

MRI Safety

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ___ 1. Generally MRI is considered safe; however, there are some hazards, which would include:
- rapid echo spin.
 - local burns from wires on a patient.
 - headaches from the magnetic field.
 - spontaneous random molecular motion.
- ___ 2. A possible patient reaction to rapid venting of the supercooled liquid gases in a superconductive magnet into the examination room would be:
- tachycardia.
 - bradycardia.
 - embolus.
 - asphyxiation.
- ___ 3. Patients with cardiac pacemakers must not be allowed within the ___-gauss line.
- 5
 - 50
 - 10
 - 1
- ___ 4. Which of the following devices is subject to torquing within the magnetic field?
- Stainless steel hip prosthesis
 - Ferromagnetic aneurysm clips
 - Dental fillings
 - Glass eye prosthesis
- ___ 5. Tissue heating, during an MRI procedure, is measured in _____ per kilogram.
- calories
 - watts
 - joules
 - ionizations
- ___ 6. Which of the following occupational workers must have conventional radiographic images of the orbits taken before an MRI head scan?
- Radiographer
 - Landscaper
 - Machinist
 - None of the above
- ___ 7. Which of the following devices are allowed within the external magnetic field?
- Cochlear implants
 - Internal drug infusion pumps
 - Neurostimulators
 - None of the above

- ___ 8. 1T is equal to:
- a. 100 Gauss
 - b. 10,000 N
 - c. 10,000 Gauss
 - d. 1,000 Watt
- ___ 9. Translational force is the primary safety concern involving the _____.
- a. RF pulse
 - b. transient magnetic field
 - c. static magnetic field
 - d. changing magnetic field
- ___ 10. Ferromagnetic materials are strongly attracted by a magnetic force. The elements: _____ are such materials.
- a. iron
 - b. nickel
 - c. cobalt
 - d. all of the above
- ___ 11. _____ materials are metals that are weakly attracted to magnets.
- a. Diamagnetic
 - b. Nonmagnetic
 - c. Paramagnetic
 - d. Ferromagnetic
- ___ 12. The magnetic field around MR equipment also may be measured in terms of the conventional unit, _____.
- a. Tesla
 - b. Gauss
 - c. Watt
 - d. Newton
- ___ 13. All MR personnel should be aware of their MR scanner's _____ gauss line and ensure that the area is marked with the appropriate warning signs. People with non-MR compatible implants should not enter the area marked by these signs because the fringe field might potentially damage their implants.
- a. 1
 - b. 5
 - c. 10
 - d. 500
- ___ 14. Two factors affect the fringe field:
1. *TR*
 2. *The main magnet's field strength*
 3. *The amount of shielding inside the MR scanner.*
- a. 1 and 2 only
 - b. 1 and 3 only
 - c. 2 and 3 only
 - d. 1,2, and 3

___ 15.

Figure 1
ASTM Icon



Pertaining to the figure 1, the icon is associated with:

- a. item that has been demonstrated to pose no known hazards in a specified MR environment with specified conditions for use.
 - b. item that poses no known hazards in all MR environments
 - c. An item that is known to pose hazards in all MR environments
 - d. all of the above
- ___ 16. Which of the following are the devices that may be contraindicated for MRI?
- a. Aneurysm clips
 - b. Bullets
 - c. Cochlear implants
 - d. Cardiac pacemakers
 - e. allo of the above
- ___ 17. Certain implanted devices can cause excessive heating during MR scanning. These devices include:
- a. Transdermal medication patches.
 - b. Pulse oximeters
 - c. Damaged ECG leads.
 - d. all of the above
- ___ 18. The effect by which a patient may experience a visual stimulation diring the MRI scan, described as "seeing stars", is known as:
- a. magnetoemodynamics
 - b. gradient slew rate
 - c. magnetophosphenes
 - d. all of the above
- ___ 19. _____ outside the MR scanner environment; it includes all areas patients, health care personnel and other employees use to access the MR department. Technologists do not control access to _____.
- a. Zone I
 - b. Zone II
 - c. Zone III
 - d. Zone IV

- _____ 20. _____ MR personnel are facility staff members who have participated in minimal safety educational programs to ensure their own safety as they work in Zone III. Examples include MR department office staff and patient aides.
- a. Non
 - b. Level 1
 - c. Level 2
 - d. Level 3
- _____ 21. Intracranial vascular clips or aneurysm clips made of _____ are absolute contraindications for MR scanning.
- a. nonmagnetic materials
 - b. Titanium
 - c. ferromagnetic materials
 - d. diamagnetic materials
- _____ 22. No mechanical devices, such as _____ may be taken into the MR scanner room
- a. watches
 - b. hearing aides
 - c. insulin pumps
 - d. all of the above
- _____ 23. In a superconducting magnet, a quench can occur in the following ways: as a controlled, or planned, procedure or as an uncontrolled, spontaneous occurrence.
- 1. *planned procedure*
 - 2. *controlled procedure*
 - 3. *Uncontrolled occurrence*
 - 4. *spontaneous occurrence*
- a. 1, 2 and 3 only
 - b. 2,3, and 4 only
 - c. 1,3, and 4 only
 - d. 1,2, 3, and 4

True/False

Indicate whether the statement is true or false.

- 24. According to U.S. Food and Drug Administration (FDA) guidelines, adults, children and infants older than one month can be scanned using a static magnetic field strength up to 20 T.
- 25. The primary safety concern of the static magnetic field is the magnetic attraction or pulling force against ferromagnetic objects
- 26. If MR personnel discover that a patient has an implanted device after the patient is taken into the MR scanner room, the technologist should back the patient out of the room without turning to minimize the risk of torque.
- 27. Objects that test positively as ferromagnetic should not be brought into the MR environment. Testing should be used instead of screening forms and verbal screening.
- 28. The RF field can potentially cause tissue heating when metallic implants, devices and other metallic objects inside or outside of the patient's body overheat when exposed to the RF field.
- 29. Technologists can send an unplugged coil into the bore of the MRI because it will not cause thermal burns.
- 30. The magnetohemodynamic effect is described as "seeing stars" during the MRI scan.
- 31. An MR precaution means that a patient's condition or implanted device or object prevents the MR examination from taking place.
- 32. An MR precaution means that the condition, device or object may need special consideration and further review and approval by the radiologist
- 33. Pacemakers generally are contraindicated for MR scanning; however, if the patient's physician believes the benefit of the MR examination outweighs the risks, special arrangements can be made to accommodate the patient. Under these circumstances, a dedicated team consisting of the radiologist, cardiologist and other personnel should be present to properly monitor the patient during the MR examination and handle possible complications.

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Answer Section

MULTIPLE CHOICE

- | | | |
|-------------------------|--------|---------------------|
| 1. ANS: B | PTS: 1 | DIF: Level: Medium |
| REF: Volume 3, Page 349 | | OBJ: Category: None |
| TOP: Exam: None | | |
| 2. ANS: D | PTS: 1 | DIF: Level: Medium |
| REF: Volume 3, Page 349 | | OBJ: Category: None |
| TOP: Exam: None | | |
| 3. ANS: A | PTS: 1 | REF: 781 |
| 4. ANS: B | PTS: 1 | REF: 782 |
| 5. ANS: B | PTS: 1 | REF: 782 |
| 6. ANS: C | PTS: 1 | REF: 782 |
| 7. ANS: D | PTS: 1 | REF: 781 |
| 8. ANS: C | PTS: 1 | |
| 9. ANS: C | PTS: 1 | |
| 10. ANS: D | PTS: 1 | |
| 11. ANS: C | PTS: 1 | |
| 12. ANS: B | PTS: 1 | |
| 13. ANS: B | PTS: 1 | |
| 14. ANS: C | PTS: 1 | |
| 15. ANS: A | PTS: 1 | |
| 16. ANS: E | PTS: 1 | |
| 17. ANS: D | PTS: 1 | |
| 18. ANS: C | PTS: 1 | |
| 19. ANS: A | PTS: 1 | |
| 20. ANS: B | PTS: 1 | |
| 21. ANS: C | PTS: 1 | |
| 22. ANS: D | PTS: 1 | |
| 23. ANS: D | PTS: 1 | |

TRUE/FALSE

- | | |
|------------|--------|
| 24. ANS: F | PTS: 1 |
| 25. ANS: T | PTS: 1 |
| 26. ANS: T | PTS: 1 |
| 27. ANS: F | PTS: 1 |
| 28. ANS: T | PTS: 1 |
| 29. ANS: F | PTS: 1 |
| 30. ANS: F | PTS: 1 |
| 31. ANS: F | PTS: 1 |
| 32. ANS: T | PTS: 1 |
| 33. ANS: T | PTS: 1 |