Radiation Safety Training

Open Source Orientation
Lab Assignment

University of Manitoba
Last revised December 16, 2019

Name of Student completing the assignment: _____
(Please underline your family name)

Name of Person mentoring this assignment: _____

Send the completed assignment electronically to EHS
Scan and e-mail to: radsafety@umanitoba.ca or Fax to: (204) 789-3906
(must be received prior to the workshop)

Keep the original completed assignment in your Radiation Safety Manual behind the last tab!

INSTRUCTIONS:
Prior to completing the lab assignment – read or review the individual documents linked under "Self Study Assignment" on the web at: http://umanitoba.ca/admin/vp_admin/risk_management/ehso/rad_safety/rad_training.html and complete the **Self Study Assignment**

Print or write clearly. All responses must be printed on this document by the student completing the assignment, except the mentor's observations section (that must be completed by the mentor listed below). The student must have a mentor physically present to supervise all of your actions related to completing the activities described herein.

This assignment will be used to assess the student's competence in order to be listed as a designated worker on an Internal Radioisotope Permit. **Please answer the questions in a manner to demonstrate your understanding of radiation safety.**

WHO can be a mentor: Any Permit Holder, or Laboratory Radiation Supervisor (LRS) listed on a valid and current University of Manitoba Internal Radioisotope Permit may voluntarily assume responsibility to physically supervise the student while completing this assignment and complete the 'mentor's observations' section. If the permit holder or LRS are not available, a staff member of EHS will be appointed, please contact Alison Yarmill at (204)789-3654 or William Grierson at (204) 789-3359 to have an EHS mentor assigned.

To the Mentor: Thank you for agreeing to mentor this new student. We hope you will recognize this as an opportunity to orient the student to your lab and departmental procedures and equipment. If you have any questions about the process please let us know.

Sincerely,
Alison Yarmill and William Grierson
Radiation Safety, Environmental Health and Safety
P310 Pathology Building, 770 Bannatyne Avenue, Winnipeg, MB R3E 0W3

1) Hazard Identification, Risk Assessment and Control Principles

Learning Objectives:

LO1 Identify hazards related to the planned use of radioactive materials.

LO2 Evaluate the risk associated with the hazards.

LO3 Identify ways to control the risks.

LO4 Value the control of risks.

Situations:

S1 **Consider an experiment that uses radioactive material**

Mentor Preparation:

Identify a laboratory experiment that uses radioactive material and provide access to the related hazard information resources:

- Your lab's standard operating procedures
- Material Safety Data Sheets may be found at: http://umanitoba.ca/admin/vp_admin/risk_management/ehso/chemical_safety/WHMISProgram.html
- Radiation Safety Data Sheets may be found in the Radionuclide Information Booklet at: http://nuclearsafety.gc.ca/eng/resources/radiation/radiation-safety-data-sheets/index.cfm
- Radiation Safety Manual, Appendix E: Quantities, Limits and Levels may be found in the hard copy manual in the lab or on the web at: http://umanitoba.ca/admin/vp_admin/risk_management/ehso/rad_safety/RadMan.html

Student Evaluation Criterion

Objectives and student's responses Add your responses to the questions in the objectives below. Print or write clearly!

IDENTIFYING AND ASSESSING HEALTH HAZARDS A health hazard is any agent, situation or condition that can cause an occupational illness. There are five types. After each heading brainstorm the possible hazards related to your planned experiment using radioactive material:

1. **Chemical hazards** related to the radioactive chemicals:
Solvents:

Reagents:

2. **Biological hazards**, such as bacteria, viruses, dusts and molds. Biological hazards are often called "biohazards". Review the Internal Radioisotope Permit to see if there is a 'Radiological- Biological Waste Approval'. If there is a copy should be filed in the Radiation Safety Manual behind the last tab. Review the 'Radiological- Biological Waste Approval' with the student.
   □ There is no 'Radiological- Biological Waste Approval' listed on the Internal Radioisotope Permit, or
   □ The mentor has reviewed the 'Radiological- Biological Waste Approval' with the student.

3. **Physical hazards** such as electric currents, heat, light, vibration, noise including ultraviolet radiation and lasers. Will the student be working with any physical hazards associated with the use of radioactive material?
   □ There are no physical hazards associated with the planned work, or
   □ The mentor has reviewed the physical hazards associated with the planned work or the related safe work procedure. If there is no documented safe work procedure, list the hazard and the related safety rules here:

Objectives and student's responses Add your responses to the questions in the objectives below. Print or write clearly!

4. **Radiation:** For each radioisotope the student will be using:

Radioisotope	Type of emission	Energy of emission	Half-life

Review the internal radioisotope permit to ensure the isotope, limit, rooms and usage are covered: yes or no

5. **Work design (ergonomic)** hazards (such as work requiring lifting, awkward posture, repetitive motions, excessive muscular force or computer use). Check all topics reviewed/ discussed:
   - □ Use a cart to transport items between labs.
   - □ If shielding will be used or does work need to be done in a fume hood? Does work set up fit the student?
   - □ If there is repetitive work (keyboarding, pipetting), the need to take breaks and change position was discussed.

6. **Workplace stresses –** Discuss if the use of radioactive material is concerning to the student.
   - □ Student is referred to Radiation Safety to discuss concerns if concerns arise.
   - □ Student is referred to Student Services to discuss concerns if concerns arise.
   - □ A buddy system is put in place until the student is comfortable. Dry runs or cold runs will be practiced until the student is comfortable

WHAT CONTROLS ARE IN PLACE TO MINIMIZE THE RISK:

A. List personal protective equipment you will use:

To protect your clothing:

□ A lab coat is worn with the buttons/snaps fastened whenever radioactive materials are handled.

To protect your hands:

□ Disposable gloves must be worn when handling radioactive materials (Have you considered the chemical and physical compatibility specific to your experiment?)

To protect your eyes or face:

□ The use of safety glasses or a face shield was discussed.

What are the safety rules related to contamination control:

□ Work with radioactive material must occur in trays or on plastic backed absorbent paper.

□ All wastes generated must be placed in radioactive waste.

B. List any engineering controls you will use (fume hood, shielding):

C. In your opinion, what is the most important work practice that will reduce the hazard and why:

Examples: Contamination monitoring, Hand-washing, Hazard labeling, Waste disposal procedures.

Mentor's Observations –Indicate if you agree each objective (listed on the first page of this section has been accomplished by the student. Add your comments as well:

2 - Radiation Safety Compliance Activity (check your lab for compliance)

Learning Objectives:

LO1 Identify and explain how the facility is appropriate to use unsealed radioactive materials.

LO2 Evaluate how to set up a counter top, fume hood, or refrigerator to use or store unsealed radioactive materials.

LO3 Evaluate a workstation to see if it is set up to minimize radioactive contamination and keep it from spreading.

Situations:

S1 Fume hood, if available, and dish washing sink.

S2 Refrigerator (or other location) used to store radioactive material.

S3 Experimental area used for radioactive work – may include a workbench, pipette, radioactive waste and, as available: shield, test tube rack, water bath, bag-sealer, hybridization oven, shaker, vortex or micro-centrifuge.

Mentor Preparation:

Identify a laboratory space to use for the exercise.

The space should be previously monitored for radioactive contamination.

Student Evaluation Criterion

Objectives and student's responses Include a "Y"in the □ to indicate you have completed this action. Add your responses to the questions in the objectives below. Print or write clearly!	**Mentor's Observations** – use a "Y" to indicate you agree each objective has been accomplished by the student. Add your comments as well.
A. The student should identify a location within a laboratory where the use of radioactive material is appropriate. Describe: Explain the advantages of the chosen location: Explain the disadvantages of the chosen location:	
B. CONTAMINATION CONTROL: Evaluate the techniques in place to minimize the spread of contamination: Which way does one use absorbent material? absorbent side up □ or down □ How are labels with the radiation warning symbol versus striped tape used to identify the workstation and the storage location? _____ How is the lab prepared for small emergencies? _____ Where should potentially contaminated items like pipettes by laid down during the experiment? _____ How is good housekeeping demonstrated in your lab? _____ Where (outside of permitted spaces) are food, beverages, and personal items to be kept? _____	

C. For each radioisotope in use, explain the techniques used to minimize exposure to ionizing radiation – give at least one example for each.

Isotope in use:	
Shielding	
Time	
Distance	

D. As time permits, review the Quick Steps Compliance Checklist in the Radiation Safety Records binder and ask your mentor about local procedures (check off all the items reviewed with your mentor).

In the lab, can you find:

☐ Radiation Safety Manual?

☐ Radiation Safety Records Binder?

☐ Inventory forms (gold sheets)?

☐ Locked storage for radioisotope stock vials?

Is the key stored secure from anyone that is not trained in Radiation Safety? Yes or No

☐ Serial number on stock vials?

☐ Past and Blank contamination monitoring forms/records?

☐ Map of lab? Is it dated? yes or no

☐ "CNSC Surface Contamination Limits" Reporting Levels

☐ "University Decontamination Levels"

☐ Using the inventory forms – find the last date radioactive material was used and can you locate the contamination monitoring records dated within 7 days of the last use?

Date of last use: _____ Date of monitoring: _____

☐ A place to hang up your lab coat after it has been worn that will not contact clean (unworn) lab coats or other coats?

☐ Disposable gloves in your size and appropriate for the chemicals properties of the material you plan to work with?

☐ Radiation Spill Kit – review contents, are the pens/tape dried out?

Postings:

☐ Radioisotope area designation posted at all entrances of permitted rooms (WHIP)?

☐ CNSC classification poster posted inside the lab

☐ Internal Radioisotope Permit – prominently posted?

☐ Waste disposal chart for Radioisotope labs?

☐ Radiation Warning labels on storage areas?

☐ Striped tape on designated work areas, items and equipment?

Do you know where (how) to get more:

☐ More plastic backed absorbent paper to line radiation work areas with?

☐ More radiation warning labels? Striped tape?

☐ Radioactive waste containers? Radioactive waste tags?

If the waste tags are already on waste containers – is the upper part filled in?

Dosimetry: ☐ Do you require a badge dosimeter? Hint: Badges are only required if working with isotopes other than, H-3, C-14, Ca-45 or S-35. Who do you get a dosimeter from? Where should you store your dosimeter? **Review lab specific procedures:** Radiological/ Biological Waste approval if radioactive materials are used with infectious materials – reviewed in the first section…. ☐ Approved Alternate Method of Detection ☐ Safe work procedures listed as a condition on the Internal Radioisotope Permit? Any other local safety procedures?	

Summary of student's observations – is your lab in compliance?
List any shortcomings (Things to do):

3 - Liquid Scintillation Counting/Wipe Test Activity

Learning Objectives:

LO1 Demonstrate how to perform weekly monitoring and record the information on the Weekly Contamination Monitoring form.

Situations:

S1 Fume hood, if available and dish washing sink.

S2 Refrigerator (or other location) used to store radioactive material.

S3 Experimental area used for radioactive work – include a workbench, pipette, radioactive waste and, as available: shield, test tube rack, water bath, bag-sealer, hybridization oven, shaker, vortex or micro-centrifuge.

Mentor Preparation:

Identify a laboratory space to use for the exercise. The space should be previously monitored for radioactive contamination.

Collect the materials needed and have them readily available. Examples: Provide filter paper, water, 50% alcohol, vials, scintillation fluid, racks, a scintillation counter, and a Weekly Contamination Monitoring form.

Student Evaluation Criterion

Objectives and student's responses Include a "Y" in the □ to indicate you have completed this action. Add your responses to the questions in the objectives below. Print or write clearly!	**Mentor's Observations** – use a "Y" to indicate you agree each objective has been accomplished by the person completing this activity. Add your comments as well.
A. The student creates a plan to effectively monitor for contamination. Locate the 'Radiation Records' binder for the room. ☐ Ensure the decontamination level for your contamination monitoring method is listed on the "Quick Step" in the 'Radiation Records' binder. ☐ Find or make a copy of the most recent blank Weekly Contamination Monitoring form/record. (hint: Records Binder divider Quick Step for Contamination Monitoring) Locate the local Liquid Scintillation Counter (LSC) or equipment listed in alternate method of contamination monitoring. ☐ Is the LSC or other contamination method unit operational? Explain how you know: ☐ What pre-operational checks or actions are required (indicate if according to instrument manual or dept's procedure): Hint – how often is a calibration check performed? Hint - is there a log book for the LSC? ☐ Review the existing Map or prepare new map ☐ Formulate a plan as to where to wipe including most likely contaminated sites and some non-working areas too. Use a map to indicate where you plan to wipe and attach the map. (consider the situations in S1, S2 and S3 as above) ☐ Select an appropriate wipe media (filter paper). Describe: ☐ Decide on whether to wet it or not, and with what. Describe: ☐ Should the floor or door handle be wiped? ☐ Should dosimeters (when in the lab) be monitored for contamination?	

Objectives and student's responses Include a "Y" in the □ to indicate you have completed this action. Add your responses to the questions in the objectives below. Print or write clearly!	**Mentor's Observations** – use a "Y" to indicate you agree each objective has been accomplished by the person completing this activity. Add your comments as well.
B. The student performs wipe testing. ☐ Include a measurement of the background (blank). ☐ Perform a routine area survey of the sites decided on above and wipe to obtain contamination on the middle of the paper, wipe approximately 100 cm^2 in an appropriate manner. ☐ Should the vials should be stored in the dark and how does that reduce interferences such as ultra-violet activation and chemiluminescence? ☐ How is your Liquid Scintillation Counter programmed? DPM or CPM ☐ Explain why DPM programs are preferred: ☐ When is CPM acceptable and why? ☐ Explain why 5 minutes of count time is required: ☐ Explain what to do if the 'decontamination level' of twice background is exceeded:	
C. Documentation: Record the results on the Weekly Monitoring Form ***Attach a copy of the weekly contamination form and the related print out from the Liquid Scintillation Counter!***	

Summary of student's assessment of the activity:

Are you confident you would be able to perform and document a wipe test on your own?

What additional information/equipment or supplies do you need?

If not, what is your plan to get the additional information or items needed to wipe test?

Declaration: By signing below, I have acknowledged that I personally have completed all the submitted answers to the questions.

Signature of student: _____

Date of Signature: _____

Mentor's Declaration: By signing below, I have acknowledged that I personally have completed all the submitted 'mentor's observations'.

Any additional comments:

Signature of mentor: _____

Date of Signature: _____