

Radioisotopes

Course Outcome Summary

Course Information

Organization	MATC
Developers	Lisa Seidman, Ph.D.
Development Date	2/12/2003
Course Number	007-102
Potential Hours of Instruction	72

Description

This course surveys the potential hazards and safety procedures associated with radioisotopes. Lab exercises include liquid scintillation counting and autoradiography.

Types of Instruction

Instruction Type	Contact Hours	Credits
Classroom Presentation	36	
On Campus Laboratory and Clinicals	36	
Individualize/Independent Study		
Simulated or Actual Work Experience		
On-the-Job Experience		

Textbooks

Biosafety in the Laboratory: Prudent Practices for Handling. National Research Council.

Joseph Accrocco and Michael Cinquanti. *Right to Know Pocket Guide for Laboratory Employees.*

University of Wisconsin Safety Department. *Radiation Safety for Radiation Workers.*

Learner Supplies

Lab coat.

Safety goggles.

Lab notebook.

Calculator with scientific notation.

Competencies

Unit I. Radioactivity, Radiation, and the Biological Effects of Radiation

1. Define the relationship between atomic structure and radioactivity.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through written examinations.
- o through the completion of written explanations of results and observations of laboratory activities.

Your performance will be successful when:

- o you diagram and define the structure of an atom.
- o you define the term isotope, radioactivity, and radiation.
- o you describe the properties of common radiations.

2. Define the terms used to quantitate radioactivity.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through the completion of laboratory activities.
- o through written examinations.

Your performance will be successful when:

- o you define the terms rad, ionizing radiation, rem, roentgen, decay, and specific radioactivity.
- o you explain the concept of half-life and biological half-life.
- o you solve half-life and specific activity problems.

3. Discuss the biological effects of radiation.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through written examinations.

Your performance will be successful when:

- o you define and differentiate somatic and hereditary effects.
- o you define the ALARA rule (As Low As Reasonably Achievable).
- o you describe the biological hazards associated with internal and external radiation exposures.

4. Discuss general aspects of radiation safety.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through the completion of laboratory activities.
- o through written examinations.
- o through the completion of written explanations of results and observations of laboratory activities.

Your performance will be successful when:

- o you list natural sources of radiation exposure.

Unit II. Radiation Detection and Measurement

1. Describe the survey meters used for detection of radiation.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through written examinations.

Your performance will be successful when:

- o you describe Geiger-Mueller (GM), Low Energy Gamma (LEG), and ion chamber survey meters.

2. Describe Liquid Scintillation Counting (LCS).

You will demonstrate your competence:

- o through the completion of written assignments.
- o through the completion of laboratory activities.
- o through written examinations.
- o through the completion of written explanations of results and observations of laboratory activities.

Your performance will be successful when:

- o you define LCS and associated terminology.
- o you solve cpm/dpm problems and counting efficiency problems.
- o you construct a quench curve.

3. Perform a survey of the lab for radioactive contamination.

You will demonstrate your competence:

- o through the completion of laboratory activities.
- o through the completion of written explanations of results and observations of laboratory activities.

Your performance will be successful when:

- o you prepare a survey plan for the lab.

- o you operate a GM survey meter.
- o you conduct a wipe test survey.
- o you prepare a report on the results of the survey.

4. Discuss radiation dosimeters and their proper use.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through written examinations.

Your performance will be successful when:

- o you describe autoradiography and the use of film badges.
- o you define thermoluminescent dosimetry (TLD).
- o you list the rules for proper use of dosimeters.

5. Discuss exposure limits.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through written examinations.

Your performance will be successful when:

- o you describe the sources of natural radiation.
- o you explain how urine, thyroid, and whole body monitoring is done.
- o you define maximum permissible dose limits.

Unit III. Radioactive Material Work Practices

1. Discuss good housekeeping practices used to keep radionucleotides outside the body.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through the completion of laboratory activities.
- o through written examinations.
- o through the completion of written explanations of results and observations of laboratory activities.

Your performance will be successful when:

- o you list basic lab rules.
- o you describe personal protective attire.
- o you describe the guidelines for safely inspecting and opening packages.
- o you describe the containment of aerosols.

2. Describe the methods for disposal of radioisotopes.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through written examinations.

Your performance will be successful when:

- o you describe the regulations for natural decay, release to server or atmosphere, and trash disposal.
- o you explain the importance of complete and accurate records for radioactive materials.

3. Discuss emergency procedures and decontamination.

You will demonstrate your competence:

- o through the completion of written assignments.
- o through written examinations.

Your performance will be successful when:

- o you describe general procedures that should be taken in the case of an emergency.
- o you describe procedures specific to minor spills, major spills, fire, and injury.
- o you explain personnel decontamination procedures.
- o you explain laboratory and equipment decontamination.

Unit IV. Applications of Radioactivity**1. Discuss the uses of radioisotopes in biotechnology.****You will demonstrate your competence:**

- o through the completion of written assignments.
- o through written examinations.

Your performance will be successful when:

- o you describe a radioactive tracer.
- o you describe a pulse-chase experiment.
- o you describe the use of radioactive probes.
- o you defines radiolabeling.

2. Describe the use of radioactivity in medicine and consumer products.**You will demonstrate your competence:**

- o through the completion of written assignments.
- o through written examinations.

Your performance will be successful when:

- o you describe x-rays, PET scan, CAT scan, and fluroscopy.
- o you list consumer products containing a radioactive component.