

01	☐ A	☐ B	☐ C	☐ D	☐ E
02	☐ A	☐ B	☐ C	☐ D	☐ E
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31	☐ A	☐ B	☐ C	☐ D	☐ E
32	☐ A	☐ B	☐ C	☐ D	☐ E
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35	☐ A	☐ B	☐ C	☐ D	☐ E
36	☐ A	☐ B	☐ C	☐ D	☐ E
37	☐ A	☐ B	☐ C	☐ D	☐ E
38	☐ A	☐ B	☐ C	☐ D	☐ E
39	☐ A	☐ B	☐ C	☐ D	☐ E

PRACTICE QUESTIONS

International Board of Magnetic Resonance Safety

MRMDU

Magnetic Resonance Medical Director/Physician (Int'l)

EDITION

Demo

QUESTIONS

9

FORMAT

Limited Edition PDF

Before you begin

What this is

9 practice questions for International Board of Magnetic Resonance Safety **MRMDU**, each with its answer key and an explanation. Answer a question before you read its key — the explanation is worth more once you have committed.

If something looks wrong

Send us three things and we will check it:

- the exam code, **MRMDU**
- the question number
- the email address on your order

Write to **support@mometrix.net**. We reply within one business day.

QUESTION 1

SINGLE CHOICE

A patient with a known ferromagnetic intracranial aneurysm clip is scheduled for an MRI. According to MR safety principles for the Medical Director/Physician, what is the most appropriate course of action?

- ☐ A Proceed with the scan at 1.5 T because most modern aneurysm clips are non-ferromagnetic.
- ☐ B Proceed only if the patient is screened a second time at the door of the MR room.
- ☒ C Do not perform the MR examination unless the specific clip model has been documented as MR conditional or MR safe.
- ☐ D Scan at a reduced SAR to mitigate magnetically induced displacement forces.

ANSWER C

WHY Magnetically induced displacement force (translational attraction) and torque scale with the static field B_0 and the mass/susceptibility of the implant. The only defensible practice is to verify the specific clip make and model against documented MR safety labeling. Without confirmed documentation, the risk of catastrophic hemorrhage from clip movement or torque is unacceptable, and lower SAR does not reduce static-field forces.

QUESTION 2

SINGLE CHOICE

Which MRI parameter is the primary determinant of the rate of change of magnetic field (dB/dt) that can cause peripheral nerve stimulation in a patient?

- ☐ A Static field strength (B_0)
- ☐ B Radiofrequency transmit power (B_1)
- ☒ C Gradient field amplitude and slew rate
- ☐ D Specific absorption rate (SAR)

ANSWER C

WHY Peripheral nerve stimulation is driven by time-varying magnetic fields produced by the gradient coils (dB/dt). The slew rate (T/m/s) and amplitude of the gradient switching determine whether stimulation thresholds are exceeded. SAR relates to RF heating, B_0 to static-field forces, and B_1 to RF energy deposition.

QUESTION 3 SINGLE CHOICE

During a long, high-SAR sequence at 3 T, which physiologic effect is most directly responsible for limiting the continuous imaging time before SAR limits are reached?

- ☒ **A** Tissue heating from RF energy deposition
- ☐ **B** Magneto-hydrodynamic effect on the ECG
- ☐ **C** Static field-induced vertigo
- ☐ **D** Gradient acoustic noise

ANSWER A

WHY SAR quantifies RF power absorbed per unit mass and produces tissue heating. IEC normal operating mode caps core temperature rise and local tissue heating, which directly constrains sequence duration at high field. Acoustic noise is a mechanical effect, vertigo is a static-field effect, and the magneto-hydrodynamic effect alters ECG waveform but is not the SAR limit driver.

QUESTION 4 SINGLE CHOICE

Regarding the use of gadolinium-based contrast agents (GBCA) in pregnant patients, which statement best reflects current MR safety guidance for the Medical Director?

- ☐ **A** GBCA are contraindicated in all pregnant patients in any trimester.
- ☐ **B** GBCA may be used during pregnancy only if administered as a Group 2 macrocyclic agent at full dose.
- ☐ **C** GBCA should be administered to all pregnant patients who would otherwise receive them when not pregnant.
- ☒ **D** GBCA cross the placenta, and use during pregnancy should be restricted to situations where the benefit clearly outweighs the unknown fetal risk.

ANSWER D

WHY Gadolinium chelates cross the placenta and are excreted by the fetal kidneys, with unknown long-term fetal effects including potential for nephrogenic systemic fibrosis. Expert consensus (including ACR Manual on MR Safety) advises that GBCA use in pregnancy should be limited to cases where the diagnostic benefit clearly outweighs the uncertain fetal risk. Routine use or blanket contraindication are both inappropriate.

QUESTION 5

SINGLE CHOICE

Under ASTM F2503, an implant marked 'MR Conditional' with a previously specified parameter (for example, 'B1+rms $\leq 2.8 \mu\text{T}$ ') means that:

- ☐ A The implant poses no known hazards in any MR environment.
- ☒ B The implant has been demonstrated to be safe only under the specific scanning conditions listed in the labeling.
- ☐ C The implant may be scanned at any field strength provided the patient signs a consent form.
- ☐ D The implant is safe only at 1.5 T and must never be exposed to a 3 T system.

ANSWER B

WHY ASTM F2503 defines 'MR Conditional' as an item with demonstrated safety in the MR environment within defined conditions, which must include at minimum static field strength, B1+rms (or SAR), dB/dt, and any geometry restrictions. Scanning outside those documented parameters (including at a higher field strength or higher B1+rms) violates the conditional labeling and may be unsafe.

QUESTION 6

SINGLE CHOICE

Nephrogenic systemic fibrosis (NSF) following gadolinium-based contrast administration is most strongly associated with which patient factor?

- ☐ A Mild hepatic enzyme elevation
- ☒ B Severe acute or chronic kidney disease (eGFR $< 30 \text{ mL/min/1.73 m}^2$)
- ☐ C Pregnancy in the second trimester
- ☐ D Allergy to iodinated contrast media

ANSWER B

WHY NSF has been linked predominantly to administration of certain (primarily linear) GBCAs in patients with severely impaired renal function (eGFR $< 30 \text{ mL/min/1.73 m}^2$, and especially those on dialysis), where prolonged retention of free gadolinium drives systemic fibrosing dermatopathy. Screening of renal function prior to GBCA administration and use of lower-risk (macrocytic) agents in at-risk patients are core risk-mitigation strategies.

QUESTION 7

SINGLE CHOICE

A Level 2 MR personnel-approved technologist accidentally leaves a pair of ferromagnetic scissors on the patient transport gurney that is then wheeled into Zone IV. What is the most likely immediate clinical consequence?

- ☐ A No consequence, because Zone IV does not contain an active magnet.
- ☒ B The scissors could become a projectile as they enter the bore's fringe field and strike the patient or staff.
- ☐ C Only the scanner's helium coolant would be affected.
- ☐ D The patient would experience severe peripheral nerve stimulation.

ANSWER B

WHY Zone IV contains the MR scanner room where the static field is strongest; small ferromagnetic objects become projectiles in the strong fringe field near the bore, with the patient, staff, or scanner at risk. Ferromagnetic projectiles are one of the leading causes of MR-related injury and death, which is why Zone IV access is tightly controlled.

QUESTION 8

SINGLE CHOICE

Which of the following constitutes the most complete and appropriate MR safety screening approach for an outpatient arriving for a contrast-enhanced MRI?

- ☐ A Ask only if the patient has a pacemaker, since pacemakers are the most common contraindication.
- ☒ B Use a comprehensive screening form covering implants, prior surgery, tattoos, occupational exposure to metal, pregnancy, renal function, and prior reactions to contrast media, with verbal verification on the day of the scan.
- ☐ C Rely on the referring clinician's notes only and forgo a separate MR safety questionnaire.
- ☐ D Screening is unnecessary if the patient has had a prior MRI at the same institution.

ANSWER B

WHY A complete MR safety screen covers implants, prior surgery (including retained surgical clips or shrapnel), tattoos (thermal risk), occupational metal exposure (e.g., metalworkers), pregnancy status, renal function (for GBCA), and prior contrast reactions. The screen must be repeated/verified on the day of the scan because patient circumstances change; a previous scan at the same institution does not obviate screening.

QUESTION 9

SINGLE CHOICE

Which responsibility is most appropriately delegated by the MR Medical Director to the MR Safety Officer (MRSO) without losing ultimate accountability?

- ☐ A Final approval of the institutional MR safety training curriculum
- ☐ B Determination of which implants are scanned under MR Conditional labeling
- ☒ C Day-to-day enforcement of screening and zone access policies in the MR environment
- ☐ D Issuing medical clearance for emergent off-hours scanning of patients with unknown implants

ANSWER C

WHY The MR Medical Director (MRMD) delegates operational day-to-day enforcement of screening and zone control to the MR Safety Officer (MRSO), while retaining ultimate accountability. Decisions about training curriculum approval, scanning of implants under conditional labeling, and emergent clearance are MRMD-level responsibilities that cannot be routinely delegated to the MRSO.