浙江大學
ZHEJIANG UNIVERSITY

LABORATORY SAFETY MANUAL

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PREFACE

Nothing is more valuable than life, and ensuring safety is of paramount importance. Safety is fundamentals of all human social activities and the prerequisite of reform and development. Public safety is a restriction line that can never be crossed and it has the supreme priority, stressed frequently by General Secretary Xi Jinping. In recent years, laboratory safety accidents have frequently occurred on campus, many of which may even take lives away. We must be alert to those misfortunes and keep awake. To ensure safety, we should insist on the conception of people oriented and can never slack.

Prevention is critical to ensure safety, which depends on Initiative study and common participation of both the laboratory safety administrative staff and front-line personals. There are no shortcuts to keep safety and we should follow the safety code all the time. We really believe that possessing necessary safety knowledge and skills before entering the laboratories are crucial to prevent and avoid laboratory safety accidents.

This laboratory safety manual supplies systematic safety guidance, which can help staff and students obtain essential safety knowledge and train safety awareness. We hope this manual is also inspiring for cultivating good experiments habits, strengthening capacity on emergency, and building a safer and healthier laboratory environment.

It should be noted that this manual was compiled only for generalpurpose uses, which involves laboratory risk points, key operating points, emergency measures, etc. More professional instructions and norms should also be learned and followed before entering the lab. All staff and students should read this manual thoroughly before entering the lab and obey safety rules when carrying out experiments.

The authors

June, 2019

Key Contacts

- Fire alarm: 119
- Police: 110
- Emergency Medical Aid: 120

Campus 110: 88206110 (Zijin'gang Campus)
87951110 (Yuquan Campus)
88273110 (Xixi Campus)
86971110 (Huajiachi Campus)
86592777 (Zhijiang Campus)
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88208993 (Laboratory Technical Safety Office, Zijin'gang Campus)
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88273305 (Xixi Campus)
86971174 (Huajiachi Campus)
Department of General Affairs:
88981555 (Campus Management Office, Zijin'gang)
87952195 (Yuquan Campus)
88273378 (Xixi Campus)
86971663 (Huajiachi Campus)
Research and Education Service Center of Logistics Group:
88981955 (Chemicals Purchasing Consultation)
87951083 (Yuquan Campus)

Contents

I . General safety guidelines

1. Learn and follow all established laboratory regulations before entering. Strictly carry out all operation procedures and keep records where relevant.
2. Ensure the visibility of the lab observation window. Post safety information placards at lab entrance and update them in time.

3. Before entering the lab, one should learn the corresponding risk points, and adopt appropriate safety precautionary measures.
4. Smoking, eating, sleeping, wearing slippers and lighting mosquito-repellent incense are forbidden in the laboratory. Heating equipments including electrical oil heaters and electric radiators are not permitted to use unless for the research purpose. Unauthorized personnel is prohibited to enter the laboratory.
5. Never break away from the position in the process of experiment. At least one companion is needed for any dangerous experiments which should be arranged during work time. Experiments shall be scheduled and conducted properly in accordance with Regulations on conducting experiments during special period in Zhejiang University.
6. Keep the lab tidy and floors dry, and dispose waste material timely.

Clean up and put everything back after use, immediately. Lock door whenever leaving the lab, even temporarily. The last one leaving the lab should check the water, electricity and gas, close the windows and doors.

7. In non-experimental areas (like elevators, offices, lounges and meeting rooms, etc.), one should not wear protective articles such as lab coats or gloves.
8. Ensure smooth flow of fire exits. Do not place the electric bicycles inside the lab, or block the evacuation exit, and charging the bicycle battery in these areas is strictly prohibited.
9. Stop experiments once hazardous conditions are detected. Take corresponding measures promptly to eliminate them. Do not take any risks.
10. When handling incidents, assess calmly, judge properly, act timely, manage effectively, report it to supervisors and others, evacuate promptly when things get out of control, look after each other, and ensure everyone's safety.

Ⅱ. Water & electricity safety

ⅰ: Electricity safety

1. The capacity and plug of laboratory circuit should match the power output of all the equipment and device. Install air switch, leakage protector. For device that requires high power, use a separate circuit.
2. Do not take apart, change or fix electrical appliances on your own. Do not splice electric wires. Do not use knife switch, wooden switch panel or moldings.
3. When using electrical appliances, please keep hands dry. When hands, feet or other body parts touch wet floor, do not power on or touch electrical appliances charged with electricity.
4. For dangerous zones having high voltage or large currents, caution signage should be posted to warn people to stay away.
5. All apparatus and appliances (air conditioners, computers and drinking fountains, etc.) should be powered off at night when last one leaving. In inevitable cases, sufficient protection must be taken for the all-night running ones.
6. When any electrical appliances catch fire, switch off the power first before using water or fire extinguisher to put out fire. If it is impossible to cut off the power, quench the fire using non-conduction extinguishing agent like powder extinguishing agent or CO_2.

ⅱ: Water safety

1. Learn about the location of water valves in lab buildings. When the water taps or pipe is leaking or blocked, fix or dredge it in a timely manner.
2. Make sure that once the water tap is turned on, it will not be left unattended.
3. Check regularly if the hose connecting cooling water device is aging and change it promptly to prevent leaking.

Ⅲ. Chemical safety

ⅰ: Purchase of chemicals

1. All chemicals listed in Catalog of Hazardous Chemicals-2015 must be purchased on the Chemicals and Materials e-procurement Platform (hereinafter referred to as the platform, http://buy.zju.edu.cn). The delivery service is provided by the suppliers. All purchasing processes including payment and settlement are all online, so users are free from the exhausting reimbursement affairs.
2. In principle, experiment gas shall be purchased from authorized online suppliers on the platform.
3. The purchase of narcotic or psychiatric drugs shall be purchased after being approved by relevant departments of the University and government, and reimbursed after registering on the platform.
4. Common chemicals (Non-hazardous chemicals) can be purchased on the platform or independently. In case of purchasing independently (including gases which are not supplied by authorized gas suppliers), the suppliers should be approved with qualification.
5. For more information on placing orders and approval process of various chemicals (including experiment gas), see the notice on the front page.
6. Illegal purchase (obtain) or unofficial transfer of hazardous chemicals (especially controlled chemicals), narcotic drugs or psychiatric drugs is prohibited.

ⅱ: General principles of chemical preservation

1. All chemicals and reagent must be tagged with identifiable labels, which should be single, complete and instructive. The label on self-made reagent shall include the information such as name, concentration or purity, person responsible, date of the reagent or reaction product.
2. The places storing the chemicals should be clean, well ventilated, safety with good insulation and away from heat or fire.
3. Do not store large quantity of reagent in the laboratory, especially the flammable, explosive ones and strong oxidants.

4. Chemicals should be stored in tightly sealed containers and properly categorized. Do not store chemicals together that are incompatible or can produce strong reaction.
5. User account shall be established and updated for chemicals in labs. Dispose waste chemicals timely.

iii. Requirements for storing by category of dangerous chemicals

1. Highly toxic chemicals, explosives, precursor chemicals in Category I, narcotic drugs and psychiatric drugs should be stored in a safe or fridge with double lock. The request, transport, usage and lock of those chemicals should be conducted by at least two persons simultaneously. Keep relevant records in time.
2. Explosive-prone chemicals and precursor chemicals in Category II or III should be stored in locked containers, and the use log should be also in good maintenance.
3. Explosives should be stored separately from flammables or oxidants under 20 centigrade. Better to be stored in an explosionproof reagent cabinet or fridge.
4. Corrosive chemicals should be placed on the lower shelf of the anticorrosion reagent cabinet or in an anti-corrosion tray in an ordinary reagent cabinet.
5. Reducing agent and organic substance should not be stored together with oxidants, sulfuric acid or nitric acid.
6. Strong acid, especially sulfuric acid, should not be stored together with strong oxidant salts like potassium permanganate and potassium chlorate. Do not mix salts like potassium cyanide, sodium sulphide, sodium nitrite, sodium chlorate and sodium sulfite with acids as they might create toxic gases.
7. Place chemicals that can create toxic gas or fume in a ventilated reagent cabinet.
8. Alkali metal like sodium or potassium should be stored in kerosene, whereas yellow phosphorus and mercury should be stored in water.
9. Do not mix medicines like acetic anhydride, acetyl chloride and thionyl chloride that are likely to hydrolyze with aqueous solution, acid or alkali.
10. Do not store halogen (fluorine, chlorine, bromine and iodine) with ammonia, acid and organics.

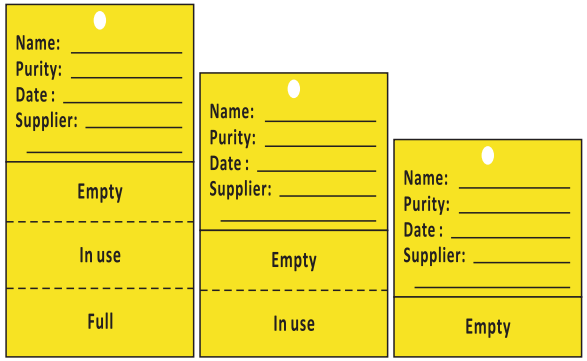
11. Do not mix ammonia with halogen, mercury, hypochlorous acid and acid.

iv: Usage of chemicals

1. Read Material Safety Data Sheet (MSDS) before experiments. Learn about the properties of various chemicals and take proper protective measures.
2. Follow the lab instructions strictly. If possible, try to reduce the usage of dangerous substances or replace them with low-risk substances.
3. Maintain good ventilation in the workplace. Do not directly touch, taste or smell the chemicals.
4. Do not heat organic solvent with open flame. Do not dry flammable organics in an oven.
5. Lab personnel should wear goggles, fitted white cotton coats with long sleeves, trousers, socks and other protective equipment when carrying out a chemical experiment, while contact lenses is strictly prohibited (Comment: Cotton lab coats are not recommended for handling flammable materials!)

Color of cylinder	Name of the gas
Black	Air, Nitrogen
Silver grey	Argon, Neon, Helium,Sulfur Dioxide, Carbon Monoxide, nitrogen monoxide (laughing gas), Sulfur Hexafluoride, Hydrogen Fluoride
White	Ethane, Nitric Oxide, Nitrogen Dioxide
Aluminum white	Carbon dioxide,Tetrafluoromethane
Light yellow	Ammonia
Brown	Ethylene, Propylene, Methane, Propane, Cyclopropane
Light blue	Oxygen
Light green	Hydrogen
Dark green	Chloride

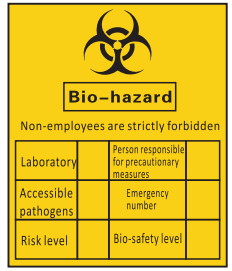
3. Reject gas cylinders without safety cap or bump protection ring, color signs and labels that certify its safety.
4. Check whether there is a status mark on the gas cylinder. If necessary, improve information likes name, purity, purchase date, supplier, etc.
5. Gas cylinders should be properly fixed in dry and ventilated places far away from heat sources. Avoid direct sunlight or strong striking. Gas should be stored by categories, and make sure flammable gas and combustion-supporting gas are stored separately.
6. The numbers of the gas cylinders shall be limited in labs.Laboratories using flammable, explosive or poisonous gas shall be equipped with gas monitoralarming devices.
7. Arrange and mark gas pipes appropriately. Use metal pipe for flammable, explosive, poisonous gas. Do not use copper pipe for ethane, ammonia or hydrogen.



8. Turn on/off the main valve or the pressure reducer slightly and slowly. When turning on the gas cylinder, switch the main valve before pressure reducer. Once after using, turn off the main valve and releaseall the remaining gas. Then turn off the pressure reducer.
9. Tear off suited part of the cylinder status mark along the dashed line according to actual situation. Make sure they are consistent.
10. Choose adaptive pressure reducer for different gas. Check for leakage after installation. Be cautious about leakage and be aware of the pressure gauge reading during working.
11. In cases where reflux might take place, install equipment like one-way valve, non-return valve and buffer tank connecting the system pipes or equipment to prevent reflux.
12. Do not use up the gas in the cylinder. Retain some residue pressure.
13. If leaking, shut the gas source valve, open windows and evacuate people around. Do not switch the electrical power during the leakage of flammable or explosive gas.

Ⅳ: Biological safety

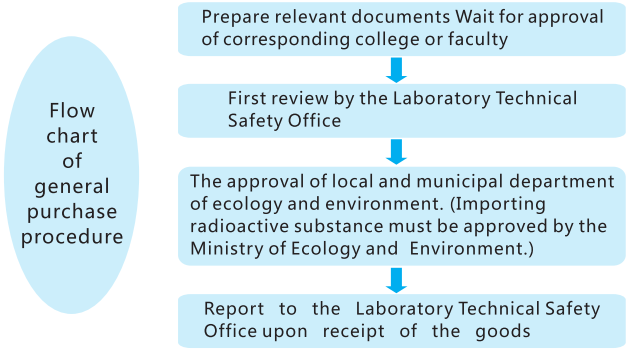
1. Experiments using pathogenic microorganism must be carried out in a bio-safety laboratory approved by the Ministry of Public Health or the Ministry of Agriculture. Biologically safe laboratory includes BSL-1, BSL-2, BSL-3 and BSL-4. Experiments involving highly pathogenic microorganisms are not allowed in BSL-1 and BSL-2, but can be carried out in BSL-3 or BSL-4 laboratory once authorization is obtained from the public health or agriculture department of the state council.
2. Workers should receive bio-safety training provided by the provincial public health or agriculture department and obtain Laboratory Biosafety Training Certificate. Strictly follow laboratory procedure guidelines.
3. Bio-safety laboratories of different levels should be equipped with bio-safety cabinet accordingly. On the door of the laboratory, there should be placards identifying bio-hazard. Always keep the doors closed. People are not allowed to enter without permission of the person in charge.



4. Strains of Viruses and bacteria as well as biological samples containing pathogenic organisms should be enlisted and kept by specific persons. There should be two people for lock-up and acquisition. Keep record of the purchase, storage, experimenting and disposal of strains of virus or biological sample.
5. Sterilize regularly laboratory, objects and equipments with autoclave or disinfectants that might have been contaminated with pathogenic microorganisms.
6. Breed laboratory animals and carry out experiments on animals in a laboratory with a permit for Laboratory Animal Experimentation.
7. Animals should be purchased from a company with a permit for Raising Laboratory Animals. The Animal Quality Certificate is required. Follow the rule of “3R” (reduction, refinement, replacement). Try to use other methods or replace higher order animals with lower order animals.
8. If emergency occurs, take the most effective measures to control the affected area. Report to the supervisor, Department of Laboratory and Equipment Management, and Department of Safety and Security.

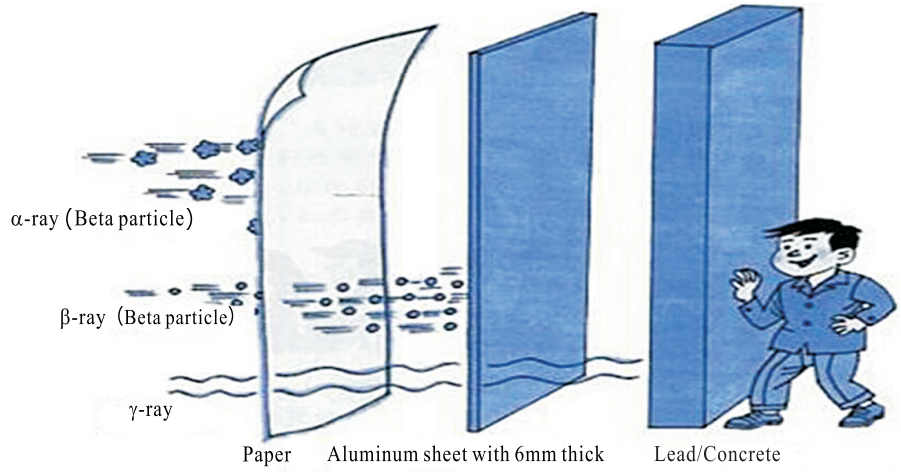
V: Radioactive safety

1. The radioisotope and radiation-generation devices shall be used under the Radiation Safety Permit which is authorized by Department of Ecology and Environment. Radiation affected areas shall be identified with warning signs and placards. Specific personnel is necessary for recording the usage of the radioactive sources and unsealed materials and checking regularly to ensure the items match the account book. Idle or residual unsealed radioactive material should be sent back to the Radioactive Material Temporary Warehouse.
2. Concerned personnel should receive professional training provided by qualified environmental agency and acquire a Radiation Safety and Protection Training Certificate. Upon certificate expiration (4 years), retraining is necessary.
3. Concerned personnel must attend the occupation health physical checkups arranged by university, and the time span since last checkup should not exceed 2 years.
4. Personnel involved in experiments with radiation should take the necessary protective measures, operate according to guidelines, avoid air contamination, surface contamination and external radiation accidents. Wear dosimeters correctly. Participate in monitoring.
5. Students should attend lectures on radiation protection and safety provided by advisors. Advisors are responsible for the instructing, supervising, and examining processes.
6. The purchase of radioactive substances must be approved by municipal department of ecology and environment, after the precheck



by the laboratory and equipment management department of university. For importing radioactive substance, the extra approval by Ministry of Ecology and Environment is needed.

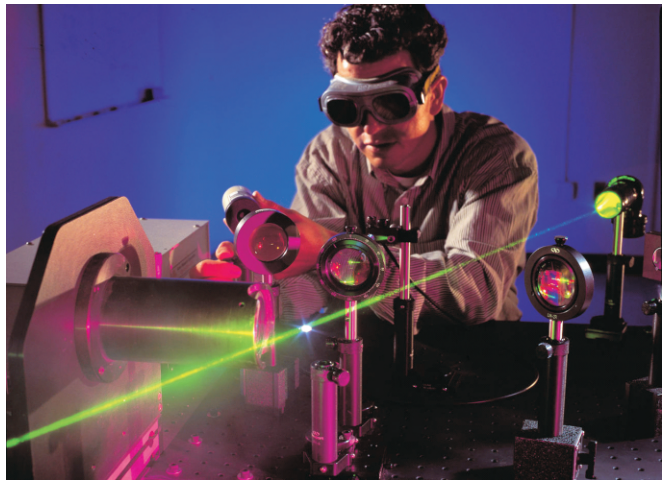
7. If radioactive source spills or the package is broken, close all doors and windows as well as shut down the ventilation system. Report to the supervisors and the related departments immediately. Launch the emergency response and notify the neighboring staff to evacuate. Strictly control the affected area. Forbid irrelevant personnel to enter. Reduce and control the level of effect.
8. After finishing all the procedures applying to discard radiationemitting devices like X-ray diffractometer, the crush of pressure vessel should be supervised by the staff from department of ecology and environment and the university laboratory and equipment management department.
9. Basic Protection Measures against Radiation: As for external exposure, time protection, distance protection and shielding protection shall be taken, namely reduce exposure span, increase distance to radioactive source (or material) and applying correct and proper shielding measures (using different shielding device accordingly to radiation). As for internal radiation, take effective measures to prevent radioactive material from entering the body through respiratory system, mouth and skin.



Ⅵ: Laser safety

1. Laser box and control panel should be labeled with warning signs for anyone entering the lab.
2. The person conducting laser-related experiments should have eceived relevant training. Operate according to the established laboratory procedures. During experiments, there should be super-vising personnel present.

3. Before laser-related experiments, remove all items that may reflect laser light (like watch, ring and bracelet) to avoid laser beam being reflected.
4. Conduct laser experiments under ample light. Meanwhile, take necessary precautionary measures. Do not stare directed into laser beam or refracted light. Avoid exposing the body to laser beam without proper protection.
5. The person conducting laser-related experiments should receive optical examination and recheck regularly (once year).
6. Forbid harming other people when conducting laser experiments.



Ⅶ: Special equipment safety

ⅰ: General management

1. Registration: After erection and tuning, before or within 30 days after being put into use, special equipment shall be reported and registered to Special Equipment Safety Supervision Department, obtaining the permission license. Place the license on noticeable position.
2. Establishing safety technology record: Staff should establish a safety technology record for newly purchased or transferred special equipment. The Record shall contain: technology document with the equipment, contract and technology document of erection, maintenance, repair and modification, registration of use, routine inspection report, working status record, operation regulation and emergency plan, and operator certificate etc.
3. Routine inspection: All staff should observe the safety technology regulation and file for routine inspection to Special Equipment Inspection Institutions one month before the license expires. Special equipment cannot be put into use unless it goes through and passes routine inspection and within the license validity.
4. Operators working with Certificate: Management personnel and operators of special equipment should be trained and obtain Special Equipment Worker Certificate before doing such work, as well as strictly follow operation procedure and relevant safety regulations.

ⅱ: Lifting Equipment

1. Lifting equipment with rated lifting capacity more than 3 tons and lifting height more than 2 meters should obtain Special Equipment Application Registration License.
2. Lifting equipment in service should be given at least one routine maintenance and inspection in one month with record.
3. Draft safety operation regulation and post warning signs at noticeable places. Prepare necessary protection measures.
4. Lifting equipment must not lift objects exceeding the allowed limitation.

5. Any people should not stay within the range of the crane.

iii: Fixed pressure vessel

1. Fixed pressure vessel with working pressure no less than 0.1 Mpa and volume no less than 30 L, except of simple pressure vessel, must acquire Special Equipment Application Registration Certificate and Pressure Vessel Registration Card.
2. Safety valves and pressure gauges should be routinely tested and inspected by authorized institutions.
3. Large volume container of experiment gas (suffocating and combustible type) must be positioned outside of room. Surrounding it shall be set isolating barrier and safety warnings.
4. Draft and post operation regulations for fixed pressure vessel.
5. If there is anything abnormal, stop the equipment immediately and report to management personnel.

Ⅷ: Common apparatus safety

i : Fridge

1. Put the fridge in locations with good ventilated and free from heat source, flammable, explosive substances and gas cylinders. Leave out space for heat dissipation.
2. Label fridge containing hazardous chemicals with warning signs. Label all the reagents in the fridge and clean up on a regular basis.
3. Hazardous chemicals should be stored in an explosion proof fridge or an ordinary fridge altered to be explosion proof. Cap and seal the containers with volatile organic reagent to avoid vapor accumulation in the fridge.
4. Stabilize the test tubes (with plug) and those containers with high center of gravity like flasks. Otherwise, they might fall and break because of the open and shut of the door of the fridge.
5. Do not store drink or food in the fridge.
6. If the fridge shut down, transfer chemicals instantly and store them properly.

ii : High-speed Centrifuge

1. High-speed centrifuge should be placed on stable and flat table. Tighten the cap before running.
2. Centrifuge tubes should be spaced out evenly to ensure the balance.
3. Ensure that the centrifuge safety switch functions. Do not open the cap of centrifuge before cutting off the power.

iii: Heating Equipment

1. When using heating equipment, take necessary protective measures. Strictly follow the operating guidelines. During operation, operator must not leave the place (at least 10-15 minutes between every observation). After use, turn off the power.
2. Heating or thermal equipment should be placed on stable, flame-

Zhejiang University Laboratory Open Flame Furnace

Permit of Use

Serial no. 2012001

College	**college	Laboratory (institute)	**institute
Premise of use	**campus**building**room		
Number of open flame furnaces	4	Power	1000W/each
Person in charge	***	telephone	12345678
Note	1.This permit must be posted at the place of using open flame furnace. Any department or individual shall not alter the place of use. 2.Use the open flame furnace only when there is someone present. 3.Maintain the place clean and tidy. Do not store flammables or explosives around.		

Department of Laboratory and Equipment Management
March 2012

retarding experimenting table or on the ground. Do not pile flammable, explosive substances or other items near it.

3. Forbid using heating device to bake volatile flammable substances like solvent, oil products and plastic crate. If the heating creates toxic gases, operate in fume hood.
4. Do not use open flame furnace in the laboratory. If one must use it for a special occasion, apply for Open Flame Furnace Permit from the Department of Laboratory and Equipment Management.
5. When using hot wire furnace, make sure that the wire is in good contact with the heating rod. Humid gas must be dried before entering the furnace.
6. Avoid the water bath to run dry. Make sure that water does not spill into electricity junction box.
7. When using hairdryer or electric heat gun, do not jam or cover the air inlet or outlet. Unplug after use.

Ⅸ: Disposal of Laboratory Waste

Laboratory waste mainly refers to chemical waste, biochemical solid waste and radioactive waste, etc.

ⅰ: Chemical waste

1. Waste fluids should be stored separately by categories and sent for disposal in time.
2. Store waste fluids temporarily in designated containers, and the fluid level should not exceed the 2/3 mark. These containers should be labeled with designated chemical waste tags which are sold on the platform.
3. When gathering chemical waste, be cautious to avoid violent reaction. Store waste fluids separately if reaction will happen after mixture.
4. Waste bottled reagent disposal should first fill out disposal registration form of Zhejiang University. Make sure the waste bottles have been clearly labelled. The information is aggregated by the office of the college, and then submitted to Department of general affairs who is responsible for disposing waste bottled reagents by 20th each month.

Zhejiang University Chemical Waste Label

Category of Waste

- Organic waste fluid (☐ Class-A ☐ Non Class-A)
- Inorganic waste fluid ☐ Neutral ☐ Acidic ☐ Alkaline ☐ with mercury ☐ with arsenic ☐ with heavy metal
- Other (☐ Solid chemical waste ☐ empty bottle)

Property of Waste

☐ Highly toxic ☐ Corrosive
☐ Toxic ☐ Spontaneous combustion
☐ Flammable ☐ Combustion upon water
☐ Explosive ☐ Narcotic
☐ Other _____

Main composition:_____
Manufacturer: _____
Name of the Laboratory:_____campus_____
building_____ room number
Person of transport and storage:_____ Date of delivery:_____
Phone No. :_____ Registration No. :_____

5. Store organic waste fluids of A Class, organic waste fluids containing halogen, inorganic waste fluids containing mercury, arsenic or heavy metal separately. Do not mix them with others.
6. Chemical waste that are radioactive, explosive, contagious, polychlorinated biphenyl or dioxin must be changed their chemical properties first with safe and scientific ways before transported to the chemical waste pickup point in the campus.
7. Highly toxic chemical waste should not be mixed with general chemical waste and should be disposed by the university regularly.

8. Collect or adsorb and decompose toxic gas before release.

ii : **Bio-chemical solid waste**

1. Bio-chemical solid waste should be gathered in specific yellow plastic bags for sorting and then labeled with bio-chemical waste solid (labels can be purchased on the Platform).
2. Waste equipment with sharp tips should be packaged securely in cardboard boxes.
3. Wastes contaminated by pathog enic microorganisms must be sterilized in the laboratory before being transportation.

Zhejiang University Bio-chemical Waste Solid Label

Laboratory: _____

Department: _____

Carrier: _____

Date: _____

Note: _____

iii : **Radioactive Waste**

1. The classification, treatment, disposal, transportation and temporary storage of radioactive waste shall follow the state law and regulation.
2. Disposal agreement with some qualified agency should be prepared for sealed radioactive sources and Isotope with long half-life. The office of laboratory and equipment management should keep a record on the disposal agreement.
3. Isotope with short half-life should be separately collected according to the half-life and the date of production. Store them for 10 half-lives in specific radioactive waste containers. Once the residue radiation reaches the background level, dispose the isotope according to guidelines for generate laboratory waste.
4. Radioactive chemical waste should be disposed by the qualified companies.

5. Radioactive Waste that has decayed to background level of radiation should be disposed according to guidelines for average laboratory waste.

iv: All laboratories should take scientific and safe measures to reduce the quantity and hazardousness of laboratory waste. Do not mix laboratory waste with household waste.

v : Laboratory waste disposal personnel should ensure traffic safety and personal protection.

vi: The disposal of laboratory waste should go through online registration. Laboratory should report and declare disposal situation through the platform or WeChat public platform（ZJU Laboratory Safety).

vii : Laboratory waste disposal personnel should deliver the waste to Laboratory waste pickup point of each campus at designated time and comply with themanagement of the station. Improper waste delivery will be rejected accordingly.

Campus	Waste Type	Working Time	Pickup point Add.	Contact	Remarks
Zijin'gang	Non-organic chemical Waste	Mon. Wen. Fri. 8:30 - 11:30	South -west corner of Medical college building	Zhang Lihua 13757136038	Not for animal body.
	Organic Chemical Waste	Tus. Thu. 9:00 - 11:00			
	Bio-chemical Solid waste	Working days 9:00 - 11:00			
	Bio-chemical Solid waste	Everyday 8:30 - 16:30	Experiment Animal Center	Zhou 13588011086	Only for animal body
Yuquan	Non - organic chemical Waste	Mon. Wen. Fri. 9:00 - 11:00	1.Yard west to 10th Teaching Building	Lv Yinjiang 13588759731	——
	Organic Chemical Waste	Tus. Thu. 9:00 - 11:00	2.Yard of 8th Teaching Building	Xu Zhenguang 15990024896	——
	Bio -chemical Solid waste	Working days 9:00 - 11:00	Yard west to 10th Teaching Building	Lv Yinjiang 13588759731	Including animal body

Huajiachi	Non-organic,Organic chemical Waste	The first Thursday each month 9:00 - 11:00	North of Old Library (West of Parking Lot)	Wang 18067960735	
	Bio -chemical Solid waste	Mon. Wen. Fri. 9:00 - 11:00			Including animal body
Xixi	Non - organic chemical Waste	Wednesday 10:30 - 11:00	in front of West 7th Chemical Building	Fang 13588277893	——
	Organic Chemical Waste	By Notice			——
	Bio - chemical Solid waste	Mon.Fri. (even numbered weeks) Tue. Thu. (odd-numbered weeks) 10:30 - 11:30			——
Contact: Contact: Ping Yufeng 13957103214 (Research and Education Service Center of Logistics Group)					

Note:

Detailed classification requirement and disposal information of each campus should be based on notices by Department of General Affairs, Department of Laboratory and Equipment Management.

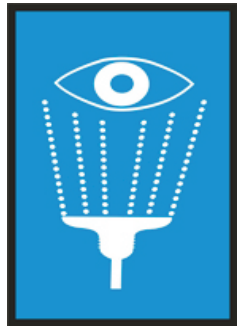
X. Facilities and individual protection

i: Fire-fighting facility

1. Laboratories should be equipped with appropriate fire-fighting facilities (smoke detector, extinguisher, fire blanket, sand bucket, fire sprinkler, etc). Ensure the validity and accessibility.
2. Post emergency evacuation map on a place where it can be seen easily, and make sure the map is consistent with the truth.
3. Be familiar with location of the fire-fighting facility and master the methods of dealing with fire risks. Personals in laboratories shall participate in evacuation drills zealously in the usual.

ii: Emergency shower and eyewash station

1. Be familiar with location of the emergency shower and master their usage.
2. Use emergency shower and eyewash station carefully. Maintain the access corridors clear. Do not use them unless there is a laboratory accident (except for repair).
3. Conduct maintenance on the emergency shower and eyewash station on a regular basis to ensure proper function. Keep records immediately.
4. In case of emergency, pull the hook handle of the emergency shower to wash.
5. After use, clean up the surroundings.



iii: Fume hood

1. Do not store chemicals in or under the fume hood.
2. When operating, raise the visual window to a height of 10-15cm above the table-board so as to ensure the ventilation effect and protect the operator's upper body.
3. During experiments, do not extend the head into the fume hood. Do

not leave the disposable gloves or other lightweight items like plastic bags in the fume hood lest the air outlet should be jammed.

4. Too much items or apparatuses inside the fume hood would interrupt the airflow. To prevent items inside the fume hood from falling out, keep them around a distance of 15cm to the inner edges of the adjustable glass.
5. Power outlets are not allowed to install inside the fume hood involving with flammable, explosive and organic reagents.
6. Check the exhaust performance on a regular basis. Maintain the ventilation effect.
7. If there is mal-function, do not conduct any experiments. Immediately close the hood window and contact maintenance personnel for repair.

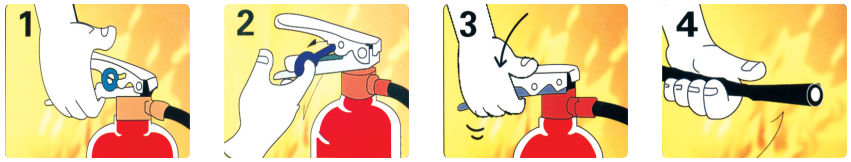
ⅳ: Individual protection

1. Use necessary personal protective equipment. Check the application, validity, and completeness, and learn the right way for use and maintenance before use.
2. Lab personnel should wear appropriate protective garment or lab coats with long sleeves.
3. Wear goggles if needed, e.g. during chemical experiments or in dangerous mechanical operations.
4. Do not wear contact lenses during chemical, biosecurity-related and high-heat experiments.
5. Wear appropriate safety helmet or protective hats and tuck long hair up under if needed. Do not wear long scarf and tie when operating rotating equipment such as a machine tool.
6. Wear appropriate kinds (or texture) of protective gloves if needed (involving with different kinds of hazardous chemicals, pathogenic microorganism, high/low temperature environment).
7. Labs involving with volatile poisonous substance or sputtering risks shall be equipped with appropriate types of respirators (or masks). Be sure the respirators (or masks) are still within validity period and sealed when not in use.

Ⅺ: Emergency rescue

ⅰ: Fire-fighting

1. During the initial stage of fire-fighting, call for help, organize personnel to fight the fire with proper precautionary measures and notify the fire department.
2. Details and requirements when notifying the fire department: the location on fire (including block and room number), what is on fire, the intensity of fire, clarify if there's anything explosive, flammable or poisonous, and if there's anyone trapped. Please provide the information of the person who reports the fire (name, employer, department and phone number).
3. Usage of fire extinguishers



- Pull out the locking pin
- Hold the discharge hose and aim the nozzle at the base of the fire
- Squeeze the trigger

ⅱ: Fire self-rescue and survival

1. Stay calm and orientate before evacuating immediately. Move orderly and never push each other or ram around. Try to go downstairs.
2. To avoid inhaling dense smoke, use wet towels or masks to cover nose and crawl along.
3. Escaping via elevators is strictly forbidden. If the stairs break down, or the passages are blocked, one should evacuate against the direction of the smoke, either escape through rooftop, balcony, downpipes, or take the rope slowly down by hand after tying ropes or connecting sheet stripes on a fixed object (such as window frames or water pipes).
4. If it is impossible to evacuate, go back indoors, close all the windows and doors that connect areas on fire. Also, wet windows

and doors to put off fire. Throw clothing or other objects out from the windows, signal for help, and wait for rescue.

5. If you are on fire, do not stamp on or flap the flames. Instead, take off your clothes immediately, or use water, heavy clothes or roll on the ground to put out the fire.
6. Life safety comes first of all. Do not care about personal properties and leave immediately. Do not return to fire scenes.

iii: Electric shock first aid

1. Remove the person in electric shock from the power source as soon as possible. Turn power off or unplug the power source. If it is impossible to identify or turn off the power source, use an insulator like a dry wooden stick or a bamboo pole to remove the wire. Do not touch the objects charged with electricity or the body of the person in shock.
2. Provide first aid and call for ambulance. Once the person is removed from electricity, lay the person on the back somewhere dry and well ventilated. If the person shocked stops breathing and is in cardiac arrest, make sure the respiratory tract is clear before performing first aid measures including resuscitation and chest compression. Meanwhile, dial 120 for an ambulance to send the wounded to hospital as soon as possible. Keep performing Cardio Pulmonary Resuscitation (CPR).
3. Essentials of resuscitation.
   Lift the chin of the wounded, remove foreign matters in the mouth to keep the respiratory tract clear.
   Pinch the nose of the wounded, blow air into the body via mouth to mouth at an interval of 1 to 1.5 second, 12-16 times per minute.If the mouth is tightly shut, perform mouth to nose resuscitation procedures. Make sure no leakage of air through the mouth.
4. Initiatives of chest compression.
   Identify the spot or chest for administering chest compression. To press correctly, use the index and middle finger of right hand to

locate the midpoint between the rib and breastbones; place the middle finger at this point, and the index finger under the breastbone. Place the other palm on the breastbone.Press with the same gesture. Straighten both arms. Do not bend the elbows. Place one hand above the other. Press the breastbone vertically down 3-5 cm before each release.Press at a constant speed of 100-120 times per minute.

iv: Chemical accident first aid

Inform the person in charge of the laboratory once chemical incidents take place. Perform first aid procedures and then take the injured to hospital for medical treatment.

1. Chemicals burns

Take off clothes contaminated with chemicals. Wash with a large amount of water for a long period to avoid enlarging the burned area. If the burned area is relatively small, wash with cold water for about 30 minutes and then apply ointment for burns. If the burned area is large, apply clean fabric (or gauze, towel, sheet) soaked with cold water onto the wound. Get medical attention immediately.

When managing the wound, try to maintain the integrity of the skin with blister. Do not tear off the wounded skin. Do not apply colored medicine or other substances (like mercurochrome, gentian violet, soy sauce or toothpaste). Otherwise it will affect the judgment on the depth of the wound and treatment.

2. Chemical Erosion

Remove contaminated clothing immediately. Wash the wound with a large amount of water or appropriate solvent or solution. Keep the wound clean for further medical treatment. If chemical contacts the eyes, immediately wash the eyes with thin strain of water. If only one eye is affected, protect the unaffected eye from water used to wash the other eye.

3. Chemical Frostbite

Move the wounded away from the low temperature environment and freezing objects. Use warm water about 40 degrees centigrade to defrost the clothes, and then take them off or cut them off. Warm the affected area. Seek medical attention immediately. For people experiencing cardiac respiratory arrest, perform cardiac compression and resuscitation. Do not parch, apply an ice pack to the affected area, soak the affected area in cold water, or punch on the affected area.

4. Inhalation of toxic chemical

Cut off the source of poison immediately (e.g. turn off the valve of the pump, plug the equipment leaking). Open windows and doors to reduce the concentration of poison.
Before entering the area having poisonous gases, please wear protective respirator and clothing.
Move the exposed person to fresh air soon. Perform first aid accordingly. Dial 120 for medical help.

5. Swallowing chemicals by mistake

Swallowing ordinary chemicals

To reduce the concentration of chemicals in the stomach, slow down the rate of absorption and protect gastric mucosa, immediately drink milk or water or eat egg, flour, starch or mashed potatoes.
Otherwise drink water with activated carbon (normally every 10-15 grams can absorb about 1 gram of toxin) to provoke vomiting or excreting. Seek medical attention immediately.

Swallowing strong acid

Immediately drink 200 ml 0.17% calcium hydroxide solution, 200 ml magnesium oxide suspension, 60 ml 3-4% aluminum hydroxide gel, milk, vegetable oil or water to dilute toxins. Eat 10 more dissolved eggs as alleviator. Seek medical attention immediately. Do not arbitrarily induce vomit or perform gastric lavage as first aid measures.

Swallowing Strong alkali

Immediately drink 500 ml diluted vinegar solution (1 portion of vinegar for 4 portions of water) or diluted fresh tangerine juice, then take olive oil, egg white, milk etc. Seek medical attention immediately. Do not arbitrarily induce vomit or perform gastric lavage as first aid measures.

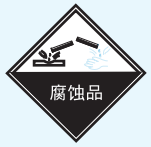
Swallowing pesticide

For organic chloride poisoning, immediately induce vomit or perform gastric lavage. Use 1-5% sodium bicarbonate solution or warm water to pump the stomach, and then use 60 ml 50% magnesium sulfate solution. Forbid using oil laxative. Seek medical attention immediately.For organophosphate pesticide poisoning, use sodium bicarbonate solution to pump the stomach; for those swallow dip Terex, use saline or water to pump the stomach. Forbid using sodium bicarbonate solution. Meanwhile, Seek medical attention immediately.

6. Gas explosion

Immediately cut off the power and gas. Evacuate personnel, move other explosive materials away. Notify the fire department.

Appendix 1 Common Safety Symbols

 Biology Safety	 Caution for infection	 Flammable fluid	 Flammable gas
 Flammable solid	 Pyrophoric substance	 Combustion upon contact with water	 oxidant
 Organic peroxide	 Highly toxic	 Toxins	 Poisonous gas
 Explosives	 carcinogen	 Corrosive	 Beware of radiation
 Laser	 microwave	 High pressure device	 Beware of Ultra violet damage

 Wear protective clothes	 Wear protective gloves	 Wear protective goggles	 Wear protective hat
 Wear protective mask	 Wear gas mask	 Keep ventilation	 Wear protective face mask
 Forbid open flame	 Forbid eating	 Forbid storage	 No trespassing
 Caution	 Beware of electric shock	 Beware of cold	 Beware of heat
 Beware of fire	 Beware of hand injury	 Beware of magnetic field	 Beware of machinery

Appendix 2 Laboratory Safety Commitment

Laboratory Safety Commitment

I have read the Laboratory Safety Manual of Zhejiang University. I am familiar with various laboratory guidelines and requirements. I promise that, from now on, I will strictly follow all safety rules and operating procedures and keep acquiring knowledge on safety measures which are not mentioned in this manual. I will learn about the emergency equipment surrounding the laboratory and its correct usage. I will learn about the security risks of the projects in the laboratory. I will learn about relevant protective and first aid measures. I will carry out my duty of warning and notifying. If accidents take place because of my violation against safety guidelines and consequently causing physical or financial damage, I will take responsibility accordingly.

To sign:

Date:

Department: _____

Stu. /EE Number: _____

ID Number: _____

Note: This signed commitment is in two copies. This copy is kept by the department of the person signed in archives for future check (first copy)

Laboratory Safety Commitment

I have read the Laboratory Safety Manual of Zhejiang University. I am familiar with various laboratory guidelines and requirements. I promise that, from now on, I will strictly follow all safety rules and operating procedures and keep acquiring knowledge on safety measures which are not mentioned in this manual. I will learn about the emergency equipment surrounding the laboratory and its correct usage. I will learn about the security risks of the projects in the laboratory. I will learn about relevant protective and first aid measures. I will carry out my duty of warning and notifying. If accidents take place because of my violation against safety guidelines and consequently causing physical or financial damage, I will take responsibility accordingly.

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References

1. Hong Kong University of Science and Technology Safety& Environmental Protection Manual
2. Hong Kong Baptist University Safety Manual
3. Tsinghua University Laboratory Safety Manual
4. Wuhan University Laboratory Safety Manual
5. Sun Yat-sen University Laboratory Safety Manual
6. University Laboratory Safety Overview (Chief Editor Li Wuyi, Zhejiang Photography Press, 2006)
7. University Chemistry Laboratory Safety and Precautions (Chief Editor Feng Jianyue, Zhejiang University Press, 2013)