Questions and Answers

MRI Safety

MRI Safety:
Introduction

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Healthineers

MRI safety training is essential for the operation of your MRI. The following questions test and deepen your knowledge of this. We therefore recommend that you watch the safety video on our PEPconnect training platform beforehand.

PEPconnect is part of the *Personalized Education Plan (PEP)* Solution. This is a platform that allows medical technology specialists to access and share training and experiences any time, anywhere, and on any device.

Additional information can be found on the web site
https://pep.siemens-info.com/en-us

1 Question

How close can you move a ferromagnetic wheelchair toward an MRI scanner?

MRI Safety:
Chapter 1 – Preface
about MR safety

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1 Solution

Never enter the MRI examination room with ferromagnetic objects.

It could be fatal!

Use the door threshold to the examination room as your (optical) boundary. There will always be an effect on ferromagnetic objects in the examination room.

For further information or for information on the 5 Gauss line (0.5 mT line), it's worth having a look in the System Owner Manual (white binder at the console).

2 Question

Name eight objects with which you should never enter the examination room.

MRI Safety:
Chapter 2 – Pre-screening
MR workers and patients

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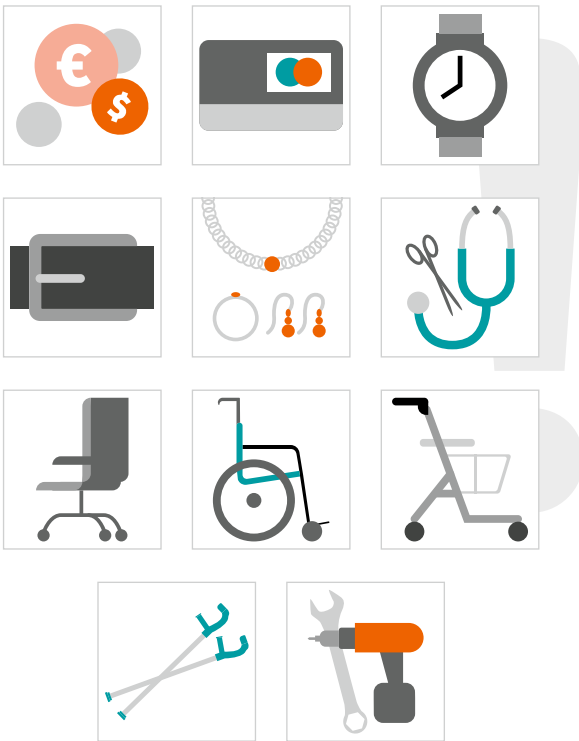
2 Solution



3 Question

What are the "stop buttons"?

Where are they located?

What do they do?

MRI Safety:
Chapter 4 – In case of emergency

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3a Solution

Table stop button
For example, in case of accidents or injuries due to table movement

They are located to the right and left on the MRI patient table and in the control room on the intercom.

Stops motorized horizontal tabletop movement with immediate effect.

To unlock it, the button has to be released where it was pushed.

3b Solution

Emergency Off button
For example, in case of fire

It is located on the console, above or below the magnet stop button in the examination room, and in the equipment room.

Pressing the button shuts down all electric power to the MRI scanner. It does not, however, shut down the magnetic field.

Use this switch if there is a defect in the electrical equipment, or in case of fire or water damage.

3c Solution

Magnet Stop button
For example, when there are accidents where metallic parts are drawn into the magnet

It is located on the Alarm Box and in the examination room near the entry door. This button is enclosed within an additional plastic cover with a seal.

Within seconds after this button is pressed, helium is vented outside through the quench tube, and the superconducting magnet loses its magnetic properties. This process is called a quench.

The quench process you trigger with magnet stop is irreversible and has serious consequences. As a rule, Siemens Healthineers Service has to be called following a quench.

4 Question

What do you do if a wheelchair or similar object is magnetically drawn toward the MRI scanner in an examination room that has no people in it?

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4 Solution

Please leave the MRI examination room, close the doors, inform your supervisor, and immediately contact our Customer Care Center (Technical Support will be dispatched as quickly as possible).

Do **not** attempt to remove the object **yourself.**

This could result in fatal injuries!

A technical service call always has to be carried out after an incident such as this. In most cases, the cover or other hardware components of your MRI scanner will be damaged; readjustments and shimming will also have to be carried out.

5 Question

What do you do if a wheelchair or similar object is magnetically drawn toward the MRI scanner in an MRI room and a person is trapped and injured?

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5 Solution

There is an immediate risk of death!
Always do as follows:

1. Immediately press the closest Magnet Stop button.

2. Attract attention to obtain support for the rest of the process.

3. Provide first aid, recover the patient, and initiate an emergency call. Assign tasks (who should do what).

4. Once the patient has been recovered and is being cared for, contact our Customer Care Center to obtain technical support.

6 Question

While performing an MRI examination, you are informed that a fire has broken out.

What do you do?

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6 Solution

Please follow the internal emergency rescue guidelines or do the following:

- Perform patient recovery from the MRI scanner. Inform everyone in the vicinity about the situation. Some patients may not be able to react appropriately to the situation (such as small children, the very ill, lame, unconscious, sedated, or disabled patients).

- Press the Emergency Off button of the MRI scanner.

- Close the windows and doors behind you. Leave the building quickly using the shortest possible route.

- Go to the designated meeting point.

7 Question

Are Siemens Healthineers headphones sufficient hearing protection?

Please explain your answer.

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7 Solution

No, headphones are insufficient. They reduce the noise level by 13–14 dB, depending on the model, but are intended primarily for communication with the patient.

Refer to the System Owner Manual (Technical Data chapter) or the Operator Manual (Safety chapter) for the exact value required for the hearing protection you are to provide based on your system and corresponding gradient configuration.

Ear plugs achieve values of approx. 30 dB, wax ear plugs 22 dB; it depends on the product used.

8 Question

What is SAR?

What are the correct parameters to enter during patient registration?

MRI Safety:
Chapter 3 – Patient examination

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8 Solution

SAR = specific absorption rate

This is a measure for the absorption of electromagnetic fields into a material, which always results in its warming. The specific absorption rate is expressed as power per weight using the unit W/kg.

During patient registration therefore, the gender, patient position, age, height, and weight have to be entered as precisely as possible.

9 Question

Is this statement true or false?

"You can aways measure in First Level ..."

Please explain your answer.

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9 Solution

Technically, you can measure in First Level after confirmation or actively clicking the MRI interface. Please note however that not all patients can be measured in First Level operating mode.

There are contraindications for measuring in First Level operating mode.

Additionally, the prerequisites for measuring in this operating mode are visual monitoring and a functioning intercom system and alarm bell. You are responsible for these.

Please refer to the PEPconnect Job Aid for further information

10 Question

What are the contra-indications for measuring in First Level controlled operating mode?

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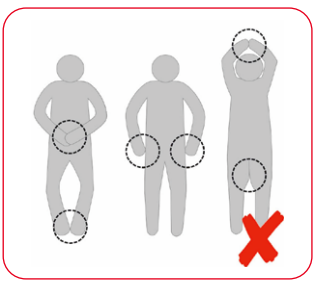
10 Solution

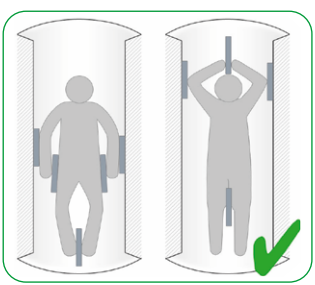
Here are a few examples of contraindications for measuring in First Level operating mode:

- Patients with poor thermoregulation (fever, chemotherapy/immunotherapy)
- Patients with metal implants (complete endoprostheses, immobilization after fractures, e.g., using plates, screws)
- Pregnant patients, newborns, and children
- Patients who cannot communicate reliably and with certainty (e.g., patients under sedation, in a coma, disoriented, or paralyzed)

11 Question

What is your impression of the following images?





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11 Solution

Dangerous current loops can develop when body parts or the patient's skin touches the tunnel lining or RF coil cables. This can result in burns or increased stimulation.

Ensure that current loops, as shown in the image marked in red, are prevented.

Ensure that the patient, as shown in the image marked in green, is positioned at the correct distance to the magnet tunnel (5 mm) and that individual body parts maintain the correct distance from one another.

12 Question

What do you check daily regarding function and cleanliness?

Give examples.

MRI Safety:
Chapter 3 – Patient examination

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12 Solution

The following items should be checked for function, condition, and cleanliness on a daily basis:

- Alarm bell, hearing protection, and communication headphones (preferably before each patient)
- Positioning aids
- Patient table (including under the spine coil)
- Exterior of the MRI scanner and in the tunnel (check whether the fan is functioning)
- Floor in the examination room
- Coils including cables and plugs

13 Question

When preparing the patient for an MRI examination, what needs to be taken into account in terms of clothing?

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13 Solution

The patient has to remove all electrically conductive materials!

Ensure that the patient is not wearing clothing that is wet or damp from perspiration.

Check that there are no metal rings, chains, or electrically conductive materials worked into items of clothing (e.g., metal bra underwires, metallic appliqués, or interwoven metal yarn, especially in active wear) on the patient.

When positioning the patient, use suitable materials only, such as blankets made of linen or cotton.

14 Question

What is PERU?

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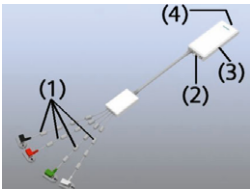
14 Solution

PERU = Physiologic ECG & Respiratory Unit

The PERU may only be used to control MRI measurement sequences. It does not replace the patient monitoring system.

The wireless PERU simultaneously records three ECG channels as well as the respiratory channel of the patient.



1 ECG leads with clamps

2 Plug for the respiration cushion

3 Transmitter unit

4 Control LEDs

The ECG electrodes and respiratory cushion are connected to the PERU.

15 Question

What is PPU?

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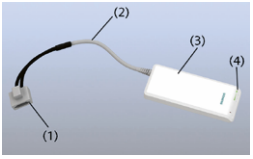
15 Solution

PPU = Peripheral Pulse Unit, wireless pulse sensor

The PPU may only be used to control MRI measurement sequences. It does not replace the patient monitoring system.

The PPU acquires the patient's peripheral pulse. It consists of a transmitter unit, a fiber-optic sensor, and a removable finger adapter.



1 Finger adapter
2 Fiber-optic cable
3 Transmitter unit
4 Control LEDs

16 Question

How do you work with PERU and PPU?

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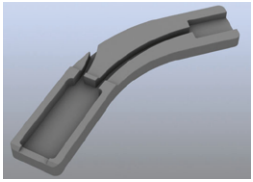
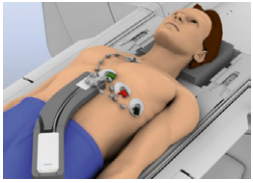
16 Solution

To prevent skin irritations, the PERU has to be located in the application cushion during the examination.

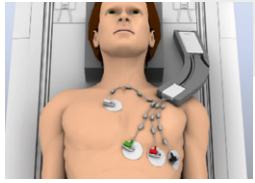


Application cushion

Positioning:



Head first supine



Feet first supine

Additional information is available in the Operator Manual or by scanning the QR code

17 Question

What kind of warning sign is this?

How do you work with it?

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17 Solution

This is a warning sign for laser radiation.
It refers to the laser light for centering at the tunnel entrance.

The accessible laser radiation for lasers of laser class 2 is between 400 nm and 700 nm, within the visible spectral range. At brief exposures of less than 0.25 seconds ("normal" eye closing reflex), class 2 lasers are not harmful to the human eye.

However, make sure that neither you nor the patient stare into the laser. Some people have a limited eye closing reflex; the laser represents a danger for these patients.

18 Question

What danger does a quench represent?

(Tip: oxygen; -269 °C)

MRI Safety:
Chapter 4 – In case of emergency

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18 Solution

By pressing the Magnet Stop button, within seconds helium is vented outside through the quench tube.

A technical defect could result in the helium venting into the examination room instead of outside. Helium rapidly displaces the oxygen, resulting in a risk of suffocation. For this reason, after a quench everyone must leave the examination room as quickly as possible.

There is a risk of injury!

Never touch super-cooled liquids or ice formations. The surfaces are very cold and can result in cold burns on contact.

Job aid:
Safety Information

Please note that the educational material is for training purposes only. For the proper use of the software or hardware, please always use the Operator Manual issued by Siemens Healthineers. This material is to be used as training material only and is by no means a substitute for the Operator Manual. Any material used in this training will not be updated on a regular basis and does not necessarily reflect the latest version of the software and hardware available at the time of the training.

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