

April 7, 2025

## Department of Chemistry

### Standard Operating Procedure (SOP)


#### For Safe Handling and Storage of Chemicals, Laboratory Safety and Chemical Waste Management


The purpose of this SOP is to outline the procedures for the safe handling and storage of chemicals, as well as the management of chemical waste in the laboratory, to protect the environment. Chemical waste management and its safe disposal without causing harm to the environment, students and living beings is a big challenge to chemistry education. The hazardous chemical waste generation and its disposal is a global issue. To address this issue the new branch of chemistry --"Green Chemistry" was established and governed by 12 Principles. A few of our faculty members of the department have contributed significantly in the area and have helped develop comprehensive guidelines for lab safety and chemical waste management have been prepared and implemented in the past few years.

Chemical waste is a broad term and includes many types of materials. The important safety guide for all chemicals is the Material Safety Data Sheet (MSDS) which helps in the identification and provides all the information on the hazards, safety, and chemical wastes that need special disposal protocol. Therefore, all the chemicals available in the lab to carry out undergraduate experiments have been listed, and their MSDS data have been collected and prepared manual data bank for ready reference, which is made available on the college website at the department page. The department has the custom of doing the following for chemical waste management.

- The chemicals are kept in a well-ventilated room at the ground floor in Chemistry Lab 2 that avoids sudden/accidental exposure of any hazardous fumes. Also, some chemicals are stored in laboratory fridge as per the instructions given on the label.
- Laboratory staff is given training on regular basis for the safe handling of chemicals and on the solution preparation to avoid any wastage/ mishandling of chemicals.
- All reagent bottles are well labelled to avoid any confusion amongst the stake holders
- Students are informed about the hazards associated with chemicals used in each experiment according to the MSDS. They are also briefed on precautions and emergency measures before performing experiments.

- Wherever possible, the traditional chemical methods of synthesis have been replaced and the green methods have been introduced to reduce or usage of hazardous chemicals.
- Preparations are carried out using the minimum quantity (0.5 g or less) of starting materials to reduce the generation of waste.
- The prepared compounds have been collected from students at the end semester exam and stored in a respective labelled container for further use in the other experiments wherever applicable so that chemicals are not allowed to enter the environment.
- Organic and inorganic analyses are carried out in semi-micro test tubes of the capacity to hold 5 mL or wherever possible spot test plates are used so that very small amounts and volumes of chemicals and reagents are respectively consumed which greatly reduces the chemical waste generation and their disposal at high dilution can be eased.
- For inorganic volumetric titrations, earlier 250 ml standard flasks were used which were later reduced to 100 ml. Now we are planning to use 50ml standard flask apparatus for further reduction of chemicals and reagents.
- Extreme care has been taken for disposing of broken glassware with SULABH personnel with proper protecting gloves in designated carton boxes. The designated carton boxes are placed in all four labs of the department. Any chemical contamination of broken glassware is separately stored.
- We are using BODMEL apparatus for melting and boiling point determination where silicon oil is generally used in place of corrosive conc. sulphuric acid. This greatly reduces the risks of chemical accidents with Kjeldahl flask for melting and boiling point determination.
- We have introduced a bridge course for 1<sup>st</sup> year UG students entitled “SVC गुरुकुल: विद्यालय से महाविद्यालय तक” where the students are given basic training about apparatus identification handling, basic laboratory techniques, dos and don'ts etc
- Recently, college has shifted from conventional LPG cylinders to IGL which is a more greener fuel.
- Many faculty members of our department have published lesson plans on basic concepts of chemistry and integrated them with climate change at TROPICSU website (<https://tropicsu.org/chemistry/>) these concepts are used in their day to day teaching to make the students more aware and sensitive towards environmental concerns.
- No extra chemicals are ordered beyond the requirements.
- Do's and Don'ts are displaced with signs in all three laboratories.
- Students are instructed about environment protection and waste managements.
- All this hazardous and other wastes managements are followed utmost care based on the principles such as prevention; minimization; reuse; recycling; recovery, utilisation and safe disposal.

  
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