

Appendix B

Mapping the ASRT Objectives for Radiation Protection (47 Objectives) and Radiation Biology (21 Objectives) to this Text

ASRT Radiation Protection Objectives	Content Addressed in the Text
1. Identify and justify the need to minimize unnecessary radiation exposure of humans.	Chapter 1 Radiation Protection Overview Chapter 4 The Radiobiology of Low-Dose Radiation Chapter 5 Radiation Protection Practice
2. Distinguish between somatic and genetic radiation effects.	Chapter 1 Radiation Protection Overview Chapter 4 The Radiobiology of Low-Dose Radiation
3. Differentiate between the stochastic (probabilistic) and nonstochastic (deterministic) effects of radiation exposure.	Chapter 1 Radiation Protection Overview Chapter 4 The Radiobiology of Low-Dose Radiation
4. Explain the objectives of a radiation protection program.	Chapter 1 Radiation Protection Overview Chapter 5 Radiation Protection Practice
5. Define radiation and radioactivity units of measurement.	Chapter 2 Basic Physics for Radiation Protection: An Overview Chapter 3 Radiation Exposure and Dose Units
6. Identify effective dose limits (EDL) for occupational and non-occupational radiation exposure.	Chapter 5 Radiation Protection Practice
7. Describe the ALARA concept.	Chapter 1 Radiation Protection Overview Chapter 3 Radiation Exposure and Dose Units Chapter 5 Radiation Protection Practice
8. Identify the basis for occupational exposure limits.	Chapter 5 Radiation Protection Practice
9. Distinguish between perceived risk and comparable risk.	Chapter 1 Radiation Protection Overview Chapter 4 The Radiobiology of Low-Dose Radiation Chapter 5 Radiation Protection Practice

ASRT Radiation Protection Objectives	Content Addressed in the Text
10. Describe the concept of the negligible individual dose (NID).	
11. Identify ionizing radiation sources from natural and man-made sources.	Chapter 2 Basic Physics for Radiation Protection: An Overview
12. Comply with legal and ethical radiation protection responsibilities of radiation workers.	Chapter 6 Radiation Protection Organizations Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations
13. Describe the relationship between irradiated area and effective dose.	Chapter 3 Radiation Exposure and Dose Units Chapter 5 Radiation Protection Practice Chapter 7 Factors Affecting Dose in Radiographic Imaging
14. Describe the theory and operation of radiation detection devices.	Chapter 5 Radiation Protection Practice
15. Identify appropriate applications and limitations for each radiation detection device.	Chapter 5 Radiation Protection Practice
16. Describe how isoeposure curves are used for radiation protection.	Chapter 5 Radiation Protection Practice
17. Identify performance standards for beam limiting devices.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 15 Radiation Protection through Quality Control
18. Describe procedures used to verify performance standards for equipment and indicate the potential consequences if the performance standards fail.	Chapter 15 Radiation Protection through Quality Control
19. Describe the operation of various interlocking systems for equipment and indicate potential consequences of interlock system failure.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 8 Factors Affecting Dose in Fluoroscopy
20. Identify conditions and locations evaluated in an area survey for radiation protection.	
21. Distinguish between controlled and non-controlled areas and list acceptable exposure levels.	Chapter 14 Protective Shielding in Diagnostic Radiology
22. Describe "Radiation Area" signs and identify appropriate placement sites.	Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations Chapter 14- Protective Shielding in Diagnostic Radiology
23. Describe the function of federal, state and local regulations governing radiation protection practices.	Chapter 6 Radiation Protection Organizations Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations
24. Describe the requirements for and responsibilities of a radiation safety officer.	Chapter 6 Radiation Protection Organizations

ASRT Radiation Protection Objectives	Content Addressed in the Text
25. Express the need and importance of personnel monitoring for radiation workers.	Chapter 5 Radiation Protection Practice
26. Describe personnel monitoring devices, including applications, advantages and limitations for each device.	Chapter 5 Radiation Protection Practice
27. Interpret personnel monitoring reports.	Chapter 5 Radiation Protection Practice
28. Compare values for individual effective dose limits for occupational radiation exposures (annual and lifetime).	Chapter 5 Radiation Protection Practice
29. Identify anatomical structures that are considered critical for potential late effects of whole body irradiation exposure.	Chapter 4 The Radiobiology of Low-Dose Radiation
30. Identify effective dose limits for the embryo and fetus in occupationally exposed women.	Chapter 5 Radiation Protection Practice
31. Distinguish between primary and secondary radiation barriers.	Chapter 14 Protective Shielding in Diagnostic Radiology
32. Demonstrate how the operation of various x-ray and ancillary equipment influences radiation safety and describe the potential consequences of equipment failure.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 8 Factors Affecting Dose in Fluoroscopy Chapter 15 Radiation Protection through Quality Control
33. Perform calculations of exposure with varying time, distance and shielding.	Chapter 7 Factors Affecting Dose in Radiographic Imaging
34. Discuss the relationship between workload, energy, half-value layer (HVL), tenth-value layer (TVL), use factor, and shielding design.	Chapter 14 Protective Shielding in Diagnostic Radiology
35. Identify emergency procedures to be followed during failures of x-ray equipment.	Chapter 6 Radiation Protection Organizations Chapter 15 Radiation Protection through Quality Control
36. Demonstrate how time, distance and shielding can be manipulated to keep radiation exposures to a minimum.	Chapter 14 Protective Shielding in Diagnostic Radiology
37. Explain the relationship of beam-limiting devices to patient radiation protection.	Chapter 7 Factors Affecting Dose in Radiographic Imaging

ASRT Radiation Protection Objectives	Content Addressed in the Text
38. Discuss added and inherent filtration in terms of the effect on patient dosage.	Chapter 7 Factors Affecting Dose in Radiographic Imaging
39. Explain the purpose and importance of patient shielding.	Chapter 6 Radiation Protection Organizations Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations
40. Identify various types of patient shielding and state the advantages and disadvantages of each type.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations
41. Use the appropriate method of shielding for a given radiographic procedure.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations
42. Explain the relationship of exposure factors to patient dosage.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 8 Factors Affecting Dose in Fluoroscopy Chapter 9 Dose in Digital Radiography Chapter 10 Radiation Dose in Computed Tomography
43. Explain how patient position affects dose to radiosensitive organs.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 8 Factors Affecting Dose in Fluoroscopy
44. Identify the appropriate image receptor that will result in an optimum diagnostic image with the minimum radiation exposure to the patient.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 8 Factors Affecting Dose in Fluoroscopy Chapter 9 Dose in Digital Radiography Chapter 10 Radiation Dose in Computed Tomography
45. Select the immobilization techniques used to eliminate voluntary motion.	Chapter 7 Factors Affecting Dose in Radiographic Imaging Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations
46. Describe the minimum source-to-tabletop distances for fixed and mobile fluoroscopic devices.	Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations
47. Apply safety factors for the patient, health care personnel and family members in the room during radiographic procedures.	Chapter 13 Optimization of Radiation Protection: Regulatory and Guidance Recommendations

ASRT Radiation Biology Objectives	Content Addressed in the Text
1. Describe principles of cellular biology.	Chapter 4The Radiobiology of Low-Dose Radiation
2. Identify sources of electromagnetic and particulate ionizing radiations.	Chapter 3 Radiation Exposure and Dose Units
3. Differentiate between ionic and covalent molecular bonds.	
4. Discriminate between direct and indirect ionizing radiation.	Chapter 2 Basic Physics for Radiation Protection: An Overview Chapter 4The Radiobiology of Low-Dose Radiation
5. Discriminate between the direct and indirect effects of radiation.	Chapter 2 Basic Physics for Radiation Protection: An Overview Chapter 4The Radiobiology of Low-Dose Radiation
6. Identify sources of radiation exposure.	Chapter 1 Radiation Protection Overview Chapter 3 Radiation Exposure and Dose Units
7. Describe radiation-induced chemical reactions and potential biologic damage.	Chapter 4The Radiobiology of Low-Dose Radiation
8. Evaluate factors influencing radiobiologic/ biophysical events at the cellular and subcellular level.	Chapter 4The Radiobiology of Low-Dose Radiation
9. Identify methods to measure radiation response.	Chapter 4The Radiobiology of Low-Dose Radiation
10. Describe physical, chemical and biologic factors influencing radiation response of cells and tissues.	Chapter 4The Radiobiology of Low-Dose Radiation
11. Explain factors influencing radiosensitivity.	Chapter 4The Radiobiology of Low-Dose Radiation
12. Recognize the clinical significance of lethal dose (LD).	
13. Identify specific cells from most radiosensitive to least radiosensitive.	Chapter 4The Radiobiology of Low-Dose Radiation
14. Employ dose response curves to study the relationship between radiation dose levels and the degree of biologic response.	Chapter 1 Radiation Protection Overview Chapter 4The Radiobiology of Low-Dose Radiation
15. Examine effects of limited vs. total body exposure	Chapter 4The Radiobiology of Low-Dose Radiation Chapter 5 Radiation Protection Practice
16. Relate short-term and long-term effects as a consequence of high and low radiation doses.	Chapter 4The Radiobiology of Low-Dose Radiation
17. Differentiate between somatic and genetic radiation effects and discuss specific diseases or syndromes associated with them.	Chapter 4The Radiobiology of Low-Dose Radiation
18. Discuss stochastic (probabilistic) and nonstochastic (deterministic) effects.	Chapter 1 Radiation Protection Overview Chapter 4The Radiobiology of Low-Dose Radiation
19. Discuss embryo and fetal effects of radiation exposure.	Chapter 4The Radiobiology of Low-Dose Radiation

ASRT Radiation Biology Objectives	Content Addressed in the Text
20. Discuss risk estimates for radiation-induced malignancies.	Chapter 4 The Radiobiology of Low-Dose Radiation
21. Discuss acute radiation syndromes.	
This text also provides knowledge beyond what is required in the above objectives in current topics on Radiation Protection including:	
Chapter 10: Radiation Dose in Computed Tomography	
Chapter 11: Image Quality Assessment Tools for Dose Optimization in Digital Radiography	
Chapter 12: Diagnostic Reference Levels	