Ministry of Higher Education and Scientific Research
University of Al-Mustaqbal
College of Health and Medical Technologies

General Physics

Frist Stage

A Lecture Three Title / Practical

Introduction to Radiation Protection & Shielding

Part ONE

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By

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2025-2026

What are the types of radiation used in radiology departments?

Ionizing Radiation:

- X-rays
- Gamma rays
- Beta particles
- Alpha particles
- Neutrons — rare in diagnostic radiology; more common in radiation therapy or nuclear medicine

Non-Ionizing Radiation: there are many types such as:

Radiofrequency (RF) waves — used in Magnetic Resonance Imaging (MRI)

Note: In diagnostic and therapeutic radiology departments, ionizing radiation (especially X-rays and gamma rays) is the primary type requiring strict radiation protection measures.

Where are gamma rays used in medical settings?

Gamma rays are not used in conventional diagnostic imaging rooms (like X-ray, CT, or fluoroscopy), which rely on X-rays generated by X-ray tubes. Instead, gamma rays originate from radioactive decay of radionuclides.

Room	Type of Radiation	Radiation Source
X-ray room	X-rays	X-ray tube
CT room	X-rays	X-ray tube
Fluoroscopy	X-rays	X-ray tube
Nuclear Medicine	Gamma rays	Radiopharmaceuticals (e.g., Tc-99m)
Gamma Knife	Gamma rays	Cobalt-60 source
PET Scan	Gamma rays	Fluorodeoxyglucose (FDG) (via positron annihilation)

🧮 Quick Quiz – 3 Minute! (Individual activity)
Total score: 0.5 point

Question (1) ❓ What type of radiation is used in Bone Densitometry (DEXA)?

A) Gamma rays from a radioactive isotope

B) X-rays from a low-dose X-ray tube

C) Radiofrequency waves from an MRI coil

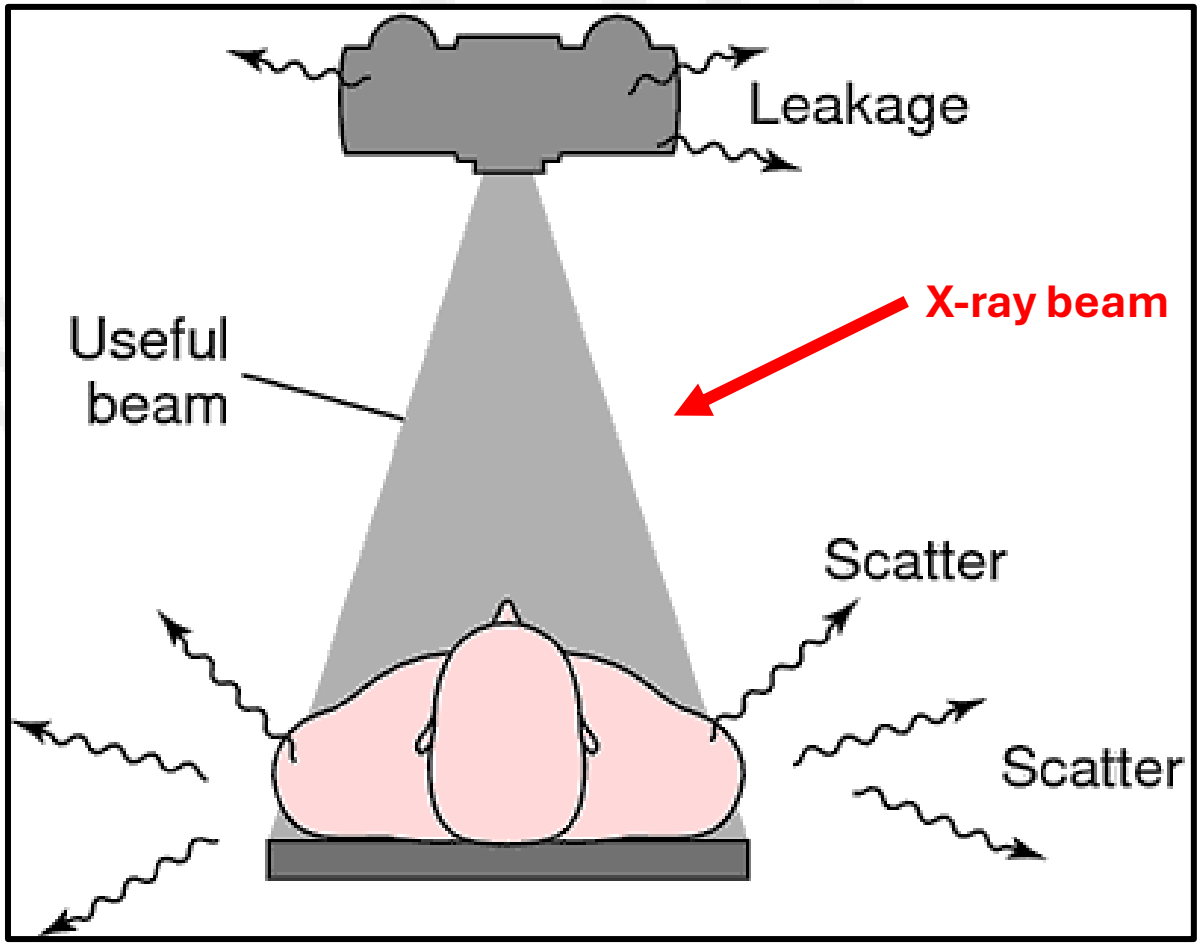
D) Beta particles from a radiopharmaceutical

Sources of Radiation Exposure in an X-ray Room?

In an X-ray room, personnel and patients may be exposed to ionizing radiation from the following sources.

1. Primary Beam

The direct X-ray beam emitted from the X-ray tube toward the patient. It carries the highest radiation intensity and must never intersect with staff during exposure.



2.Scatter Radiation

Produced when the primary beam interacts with the patient's body

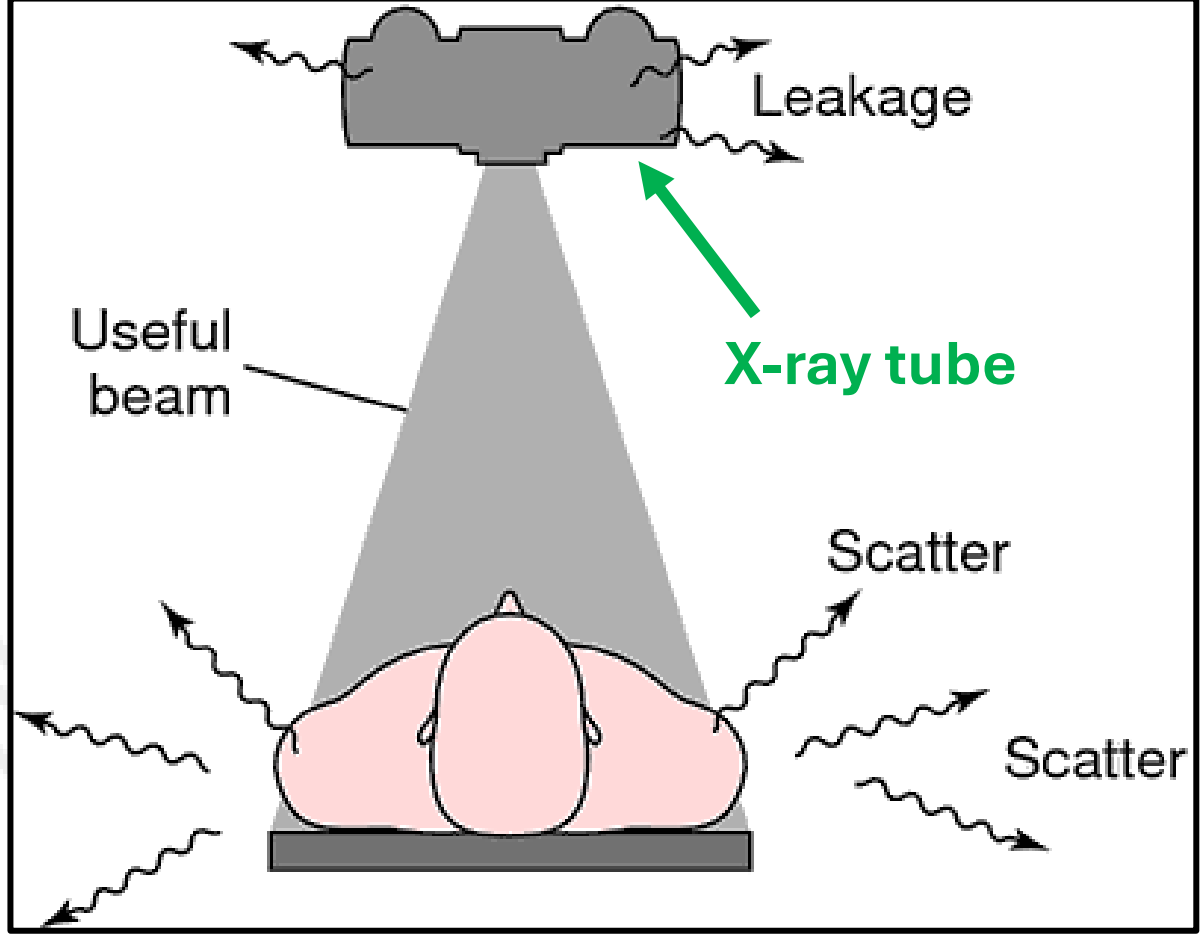
Radiates in multiple directions and is the main source of occupational exposure for radiographers and technologists.

3. Leakage Radiation

Small amounts of radiation that **escape** through the shielding of the X-ray tube housing.

4. Secondary/Reflected Radiation

A component of **scatter radiation** that bounces off walls, floors, or equipment surfaces. Generally **low in intensity** but factored into shielding calculations for room construction.

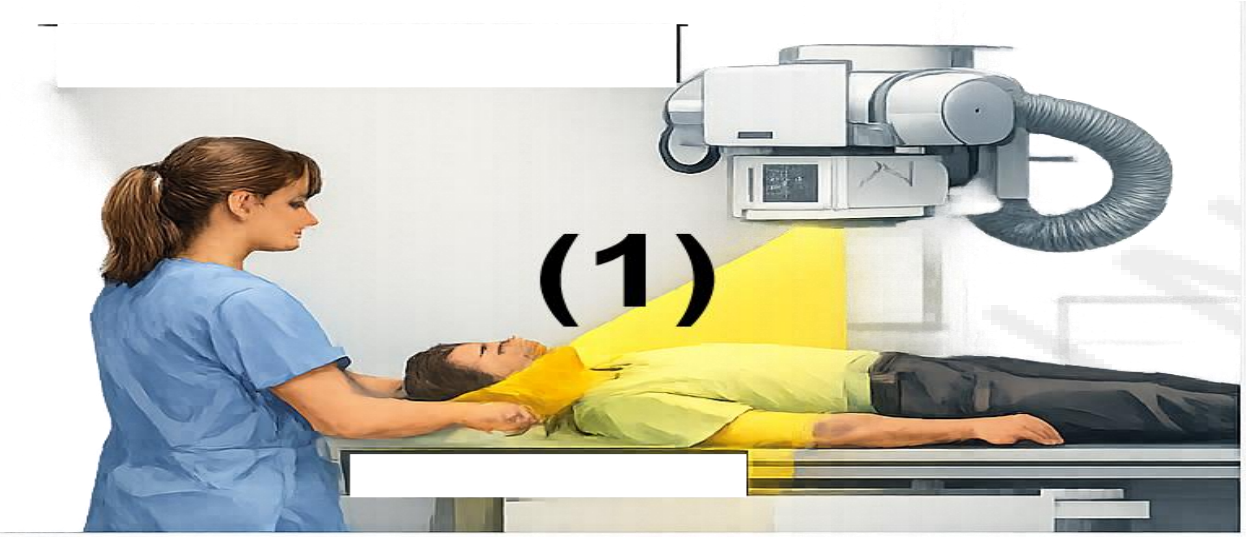


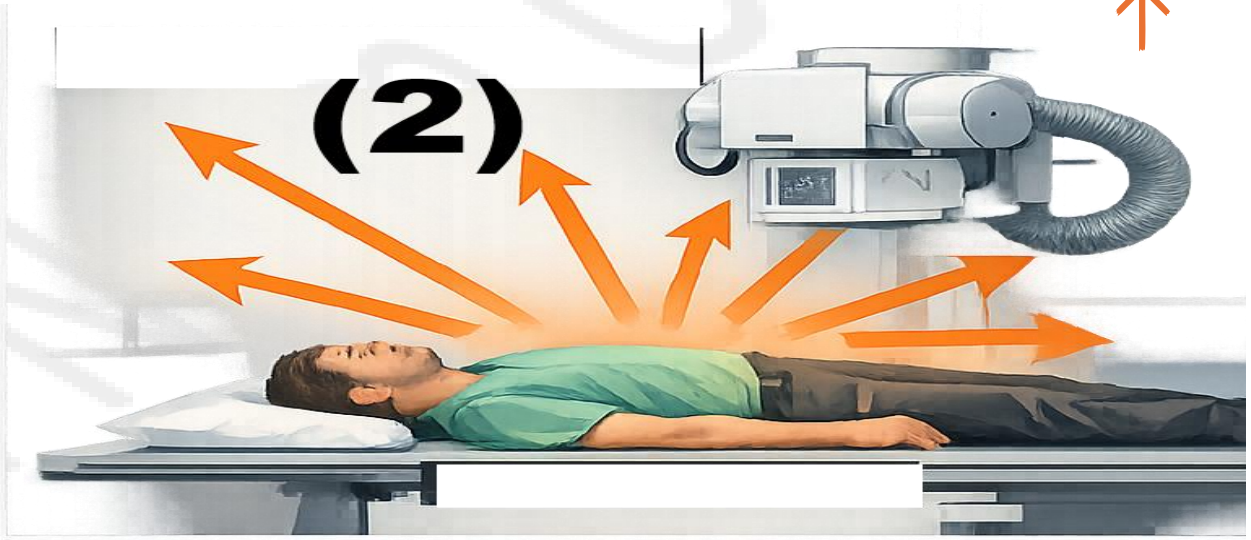
Note: Staff are primarily exposed to **scatter radiation**, not the primary beam.

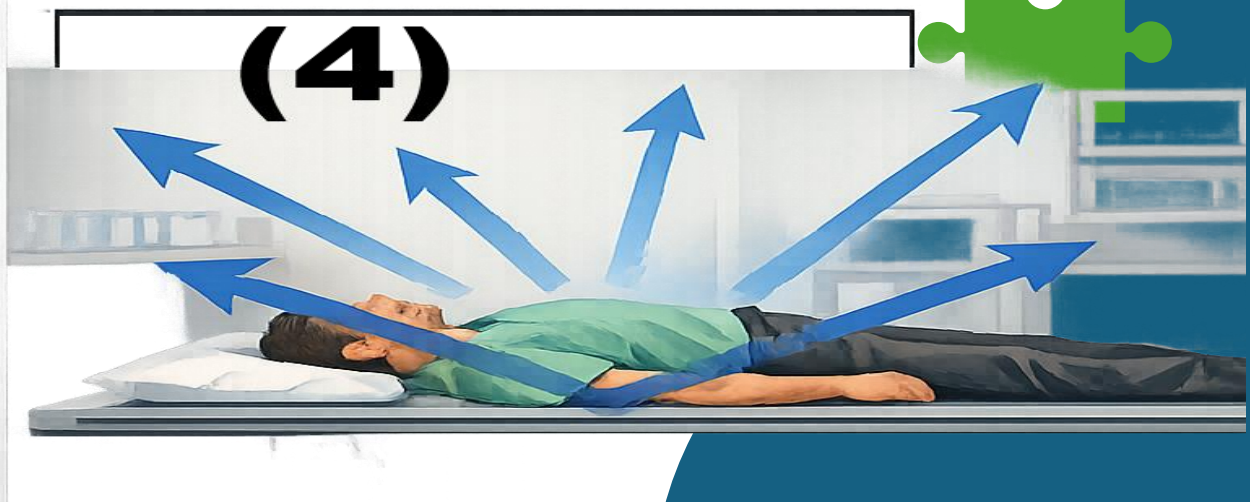
Quick Quiz – 3 Minutes! (Group activity)

Total score: 0.5 points

Question (2) Choose the radiation type according to the number provided in the image.








Any
Question

References

- Science Introduction to Physics in Modern Medicine, (Suzanne Amador 2002), Radiation Physics for Medical Physicists (Ervien B, Poodgorasak.2006)
- Physics Utah Science Standards, 2019
- Science Direct, Google Scholar. Web of Science

Thank you for listening