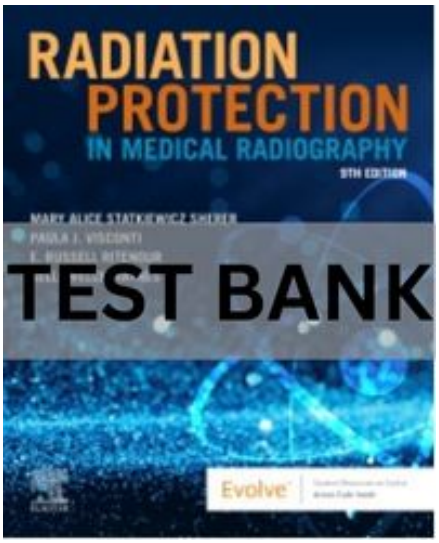
Radiation Protection in Medical Radiography 9th Edition Test Bank

Chapter 01: Introduction to Radiation Protection
Sherer: Radiation Protection in Medical Radiography, 9th Edition



MULTIPLE CHOICE

1. Consequences of ionization in human cells include
   1. creation of unstable atoms.
   2. production of free electrons.
   3. creation of highly reactive free molecules *(called free radicals)* capable of producing substances poisonous to the cell.
   4. creation of new biologic molecules detrimental to the living cell.
   5. injury to the cell that may manifest itself as abnormal function or loss of function.
   6. production of low-energy x-ray photons.

   a. 1, 2, 3, and 4 only
   b. 2, 3, 4, and 5 only
   c. 3, 4, 5, and 6 only
   d. All the options

   ANS: D

2. Which of the following is a form of radiation that is capable of creating electrically charged particles by removing orbital electrons from the atom of normal matter through which it passes?
   a. Ionizing radiation
   b. Nonionizing radiation
   c. Subatomic radiation
   d. Ultrasonic radiation

   ANS: A

3. Regarding exposure to ionizing radiation, patients who are educated to understand the medical benefit of an imaging procedure are more likely to
   a. assume a small chance of biologic damage but not suppress any radiation phobia they may have.
   b. cancel their scheduled procedure because they are not willing to assume a small chance of biologic damage.
   c. suppress any radiation phobia but not risk a small chance of possible biologic damage.
   d. suppress any radiation phobia and be willing to assume a small chance of possible biologic damage.

   ANS: D

4. The millisievert (mSv) is equal to
   a. 1/10 of a sievert.
   b. 1/100 of a sievert.

c. 1/1000 of a sievert.
d. 1/10,000 of a sievert.

ANS: C

5. The advantages of the BERT method are
1. BERT does not imply radiation risk; it is simply a means for comparison.
2. BERT emphasizes that radiation is an innate part of the environment.
3. BERT provides an answer that is easy for the patient to comprehend.
a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. All the options

ANS: D

6. If a patient asks a radiographer a question about how much radiation he or she will receive from a specific x-ray procedure, the radiographer can
a. respond by using an estimation based on the comparison of radiation received from the x-ray to natural background radiation received.
b. avoid the patient's question by changing the subject.
c. tell the patient that it is unethical to discuss such concerns.
d. refuse to answer the question and recommend that he or she speak with the referring physician.

ANS: A

7. Why should the selection of technical exposure factors for all medical imaging procedures always follow ALARA?
a. So that referring physicians ordering imaging procedures do not have to accept responsibility for patient radiation safety.
b. So that radiographers and radiologists do not have to accept responsibility for patient radiation safety.
c. Because radiation-induced cancer does not appear to have a fixed threshold, that is, a dose level below which a person would have no chance of developing this disease.
d. Because radiation-induced cancer does have a dose level at which individuals would have a chance of developing this disease.

ANS: C

8. The cardinal principles of radiation protection include which of the following?
a. Time
b. Distance
c. Shielding
d. All the options

ANS: D

9. In a hospital setting, which of the following professionals is expressly charged by the hospital administration with being directly responsible for the execution, enforcement, and maintenance of the ALARA program?
a. Assistant administrator of the facility

b. Chief of staff
c. Radiation Safety Officer
d. Student radiologic technologist

ANS: C

10. Why is a question concerning the amount of radiation a patient will receive during a specific x-ray procedure difficult to answer?
1. Because the received dose is specified in a number of different units of measure.
2. Because the scientific units for radiation dose are normally not comprehensible by a patient.
3. Because the patient should not receive any information about radiation dose.
a. 1 and 2 only
b. 1 and 3 only
c. 2 and 3 only
d. All the options

ANS: A

11. X-rays are a form of which of the following kinds of radiation?
a. Environmental
b. Ionizing
c. Internal
d. Nonionizing

ANS: B

12. What unit is used to measure radiation exposure in the metric International System of Units?
a. Coulomb per kilogram
b. Milligray
c. Millisievert
d. Sievert

ANS: A

13. What organization was founded in 2007 that continues their pursuit to raise awareness of the need for dose reduction protocols by promoting pediatric-specified scan protocols to be used for both radiology and non-radiology users of CT?
a. U.S. Food and Drug Administration
b. Alliance for Radiation Safety in Pediatric Imaging
c. American Registry of Radiologic Technologists
d. The Joint Commission

ANS: B

14. Which of the following provides the basis for determining whether an imaging procedure or practice is justified?
a. ALARA concept
b. BERT method
c. Diagnostic efficacy
d. NEXT program

ANS: C

15. Which of the following is a method of explaining radiation to the public?
    a. ALARA
    b. BERT
    c. ORP
    d. NEXT

    ANS: B

16. Radiology departments or individual radiologic technologists can "pledge" to image gently. The pledge includes which of the following?
    a. Make the image gently message a priority in staff communications each year.
    b. Review the protocol recommendations and, when necessary, implement adjustments to practice processes.
    c. Communicate openly with parents.
    d. All of the options.

    ANS: D

17. In a team approach to patient care, various participants
    1. assume responsibility for their areas of expertise.
    2. emphasize the importance of communication throughout the team.
    3. rotate as the person in charge of the team.
    a. 1 and 2 only
    b. 1 and 3 only
    c. 2 and 3 only
    d. All the options

    ANS: A

18. Which of the following radiation quantities is intended to be the best overall measure of the biologic effects of ionizing radiation?
    a. Exposure
    b. Effective dose
    c. Absorbed dose
    d. There is no radiation quantity that is intended to be the best overall measure of the biologic effects of ionizing radiation.

    ANS: B

19. Typically, people are more willing to accept a risk if they perceive that the potential benefit to be obtained is
    a. greater than the risk involved.
    b. equal to the risk involved.
    c. less than the risk involved.
    d. typically, people are not willing to accept risk no matter how great the benefit may be.

    ANS: A

20. Which of the following statements below is true?
    a. It appears that no safe dose level exists for radiation-induced malignant disease.
    b. The ALARA principle establishes a dose level for radiation-induced malignancy.
    c. The BERT method establishes a dose level for radiation-induced malignancy.

d. The NEXT program and reference values establish a dose level for radiation-induced malignancy.

ANS: A

21. The ALARA principle provides a method for comparing the amount of radiation used in various health care facilities in a particular area for specific imaging procedures. This information may be helpful to many
a. accrediting bodies.
b. advisory groups.
c. radiation standards organizations.
d. regulatory agencies.

ANS: D

22. The term as low as reasonable achievable (ALARA) is synonymous with the term
a. background equivalent radiation time (BERT).
b. equivalent dose (EqD).
c. diagnostic efficacy.
d. optimization for radiation protection (ORP).

ANS: D

23. Diagnostic efficacy includes
1. determining if an imaging procedure is justified.
2. producing optimal quality images with the least radiation exposure to the patient.
3. adhering to radiation safety guidelines.
4. revealing the presence or absence of disease in a patient.
a. 1, 2, and 3 only
b. 1, 2, and 4 only
c. 2, 3, and 4 only
d. All the options

ANS: D

24. Which of the following are required by The Joint Commission for CT?
1. Annual education of staff in dose reduction techniques
2. Minimum qualifications for medical physicists
3. Documentation of CT radiation doses
4. Management of CT protocols to minimize radiation dose
a. 1 and 2 only
b. 1 and 3 only
c. 2 and 4 only
d. All the options

ANS: D

25. Effective protective actions take into consideration
1. both human and environmental physical determinants.
2. technical elements.
3. procedural factors.
a. 1 and 2 only
b. 1 and 3 only

c. 2 and 3 only
d. All of the options

ANS: D

Chapter 02: Radiation: Types, Sources, and Doses Received
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MULTIPLE CHOICE

1. If ionizing radiation from natural sources grows larger because of accidental or deliberate human actions such as mining radioactive elements, the sources are termed
   a. artificial sources.
   b. enhanced natural sources.
   c. extraterrestrial sources.
   d. human-made sources.

   ANS: B

2. Electromagnetic radiation travels or propagates through space in the form of a wave but can interact with matter as a particle of energy called a photon. This dual nature is referred to as
   a. wave attenuation capability.
   b. wave-particle interchange ability.
   c. wave-particle duality.
   d. wave-particle phenomena.

   ANS: C

3. Which of the following statements concerning the 1979 nuclear reactor accident at TMI-2 is *not* true?
   a. Many excess cancer deaths have been predicted to occur in the 2 million people living within 50 miles of the plant at the time of the accident.
   b. TMI-2 has been dormant since the accident in 1979.
   c. The average dose received by the exposed population living within a 10-mile radius of the TMI nuclear power station at the time of the accident was determined to be 0.08 mSv, which is well below the average annual background level.
   d. The pressurized water reactor underwent an accidental loss of coolant, leading to severe overheating of the highly radioactive reactor core that resulted in a partial meltdown and significant radiation leak.

   ANS: A

4. Terrestrial radiation includes which of the following sources?
   a. Long-lived radioactive elements such as uranium-238, radium-226, and thorium-232 that are present in variable quantities in the crust of the Earth
   b. Radioactive fallout from nuclear weapons tests in which detonation occurred above ground
   c. The sun and beyond the solar system
   d. Airport surveillance systems and electron microscopes

   ANS: A

5. The Environmental Protection Agency (EPA) recommends that action be taken to reduce elevated levels of radon in homes to a concentration *less than*
   a. 200 pCi/L of air.
   b. 135 pCi/L of air.
   c. 47 pCi/L of air.
   d. 4 pCi/L of air.

   ANS: D

6. Cosmic radiation occurs in which two forms?
   a. Solar and human-made
   b. Artificial and galactic
   c. Natural background and artificial
   d. Solar and galactic

   ANS: D

7. As a result of technologic advances since the 1970s and strict regulations imposed within the United States by the FDA regarding consumer products containing radioactive material, the radiation exposure of the general public from such produces may now be considered
   a. substantial.
   b. moderate.
   c. very slight.
   d. negligible.

   ANS: D

8. Through which of the following routes can radon enter houses?
   1. Crawl spaces under the living areas
   2. Floor drains and sump pumps
   3. Porous cement block foundations
   a. 1 and 2 only
   b. 1 and 3 only
   c. 2 and 3 only
   d. All the options

   ANS: D

9. Removal and storage of contaminated water from the Fukushima Daiichi Nuclear Power Plant continues to be a major concern because
   a. there is still immediate danger of another earthquake.
   b. there is still immediate danger of another tsunami.
   c. there is still immediate danger from explosions.
   d. the amount of contaminated water can still increase.

   ANS: D

10. When exposed to high radon levels in the home, which of the following groups of people have the highest risk of developing lung cancer?
    a. Teenagers
    b. Adults from 20 to 30 years of age
    c. Nonsmokers
    d. Smokers

ANS: D

11. Which of the following helps shield the global population from exposure to essentially all high-energy, bombarding cosmic rays?
    a. Clouds
    b. Fog
    c. Atmosphere and magnetic field of the Earth
    d. Smog

    ANS: C

12. Which of the following radiation exposures is considered by the Environmental Protection Agency to be the second leading cause of lung cancer in the United States?
    a. Annual PA and Lateral chest x-rays
    b. Cosmic ray exposure
    c. Radon exposure
    d. A fluoroscopic examination of the upper gastrointestinal system

    ANS: C

13. Which of the following are forms of electromagnetic radiation?
    1. Microwaves
    2. Visible light
    3. X-rays
    4. Gamma rays
    5. Ultraviolet radiation
    a. 1, 2, and 3 only
    b. 2, 3, and 4 only
    c. 3, 4, and 5 only
    d. All the options

    ANS: D

14. What is the most common unit of measure of equivalent dose?
    a. Coulomb per kilogram
    b. Milligray
    c. Millisievert
    d. MicroLiter

    ANS: C

15. In the electromagnetic spectrum, higher frequencies are associated with
    a. longer wavelengths and lower energies.
    b. longer wavelengths and higher energies.
    c. shorter wavelengths and lower energies.
    d. shorter wavelengths and higher energies.

    ANS: D

16. Which of the following radiation quantities use the same unit of measure?
    a. Effective dose and equivalent dose
    b. Exposure and effective dose
    c. Absorbed dose and equivalent dose

d. All of the above

ANS: A

17. A flight on a typical commercial airliner results in an equivalent dose rate of
    a. 0.001 to 0.005 mSv/hr.
    b. 0.005 to 0.01 mSv/hr.
    c. 0.02 to 0.04 mSv/hr.
    d. 0.05 to 0.09 mSv/hr.

    ANS: B

18. The first decay product of radium is
    a. cesium.
    b. radon.
    c. strontium.
    d. x-ray.

    ANS: B

19. When spread over the inhabitants of the United States, fallout from nuclear weapons tests and other environmental sources along with other human-made radiations contributes
    a. only a small portion of 0.1 mSv to the equivalent dose of each person.
    b. a dose of approximately 1.5 mSv to the equivalent dose of each person.
    c. a dose of approximately 3.2 mSv to the equivalent dose of each person.
    d. a dose of approximately 6.3 mSv to the equivalent dose of each person.

    ANS: A

20. What is the total average annual radiation equivalent dose for estimated levels of radiation exposure for humans?
    a. 2.3 mSv
    b. 3.1 mSv
    c. 5.5 mSv
    d. 8.2 mSv

    ANS: C

21. The mass of an alpha particle is approximately
    a. two times the mass of a hydrogen atom and a negative charge of minus 2.
    b. four times the mass of a hydrogen atom and a positive charge twice that of an electron.
    c. six times the mass of a hydrogen atom and a negative charge of minus 1.
    d. eight times the mass of a hydrogen atom and a positive charge four times that of an electron.

    ANS: B

22. What is the half-life of radon-220?
    a. 54.5 seconds
    b. 8 days
    c. 2 years
    d. 1622 years

ANS: A

23. Which of the following sources of radiation is human-made?
    1. Atmospheric fallout from nuclear weapons testing
    2. Cosmic radiation from the sun and beyond the solar system
    3. Nuclear power plant accidents as a consequence of natural disasters
    a. 1 and 2 only
    b. 1 and 3 only
    c. 2 and 3 only
    d. All the options

    ANS: B

24. Two cGy equals
    a. 2 Gy.
    b. .2 Gy.
    c. .02 Gy.
    d. .002 Gy.

    ANS: C

25. Of the two sources of ionizing radiation listed below, which source remains fairly constant from year to year?
    a. Human-made
    b. Natural

    ANS: B

Chapter 03: Interaction of X-Radiation with Matter
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MULTIPLE CHOICE

1. Particles associated with electromagnetic radiation that have neither mass nor electric charge and travel at the speed of light are
    a. ions.
    b. negatrons.
    c. positrons.
    d. x-ray photons.

    ANS: D

2. Although coherent scattering is most likely to occur _____, some of this unmodified scattering occurs throughout the diagnostic range and can result in small amounts of radiographic fog.
    a. at less than 10 keV
    b. between 30 keV and 60 keV
    c. between 60 keV and 90 keV
    d. above 100 keV

    ANS: A

3. Which of the following is not a type of interaction between x-radiation and biologic matter?