

Radiography Student Practice Test Study Guide

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The following information guide is aligned with the concepts covered in this practice test and is written for student technologists preparing for clinical performance checks and registry-style questions.

How to use this guide: Use this as a “concept map” for what the test is really evaluating. Each section summarizes the decision rules behind the questions, then gives a short set of clinical cues you can rehearse during competency check-offs. If you want a practical workflow, read one domain at a time, then retake the practice test and compare the missed-domain list to the sections below. You will notice the test emphasizes safe imaging behaviors and consistent positioning more than trivia. That emphasis aligns with how well technologists actually perform in clinical settings.

1) Radiation protection and dose management (ALARA mindset): Core principles you should be able to explain and apply: ALARA means you keep dose as low as you reasonably can while still producing a diagnostic exam. In radiography, the biggest levers are field size (collimation), repeats, technique selection, appropriate shielding practices, and staff distance.

Collimation is one of the most reliable dose and image-quality controls. Tight collimation reduces the irradiated volume, scatter, and scatter-to-primary ratio, improves contrast, and lowers patient exposure. Digital cropping does not reduce the dose because the radiation already occurred. Collimation remains a first-line protection step even in DR. Research and best-practice guidance repeatedly identify collimation and exposure indicator monitoring as central to dose control in digital radiography.

The 15% rule is a technique relationship you should know cold. A 15% increase in kVp roughly doubles receptor exposure, so you can cut mAs in half to maintain exposure. A 15% decrease in kVp roughly halves receptor exposure, so you would typically double mAs to maintain exposure. This is not a license to chase exposure indicator numbers. It is a way to quickly think through technique trade-offs.

Filtration and HVL are about beam quality. Increasing filtration removes low-energy photons that would contribute to skin dose without improving image formation. The half-value layer (HVL) reflects beam penetrability and is used as a metric of beam quality.

Staff protection is distance plus shielding. In mobile radiography, stepping back is important because of the inverse-square law. When shielding is available and

appropriate, it further reduces exposure. Avoid holding detectors when a safe alternative is available, follow policy, and use immobilization aids when needed.

Pediatrics requires intentional technique and repeated prevention. Use pediatric technique charts, tighten collimation, and use immobilization methods appropriately. Pediatric dose management principles emphasize collimation and technique tailoring to size and clinical need.

Effective dose relates to whole-body stochastic risk. You do not calculate it at the bedside, but you should know that the effective dose is the “whole-patient risk modeling” concept, not entrance skin exposure.

2) Radiation physics you must recognize in practical terms: X-ray production: Two main products come from the tube:

- Bremsstrahlung: electron deceleration near the nucleus, broad spectrum.
- Characteristic radiation: an incident electron knocks out an inner-shell electron, then an outer-shell electron fills the vacancy and releases a photon with discrete energy.

You should be able to identify characteristic radiation in words, not just pick it from a list. Interactions with the patient: The test focuses on practical consequences:

Compton scatter is the main scatter mechanism at typical diagnostic energies and body thicknesses. It reduces image contrast and increases occupational exposure. Scatter management is why you collimate, use grids appropriately, and consider an air gap when indicated. Compton cannot be “eliminated” by simply raising kVp. Raising kVp can increase scatter fraction even if it improves penetration.

3) Technique selection and image quality: what your images are telling you: Exposure and noise: If an image is excessively noisy or grainy, think quantum mottle. The most direct correction is usually increasing mAs. Noise is largely photon-number-driven, and mAs controls the photon number. kVp changes penetration and contrast; it can influence exposure, but the fastest correct mental model for grainy images is “insufficient photons reached the detector.”

Contrast controls

- Higher kVp generally produces a longer gray scale and lower contrast.
- Lower kVp increases subject contrast, within diagnostic limits.

You should connect this to clinical goals: chest imaging often uses higher kVp for penetration and long gray scale, while extremities can use lower kVp to emphasize contrast.

Geometric sharpness: Geometric unsharpness increases with:

- Larger focal spot size
- Larger object-to-image distance (OID)

It decreases with:

- Longer source-to-image distance (SID)

When you see blur, ask whether it is motion blur, geometric blur, or insufficient resolution. Geometry changes can fix geometric blur, but they do not fix motion.

Grids: A grid's job is simple: reduce scatter reaching the detector to improve contrast. A grid does not increase spatial resolution, reduce motion blur, or change pixel size.

Grid cutoff is most likely when alignment is wrong: off-level, off-center, wrong SID for a focused grid, or incorrect centering. The clinical cue is uneven density across the image that does not match the anatomy.

4) Digital radiography essentials: exposure indicators and "exposure creep." Exposure index is feedback, not a goal in isolation: Digital systems can look "okay" even when overexposed because of wide latitude. That reality creates exposure creep, a gradual drift toward higher techniques over time. Exposure creep is a known issue in CR and DR environments and has been described and studied for years. A healthy department treats the exposure index as a quality and safety signal that must be trended, standardized, and audited.

Standardized exposure index concepts: Exposure index (EI) standardization work explains why manufacturer-specific indicators have caused confusion and why standardized concepts are important for managing dose and image quality across equipment.

Why collimation still matters in DR: Electronic cropping does not reduce dose. Physical collimation reduces irradiated tissue and scatter, improving contrast and supporting safer practice.

Histogram and field recognition: If the collimation field is not recognized correctly, histogram analysis may fail, resulting in inaccurate exposure indicator values and poor rescaling. Clinically, that can look like oddly bright or dark images even when the technique seems consistent.

Digital spatial resolution: In digital radiography, pixel size and sampling frequency strongly influence achievable spatial resolution. Technique factors influence noise and contrast more than intrinsic detector sampling.

5) Quality assurance and artifacts: diagnosing system problems: You should be able to separate “patient factors” from “system factors.”

- Repeating line artifacts across images often signal detector calibration or readout problems (row/column issues), not patient motion. Motion blur changes with the patient and often looks smeared rather than fixed and repeating.
- A consistently dark look across many exams can indicate technique issues, incorrect exposure index targets, or processing configuration problems. Grid cutoff is more likely to be regional and alignment-related.

The mental habit to build is: if the artifact repeats across patients and projections, suspect equipment or processing.

6) Patient care, contrast safety, and communication: Contrast screening and escalation: A prior rash or reaction to iodinated contrast is not something you ignore or “handle quietly.” The correct practice is to notify the radiologist and follow policy for risk stratification, possible premedication, alternative imaging pathways, and documentation. Evidence syntheses and clinical guidance consistently emphasize the importance of documenting and managing hypersensitivity reactions.

Recognizing reaction severity: Mild reactions may include limited hives, warmth, and nausea. Severe reactions involve airway compromise such as wheezing or stridor, hypotension, or escalating systemic symptoms. Your job is to provide rapid recognition, escalation, and adherence to the emergency response protocol.

Vasovagal response: A classic vasovagal pattern is bradycardia with hypotension, often with pallor, diaphoresis, and dizziness. This is not the same as an allergic-type reaction, and that distinction affects response steps.

Trauma precautions: For suspected cervical spine injury, maintain spinal precautions and follow trauma protocols. Do not remove collars or ask the patient to move for positioning convenience.

Informed consent principles in radiography communication: Even when formal written consent is not required for routine radiography, the principles still matter: explain in plain language, verify understanding, answer questions, and avoid assumptions that “someone else already explained it.”

7) Infection control: standard precautions in imaging: The test emphasizes practical basics:

- Hand hygiene before and after patient contact.
- Gloves do not replace hand hygiene and must be changed between patients.

- In isolation rooms, don appropriate PPE before entering and disinfect equipment contact surfaces after the exam, including handles and control points, not only the detector.

Consistency here is part of professional identity, not optional behavior.

8) Ethics, law, and professional practice: A simple rule: Do not use personal devices to photograph clinical images. Even if identifiers are not visible, facility policy and privacy expectations typically prohibit it. Follow your program's educational pathways for case review.

When a projection request seems inappropriate for the clinical question, your job is to clarify through the right channels. That usually means communicating with the radiologist or ordering provider per protocol, not independent substitution or silent compliance.

9) Positioning checklists aligned to the test: Below are high-yield reminders. Practice these as "set pieces," so your positioning becomes repeatable.

Chest: Upright PA chest

- CR at T7.
- Roll shoulders forward and depress shoulders to move scapulae off the lung fields.
- Suspend breathing at full inspiration for routine PA.

Abdomen: AP supine (KUB)

- Center at the iliac crests.
- Aim to include the kidneys through the pubic symphysis, adjust based on body habitus and protocol.

Air-fluid levels: Left lateral decubitus position of the abdomen with a horizontal beam when the patient cannot stand.

Spine: Lateral lumbar

- Look for superimposed posterior vertebral body margins, minimal rotation.

Lumbar obliques

- "Scottie dog" anatomy for pars interarticularis.

Cervical foramina

- 45-degree obliques best show intervertebral foramina.

Open-mouth odontoid

- Align the lower edge of the upper incisors with the skull base so the dens is not obscured.

Upper extremity

AP elbow

- Hand supinated, epicondyles parallel to IR.

Lateral elbow

- True lateral to evaluate fat pads, including the posterior fat pad sign.

Lower extremity

AP pelvis

- Symmetric obturator foramina and iliac wings, sacrum, and coccyx aligned with pubic symphysis.

AP knee

- Slight internal rotation to place femoral condyles parallel to IR.

Skull and sinuses

Caldwell

- Petrous ridges in the lower third of the orbits with a 15-degree caudal angle.

Towne

- Shows foramen magnum and occipital bone with correct OML/IOML alignment.

Shoulder and hip

Shoulder rotation

- Internal rotation: lesser tubercle in profile.
- External rotation: greater tubercle in profile.

AP hip

- Internal rotation, when trauma is not suspected, places the femoral neck parallel to IR.

Hand and wrist

PA hand

- Center at third MCP.

Scaphoid

- PA wrist with ulnar deviation plus scaphoid views per protocol.

10) Rapid self-check cues (short memory list)

- Grainy image equals insufficient photons, raise mAs first.
- Higher kVp lowers contrast, increases penetration, and changes scatter behavior.
- Tight collimation is dose control and contrast control, even in DR.
- Exposure index is a safety signal; trend it, do not chase it unthinkingly.
- Grid cutoff equals alignment problem.
- Severe contrast reaction signs include airway compromise; escalate immediately.
- Trauma patient equals spinal precautions and protocol imaging.

Additional Reading:

Seibert, J. A., & Morin, R. L. (2011). The standardized exposure index for digital radiography. *Journal of the American College of Radiology*.

Gibson, D. J., & Davidson, R. A. (2012). Exposure creep in computed radiography. *Academic Radiology*.

Lewis, S., et al. (2019). Retrospective evaluation of exposure indicators as a marker of exposure creep.

Mothiram, U., et al. (2014). Digital radiography exposure indices: a review.

Don, S. (2013). Ten steps to help manage radiation dose in pediatric imaging. *AJR*.

Bottinor, W., Polkampally, P., & Jovin, I. (2013). Adverse reactions to iodinated contrast media.

Liu, K., et al. (2025). Predictors of acute adverse reactions to non-ionic iodinated contrast media: a systematic review and meta-analysis.