1. PURPOSE

1.1. To provide guidelines to students and instructors of the basics of laboratory safety and point out the most common types of safety hazards in the physics laboratory at Thompson Rivers University (TRU).

2. SCOPE

2.1. This procedure applies to students and employees at TRU working in the Physics department.

3. PRECAUTIONS

POTENTIAL HEALTH & SAFETY HAZARDS

HAZARD		TO PROTECT YOURSELF
LASER		Do not look into the beam. Wear the required eye protection and protective clothing.
RADIATION		Wear required PPE and limit access to a source.
MAGNETIC FIELD		Wear the appropriate PPE
UV Light		Do not look directly at a UV lamp when the lamp is switched on.

4. ASSOCIATED DOCUMENTATION

Doc. Number	Doc. Title
	Incident Investigation Form

5. PROCEDURES AND RESPONSIBILITIES

INSTRUCTORS

5.1. Have charge of a laboratory and authority over students working in the lab.

5.2. Have overall responsibility for safety in the laboratory.

5.3. Will inform students of possible hazards in working in the laboratory environment as the hazards present themselves.

5.4. It is the supervisor's responsibility to ensure that students and new employees are aware of safety rules and follow them and that the following training has been provided:

- An appropriate safety orientation when individuals are first working in the laboratory,
- Generic and specific WHMIS training as needed for chemicals encountered
- Radiation Safety Training,
- Training on special or unusual hazards in the lab, and
- Training in the use of laboratory specific emergency equipment and emergency response.

5.5. Additionally supervisors will complete incident investigation reports for every incident or injury that occurs in his/her lab. After the report is complete a copy will be sent to the OHS Department. Incidents to be investigated include, but not limited to:

- Spills,
- Fires,
- Incidents requiring first aid or medical attention, and
- Near misses.

STUDENTS

5.6. When in the laboratory students are responsible to:

- Follow all applicable safety rules and practices,
- Use and wear the required PPE,
- Report all incidents,

- Report all unsafe conditions, and
- Complete recommended occupational health screening programs.

6. GENERAL LABORATORY HEALTH AND SAFETY REQUIREMENTS

6.1. No eating or drinking in the laboratory. Consume food and drink only in properly designated areas.

6.2. Applying cosmetics and handling contact lenses is not allowed in laboratories.

6.3. Use the appropriate personal protective equipment (PPE) at all times. Refer to the PPE procedure for more information.

6.4. Use laboratory equipment for its designated purpose.

6.5. Confine long hair and loose clothing.

6.6. Use a proper pipetting device – **absolutely no pipetting by mouth**.

6.7. Avoid exposure to gases, vapours, aerosols and particulates by using a properly functioning laboratory fume hood.

6.8. Wash hands upon completion of laboratory work and removal of protective equipment including gloves and laboratory coats. A vigorous hand washing with mild soap for 20 seconds is appropriate.

6.9. Fix unsafe conditions (employees) or report to the Instructor conducting the laboratory (students).

6.10. Know the location and correct use of all available safety equipment.

6.11. Determine potential hazards and appropriate safety precautions before beginning new operations and confirm that existing safety equipment is sufficient for this new procedure.

6.12. Avoid disturbing or distracting other workers while they are performing laboratory tasks.

6.13. Ensure visitors to the laboratory are equipped with appropriate safety equipment.

6.14. All hazardous chemicals must be correctly and labeled in accordance to Workplace Hazardous Materials Information Systems (WHMIS) requirements.

6.15. The *Material Safety Data Sheet* (MSDS) will be consulted before using an unfamiliar chemical.

6.16. Proper waste disposal procedures must be followed.

6.17. Refer to the on-line Work Alone procedure on the action to be taken if working alone in the building.

6.18. Unattended laboratory work should be kept to a minimum. It must be visited periodically with a sign posted adjacent to the equipment outlining the procedure being done alone with the name and phone number of a contact person. The sign will indicate the date and time the work was started, when it is expected to be completed and when it was last checked.

6.19. When using needles, glass pipettes, glass slides and cover slips, scalpels and appropriate precautions should be taken to avoid percutaneous injuries. These items should be disposed of immediately after use by placing them in an appropriate puncture-resistant container. Bending, recapping or clipping of needles is prohibited. If recapping is absolutely necessary, a mechanical device or the one handed scoop method must be used.

LASERS

6.20. Lasers present different magnitudes of hazard depending on their power and wavelength. The precautions necessary differ for the different classes of laser. Refer to Laser on www.tru.ca/hsafety for more information on lasers in working and learning safely at TRU/ Safe Work Procedures.

6.21. Ensure that operation, repair and maintenance are performed by competent, trained and qualified personnel only.

6.22. Ensure that appropriate protective eyewear and protective clothing are worn as determined by the class of the laser.

6.23. Manufacturer installed safety devices such as shields or interlocks are never to be altered, disconnected or removed without written approval from the laboratory supervisor.

CRYOGENIC MATERIALS

6.24. Cryogenics are very low temperature materials such as dry ice (CO2(s)), liquefied air, nitrogen, helium, oxygen, argon and neon.

6.25. The following hazards are associated with the use of cryogenics:

- Asphyxiation due to displacement of oxygen (for materials other than liquefied air and oxygen),
- Freezing and fracturing of materials from extreme cold,
- Frostbite,
- Explosion due to pressure build up, and

- Condensation of oxygen and fuel, such as hydrogen or hydrocarbons, resulting in explosive mixtures.

6.26. The following are precautions for handling cryogenics:

- Control ice build-up,
- Use only approved low-pressure containers equipped with pressure-relief devices. Lunch box Thermos bottles are not acceptable,
- Protect skin and eyes from contact; wear eye protection and insulated gloves,
- Wear safety goggles when breaking large pieces of dry ice or using mixtures of dry ice and solvent,
- Wear a face shield when removing samples from storage Dewars due to the possibility of rupture from pressure build-up,
- Use and store in well-ventilated areas. Alarmed oxygen sensors are required in areas where the volume of gas could result in the displacement of oxygen to a level lower than what is tolerable by people, thereby causing an asphyxiation hazard,
- Keep away from sparks or flames,
- Use materials resistant to embrittlement (e.g. rubber tubing),
- Watches, rings, bracelets or other jewelry that could trap fluids against flesh should not be worn when handling cryogenic liquids,
- To prevent thermal expansion of contents and rupture of the vessel, ensure containers are not filled to more than 80% of capacity, and
- Never store dry ice in a refrigerator/freezer (especially deep chest freezers). Dry ice will sublimate at -78°C and could asphyxiate the person opening the equipment.

FRENCH OR HYDRAULIC PRESSES

6.27. Ensure that loose clothing and long hair is secured, and any other items are clear of the press before operation.

6.28. Ensure that appropriate protective eyewear is worn.

ULTRAVIOLET (UV) LAMPS

6.29. Exposure to ultraviolet light (UV) may result in serious and painful injury to the eyes or skin depending on the specific wavelength of the light to which the individual is

exposed, the intensity of the light and the duration of exposure.

6.30. The following are precautions to take with UV lamps:

- Conspicuously label all UV lights sources with the following warning (or equivalent) "Warning – this device produces potentially harmful UV light. Protect eyes and skin from exposure."
- Ensure that the UV light source is shielded,
- Ensure that appropriate PPE is worn and is sufficient to protect the eyes and skin. PPE should at least include a UV resistant face shield, gloves and a lab coat, and
- Depending on the situation, shielding of the equipment itself or work area may be warranted.

RADIATION AND RADIOACTIVE WASTE

6.31. Radiation Safety requirements in the Physics department at TRU can be found on the TRU website at http://www.tru.ca/hsafety/workinglearningsafely/work/radiation.html

CORROSIVE

6.32. These materials have the ability to damage tissue at the site of contact.

Corrosive Liquids

6.33. Corrosive liquids can be particularly hazardous as they act rapidly upon contact. Examples of common corrosive liquids are:

6.34. Strong acids (chromic acid, hydrochloric acid, nitric acid, etc. Hydrofluoric acid may be fatal through inhalation, absorption or ingestion and causes extensive, deep and painful burns. Avoid use if possible.)

6.35. Strong bases (aqueous sodium hydroxide, potassium hydroxide, ammonia, etc.)

6.36. Strong oxidizing agents (peroxides, etc.)

CRYOGENIC MATERIALS

6.37. Cryogenics are very low temperature materials such as dry ice (CO2(s)), liquefied air, nitrogen, helium, oxygen, argon and neon. The following hazards are associated with the use of cryogenics:

- Asphyxiation due to displacement of oxygen (for materials other than liquefied air and oxygen),

- Freezing and brittleness of materials from extreme cold,
- Frostbite,
- Explosion due to pressure build-up, and
- Condensation of oxygen and fuel such as hydrogen or hydrocarbons resulting in explosive mixtures.

6.38. The following are precautions for handling cryogenics:

- Always handle these liquids carefully to avoid skin burns and frostbite. Exposure that may be too brief to affect the skin of the face or hands may damage delicate tissues, such as the eyes,
- Protect skin and eyes from contact; wear eye protection and insulated gloves,
- Wear safety goggles when breaking large pieces of dry ice or using mixtures of dry ice and solvent,
- Wear a face shield when removing samples from storage dewars due to the possibility of rupture from pressure build-up,
- Use and store in well-ventilated areas. Alarmed oxygen sensors may be required in areas where the volume of gas could result in the displacement of oxygen, thereby causing an asphyxiation hazard,
- Keep away from sparks or flames,
- Use materials resistant to embrittlement (e.g. rubber tubing),
- Watches, rings, bracelets or other jewelry that could trap fluids against flesh should not be worn when handling cryogenic liquids,
- Never store dry ice in a refrigerator/freezer (especially deep chest freezers). Dry ice will sublimate at -78°C and could asphyxiate the person opening the equipment,
- Boiling and splashing always occur when charging or filling a warm container with cryogenic liquid or when inserting objects into these liquids. Perform these tasks slowly to minimize boiling and splashing. Use tongs to withdraw objects immersed in a cryogenic liquid, and
- Cylinders and Dewars should not be filled to more than 80% of capacity, since expansion of gases during warming may cause excessive pressure build-up.

7. RECORDS/VERIFICATION OF UNDERSTANDING

7.1. Records:

- Incident Investigation Records
- Training Records

7.2. Verification of Understanding

- A training master log will be maintained by The Dean of Science for all Instructors and Staff, and with the Instructors for Students

8. SUMMARY OF CHANGES

Revision #	Date	Change (include section #)	Issued By
1	10/09/2014	NEW	OHS Officer