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Document Title: <b>WORK INSTRUCTION FOR CHEMISTRY PRACTICAL SESSIONS</b>		

# CHUKA UNIVERSITY

## WORK INSTRUCTION


### FOR

## CHEMISTRY PRACTICAL SESSIONS (CU/WI/CHEM/01)

#### DOCUMENT REVIEW SHEET

The signatures below certify that this Work Instruction (WI) has been reviewed and accepted, and demonstrate that the signatories are aware of all the requirements contained herein and are committed to ensuring their provision.


Name	Signature	Date
<b>Revised By: COD/COORDINATOR</b>		15.1.2018
<b>Controlled By: COD/COORDINATOR</b>		15.1.2018
<b>Approved By: DEAN</b>		15.1.2018

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## 2.0. GENERAL

### 2.1 Purpose

The purpose of this Work Instruction (WI) is to guide in conducting of Chemistry practicals and ensure that they are carried out effectively and comply with the course requirements as per various chemistry programmes.

### 2.2 Scope

This (WI) applies to all experiments and demonstrations conducted in the Chemistry Laboratories by any laboratory user including students.

### 2.3 References

- (i) ISO 9001:2015 Clause 4.4.2
- (ii) Quality Manual
- (v) Laboratory manuals
- (vi) Equipment technical operation manuals

### 2.4 Definitions and Abbreviations


#### Definitions

In addition to the relevant definitions of terms given in ISO 9000:2005, the following specific definitions shall apply:

- Laboratory Session: Time duration allocated for student to do laboratory Practicals.
- Laboratory Sheet/manual: A printed material usually contains a series of instructions and information given to the student on how to conduct the specific experimental procedures.
- Laboratory Report: A written report prepared by student based on individual practical lesson requirement. The format and requirements are usually stated in the laboratory sheet.
- Laboratory Instructor: An academic staff (lecturer or tutor) in charge of the laboratory session. The laboratory instructor will give briefing and instructions to students during the laboratory session.
- Laboratory Technologist: A person in charge of conducting all the laboratory practical sessions of the semester and requesting all laboratory materials.

#### Abbreviations

AMR	=	Assistant Management Representative
MR	=	Management Representative
QMS	=	Quality Management System
CU	=	Chuka University
WI	=	Work Instruction

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## 2.5. Responsibility

The COD has the principal responsibility for ensuring that this work instruction remains adequate for its intended purposes.

- (i) The Chemistry Laboratory Technologists have to ensure that all instruments/equipments and apparatus are in good condition for use at all times.
- (ii) Technologists shall conduct practical lessons assigned to them.
- (iii) Chemistry Science lecturers tasked with setting practical lessons should coordinate how those practical lessons are conducted and ensure adequate learning for the intended students.

## 3.0. CHEMISTRY LABORATORY REGULATIONS

### 3.1. The Chemistry Laboratory Schedule

- (i) Course coordinator is the one who is in-charge of organizing the laboratory schedule.
- (ii) Laboratory schedule will be put up on the departmental notice boards or faculty webpage before the commencement of laboratory session in each semester.
- (iii) Students are not allowed to change laboratory schedule without getting approval from the laboratory instructors.
- (iv) The laboratory operating hours of normal working day are: Monday to Friday, 8.00 am to 5.00 pm (Excluding public holidays)


### 3.2. Tools and Equipment

- (i) Working laboratory equipments, apparatus, chemicals and reagents.
- (ii) Relevant glasswares (laboratorywares)
- (iii) Appropriate, well detailed laboratory instructional manuals.
- (iv) Instrument and equipment operation manuals necessary to carry out specific experiment.

### 3.3. Chemistry Laboratory Safety Rules

Accidents in a chemical laboratory usually result from improper judgment on the part of the victim or one of his/her neighbors. Learn and observe the safety and laboratory rules listed below.

**1) Notify your instructor at once in case of any accident or personal injury to you or your neighbor, even if apparently minor.** If your instructor is temporarily absent, notify the instructor in the adjoining laboratory, or one of the stockroom personnel. If you are asked to go see the nurse, you must go. Refusal to do so grounds for being dropped from the course.

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**2) Wear safety goggles.** Because the eyes may be permanently damaged by spilled chemicals and flying broken equipment, be sure to wear safety goggles or safety glasses whenever working in the laboratory. If you get anything in your eye, use the eye wash immediately, and then report it to your Instructor. Use your hands to hold your eye open so that it can be rinsed thoroughly.

*Note: Eye washing with a contact lens in place will not clear a splashed chemical from the eye. The contact must be removed for effective cleansing. It is advisable for those wearing contacts to switch to glasses for the laboratory period.*

**3) Locate safety equipment.** During the first laboratory period familiarize yourself with location and operation of the safety features of the laboratory such as spill cleanup and first aid kits

**4) Know the ways to put out a fire**

a) If it is open fire, such as a large chemical spill on a laboratory bench, the correct extinguisher should be used.

b) If it is a small, contained fire, such as in a flask or beaker, cover the container with a piece of ceramic, cutting off the supply of oxygen to the fire and thus putting it out.

**5) Be careful when using glassware.** Cuts and burns are the most common injuries that occur in chemistry laboratories. Cuts can be prevented by following a few simple rules:

a) When inserting glass tubing into rubber stoppers, use the following procedure:

- i. Make sure the glass tubing ends are fire polished.
- ii. Always use glycerin or soapy water as a lubricant both on the tubing and in the hole.
- iii. Protect your hand by wrapping the glass tubing with a towel.
- iv. Hold the glass near the end to be inserted, thus minimizing the torque, and insert using a twisting motion. Never hold the glass at a bend.

b) Fire polish all sharp edges of broken glass.

c) Discard cracked or broken glassware in the designated container.

d) Never heat heavy glassware such as graduated cylinders, suction flasks, or reagent bottles since they might shatter.


**6) Wash chemicals from skin.**

a) If you receive a chemical burn from a caustic material, i.e. acid or base, immediately wash the burned area with large quantities of water. Ask another student to summon laboratory instructor.

b) Wash hands and face quickly and thoroughly whenever they come in contact with a chemical.

c) Always wash your hands, before leaving the laboratory since toxic chemicals may be transferred to the mouth at a later time.

d) Chemicals spilled over a large part of the body require immediate action. Remove all contaminated clothing and use the safety shower, flooding the burned area. Do not use salves, creams, lotions, etc. Get medical attention.

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**7) Be careful with flames.** A lighted gas burner can be a major fire hazard.

a) General Precautions:

- i. The burner should be burning only for the period of time in which it is actually utilized.
- ii. Before lighting your burner carefully position it on the desk away from flammable materials, overhanging reagent shelves, flammable reagents such as acetone, toluene, and alcohol on neighboring desks.
- iii. Be careful not to extend your arm over a burner while reaching for something.

b) Personal Precautions:

- i. Keep long hair tied back so that it cannot fall forward into a flame.
- ii. Keep beards away from flames.

**8) Never point a test tube toward a laboratory neighbor or yourself when:**

- a) Heating a test tube over a burner.
- b) Carrying out a reaction in a test tube.

**9) Wear suitable clothing.** Wear clothing that will protect you against spilled chemicals or flaming liquids. Hard-soled, covered footwear must be worn in the laboratory at all times--**no sandals allowed.**

**10) Assume that a particular reagent is hazardous unless you know for sure it is not.**

- a) Never taste a chemical unless specifically directed to do so.
- b) If you are instructed to smell a chemical, point the vessel away from your face and carefully fan the vapors toward your face with your hand and sniff gently.
- c) Material Safety Data Sheets are available in the laboratory.

**11) Never fill a pipette by using your mouth.**


**12) Assemble safe apparatus.** Always assemble an apparatus as outlined in your instructions. Makeshift equipment and poor apparatus assemblies are the first steps to an accident.

**13) Dilute concentrated acids and bases by pouring the reagent into water (room temperature or lower) while stirring constantly.** Never pour water into concentrated acids; the heat of solution will cause the water to boil and the acid to splatter.

To help you remember--"*Do as you oughter, pour acid into water.*"

**14) Use the fume hoods.** Any experiment involving the use of or production of poisonous or irritating gases must be performed in a hood.

**15) Read the laboratory.** Read the laboratory carefully, *read it twice*, before taking anything from a bottle. Many chemicals have similar names, such as sodium sulfate and sodium sulfite. Using the wrong reagent can spoil an experiment or can cause a serious accident.

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**16) Eating, drinking, and smoking are strictly prohibited in the laboratory** at all times because of the possibility of chemicals getting into the mouth or lungs through contamination. The chief hazard with smoking is fire.

**17) Avoid rubbing your eyes unless you know your hands are clean.**

**18) Do not put hot objects on the desktops.** Place hot objects on a wire gauze or ceramic pad.

**19) Never throw lighted matches into a sink.** They may ignite a discarded flammable liquid.

**20) Perform only authorized experiments.** Unless authorized to do so by the instructor, a student will be subject to immediate and permanent expulsion from the laboratory if:

a) Attempting to conduct unauthorized experiments.

b) Attempting variations of the experiment in the laboratory manual

*Performing unauthorized experiments are dangerous. Students lack the experience to recognize whether or not the chemicals and techniques are safe.*

**21) Keep your workspace orderly.**

a) Place tall items, such as graduated cylinders, toward the back of the workbench so they will not be overturned by reaching over them.

b) Clean up all chemical spills, scraps of paper, and glassware immediately.

c) Keep drawers closed while working and the aisles free of any obstructions, including chairs.

d) Never place coats, books, and other belongings on the laboratory bench where they will interfere with the experiment and are likely to be damaged.

**22) Clean up your workspace at the end of each laboratory period.**

a) Wash and wipe off your desktop.

b) Be sure gas and water are turned off.

c) Return all special equipment to the stockroom.

d) Put everything back into your locker drawer and lock.

**23) Avoid using excessive amounts of reagent.**

a) Never use more than called for in the experiment.

b) Do not return any excess chemical to the reagent bottle; share it with another student or dispose it off according to the instructions listed in #24.

c) If you are uncertain how to dispose of an excess of a specific chemical, consult your instructor.

**24) Discard waste chemicals as follows:**

a) Non-flammable water-soluble liquids - liquid waste bottle

b) Chemical solids, contaminated paper, contaminated broken glassware - solid waste containers.


c) Paper products - trash can

d) Organic solvents - organic waste bottle

(do not put acids in the organic waste bottle.)

e) Glass tubing waste or broken glass - broken glass wooden box



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**25) Always add a reagent slowly--never "dump" in.** Two reasons:

- Some reactions give off a lot of heat, and unless adding slowly, can become too vigorous and out of control.
- If you make a mistake and choose the wrong chemical, adding slowly decreases the possibility of causing a serious accident.

**26) Treat chemical spills as follows:**

- Alert your laboratory neighbors and your instructor.
- Clean up the spill as directed by your laboratory instructor.

**27) Never fill a vessel more than about 70% capacity if you plan to heat it,** unless specifically told to do so.

**28) Never work in the laboratory without the instructor present.** This includes setting up equipment.

**29) Maintain a wholesome, business like attitude in the laboratory.** Horseplay and other acts of carelessness are prohibited.

**30) Be aware of your laboratory neighbors' activities; you may be a victim of their mistakes.** If you observe improper techniques or unsafe practices:

- Advise your neighbor.
- Advise your instructor if necessary.


**31) Observe all specific precautions and modifications mentioned in each experiment.**

**32) Do not remove any chemicals from the laboratory.**


**33) For reasons of safety, you may not be allowed to attend laboratory if you are late.**

### **3.4. General Rules in Science Laboratory**

- For any safety critical practical session, students are not allowed to work alone without the supervision of laboratory instructor.
- Any unauthorized experiment without the knowledge of laboratory instructor is prohibited.
- Students must abide the dress code while working in the laboratory.
- Foods, drinks and smoking are strictly prohibited inside the laboratory.
- Student bags and other belongings must be kept at the designated places.
- Noise must be kept to the minimum as a courtesy to respect others.
- Equipment and apparatus must be handled with care
- Students shall be liable for damages of devices caused by individual negligence. If damages occurred, an investigation will take place to identify the causes and the names of the involved students will be recorded for faculty attention.
- Students shall report immediately to the laboratory technologist/assistant, if the laboratory equipment is suspected to be malfunctioning or faulty.

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- (x) Students are required to instill an instinctive awareness towards property value of laboratory equipment and to be responsible when using it. Any damages can cause to jeopardize the success of not only the individual work but also to the university.
- (xi) Do not attempt to remove and dismantle any parts of the equipment/instrument peripheral from its original design without permission. Instrument and equipment must be returned orderly after using them.
- (xii) Students are strictly prohibited to take any equipment out from the laboratory without the permission of laboratory technologist.
- (xiii) Students should ask permission from laboratory instructor before operating the laboratory equipment.
- (xiv) Students should not attempt to use any unfamiliar equipment without, first consulting the laboratory instructor. Do not take away any technical manuals from the laboratory.
- (xv) Students should report immediately to the Laboratory technologist/assistant if any injury occurred.
- (xvi) Student should report immediately to the Laboratory technologist/assistant if discovered any damages of equipment and hazardous situation.
- (xvii) Please check the notice board regularly and pay attention to the laboratory announcements.
- (xviii) Please check with the laboratory instructor about the deadline of laboratory report submission.
- (xix) Disciplinary action shall be taken against those students who fails to abide to the rules and regulations.
- (xx) It is disallowed to bring any outsiders (non-registered parties) into the Chemistry Laboratory.
- (xxi) Students are strictly prohibited from taking out any items from the Chemistry Laboratory. In the event of an emergency, everyone in the laboratory should escape through the emergency exit. If in a story building, avoid using lifts, use the stairs.
- (xxii) If a fire breaks out in the laboratory, the person nearest to the central power circuit breaker should switch off the switch.
- (xxiii) It is always a good practice and a responsibility of an individual to keep a tidy working condition in laboratory.
- (xxiv) For overall safety when working with other people, it is essential for each student to follow the procedures given by the laboratory instructor when conducting laboratory experiment.
- (xxv) Before the experiment start, students must have studied the information and understood the procedures mentioned in the given laboratory sheet.
- (xxvi) Electric shock is a serious fatal error due to human negligence. Electric current of higher than 100mA may cause death to human. Thus, do not work with electricity under wet condition in laboratory.
- (xxvii) If there is a tingling feel when working with electrical devices, stop and switch off the devices immediately. Place a warning note before reporting to the laboratory staff/instructor and wait until further instruction.

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- (xxviii) Informing laboratory staff/instructor if you doubt the condition is not safe during the experiment.
- (xxix) Students with long hair must get their hair tied up tidily when doing laboratory work.
- (xxx) Before operating a high voltage equipment, always ask the laboratory staff/instructor to accompany, to check proper condition of electric circuit.
- (xxxix) When operating laser equipment, please avoid looking directly to the laser source.

### 3.5. Rules and Regulations on Material Use In The Laboratory

- (i) The facilities at the Chemistry laboratory are to be used for learning purposes only.
- (ii) Carry your STUDENT IDENTITY cards at all times whenever you come into the Chemistry Laboratory.
- (iii) Do not tamper with any equipment or practical setups. If there are problems or faults, report immediately to the staff at the Chemistry Laboratory.
- (iv) Do not remove any equipment or technical operation/ service manuals from the Chemistry Laboratory.
- (v) Do not alter the default hardware and software setup of the instrument/ equipment in the Chemistry laboratory.
- (vi) If you have any doubts about what you are doing, do not do it. Contact the support staff at the Chemistry Laboratory for clarification.
- (vii) Switch off your hand phone when you are in the Chemistry Laboratory.
- (viii) Do not bring your bags into the Chemistry laboratory.
- (ix) Chemistry Laboratory staff reserves the right to suspend the student from using the laboratory facilities if found in breach of any rules and regulations stated above.

### 3.6. Chemistry Practical Lessons Attendance

- (i) Attendance is compulsory to all students
- (ii) Student must be punctual to attend laboratory session.
- (iii) Students are generally given 1-2 weeks time to prepare the laboratory report.
- (iv) Laboratory report has to be submitted to the laboratory coordinator at the designated time and place.
- (v) Laboratory report is serious, work. Thus, fabricating result and copying manners are strictly prohibited.
- (vi) The student shall be briefed to follow instructions.
- (vii) Student must complete the experiment within allocated duration of laboratory session.
- (viii) Students who are late for more than 30 minutes will be barred to attend the laboratory session. Only students with valid reason of medical basis or unforeseen circumstances can be considered to apply for laboratory replacement.
- (ix) Attendance shall be taken during the laboratory session.
- (x) Student will be asked to show his/her results to the laboratory instructor before leaving at the end of laboratory session.
- (xi) The laboratory instructor shall sign the data collected from the Laboratory for an individual group.

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- (xii) Marks awarded to laboratory reports will constitute a specific percentage within the 30% marks slotted for CATS(continous assesment tests).

#### 4.0 CHEMISTRY LABORATORY INSTRUCTIONS

- 4.1 The lecturer prepares the practical lessons/tasks in consultation with the laboratory technologist.
- 4.2 The laboratory technologist ensure that all the relevant equipments, apparatus, chemicals and reagents are availed to students.
- 4.3 The laboratory technologist also ensure that the appropriate equipments and apparatus are ready to be used in the practical lessons/assignments/tasks.
- 4.4 The lecturer prepares a list of students expected to attend a given practical lesson. If the students cannot fit in the laboratory, the lecturer prepares the list in groups and allocates time to the groups appropriately i.e. when the students are available to take the practical lessons.
- 4.5 Only the students scheduled for the practical lesson are allowed in the laboratory. To enforce this condition, the laboratory technologist/attendant maintains lists of all the students scheduled for practical lessons.
- 4.6 The students are issued with the practical lesson/assignment/task manuals one week prior to the start of the practical lesson/assignment/task.
- 4.7 On the practical session, the students do their tasks as laid out in the issued laboratory sheet/manuals, with the help of chemistry technologists. In every practical lesson, there is a technologist assigned to assist the students in their practical tasks.
- 4.8 If students need any clarifications from the lecturer, they can request the lecturer to arrange when to meet them in the laboratory.
- 4.9 In the end of the practical session, the students in the laboratory should return all equipments and apparatus they were using and sign the attendance sheet for that particular laboratory session.

#### 5.0 RECORDS

This section is used to identify records.

Record ID	Owner	Location	Record Media	Retention/Disposition