

Instructions: On the Answer Sheet, enter your 2-digit ID number (with a leading 0 if needed) in the boxes of the ID section. *Fill in the corresponding numbered circles.* Answer each of the numbered questions by filling in the corresponding circles in the numbered question section. Print your name in the space at the bottom of the answer sheet. Sign here stating that you have neither given nor received help.

your signature

1. To minimize blur in planar radiography it is best to
 - A. maximize the source spot size, minimize the distance from the source to the patient, and minimize the distance from the patient to the film.
 - B. maximize the source spot size, maximize the distance from the source to the patient, and minimize the distance from the patient to the film.
 - C. minimize the source spot size, maximize the distance from the source to the patient, and minimize the distance from the patient to the film.
 - D. minimize the source spot size, maximize the distance from the source to the patient, and maximize the distance from the patient to the film.
 - E. minimize the source spot size, minimize the distance from the source to the patient, and minimize the distance from the patient to the film.

2. The following are true about the dual-energy x-ray scan *except*
 - A. It depends on the patient not moving between the two different scans.
 - B. It can be used to “subtract” the bones away from a chest x-ray to better see the underlying lungs.
 - C. It produces tomographic images to separate the lungs from the ribs.
 - D. It uses two different scans of the same patient at two different x-ray energies, which produce different relative sensitivities to bone and soft tissues.
 - E. It is an adaptation to the classical planar radiograph that has recently been introduced into clinical practice.

3. The healthy kidney is visible on the x-ray radiograph because
 - A. the kidney filters radioactive tracers.
 - B. x-rays reflect off the shiny surface of the kidney.
 - C. the kidney is completely opaque to x-rays.
 - D. x-rays bend around the surface of the kidney.
 - E. the healthy kidney is surrounded by fat, which exhibits less attenuation to x-rays than the kidney itself.

4. Given that one chest radiography was taken using 25 mA and 75 kVp at 1.0 m distance between the film and the x-ray source, suppose that a second chest radiograph was taken at 100 mA and 75 kVp that yielded the same exposure. What distance would you expect between the film and the x-ray source?
 - A. 2.0 m
 - B. 4.0 m
 - C. 1.0 m
 - D. 0.25 m
 - E. 0.5 m

5. Which of the following actions increase the SNR in a planar radiograph?

- I - Increasing the scatter fraction.
- II - Decreasing the scatter fraction.
- III - Increasing the absorption of the tissue.
- IV - Decreasing the absorption of the tissue.

- A. I and IV
- B. II and IV
- C. I and III
- D. II and III
- E. None has any effect on SNR.

6. How can one reduce magnification effects of a projection radiography system?

- A. Use a higher radiation dose.
- B. Move the object away from the detector.
- C. Use a smaller object.
- D. Move the object closer to the detector.
- E. Move the X-ray source closer to the detector.

7. The signal-to-noise ratio of an X-ray image can be improved by which of the following?

- A. Decreasing the tube current in the X-ray source
- B. Increasing the grid ratio
- C. Decreasing the thickness of the phosphor intensifying screen
- D. Increasing the obesity of the patient
- E. Decreasing the distance from the patient to the detector

8. Which one of the following statements is true?

- I - Acceptance of Compton scattered photons increases image contrast, and thus signal-to-noise ratio as well.
- II - The film-screen detector produces an optical image on film; the degree of film blackening (the optical density) depends on film exposure in a nonlinear way characterized by the H-and-D curve.
- III - Projection radiography produces radiographs, which are 1-D projections of a 3-D object.

- A. II and III
- B. I,II, and III
- C. I
- D. I and II
- E. II

9. What simple strategies can an x-ray technician use to reduce the magnification and distortion effects of the projection radiography system?

I - Moving the object closer to detector panel

II - Moving the object further away from the detector panel

III - Moving the X-ray source further away from the object and the detector

IV - Moving the X-ray source closer to the object and the detector

A. II and IV

B. I and IV

C. II and III

D. None of them

E. I and III

10. Which of the following actions alter the SNR as indicated?

I - Increase the scatter fraction, which causes an increase in the noise level

II - Increase the scatter fraction, which causes a decrease in the noise level

III - Decrease the absorption efficiency, which causes a decrease in the signal amplitude

IV - Decrease the absorption efficiency, which causes an increase in the signal amplitude

A. I and IV

B. II and IV

C. II and III

D. I and III

E. None of them

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permutation number = 1236

BioE 1330 - Review Chapter 5 2/24/2010
Answer Sheet - Correct answer is A for all questions

1. To minimize blur in planar radiography it is best to

- A. minimize the source spot size, maximize the distance from the source to the patient, and minimize the distance from the patient to the film.
- B. maximize the source spot size, minimize the distance from the source to the patient, and minimize the distance from the patient to the film.
- C. minimize the source spot size, maximize the distance from the source to the patient, and maximize the distance from the patient to the film.
- D. minimize the source spot size, minimize the distance from the source to the patient, and minimize the distance from the patient to the film.
- E. maximize the source spot size, maximize the distance from the source to the patient, and minimize the distance from the patient to the film.

Explanation: the best geometry for a sharp shadow is to have the patient near the film and far from a small spot source.

[*imaging0037.mcq*]

2. The following are true about the dual-energy x-ray scan *except*

- A. It produces tomographic images to separate the lungs from the ribs.
- B. It can be used to “subtract” the bones away from a chest x-ray to better see the underlying lungs.
- C. It is an adaptation to the classical planar radiograph that has recently been introduced into clinical practice.
- D. It uses two different scans of the same patient at two different x-ray energies, which produce different relative sensitivities to bone and soft tissues.
- E. It depends on the patient not moving between the two different scans.

Explanation: It does not produce tomographic images; it is still a projection. The ribs may be “subtracted” because they respond differently than lung at the two energies.

[*imaging0099.mcq*]

3. The healthy kidney is visible on the x-ray radiograph because

- A. the healthy kidney is surrounded by fat, which exhibits less attenuation to x-rays than the kidney itself.
- B. x-rays bend around the surface of the kidney.
- C. x-rays reflect off the shiny surface of the kidney.
- D. the kidney is completely opaque to x-rays.
- E. the kidney filters radioactive tracers.

Explanation: Organ tissue such as kidney has a higher average atomic mass than fat (fat has a disproportionately high hydrogen content) and thus kidney absorbs x-ray more than fat.

[*imaging0100.mcq*]

4. Given that one chest radiography was taken using 25 mA and 75 kVp at 1.0 m distance between the film and the x-ray source, suppose that a second chest radiograph was taken at 100 mA and 75 kVp that yielded the same exposure. What distance would you expect between the film and the x-ray source?

- A. 2.0 m
- B. 4.0 m
- C. 0.5 m
- D. 0.25 m
- E. 1.0 m

Explanation: Exposure (numbers of photons per second) is directly proportional to tube current. The inverse square law states that exposure varies inversely with the square of the distance. Therefore the effect on exposure from using 4 times the current (100 mA / 25 mA) would be cancelled by being twice as far away.

[*imaging0101.mcq*]

5. Which of the following actions increase the SNR in a planar radiograph?

- I - Increasing the scatter fraction.
- II - Decreasing the scatter fraction.
- III - Increasing the absorption of the tissue.
- IV - Decreasing the absorption of the tissue.

- A. II and IV
- B. I and III
- C. II and III
- D. I and IV
- E. None has any effect on SNR.

Explanation: Decreasing scatter fraction lowers noise, and decreasing absorption raises signal (more than it increases noise). Both increase SNR.

[*imaging0103.mcq*]

6. How can one reduce magnification effects of a projection radiography system?

- A. Move the object closer to the detector.
- B. Move the X-ray source closer to the detector.
- C. Move the object away from the detector.
- D. Use a higher radiation dose.
- E. Use a smaller object.

Explanation: Moving the object closer to the detector, or moving the source *away from* the detector and object will minimize magnification.

[*imaging0113.mcq*]

7. The signal-to-noise ratio of an X-ray image can be improved by which of the following?

- A. Decreasing the distance from the patient to the detector
- B. Decreasing the tube current in the X-ray source
- C. Decreasing the thickness of the phosphor intensifying screen
- D. Increasing the grid ratio
- E. Increasing the obesity of the patient

Explanation:

[*imaging0167.mcq*]

8. Which one of the following statements is true?

- I - Acceptance of Compton scattered photons increases image contrast, and thus signal-to-noise ratio as well.
- II - The film-screen detector produces an optical image on film; the degree of film blackening (the optical density) depends on film exposure in a nonlinear way characterized by the H-and-D curve.
- III - Projection radiography produces radiographs, which are 1-D projections of a 3-D object.

- A. II
- B. I,II, and III
- C. II and III
- D. I and II
- E. I

Explanation: II is true.

[*imaging0198.mcq*]

9. What simple strategies can an x-ray technician use to reduce the magnification and distortion effects of the projection radiography system?

- I - Moving the object closer to detector panel
- II - Moving the object further away from the detector panel
- III - Moving the X-ray source further away from the object and the detector
- IV - Moving the X-ray source closer to the object and the detector

- A. I and III
- B. I and IV
- C. II and III
- D. II and IV
- E. None of them

Explanation: Answer is I and III. For explanation look at homework solution.

[*imaging0203.mcq*]

10. Which of the following actions alter the SNR as indicated?

I - Increase the scatter fraction, which causes an increase in the noise level

II - Increase the scatter fraction, which causes an decrease in the noise level

III - Decrease the absorption efficiency, which causes a decrease in the signal amplitude

IV - Decrease the absorption efficiency, which causes an increase in the signal amplitude

A. I and III

B. I and IV

C. II and III

D. II and IV

E. None of them

Explanation: Answer is I and III. For explanation look at homework solution.

[*imaging0204.mcq*]