples of highly corrosive chemicals are hydrochloric, sulfuric, nitric, phosphoric, and perchloric acids (all acids in greater than 1 Molar concentration), and potassium hydroxide (either solid or in aqueous solution greater than 1 Molar concentration).

F. Reproductive Toxins

A reproductive toxin refers to chemicals which affect reproductive capabilities including chromosomal damage (mutations) and which affect fetuses (teratogenesis).

A reproductive toxin is a compound that:

- a) Is described as such in the applicable SDS or label.
- b) Is identified as such by the Oak Ridge Toxicology Information Resource Center (TIRC), (615) 576-1746.

Examples of reproductive toxins are organomercurial compounds and ethidium bromide, carbon disulfide, xylene, toluene, benzene, mercury, lead compounds, ethyl ethers, vinyl chloride.

G. Select Carcinogens

Select carcinogen means any substance which meets one of the following criteria:

- a) It is regulated by OSHA as a carcinogen
- b) It is listed under the category, "known to be carcinogens," in the National Toxicology Program (NTP) Annual Reports on Carcinogens.
- c) It is listed under Group 1 "carcinogenic to humans" by the International Agency for Research on Cancer Monographs (IARC).
- d) It is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" and causes statistically significant tumor incident in experimental animals under set criteria of exposure.

Examples of select carcinogens are benzene, nickel metal dust, vinyl chloride, and formaldehyde.

H. Mercury

Schools are not to have mercury, including equipment or materials containing mercury, on the premises (with limited exceptions), and any mercury-added products must be disposed of appropriately. Mass. Gen. Laws c. 21H, § 6G (as amended by Chapter 190 of the Acts of 2006, effective October 1, 2006), states:

No school in the commonwealth shall purchase for use in a primary or secondary classroom elemental mercury, mercury compounds or mercury-added instructional equipment and materials, except measuring devices and thermometers for which no adequate nonmercury substitute exists that are used in school laboratories. This section shall not apply to the sale of mercury-added lamps or those products whose only mercury-added component is a mercury-added lamp or lamps.

Mass. Gen. Laws c. 21H, § 6I (as amended by Chapter 190 of the Acts of 2006, effective May 1, 2008), states:

(a) No person, household, business, school, healthcare facility or state or municipal government shall knowingly dispose of a mercury-added product in any manner other than by recycling, disposing as hazardous waste or using a method approved by the department [of environmental protection].

APPENDIX F

POLICY FOR TRANSPORTING CHEMICALS

1. Chemicals are **never** to be transported out of, or away from, the building or buildings in which they are permanently stored by any teacher, student, or custodian.

The only chemicals that are permitted to be transported are those listed on the FDA's "Generally Recognized as Safe (GRAS)" List (baking soda, vinegar, etc.).

2. If chemicals are stored in a school building that is to be occupied in the immediate future by a different school – *i.e.*, a school other than the one that currently occupies that building – the chemicals should remain inside that building for use by the incoming school (if possible).
3. If chemicals cannot be left in place for use by an incoming school or must be removed from a building for any reason, they must only be done so by a licensed hazardous waste company. Contact the Environmental Specialist from BPS Facilities Management for assistance in scheduling.
4. When transporting chemicals within a school, use a cart on wheels and make sure all bottles being moved are secure. Chemicals are **never** to be transported by a student.

APPENDIX G

New and Improved -- Flame Tests Demonstration (“Rainbow Demonstration”)

Presented by Jillian Meri Emerson, Staff Research Associate
Department of Chemistry
University of California, Davis
jlmemerson@ucdavis.edu

Safety Considerations

Barium chloride is highly toxic. Precautions must be taken to avoid ingestion of the salt or solution. Wear proper personal protective equipment when preparing solutions. Students should wear chemical splash goggles and avoid contact with solutions when performing this experiment. Wash hands after handling materials used to prepare for or perform this experiment.

Caution should be taken around open flames (Bunsen burner or propane torch). Ensure lab bench is clear of flammable materials (solvents, papers, etc.) when performing this experiment. Students should be closely supervised when performing this experiment.

Wooden Applicators Soaked in Saturated Salts Solutions

Saturated salt solutions were prepared according to the table to the right. Note grams were added to 250ml DI water (not brought to volume).

Salts solutions were prepared in DI water. Five wooden applicators were broken in half and placed in a weight boat. The saturated solutions were poured into the weigh boats to cover the applicators. Solutions were allowed to evaporate. Most salt solutions evaporated in 1 week. CaCl₂ and LiCl were still damp after 4 months as these salts are highly hygroscopic.

Salt	Actual g in 250 mL H ₂ O
BaCl ₂ /BaCl ₂ • 2H ₂ O	106
CaCl ₂	190
CuCl ₂ • H ₂ O	288
LiCl	233
KCl	88
NaCl	91
SrCl ₂	392

Summary of Results:

- Barium Chloride BaCl₂*2H₂O (light green) - color flame clearly distinguishable
- Calcium Chloride CaCl₂ (orange red) – color flame clearly distinguishable
- Copper Chloride CuCl₂ (blue/green) – color flame clearly distinguishable
- Lithium Chloride LiCl (fuchsia flame) – color flame clearly distinguishable
- Potassium Chloride KCl (light lilac) – color flame distinguishable (better than any other tested)
- Sodium Chloride NaCl (yellow flame) – color flame clearly distinguishable
- Strontium Chloride SrCl₂ (red or crimson flame) – color flame clearly distinguishable

Flame tests were performed on damp CaCl_2 and LiCl . All other salts were dry. Wooden applicators need an additional flame source to burn. Just burning applicators alone did not produce a flame to be seen from more than a feet away. A Bunsen burner or handheld propane torch were used to provide spectacular results!

A picture is worth a thousand words!

						
Ba light green	Ca orange/red	Cu blue & green 	Li fuchsia	K lilac	Na bright yellow	Sr crimson

APPENDIX H

HIGH SCHOOL CHEMISTRY LABORATORY MINIMUM SAFETY EQUIPMENT

Mandatory Equipment	Location¹	Quantity	Initially Provided by	Maintained/ Replaced by	Inspections
Class ABC Fire Extinguisher	Science Areas	1 per location	Facilities Management	School	Monthly by teacher/SSC (sign tag) Annually by Facilities
Fire Blanket	Science Areas	1 per location	Facilities Management	School	Annually by teacher
Eyewash Station	Within 100 feet of areas of chemical use/storage	As needed to meet location requirement	Facilities Management	Facilities Management	Weekly by teacher/SSC (sign tag) Annually by Facilities
Safety Shower	Within 100 feet of areas of chemical use/storage	As needed to meet location requirement	Facilities Management	Facilities Management	Weekly by teacher/SSC (sign tag) Annually by Facilities
Dedicated Broken Glass Container	Science Areas where glassware is present/used	1 per location	School	School	None
Fume Hood ²	Chemistry Laboratory	1 per laboratory (or 1 shared between 2 labs with a common wall)	Facilities Management	Facilities Management	Annually by Facilities
Spill Kit	Chemical Storage Rooms/Areas	1 per location	Facilities Management	School	After each use and Annually by teacher
Nitrile Gloves (range of sizes)	Laboratories/Classrooms	2 pairs per student, plus 10%	School	School	None
Safety Glasses and/or Goggles	Laboratories/Classrooms	1 per student, plus 10%	School	School	Before each use by student
Aprons	Laboratories/Classrooms	1 per student, plus 10%	School	School	None
First Aid Kit	Laboratories/Classrooms	1 per location	Facilities Management	School	Monthly by teacher
SDSs for all chemicals and Right-to-Know Poster	Each Chemical Storage Room and Main Office (SDSs only)	1 per location	School	School	At least annually by teacher/SSC during ChemVentory update
NFPA Signage	Chemical Storage Room doors, Classroom doors, & Cabinets	1 per location	Facilities Management	School	At least annually by teacher/SSC during ChemVentory update
Evacuation Posting	Science Areas	1 per location	School	School	Practice evacuation procedures each fall and spring

1. A "Science Area" shall include but not be limited to the laboratory, the classroom, the preparation or prep room, and associated chemical storage areas.
2. A built-in fume hood is recommended in laboratories in which multiple labs require ventilation, or in which larger classes are taught. A portable fume hood is acceptable in laboratories in which labs requiring ventilation are infrequently performed.

APPENDIX I

PROCEDURES FOR SELECTING AND CLEANING SAFETY GOGGLES AND GLASSES**ANSI Standard for Eyewear**

OSHA requires personal protective equipment to meet the following standard for eye and face protection: **ANSI Z87.1-2010**. Eyewear that meets the ANSI standard will have a certification marking of “Z87” or “Z87+” molded into the frame. Boston Public Schools approved Vendors and Item Numbers should be used.

Goggles vs. Glasses

- Splash-proof safety goggles are required for science laboratory investigations involving ANY chemical that could damage the eyes. Goggles provide protection from potential chemical splash hazards.
- Safety glasses are mainly designed to protect eyes from flying objects or moderate impacts and are not sufficient for protecting the eyes from chemical splashes.
- ANSI does not provide specific standards for other factors that may be important to the teachers/students, such as durability, comfort, and chemical splash protection. As a result, it is the teacher’s responsibility to consider these factors when purchasing eyewear.

Keeping Protective Eyewear Clean

- A. To clean eyewear, place under UV lamps in a safety goggle sanitizing cabinet for approximately 15 minutes.
- B. If the classroom is not equipped with a sanitizing cabinet, an alternative option is to use a (safe) liquid disinfectant.
 1. First, place the goggles in a large bowl and pour the liquid disinfectant into the bowl. Make sure the goggles are completely submerged.
 2. Let the goggles soak in the disinfectant solution for approximately 10 minutes.
 3. Remove the goggles and allow them to air dry. Do not rinse the disinfectant off the goggles.
 4. Once goggles are dry, use a lint-free cloth to remove any remaining disinfectant and to clean the lenses.
- C. Eyewear can also be cleaned with disinfectant wipes; however, this method is not as effective as using a UV lamp cabinet or liquid disinfectant. Disinfectant wipes are primarily useful for removing dirt or body oils that may accumulate on the eyewear.

APPENDIX J

SAFETY EQUIPMENT INSPECTION CHECKLISTS

Inspections	Step 1	Step 2	Step 3	Step 4	Step 5
Fire Extinguisher (monthly)	Access and Signage: Verify extinguisher is in its intended location and is not blocked or otherwise obstructed. Ensure that it is easily visible with a locator sign posted above. Ensure that it is mounted on a wall or set in a cabinet with the instructions facing outward.	Pin and Gauge: Ensure that the plastic safety seal or tamper indicator has not been broken. Make sure that the pin is securely in place. If it is equipped with a gauge, make sure it is in the operable position (green zone).	Physical Condition: Verify the extinguisher is full by "hefting", or lifting it off of its hook. Make sure there is no obvious physical damage to the body or its hose or nozzle. Ensure the hose or nozzle is secured in place and is free of obstructions that would affect its use. Powder in the nozzle indicates that the fire extinguisher has been discharged and must be replaced.	Inspection Tag: Ensure the extinguisher has a current annual inspection tag from an outside vendor. Initial and date the back of the inspection tag to indicate that a monthly visual inspection has been performed.	Report missing, faulty, or damaged fire extinguishers to Facilities Management immediately.
Eyewash (weekly)	Operation: Verify the eyewash turns on in one second or less, stays on and flow is sufficiently high to allow user to hold eyes open while rinsing. (Place a bucket under drain line if needed.)	Spray Heads: Ensure unit washes both eyes. Ensure spray heads are clean and protected by covers which are removed/opened by water flow.	Inspection Tag: Ensure the eyewash has a current inspection tag. Initial and date the inspection tag to indicate that a weekly inspection has been performed.	Report faulty or damaged eyewashes to Facilities Management immediately.	N/A
Safety Shower (weekly)	Operation: Verify the shower turns on in one second or less and stays on until manually closed. (Place a bucket under drain line if needed.)	Spray Head: Ensure spray head is clean.	Inspection Tag: Ensure the shower has a current inspection tag. Initial and date the inspection tag to indicate that a weekly inspection has been performed.	Report faulty or damaged safety showers to Facilities Management immediately.	N/A
First Aid Kit (monthly)	Presence: Verify kit is present.	Stock: Ensure the kit is fully stocked.	Report missing first aid kits or supplies to the Science Safety Coordinator.	N/A	N/A

Annual Inspections	Step 1	Step 2	Step 3
Fire Blanket	Presence: Verify blanket is present, mounted and its location is marked by a sign or label reading "Fire Blanket".	Condition: Verify the blanket is in good condition.	Report faulty or missing fire blankets to the Science Safety Coordinator and/or Headmaster/Principal immediately.
Spill Kit	Presence: Verify kit is present and its location is marked by a sign reading "Chemical Spill Kit".	Stock: Ensure the kit is fully stocked.	Report missing spill kits or supplies to the Science Safety Coordinator.
SDSs	Presence: Verify hardcopies of SDSs for all chemicals stored in the area are present.	Current: Ensure the most current SDS is provided for each chemical and that the chemical inventory for the area is up-to-date.	Report missing SDSs to the Science Safety Coordinator or print the needed SDS from the manufacturer's website.
NFPA signage	Presence: Verify NFPA diamond stickers are located on all chemical storage room doors, chemical storage cabinets, and classroom doors in which cabinets and/or storage rooms are located.	Appropriate: Ensure the diamonds are filled out appropriately with the recognized hazard ranking of the chemicals stored.	Contact Science Safety Coordinator and/or Facilities Management for assistance in filling out NFPA diamonds.

APPENDIX K

FIRST AID KIT CONTENTS FOR SCIENCE AREAS

The following list sets forth the minimally acceptable number and type of first-aid supplies for first-aid kits in science areas at BPS. The contents of the first-aid kit listed should be replaced upon use.

1. 50-Alcohol Wipes
2. 20-Antiseptic wipes
3. 25-Triple Antibiotic Ointment
4. 40-Fingertip bandages
5. 1-Cold Pack
6. 10-Amonia Inhalants
7. 1-Triangle Bandage
8. 25-3"x3" Sterile pads
9. 100-1"x3" Plastic strips
10. 50-7/8" x3" Extra heavy weight strips
11. 40-Knuckle bandages
12. 5-Yds tri-cut adhesive tape
13. 1-bloodstoooper Compress
14. 1-4oz eyewash
15. 1-3oz burn spray
16. 1-3oz antiseptic spray
17. 20-3" cotton tip applicators
18. 1-scissor
19. 1-tweezer
20. 1-burn aid gel
21. 2-pair disposable nitrile gloves
22. 10-2x3" non-adherent sterile pads
23. 4-eye pads
24. 1-first aid handbook
25. 1 breathing barrier

APPENDIX L



**BPS SCIENCE SAFETY
EMERGENCY CONTACT LIST**

(To be posted in all designated science areas, classrooms and laboratories)

CLASSROOM NUMBER _____

**FOR ALL EMERGENCIES, FIRST CALL
POLICE, FIRE, AMBULANCE – DIAL 911**

THEN CALL THE MAIN OFFICE

THEN:

For all incidents in a science classroom or laboratory, contact:

FACILITIES MANAGEMENT

Environmental Specialist: 617-635-8300

SCIENCE DEPARTMENT

_____ : 617-635-8750

SCIENCE SAFETY COORDINATOR (SSC)

_____ : _____

APPENDIX M

An accident/ incident must be investigated to identify the root cause and contributing factors and to prevent or reduce recurrence. This form must be completed within 48 hours of the incident.	
Name of Individuals Involved in the Incident:	Click here to enter text.
School:	Click here to enter text.
Teacher/Supervisor(s):	Click here to enter text.
Witness (if applicable):	Click here to enter text.
Location of Incident (Room/Class):	Click here to enter text.
Date of Incident:	Click here to enter text.
Time of Incident:	Click here to enter text.
Name(s) of Facilities Management Staff Investigating Incident:	Click here to enter text.
Date of Investigation/Follow-Up:	Click here to enter text.
1. Description of task being performed when incident occurred:	
2. Description of incident (include materials, chemicals, equipment and people involved):	
3. Extent of injuries/damage/release of chemical:	
4. Response actions taken (first aid/medical attention/911/clean-up of spill):	

5. Was student/teacher provided training on hazards of work, including task-specific procedures, equipment, PPE, etc.?			
6. Was adequate PPE required and worn? Specify PPE worn at time of incident.			
7. Were standard operating procedures developed and followed?			
8. Were there other contributing causal factors (lack of sleep, stress, etc.)?			
9. Suggestion(s) to prevent recurrence of incident / reduce hazard (e.g., engineering controls, PPE, procedural/behavior changes, etc.) and names of people responsible to implement:			
Reviewed By:	Click here to enter text.	Date:	Click here to enter a date.
Approved By:	Click here to enter text.	Date:	Click here to enter a date.

APPENDIX N



RIGHT TO KNOW WORKPLACE NOTICE for Public Employees

The **RIGHT TO KNOW LAW, Chapter 111F** of the Massachusetts General Laws, provides rights to Public Sector employees regarding the communication of information on toxic and hazardous substances. These rights include:

LABELING - All containers in the workplace containing toxic or hazardous substances must be labeled. Labels must be clear, prominent, in English and weather resistant. When a chemical product is transferred to a smaller container, the smaller container must also be labeled. In 2014, manufacturer labels will begin to include pictograms. Products purchased before 2014 do not need pictograms. Tips for understanding pictograms are available at www.osha.gov.

MATERIAL SAFETY DATA SHEET (MSDS) - Public Employers must maintain Material Safety Data Sheets in an accessible location for employees. In 2014, manufacturers will begin calling the MSDS a "Safety Data Sheet" to comply with changes in the OSHA Hazard Communication Standard. Public Employers must update their MSDS / SDS files when a manufacturer updates the sheets.

TRAINING - Public Employers must provide annual training to employees who work with chemical products. New employees must receive training within thirty days from date of hire. The training must be conducted by a competent person. At a minimum, training must include an explanation of employee rights, information on how to read a chemical Safety Data Sheet, the specific hazards of the chemicals used or stored in the workplace, the type of personal protective equipment to be worn, and information on labeling of hazardous substances. This training must be done with pay during the employee's normal work hours. A record of this training must be maintained by the employer. A sample training outline is available at www.mass.gov/dols/wshp.

WORKPLACE NOTICE - Public Employers must post this Right-to-Know notice in a central location in the workplace informing employees of their rights under the law. This notice is not required for private companies covered by the OSHA Hazard Communication standard.

NON-DISCRIMINATION - An employee who believes he or she has been discharged or disciplined by an employer for exercising rights granted under the Law, may file a complaint with the Director of the Department of Labor Standards. A copy of the complaint must be sent to the employer at the same time by certified mail.

All Right-to Know inquiries should be addressed to:
Department of Labor Standards
167 Lyman Street, Westboro, MA 01581
Tel: 508-616-0461 or Email: safepublicworkplace@state.ma.us

More safety and health information for public sector workplaces is available at www.mass.gov/dols/wshp.

APPENDIX O

School _____ Room # _____ Time _____ Date _____

Attendees _____

#	Criteria To Be Inspected	Acceptable	Needs Improvement	Comments
1	Students are required to wear safety glasses at all times			
2	Personal protective equipment is provided to students when appropriate			
3	Students are required to wear appropriate clothing and footwear during lab exercises			
4	No food or drink is present during lab exercises			
5	Doors to centralized chemical storage area are NFPA labeled			
6	Laboratory conduct signage is visible for students			
7	Emergency Evacuation route is posted and visible to students			
8	Doors to centralized chemical storage area are locked			
9	Doors to science labs/classrooms are locked			
10	Fire extinguisher is accessible (not blocked)			
11	Walkways and exits are accessible and free of obstacles.			
12	Eye wash/deluge shower is accessible (no other materials stored nearby)			
13	All sinks are free of trash and other materials			
14	Hood shall not be used for storage. Hood is only used when functioning.			
15	Each science classroom/lab has a broken glass container			
16	All laboratory surfaces are kept clean (no spills, powders, liquids)			
17	No evidence of chemical disposal down the drain			
18	Hazardous waste storage area is well defined			

#	Criteria To Be Inspected	Acceptable	Needs Improvement	Comments
19	No stock chemicals are present in the classroom/lab/hood(s)			
20	All chemical solutions are properly labeled with name, concentration, date, and preparer			
21	All chemicals in chemical storage area are properly labeled and shelved			
22	No storage of flammable materials on top of cabinets			
23	Over-the-counter chemicals are labeled "For Lab Use Only" and stored in prep/storage area			
24	Unknowns are labeled with a code which is listed elsewhere in the classroom/lab.			
25	No chemical solutions are left out in the classroom/lab area over vacation.			
26	Refrigerator is labeled "For Lab Use Only" and is used only for such. Interior is clean and free of spills.			
27	Microwave is labeled "For Lab Use Only" and is used only for such. Interior is clean and free of spills.			
28	No toaster ovens, toasters, and/or coffee makers are in classroom/lab area, prep rooms, and storage areas.			
29	Food is stored separately from chemicals.			
30	Electrical equipment is plugged into grounded outlets only (GFI).			
31	Electrical hot plates only are used (no alcohol or natural gas burners).			
32	Eye wash is clean and functional.			
33	Fume hood is functional (including fans).			
34	Fire extinguisher has been inspected.			
35	Main gas valve is turned off and locked.			

For additional guidance, please refer to "Science & Safety: Making the Connection" by the Council of State Science Supervisors (CSSS), accessible at: www.csss-science.org/downloads/scisafe.pdf

Inspected by _____ Date _____

Signature _____

APPENDIX P

SUMMARY OF MWRA SEWER DISPOSAL DISCHARGE PROHIBITIONS

The following **summary** list of MWRA **Sewer Disposal Discharge Prohibitions** (intended for protection of MWRA sewerage system workers, facilities, and equipment) was summarized by the EH&S office for laboratory personnel. None of the items on this list can be disposed of down any sink drain or any other way that will introduce the materials into the municipal sewerage system:

- (1) Any water or wastewater with a pH lower than 5.5 or higher than 10.5
- (2) Any liquid, solid, or gas, including, but not limited to, gasoline, kerosene, naphtha, benzene, toluene, xylene, ethers, alcohols, ketones, aldehydes, peroxides and methyl ethyl ketone, which is fire or explosion hazard or is otherwise injurious either alone or by interaction with other substances.
- (3) Any noxious or malodorous liquid, gas, or solid, or any other pollutant which either singly or by interaction with any other waste causes a public nuisance, a dangerous situation, or which results in the presence of toxic gases, vapors, or fumes that may cause acute worker health and safety problems.
- (4) Any hazardous waste, or any wastewater which results from the treatment of hazardous waste.
- (5) Any discharge of mercury, PCB, pesticides or phenanthrene.
- (6) Any substance containing pathogenic organisms in such quantities as determined by local, state, and/or federal law as hazardous to the public health or the environment.
- (7) Concentrations in excess of the following values:

Material	Daily Maximum Limit (mg/l)
Antimony	10.0
Arsenic (total), Chromium (hexavalent), Cyanide (total), Phenolic Compounds (defined in 360 CMR 10.00)	0.5
Boron	20.0
Cadmium	0.1
Chlorinated Naphthalenes	0.8
Chromium (total), Nickel, Toxic Organics (not elsewhere listed in 360 CMR 10.00), Zinc (total)	1.0
Copper, Fluoranthene	1.5
Fats, oils, and grease (total)	300.0
Hexachlorobutadiene	3.0
Lead	0.2
Pentachlorophenol	0.05
Material	Daily Maximum Limit (mg/l)

Petroleum Hydrocarbons	15.0
Phenol, Selenium, Total Toxic Organics	5.0
Silver	2.0
Trichloroethylene	0.07

Reference: Massachusetts Water Resources Authority, 360 CAR 10.0 Sewer Use.

LABORATORY CHEMICAL WASTE COLLECTION GUIDELINES FOR COMPLIANCE WITH THE UNIVERSITY'S MWRA SEWER USE DISCHARGE PERMIT

- (1) No person shall discharge, or allow to be discharged, directly or indirectly, into the MWRA sewerage system, hazardous waste or pollutants beyond allowable discharge limits as outlined in MWRA sewer regulation 360 CAR 10.00, and as summarized in Lab Safetygram 002B, 1194. In laboratories, the most common routes for hazardous chemicals to get into the sewer system are through the sinks and floor drains.
- (2) Wastes must be stored and accumulated in locations a safe distance away from sinks and floor drains.
- (3) Wastes must be collected in compatible containers, preferably the original container.
- (4) A container holding hazardous waste shall not be opened, handled or stored in a manner which may rupture the container or cause it to leak.
- (5) Containers or waste chemicals must be separated from virgin and stock chemicals.
- (6) Containers of incompatible waste chemicals must be segregated from one another to prevent accidental contact which could result in a fire, explosion, and/or unexpected release of a toxic liquid or vapor.
- (7) Waste containers must be tightly sealed at all times with a screw top (exception: when adding waste).
- (8) Waste containers must be inspected weekly for cracks, leaks and deterioration.
- (9) Waste containers must be labeled with:
 - (a) The words "Laboratory Waste".
 - (b) The full chemical name(s), **not** formula or structure.
 - (c) The type of hazards(s) associated with the waste (e.g., ignitable, toxic, corrosive, reactive)
 - (d) Chemical mixture identified by approximate percent or volume compositions for every hazardous chemical component.

Massachusetts Water Resources Authority, 360 CMR 10.00 Sewer Use Department of Environmental Quality Engineering, 310 CMR 30.00 Hazardous Waste Regulations.

APPENDIX Q

APPENDIX R

