



Western Technical College

10526197 Radiation Protection and Biology

Course Outcome Summary

Course Information

Description	Prepares radiography students to protect themselves and others from exposure to radioactivity. Students examine the characteristics of radiation and how radiation affects cell biology. Students apply standards and guidelines for radiation exposure.
Career Cluster	Health Science
Instructional Level	Associate Degree Courses
Total Credits	3
Total Hours	54

Pre/Corequisites

Prerequisite 10526158 Introduction to Radiography

Textbooks

Radiologic Science for Technologists. 11th Edition. Copyright 2017. Bushong, Stewart C. Publisher: Elsevier Science. **ISBN-13:**978-0-323-35377-9. Required. (Part of Western Bundle Package **ISBN-13:** 978-0-323-54018-6)

Mosby's Radiography Online: Radiologic Physics (User Guide and Access Code). 2nd Edition. Copyright 2008. Mosby. Publisher: Elsevier Science. **ISBN-13:**978-0-323-05349-5. Required. (Part of Western Bundle Package **ISBN-13:** 978-0-323-54018-6)

Learner Supplies

Corectec Review Course Online. **Vendor:** eCampus <https://westerntc.ecampus.com>. Required.

Success Abilities

1. Refine Professionalism: Act Ethically

Program Outcomes

1. Practice radiation safety principles

Course Competencies

1. Evaluate the characteristics and relationships of protons, neutrons, electrons and energy levels of the atom

Assessment Strategies

- 1.1. Oral, written, graphic and/or skill assessment

Criteria

- 1.1. you describe the characteristics of protons, neutrons, electrons and energy levels of the atom
- 1.2. you describe the relationship between protons, neutrons, electrons and energy levels of the atom
- 1.3. you explain the purpose of protons, neutrons, electrons and energy levels of the atom

Learning Objectives

- 1.a. Describe the characteristics of protons, neutrons, electrons, and energy levels of the atom
- 1.b. Describe the relationships between protons, neutrons, electrons and energy levels
- 1.c. Explain the purpose of protons, neutrons, and energy levels of the atom

2. Compare the processes of ionization and excitation

Assessment Strategies

- 2.1. Oral, written, graphic and/or skill assessment

Criteria

- 2.1. you differentiate between ionization and excitation
- 2.2. you name ionization processes
- 2.3. you name excitation processes
- 2.4. you describe the interaction with matter

Learning Objectives

- 2.a. Describe the excitation process
- 2.b. Describe the ionization process
- 2.c. Define ionization and excitation

3. Compare natural and man-made sources of ionizing radiation

Assessment Strategies

- 3.1. Oral, written, graphic and/or skill assessment

Criteria

- 3.1. you contrast charged and uncharged forms of particulate radiation
- 3.2. you characterize radioactivity
- 3.3. you describe characteristics of radioactivity
- 3.4. you distinguish between natural and man-made radiation
- 3.5. you include examples of natural and man-made radiation

Learning Objectives

- 3.a. Contrast charged and uncharged forms of radiation
- 3.b. Characterize radioactivity
- 3.c. Describe characteristics of radioactivity
- 3.d. Distinguish between natural and man-made radiation
- 3.e. List examples of natural and man-made radiation

4. Interpret photon interactions with matter

Assessment Strategies

4.1. Oral, written, graphic and/or skill assessment

Criteria

- 4.1. you illustrate photon interactions with matter
- 4.2. you illustrate the effects of interactions with matter
- 4.3. you specify the end result
- 4.4. you associate the energies of interactions with matter

Learning Objectives

- 4.a. Describe Photoelectric Interactions
- 4.b. Describe Compton Scattering
- 4.c. characterize the differences between absorption and scattering
- 4.d. Calculate secondary photon energy as a result of interaction

5. Contrast the significance of photoelectric effect versus scattering interactions in diagnostic imaging

Assessment Strategies

5.1. Oral, written, graphic and/or skill assessment

Criteria

- 5.1. you identify effects of scatter radiation
- 5.2. you identify effects of photoelectric radiation
- 5.3. you explain the factors that alter the ratio of scatter radiation to PE radiation
- 5.4. you select the interaction that is preferred for image formation
- 5.5. you select the interaction that is preferred for patient protection

Learning Objectives

- 5.a. Describe the Photoelectric Effect
- 5.b. Identify the effects of scatter radiation
- 5.c. Identify the effects of the Photoelectric Effect
- 5.d. Describe the Compton Effect

6. Analyze the application of radiation protection principles for patients and personnel

Assessment Strategies

6.1. Oral, written, graphic and/or skill assessment

Criteria

- 6.1. you illustrate the effect of shielding on radiation protection
- 6.2. you illustrate the effect of time on radiation protection
- 6.3. you illustrate the effect of distance on radiation protection
- 6.4. you identify controlled and uncontrolled facility and equipment design
- 6.5. you describe the proper handling and disposal of radioactive materials

Learning Objectives

- 6.a. List various patient and personnel shielding devices
- 6.b. Differentiate the usages of the various devices for the patient and personnel
- 6.c. Apply the ALARA concept to protecting patients and personnel
- 6.d. Solve Inverse Square Law problems

7. Categorize between the various effects of radiation exposure

Assessment Strategies

7.1. Oral, written, graphic and/or skill assessment

Criteria

- 7.1. you differentiate between stochastic and deterministic effects
- 7.2. you differentiate between early and late effects
- 7.3. you differentiate between low dose and high dose effects

Learning Objectives

- 7.a. Differentiate between early and late effects
- 7.b. Differentiate between low dose and high dose effects
- 7.c. Differentiate between stochastic and non stochastic effects

8. Summarize the effects of radiation exposure to the cell

Assessment Strategies

8.1. Oral, written, graphic and/or skill assessment

Criteria

- 8.1. you describe effect of radiation on DNA
- 8.2. you differentiate between direct and indirect and target theory
- 8.3. you describe the radiolysis of water
- 8.4. you identify different types of cell injury
- 8.5. you identify biophysical events

Learning Objectives

- 8.a. List different types of cell injury
- 8.b. Describe the radiolysis of water
- 8.c. Differentiate between direct, and indirect, and target theory
- 8.d. Describe the effect of radiation on DNA

9. Compare monitoring devices used for the detection of radiation

Assessment Strategies

9.1. Oral, written, graphic and/or skill assessment

Criteria

- 9.1. you compare important features or attributes of monitoring devices
- 9.2. you outline the similarities and differences between the monitoring devices
- 9.3. you describe the uses and location of personnel monitoring devices

Learning Objectives

- 9.a. List different types of radiation monitoring devices
- 9.b. Describe the function of monitoring devices
- 9.c. Contrast the advantages and disadvantages of monitoring devices

10. Summarize standards from NCRP

Assessment Strategies

10.1. Oral, written, graphic and/or skill assessment

Criteria

- 10.1. you identify the standards from NCRP that apply to radiation technology
- 10.2. you describe why the standards are important
- 10.3. you recall current source of NCRP regulations
- 10.4. you identify the radiation exposure limits for various populations and body parts

Learning Objectives

- 10.a. List radiation dose equivalent values for general public exposure
- 10.b. List radiation dose equivalent values for occupational exposure for body parts
- 10.c. Identify sources to gather NCRP information
- 10.d. Describe the application of NCRP standards
- 10.e. List standards of the NCRP that apply to radiography

11. Apply the different radiation exposure units

Assessment Strategies

11.1. Oral, written, graphic and/or skill assessment

Criteria

- 11.1. you include both SI units and traditional units
- 11.2. you include the conversion factor for units
- 11.3. you define exposure units

Learning Objectives

- 11.a. Define SI and Traditional units of radiation
- 11.b. Convert SI units to Traditional units
- 11.c. Convert Traditional units to SI units

12. Summarize the principles of cellular biology

Assessment Strategies

12.1. Oral, written, graphic and/or skill assessment

Criteria

12.1. you describe cell division

12.2. you include the components of cell structure and their functions

Learning Objectives

12.a. Describe the components of cell structure and their functions

12.b. Describe stem cell division

12.c. Describe germ cell division

13. Summarize radio-sensitivity to tissues and organs

Assessment Strategies

13.1. Oral, written, graphic and/or skill assessment

Criteria

13.1. you describe damage to tissues and organs

13.2. you include the components of tissues and organs and their functions

13.3. you categorize tissues and organs according to the level of radio-sensitivity

13.4. you include radio-protectants and radio-sensitizers

Learning Objectives

13.a. Describe damage to tissues and organs

13.b. List the factors which determine the extent of damage

13.c. Categorize characteristics of tissues and organs to their radiosensitivity

13.d. List radio-protectants and radio-sensitizers

14. Interpret graphic dose-related relationships

Assessment Strategies

14.1. Oral, written, graphic and/or skill assessment

Criteria

14.1. you compare dose response relationship graphs

14.2. you differentiate between threshold and non-threshold effects

14.3. you differentiate between linear and non-linear

14.4. you give examples of each effect

Learning Objectives

14.a. Compare dose response relationship graphs

14.b. Differentiate between threshold and non-threshold effects

14.c. Differentiate between linear and non-linear effects