Board Exam Desk

Radiologic Technology Reviewer

Radiologic Technology Licensure Examination | PRC | 120 original questions

2026 Edition | Updated November 2026

Original board-style practice questions with an answer key.

Practice questions

Anatomy, Physiology and Pathology

1. A carpenter injures the base of his thumb. Which carpal bone articulates directly with the base of the first metacarpal?

A. Trapezoid
B. Trapezium
C. Scaphoid
D. Capitate

7. On a 45-degree oblique lumbar spine radiograph, the 'neck' of the Scottie dog figure corresponds to which vertebral part?

A. Pedicle
B. Transverse process
C. Pars interarticularis
D. Inferior articular process

13. A patient swallows air before an erect abdominal radiograph. In which part of the stomach will the gas mainly collect?

A. Fundus
B. Pylorus
C. Antrum
D. Lesser curvature

19. Which statement correctly describes the usual position of the kidneys?

A. They are retroperitoneal, with the right kidney slightly lower than the left
B. They are intraperitoneal, with the left kidney lower than the right
C. They are retroperitoneal, with both kidneys at exactly the same level
D. They are intraperitoneal and lie anterior to the stomach

25. Which paranasal sinus lies directly below the sella turcica?

A. Frontal sinus
B. Maxillary sinus
C. Sphenoid sinus
D. Anterior ethmoid cells

31. When the elbow is fully flexed, the coronoid process of the ulna is received by which depression of the humerus?

A. Olecranon fossa
B. Radial notch
C. Coronoid fossa
D. Trochlear notch

37. Which tarsal bone forms the ankle mortise joint with the distal tibia and fibula?

A. Talus
B. Calcaneus
C. Navicular
D. Cuboid

43. Which of the following segments of the large intestine is retroperitoneal?

A. Transverse colon
B. Sigmoid colon
C. Vermiform appendix
D. Ascending colon

49. After a fatty meal, which hormone stimulates the gallbladder to contract and release bile?

A. Gastrin
B. Cholecystokinin
C. Insulin
D. Antidiuretic hormone

55. At approximately what vertebral level does the trachea bifurcate into the main bronchi?

A. C6 to C7
B. T4 to T5
C. T8 to T9
D. T11 to T12

61. A child aspirates a peanut. It most likely lodges in the right main bronchus because the right bronchus is

A. Narrower, longer and more horizontal than the left
B. Lined with fewer cilia than the left
C. Positioned anterior to the heart
D. Wider, shorter and more vertical than the left

67. A chest radiograph shows a thin visceral pleural line with no lung markings lateral to it. Which condition is most likely?

A. Pleural effusion
B. Pneumothorax
C. Lobar pneumonia
D. Pulmonary edema

73. A patient was struck in the eye by a fist. The thin orbital floor fractured and orbital fat herniated into the maxillary sinus. This injury is called a

A. Blowout fracture
B. Tripod fracture
C. Le Fort I fracture
D. Contrecoup fracture

79. An elderly woman falls on her outstretched hand. The radiograph shows a transverse fracture of the distal radius with the fragment displaced posteriorly. This is a

A. Smith fracture
B. Colles fracture
C. Boxer fracture
D. Monteggia fracture

85. A toddler with a barking cough has an AP soft tissue neck radiograph showing subglottic narrowing shaped like a tapered point. The most likely diagnosis is

A. Epiglottitis
B. Retropharyngeal abscess
C. Croup
D. Foreign body in the esophagus

91. Which portion of the small intestine is the longest?

A. Duodenum
B. Jejunum
C. Pylorus
D. Ileum

97. Compared with the male pelvis, the typical female pelvis has

A. A narrower, heart-shaped inlet and a pubic arch angle less than 90 degrees
B. A deeper, narrower pelvis and a longer sacrum
C. Larger acetabula facing more anteriorly
D. A wider, rounder inlet and a pubic arch angle greater than 90 degrees

103. Cerebrospinal fluid is produced mainly by the

A. Arachnoid granulations
B. Dural venous sinuses
C. Pineal gland
D. Choroid plexuses of the ventricles

109. Which bone feature forms the most lateral palpable bony prominence of the hip and is used as a positioning landmark?

A. Greater trochanter
B. Lesser trochanter
C. Ischial tuberosity
D. Anterior inferior iliac spine

115. A radiograph of an adult with long-standing bone pain shows a thickened, enlarged skull with patchy 'cotton wool' densities. The most likely condition is

A. Osteogenesis imperfecta
B. Paget disease of bone
C. Rickets
D. Osteomalacia

Radiologic Physics and Equipment

2. The air kerma measured 60 cm from an x-ray source is 5.4 mGy. Using the same technique, what is the air kerma at 90 cm?

A. 3.6 mGy
B. 2.4 mGy
C. 8.1 mGy
D. 1.8 mGy

8. A twelve-pulse three-phase unit is operated at 80 kVp, 400 mA and 0.25 s. How many heat units are produced (use a factor of 1.41)?

A. 8,000 HU
B. 10,800 HU
C. 11,280 HU
D. 12,410 HU

14. In tungsten, the K-shell binding energy is about 69.5 keV and the L-shell binding energy is about 12.1 keV. What is the energy of the characteristic photon from an L-to-K transition?

A. 81.6 keV
B. 69.5 keV
C. 12.1 keV
D. 57.4 keV

20. Decreasing the anode target angle of an x-ray tube will

A. Increase the effective focal spot size and reduce the heel effect
B. Reduce the effective focal spot size and eliminate the heel effect
C. Increase the actual focal spot size and the tube heat capacity
D. Reduce the effective focal spot size but make the heel effect more pronounced

26. For an AP thoracic spine, the thicker lower thoracic region should be placed toward the cathode end of the tube because

A. Beam intensity is greater on the anode side
B. The focal spot is smaller on the cathode side
C. Scatter radiation is lower on the anode side
D. Beam intensity is greater on the cathode side

32. Which component of the x-ray circuit converts alternating current to pulsating direct current so that electrons flow from cathode to anode only?

A. Autotransformer
B. Step-up transformer
C. Rectifier
D. Filament ammeter

38. A step-up transformer has a turns ratio of 500:1 and a primary voltage of 220 V. What is the secondary voltage?

A. 55 kV
B. 11 kV
C. 110 kV
D. 220 kV

44. If a transformer steps the voltage up by a factor of 400, the current in the secondary coil will be

A. Increased by a factor of 400
B. Unchanged
C. Reduced by a factor of 400
D. Reduced by a factor of 20

50. What is the function of the negatively charged focusing cup surrounding the filament?

A. To increase the number of electrons boiled off the filament
B. To absorb low-energy photons leaving the tube
C. To dissipate heat from the anode stem
D. To condense the electron stream into a narrow beam aimed at the focal spot

56. Which type of x-ray generator produces the lowest voltage ripple?

A. Single-phase full-wave rectified
B. High-frequency generator
C. Three-phase six-pulse
D. Single-phase half-wave rectified

62. Which x-ray interaction with matter is the main source of scatter radiation reaching the image receptor in general radiography?

A. Photoelectric absorption
B. Compton scattering
C. Pair production
D. Photodisintegration

68. The probability of a photoelectric interaction varies roughly with the inverse cube of photon energy. If the photon energy is doubled, the probability becomes

A. One-half as great
B. One-eighth as great
C. One-fourth as great
D. Eight times as great

74. A beam has a half-value layer of 2.5 mm Al. If 64 mGy enters a 7.5 mm aluminum filter, how much is transmitted?

A. 16 mGy
B. 8 mGy
C. 21.3 mGy
D. 4 mGy

80. Which photon interaction cannot occur unless the photon energy is at least 1.02 MeV?

A. Compton scattering
B. Coherent scattering
C. Pair production
D. Photoelectric absorption

86. In automatic exposure control, what is the purpose of the backup timer?

A. To start the exposure only after the rotor reaches full speed
B. To end the exposure if the detector fails to terminate it, protecting patient and tube
C. To set the kVp automatically for the part thickness
D. To delay the exposure until the patient stops breathing

92. The main advantage of a rotating anode over a stationary anode is that it

A. Produces a beam with no heel effect
B. Increases the energy of characteristic photons
C. Eliminates the need for a filament
D. Spreads the heat over a much larger target area, allowing higher tube loading

98. An exposure is made at 95 kVp. What is the maximum energy of the bremsstrahlung photons produced?

A. 69.5 keV
B. 47.5 keV
C. 95 keV
D. 190 keV

104. A 6 cm object is radiographed at 120 cm SID with an object-to-image distance of 20 cm. What is the size of the image?

A. 6.0 cm
B. 6.6 cm
C. 8.0 cm
D. 7.2 cm

110. Thermionic emission in the x-ray tube takes place at the

A. Focal track of the anode
B. Rotor of the induction motor
C. Filament of the cathode
D. Glass or metal envelope window

116. Which material is added to the tube port as added filtration to remove low-energy photons that would only increase patient skin dose?

A. Aluminum
B. Lead
C. Tungsten
D. Glass

Radiation Protection and Radiobiology

3. Under the ICRP recommendations adopted in the IAEA Basic Safety Standards, the occupational effective dose limit is

A. 1 mSv per year averaged over a defined 5-year period
B. 50 mSv per year with no averaging allowed
C. 150 mSv per year to the whole body
D. 20 mSv per year averaged over a defined 5-year period

9. What is the recommended annual effective dose limit for members of the public?

A. 5 mSv
B. 1 mSv
C. 20 mSv
D. 0.1 mSv

15. During fluoroscopy, a radiologic technologist steps back so that her distance from the patient (the scatter source) doubles. Her exposure rate becomes approximately

A. One-half of the original
B. Twice the original
C. One-eighth of the original
D. One-fourth of the original

21. According to the law of Bergonie and Tribondeau, which cells are the most radiosensitive?

A. Immature, undifferentiated cells with a high rate of division
B. Mature, highly specialized cells that rarely divide
C. Cells with low metabolic activity
D. Cells with a long time to mitosis

27. What is the SI unit of equivalent dose and effective dose?

A. Gray
B. Becquerel
C. Sievert
D. Coulomb per kilogram

33. A tissue absorbs 0.3 mGy from alpha particles, which have a radiation weighting factor of 20. What is the equivalent dose?

A. 0.3 mSv
B. 0.015 mSv
C. 6 mSv
D. 60 mSv

39. The lungs, with a tissue weighting factor of 0.12, receive an equivalent dose of 10 mSv. How much does this contribute to the effective dose?

A. 10 mSv
B. 0.12 mSv
C. 1.2 mSv
D. 12 mSv

45. A physician requests a lumbar spine radiograph only after confirming the expected diagnostic benefit outweighs the radiation risk. Which radiation protection principle does this reflect?

A. Optimization
B. Justification
C. Dose limitation
D. Time reduction

51. Under ICRP guidance, once a radiation worker declares her pregnancy, the dose to the embryo or fetus should not exceed about

A. 1 mSv for the remainder of the pregnancy
B. 5 mSv per month
C. 20 mSv for the remainder of the pregnancy
D. 50 mSv for the entire pregnancy

57. After a long interventional fluoroscopy procedure, a patient develops reddening of the skin at the beam entrance site. This is an example of a

A. Stochastic effect with no dose threshold
B. Deterministic effect (tissue reaction) with a dose threshold
C. Genetic effect seen in the next generation
D. Late somatic effect with a linear nonthreshold response

63. Which practice most directly reduces the volume of patient tissue irradiated during a radiographic examination?

A. Using a higher-ratio grid
B. Collimating the beam to the area of interest
C. Increasing the SID with the same field size
D. Using a faster processing algorithm

69. Thermoluminescent dosimeters used for personnel monitoring most commonly contain which crystal?

A. Lithium fluoride
B. Aluminum oxide
C. Silver bromide
D. Sodium iodide

75. When a single personnel dosimeter is worn during fluoroscopy with a lead apron, it should be worn

A. At collar level outside the apron
B. At waist level under the apron
C. On the wrist of the dominant hand
D. Clipped to the back of the apron

81. A wall of the x-ray room that the useful beam can be directed toward must be designed as a

A. Secondary barrier
B. Primary barrier
C. Control booth barrier only
D. Leakage barrier only

87. Which fluoroscopic technique reduces patient dose while still allowing dynamic viewing?

A. Continuous fluoroscopy at higher mA
B. Moving the image intensifier away from the patient
C. Using magnification mode throughout the procedure
D. Pulsed fluoroscopy at a reduced frame rate

93. During which period of gestation is the embryo most likely to develop major congenital malformations from significant radiation exposure?

A. Preimplantation, the first week
B. The third trimester
C. The final two weeks before delivery
D. Organogenesis, roughly weeks 2 to 8

99. What is the SI unit of radiation exposure in air?

A. Gray
B. Coulomb per kilogram
C. Sievert
D. Becquerel

105. In the Philippines, the licensing and regulation of radioactive materials used in nuclear medicine falls under which agency?

A. Professional Regulation Commission
B. Department of Science and Technology - PAGASA
C. Philippine Health Insurance Corporation
D. Philippine Nuclear Research Institute

111. Following acute whole-body irradiation, which acute radiation syndrome appears at the lowest dose range?

A. Hematopoietic syndrome
B. Gastrointestinal syndrome
C. Central nervous system syndrome
D. Cardiovascular syndrome

117. Radiation protection standards assume that the risk of stochastic effects such as cancer follows which dose-response model?

A. Linear threshold
B. Sigmoid threshold
C. Quadratic with a safe threshold
D. Linear nonthreshold

Radiographic Technique and Image Processing

4. An abdominal exposure uses 80 kVp at 20 mAs. Using the 15 percent rule, what mAs maintains receptor exposure if the kVp is raised to 92?

A. 10 mAs
B. 20 mAs
C. 40 mAs
D. 15 mAs

10. A technique requires 24 mAs and the technologist selects the 300 mA station. What exposure time is needed?

A. 0.12 s
B. 0.08 s
C. 0.06 s
D. 0.8 s

16. A portable chest exposure of 10 mAs is satisfactory at 100 cm. What mAs is needed to keep receptor exposure the same at 180 cm?

A. 18 mAs
B. 5.6 mAs
C. 3.1 mAs
D. 32.4 mAs

22. A knee technique uses 16 mAs with an 8:1 grid (conversion factor 4). What mAs is needed with a 12:1 grid (conversion factor 5)?

A. 20 mAs
B. 12.8 mAs
C. 24 mAs
D. 80 mAs

28. A grid has lead strips 2.4 mm high separated by interspace material 0.2 mm wide. What is the grid ratio?

A. 8:1
B. 10:1
C. 16:1
D. 12:1

34. For which condition should the technologist increase exposure factors above the routine technique?

A. Osteoporosis
B. Emphysema
C. Ascites
D. Pneumothorax

40. Raising the kVp while adjusting the mAs to keep receptor exposure constant will produce

A. Higher image contrast with a shorter scale of grays
B. No change in contrast but more magnification
C. Lower image contrast with a longer scale of grays
D. More geometric unsharpness

46. A 1.2 mm focal spot is used at 100 cm SID with the part 10 cm from the image receptor. What is the geometric unsharpness (focal spot blur)?

A. About 0.12 mm
B. About 1.08 mm
C. About 0.01 mm
D. About 0.13 mm

52. A digital image has an exposure index exactly twice the target exposure index. What is the deviation index?

A. About +3
B. About +2
C. About -3
D. About +10

58. The photostimulable phosphor in a computed radiography imaging plate is usually

A. Amorphous selenium
B. Thallium-activated cesium iodide
C. Gadolinium oxysulfide on polyester film
D. Europium-activated barium fluorohalide

64. Which material converts x-ray photons directly into electrical charge in a direct-conversion flat-panel detector?

A. Amorphous selenium
B. Cesium iodide
C. Amorphous silicon photodiode
D. Calcium tungstate

70. According to the Nyquist theorem, to faithfully record a signal the sampling frequency must be at least

A. Twice the highest spatial frequency present
B. Equal to the highest spatial frequency present
C. Half the highest spatial frequency present
D. Four times the lowest spatial frequency present

76. A detector 430 mm wide has a matrix of 2150 pixels across. What is its maximum theoretical spatial resolution?

A. 2.5 lp/mm
B. 5.0 lp/mm
C. 0.2 lp/mm
D. 10 lp/mm

82. In film processing, which chemical in the fixer removes unexposed, undeveloped silver halide from the emulsion?

A. Hydroquinone
B. Phenidone
C. Potassium bromide
D. Ammonium thiosulfate

88. A digital radiograph has a very low exposure index and appears grainy even after processing. The most likely cause is

A. Quantum mottle from insufficient mAs
B. Excessive kVp producing too much scatter
C. Use of too large a focal spot
D. Excessive collimation

94. Which exposure factor is the primary controller of the penetrating ability of the x-ray beam?

A. Milliamperage
B. Exposure time
C. Kilovoltage peak
D. Focal spot size

100. A focused grid is accidentally placed with its tube side facing the image receptor. The resulting image will show

A. Uniform loss of exposure across the whole image
B. Severe loss of exposure along both lateral edges with a fairly normal central strip
C. Loss of exposure on one side only
D. No visible change in exposure

106. On a digital workstation, widening the display window width will

A. Increase displayed contrast
B. Increase image brightness without changing contrast
C. Decrease displayed contrast by spreading more gray levels across the range
D. Improve the spatial resolution of the stored image

112. A lateral cervical spine is taken at a 180 cm SID with the shoulders about 15 cm from the receptor and no grid. What reduces scatter reaching the receptor in this setup?

A. The longer SID increasing beam intensity
B. The air gap created by the object-to-image distance
C. The anode heel effect
D. Automatic exposure control

118. In film radiography, the invisible image formed by silver atoms collecting at sensitivity specks after exposure is called the

A. Manifest image
B. Fog image
C. Latent image
D. Reversal image

Radiographic Positioning and Contrast Procedures

5. A routine PA chest radiograph is performed at an SID of about 180 cm mainly to

A. Reduce magnification of the heart and improve detail
B. Increase the exposure to the lungs
C. Allow the use of a shorter exposure time without a grid
D. Project the clavicles above the apices

11. For a PA chest, the patient's shoulders are rolled forward and the backs of the hands are placed on the hips in order to

A. Elevate the diaphragm
B. Superimpose the posterior ribs
C. Bring the clavicles to the level of the apices
D. Move the scapulae out of the lung fields

17. A chest radiograph shows adequate inspiration when how many posterior ribs are seen above the diaphragm?

A. At least 6
B. At least 10
C. At least 8 anterior ribs
D. Exactly 12

23. A patient with suspected free intraperitoneal air cannot stand. Which position best demonstrates the air?

A. Right lateral decubitus with a horizontal beam
B. Supine AP with a vertical beam
C. Left lateral decubitus with a horizontal beam
D. Prone PA with a vertical beam

29. A patient who cannot stand has a suspected small pneumothorax on the left. Which decubitus position should be used?

A. Right lateral decubitus
B. Left lateral decubitus
C. Dorsal decubitus
D. Ventral decubitus

35. For an AP hip, the lower limb is internally rotated 15 to 20 degrees in order to

A. Project the lesser trochanter in full profile
B. Place the femoral neck parallel to the image receptor
C. Open the sacroiliac joint
D. Superimpose the greater trochanter over the femoral neck

41. In the parietoacanthial (Waters) projection of the sinuses, a correctly positioned image shows the petrous ridges

A. Just below the maxillary sinuses
B. In the lower third of the orbits
C. Filling the orbits
D. At the level of the supraorbital margins

47. In a PA axial (Caldwell) projection of the skull using a 15-degree caudad angle with the OML perpendicular, the petrous ridges should project

A. Just below the maxillary sinuses
B. Above the orbits
C. Into the lower third of the orbits
D. Through the foramen magnum

53. For an AP open-mouth projection of C1 and C2, which line is placed perpendicular to the image receptor?

A. Line from the lower edge of the upper incisors to the mastoid tips
B. Infraorbitomeatal line
C. Acanthiomeatal line
D. Glabelloalveolar line

59. A patient fell on an outstretched hand and has tenderness in the anatomic snuffbox. Which projection best elongates the suspected bone?

A. PA wrist with radial deviation
B. PA wrist with ulnar deviation
C. Lateral wrist in neutral position
D. Tangential carpal canal projection

65. In a mediolateral knee projection, the central ray is angled 5 to 7 degrees cephalad in order to

A. Open the patellofemoral joint
B. Project the fibular head away from the tibia
C. Superimpose the femoral condyles by offsetting the longer medial condyle
D. Show the intercondylar fossa

71. The PA axial 'tunnel' projections of the knee are performed primarily to demonstrate the

A. Intercondylar fossa
B. Patellofemoral articulation
C. Proximal tibiofibular joint
D. Tibial tuberosity

77. In a 45-degree RPO projection of the lumbar spine, which zygapophyseal joints are demonstrated?

A. Right joints, those closest to the image receptor
B. Left joints, those farthest from the image receptor
C. Both right and left joints equally
D. Only the L5-S1 joint on the left

83. An LPO projection of the cervical spine with a 15 to 20 degree cephalad angle demonstrates which intervertebral foramina?

A. Left foramina, those closer to the image receptor
B. Both sides superimposed
C. No foramina, only the zygapophyseal joints
D. Right foramina, those farther from the image receptor

89. For insertion of the enema tip before a barium enema, the patient is placed in which position?

A. Sims position, on the left side with the right knee flexed
B. Trendelenburg position, supine with the head lowered
C. Fowler position, supine with the head raised
D. Right lateral recumbent with both legs extended

95. During an esophagram, which projection places the esophagus between the vertebral column and the heart?

A. LPO at about 15 degrees
B. RAO at about 35 to 40 degrees
C. AP supine with no rotation
D. Left lateral decubitus

101. A patient with suspected perforation of the colon is scheduled for a contrast enema. Which contrast agent is preferred?

A. Barium sulfate suspension
B. High-density barium paste
C. Water-soluble iodinated contrast
D. Oil-based iodinated contrast

107. Ureteric compression during excretory urography is contraindicated in a patient with

A. A history of kidney stones
B. Mild hypertension
C. A recent upper GI series
D. A known abdominal aortic aneurysm

113. Hysterosalpingography is mainly performed to evaluate the

A. Uterine cavity and patency of the fallopian tubes
B. Ovarian follicle count
C. Thickness of the endometrium in the luteal phase
D. Patency of the ureters

119. In a double-contrast barium enema, which agent serves as the negative contrast medium?

A. Barium sulfate
B. Iodinated contrast
C. Air or carbon dioxide
D. Gadolinium chelate

Nuclear Medicine, Radiation Therapy and Allied Imaging Modalities

6. A dose of Tc-99m (half-life 6 hours) measures 800 MBq at 7:00 AM. What is its activity at 7:00 PM the same day?

A. 200 MBq
B. 400 MBq
C. 100 MBq
D. 133 MBq

12. What is the principal gamma photon energy of technetium-99m?

A. 364 keV
B. 511 keV
C. 80 keV
D. 140 keV

18. In a radionuclide generator used in nuclear medicine departments, technetium-99m is eluted from which parent radionuclide?

A. Iodine-131
B. Cobalt-60
C. Gallium-67
D. Molybdenum-99

24. A patient with suspected bone metastases is referred for a skeletal scintigraphy. Which radiopharmaceutical is typically used?

A. Tc-99m macroaggregated albumin
B. Iodine-123 sodium iodide
C. Thallium-201 chloride
D. Tc-99m methylene diphosphonate

30. Which radionuclide is used for therapeutic ablation of thyroid tissue in hyperthyroidism and differentiated thyroid cancer?

A. Technetium-99m
B. Fluorine-18
C. Iodine-123
D. Iodine-131

36. PET scanners detect coincident photons produced by positron annihilation. These photons have an energy of

A. 140 keV each, traveling in the same direction
B. 1.02 MeV each, traveling at right angles
C. 364 keV each, emitted randomly
D. 511 keV each, traveling in nearly opposite directions

42. In CT, a tissue has a linear attenuation coefficient 10 percent higher than that of water. What is its CT number?

A. +10 HU
B. +1000 HU
C. +100 HU
D. -100 HU

48. In a helical CT scan, the table moves 30 mm per gantry rotation with a total beam collimation of 20 mm. What is the pitch?

A. 0.67
B. 10
C. 1.5
D. 600

54. Which CT scanner generation uses an x-ray tube rotating inside a complete stationary ring of detectors?

A. First generation
B. Fourth generation
C. Second generation
D. Third generation

60. The gyromagnetic ratio of hydrogen is 42.58 MHz per tesla. What is the Larmor frequency of hydrogen protons in a 1.5 T MRI scanner?

A. 63.87 MHz
B. 28.39 MHz
C. 42.58 MHz
D. 127.74 MHz

66. On a T2-weighted MR image of the brain, cerebrospinal fluid appears

A. Dark (hypointense)
B. Bright (hyperintense)
C. Isointense to gray matter
D. Completely signal void like cortical bone

72. Before MRI screening is complete, a patient reports having an older ferromagnetic cerebral aneurysm clip. What is the appropriate action?

A. Do not scan until the clip is confirmed MR-safe, because it may move in the magnetic field
B. Scan normally because intracranial clips are always MR-safe
C. Scan with a lead apron over the head
D. Scan only with T1-weighted sequences

78. A sonographer switches from a 3.5 MHz transducer to a 7.5 MHz transducer. What is the expected effect?

A. Deeper penetration with poorer resolution
B. Better penetration and better resolution
C. Better spatial resolution but less depth of penetration
D. No change in resolution or penetration

84. In diagnostic ultrasound, an echo returns 130 microseconds after the pulse is sent. Assuming a speed of 1540 m/s in soft tissue, how deep is the reflector?

A. About 20 cm
B. About 5 cm
C. About 10 cm
D. About 1.5 cm

90. Ultrasound transducers both produce and detect sound waves by means of the

A. Photoelectric effect
B. Piezoelectric effect
C. Doppler effect
D. Thermionic effect

96. Cobalt-60 teletherapy units emit gamma photons of 1.17 and 1.33 MeV. What is their average energy?

A. 1.25 MeV
B. 2.50 MeV
C. 1.17 MeV
D. 0.66 MeV

102. Which describes brachytherapy?

A. External megavoltage beams aimed from a distance
B. Sealed radioactive sources placed within or very close to the tumor
C. Oral or intravenous unsealed radionuclides concentrating in an organ
D. Low-energy x-rays used only for skin lesions at long distance

108. A patient is prescribed 60 Gy in 2 Gy fractions, given once a day, five days a week. How many weeks will the treatment course take?

A. 5 weeks
B. 4 weeks
C. 6 weeks
D. 12 weeks

114. Megavoltage photon beams from a linear accelerator spare the patient's skin because

A. The beam is completely absorbed in the first millimeter
B. Photons are reflected by the epidermis
C. Maximum dose is reached at a depth below the surface
D. The skin is the most radioresistant tissue

120. Screen-film and digital mammography use low kVp, typically around 25 to 30, mainly in order to

A. Reduce the exposure time to under 1 millisecond
B. Increase photoelectric absorption differences between similar soft tissues
C. Increase Compton scatter for better contrast
D. Allow use of a tungsten target without filtration

Answer key

Radiologic Technology

1. B. Trapezium

The first carpometacarpal joint is a saddle joint formed between the trapezium and the base of the first metacarpal.

2. B. 2.4 mGy

By the inverse square law, 5.4 x (60/90)^2 = 5.4 x 0.444 = 2.4 mGy.

3. D. 20 mSv per year averaged over a defined 5-year period

The occupational limit is 20 mSv per year averaged over 5 years, with no more than 50 mSv in any single year.

4. A. 10 mAs

92 kVp is a 15 percent increase over 80 kVp (80 x 1.15 = 92), which doubles receptor exposure, so mAs is halved: 20 / 2 = 10 mAs.

5. A. Reduce magnification of the heart and improve detail

A long SID reduces magnification and distortion of the heart and mediastinum, giving a truer cardiac size.

6. A. 200 MBq

Twelve hours equals two half-lives, so 800 / 2 / 2 = 200 MBq.

7. C. Pars interarticularis

The neck of the Scottie dog is the pars interarticularis, the site where a spondylolysis defect appears as a 'collar'.

8. C. 11,280 HU

HU = kVp x mA x s x 1.41 = 80 x 400 x 0.25 x 1.41 = 11,280 HU.

9. B. 1 mSv

ICRP and the IAEA Basic Safety Standards set the public effective dose limit at 1 mSv per year.

10. B. 0.08 s

Time = mAs / mA = 24 / 300 = 0.08 s.

11. D. Move the scapulae out of the lung fields

Rotating the shoulders forward draws the scapulae laterally so they do not overlap the lungs.

12. D. 140 keV

Tc-99m emits a 140 keV gamma photon, which is well suited to gamma camera imaging.

13. A. Fundus

The fundus is the most superior portion of the stomach, so gas rises there when the patient is upright.

14. D. 57.4 keV

The characteristic photon energy equals the difference in binding energies: 69.5 - 12.1 = 57.4 keV.

15. D. One-fourth of the original

By the inverse square law, doubling distance reduces intensity to (1/2)^2 = 1/4.

16. D. 32.4 mAs

By the exposure maintenance (square law) formula, new mAs = 10 x (180/100)^2 = 10 x 3.24 = 32.4 mAs.

17. B. At least 10

Ten posterior ribs visible above the diaphragm on a PA chest indicates full inspiration on most adults.

18. D. Molybdenum-99

Mo-99 (half-life about 66 hours) decays to Tc-99m, which is eluted from the generator column with saline.

19. A. They are retroperitoneal, with the right kidney slightly lower than the left

The kidneys lie behind the peritoneum at about T12 to L3, and the bulk of the liver pushes the right kidney slightly lower.

20. D. Reduce the effective focal spot size but make the heel effect more pronounced

By the line-focus principle a steeper (smaller) target angle gives a smaller effective focal spot, but more of the beam passes through the anode heel, increasing the heel effect.

21. A. Immature, undifferentiated cells with a high rate of division

Radiosensitivity is greatest in stem cells and other immature cells that divide rapidly and are poorly differentiated.

22. A. 20 mAs

New mAs = 16 x (5/4) = 20 mAs.

23. C. Left lateral decubitus with a horizontal beam

With the left side down, free air rises to the right flank and is seen against the liver, where it is not confused with stomach gas.

24. D. Tc-99m methylene diphosphonate

Tc-99m MDP binds to hydroxyapatite in areas of bone turnover; MAA is used for lung perfusion and thallium for myocardial perfusion.

25. C. Sphenoid sinus

The sphenoid sinus occupies the body of the sphenoid bone, immediately inferior to the sella turcica that houses the pituitary gland.

26. D. Beam intensity is greater on the cathode side

Because of the anode heel effect, x-ray intensity is higher toward the cathode, so the thicker part is placed under the cathode for more uniform density.

27. C. Sievert

Equivalent and effective dose are expressed in sievert; absorbed dose uses gray and activity uses becquerel.

28. D. 12:1

Grid ratio = strip height / interspace width = 2.4 / 0.2 = 12, giving 12:1.

29. A. Right lateral decubitus

Air rises, so the affected left side is placed up by lying the patient on the right side; for fluid, the affected side goes down.

30. D. Iodine-131

I-131 emits beta particles that destroy thyroid tissue that takes up iodine; I-123 and Tc-99m are used only for imaging.

31. C. Coronoid fossa

The coronoid fossa on the anterior distal humerus accepts the coronoid process during flexion; the olecranon fossa is posterior and receives the olecranon in extension.

32. C. Rectifier

Rectifier diodes allow current flow in one direction only, ensuring the tube is always driven with the cathode negative.

33. C. 6 mSv

Equivalent dose = absorbed dose x radiation weighting factor = 0.3 mGy x 20 = 6 mSv.

34. C. Ascites

Ascites is an additive condition because accumulated fluid increases attenuation; the other choices are destructive and need less exposure.

35. B. Place the femoral neck parallel to the image receptor

The femoral neck normally angles anteriorly; internal rotation brings it parallel to the receptor so it is shown at full length.

36. D. 511 keV each, traveling in nearly opposite directions

A positron annihilates with an electron to produce two 511 keV photons emitted about 180 degrees apart, which the detector ring records in coincidence.

37. A. Talus

The talus articulates superiorly with the tibia and laterally with the fibula to form the ankle (talocrural) joint.

38. C. 110 kV

Secondary voltage = primary voltage x turns ratio = 220 V x 500 = 110,000 V, or 110 kV.

39. C. 1.2 mSv

Contribution = equivalent dose x tissue weighting factor = 10 mSv x 0.12 = 1.2 mSv.

40. C. Lower image contrast with a longer scale of grays

Higher kVp increases penetration and Compton scatter, flattening differences in attenuation and producing a long-scale, low-contrast image.

41. A. Just below the maxillary sinuses

With the OML at about 37 degrees to the receptor, the petrous ridges project below the maxillary sinuses so the sinuses are seen clearly.

42. C. +100 HU

HU = 1000 x (mu tissue - mu water) / mu water = 1000 x 0.10 = +100 HU.

43. D. Ascending colon

The ascending and descending colon are fixed behind the peritoneum, while the transverse and sigmoid colon hang on their own mesenteries.

44. C. Reduced by a factor of 400

In an ideal transformer power is conserved (V x I constant), so a 400-fold increase in voltage gives a 400-fold decrease in current.

45. B. Justification

Justification requires that any exposure produce more benefit than harm before it is performed; optimization (ALARA) then keeps the dose as low as reasonably achievable.

46. D. About 0.13 mm

Blur = focal spot x OID / SOD = 1.2 x 10 / 90 = 0.133 mm, since SOD = 100 - 10 = 90 cm.

47. C. Into the lower third of the orbits

A 15-degree caudad angle moves the petrous ridges into the lower third of the orbits; with no angle they would fill the orbits.

48. C. 1.5

Pitch = table movement per rotation / beam collimation = 30 / 20 = 1.5.

49. B. Cholecystokinin

Cholecystokinin is released by the duodenal mucosa in response to fats and causes gallbladder contraction; this is the basis of the fatty-meal phase of older gallbladder studies.

50. D. To condense the electron stream into a narrow beam aimed at the focal spot

The focusing cup repels electrons electrostatically, keeping the thermionic electron cloud from spreading so it strikes a small focal area.

51. A. 1 mSv for the remainder of the pregnancy

ICRP recommends protection of the embryo or fetus comparable to that of a member of the public, about 1 mSv for the rest of the pregnancy.

52. A. About +3

DI = 10 x log10(EI / target EI) = 10 x log10(2) = 3.0.

53. A. Line from the lower edge of the upper incisors to the mastoid tips

Aligning the upper occlusal plane and mastoid tips perpendicular removes the teeth and skull base from the dens and lateral masses.

54. B. Fourth generation

Fourth-generation scanners have a fixed 360-degree detector ring with only the tube rotating; third-generation units rotate both tube and detector arc together.

55. B. T4 to T5

The carina lies at about the level of the sternal angle, which corresponds to the T4 to T5 interspace.

56. B. High-frequency generator

High-frequency generators produce a nearly constant potential with ripple under about 1 percent, compared with 100 percent for single-phase and roughly 13 percent for three-phase six-pulse.

57. B. Deterministic effect (tissue reaction) with a dose threshold

Skin erythema appears only above a threshold dose and its severity increases with dose, which defines a deterministic effect.

58. D. Europium-activated barium fluorohalide

CR plates use barium fluorohalide doped with europium, which stores the latent image and releases light when scanned by a laser.

59. B. PA wrist with ulnar deviation

Ulnar deviation lengthens the scaphoid and opens the surrounding joint spaces, helping to show scaphoid fractures.

60. A. 63.87 MHz

Larmor frequency = gyromagnetic ratio x field strength = 42.58 x 1.5 = 63.87 MHz.

61. D. Wider, shorter and more vertical than the left

The right main bronchus has a larger diameter and a more vertical course, so aspirated objects tend to fall into it.

62. B. Compton scattering

In the diagnostic range, Compton interactions with outer-shell electrons deflect photons that can still reach the receptor as scatter.

63. B. Collimating the beam to the area of interest

Beam restriction limits the field to the anatomy of interest, decreasing both the irradiated volume and the scatter produced.

64. A. Amorphous selenium

Amorphous selenium is a photoconductor that converts x-rays straight to charge; cesium iodide is a scintillator used in indirect systems.

65. C. Superimpose the femoral condyles by offsetting the longer medial condyle

The medial femoral condyle projects lower than the lateral; a slight cephalad angle superimposes them and opens the joint space.

66. B. Bright (hyperintense)

Water has a long T2 relaxation time, so CSF and fluid-filled lesions are bright on T2-weighted images and dark on T1-weighted images.

67. B. Pneumothorax

Air in the pleural space separates the visceral pleura from the chest wall, leaving a peripheral zone devoid of vascular markings.

68. B. One-eighth as great

Probability is proportional to 1/E^3, so doubling E gives (1/2)^3 = 1/8 of the original probability.

69. A. Lithium fluoride

TLDs usually use lithium fluoride, which stores energy and releases light when heated; OSL dosimeters use aluminum oxide.

70. A. Twice the highest spatial frequency present

Sampling at less than twice the highest frequency causes aliasing, so the Nyquist frequency is half the sampling rate.

71. A. Intercondylar fossa

Tunnel views such as the Camp-Coventry and Holmblad methods open the intercondylar fossa of the femur.

72. A. Do not scan until the clip is confirmed MR-safe, because it may move in the magnetic field

Ferromagnetic aneurysm clips can torque or move in the static field, risking hemorrhage, so they are a contraindication unless documented as MR-safe or conditional.

73. A. Blowout fracture

A blowout fracture results from a sudden rise in intraorbital pressure that breaks the thin orbital floor into the maxillary sinus.

74. B. 8 mGy

7.5 mm is three HVLs (7.5 / 2.5), so the beam is halved three times: 64 / 2 / 2 / 2 = 8 mGy.

75. A. At collar level outside the apron

A collar-level badge outside the apron estimates the dose to the unshielded head, neck and lens of the eye, where exposure is highest.

76. A. 2.5 lp/mm

Pixel size = 430 / 2150 = 0.2 mm; one line pair needs two pixels, so resolution = 1 / (2 x 0.2) = 2.5 lp/mm.

77. A. Right joints, those closest to the image receptor

In posterior obliques of the lumbar spine, the downside joints are shown, so an RPO shows the right zygapophyseal joints.

78. C. Better spatial resolution but less depth of penetration

Higher-frequency sound has a shorter wavelength for finer resolution but is attenuated faster, limiting penetration.

79. B. Colles fracture

A Colles fracture is a distal radius fracture with dorsal (posterior) displacement; a Smith fracture has volar displacement.

80. C. Pair production

Pair production converts a photon into an electron and a positron, each with 0.51 MeV rest mass, so at least 1.02 MeV is required.

81. B. Primary barrier

Any barrier that the primary beam may strike is a primary barrier and needs more shielding than barriers exposed only to scatter and leakage.

82. D. Ammonium thiosulfate

Ammonium thiosulfate is the clearing agent of the fixer; hydroquinone and phenidone are developer reducing agents and potassium bromide is a restrainer.

83. D. Right foramina, those farther from the image receptor

In posterior obliques of the cervical spine, the upside foramina are shown, so an LPO demonstrates the right foramina.

84. C. About 10 cm

Depth = speed x time / 2 = 1540 x 0.000130 / 2 = 0.100 m, about 10 cm, since the sound travels to the reflector and back.

85. C. Croup

Croup (laryngotracheobronchitis) causes subglottic edema that produces the tapered 'steeple' appearance on a frontal view; epiglottitis shows a swollen epiglottis on the lateral view.

86. B. To end the exposure if the detector fails to terminate it, protecting patient and tube

The backup timer limits exposure time (or mAs) so that a malfunction or wrong chamber selection does not cause an excessive exposure.

87. D. Pulsed fluoroscopy at a reduced frame rate

Pulsed fluoroscopy produces radiation only in short bursts, so lower pulse rates substantially cut dose compared with continuous mode.

88. A. Quantum mottle from insufficient mAs

Too few photons reaching the detector produce a low exposure index and statistical noise, called quantum mottle.

89. A. Sims position, on the left side with the right knee flexed

The Sims position relaxes the abdominal muscles and follows the natural course of the rectum and sigmoid for easier tip insertion.

90. B. Piezoelectric effect

Piezoelectric crystals vibrate when voltage is applied and generate voltage when struck by returning echoes.

91. D. Ileum

Of the small bowel distal to the duodenum, the jejunum makes up about two-fifths and the ileum about three-fifths, making the ileum the longest segment.

92. D. Spreads the heat over a much larger target area, allowing higher tube loading

Rotation constantly brings a fresh area of the focal track under the electron beam, so heat is spread around the track and higher mA can be used.

93. D. Organogenesis, roughly weeks 2 to 8

Major organs form during organogenesis, so doses large enough to cause malformations are most damaging in this period.

94. C. Kilovoltage peak

kVp determines photon energy and therefore beam quality; mA and time control quantity only.

95. B. RAO at about 35 to 40 degrees

The RAO projects the barium-filled esophagus clear of the spine, between the spine and the heart shadow.

96. A. 1.25 MeV

The average of 1.17 and 1.33 MeV is (1.17 + 1.33) / 2 = 1.25 MeV.

97. D. A wider, rounder inlet and a pubic arch angle greater than 90 degrees

The female pelvis is broader and shallower, with a round inlet and an obtuse pubic arch that facilitate childbirth.

98. C. 95 keV

The maximum bremsstrahlung photon energy equals the peak kilovoltage, so 95 kVp produces photons up to 95 keV.

99. B. Coulomb per kilogram

Exposure measures ionization in air and is expressed in coulomb per kilogram, replacing the roentgen.

100. B. Severe loss of exposure along both lateral edges with a fairly normal central strip

In an upside-down focused grid the lead strips diverge away from the beam, so only the central strip transmits and both sides are cut off sharply.

101. C. Water-soluble iodinated contrast

Barium leaking into the peritoneum can cause serious peritonitis, so water-soluble iodinated media are used when perforation is suspected.

102. B. Sealed radioactive sources placed within or very close to the tumor

Brachytherapy means short-distance therapy, delivering a high dose to the tumor with rapid falloff to surrounding tissue.

103. D. Choroid plexuses of the ventricles

Most CSF is secreted by the choroid plexuses in the ventricles and is reabsorbed into the venous sinuses through the arachnoid granulations.

104. D. 7.2 cm

SOD = 120 - 20 = 100 cm; magnification factor = 120/100 = 1.2; image size = 6 x 1.2 = 7.2 cm.

105. D. Philippine Nuclear Research Institute

The PNRI is the regulatory authority for radioactive materials, while x-ray equipment facilities are regulated under the Department of Health.

106. C. Decrease displayed contrast by spreading more gray levels across the range

A wider window maps a larger range of pixel values to the gray scale, giving a longer scale and lower displayed contrast.

107. D. A known abdominal aortic aneurysm

Compression devices press on the abdomen and could injure an aneurysm, so they are avoided in that case along with recent abdominal surgery or trauma.

108. C. 6 weeks

60 Gy / 2 Gy = 30 fractions; 30 fractions / 5 per week = 6 weeks.

109. A. Greater trochanter

The greater trochanter projects laterally from the proximal femur and is easily palpated; it lies roughly at the level of the pubic symphysis.

110. C. Filament of the cathode

Heating the tungsten filament with current causes electrons to be boiled off its surface, a process called thermionic emission.

111. A. Hematopoietic syndrome

Bone marrow is the most sensitive of the critical organ systems, so the hematopoietic syndrome appears at lower doses (about 1 to 10 Gy) than the GI or CNS forms.

112. B. The air gap created by the object-to-image distance

Scatter leaving the patient at oblique angles misses the receptor across the air gap, so the increased OID acts like a grid; the long SID offsets the magnification.

113. A. Uterine cavity and patency of the fallopian tubes

Contrast injected through the cervix outlines the uterine cavity and spills into the peritoneum if the fallopian tubes are open.

114. C. Maximum dose is reached at a depth below the surface

Secondary electrons set in motion travel forward and build up dose, so the maximum dose occurs below the skin, a phenomenon called the skin-sparing effect.

115. B. Paget disease of bone

Paget disease causes disordered remodeling with bone enlargement and mixed sclerotic patches, classically described as a cotton-wool skull.

116. A. Aluminum

Aluminum filtration preferentially absorbs low-energy photons that cannot reach the receptor, hardening the beam and lowering skin dose.

117. D. Linear nonthreshold

The linear nonthreshold model assumes any dose carries some risk proportional to dose, which is the conservative basis of ALARA.

118. C. Latent image

Exposure creates the latent image at the sensitivity specks; chemical development converts it into the visible manifest image.

119. C. Air or carbon dioxide

Gas is radiolucent and serves as the negative agent, distending the colon while a thin barium coating outlines the mucosa.

120. B. Increase photoelectric absorption differences between similar soft tissues

Breast tissues have similar densities, so low-energy photons that interact mainly by photoelectric absorption are needed to produce subject contrast.

Topics to review

- Radiographic positioning and anatomy
- Image formation and exposure factors
- Radiation protection and quality control
- Patient care and imaging modalities

Online question banks and study resources

Radiologic technologist - Pass Harbor (Question bank)

X-ray technologist - Pass Harbor (Question bank)

Official PRC board information

Current PRC exam programs

Independent study material prepared by Board Exam Desk.