



College of Science

General health and safety policies and guidelines 2022

(Original version 2016, 1st revised version 2019, 2nd revised version 2022)

Health and Safety – General Policy Statement

The College of Science, United Arab Emirates University (UAEU), has the utmost concern and commitment towards the Health and Safety of its employees, students, contractors and all those who are affected by the activities of the College. The provision of a safe working environment is an integral part of the agenda of the College of Science. The College of Science as part of UAEU recognizes that it has a legal duty to provide a safe and healthy working environment within the area of its operations.

Therefore, the College of Science, UAEU is committed to a continuous improvement of the working environment through effective administration, education, training, and supervision as well as through infrastructural support.

Within the College of Science, the Dean, Vice-Dean, and the head of the health and safety communicate and promote this policy and seek continuous improvement in health, safety & environmental protection (HSE). All faculty members, other employees and students within the College are to demonstrate their commitment towards safety and they are to be equipped with the knowledge, competence, confidence and capacity to deal effectively with HSE issues in support of the UAEU's wider aims and objectives. All persons within the operational area of the college must comply with the health and safety regulations of the university

the **Key Points and Objectives** of which are:

- A positive health & safety culture is supported, where all members of the College are aware of their responsibilities.
- Local as well as applicable international standards in HSE management are to be complied to.
- In all areas, procedures of hazard identification, application of controls and risk minimization are to be in place.
- The college works in partnership with contractors on HSE issues, especially with Khadamat, where there are shared activities within the operational area of the college.
- the Dean, Vice-Dean, and college working group on safety monitors and reviews the health & safety performance of each department and asks for necessary resources from the higher administration of the university to meet the University health & safety obligations.

While the University defines and keeps under review the organization it needs to implement and/or maintain the HSE infrastructure mandated by the University's HSE policy, the College of Science and the individual departments are responsible for the management of HSE activities in their areas of jurisdiction. It is the responsibility of the University HSE department to provide

advice and support in all HSE related matters. The Dean of the College will review HSE operations with the College annually and will initiate additional reviews, whenever circumstances require it.

Organization and responsibilities

As part of the university the College Science abides by the legal framework set by the government of the United Arab Emirates such as described in the Labour Law [Federal Law No. (8) of 1980 as amended], the Ministerial Decision No. (32) of 1982 concerning preventive methods to protect employees, the Ministerial Decision No. (4/1) of 1981 concerning hazardous works, and the Ministerial Decision No. (27/1) of 1981 concerning remote areas and locations.

The College of Science shares the responsibility of:

- 1.) allocating adequate financial and personnel support for the implementation of the Health and Safety Policy and for keeping a safe environment on all university premises.

The College of Science is responsible for:

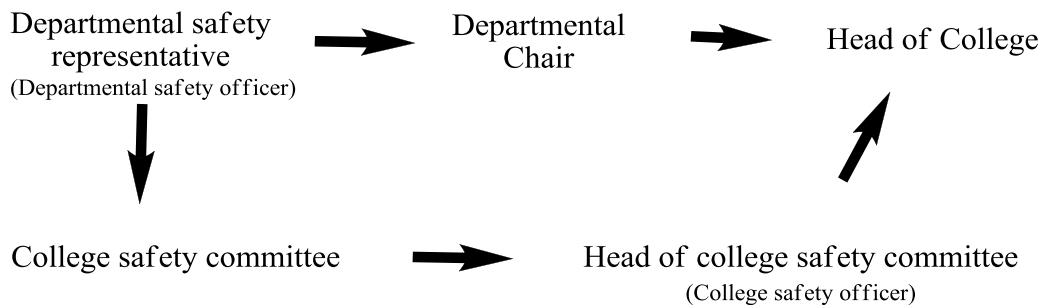
- 2.) designating persons in charge of implementing and maintaining a safe environment at various levels and locations within the operational area of the College of Science
- 3.) monitoring the Safety policy and the efforts to keep the College of Science a safe working environment
- 4.) reviewing the Health and Safety Policy and procedures of the College of Science and the implementation of any mandated changes.

The Dean of the College of Science appoints a safety committee for the college, ideally comprised of a member from each department. In items "Health and Safety", each college safety committee member is to advise and report to the Head of the respective Department. The head of the college safety committee is also designated as college safety officer. He is to report to the Dean/Vice Dean of the College of Science. The Dean/Vice Dean and the college safety officer ensure the members of the College of Science are knowledgeable and compliant of the University Health and Safety Policy and its regulations. The College Health and Safety standard operational procedures are to be publicized and to be easily accessible to all university staff and university students. It is the responsibility of the head of the college to verify periodically that all safety measures are in place and that funding and other resources for safety measures in the college are adequate. He has to confirm that all accidents within the confines of the college and/or involving his college's students/staff have been recorded in the accident log-book of the college/university and that the dissemination of safety information and safety training of personnel and students are adequate. It is the duty of the head of the college, in conjunction with the college safety officer, to review the college health and safety protocol at



regular intervals. It is the duty of the college safety officer to provide for adequate training in "Health and Safety" for students and staff.

Each department designates a departmental safety officer, who is to be member of the college safety committee. The departmental safety officer advises staff/students of safety issues, sees to it that all staff and students comply with the university and college safety regulations, reports on any safety infrastructural deficiencies to the head of the department and/or the head of the college safety committee, and is instrumental in training the staff/students of his department in "Health and Safety" on a regular basis.



Organogram "Safety" at the department and college level

At regular intervals, but at least once a year, the Dean/Vice Dean will report to the higher administration of the university about health and safety concerns within the College of Science.

The Head of the College Safety Committee has monthly High Risk College Committee meetings with FMDHS.

Late working hours

Heads of departments and the Dean/Vice-dean of the College of Science will decide upon allowed access to parts of the facilities under the management of the College. This includes the access outside of the normal working hours. University staff arriving at the university outside normal working hours will be registered at the points of entry to the university. The same rule applies to graduate students. Undergraduate students will be permitted to remain on-campus then, when their hostels are situated on-campus, but are allowed to access work-related areas (laboratories, workshops, classrooms) on campus only with special permission. Security staff, department heads and the college safety officer have the authority to ask the identity of persons found in the buildings after-hours and check the information against their registration log book.

No after-hour work should be carried out that is dangerous. When working after-hours in workshops or laboratories, persons should best not work singly, or if so, have another person check on them periodically.

Normal working hours on the university campus are designated as:

Monday – Thursday: 7.30 – 19.00

Friday: 7.30 – 13.00

Evening and weekend working hours are considered as:

Weekdays: 19.00 – 7.30

Fridays: 13.00 -

Saturdays and Sundays

Public holidays

It is realized that due to the Graduate programs, activities can be ongoing in the times designated as evening and weekend working hours.

Disabled Persons

Disabled persons who are in need of special infrastructure due to health and safety matters should contact the Head of the College of Science. Necessary infrastructure would then be implemented, where possible. It is ascertained by the university and College of Science that quick routes of egress from buildings are available for disabled persons.

Visitors

Visitors are to be registered at the gate of entry. Children will be allowed on the campus during official school visits. School visits must be planned ahead of time, where the head of the department or the Dean of the Faculty of Science has granted permission to an official request by the respective school. Children accompanying their parents are allowed into College of Science's operational areas only in exceptional cases. They should not enter workshop or laboratory areas. Exceptions will be made on open days, official school visits and other officially sanctioned work-experience exercises. At all times there is to be a close supervision of the children by university staff. All visitors must follow the university's rules and regulations regarding "health and safety". Pets are not allowed.

Contractors

Every outside contractor performing work within the operational area of the College of Science must accept the full responsibility for complying with the provisions of the University's rules and

regulations regarding "health and safety" in addition to all other relevant statutory provisions in respect of the work comprising the contract. The Campus Development Department and/or the "University Safety Department" may advise the contractor of any working method that poses a danger to the safety on campus and will require the contractor to remedy any such dangerous situation without delay.

Hazardous Materials

Staff members and graduate students working with hazardous materials should ascertain that material safety data sheets/safety data sheets (see annex page 37) are available for all compounds in their handling. This includes all materials stored under their management. Written instructions to undergraduate students in their practical work must draw attention to the risks associated with using hazardous substances (see annex pages 45 and 46). Accurate book-keeping of all materials must be maintained. The departments keep electronic records of all chemicals in their respective laboratories.

The major laboratory areas of the College of Science are in F1, F2, E2, E3 and E4. It is understood that maximal placement of hazardous materials in the laboratories E2, E3 and E4 is governed by the provisions set forth in the Hazardous Material Protection Brief of RJA International from March 6th, 2013. Persons who would want to work with chemicals or biological material of the following type:

- gases and low boiling substances of NFPA rating 4 (health) such as fluorine, hydrogen fluoride, phosgene, among others, as well as such gases as carbon monoxide and ammonia (see annex page 11)
- potentially explosive compounds such as organic peroxides, etc.
- pyrophoric compounds such as diethyl zinc
- radioactive compounds that are not part of an instrument
- otherwise hazardous classes of compounds and chemical materials such as dioxins, organomercury compounds, hexamethylphosphorous triamide and other strongly alkylating compounds, asbestos, etc.
- genetically modified material such as genetically modified plant material
- legally prohibited or restricted compounds such as alkaloids and restricted phosphorus based compounds

will need to have clearance to use these chemicals through the Hazardous/Bio-hazardous Research Ethics Review board. https://www.uaeu.ac.ae/en/dvcrgrs/research/rspo/ethical_review.shtml The work with certain low-boiling, toxic material needs the wearing of gas masks (see annex page 23-25). At this time (June 2022), of the above, COS only has HF, CO and NH₃ in its possession.

Special caution shall be exerted when handling gases (annex pages 11-19). Hazardous materials shall be stored in adequate storage facilities (annex page 29)

Radiation Protection

The College works with limited amounts of ionizing radiation. It keeps exact accounts of radioactive materials. Persons working with ionizing materials have been trained in UAE accredited workshops.

The Federal Authority for Nuclear Regulation (FANR) must be informed of any acquisition, sale or move, even within the campus, of nuclear materials (thorium, uranium and plutonium). All radioactive materials are to be registered with FANR. The College of Science, through its physics department, is in contact with FANR regarding these matters. The person to contact for information on working with radioactive materials is Mr. Salah Alaasr (6718).

Laboratories

It is understood that all laboratories are furnished with the requisite safety equipment as there are safety shower, eye-wash (see annex pages 31-32), fire detection and adequate fire-fighting equipment (see annex pages 26, 27, 32). All laboratories have well-ventilated fume-cupboards (annex page 33, 42). It is mandatory that students wear personal protective equipment (annex pages 20-22). It is understood that all hazardous chemicals are stored in cabinets specifically designed for chemicals, which can be locked (annex, page 29). It is understood that for all chemicals in a laboratory there is an electronic inventory. Specific hazards are made clear by adequate signage. Emergency exit signage is to be clearly visible for all persons within the operational area of the College of Science.

For all laboratories, in which chemicals are used, the following forms are made available in hard-copy:

General Safety Contract Form (filled out by the student)

Specific Assessment form of Proposed Experiment

Chemical Inventory Forms for Teaching Laboratories

Accident/Incident Report Forms (accident reporting is carried out in conjunction with operational contractor Khadamat, see annex pages 36, 39)

Laboratory Safety Check List

Reporting Form for the Laboratory Student Chemical Hygiene Officer (CHO) [for chemistry only, annex page 36]

General Safety Guideline provided by Khadamat

It is understood that at this point no department within the College of Science works with pathogenic material. All biological wastes are to be autoclaved.

Chemical and biological wastes are to be removed periodically by Khadamat as the operational contractor. It is of importance to separate the wastes into domestic waste, solid chemical waste (yellow bin), biological waste (red bin) and broken glassware (silver metal bin) and sharps (small bin) (see annex page 40,41). Liquid organic and liquid aqueous wastes are to be collected into separate plastic waste containers. All wastes shall be labelled. For any queries in regard to waste management, please consult the website <https://www.khadamat.ae/what-we-do/waste-management.aspx>, where both the Waste Material Data Sheet and the Laboratory Waste Collection Request Form can be found.

For the storage of larger amounts of chemicals, two designated storage spaces in F2 are made available.

SOPs are to be available **for the operation of potentially hazardous mechanical and electrical equipment. Capital equipment/instruments** is to be used only by designated persons and researchers adequately trained on the equipment and with the knowledge of the designated persons and//or department heads.

Typical such instruments are the:

FT-NMR 400 MHz in F2 (Assoc. Prof. Dr. Ziad Moussa, Mr. Bassam al Hindawi)

ICP in E4 (Mr. Omer Al-Bashier)

XRD in E4 (Dr. Bahaa Al-Deen, Mr. Wajeeh Kittaneh)

A complete list of instruments with the persons-in-charge can be found with the respective heads of department.

Before new equipment/a new instrument is to be used, adequate safety checks should be performed. Wherever possible, only instruments of high safety standards are to be acquired (see annex, page 44).

Safety training

For Undergraduate students, the College of Science is to give safety workshops at least once a year. These will be given by the safety officer of the department, but also outside expertise is invited. In student laboratories, where hazardous materials or equipment are used, students take a safety-unit in the first period of their lab course. Students will sign that they have understood all instructed safety issues pertaining to the course. Graduate students are to have a general health and safety induction in the first semester of their practical work. Additionally, fire and building evacuation exercises will be held from time to time, in conjunction with the operational contractor Khadamat, but not less than once per half year for each building. It is understood that for the moment, Khadamat will provide the chief fire marshal.



Queries regarding "Health and Safety"

For queries, staff and students should consult their immediate supervisor. Otherwise, the departmental safety officer, the head of safety of the college, the head of college and the university safety department will be ready to answer questions regarding "health and safety", in that order. Departments of the College of Science have their safety protocols available on-line.

Reporting of Accidents and Incidents

All accidents will be reported on an accident report form. This report form will be forwarded to the HSE coordinator of the department, who will forward a copy to the dean's office. All serious accidents and dangerous incidents will be logged electronically through the operational contactor Khadamat into the university's accident report log as soon as possible and will be reported in person to the college safety officer within 24 hours. In case of serious accidents and incidents, the head of college and the university senior administration should be informed as soon as is possible.

Monitoring of health and safety policies and regulations

The college safety committee will inspect regularly all areas of the operations pertaining to the College of Science to ascertain that all governing rules of health and safety are followed throughout the parts under the college's management. A record of inspection and remedial action is kept both with the head of the college safety committee and the university safety department.

COVID-precautions

In regard to COVID-precautions, COS is following all guidelines advised by the department of "Operations & Emergency Section". This includes "social" distancing in the laboratories and wearing face masks at all times. Signage is hung on the corridors and laboratory doors as a reminder.

Responsible Persons (current cycle, ending Aug. 15th, 2022)

Prof. Dr. Maamar Benkraouda (Dean, COS, Tel. 6742)

Assoc. Prof. Dr. Asma Al Menhali (Vice-Dean, COS, Tel. 6732)

Prof. Dr. Thies Thiemann (Coordinator, HSE-COS, Mobile: 050-221-8368)

Prof. Dr. Hakim Al Saibi (HSE Coordinator, Geology Department, Tel. 6195)

Prof. Dr. Fathalla Ahmed (Coordinator, Physics Department, Tel. 6320)

Prof. Dr. Victor Bodi (Coordinator, Mathematics Department, Tel. 6735)

Prof. Dr. Mohammad Al-Deeb (Coordinator, Biology Department, Tel. 6527)

College of Science Laboratory Safety Guidelines

Annex

Working with gases

Working with gases in general

When working with gases in general, one should note the following danger points:

Gases can expand rapidly, especially if under pressure, and displace air oxygen quickly. If this happens in a confined space, it may lead to asphyxiation of the occupants.

Therefore:

- a.) If a liquid air/nitrogen/helium container is transported by elevator, nobody should accompany the container in the elevator itself. This holds true for gas cylinders as well. Rather, the liquid gas container/cylinder should be placed in the elevator and should be received by (best) another person on the desired floor.
- b.) If working with gases, the work space should be in a well-ventilated room of adequate size.

It should be noted that certain gases are heavier than air and tend to collect near the floor. Among these are argon and hydrogen sulfide.

Numerous accidents have happened to date where workers have wandered into rooms which were inadvertently filled with gases other than oxygen/air. One of the more known incidents was the entry of two engineers into the space-shuttle capsule days before the launch which had been flushed with nitrogen to avert an eventuality of a fire. One of the engineers died.

Please note that in certain cases, gas sensors are needed to work with gases or liquified gases. A typical example is the oxygen sensor that was installed in F2 (NMR room).



Toxic gases

Many gases are toxic to humans.

Some of the more toxic gases generally in use are:

Fluorine, hydrogen fluoride, hydrogen cyanide, and phosgene
(all of these have the highest NFPA rating of **4**)

Other toxic gases with an NFPA rating of **3** are:

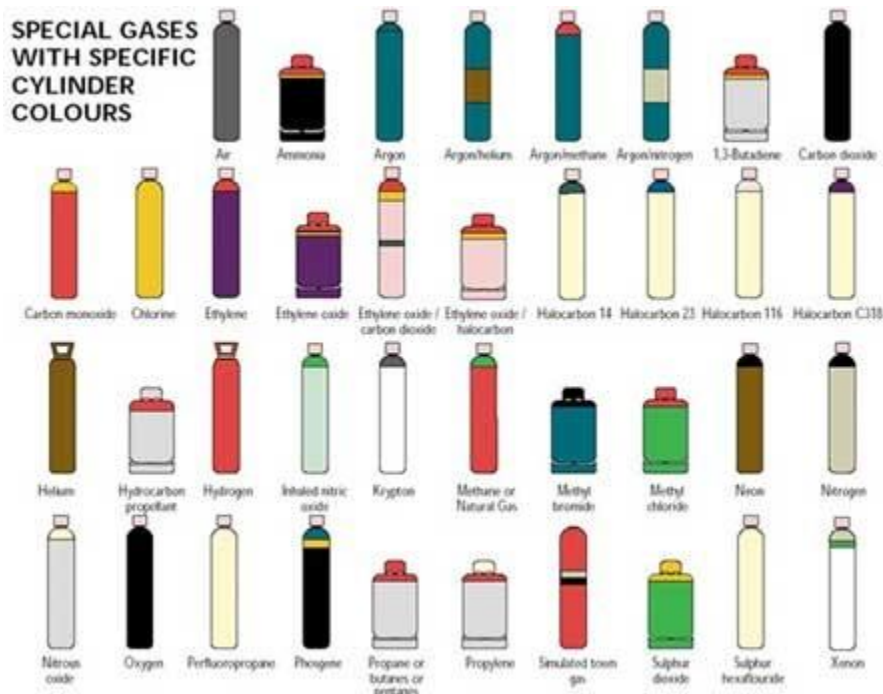
Carbon monoxide, chlorine, hydrogen bromide, hydrogen chloride
and ammonia.



(NFPA hazard classification)

Gas storage and handling

Identification of gas cylinders (typical example of a label)



Typical coloring of the cylinders to identify the gas inside. Please note that the coloring scheme was changed in 2010, and both old and new cylinders are still in use.

See: www.boconline.co.uk



A new standard governing the colour coding of transportable gas cylinders is coming into force across Europe. As a result, the cylinders you receive from BOC Special Products will in some cases have a new colour scheme

Pure gases



The colours in this chart are provided as an indication only, actual colours may vary

Further coloring scheme

See: www.boconline.co.uk

Acetylene cylinders are maroon.

Argon cylinders have a **dark green** shoulder.

Carbon dioxide cylinders have a **grey** shoulder.

Chlorine cylinders have a **yellow** shoulder.

Helium cylinders have a **brown** shoulder.

Hydrogen cylinders have a **red** shoulder.

Nitrous oxide cylinders have a **blue** shoulder.

Nitrogen cylinders have a **black** shoulder. (previously grey)

Oxygen cylinders have a **white** shoulder. (previously black)

Based on gas properties

Toxic or **corrosive** gas cylinders have a yellow shoulder (e.g., ammonia, chlorine, fluorine, arsine, carbon monoxide, and sulfur dioxide).

Flammable gas cylinders have a red shoulder (e.g., hydrogen, methane, ethylene, and forming gas).

Oxidising gas cylinders have a light blue shoulder (e.g., nitrous oxide, and oxygen-containing blends).

Inert (nontoxic, nonflammable, nonoxidising) gas cylinders have a bright green shoulder (e.g., neon, krypton, and xenon).

Toxic and **flammable** or **toxic** and **corrosive** gas cylinders have yellow and red shoulders (either two bands or quartered).

Toxic and **oxidising** or **corrosive** and **oxidising** gas cylinders have yellow and light blue shoulders (either two bands or quartered).



All cylinders, in use or not (even when empty) should be strapped to the wall, so that there is no danger of falling over, even in case of an earthquake.





The cylinders should be transported by cart with fastened chain in place.

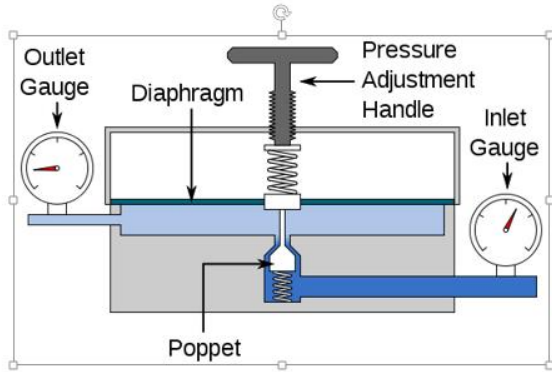
When gas cylinder is no longer in use, it must be stored with the cap on!!



Gas cylinders should be clearly marked, including risk indications (in addition to NFPA risk number or other risk classification)



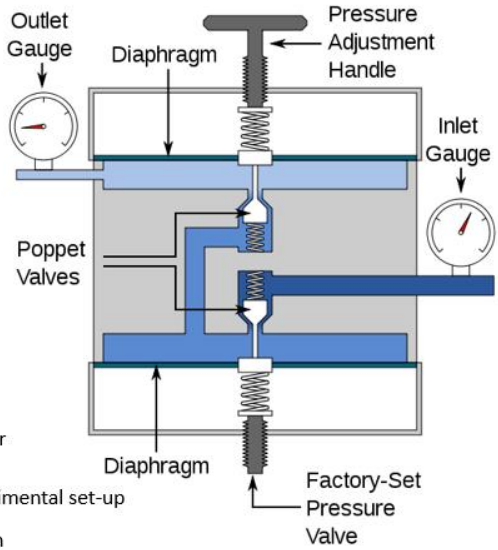
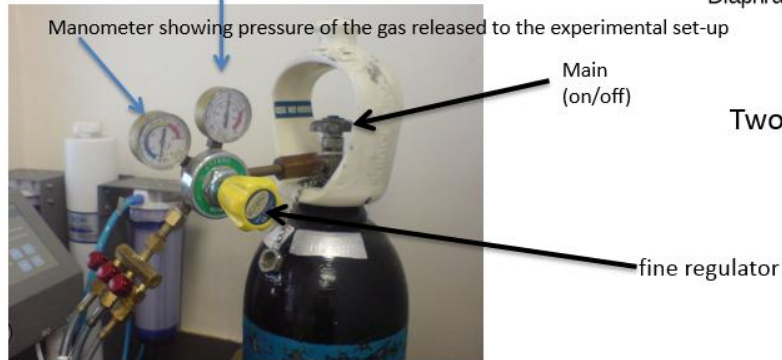
Typical set-up of a toxic gas within a cabinet with fixed line and regulators



Single stage pressure regulator

Manometer showing pressure in the cylinder

Manometer showing pressure of the gas released to the experimental set-up



Two stage regulator

Factory-Set Pressure Valve

Typical design of regulators for gas cylinders



Gas storage (secured cylinders with warning signage)



Non-secured gas cylinders stored openly in the sunlight!



From: www.waltbeattie.com

ALWAYS

keep cylinder stocks to the necessary minimum for your volume of trade

ALWAYS

only use cylinders filled by a reputable gas supplier who fills and regularly tests cylinders in accordance with current safety regulations

ALWAYS

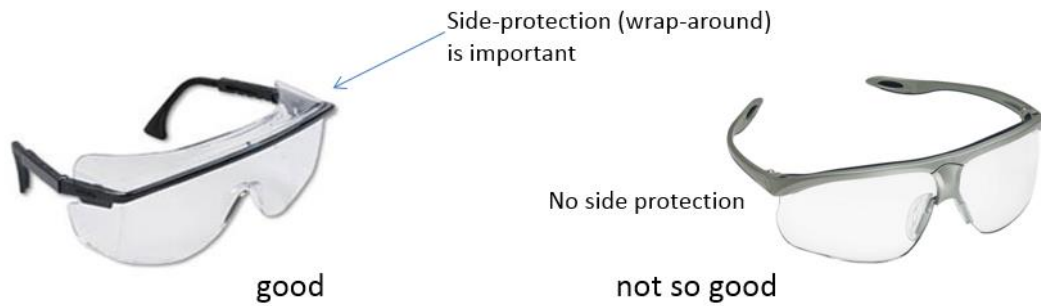
return gas cylinders to the supplier you purchased them from – and to no-one else

ALWAYS

have spare washers available to replace worn washers which may cause leaks at the cylinder connection

- NEVER fill one gas cylinder from another - this is extremely dangerous
 - NEVER carry gas cylinders in a car or other closed vehicle
 - NEVER connect gas cylinders to any equipment other than the primary regulator
 - NEVER drop, throw or mishandle cylinders
 - NEVER use cylinders for anything other than storing and delivering dispense gas
 - NEVER oil or lubricate cylinder valves
-
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Personal Protective Equipment



goggles

lab-coat

Be sure that the lab-coat is **not** made from flammable material
A lab coat should not be loose so that it should not hinder you in your work



shoes

Shoes should be covered shoes (no high heels!)



Laboratories cannot be entered without personal protective equipment (PPE). This includes goggles (very important), a decent laboratory coat and closed shoes. Important is that the lab coat is made from non-inflammable material and that the goggles have a side-protection.



Gloves are not all the same.
Wearing gloves does not mean
that no chemical will penetrate.
With extremely hazardous materials, it is wise
to wear two gloves , one heavy duty and one for inner protection.



Correct removal of gloves

Reusable gloves (chemically resistant)

Follow the steps shown

Wipe or rinse gloves and remove carefully to protect your skin from contamination

Dispose of gloves in a suitable container

Store gloves on a clean surface for re-use

- Always select the correct size gloves
- Use gloves for no longer than one day

www.hse.gov.uk

Gloves must be removed in such a way that the outer surface of the glove is not touched with one's bare hands.

This also holds true for single-use gloves.



Gas masks

It is beneficial to have access to gas masks in case of emergency (gas leak, fire, low boiling spilled liquid).

There are a variety of gas masks available. Some of them do not cover the head as such but only the mouth (**A**).

These are not useful, if the substance that needs to be protected against is a corrosive gas or otherwise interacts with the skin. If this is the case, then a full-head-covering mask is necessary (**B**).

Thus, mask **A** may be adequate when combating a CO leak, it would not be good for HCl gas leak, where **B** would have to be used.



A



B

There are certain reagents (such as phosgene [COCl_2]) where the use of a gas mask is necessary. At the UAEU we do not perform any experiments using such reagents. When using a gas mask, it is better not to work alone.



Gas masks are composed of the mask itself and importantly the filter.

There are different types of filters. So, it is important to check whether you use the right filter for your work. Filters have an expiry date and should be exchanged periodically.



The filter is selected according to the toxic compound you work with. Each filter type protects against a particular hazard:

AX - Low-boiling (≤ 65 °C) organic compounds

A - High-boiling (> 65 °C) organic compounds

B - Inorganic gases (hydrogen sulfide, chlorine, hydrogen cyanide)

E - Sulfur dioxide and hydrogen chloride (acidic gases)

K - Ammonia and amines

CO - Carbon monoxide

Hg - Mercury

Reactor - Iodine and methyl iodide (radioactive)

P - Particles; classified as P1, P2, and P3 according to removal efficiency

ABEK, ABEK-P3, ABEK-HgP3 or other combination filters against multiple hazards

Be careful to cover your eyes with the mask as chemicals easily enter your body through your eyes!



Fighting fires – fire extinguishers

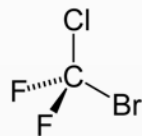
Comparison of fire classes in different countries

Comparison of fire classes				
American	European	UK	Australian/Asian	Fuel/heat source
Class A	Class A	Class A	Class A	Ordinary combustibles
Class B	Class B	Class B	Class B	Flammable liquids
	Class C	Class C	Class C	Flammable gases
Class C	UNCLASSIFIED	UNCLASSIFIED	Class E	Electrical equipment
Class D	Class D	Class D	Class D	Combustible metals
Class K	Class F	Class F	Class F	Cooking oil or fat



Main types of fire extinguishers

Halon



(liquified,
pressurized with N₂)



(suitable for fire classes A and B)

Because halon is an ozone depletor, Australia and Europe have banned halon, and it is no longer produced. In the Middle East and America, halon is still used.

CO₂



(suitable for class B and E fires)

Powder Monoammonium phosphate NH₄⁺H₂PO₄ (suitable for fire classes A, B and C)

At the university labs, we have powder and CO₂ fire extinguishers!



In case of fire:

a.) see, if you can put out the fire (if it small enough and you have the fire extinguisher at hand).

If not, then

b.) shut off the power

c.) sound the alarm

d.) evacuate the lab occupants

e.) call Khadamat under: 03-713-8000

f.) call the civil defense under 997

If you think that you can put out the fire, still proceed with b-e. The evacuation of the lab should occur concomitant with your fighting the fire. Nevertheless, it is important that at least one other person is monitoring the fire extinguishing.

UAEU

(on-campus clinic, nurses, ambulance)

RPM Clinic: 050 927 5824

Male: 03-713-4094/4011

Female: 03-713-6034/6035

Khadamat Facilities Management LLC

(actual facilities management + estate management)

[maintenance, waste management] [cleaning and security sub-contracted]

(24/7 service --- central collection/dissemination point of information in case of emergency)

fire marshal

Campus security: 03-713-8060

Ambulance (external): 998



Laboratories – Chemical Storage



Safety Chemical Cabinet

Hazardous chemicals should only be stored in designated chemical safety cabinets.



Storage (Part II)

Although chemicals should generally be stored in dry, ventilated rooms, there are certain chemicals that react violently with water, in a reaction which can lead to a fire.

These are:

Sodium (Na), potassium (K), lithium aluminum hydride (LiAlH_4), sodium hydride (NaH), among others.

Then, there are **pyrophoric** chemicals (i.e., chemicals that react with air oxygen and ignite spontaneously).

Pyrophoric materials are:

Cerium metal, diethylzinc, many other organometallics, finely divided sodium, finely divided potassium, white phosphorus, among others. These materials must be stored under exclusion of air. Often they can be stored under a deaerated non-reactive liquid (such as under an alkane, white oil, etc.)

It must be very clear to the fire department and other emergency services that no water may be used in the areas where these chemicals are stored.

Storage (Part I)

Never store acids and bases close together as in the case of an accident, acids and bases can react without control, generating a lot of energy which can lead to explosions.

Typical acids are: HBr , HCl , H_3PO_4 , H_2SO_4 , HNO_3

Compounds that generate acids when in contact with water are: POCl_3 , PCl_3 , PCl_5 , SOCl_2 , SO_2Cl_2

Typical bases are: NH_3 , amines, NaOH , NaOMe (sodium methoxide), KO^tBu (potassium *tert*-butoxide)

Also, the following **salts** are **basic** and react with water to form strongly basic solutions: NaH , KH , NaNH_2 , KNH_2

Store the following **salts** away(!!) from **acids**:

NaCN , KCN , Na_2S , K_2S as in contact with acids they produce the deadly gases H_2S and HCN , respectively.



Lab Safety Equipment





Lab Safety Equipment



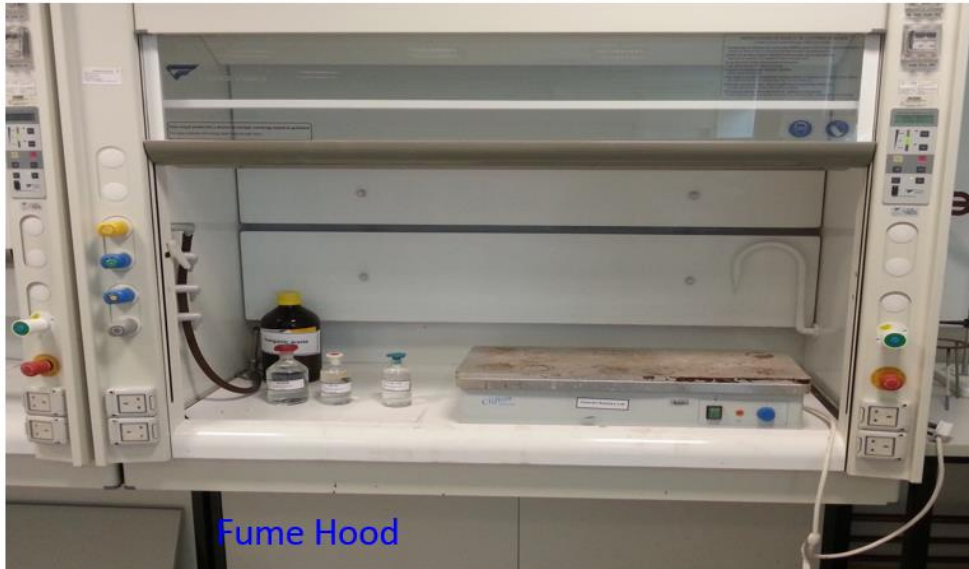
Fire Extinguisher



Chemical Spill Leader



Laboratories – Fume Cupboards





A. Inventory List



UAE UNIVERSITY SHARED LABORATORIES - HAZARDOUS MATERIALS DATABASE

MATERIALS	BUILDING	ROOM	CAS NUMBER	MATERIAL STATE	NFPA 400 - HAZARDOUS MATERIALS				UNITS
					HAZARD	STORED QUANTITY (g)	STORED ARRANGEMENT	USED QUANTITY - CLOSED SYSTEMS	
Ammonium Persulfate	EA	2014		Solid		270			0
Ammonium Sulfate	EA	2014		Solid		5200			0
Acrylamide	EA	2014		Solid		3010			0
Ammonium Iron(III) Sulfate	EA	2014		Solid		1000			0
L-Ascorbic acid	EA	2014		Solid		325			0
Agarose	EA	2014		Solid		1000			0
Agarose with Range	EA	2014		Solid		400			0
Alkanol	EA	2014		Solid		2090			0
Arginine	EA	2014		Solid		115			0
Aluminum Carbide	EA	2014		Solid		225			0
Ammonium Sulfate	EA	2014		Solid		400			0
Anthracene	EA	2014		Solid		10			0
Ammonium Dichromate	EA	2014		Solid		700			0
Alanine	EA	2014		Solid		115			0
Amphoteric Iron oxide	EA	2014		Solid		210			0
Aspartic acid	EA	2014		Solid		3			0
Arthrose	EA	2014		Solid		3			0
Asparagine	EA	2014		Solid		1			0
Asparagine	EA	2014		Solid		3			0
Benzoin	EA	2014		Solid		130			0
Bis-oxalate	EA	2014		Solid		50			0



B. Emergency Call List



Police: 999
Ambulance: 998
Civil Defense: 997
Security: 8060
Clinic: 4094 (Male)/6034 (Female)



C. Other Important Sheets





Example of MSDS Sheet



Material Safety Data Sheet Nitric acid, 65% MSDS

Section 1: Chemical Product and Company Identification		
Product Name: Nitric acid, 65%	Contact Information:	
Catalog Codes: SLN2161	ScienceLab.com, Inc.	
CAS#: Mixture.	14025 Smith Rd.	
RTECS: Not applicable.	Houston, Texas 77308	
TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming	US Sales: 1-800-901-7247	
CM: Not applicable.	International Sales: 1-281-441-4400	
Synonym: Nitric Acid, 65%	Order Online: ScienceLab.com	
Chemical Name: Not applicable.	CHEMTREC (24HR Emergency Telephone), call:	
Chemical Formula: Not applicable.	1-800-424-9300	
	International CHEMTREC, call: 1-703-527-3887	
	For non-emergency assistance, call: 1-281-441-4400	

Section 2: Composition and Information on Ingredients		
Composition:		
Name	CAS #	% by Weight
Water	7732-18-5	35
Nitric acid, fuming	7697-37-2	65
Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 344 ppm 0.5 hours [Rat] 344 ppm 0.5 hours [Rat]		

Section 3: Hazards Identification



Chemistry Department

Example of COSHH Form




UNITED ARAB EMIRATES UNIVERSITY
DEPARTMENT OF CHEMISTRY
SPECIFIC ASSESSMENT OF PROPOSED EXPERIMENT
COSHH - Form

Section/Lab. #: General Chemistry Major Supervisor/Instructor: Ms. Ibtesam Saeed	Personnel involved: Ms. Ibtesam Saeed
Title of Experiment/Procedure: Chemical Equilibrium: Le Chatelier's principles	
Substances: 1. AgNO ₃ The substance decomposes on heating producing toxic fumes including nitrogen oxides. The substance is a strong oxidant and reacts violently with combustible and reducing materials. Reacts with incompatible substances such as acetylene, alkalies, halides and many other compounds causing fire and explosion hazard. Attacks some forms of plastics, rubber and coatings.	Hazards:
Information sources: International Labour Organization http://www.ilo.org/public/english/protection/safework/cis/products/icsc/dasht/_jcscl1116.htm	
Exposure limits: Depending on the degree of exposure, periodic medical examination is suggested. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Rinse contaminated clothes (fire hazard) with plenty of water. TLV: (as Ag) 0.01 mg/m ³ as TWA; (ACGIH 2004). MAK: (Inhalable fraction) 0.01 mg/m ³ ; Peak limitation category: II(2); Pregnancy risk group: II(2); (DFG 2004).	
Are less hazardous substances available? If so, why not use them? no	
Control Measures/Checks/Monitoring required:	



Example of the Accident Form


College of Science
Chemistry Department

Accident / Incident Report: Form 4

WHAT (Brief description of incident):	Small fire
WHEN (Date and time of incident):	20/04/2010 12:30-pm
WHERE (Building and room number):	Building 81, Room 015
Potential / Severity (rate low, medium, high):	low
Description of Accident / Incident:	In the week of teaching "Introduction to qualitative analysis" experiment for General Chemistry lab, when I opened the flame, gas leaked from the hose and made small fire because the Bunsen burner and hose were very old.
Basic Cause of Accident / Incident:	Due to using old Bunsen burner and hose and lack of new equipments.
Recommendations (What can be done to prevent similar incidents):	Avoiding using flame-based Bunsen burner, for example, use electrical Bunsen burner. Also, need to replace all old gas hoses.

Submitted by:

Employee/Student(s) Itessam A. Saad	Head /Supervisor: Dr. Mohamed Totari	Reviewed by:
Date: 21/04/2010	Date: 21/04/2010	Date:

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Waste Disposal



Yellow bins are for solid chemical waste, while silver metal cylinders are for broken glassware.



Waste Disposal (continued)



Biological
waste

The red bin is for biological waste, the bin on the right for “sharps”.



Examples of unsafe behavior inside the lab



Laboratory PPE is required to enter the laboratories. Experiments that emit fumes or gases should be carried out under the fume cupboard.



Good house-keeping





**Acquisition of new instruments that guarantee a higher safety standard:
Example: Stone-cutting and polishing machinery in the geology department**



Typical safety instructions found for undergraduate educational laboratories (source: Laboratory Manual for Organic Chemistry 2)

Safety in the Organic Chemistry Laboratory

The chemistry laboratory can be a place of discovery and learning. However, by the very nature of laboratory work, it can be a place of danger, if proper common-sense precautions are not taken. While every effort has been made to eliminate the use of explosive, highly toxic, and carcinogenic substances from the experiments which you will perform, there is a certain unavoidable hazard associated with the use of a variety of chemicals and glassware.

You are expected to learn and adhere to the following general safety guidelines to ensure a safe laboratory environment for both yourself and the people you may be working near you. Additional safety precautions will be announced in class prior to experiments where a potential danger exists. Students who fail to follow all safety rules may be asked to leave the lab or suffer grading penalties.

Attire

- Safety goggles must be worn at all times while in the laboratory. This rule must be followed, whether you are actually working on an experiment or simply writing in your lab notebook. You must wear safety goggles provided by the chemistry department.
- Contact lenses are not allowed. Even when worn under safety goggles, various fumes may accumulate under the lens and cause serious injuries or blindness.
- Closed toe shoes and long pants must be worn in the lab. Sandals and shorts are not allowed.
- Long hair must be tied back when using open flames.

Conduct

- Eating, drinking, and smoking are strictly prohibited in the laboratory.
- No unauthorized experiments are to be performed. If you are curious about trying a procedure not covered in the experimental procedure, consult with your laboratory instructor.
- Never taste anything. Never directly smell the source of any vapor or gas; instead by means of your cupped hand, waft a small sample to your nose. Do not inhale these vapors, but take in only enough to detect an odor, if one exists.
- Coats, backpacks, etc., should not be left on the lab benches and stools. There is a hook rack along the back wall at either end of the lab. There are coat racks just inside each entrance to the balance room at the back of the lab. Beware that lab chemicals can destroy personal possessions.

Typical safety instructions found for undergraduate educational laboratories (source: Laboratory Manual for Organic Chemistry 2, continued)

- Always wash your hands before leaving the lab.
- Learn where the safety and first-aid equipment is located. This includes fire extinguishers, fire blankets, and eye-wash stations.
- Notify the instructor immediately in case of an accident.

Proper Handling of Chemicals and Equipment

- Consider all chemicals to be hazardous unless you are instructed otherwise. **Material Safety Data Sheets (MSDS)** are available in the lab for all chemicals in use. These will inform you of any hazards and precautions of which you should be aware.
- Know what chemicals you are using. Carefully read the label twice before taking anything from a bottle.
- Excess reagents are never to be returned to stock bottles. If you take too much, dispose of the excess.
- Many common reagents, for example, alcohols and acetone, are highly flammable. Do not use them anywhere near open flames.
- Always pour acids into water. If you pour water into acid, the heat of reaction will cause the water to explode into steam, sometimes violently, and the acid will splatter.
- If chemicals come into contact with your skin or eyes, flush immediately with copious amounts of water and consult with your instructor.
- Never point a test tube or any vessel that you are heating at yourself or your neighbor--it may erupt like a geyser.
- Dispose of chemicals properly. Waste containers will be provided and their use will be explained by your instructor. Unless you are explicitly told otherwise, assume that only water may be put in the lab sinks.
- Clean up all broken glassware immediately and dispose of the broken glass in the appropriate broken glass containers.
- Contact Khadamat for clean-up of mercury spills.
- Never leave burners unattended. Turn them off whenever you leave your workstation. Be sure that the gas is shut off at the bench rack, when you leave the lab.
- Beware of hot glass--it looks exactly like cold glass.