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Questions & Answers PDF

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Question: 1

Radiographic contrast can be improved by which of the following?

A. Decreasing the voltage supplied to the x-ray tube
B. Decreasing the current supplied to the x-ray tube
C. Decreasing the amount of scattering
D. Decreasing the amount of time that the beam is turned on

Answer: C

Explanation:
Radiographic contrast is an expression of the differences (light vs dark) that are seen between various tissues imaged during radiography. Scattered x-ray photons can increase the overall exposure, reducing the contrast. Thus, contrast can be improved by reducing the amount of scattering. Higher voltage creates x-rays of shorter wavelength, which penetrate tissue better than longer waves: increasing the voltage, not decreasing it, can improve contrast. Decreasing the current reduces the intensity of the beam, reducing the overall exposure of the film, without changing the contrast. Decreasing the amount of time that the beam is on also reduces the overall film exposure without changing the contrast.

Question: 2

Bone is more radio-opaque than fat because:

A. Bone has more water than fat has: thus, more photons are absorbed
B. More electrons are available to absorb the energy' of x-ray photons
C. Bone has fewer cells and more non-living tissue
D. None of the above

Answer: B

Explanation:
Radiographic density of a tissue (how radio-opaque the tissue appears in radiography) depends on how well it can stop x-ray photons, absorbing their energy in the process. This is determined by the number of electrons contained within a given volume of tissue, since electrons are what absorb the energy. Bone does contain more water than fat does, but this is not why bone stops more x-rays. Bone consists largely of calcium and phosphorus, which are fairly large atoms and contain many electrons. Fat tissue, on the other hand, contains mostly molecules built of carbon backbones, so the concentration of electrons is slightly less than that of soft tissue, such as cartilage, and a lot less than that of bone. Nevertheless, fat is still more radio-opaque than air, or other gases. Thus, obese patients produce radiographs of reduced quality.

Question: 3

Which of the following is MOST accurate, regarding the effects of fat on flat radiography and computed tomography (CT) scanning?

A. Fat adds radiographic contrast to elucidate organs and other structures
B. Fat is more radiolucent than bone, but less radiolucent than soft tissue
C. Since they have very little fat, anorexic patients and others with extremely low fat-to-lean body mass ratios produce images of higher quality, as compared with individuals of mesomorphic (normal) body habitus
D. Obese patients do not present any particular difficulty in terms of image quality because fat is fairly radiolucent

Answer: A

Explanation:
Fat is more radiolucent than both bone and soft tissue, but still stops x-rays much better than air. Thus, obese individuals are indeed more difficult to image because the x-rays must penetrate thick layers of fat to reach internal structures. While this might suggest that the thinner the patient is the better, people with extremely low body fat can lose the fat around internal organs. Not only does this fat play a protective role, but in radiography it serves as contrast material to elucidate the exact shape of the organs as well as other internal structures. Thus, while bone tissue shows up as being very light, fat appears as a shade of gray, making the internal organs stand out against the black background.

Question: 4

An acceptable anteroposterior (AP) or posteroanterior (PA) chest radiograph should show all of the following anatomic features EXCEPT:

A. Medial and lateral lung fields
B. The heart
C. The trachea, covering the upper thoracic vertebrae
D. At least 8 posterior ribs

Answer: D

Explanation:
A radiograph taken in the PA or AP orientations should make it possible to view the entire thoracic cavity. The costophrenic angle, lateral and medial lung fields, and bases of each lung are included in this region. Silhouettes of the heart and trachea should be visible superimposed on the upper thoracic vertebrae. At least 10 posterior ribs, not merely 8, should be visible. Through the mediastinum, the lower thoracic vertebral bodies should be visible as well. In order to bring all of these areas within the image, the patient must be positioned correctly and should have inspired and be holding his or her breath when the image is taken, which increases the size of the thoracic cavity.

Question: 5

A radiograph that is described as "overpenetrated" is associated with which of the following?

A. Too much current (mAs) supplied to the x-ray tube
B. Bones appearing very lucent
C. Not enough voltage (kVp) supplied to the x-ray tube
D. All of the above

Answer: B

Explanation:
Overpenetration means that the ability of the x-ray beam to penetrate materials is so good that much of the energy passes through all body tissues, including bone. This makes bone tissue more lucent than it should be so that it appears like the way that soft tissue is supposed to appear, Soft tissue, as well as fat, appears still more lucent such that they may not even be visible. Increased penetration of a beam is the result of increased voltage, not decreased. As the voltage is increased, the energy of the x-rays increases, which is to say that the wavelength (i) is shortened, improving the beam's quality. There comes a point, however, when X is so short that the penetration is too good, decreasing the visibility of everything. While the electrical current (mAs) affects the intensity of the beam (the number of x-ray photons emitted) and can affect the contrast, it does not affect the ability of the photons to penetrate materials.

Question: 6

A standard PA chest radiograph is taken with the patient:

A. supine, with the x-ray beam aimed at the chest
B. standing, with the x-ray beam aimed at the chest
C. standing, with the x-ray beam aimed at the back
D. prone, with the x-ray beam aimed at the back

Answer: C

Explanation:
Flat film chest radiography is taken in either a PA or AP orientation, and also may be taken in a lateral orientation. PA means that the patient is with his or her back toward the machine, so that the x-rays enter through the back and exit through the chest on their way to the photographic plate. AP is the opposite, so the patient is with the chest toward the machine. Lateral means that the beam passes from one side of the rib cage to the other. For chest x-radiography, it is better if the patient stands, in which case PA is usually the orientation used. When a patient is too ill to be moved, a portable machine is brought to the bedside. Usually it is easier for the patient to be supine, rather than prone, so the orientation is AP.

Question: 7

Which of the following statements is true regarding the PA orientation versus the AP orientation for chest radiography?

A. Silhouettes of both the heart and mediastinum appear larger in the AP view, compared with the PA view
B. Silhouettes of both the heart and mediastinum appear larger in the PA view, compared with the AP view
C. The heart appears larger in AP than PA orientation, while the mediastinum appears larger in PA than AP orientation
D. The heart appears smaller in AP than PA orientation, while the mediastinum appears smaller in PA than AP orientation

Answer: A

Explanation:
When compared with the PA view, the heart and mediastinum appear magnified when the AP orientation is used. This is because these structures are slightly further away from the photographic plate when the beam enters the chest and exits through the back than in the opposite scenario. To visualize why this is the case, think of a flashlight shining on your hand to project a shadow on the wall. Move the hand back from the wall and the image gets larger. Enlargement of either the heart or mediastinum can have very important clinical implications. This is one reason why it is important not to mislabel an AP image as a PA image, or vice versa.

Question: 8

The rinse medium in a film processor is found to have a residual ammonium thiosulfate level of 31 ggm/in2. What is likely to happen to the film within 1 year?

A. It will appear brown
B. It will appear yellow
C. The film density will appear very low
D. It will appear gray, with a lot of contrast

Answer: B

Explanation:
The resistance of a radiograph to color change is known as its archival quality and is related mostly to the residual level of ammonium thiosulfate. With ammonium thiosulfate levels above 25 ggm/in2, radiographs tend to turn yellow within a year, but they tend not to turn brown unless ammonium thiosulfate levels are above 100 ugm/in2. Low density overall on a film can be the result of the film not being in the developing fluid long enough a lower than optimal temperature of the developing fluid, or exhausted developing material. Graying with a loss of contrast could be the result of a film being underdeveloped or overexposed.

Question: 9

Streaks on a radiographic film following manual processing may be the result of which of the following?

A. Developing solution on the film prior to processing
B. Fixer on the film prior to processing
C. Temperature differences between processing solutions
D. Developing solution on the hangar clips

Answer: D

Explanation:
Developing solution on hangar clips can drip down along the film when it is supposed to be drying after being rinsed of developing solution. Drops falling down along the film in this situation create streaks that overdevelop in relation to the rest of the film. However, if developing solution is on the film prior to processing, this tends to produce spots rather than streaks, generally dark spots. Fixer on the film prior to processing will produce white spots, since the film reacts to the fixer as if x-rays did not reach it because of blockage by radio-opaque tissue. Temperature differences between solutions cause shrinking and swelling of the film, which produces reticular patterns.

Question: 10

A radiographer processing a film manually places a film in the development tank, then removes if after the timer sounds, indicating that the appropriate amount of time has passed. After rinsing the film, however, she notices that the film is less developed toward the bottom than from the middle to the top. The most likely problem is that:

A. the timer has malfunctioned
B. the lower part of the film was exposed to solution from the fixing tank
C. light leaked into the dark room
D. the solution at the bottom of the development tank is colder than the solution at the top

Answer: D

Explanation:
The only difference betv;een the upper and lower parts of the film is that the latter was lower in the tank compared with the former. Since the developing agent is dissolved, it is present throughout the tank at the same concentration. However, it is very easy for temperature differences to develop within the tank, if the solution is not stirred on a regular basis. Since the film was in the tank when the unequal development took place, fixer would not be the problem, unless someone entered the room, removed the film from the development tank dipped the lower end into the fixer tank and then placed it back into the developer. Such an occurrence is even less likely if the film is handled by automatic processing equipment. A light leak would affect the entire film, as would early or late removal of the film from the developer, due to a malfunctioning timer.

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