

INI CET Radiology

Sample Paper – 2

Duration: 14 Minutes

Maximum Marks: 15

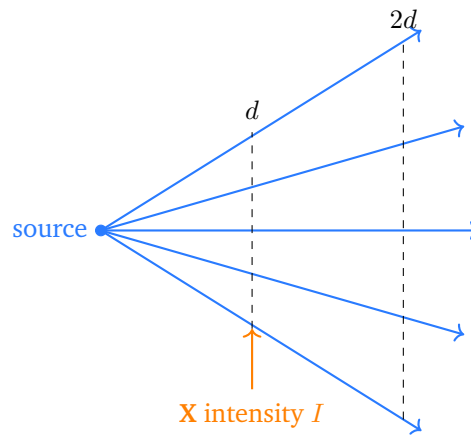
Instructions

- 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.** The SI unit of *equivalent* (and effective) radiation dose, which weights the absorbed dose for the biological harmfulness of the radiation type, is the:
- (A) Gray (Gy)
(B) Sievert (Sv)
(C) Becquerel (Bq)
(D) Roentgen (R)
- Q2.** For a point source of radiation, the schematic below shows the beam spreading over an ever-larger area with distance. The intensity I (marked **X**) measured at a distance d varies as:





- (A) Inversely proportional to the square of the distance ($I \propto 1/d^2$)
- (B) Inversely proportional to the distance ($I \propto 1/d$)
- (C) Directly proportional to the distance ($I \propto d$)
- (D) Directly proportional to the square of the distance ($I \propto d^2$)

Q3. Which of the following is a *deterministic* (tissue-reaction) effect of ionising radiation, that is, one with a threshold dose above which the severity increases with dose?

- (A) Radiation-induced skin erythema
- (B) Radiation-induced solid cancer
- (C) A hereditary germ-cell mutation
- (D) Radiation-induced leukaemia

Imaging Modalities and Contrast Media

Q4. In a diagnostic ultrasound probe, the piezoelectric crystal is central to image formation because it:

- (A) Emits ionising X-ray photons towards the tissue
- (B) Converts electrical energy into ultrasound pulses and returning echoes back into electrical signals
- (C) Generates the strong static magnetic field needed for imaging
- (D) Produces gamma rays that a detector records

- Q5.** Comparing the two basic MRI sequences, simple fluid such as cerebrospinal fluid (CSF) characteristically appears:
- (A) Bright on T1-weighted and dark on T2-weighted images
 - (B) Dark on T1-weighted and bright on T2-weighted images
 - (C) Dark on both T1- and T2-weighted images
 - (D) Bright on both T1- and T2-weighted images
- Q6.** A patient develops acute hypotension, urticaria and bronchospasm moments after intravenous iodinated contrast (an anaphylactoid reaction). The single most important first-line drug is:
- (A) Intravenous hydrocortisone given alone
 - (B) An oral antihistamine given alone
 - (C) Intramuscular adrenaline (epinephrine)
 - (D) Intravenous furosemide

Chest and Cardiovascular Radiology

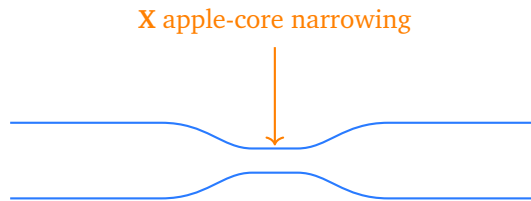
- Q7.** A chest radiograph shows a homogeneous opacity confined to the right middle lobe that contains air bronchograms and obscures (silhouettes) the right heart border. This indicates:
- (A) Pneumothorax
 - (B) Pleural effusion
 - (C) Lobar collapse with volume loss
 - (D) Lobar consolidation (pneumonia)
- Q8.** Which combination of chest radiograph findings is most characteristic of left heart failure with pulmonary venous hypertension?
- (A) A peripheral lucent rim with absent lung markings
 - (B) A single grossly dilated inverted-U pelvic loop
 - (C) Upper-lobe blood diversion, Kerley B lines and bat-wing perihilar oedema



(D) Free gas collecting under the diaphragm

Gastrointestinal and Genitourinary Radiology

Q9. The double-contrast barium-enema sketch below shows a short, irregular, annular narrowing of the colonic lumen with shouldered margins (marked X), giving an 'apple-core' appearance. This indicates:



- (A) Annular constricting carcinoma of the colon
- (B) Colonic diverticulosis
- (C) A normal haustral pattern
- (D) Ulcerative colitis

Q10. On a small-bowel barium follow-through, a long, smooth, narrowed segment of the terminal ileum resembling a thin thread (the 'string sign') is most characteristic of:

- (A) Coeliac disease
- (B) Small-bowel lymphoma
- (C) Ileo-colic intussusception
- (D) Crohn disease

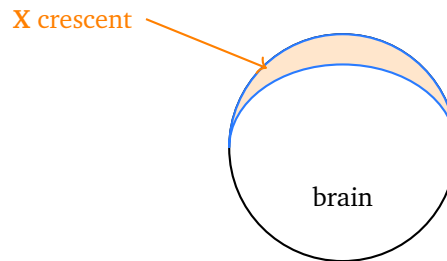
Q11. A young adult presents with acute right renal colic and suspected obstructing ureteric calculus. The single most sensitive investigation, detecting almost all stones without any contrast, is:

- (A) A plain abdominal radiograph alone
- (B) An intravenous urogram with iodinated contrast
- (C) Retrograde pyelography
- (D) Non-contrast CT of the kidneys, ureters and bladder (CT KUB)



Musculoskeletal and Neuroradiology

Q12. The non-contrast CT sketch below shows a crescent-shaped (concave inner border) extra-axial collection along the cerebral convexity (marked X) that spreads across the cranial suture lines. This indicates:



- (A) Subdural haematoma
 - (B) Extradural (epidural) haematoma
 - (C) Subarachnoid haemorrhage
 - (D) An acute cerebral infarct
- Q13.** An aggressive lesion in the metaphysis of the distal femur of a 16-year-old shows a spiculated 'sunburst' periosteal reaction and a Codman triangle on the radiograph. The most likely diagnosis is:
- (A) A simple (unicameral) bone cyst
 - (B) Chronic osteomyelitis
 - (C) Osteosarcoma
 - (D) Enchondroma

Interventional, Nuclear and Emergency Radiology

- Q14.** In most haemodynamically stable patients with suspected acute pulmonary embolism, the current first-line imaging investigation is:
- (A) A plain chest radiograph alone
 - (B) A bedside FAST ultrasound
 - (C) CT pulmonary angiography (CTPA)
 - (D) A ventilation-only lung scan



- Q15.** A technetium-99m methylene diphosphonate (MDP) bone scan is most useful for:
- (A) Imaging a soft-tissue abscess
 - (B) Detecting skeletal metastases and occult fractures across the whole skeleton
 - (C) Measuring the glomerular filtration rate
 - (D) Assessing myocardial perfusion



Detailed Solutions

Q1.

Solution

Concept – radiation dose units: Different radiation quantities have distinct SI units.

Step 1 – name the equivalent-dose unit: The **Sievert (Sv)** is the SI unit of *equivalent* and *effective* dose; it is the absorbed dose weighted for the biological harm of the radiation type and the sensitivity of the tissue.

Step 2 – contrast the others: The Gray is the absorbed dose (joules per kilogram), the Becquerel is activity (decays per second) and the Roentgen is a legacy unit of exposure.

Why the other options are wrong:

- A, Gray: measures absorbed dose, not the biologically weighted equivalent dose.
- C, Becquerel: measures the activity of a source.
- D, Roentgen: is an old exposure unit, not the SI equivalent-dose unit.

Final Answer: Sievert (Sv) $\Rightarrow$ **B**

Answer: (B) [Go Back to Q1](#)

Q2.

Solution

Concept – the inverse square law: Radiation from a point source spreads out over a widening sphere as it travels.

Step 1 – state the law: The same energy is spread over the surface of a sphere whose area is $4\pi d^2$, so the intensity **X** falls off as **one over the square of the distance** ($I \propto 1/d^2$).

Step 2 – apply it: Doubling the distance from d to $2d$ quarters the intensity ($1/2^2 = 1/4$); this is why increasing distance is such a powerful radiation-protection measure.

Why the other options are wrong:

- B, $1/d$: understates how fast intensity actually falls.
- C, $\propto d$: intensity decreases, not increases, with distance.
- D, $\propto d^2$: is the reverse of the real relationship.



Final Answer: $I \propto 1/d^2 \Rightarrow \boxed{A}$

Answer: (A) [Go Back to Q2](#)

Q3.

Solution

Concept – deterministic versus stochastic effects: Radiation effects fall into two classes that behave very differently with dose.

Step 1 – identify the deterministic effect: **Skin erythema** is a deterministic (tissue-reaction) effect: it has a **threshold dose** below which it does not occur, and above which the severity rises with increasing dose.

Step 2 – contrast with stochastic effects: Cancer, leukaemia and hereditary mutations are *stochastic*: their *probability* (not severity) rises with dose and they are assumed to have no threshold.

Why the other options are wrong:

- B, solid cancer: is a stochastic effect with no threshold.
- C, hereditary mutation: is stochastic, affecting probability not severity.
- D, leukaemia: is a stochastic malignancy, not a threshold tissue reaction.

Final Answer: Skin erythema $\Rightarrow \boxed{A}$

Answer: (A) [Go Back to Q3](#)

Q4.

Solution

Concept – the piezoelectric effect in ultrasound: Diagnostic ultrasound relies on a crystal that couples electricity and sound.

Step 1 – state the function: A piezoelectric crystal **converts electrical energy into ultrasound pulses** when a voltage is applied, and converts the returning echoes back into electrical signals.

Step 2 – how the image forms: The machine times each echo and uses its amplitude to build a real-time greyscale image; no ionising radiation is involved.

Why the other options are wrong:

- A, X-ray photons: ultrasound is non-ionising and uses sound, not X-rays.
- C, magnetic field: that is the physics of MRI, not ultrasound.



- D, gamma rays: describes nuclear medicine, not ultrasound.

Final Answer: Interconverts electrical and ultrasound energy ⇒ B

Answer: (B) [Go Back to Q4](#)

Q5.

Solution

Concept – T1- versus T2-weighted MRI: The two basic sequences display fluid in opposite ways.

Step 1 – state the appearance: Simple fluid such as CSF is **dark (low signal) on T1** and **bright (high signal) on T2**.

Step 2 – a memory aid: On T2, ‘water is white’, so oedema, cysts and CSF light up; on T1, fat is bright and fluid is dark, which gives good anatomical detail.

Why the other options are wrong:

- A, bright on T1/dark on T2: is the reverse of the true pattern.
- C, dark on both: fluid is bright on T2, not dark.
- D, bright on both: fluid is dark on T1, not bright.

Final Answer: Dark on T1, bright on T2 ⇒ B

Answer: (B) [Go Back to Q5](#)

Q6.

Solution

Concept – managing a contrast anaphylactoid reaction: A severe reaction with hypotension and bronchospasm is a medical emergency.

Step 1 – give the first-line drug: Intramuscular adrenaline (epinephrine) is the single most important treatment; it reverses bronchospasm, supports blood pressure and reduces mucosal oedema.

Step 2 – supportive measures: Stop the contrast, call for help, give high-flow oxygen and intravenous fluids; antihistamines and steroids are adjuncts only.

Why the other options are wrong:

- A, hydrocortisone alone: is slow-acting and never the first drug in anaphylaxis.
- B, oral antihistamine alone: is inadequate for a severe reaction.



- D, furosemide: has no role in an acute anaphylactoid reaction.

Final Answer: Intramuscular adrenaline $\Rightarrow$

Answer: (C) [Go Back to Q6](#)

Q7.

Solution

Concept – lobar consolidation and the silhouette sign: Alveoli fill with exudate while the airways stay patent.

Step 1 – read the film: A homogeneous opacity confined to one lobe containing **air bronchograms**, with the adjacent heart border obscured (the **silhouette sign**), indicates **lobar consolidation (pneumonia)**.

Step 2 – localise it: Loss of the right heart border places the disease in the right middle lobe, which lies against it; there is no volume loss.

Why the other options are wrong:

- A, pneumothorax: gives a peripheral lucent zone, not a lobar opacity with air bronchograms.
- B, pleural effusion: causes a dependent meniscus, not air bronchograms.
- C, lobar collapse: shows volume loss and shift, unlike patent-airway consolidation.

Final Answer: Lobar consolidation $\Rightarrow$

Answer: (D) [Go Back to Q7](#)

Q8.

Solution

Concept – chest signs of left heart failure: Raised pulmonary venous pressure produces a recognisable sequence on the film.

Step 1 – list the signs: **Upper-lobe blood diversion**, **Kerley B lines** (short horizontal septal lines at the bases) and **bat-wing perihilar oedema** together indicate left heart failure.

Step 2 – the progression: Rising pressure causes redistribution first, then interstitial oedema (Kerley lines), then alveolar oedema and often pleural effusions and cardiomegaly.



Why the other options are wrong:

- A, peripheral lucent rim: describes a pneumothorax.
- B, dilated pelvic loop: is a sigmoid volvulus, an abdominal sign.
- D, gas under the diaphragm: is pneumoperitoneum, not heart failure.

Final Answer: Diversion, Kerley B lines and bat-wing oedema ⇒ C

Answer: (C) [Go Back to Q8](#)

Q9.

Solution

Concept – the apple-core lesion of colonic carcinoma: An annular tumour encircles and constricts the bowel lumen.

Step 1 – read the study: A short, irregular, **annular narrowing** with **shouldered margins** (X) on a double-contrast barium enema gives the classic ‘**apple-core**’ appearance of an annular constricting colonic carcinoma.

Step 2 – the next step: Colonoscopy with biopsy confirms the diagnosis, and staging CT assesses spread.

Why the other options are wrong:

- B, diverticulosis: shows outpouchings, not a constricting annular stricture.
- C, normal haustra: are smooth, symmetrical folds without narrowing.
- D, ulcerative colitis: gives a smooth, featureless ‘lead-pipe’ colon, not a short shouldered stricture.

Final Answer: Annular constricting colonic carcinoma ⇒ A

Answer: (A) [Go Back to Q9](#)

Q10.

Solution

Concept – the string sign of Crohn disease: Transmural inflammation narrows the affected small bowel.

Step 1 – read the study: A long, narrowed segment of **terminal ileum** resembling a thin thread (the ‘**string sign**’) on a barium follow-through is characteristic of **Crohn disease**.

Step 2 – related features: Skip lesions, a cobblestone mucosa, deep ulcers and



fistulae support the diagnosis; the terminal ileum is the commonest site.

Why the other options are wrong:

- A, coeliac disease: shows small-bowel fold changes and dilatation, not a narrowed string.
- B, lymphoma: tends to cause aneurysmal dilatation or a mass, not luminal narrowing.
- C, intussusception: gives a coiled-spring or target appearance, not a string.

Final Answer: Crohn disease $\Rightarrow$

Answer: (D) [Go Back to Q10](#)

Q11.

Solution

Concept – imaging a ureteric calculus: Renal colic needs a fast, sensitive test that finds stones of all types.

Step 1 – name the investigation: **Non-contrast CT of the kidneys, ureters and bladder (CT KUB)** is the investigation of choice; it detects nearly all calculi, including radiolucent ones, without contrast.

Step 2 – what it shows: It confirms the stone, its size and site, and secondary signs of obstruction such as hydronephrosis and perinephric stranding.

Why the other options are wrong:

- A, plain radiograph: misses radiolucent (for example uric acid) stones and overlying gas obscures the ureter.
- B, intravenous urogram: is slower, uses contrast and is now largely replaced by CT KUB.
- C, retrograde pyelography: is invasive and reserved for problem cases, not first-line.

Final Answer: Non-contrast CT KUB $\Rightarrow$

Answer: (D) [Go Back to Q11](#)



Q12.

Solution

Concept – the subdural haematoma: Its shape and relation to sutures distinguish it on CT.

Step 1 – read the CT: A **crescent-shaped** (concave inner border) extra-axial collection along the convexity that **crosses suture lines (X)** is a subdural haematoma, from torn bridging veins.

Step 2 – the clinical setting: It is common in the elderly and alcohol users after minor trauma; chronic subdurals appear hypodense (dark) rather than hyperdense.

Why the other options are wrong:

- B, extradural haematoma: is biconvex (lens-shaped) and does *not* cross suture lines.
- C, subarachnoid haemorrhage: shows blood in the sulci and basal cisterns, not a convexity crescent.
- D, cerebral infarct: is a hypodense wedge in a vascular territory, not an extra-axial collection.

Final Answer: Subdural haematoma ⇒ A

Answer: (A) [Go Back to Q12](#)

Q13.

Solution

Concept – radiographic features of osteosarcoma: This aggressive bone tumour produces a distinctive periosteal reaction.

Step 1 – read the film: A **sunburst** spiculated periosteal reaction with a **Codman triangle**, in the metaphysis of a long bone (classically around the knee) in an adolescent, points to **osteosarcoma**.

Step 2 – confirm and stage: MRI defines the local extent, and a chest CT looks for lung metastases; biopsy gives the tissue diagnosis.

Why the other options are wrong:

- A, simple bone cyst: is a well-defined lucent lesion, not an aggressive spiculated one.
- B, osteomyelitis: can mimic tumour but usually lacks a true sunburst reaction.



- D, enchondroma: is a benign lytic lesion with chondroid calcification, not aggressive.

Final Answer: Osteosarcoma $\Rightarrow$

Answer: (C) [Go Back to Q13](#)

Q14.

Solution

Concept – imaging pulmonary embolism: Modern practice favours a fast, direct test of the pulmonary arteries.

Step 1 – name the investigation: **CT pulmonary angiography (CTPA)** is the first-line test in most stable patients; it shows filling defects directly within the pulmonary arteries.

Step 2 – when V/Q is used: A ventilation-perfusion (V/Q) scan is the alternative when CTPA is contraindicated, for example in pregnancy or contrast allergy, or with a normal chest radiograph.

Why the other options are wrong:

- A, plain radiograph: is often normal and cannot exclude embolism.
- B, FAST ultrasound: detects free abdominal or pericardial fluid, not pulmonary emboli.
- D, ventilation-only scan: is incomplete; both ventilation and perfusion are needed for a V/Q study.

Final Answer: CT pulmonary angiography $\Rightarrow$

Answer: (C) [Go Back to Q14](#)

Q15.

Solution

Concept – the technetium-99m bone scan: This nuclear-medicine study maps osteoblastic activity across the whole skeleton.

Step 1 – state its main use: A technetium-99m MDP bone scan is most useful for **detecting skeletal metastases and occult fractures**, showing ‘hot spots’ of increased bone turnover in a single whole-body survey.

Step 2 – other uses: It also helps in osteomyelitis, Paget disease and stress fractures, and it can be positive before radiographic changes appear.



Why the other options are wrong:

- A, soft-tissue abscess: is better assessed with ultrasound, CT or a labelled-white-cell scan.
- C, glomerular filtration rate: is measured with renal tracers such as DTPA, not MDP.
- D, myocardial perfusion: uses cardiac tracers (for example sestamibi), not a bone agent.

Final Answer: Detecting metastases and occult fractures ⇒ B

Answer: (B) [Go Back to Q15](#)



Answer Key

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

