INI CET Radiology

Sample Paper – 10

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. Scattered radiation reaching the detector degrades a radiograph. The main purpose of an anti-scatter grid placed between the patient and the detector is to:

(A) Increase the radiation dose to the patient with no imaging benefit

(B) Magnify the image geometrically

(C) Absorb scattered photons and improve image contrast

(D) Shorten the exposure time only

Q2. In a radiology quality-assurance (QA) programme, a ‘phantom’ is used mainly to:

(A) Deliver therapeutic radiotherapy to tumours

(B) Replace the radiographer during exposures

(C) Provide a standardised test object to check image quality and equipment performance

(D) Store completed patient images for archiving

Q3. A CT abdomen delivers an effective dose of about 10 mSv. Taking natural background radiation as roughly 3 mSv per year, communicating this risk to a patient, the dose is approximately equivalent to:

(A) About 3 years of natural background radiation

(B) About 3 days of natural background radiation

(C) About 300 years of natural background radiation

(D) No measurable radiation exposure at all

Imaging Modalities and Contrast Media

Q4. Modern multidetector CT acquires a volume of thin slices. Multiplanar reconstruction (MPR) and 3D volume rendering of this dataset allow the radiologist to:

(A) Display the same acquired data in coronal, sagittal and oblique planes without re-scanning the patient

(B) Increase the patient's radiation dose retrospectively

(C) Convert the CT data directly into an MRI examination

(D) Remove all soft tissue so only air remains

Q5. Fetal MRI is increasingly used as a problem-solving tool in pregnancy. Its main advantage over ultrasound as a second-line study is that it:

(A) Uses ionising radiation to see the fetus more clearly

(B) Provides superior soft-tissue contrast, especially of the fetal brain, without ionising radiation

(C) Is the routine first-line screening test in every pregnancy

(D) Requires iodinated contrast for every scan

Q6. Compared with older high-osmolar ionic agents, modern iso-osmolar and low-osmolar non-ionic iodinated contrast media are now preferred because they:

(A) Are cheaper and contain no iodine

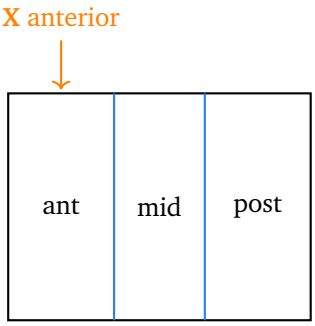
(B) Increase the overall frequency of adverse reactions

(C) Are used exclusively for MRI examinations

(D) Have a lower osmolality and a lower rate of adverse reactions

Chest and Cardiovascular Radiology

Q7. The mediastinal-compartment schematic below marks the *anterior* compartment (**X**). A mass here is classically one of the 'four Ts'. Which lesion belongs to this compartment?



(A) Thymoma

(B) Bronchogenic (foregut) cyst

(C) Neurogenic tumour of a spinal nerve root

(D) Descending aortic aneurysm

Q8. The coronary artery calcium (CAC) score obtained from a non-contrast cardiac CT is used mainly to:

(A) Measure the ejection fraction of the left ventricle

(B) Quantify calcified atherosclerotic plaque and refine cardiovascular risk

(C) Diagnose an acute pulmonary embolism

(D) Assess valvular vegetations in endocarditis

Gastrointestinal and Genitourinary Radiology

Q9. On a contrast CT of the abdomen, which combination of findings best supports a diagnosis of acute appendicitis?

(A) A collapsed appendix under 6 mm with no surrounding change

(B) Free intraperitoneal air with no bowel dilatation

(C) A grossly dilated fluid-filled stomach in isolation

(D) A dilated appendix over 6 mm with wall thickening, periappendiceal fat stranding and sometimes an appendicolith

Q10. A 'porcelain gallbladder' (extensive mural calcification of the gallbladder wall) is important to recognise on imaging because it is associated with:

(A) An episode of acute pancreatitis that always resolves fully

(B) No clinical significance whatsoever

(C) A benign course requiring no follow-up at all

(D) An increased risk of gallbladder carcinoma

Q11. At the first-trimester combined screening ultrasound, an increased nuchal translucency is an important soft marker most associated with:

(A) Entirely normal fetal growth only

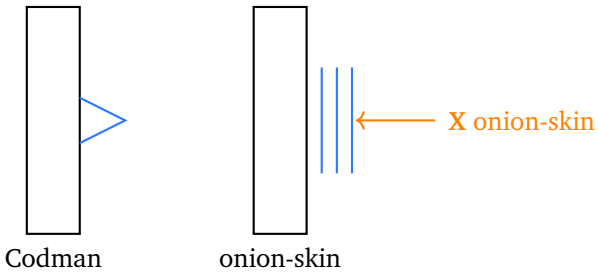
(B) An increased risk of a chromosomal abnormality such as trisomy 21

(C) Maternal diabetes as the sole cause

(D) Placenta praevia in the mother

Musculoskeletal and Neuroradiology

Q12. The two periosteal-reaction sketches below compare a Codman triangle with a lamellated 'onion-skin' reaction. A laminated onion-skin periosteal reaction (marked **X**) in the diaphysis of a child is most typical of:



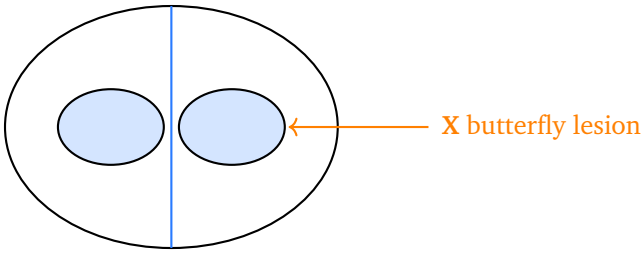
(A) A simple (unicameral) bone cyst

(B) Ewing sarcoma

(C) Osteosarcoma with a sunburst reaction

(D) A healing fracture callus

Q13. The brain schematic below shows a tumour crossing the corpus callosum in a 'butterfly' pattern (marked **X**). On MRI this appearance, with irregular ring enhancement and central necrosis, is most typical of:



(A) Glioblastoma (a high-grade glioma)

(B) A meningioma with a dural tail

(C) A simple arachnoid cyst

(D) A pituitary microadenoma

Interventional, Nuclear and Emergency Radiology

Q14. A transjugular intrahepatic portosystemic shunt (TIPS) is an interventional radiology procedure performed mainly to:

(A) Dissolve gallstones within the gallbladder

(B) Embolise a bleeding renal artery after trauma

(C) Create a low-resistance channel between the portal and hepatic veins to lower portal pressure

(D) Replace a stenosed cardiac valve percutaneously

Q15. In whole-body PET-CT for cancer staging, the standardised uptake value (SUV) of a lesion is used to:

(A) Measure the patient's blood pressure during the scan

(B) Estimate the radiation dose received by the radiographer

(C) Quantify how avidly a lesion takes up FDG, helping distinguish active tumour from benign tissue

(D) Calculate the volume of contrast needed for a later MRI

Detailed Solutions

Q1.

Solution

Concept – scatter and the anti-scatter grid: Scattered photons carry no useful information and cloud the image.

Step 1 – what scatter does: Compton-scattered photons reach the detector from all directions, adding a uniform veil that lowers contrast.

Step 2 – how the grid helps: The grid is a series of thin lead strips that **absorb obliquely travelling scattered photons** while letting the primary beam pass, so **image contrast improves**.

Why the other options are wrong:

- A, dose with no benefit: a grid does raise dose slightly, but its purpose is the contrast gain, not dose.
- B, magnification: is a geometric effect of source-object distance, not the grid.
- D, exposure time only: the grid does not simply shorten exposure.

Final Answer: Absorbs scatter and improves contrast $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q1

Q2.

Solution

Concept – phantoms in quality assurance: QA keeps imaging equipment performing to a known standard.

Step 1 – define a phantom: A phantom is a **standardised test object** of known dimensions and densities, imaged in place of a patient.

Step 2 – what it checks: Repeated phantom scans monitor spatial resolution, contrast, uniformity, CT number accuracy and dose, flagging drift before it affects patients.

Why the other options are wrong:

- A, radiotherapy: a phantom does not treat patients.
- B, replace the radiographer: it is an object, not staff.
- D, store images: archiving is done by the PACS, not a phantom.

Final Answer: A standardised test object for QA $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q2

Q3.

Solution

Concept – communicating CT dose in background-radiation years: Comparing effective dose to natural background makes risk tangible.

Step 1 – do the arithmetic: CT abdomen dose is about **10 mSv**; natural background is about **3 mSv per year**. $10 \div 3 \approx 3.3$ years.

Step 2 – state the equivalent: So the scan is roughly **3 years of natural background radiation**, an intuitive way to explain the small added risk.

Why the other options are wrong:

- B, 3 days: would be about 0.025 mSv, far too small.
- C, 300 years: would be about 900 mSv, hundreds of times too large.
- D, no radiation: CT clearly uses ionising radiation.

Final Answer: About 3 years of background radiation $\Rightarrow$ A

Answer: (A) Go Back to Q3

Q4.

Solution

Concept – multiplanar reconstruction and 3D rendering: Modern CT is a true volumetric dataset.

Step 1 – what MPR does: Because thin isotropic slices form a volume, the data can be **reformatted into coronal, sagittal and oblique planes** on the workstation, with no extra scan.

Step 2 – 3D rendering: Volume rendering and maximum-intensity projections build 3D views of bone or vessels from the same acquisition, aiding surgical planning.

Why the other options are wrong:

- B, retrospective dose: reconstruction never adds dose to a completed scan.
- C, into an MRI: reformatting cannot turn CT data into MRI.
- D, remove all soft tissue: rendering can suppress tissue selectively, but that is not the purpose of MPR.

Final Answer: Reformats one dataset into any plane ⇒ A

Answer: (A) Go Back to Q4

Q5.

Solution

Concept – fetal MRI in pregnancy: MRI is a second-line problem-solver after ultrasound.

Step 1 – the key advantage: Fetal MRI gives **superior soft-tissue contrast, especially of the fetal brain**, and uses **no ionising radiation**, so it is safe in pregnancy.

Step 2 – typical indications: It clarifies equivocal ultrasound findings such as ventriculomegaly, posterior-fossa anomalies and complex body-wall or placental abnormalities.

Why the other options are wrong:

- A, ionising radiation: MRI uses magnetic fields, not radiation.
- C, first-line in every pregnancy: ultrasound remains the first-line screen.
- D, iodinated contrast: iodinated contrast is for CT, and gadolinium is generally avoided in pregnancy.

Final Answer: Better soft-tissue contrast, no radiation ⇒ B

Answer: (B) Go Back to Q5

Q6.

Solution

Concept – osmolality of iodinated contrast: Adverse reactions relate partly to the osmolality of the agent.

Step 1 – the improvement: Iso-osmolar and low-osmolar non-ionic agents have a **lower osmolality** than the old high-osmolar ionic media, and this brings a **lower rate of adverse reactions**.

Step 2 – why it matters: Lower osmolality means less discomfort, less endothelial and osmotic effect, and better tolerance, which is why these agents are now standard.

Why the other options are wrong:

- A, no iodine: they still contain iodine, which provides the contrast.

- B, increase reactions: they reduce, not increase, reactions.
- C, only for MRI: these are iodinated agents used for CT and X-ray, not MRI.

Final Answer: Lower osmolality, fewer reactions $\Rightarrow$ D

Answer: (D) Go Back to Q6

Q7.

Solution

Concept – mediastinal masses by compartment: Location narrows the differential of a mediastinal mass.

Step 1 – the anterior 'four Ts': The anterior compartment (**X**) classically holds **Thymoma**, Teratoma (germ-cell tumour), Thyroid (retrosternal goitre) and 'Terrible' lymphoma. Thymoma fits here.

Step 2 – the other compartments: Middle mediastinum: bronchogenic cysts, lymph nodes and vascular lesions. Posterior mediastinum: neurogenic tumours and paraspinal disease.

Why the other options are wrong:

- B, bronchogenic cyst: is a middle-compartment lesion.
- C, neurogenic tumour: is a posterior-compartment lesion.
- D, descending aortic aneurysm: lies posteriorly, not in the anterior compartment.

Final Answer: Thymoma (anterior mediastinum) $\Rightarrow$ A

Answer: (A) Go Back to Q7

Q8.

Solution

Concept – coronary artery calcium scoring: Calcified plaque can be measured on non-contrast cardiac CT.

Step 1 – what CAC measures: The CAC (Agatston) score **quantifies calcified atherosclerotic plaque** in the coronary arteries.

Step 2 – how it is used: A higher score reflects a greater plaque burden and **refines cardiovascular risk**, guiding preventive treatment in intermediate-risk patients.

Why the other options are wrong:

- A, ejection fraction: is assessed by echocardiography or cardiac MRI.
- C, pulmonary embolism: needs CT pulmonary angiography with contrast.
- D, valvular vegetations: are shown by echocardiography, not a calcium score.

Final Answer: Quantifies plaque and refines risk ⇒ B

Answer: (B) Go Back to Q8

Q9.

Solution

Concept – CT features of acute appendicitis: Several signs together confirm the diagnosis on CT.

Step 1 – the key features: A **dilated appendix over 6 mm** with **wall thickening and enhancement**, **periappendiceal fat stranding**, and sometimes an **appendicolith**, support acute appendicitis.

Step 2 – complications: Look also for a periappendiceal abscess, free fluid or extraluminal gas, which indicate perforation.

Why the other options are wrong:

- A, collapsed appendix under 6 mm: is a normal appendix.
- B, free air without dilatation: points to a perforated viscus elsewhere, not appendicitis alone.
- C, dilated stomach only: suggests gastric outlet obstruction, not appendicitis.

Final Answer: Dilated appendix, fat stranding, appendicolith ⇒ D

Answer: (D) Go Back to Q9

Q10.

Solution

Concept – porcelain gallbladder: Mural calcification of the gallbladder has clinical importance.

Step 1 – recognise it: A 'porcelain gallbladder' shows **extensive calcification of the gallbladder wall** on plain film, ultrasound or CT.

Step 2 – why it matters: It carries an **increased risk of gallbladder carcinoma**, so it is a recognised indication to consider cholecystectomy.

Why the other options are wrong:

- A, pancreatitis that always resolves: is unrelated to wall calcification.
- B, no significance: is wrong, given the malignancy link.
- C, benign, no follow-up: understates the cancer risk.

Final Answer: Increased gallbladder carcinoma risk $\Rightarrow$ D

Answer: (D) Go Back to Q10

Q11.

Solution

Concept – nuchal translucency as a screening marker: First-trimester ultrasound uses soft markers for aneuploidy.

Step 1 – what it measures: Nuchal translucency is the fluid space behind the fetal neck at 11 to 14 weeks; an **increased** value is an important soft marker.

Step 2 – what it signals: It raises the risk of a **chromosomal abnormality such as trisomy 21** (Down syndrome) and prompts combined biochemical screening or diagnostic testing.

Why the other options are wrong:

- A, normal growth only: increased NT is by definition abnormal.
- C, maternal diabetes alone: is not the specific association.
- D, placenta praevia: relates to placental position, not nuchal translucency.

Final Answer: Increased risk of trisomy 21 $\Rightarrow$ B

Answer: (B) Go Back to Q11

Q12.

Solution

Concept – periosteal reactions in bone tumours: The pattern of periosteal reaction hints at the underlying lesion.

Step 1 – read the sketch: A **laminated 'onion-skin'** (multilayered) periosteal reaction in the diaphysis of a child (**X**) is classically seen in **Ewing sarcoma**.

Step 2 – the contrast: Osteosarcoma more typically shows a **Codman triangle** and a 'sunburst' spiculated reaction, usually about the metaphysis around the knee.

Why the other options are wrong:

- A, simple bone cyst: is a lucent lesion with no aggressive periosteal reaction.
- C, osteosarcoma with sunburst: gives a sunburst, not an onion-skin, pattern.
- D, healing callus: is smooth reparative bone, not lamellated onion-skin.

Final Answer: Ewing sarcoma (onion-skin) $\Rightarrow$ B

Answer: (B) Go Back to Q12

Q13.

Solution

Concept – the butterfly glioma: A tumour crossing the corpus callosum has a characteristic look.

Step 1 – read the schematic: A lesion crossing the **corpus callosum** to involve both hemispheres in a **butterfly** pattern (**X**), with irregular ring enhancement and central necrosis, is typical of **glioblastoma**, a high-grade glioma.

Step 2 – the imaging clue: Marked surrounding oedema and mass effect are usual, and the necrotic centre reflects rapid, disorganised growth.

Why the other options are wrong:

- B, meningioma: is an extra-axial, dural-based mass with a 'dural tail', not a butterfly lesion.
- C, arachnoid cyst: follows CSF density and does not enhance.
- D, pituitary microadenoma: is a tiny sellar lesion, not a callosal butterfly mass.

Final Answer: Glioblastoma (butterfly glioma) $\Rightarrow$ A

Answer: (A) Go Back to Q13

Q14.

Solution

Concept – TIPS for portal hypertension: TIPS is a percutaneous decompression of the portal system.

Step 1 – what it does: Under image guidance, a stent is placed to **connect a hepatic vein to a portal vein branch**, creating a low-resistance channel that **lowers portal pressure**.

Step 2 – the indications: TIPS is used for refractory variceal bleeding and refractory ascites in portal hypertension; hepatic encephalopathy is a recognised complication.

Why the other options are wrong:

- A, dissolve gallstones: is not what TIPS does.
- B, embolise a renal artery: is a different interventional procedure.
- D, replace a cardiac valve: is a cardiac (TAVI) procedure, unrelated to TIPS.

Final Answer: Portosystemic shunt to lower portal pressure $\Rightarrow$ C

Answer: (C) Go Back to Q14

Q15.

Solution

Concept – the standardised uptake value (SUV): SUV puts a number on FDG avidity in PET-CT.

Step 1 – define SUV: SUV normalises tracer concentration in a lesion to the injected dose and body weight, so it **quantifies how avidly the lesion takes up FDG**.

Step 2 – how it is used: A high SUV suggests active, glucose-avid **tumour**, helping to separate malignant from benign tissue and to follow the response to treatment.

Why the other options are wrong:

- A, blood pressure: SUV is a metabolic measure, not a haemodynamic one.
- B, radiographer dose: SUV describes the lesion, not staff exposure.
- D, MRI contrast volume: SUV has nothing to do with MRI dosing.

Final Answer: Quantifies FDG uptake in a lesion $\Rightarrow$ C

Answer: (C) Go Back to Q15

Answer Key

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