INI CET Radiology

Sample Paper – 9

Duration: 14 Minutes **Maximum Marks: 15**

Instructions

- This paper contains **15** Multiple Choice Questions (Single Best Response), modelled on the Radiodiagnosis (Radiology) content of **INI CET** (Institutes of National Importance Combined Entrance Test) conducted by AIIMS New Delhi.
- The **15-question** length matches the number of Radiology items you actually meet in the real 200-question paper.
- Each correct answer carries **+1 mark**. There is **negative marking of one-third (0.33) mark** for every incorrect answer; unattempted questions carry no penalty.
- Every question has **exactly one best answer**. Choose the single most appropriate option.
- Attempt this practice paper in one timed sitting of about **14 minutes**, the pace the real computer-based test demands.

Physics and Radiation Safety

Q1. Regarding the image-quality trade-offs in radiography, which statement is correct?

(A) A larger focal spot improves spatial resolution

(B) Spatial resolution and contrast resolution measure the same property

(C) Lowering the dose (reducing mAs) increases quantum mottle (noise) and worsens low-contrast detectability

(D) Increasing the number of detector pixels reduces spatial resolution

Q2. The two central radiation-protection principles that govern *every* medical exposure are:

(A) Randomisation and blinding

(B) Shielding of staff and time only

(C) Time, distance and shielding only

(D) Justification (the exposure must do more good than harm) and optimisation (ALARA)

Q3. Children are more radiosensitive than adults. The best dose-reduction strategy for a paediatric CT scan is to:

(A) Use standard adult scan settings for every child

(B) Add routine multiphase (arterial and venous) contrast passes

(C) Increase the tube current to eliminate all image noise

(D) Use weight-based (child-sized) low-dose protocols and scan only when clinically justified

Imaging Modalities and Contrast Media

Q4. Dual-energy CT (imaging at two different tube voltages) is particularly useful because it can:

(A) Image the body using no X-rays at all

(B) Distinguish materials by atomic number, so it can identify monosodium urate deposits in gout and characterise uric-acid (urate) stones

(C) Replace MRI for routine brain imaging

(D) Eliminate the entire patient radiation dose

Q5. Susceptibility-weighted imaging (SWI) on MRI is most sensitive for detecting:

(A) The core of an acute cortical infarct

(B) Fine cortical bone detail

(C) Freshly injected iodinated contrast

(D) Cerebral microbleeds and other blood-degradation (haemosiderin) products

Q6. Regarding dedicated small-bowel contrast studies, which statement is correct?

(A) Enteroclysis (contrast infused directly through a naso-jejunal tube) gives better small-bowel distension and mucosal detail than a simple barium follow-through

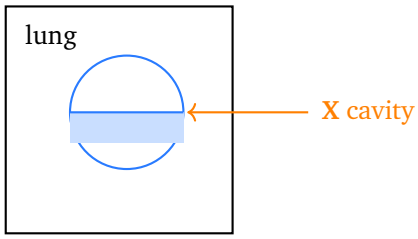
(B) A barium follow-through requires a naso-jejunal tube

(C) Enteroclysis uses no contrast medium at all

(D) A follow-through study images only the colon

Chest and Cardiovascular Radiology

Q7. The chest radiograph sketched below shows a thick, irregular-walled lung cavity containing an air-fluid level (marked **X**). In an older chronic smoker with weight loss, the most likely diagnosis is:



(A) Simple pleural effusion

(B) Cardiomegaly

(C) Cavitating bronchogenic carcinoma

(D) Pneumothorax

Q8. Bilateral, symmetrical hilar lymphadenopathy with right paratracheal nodes, in an otherwise well young adult, is most characteristic of:

(A) Sarcoidosis

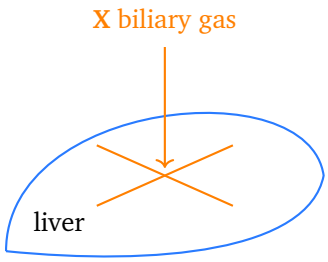
(B) Lymphoma

(C) Lobar pneumonia

(D) Pneumothorax

Gastrointestinal and Genitourinary Radiology

Q9. The abdominal CT schematic below shows branching gas lucencies within the liver that converge *towards the centre* (the porta), marked **X**. This indicates:



(A) Pneumobilia (air in the biliary tree)

(B) Portal venous gas

(C) A normal liver

(D) Free intraperitoneal air

Q10. A febrile patient with right-upper-quadrant pain has a thick-walled, complex hypoechoic liver lesion with internal debris on ultrasound, and a low-attenuation centre with rim enhancement on CT. This is most likely a:

(A) Simple hepatic cyst

(B) Cavernous haemangioma

(C) Pyogenic liver abscess

(D) Normal liver parenchyma

Q11. On the excretory (delayed) phase of a CT urogram, an irregular soft-tissue filling defect within the opacified renal pelvis of an older patient with painless haematuria most likely represents:

(A) A simple renal cyst

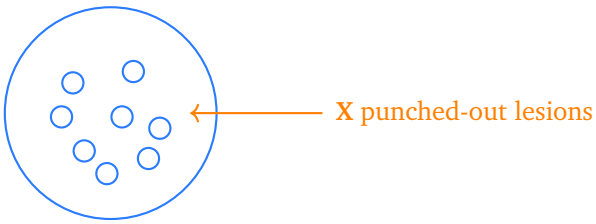
(B) An adrenal adenoma

(C) Transitional cell (urothelial) carcinoma

(D) Normal ureteric peristalsis

Musculoskeletal and Neuroradiology

Q12. The skull radiograph schematic below shows multiple small, well-defined 'punched-out' lytic lesions (a pepper-pot skull), marked **X**. In an elderly patient with bone pain, anaemia and renal impairment, this indicates:



(A) Paget disease of bone

(B) Multiple myeloma

(C) Osteopetrosis

(D) A normal skull

Q13. Which statement about the imaging of an acute ischaemic stroke is correct?

(A) Non-contrast CT shows the infarct as a bright lesion within minutes of onset

(B) Diffusion-weighted MRI (DWI) shows restricted diffusion (bright signal) within minutes, far earlier than CT changes appear

(C) Diffusion-weighted MRI is negative in acute infarction

(D) Non-contrast CT is more sensitive than DWI for early ischaemia

Interventional, Nuclear and Emergency Radiology

Q14. Regarding image-guided percutaneous biopsy and abscess drainage, which statement is correct?

(A) Ultrasound or CT guidance allows accurate real-time needle placement, and the coagulation status should be checked beforehand

(B) Guidance is unnecessary; blind biopsy is preferred for deep lesions

(C) A drainage catheter must never be left in situ after the procedure

(D) Percutaneous biopsy is contraindicated for all deep lesions

Q15. On dual-energy X-ray absorptiometry (DEXA), the WHO T-score threshold that defines *osteoporosis* is a T-score of:

(A) 0 or above

(B) -2.5 or lower

(C) between -1.0 and 0

(D) $+2.5$ or higher

Detailed Solutions

Q1.

Solution

Concept – image-quality trade-offs: Radiographic image quality is a balance between spatial resolution, contrast resolution, noise and radiation dose.

Step 1 – define the terms: Spatial resolution is the ability to separate small adjacent structures; contrast resolution is the ability to distinguish tissues of similar density; noise (quantum mottle) is random graininess from too few detected photons.

Step 2 – link dose and noise: Lowering the dose means fewer photons reach the detector, so **quantum mottle rises** and low-contrast structures become harder to see, degrading contrast resolution.

Why the other options are wrong:

- A, larger focal spot: a smaller focal spot (not a larger one) improves spatial resolution by reducing geometric blur.
- B, same property: spatial and contrast resolution are distinct quantities.
- D, more pixels: finer detector sampling improves, not reduces, spatial resolution.

Final Answer: Lower dose raises noise and worsens contrast resolution ⇒ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept – the pillars of radiation protection: Every medical exposure is governed by two overarching principles.

Step 1 – name them: Justification (the benefit of the exposure must outweigh its harm) and **optimisation** (keeping the dose As Low As Reasonably Achievable, ALARA).

Step 2 – how they apply: Justification decides *whether* to image; optimisation decides *how* to image with the least dose consistent with a diagnostic result. Dose limits apply to staff and public, but not to justified patient exposures.

Why the other options are wrong:

- A, randomisation and blinding: are research-trial methods, not radiation-

protection principles.

- B, shielding and time only: these are practical tools, not the governing principles.
- C, time, distance and shielding: are the three protective measures, but the governing principles are justification and optimisation.

Final Answer: Justification and optimisation ⇒ D

Answer: (D) Go Back to Q2

Q3.

Solution

Concept – paediatric radiation sensitivity: Children have more radiosensitive dividing tissues and a longer lifespan for late effects to appear, so their doses must be minimised.

Step 1 – choose the strategy: Use **weight-based (child-sized) low-dose CT protocols**, restrict the scan to the region needed, avoid unnecessary repeat or multiphase passes, and scan only when the study is justified.

Step 2 – the guiding idea: 'Child-size' the exposure factors (lower kV and mAs for the child's size) rather than copying adult settings.

Why the other options are wrong:

- A, adult settings: over-expose a small child and deliver excess dose.
- B, multiphase passes: multiply the dose and are rarely needed in children.
- C, increase tube current: adding current to remove all noise raises the dose, the opposite of dose reduction.

Final Answer: Weight-based low-dose protocols, scan only when justified ⇒ D

Answer: (D) Go Back to Q3

Q4.

Solution

Concept – dual-energy CT (DECT): Scanning at two X-ray energies lets the scanner separate materials by how their attenuation changes with energy (their effective atomic number).

Step 1 – state the application: Because urate has a distinct energy behaviour, DECT can **colour-map monosodium urate deposits in gout** and **characterise**

uric-acid (urate) stones, distinguishing them from calcium stones.

Step 2 – other uses: Virtual non-contrast images, iodine maps and bone or metal removal are further DECT applications.

Why the other options are wrong:

- A, no X-rays: DECT is still an X-ray (CT) technique.
- C, replace brain MRI: MRI remains superior for soft-tissue brain detail.
- D, no dose: DECT still delivers a radiation dose.

Final Answer: Distinguishes materials by atomic number (gout, urate stones) $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q4

Q5.

Solution

Concept – susceptibility-weighted imaging (SWI): SWI is an MRI sequence exquisitely sensitive to substances that distort the local magnetic field.

Step 1 – state its strength: It detects **cerebral microbleeds** and other blood-breakdown products (haemosiderin), as well as calcium and venous deoxy-haemoglobin, which appear as blooming low-signal foci.

Step 2 – clinical value: It reveals microbleeds in amyloid angiopathy, hypertension, diffuse axonal injury and cavernomas that other sequences miss.

Why the other options are wrong:

- A, infarct core: that is best shown by diffusion-weighted imaging, not SWI.
- B, cortical bone: bone detail is a CT strength; MRI shows cortical bone poorly.
- C, iodinated contrast: iodine is a CT/X-ray contrast, not seen on SWI.

Final Answer: Cerebral microbleeds and haemosiderin products $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q5

Q6.

Solution

Concept – small-bowel contrast studies: Two barium techniques image the small bowel: the follow-through and enteroclysis.

Step 1 – compare them: In **enteroclysis**, contrast is infused directly through a **naso-jejunal tube**, giving superior luminal distension and mucosal detail. A **barium follow-through** has the patient swallow barium and takes serial films as it passes, which is simpler but distends the bowel less well.

Step 2 – the practical choice: Enteroclysis is preferred when fine mucosal or subtle stricture detail is needed; the follow-through is easier and better tolerated.

Why the other options are wrong:

- B, follow-through needs a tube: it does not; the patient swallows the barium.
- C, enteroclysis no contrast: it uses contrast infused through the tube.
- D, follow-through images colon: it images the small bowel, not just the colon.

Final Answer: Enteroclysis gives better distension and mucosal detail ⇒ A

Answer: (A) Go Back to Q6

Q7.

Solution

Concept – the cavitating lung lesion: A lung cavity is a gas-filled space within a lesion; its wall thickness and the clinical context narrow the differential (tuberculosis, abscess, cancer).

Step 1 – read the film: A **thick, irregular-walled cavity** with an air-fluid level (X) in an **older chronic smoker with weight loss** points strongly to a **cavitating bronchogenic carcinoma** (typically squamous cell).

Step 2 – weigh the differentials: A lung abscess gives a thick but smoother wall with a fever and copious sputum; post-primary tuberculosis favours the upper lobes with surrounding nodules. A thick, irregular wall in this clinical picture favours malignancy.

Why the other options are wrong:

- A, pleural effusion: gives a dependent meniscus, not a walled cavity.
- B, cardiomegaly: is an enlarged cardiac silhouette, not a lung cavity.
- D, pneumothorax: is a peripheral lucency with no wall or fluid level.

Final Answer: Cavitating bronchogenic carcinoma ⇒ C

Answer: (C) Go Back to Q7

Q8.

Solution

Concept – the pattern of hilar lymphadenopathy: The symmetry of enlarged nodes helps separate sarcoidosis from lymphoma.

Step 1 – interpret the pattern: Bilateral, symmetrical hilar nodes with right paratracheal nodes in a **well** young adult is the classic '1-2-3' (Garland triad) picture of **sarcoidosis**.

Step 2 – contrast with lymphoma: Lymphoma tends to give *asymmetrical* nodes and a bulky anterior mediastinal mass, usually with systemic symptoms.

Why the other options are wrong:

- B, lymphoma: is typically asymmetrical with a mediastinal mass, not symmetrical bilateral hilar nodes in a well patient.
- C, pneumonia: causes airspace opacity, not symmetrical hilar adenopathy.
- D, pneumothorax: is a peripheral pleural lucency, unrelated to nodes.

Final Answer: Sarcoidosis ⇒ A

Answer: (A) Go Back to Q8

Q9.

Solution

Concept – pneumobilia: Gas within the biliary tree has a characteristic central distribution.

Step 1 – read the pattern: Branching gas lucencies that **converge towards the centre of the liver** (the porta), marked **X**, are **pneumobilia** (air in the bile ducts), because bile flows centrally towards the hepatic hilum.

Step 2 – the causes: Pneumobilia follows a patent sphincterotomy or biliary-enteric anastomosis, an incompetent sphincter of Oddi, or a gallstone ileus with a cholecysto-enteric fistula.

Why the other options are wrong:

- B, portal venous gas: reaches the *periphery* of the liver (within about 2 cm of

the capsule) and is an ominous sign of bowel ischaemia.
- C, normal liver: branching gas in the liver is never normal.
- D, free intraperitoneal air: lies under the diaphragm or outlines bowel wall, not inside the liver.

Final Answer: Pneumobilia (air in the biliary tree) ⇒ A

Answer: (A) Go Back to Q9

Q10.

Solution

Concept – characterising a focal liver lesion: Ultrasound and CT features separate an abscess from a simple cyst and a haemangioma.

Step 1 – read the features: A **thick-walled, complex hypoechoic lesion with internal debris** that shows a **low-attenuation centre with rim enhancement** on CT, in a **febrile** patient, is a **pyogenic liver abscess**.

Step 2 – the comparators: A simple cyst is thin-walled, anechoic with posterior acoustic enhancement and no wall enhancement; a haemangioma shows peripheral, discontinuous nodular enhancement that fills in centripetally on delayed images.

Why the other options are wrong:

- A, simple cyst: is anechoic with no internal debris and no rim enhancement, and the patient is asymptomatic.
- B, haemangioma: shows the classic peripheral nodular fill-in, not a debris-filled cavity with fever.
- D, normal parenchyma: has no discrete lesion.

Final Answer: Pyogenic liver abscess ⇒ C

Answer: (C) Go Back to Q10

Q11.

Solution

Concept – the CT urogram filling defect: In the excretory phase the collecting system opacifies, so soft-tissue lesions appear as filling defects.

Step 1 – interpret the defect: An **irregular soft-tissue filling defect** in the opacified renal pelvis of an **older patient with painless haematuria** is characteristic

of **transitional cell (urothelial) carcinoma**.

Step 2 – follow-up: Urothelial tumours are often multifocal, so the whole urothelium (pelvis, ureters and bladder) is assessed, and cytology or ureteroscopy confirms the diagnosis.

Why the other options are wrong:

- A, simple cyst: is a fluid-filled parenchymal lesion, not an intraluminal filling defect.
- B, adrenal adenoma: arises in the adrenal gland, outside the collecting system.
- D, peristalsis: causes transient, smooth narrowing that resolves on delayed images, not a fixed irregular defect.

Final Answer: Transitional cell (urothelial) carcinoma ⇒ C

Answer: (C) Go Back to Q11

Q12.

Solution

Concept – the pepper-pot skull: Multiple discrete lytic lesions in the skull have a short differential dominated by myeloma.

Step 1 – read the film: Multiple small, well-defined **'punched-out'** lytic lesions (**X**) with no sclerotic rim (a pepper-pot skull) in an **elderly patient with bone pain, anaemia and renal impairment** indicate **multiple myeloma**.

Step 2 – confirm the diagnosis: Serum and urine protein electrophoresis (an M-band and Bence-Jones protein) and marrow plasmacytosis confirm it; whole-body MRI or low-dose CT has replaced the old skeletal survey for staging.

Why the other options are wrong:

- A, Paget disease: gives a mixed lytic-sclerotic, thickened skull ('cotton-wool' spots), not clean punched-out holes.
- C, osteopetrosis: causes dense, sclerotic (too-white) bone, the opposite of lytic lesions.
- D, normal skull: has no lytic lesions.

Final Answer: Multiple myeloma ⇒ B

Answer: (B) Go Back to Q12

Q13.

Solution

Concept – imaging the acute ischaemic stroke: Diffusion-weighted MRI and CT detect infarction on different time-scales.

Step 1 – state the key fact: Diffusion-weighted imaging (DWI) shows **restricted diffusion** (bright signal, with a dark ADC map) within **minutes** of onset, long before CT changes appear.

Step 2 – the role of CT: Non-contrast CT is done first mainly to *exclude haemorrhage*; early ischaemic signs (loss of grey-white differentiation, a dense-artery sign) are subtle and appear only after several hours.

Why the other options are wrong:

- A, CT bright within minutes: infarcts are dark (hypodense) on CT and take hours to appear.
- C, DWI negative: DWI is strongly positive in acute infarction.
- D, CT more sensitive: DWI is far more sensitive than CT for early ischaemia.

Final Answer: DWI shows restriction within minutes, earlier than CT $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q13

Q14.

Solution

Concept – image-guided biopsy and drainage: Interventional radiology uses ultrasound or CT to place needles and catheters accurately.

Step 1 – state the principle: Ultrasound or CT guidance gives real-time or precise needle placement into a lesion or collection, and the **coagulation status (platelets, INR)** is checked and corrected beforehand to reduce bleeding.

Step 2 – drainage: For an abscess, a catheter is placed by the Seldinger or trocar technique and *left in situ* to drain until the collection resolves.

Why the other options are wrong:

- B, blind biopsy preferred: guidance improves accuracy and safety and is preferred.
- C, never left in situ: a drainage catheter is deliberately left in place to drain the collection.
- D, contraindicated for deep lesions: image guidance makes deep lesions accessible, not off-limits.

Final Answer: US/CT guidance with pre-procedure coagulation check $\Rightarrow$ A

Answer: (A) Go Back to Q14

Q15.

Solution

Concept – DEXA and the T-score: Bone densitometry grades bone mineral density against a young-adult reference.

Step 1 – state the threshold: The **T-score** is the number of standard deviations from the young-adult mean. A T-score of -2.5 **or lower** defines **osteoporosis** (WHO criteria).

Step 2 – the full scale: A T-score of -1.0 or above is normal; between -1.0 and -2.5 is osteopenia (low bone mass); and -2.5 or below with a fragility fracture is severe (established) osteoporosis.

Why the other options are wrong:

- A, 0 or above: is normal bone density.
- C, between -1.0 and 0: falls in the normal range.
- D, $+2.5$ or higher: denotes above-average density, not osteoporosis.

Final Answer: T-score of -2.5 or lower $\Rightarrow$ B

Answer: (B) Go Back to Q15

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	2	D	3	D	4	B	5	D
6	A	7	C	8	A	9	A	10	C
11	C	12	B	13	B	14	A	15	B