

Fluoroscopy Safety Exam

Name: _____

Date: _____

Department _____

Activity/Place Where You Use X-rays: _____

Contact Phone: _____ Contact email: _____

- 1. In discussing dose magnitudes, the units of measurements used are { [rem] or [rad] } (for fluoroscopy, 1 rem = 1 rad) or { [Sv] or [Gy] } (for fluoroscopy, 1 Sv = 1 Gy). What is the annual occupational dose limit imposed by the State of Washington, and complied with by Providence Everett Medical Center, for all personnel working with radiation sources? (WAC 245-221-010). The total annual effective dose equivalent limit (whole body) is**
 - A. 1 rem = 0.01 Sv = 1000 mrem per year
 - B. 5 rem = 0.05 Sv = 5000 mrem per year
 - C. 10 rem = 0.10 Sv = 10,000 mrem per year
 - D. 0.5 rem = 5 mSv = 500 mrem per year
- 2. Which is not correct regarding the Inverse-Square-Law?**
 - A. It only applies to the operator of the fluoro system, not to the other staff members
 - B. Exposure reduction is due to the divergent nature of radiation
 - C. Doubling the distance from the radiation source decreases dose rate by one fourth
 - D. Tripling the distance from the radiation source decreases dose rate by one ninth
- 3. The total effective dose equivalent allowed to occupational workers by state regulations refers to the total amount of radiation dose received by the whole body, both internal and external. An extremity is allowed to receive a higher dose, because it is less susceptible to somatic effects. What is the maximum shallow dose equivalent to an arm that is allowed?**
 - A. 1 rem = 0.01 Sv = 1000 mrem per year
 - B. 5 rem = 0.05 Sv = 5000 mrem per year
 - C. 10 rem = 0.10 Sv = 10,000 mrem per year
 - D. 50 rem = 0.50 Sv = 50,000 mrem per year

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- 4. Regarding the use of leaded aprons, which statement is correct?**
- A. Standard lead aprons (0.5mm Pb) can block 88% of the x-rays generated by a fluoro system using typical (75 kVp) settings
 - B. Lead aprons are less effective at higher x-ray energies (e.g., when used with large patients)
 - C. The operator and nearby staff (within 3 meters) are required to wear lead aprons or stand behind protective barriers whenever fluoroscopy systems are being used.
 - D. All of the above
- 5. Regarding the examination room environment, which statement is NOT true?**
- A. Operator exposure is greatest when standing on the image intensifier side of the table
 - B. Exposures are significantly greater below the table, if the x-ray tube is below the table
 - C. The highest exposures from scatter are found near the beam's entrance location on the patient
 - D. Exposure levels are highest within the direct X-ray beam
- 6. With respect to staff exposures, which statement is correct?**
- A. The primary beam is the source of the majority of operator/staff radiation exposure
 - B. The patient's body removes all of the scatter directed to areas above the table.
 - C. Typically, the operator would receive 10 percent of the patient's ESE if lead aprons weren't worn.
 - D. All of the above are correct
- 7. Biological damage can result from which of the following processes?**
- A. Ionization of atoms in tissue, causing them to be more reactive
 - B. Development of free radicals that alter chemical bonds within cellular DNA
 - C. Direct interaction of cellular DNA with radiation
 - D. All of the above
- 8. Which of the following is NOT true about radiation deterministic effects?**
- A. They are not associated with a threshold dose below which no effect occurs
 - B. Erythema and epilation are typical radiation-induced deterministic effects
 - C. The severity of damage increases with increasing radiation dose
 - D. Effects can be temporary at low dose and permanent at high dose
- 9. Which is true about stochastic radiation effects?**
- A. Radiation-induced cancer has been observed in patients receiving radiation therapy
 - B. The total risk to an individual is continually increased with increasing radiation exposure
 - C. Increasing dose corresponds to increasing incidence of cell mutation compared to their natural incidence
 - D. All of the above are true

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- 10. Which factors may lead to under-reporting of radiation-induced skin effects?**
- A. Skin damage is often located in regions not visible to the patient
 - B. Due to latency, skin injury expression can be weeks to months after the procedure
 - C. Physicians are relatively unaware of the possibility of occurrence
 - D. All of the above contribute to under-reporting of skin injury
- 11. The inverse square law refers to how the amount of radiation changes with distance from the radiation source. During a fluoroscopic examination, if a physician is standing 2 feet from the patient, and she is subjected to a dose of 2 mrem during one minute of fluoro, what would the dose be if she stood 4 feet from the patient?**
- A. 4 mR, because $[4 \text{ feet} / 2 \text{ feet}] = 2$ and $2 * 2\text{mR} = 4 \text{ mR}$
 - B. 1 mR, because $[2 \text{ feet} / 4 \text{ feet}] = 0.5$, and $0.5 * 2\text{mR} = 1 \text{ mR}$
 - C. 0.5 mR, because $[2\text{ft} / 4\text{ft}] * [2\text{ft} / 4\text{ft}] = 0.25$, and $0.25 * 2\text{mR} = 0.5 \text{ mR}$
 - D. 8 mR, because $[4\text{ft} / 2\text{ft}] * [4\text{ft} / 2\text{ft}] = 4$, and $4 * 2\text{mR} = 8 \text{ mR}$
- 12. Steeply-angled fluoroscopic views are more likely to induce skin injury because:**
- A. The X-ray beam must traverse thicker portions of the patient, thus requiring a higher incident patient dose
 - B. The wider span of anatomy may cause the x-ray tube to be positioned closer to the patient
 - C. Rotating between steeper-angled views can cause large II - patient air gaps to occur
 - D. All of the above are more likely to induce skin injury
- 13. Which of the following factors does NOT help reduce beam on-time:**
- A. Operator awareness of 5-minute time notifications
 - B. Keeping the fluoro ON while adjusting the position of the viewing monitor
 - C. Judicial use of Last-Image-Hold features
 - D. Planning images before irradiation to reduce unnecessary panning
- 14. Radiation dose given to the fluoroscopy operator IS affected by:**
- A. Choice of I.I. / X-ray tube orientation (i.e., brachial versus femoral view)
 - B. Changes of 2 feet in the distance from the patient
 - C. Procedures with the X-ray tube above the table
 - D. All of the above affects operator exposure
 - E. None of these directly affect operator exposure
- 15. All of the following are examples of good radiation safety practice during fluoroscopy except:**
- A. Alerting nearby staff before energizing the X-ray tube
 - B. Using brief successive fluoro "on" times instead of continuous exposures
 - C. Turning up the room light intensity to write down patient notes
 - D. Moving away from the patient when remote-operated contrast injectors are used
- 16. When wearing a lead apron, where should your radiation badge be attached?**
- A. Under the lead apron at the waist, to protect it from scattered radiation.
 - B. Near the neck area, outside the apron, to obtain the worst case value
 - C. In a pocket, and then replaced after use of the lead apron is completed
 - D. Where-ever you want, as long as you don't lose it

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17. The following is true about radiation shields except:

- A. Properly positioned shields can provide total protection from radiation
- B. Shields are positioned correctly when the irradiated body portion can be viewed through the shield.
- C. To maximize benefit to the staff, the shield should be placed as close to the patient as possible
- D. Portable radiation shields are useful in protecting staff members who remain fairly stationary during the procedure.

18. Which statement is true regarding regulations dealing with the use of ionizing radiation?

- A. The Food and Drug Agency (FDA) sets limits on the amount of radiation dose that a patient can receive.
- B. The Nuclear Regulatory Commission (NRC) regulates all X-ray devices at PEMC
- C. The Washington Department of Health establishes radiation limits applicable to fluoroscopy operators and staff
- D. All of the above are correct

19. All of the following is true about radiation risk and ALARA except:

- A. The operator determines what constitutes reasonable techniques for reducing radiation exposure
- B. The risk to radiation workers receiving continuous dose at the regulatory limits is approximately 6 times the accidental death rate to unexposed workers in general industry.
- C. Operators need not be concerned about radiation unless they exceed regulatory limits.
- D. The ALARA goal is keeping radiation exposure "As Low As Reasonably Achievable"

20. Regarding radiation badges at PEMC, which statement is incorrect?

- A. Radiation badges should be placed outside lead aprons to provide for worst case dose values
- B. It is not necessary to wear a badge unless you may possibly receive an annual dose of more than 1000 mrem.
- C. Radiation badges are available upon request to any operator of a fluoroscopy system
- D. Regulations require the monitoring of workers who exceed defined radiation exposure thresholds
- E. More than one statement is incorrect.

Exam Completed