

# Radiation and Shielding

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# Introduction to Radiation

Radiation is the emission of energy as electromagnetic waves or as moving subatomic particles. It can be classified into four major types:

- ▶ Alpha particles
- ▶ Beta particles
- ▶ Neutrons
- ▶ Electromagnetic waves (gamma rays and X-rays)

These types of radiation vary in mass, energy, and their ability to penetrate materials.

# Alpha Particles

- ▶ Consist of two protons and two neutrons
- ▶ Heaviest type of radiation particle
- ▶ Emitted by radioactive materials like uranium and thorium
- ▶ Example: Radon gas in homes

# Beta Particles

- ▶ Electrons not attached to atoms
- ▶ Small mass and negative charge
- ▶ Emitted by materials like tritium and carbon-14
- ▶ Used in applications like carbon dating and medical imaging

# Neutrons

- ▶ Uncharged particles found in atomic nuclei
- ▶ Commonly released during nuclear fission
- ▶ Essential for sustaining nuclear reactions in reactors

# Electromagnetic Radiation

- ▶ Includes gamma rays and X-rays
- ▶ No mass or charge
- ▶ High energy, capable of deep penetration
- ▶ Widely used in medical treatments and imaging

# Effects of Shielding

- ▶ **Alpha particles:**

- ▶ Stopped by a sheet of paper or skin
- ▶ However dangerous if inhaled or ingested

- ▶ **Beta particles:**

- ▶ Require small amounts of shielding (plastic and glass)
- ▶ Can penetrate skin but not deeply into tissues

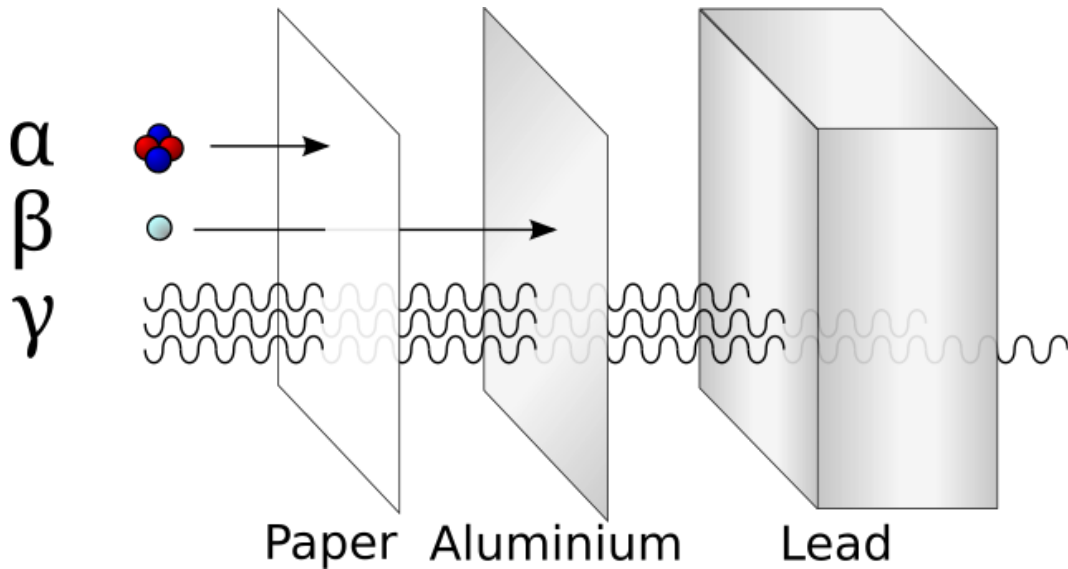
- ▶ **Gamma rays and X-rays:**

- ▶ Require dense materials like lead or concrete
- ▶ Can penetrate deep into tissues and organs

- ▶ **Neutrons:**

- ▶ Best shielded by materials with light atoms (like water) yet difficult.
- ▶ Can penetrate deeply due to being uncharged particles; it does interact with electrons and can penetrate deep into materials.

## A Visualized Representation





# Radiation Detectors



# Conclusion

- ▶ Radiation comes in various forms with distinct properties and uses.
- ▶ Understanding the types and effects of radiation helps in safely harnessing its benefits while minimizing risks.
- ▶ Effective shielding is crucial in protecting against harmful radiation exposure.