INI CET Radiology

Sample Paper – 8

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. Clinical MRI scanners commonly operate at field strengths such as 1.5 tesla (T) and 3 T. The safety parameter that limits radiofrequency-induced tissue heating during a scan is the:

(A) Hounsfield unit (HU)

(B) Half-value layer (HVL)

(C) Specific absorption rate (SAR)

(D) Tube current (mA)

Q2. Which imaging modality uses non-ionising high-frequency sound waves and is therefore the first-line investigation for imaging the foetus during pregnancy?

(A) Non-contrast CT of the abdomen

(B) Fluoroscopy

(C) Ultrasound

(D) Plain radiography

Q3. Restricting the X-ray beam to the exact area of clinical interest using adjustable lead diaphragms (collimation) principally helps to:

(A) Increase the tube voltage automatically

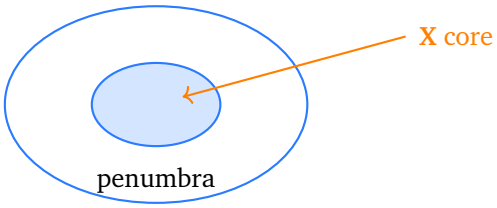
(B) Reduce patient dose and scattered radiation

(C) Magnify the anatomical image

(D) Convert X-rays into gamma rays

Imaging Modalities and Contrast Media

Q4. On perfusion imaging (CT or MRI) in acute ischaemic stroke, the central region of already-infarcted, non-salvageable tissue (marked **X** in the schematic below) is termed the:



(A) Infarct core

(B) Ischaemic penumbra

(C) Normal perfusion zone

(D) Watershed rim

Q5. In gastrointestinal contrast studies, which of the following is a *positive* contrast agent that appears white (dense) on the image?

(A) Air insufflated into the bowel

(B) Barium sulphate suspension

(C) Plain water

(D) Carbon dioxide gas

Q6. Before giving intravenous iodinated contrast for a CT scan, renal function is checked by estimating the glomerular filtration rate (eGFR). In an at-risk patient, the main measure to prevent contrast-induced nephropathy is:

(A) Adequate intravenous hydration around the scan

(B) Deliberately giving a higher contrast dose

(C) Withholding all fluids for 24 hours

(D) Routine haemodialysis for every patient

Chest and Cardiovascular Radiology

Q7. A chest CT shows bilateral *peripheral* (reverse-batwing) ground-glass opacities that spare the central perihilar lungs. This peripheral distribution is characteristically seen in:

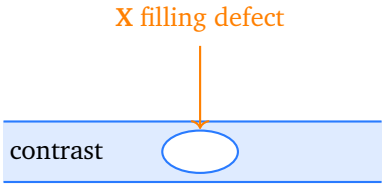
(A) Cardiogenic pulmonary oedema

(B) Lobar pneumonia

(C) Organising pneumonia (for example cryptogenic organising pneumonia)

(D) A simple pneumothorax

Q8. The CT pulmonary angiogram sketched below shows an intraluminal filling defect (marked **X**) within a contrast-opacified pulmonary artery. This indicates:



(A) Aortic dissection

(B) Pneumothorax

(C) Pulmonary embolism

(D) Pleural effusion

Gastrointestinal and Genitourinary Radiology

Q9. A grossly dilated, gas-filled caecum displaced to the left upper quadrant with an inverted 'coffee-bean' configuration on an abdominal radiograph is characteristic of:

(A) Caecal volvulus

(B) Sigmoid volvulus

(C) Small-bowel obstruction

(D) Toxic megacolon

Q10. Simultaneous dilatation of both the common bile duct and the pancreatic duct (the 'double-duct sign') on MRCP, evaluated further at ERCP, is most suspicious for:

(A) A few small gallstones confined to the gallbladder

(B) Acute appendicitis

(C) A normal anatomical variant

(D) A periampullary or pancreatic-head carcinoma

Q11. In a young man with sudden severe scrotal pain, colour Doppler ultrasound showing *absent* intratesticular blood flow indicates:

(A) A normal testis

(B) Testicular torsion

(C) Epididymo-orchitis

(D) A simple hydrocele

Musculoskeletal and Neuroradiology

Q12. Looser zones (pseudofractures), seen as short lucent bands running across the cortex at right angles, are a radiological hallmark of which metabolic bone disease?

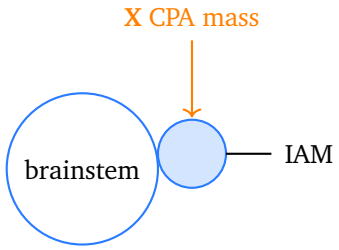
(A) Osteopetrosis (bone-within-bone appearance)

(B) Paget's disease of bone

(C) Acute osteomyelitis

(D) Osteomalacia

Q13. The MRI sketch below shows an enhancing mass at the cerebellopontine angle (marked **X**) extending into the internal auditory meatus (IAM). This is most likely a:



(A) Pituitary adenoma

(B) Vestibular schwannoma (acoustic neuroma)

(C) Extradural haematoma

(D) Colloid cyst of the third ventricle

Interventional, Nuclear and Emergency Radiology

Q14. A peripherally inserted central catheter (PICC) is placed under imaging guidance for long-term venous access. The correctly positioned catheter tip should lie at the:

(A) Junction of the superior vena cava and right atrium

(B) Right internal jugular vein

(C) Brachial artery

(D) Left ventricle

Q15. A myocardial perfusion stress scan using thallium-201 or technetium-99m sestamibi shows a defect on stress imaging that fills in (reverses) on the resting images. This reversible defect indicates:

(A) An old, completed myocardial infarction (fixed scar)

(B) Entirely normal myocardium

(C) A pericardial effusion

(D) Reversible, stress-inducible myocardial ischaemia

Detailed Solutions

Q1.

Solution

Concept – MRI field strength and RF heating: MRI uses a strong static magnetic field plus radiofrequency (RF) pulses, which deposit energy in tissue.

Step 1 – name the safety parameter: The **specific absorption rate (SAR)** quantifies the RF power absorbed per kilogram of tissue and is the main measure that limits tissue heating during a scan.

Step 2 – how it is controlled: At higher field strengths such as 3 T, RF deposition rises, so scanner software caps the SAR (in watts per kilogram) to keep heating within safe limits.

Why the other options are wrong:

- A, Hounsfield unit: is a CT density measure, unrelated to MRI heating.
- B, half-value layer: describes X-ray beam attenuation, not RF energy.
- D, tube current (mA): applies to X-ray tubes, not MRI.

Final Answer: Specific absorption rate (SAR) $\Rightarrow$ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept – non-ionising imaging in pregnancy: Choosing a safe modality for the foetus means avoiding ionising radiation.

Step 1 – identify the modality: Ultrasound uses non-ionising high-frequency sound waves and is the first-line, safe investigation for imaging the foetus in pregnancy.

Step 2 – the reasoning: Because there is no ionising radiation, ultrasound can be used repeatedly for dating, anomaly screening and growth monitoring without foetal dose concerns.

Why the other options are wrong:

- A, non-contrast CT: uses ionising radiation and is generally avoided in pregnancy.
- B, fluoroscopy: delivers continuous ionising radiation.
- D, plain radiography: also uses ionising X-rays and is not first-line for the

foetus.

Final Answer: Ultrasound ⇒ C

Answer: (C) Go Back to Q2

Q3.

Solution

Concept – collimation: Collimation shapes and limits the X-ray beam with adjustable lead diaphragms.

Step 1 – state the benefit: Restricting the beam to the region of interest **reduces patient dose and scattered radiation**, and it also improves image contrast.

Step 2 – how it works: A smaller irradiated volume produces less scatter, which both lowers the dose to surrounding tissue and sharpens the image.

Why the other options are wrong:

- A, increases tube voltage: collimation does not change kVp.
- C, magnifies the image: magnification depends on geometry, not collimation.
- D, converts X-rays to gamma rays: collimation only restricts the beam, it does not change its nature.

Final Answer: Reduces patient dose and scattered radiation ⇒ B

Answer: (B) Go Back to Q3

Q4.

Solution

Concept – perfusion imaging in acute stroke: Perfusion CT or MRI separates dead from salvageable brain tissue.

Step 1 – read the schematic: The central, already-infarcted, non-salvageable region (marked **X**) is the **infarct core**; the surrounding at-risk but salvageable tissue is the penumbra.

Step 2 – why it matters: A small core with a large penumbra favours reperfusion therapy, because there is more tissue to save.

Why the other options are wrong:

- B, ischaemic penumbra: is the salvageable rim around the core, not the marked centre.

- C, normal perfusion zone: is unaffected brain, not the infarct.
- D, watershed rim: refers to border-zone territory, not the perfusion core.

Final Answer: Infarct core $\Rightarrow$ A

Answer: (A) Go Back to Q4

Q5.

Solution

Concept – positive versus negative GI contrast: Contrast agents are grouped by how they appear on the image.

Step 1 – classify the agent: Barium sulphate suspension is a *positive* contrast agent: it strongly attenuates X-rays and appears white (dense) on the image.

Step 2 – the contrast: Negative agents such as air, carbon dioxide and water attenuate little and appear dark; iodinated water-soluble agents are the other main positive group.

Why the other options are wrong:

- A, air: is a negative (radiolucent) contrast agent.
- C, water: is a negative contrast agent used in CT enterography.
- D, carbon dioxide gas: is a negative contrast agent.

Final Answer: Barium sulphate suspension $\Rightarrow$ B

Answer: (B) Go Back to Q5

Q6.

Solution

Concept – preventing contrast-induced nephropathy: Iodinated contrast can harm kidneys in patients with a low eGFR.

Step 1 – name the key measure: Adequate intravenous hydration before and after the scan is the main proven measure to reduce the risk of contrast-induced nephropathy.

Step 2 – the overall approach: Check eGFR first, use the lowest effective contrast volume, and avoid other nephrotoxic drugs around the study.

Why the other options are wrong:

- B, higher contrast dose: increases, not reduces, renal risk.

- C, withholding all fluids: causes dehydration and worsens the risk.
- D, routine haemodialysis for everyone: is not indicated as a general preventive step.

Final Answer: Adequate intravenous hydration ⇒ A

Answer: (A) Go Back to Q6

Q7.

Solution

Concept – peripheral (reverse-batwing) ground-glass pattern: The distribution of ground-glass opacity narrows the differential.

Step 1 – interpret the pattern: Bilateral **peripheral** ground-glass opacities sparing the central lungs (the reverse-batwing pattern) are characteristic of **organising pneumonia**, such as cryptogenic organising pneumonia.

Step 2 – the counterpart: A central (batwing) distribution instead suggests cardiogenic pulmonary oedema, so the peripheral spread here points away from oedema.

Why the other options are wrong:

- A, cardiogenic oedema: gives a central batwing pattern, not a peripheral one.
- B, lobar pneumonia: produces a lobar consolidation, not bilateral peripheral ground-glass.
- D, pneumothorax: is a peripheral lucency, not ground-glass opacity.

Final Answer: Organising pneumonia ⇒ C

Answer: (C) Go Back to Q7

Q8.

Solution

Concept – CT pulmonary angiogram in pulmonary embolism: CTPA opacifies the pulmonary arteries so that clots stand out.

Step 1 – read the image: An **intraluminal filling defect** (X) within a contrast-filled pulmonary artery is the direct sign of a **pulmonary embolism**.

Step 2 – supportive findings: Right-heart strain, a wedge-shaped peripheral infarct and vessel cut-off may accompany a large embolus.

Why the other options are wrong:

- A, aortic dissection: shows an intimal flap in the aorta, not a pulmonary-artery defect.
- B, pneumothorax: is pleural air, not an intravascular defect.
- D, pleural effusion: is a dependent fluid collection outside the vessels.

Final Answer: Pulmonary embolism $\Rightarrow$ C

Answer: (C) Go Back to Q8

Q9.

Solution

Concept – caecal volvulus: The mobile caecum twists and is displaced across the abdomen.

Step 1 – read the film: A grossly dilated, gas-filled caecum displaced to the **left upper quadrant** with a '**coffee-bean**' shape is characteristic of caecal volvulus.

Step 2 – the distinction: In sigmoid volvulus the dilated loop instead arises from the pelvis and points to the right upper quadrant, the reverse displacement.

Why the other options are wrong:

- B, sigmoid volvulus: the loop points to the right upper quadrant, opposite to caecal volvulus.
- C, small-bowel obstruction: gives central ladder loops, not a single displaced caecum.
- D, toxic megacolon: shows a dilated, featureless transverse colon with mucosal oedema.

Final Answer: Caecal volvulus $\Rightarrow$ A

Answer: (A) Go Back to Q9

Q10.

Solution

Concept – the double-duct sign: Combined bile-duct and pancreatic-duct dilatation implies obstruction at the ampulla.

Step 1 – interpret the sign: Dilatation of *both* the common bile duct and the pancreatic duct on MRCP (the **double-duct sign**) is highly suspicious for a **peri-**

ampullary or pancreatic-head carcinoma.

Step 2 – the follow-up: ERCP allows tissue sampling and stenting, while cross-sectional imaging stages the tumour.

Why the other options are wrong:

- A, gallbladder stones alone: do not dilate the pancreatic duct.
- B, acute appendicitis: is unrelated to the biliary and pancreatic ducts.
- C, normal variant: dual-duct dilatation is not a normal finding.

Final Answer: Periampullary/pancreatic-head carcinoma ⇒ D

Answer: (D) Go Back to Q10

Q11.

Solution

Concept – Doppler ultrasound in the acute scrotum: Blood flow distinguishes torsion from infection.

Step 1 – interpret the Doppler: Absent intratesticular blood flow on colour Doppler indicates **testicular torsion**, a surgical emergency.

Step 2 – the timing: The testis must be detorted within about six hours to remain viable, so imaging must not delay surgery when torsion is clinically likely.

Why the other options are wrong:

- A, normal testis: shows normal, symmetric flow.
- C, epididymo-orchitis: shows *increased* flow (hyperaemia), the opposite of absent flow.
- D, simple hydrocele: is a fluid collection with preserved testicular flow.

Final Answer: Testicular torsion ⇒ B

Answer: (B) Go Back to Q11

Q12.

Solution

Concept – Looser zones in metabolic bone disease: Radiological signs help separate the metabolic bone disorders.

Step 1 – match the sign: Looser zones (pseudofractures), lucent bands run-

ning across the cortex, are a hallmark of **osteomalacia**, reflecting defective bone mineralisation.

Step 2 – the contrast: By comparison, a 'bone-within-bone' appearance and dense sclerotic bones point to osteopetrosis, a different metabolic bone disease.

Why the other options are wrong:

- A, osteopetrosis: shows dense, bone-within-bone sclerosis, not Looser zones.
- B, Paget's disease: shows coarse trabeculae and bone expansion.
- C, osteomyelitis: shows infection features such as periosteal reaction and lucency, not pseudofractures.

Final Answer: Osteomalacia $\Rightarrow$ D

Answer: (D) Go Back to Q12

Q13.

Solution

Concept – cerebellopontine-angle mass: The location and internal-auditory-meatus extension identify the lesion.

Step 1 – read the MRI: An enhancing mass at the **cerebellopontine angle** (**X**) that extends into the **internal auditory meatus** is most likely a **vestibular schwannoma** (acoustic neuroma).

Step 2 – the clinical clue: Patients typically present with unilateral sensorineural hearing loss, tinnitus and imbalance.

Why the other options are wrong:

- A, pituitary adenoma: arises in the sella, not the cerebellopontine angle.
- C, extradural haematoma: is a biconvex extra-axial blood collection after trauma, not a CPA tumour.
- D, colloid cyst: sits at the foramen of Monro in the third ventricle.

Final Answer: Vestibular schwannoma $\Rightarrow$ B

Answer: (B) Go Back to Q13

Q14.

Solution

Concept – PICC line tip position: Central venous catheters must end in a large central vein.

Step 1 – state the target: The correctly positioned PICC tip lies at the **junction of the superior vena cava and right atrium (the cavoatrial junction)**, confirmed on imaging.

Step 2 – why it matters: A tip too proximal risks thrombosis and malfunction, while one too deep in the atrium risks arrhythmia, so post-placement imaging checks the position.

Why the other options are wrong:

- B, internal jugular vein: is too proximal for a central tip.
- C, brachial artery: is arterial, an incorrect and dangerous location.
- D, left ventricle: is a cardiac chamber, never the target for a venous line.

Final Answer: Cavoatrial (SVC–right atrium) junction $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q14

Q15.

Solution

Concept – myocardial perfusion stress imaging: Comparing stress and rest images reveals inducible ischaemia.

Step 1 – interpret the pattern: A defect on stress imaging that **fills in (reverses) at rest** indicates **reversible, stress-inducible myocardial ischaemia** in viable but underperfused muscle.

Step 2 – the contrast: A *fixed* defect present on both stress and rest images instead represents old infarction (scar), which does not reverse.

Why the other options are wrong:

- A, completed infarction: gives a fixed defect on both stress and rest, not a reversible one.
- B, normal myocardium: shows uniform uptake with no stress defect.
- C, pericardial effusion: is a fluid collection, not a perfusion defect.

Final Answer: Reversible, stress-inducible ischaemia $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q15

Answer Key

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