INI CET Radiology

Sample Paper – 4

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. Effective dose is used to express the overall stochastic risk of a radiological examination. It is obtained from each organ's equivalent dose by multiplying it by the organ's:

(A) Physical half-life, then adding the results

(B) Tissue weighting factor, then summing over all irradiated organs

(C) Atomic number, then averaging the results

(D) Exposure time, then taking the maximum value

Q2. The small device worn on the trunk by a radiation worker to record the cumulative occupational dose received over a monitoring period, such as a film badge or a thermoluminescent dosimeter (TLD), is called a:

(A) Geiger–Muller survey meter for area monitoring

(B) Ionisation chamber used for beam calibration

(C) Personal dosimeter

(D) Dose–area product (DAP) meter on the tube

Q3. The recommended annual effective dose limit for occupationally exposed radiation workers (averaged over a defined 5-year period) is:

(A) 1 mSv per year, the limit for members of the public

(B) 20 mSv per year

(C) 50 mSv per year, allowed in every single year

(D) 100 mSv per year

Imaging Modalities and Contrast Media

Q4. Ultrasound images depend on differences in acoustic impedance between tissues. A simple fluid-filled cyst transmits sound freely and therefore appears on the scan as:

(A) Anechoic (black) with posterior acoustic enhancement behind it

(B) Uniformly echogenic (bright) with dense posterior shadowing

(C) Identical in echogenicity to the surrounding fat

(D) A bright reflective focus casting an acoustic shadow

Q5. Diffusion-weighted MRI (DWI) is the most sensitive sequence for detecting an acute ischaemic stroke within minutes of onset. Cytotoxic oedema in the infarcted core restricts water movement, so the lesion appears:

(A) Dark (low signal) on DWI with a high ADC value

(B) Bright (high signal) on DWI with a low (dark) ADC value

(C) Bright on DWI and equally bright on the ADC map

(D) Invisible on DWI but bright on the ADC map

Q6. A patient who had a previous moderate reaction to iodinated contrast now needs a contrast-enhanced CT that cannot be avoided. The recommended pretreatment is:

(A) No premedication because a repeat reaction never occurs

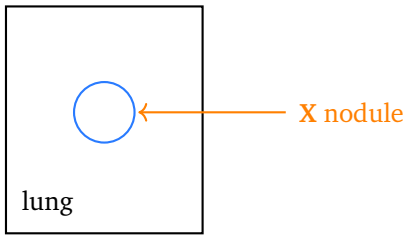
(B) A prophylactic intravenous adrenaline (epinephrine) infusion during the scan

(C) A small intravenous test dose of full-strength contrast beforehand

(D) A corticosteroid (for example prednisolone) plus an antihistamine given before the scan

Chest and Cardiovascular Radiology

Q7. The chest radiograph schematic below shows a single, well-defined, rounded opacity (marked **X**) under 3 cm across, surrounded by normal aerated lung. This 'coin lesion' is best described as a:



(A) Lobar consolidation

(B) Pleural effusion

(C) Cavitating abscess with an air-fluid level

(D) Solitary pulmonary nodule

Q8. A 'boot-shaped' heart (coeur en sabot), with an uplifted cardiac apex and a concave pulmonary bay, on a paediatric chest radiograph is characteristic of:

(A) An uncomplicated atrial septal defect

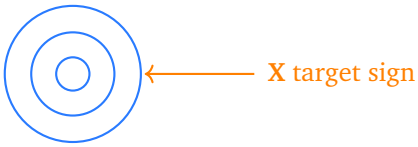
(B) Tetralogy of Fallot

(C) Total anomalous pulmonary venous connection ('snowman' heart)

(D) Coarctation of the aorta

Gastrointestinal and Genitourinary Radiology

Q9. The transverse abdominal ultrasound schematic below, from a child with colicky pain and 'redcurrant jelly' stools, shows concentric rings of bowel within bowel producing a 'target' (doughnut) appearance (marked **X**). This indicates:



(A) Intussusception

(B) A normal loop of bowel

(C) An appendicolith

(D) A simple renal cyst

Q10. A plain abdominal radiograph of a neonate with bilious vomiting shows two gas-filled bubbles, one in the stomach and one in the proximal duodenum, with no gas beyond ('double bubble'). This is characteristic of:

(A) Duodenal atresia

(B) Necrotising enterocolitis

(C) Hirschsprung disease

(D) A normal pattern of swallowed air

Q11. A solid, enhancing mass arising from the renal cortex on contrast CT, with tumour thrombus extending into the renal vein and inferior vena cava, is most characteristic of:

(A) A simple renal cyst

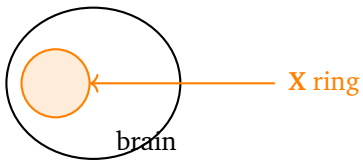
(B) An angiomyolipoma

(C) Transitional cell carcinoma of the renal pelvis

(D) Renal cell carcinoma

Musculoskeletal and Neuroradiology

Q12. The contrast-enhanced brain MRI schematic below shows a lesion with a bright enhancing rim surrounding a non-enhancing centre (marked **X**). The classic differential for such a 'ring-enhancing' lesion includes:



(A) Only a simple arachnoid cyst

(B) Only an acute cerebral infarct

(C) Cerebral abscess, metastasis or glioblastoma

(D) Only diffuse cerebral atrophy

Q13. On a paediatric wrist radiograph, a fracture that runs through the growth plate (physis) and extends into the metaphysis is described and graded using the:

(A) Garden classification

(B) Weber classification

(C) Salter–Harris classification

(D) Gustilo–Anderson classification

Interventional, Nuclear and Emergency Radiology

Q14. Percutaneous nephrostomy, performed under ultrasound and fluoroscopic guidance, is most commonly indicated to:

(A) Relieve an obstructed, hydronephrotic kidney by draining urine above the obstruction

(B) Dissolve renal calculi by direct chemical instillation

(C) Deliver chemotherapy into a bladder tumour

(D) Measure the glomerular filtration rate directly

Q15. In a haemodynamically stable adult with major (poly)trauma, the imaging investigation of choice to rapidly survey the head, spine, chest, abdomen and pelvis in a single acquisition is:

(A) A skeletal survey with plain radiographs only

(B) Whole-body MRI

(C) Whole-body contrast-enhanced CT (a trauma ‘pan-scan’)

(D) A series of ultrasound scans used alone

Detailed Solutions

Q1.

Solution

Concept – effective dose and tissue weighting: Effective dose combines organ doses into a single risk-related number.

Step 1 – state the calculation: Each organ's **equivalent dose** is multiplied by its **tissue weighting factor** (w_T), which reflects that organ's radiosensitivity.

Step 2 – combine the organs: The weighted values are then **summed over all irradiated organs** to give the whole-body effective dose in sieverts.

Why the other options are wrong:

- A, physical half-life: relates to a radionuclide's decay, not to effective dose.
- C, atomic number: is not part of the effective-dose formula.
- D, exposure time: contributes to absorbed dose but is not the weighting factor.

Final Answer: Tissue weighting factor, summed over organs $\Rightarrow$ B

Answer: (B) Go Back to Q1

Q2.

Solution

Concept – personal dosimetry: Radiation workers must have their individual cumulative dose recorded.

Step 1 – name the device: A **personal dosimeter**, such as a film badge or a thermoluminescent dosimeter (TLD), is worn on the trunk to record the accumulated occupational dose.

Step 2 – how it works: A TLD stores absorbed energy in trapped electrons, which are released as light on heating; the light output is proportional to the dose received.

Why the other options are wrong:

- A, Geiger–Muller meter: is an area survey meter, not a worn personal monitor.
- B, ionisation chamber: is used to calibrate the beam output, not to monitor a person.
- D, dose–area product meter: sits on the tube to record patient exposure, not

the worker's dose.

Final Answer: Personal dosimeter $\Rightarrow$ C

Answer: (C) Go Back to Q2

Q3.

Solution

Concept – occupational dose limits: Dose limits differ for workers and for the general public.

Step 1 – state the worker limit: The recommended limit for occupationally exposed workers is **20 mSv per year**, averaged over a defined 5-year period.

Step 2 – contrast with the public: Members of the public are held to a much lower **1 mSv per year**, reflecting that they have not accepted an occupational risk.

Why the other options are wrong:

- A, 1 mSv per year: is the limit for the public, not for workers.
- C, 50 mSv every year: 50 mSv is only an allowable single-year ceiling, not the annual average limit.
- D, 100 mSv per year: greatly exceeds the recommended occupational limit.

Final Answer: 20 mSv per year $\Rightarrow$ B

Answer: (B) Go Back to Q3

Q4.

Solution

Concept – acoustic impedance and cyst appearance: Ultrasound echoes arise at interfaces where acoustic impedance changes.

Step 1 – describe a simple cyst: Clear fluid has few internal interfaces, so it reflects almost nothing and appears **anechoic (black)**.

Step 2 – the confirming sign: Because sound passes through fluid with little attenuation, tissue behind the cyst is brighter, giving **posterior acoustic enhancement**.

Why the other options are wrong:

- B, echogenic with shadowing: describes a solid or calcified structure, not

clear fluid.

- C, same as fat: a cyst is darker (anechoic), not isoechoic to fat.
- D, bright focus with a shadow: describes a calculus or calcification, not a cyst.

Final Answer: Anechoic with posterior enhancement ⇒ A

Answer: (A) Go Back to Q4

Q5.

Solution

Concept – diffusion-weighted imaging in stroke: DWI detects the restricted water movement of an acute infarct.

Step 1 – read the signal: Cytotoxic oedema restricts water diffusion, so the infarct is **bright (high signal) on DWI**.

Step 2 – confirm with the ADC map: True restricted diffusion shows a **low (dark) ADC value**, which distinguishes a real infarct from 'T2 shine-through'.

Why the other options are wrong:

- A, dark on DWI with high ADC: is the opposite of restricted diffusion.
- C, bright on both DWI and ADC: indicates T2 shine-through, not acute infarction.
- D, invisible on DWI: an acute infarct is conspicuous on DWI, not absent.

Final Answer: Bright on DWI, low ADC ⇒ B

Answer: (B) Go Back to Q5

Q6.

Solution

Concept – premedication after a prior contrast reaction: A previous reaction raises the risk of a repeat, so prophylaxis is used.

Step 1 – name the regimen: When contrast is unavoidable, a **corticosteroid** (for example prednisolone) is given at intervals before the scan, together with an **antihistamine**.

Step 2 – the supporting measures: A low-osmolar or iso-osmolar agent is chosen, the patient is observed afterwards, and resuscitation facilities are kept ready.

Why the other options are wrong:

- A, no premedication: ignores the raised risk of a repeat reaction.
- B, prophylactic adrenaline infusion: adrenaline treats an established severe reaction; it is not a routine premedication.
- C, a test dose: does not reliably predict a reaction and may itself provoke one.

Final Answer: Corticosteroid plus antihistamine $\Rightarrow$ D

Answer: (D) Go Back to Q6

Q7.

Solution

Concept – the solitary pulmonary nodule: A small round lung opacity has a defined radiological definition.

Step 1 – read the film: A single, well-defined, rounded opacity (**X**) **under 3 cm** across, surrounded by aerated lung, is a **solitary pulmonary nodule** (a 'coin lesion').

Step 2 – the work-up: Comparison with old films, then CT (and often PET-CT or biopsy), helps separate benign causes (granuloma, hamartoma) from malignancy.

Why the other options are wrong:

- A, lobar consolidation: fills a whole lobe with air bronchograms, not a discrete nodule.
- B, pleural effusion: is a dependent opacity with a meniscus, not a round nodule.
- C, cavitating abscess: shows a thick wall and an air-fluid level, unlike a solid nodule.

Final Answer: Solitary pulmonary nodule $\Rightarrow$ D

Answer: (D) Go Back to Q7

Q8.

Solution

Concept – the boot-shaped heart: Certain congenital lesions give a recognisable cardiac silhouette.

Step 1 – read the film: An uplifted apex (from right ventricular hypertrophy) with a concave pulmonary bay produces the **boot shape (coeur en sabot)** of **Tetralogy of Fallot**.

Step 2 – the associated finding: Pulmonary oligaemia (dark lung fields) reflects reduced pulmonary blood flow from the right ventricular outflow obstruction.

Why the other options are wrong:

- A, atrial septal defect: gives cardiomegaly with pulmonary plethora, not a boot shape.
- C, TAPVC: classically produces a 'snowman' (figure-of-eight) silhouette.
- D, coarctation: shows rib notching and a 'figure-3' aortic contour, not a boot-shaped heart.

Final Answer: Tetralogy of Fallot $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q8

Q9.

Solution

Concept – the target sign of intussusception: Telescoped bowel gives concentric rings on transverse ultrasound.

Step 1 – read the image: Concentric rings of bowel within bowel form the **target (doughnut) sign** (**X**), diagnostic of **intussusception**.

Step 2 – the clinical setting: In a young child with colicky pain, a palpable mass and 'redcurrant jelly' stools, an ileocolic intussusception is treated with an air or contrast reduction enema.

Why the other options are wrong:

- B, normal bowel: does not show concentric bowel-within-bowel rings.
- C, appendicolith: is a bright shadowing focus in the appendix, not a target of bowel layers.
- D, renal cyst: is an anechoic renal lesion, unrelated to bowel layers.

Final Answer: Intussusception $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q9

Q10.

Solution

Concept – the double-bubble sign: Proximal duodenal obstruction traps gas in the stomach and duodenal cap.

Step 1 – read the film: Two gas bubbles (stomach and proximal duodenum) with **no distal bowel gas** is the **double-bubble** sign of **duodenal atresia**.

Step 2 – the association: It presents with bilious vomiting soon after birth and is associated with Down syndrome; some gas distally suggests a malrotation with midgut volvulus instead.

Why the other options are wrong:

- B, necrotising enterocolitis: shows pneumatosis intestinalis and possibly portal venous gas, not a double bubble.
- C, Hirschsprung disease: causes distal large-bowel obstruction with a transition zone.
- D, normal swallowed air: is distributed through the bowel, not confined to two bubbles.

Final Answer: Duodenal atresia $\Rightarrow$ A

Answer: (A) Go Back to Q10

Q11.

Solution

Concept – renal cell carcinoma on cross-sectional imaging: A cortical renal mass with venous invasion has a classic appearance.

Step 1 – read the scan: A solid, **enhancing cortical mass** with **tumour thrombus** in the renal vein and inferior vena cava is characteristic of **renal cell carcinoma**.

Step 2 – staging use: CT (and MRI for venous extent) defines the tumour size, perinephric spread, nodal disease and the cranial limit of any caval thrombus, guiding surgery.

Why the other options are wrong:

- A, simple cyst: is anechoic and non-enhancing, without solid tissue or thrombus.

- B, angiomyolipoma: contains macroscopic fat (negative HU) and does not invade the vein.
- C, transitional cell carcinoma: arises in the pelvicalyceal system (urothelium), not the cortex.

Final Answer: Renal cell carcinoma ⇒ D

Answer: (D) Go Back to Q11

Q12.

Solution

Concept – the ring-enhancing lesion: An enhancing rim around a non-enhancing core has a well-known differential.

Step 1 – read the scan: A bright **enhancing rim** around a non-enhancing centre (X) is a **ring-enhancing lesion**.

Step 2 – list the differential: Common causes include **cerebral abscess, metastasis and glioblastoma**, and in endemic settings tuberculoma or neurocysticercosis; DWI (an abscess restricts diffusion) and the clinical picture help separate them.

Why the other options are wrong:

- A, arachnoid cyst only: a cyst follows CSF and does not enhance as a ring.
- B, acute infarct only: an infarct usually does not form a discrete enhancing ring acutely.
- D, diffuse atrophy only: atrophy is generalised volume loss, not a focal ring lesion.

Final Answer: Abscess, metastasis or glioblastoma ⇒ C

Answer: (C) Go Back to Q12

Q13.

Solution

Concept – growth-plate injuries: Paediatric physeal fractures are graded by a dedicated system.

Step 1 – name the classification: A fracture through the physis extending into the metaphysis is described by the **Salter–Harris classification** (types I to V by the planes involved).

Step 2 – why it matters: The type predicts the risk of growth arrest and deformity, so recognising physeal involvement guides management and follow-up.

Why the other options are wrong:

- A, Garden: classifies femoral neck fractures in adults.
- B, Weber: classifies ankle (lateral malleolar) fractures.
- D, Gustilo–Anderson: grades open fractures by soft-tissue injury, not the growth plate.

Final Answer: Salter–Harris classification $\Rightarrow$ C

Answer: (C) Go Back to Q13

Q14.

Solution

Concept – percutaneous nephrostomy: This interventional procedure drains an obstructed collecting system.

Step 1 – state the indication: Percutaneous nephrostomy relieves an **obstructed, hydronephrotic kidney** by draining urine **above the obstruction**, protecting renal function and treating infection behind a blockage.

Step 2 – the parallel procedure: The same principle underlies percutaneous transhepatic biliary drainage, which decompresses an obstructed biliary tree.

Why the other options are wrong:

- B, dissolve calculi chemically: is not the purpose of a nephrostomy.
- C, deliver chemotherapy to the bladder: bladder therapy is given per urethra, not via a nephrostomy.
- D, measure GFR: renal function is assessed by blood tests or nuclear studies, not by nephrostomy.

Final Answer: Drain an obstructed hydronephrotic kidney $\Rightarrow$ A

Answer: (A) Go Back to Q14

Q15.

Solution

Concept – imaging the stable polytrauma patient: Major trauma needs a rapid, comprehensive survey.

Step 1 – name the investigation: In a haemodynamically **stable** adult with major trauma, **whole-body contrast-enhanced CT** (a trauma 'pan-scan') images the head, spine, chest, abdomen and pelvis in one acquisition.

Step 2 – the caveat: The patient must be stable enough for the scanner; an *unstable* patient with a positive FAST goes straight to theatre rather than to CT.

Why the other options are wrong:

- A, plain radiographs only: miss visceral and vascular injuries that CT detects.
- B, whole-body MRI: is too slow and access-limited for acute trauma triage.
- D, ultrasound alone: FAST screens for free fluid but cannot survey the whole body definitively.

Final Answer: Whole-body contrast-enhanced CT $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q15

Answer Key

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