

Physics Laboratory Safety Handout

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Purpose

The purpose of this document is to inform the physics student of the basics of laboratory safety and point out the most common types of safety hazards in the physics laboratory. This document is NOT a complete listing of the safety hazards in this laboratory or any laboratory but rather it plays the role of alerting the student to only some of the possible safety hazards.

Instructors Responsibilities

The laboratory instructor will inform the students of possible hazards in working in the laboratory environment as these hazards present themselves. Some of the experiments need extra concern as they include multiple safety hazards. The instructor will also maintain a watch on the different laboratory groups and point out safety issues and corrective action as the need arises. If you have a question about safety you should direct it immediately to the lab instructor.

Student Responsibilities

The students in the physics lab are expected to exercise common sense judgment when working with laboratory equipment. When personal experience does not help in the identifying and avoiding possible safety hazards, the student should exercise extra caution and ask the instructor for assistance. Safety is more important than pride and questions about safety will be answered promptly by the instructor. Note that it is better to NOT proceed if you suspect a safety issue than to learn the hard way!

Students are expected to listen to and follow all instructions given by the laboratory instructor. This includes all safety precautions and guidelines.

Primary Physics Laboratory Safety Concerns

Although the physics laboratory doesn't usually use chemicals like biology and chemistry labs, there are still safety concerns that not everyone is commonly aware about. In the physics lab, the main concerns are mechanical, extreme heat and cold, electrical, radiation.

Many of the devices in the physics lab require **mechanical motion** and use significant amounts of mass. Students should be careful to place themselves and sensitive electronics out of the path of these masses in case a string or other holding device was to fail. This does happen from time-to-time in introductory laboratories.

In the heat and thermodynamics experiment two different heat mechanisms are used: **electric furnace and hot plate**. Care should be taken while heating the objects by either method. Use insulating gloves and large tongs to transfer the object in and out of the furnace or hotplate. Check the electric furnace with tester for any leakage current before touching it.

A HeNe laser (633nm, 3mW) is being used in optics experiment. Direct staring into the beam will damage the retina of the eye. Safety goggles should always be worn while working at the level of the laser beam.

Extra precautions are needed while working with **cryogenics** in the lab. In the Liquid Nitrogen L-N₂ experiment, cryogenics gloves and safety goggles should be worn. There's always a chance of accidental spillage of L-N₂ which can be avoided by caution and common sense. Always avoid direct contact with L-N₂ as it will cause frost bite and in some cases, irreversible damage to skin.

The variac (variable transformer) is rated at 5KVA, 20A. **High voltage /current** can be lethal so rubber gloves should be used while working with it. Always check for leakage current in the magnetic phase transition apparatus prior to operation and operate the variac with one hand.

General Laboratory Rules

The following list of rules is general in nature and applies to the laboratory environment at all times. Rules and guidelines specific to a particular piece of laboratory equipment or a particular laboratory will be given at the time of the laboratory.

- 1) No food or drink is to be consumed in the laboratory. Any food or drink brought to the lab must remain in the student's carrying bag until they leave.
- 2) Students must wear appropriate clothing to laboratory. This includes shoes that are not open toed (No sandals, slippers, etc.). Please wear clothing to lab that you don't care if it gets dirty. We don't have a lot of chemicals but you will have to kneel on the floor to make measurements and some of the equipment can have greasy rotation points.
- 3) Place all sensitive electronic equipment safely on your table or within your bag under your table so that expensive damage can be avoided.
- 4) Do not modify or damage the laboratory equipment in any way unless the modification is directed by the instructor. This does not include the changing of a lab setup as prescribed by the procedures in the carrying out of measurements.
- 5) Use care when loosening and tightening screws and bolts. Treat the equipment as if it were your own.
- 6) Do not force any of the equipment. If an excessive amount of force is necessary then tell your instructor.
- 7) In case the fire alarm sounds, please exit the building by the nearest safe exit. Do Not Use The Elevators. If the fire is in the room leave everything behind. Your safety is not worth even an Rs.100, 000 computers. If the fire is not in the room and immediate danger is not apparent, then quickly and quietly pack your bag and exit the room or just leave the stuff behind. The instructor will lock the doors on the way out to ensure security.
- 8) In the case of any other emergency, follow the instructions of the laboratory instructor and all safety personnel that may have responded to the scene.

Remember, safety is the first priority. Let us work toward a safe and productive semester in physics lab.

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