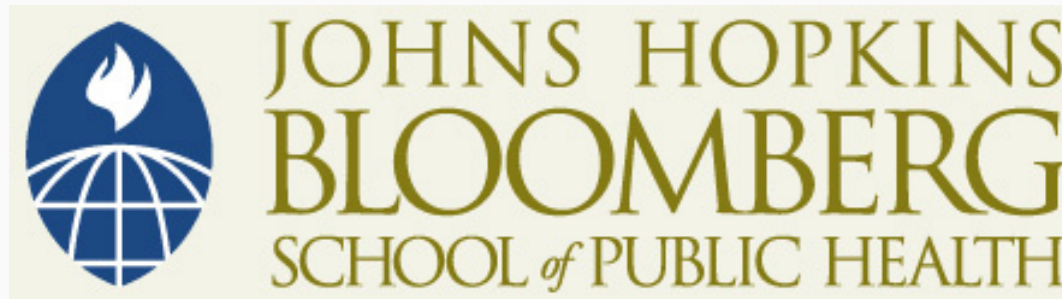


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## *Radiation Terror 101*

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## *Part 1*

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General Radiation Principles, Part I

# *Types of Radiation: Electromagnetic vs. Particulate*

## ■ **Electromagnetic radiation**

- UV, visible light, X rays, EMFs
- No mass, no charge

## ■ **Particulate radiation**

- Alpha particles, beta particles, neutrons
- Mass and (alphas and betas) charge

## *Types of Radiation: Ionizing vs. Non-Ionizing*

- **Ionizing radiation** is radiation with sufficient energy to eject electrons from atoms
  - This process is called **ionization**
- **Non-ionizing radiation** is radiation without sufficient energy to produce ionization
- Radiation terror uses **ionizing radiation**

# *Ionizing Radiation*

- **Particulate**

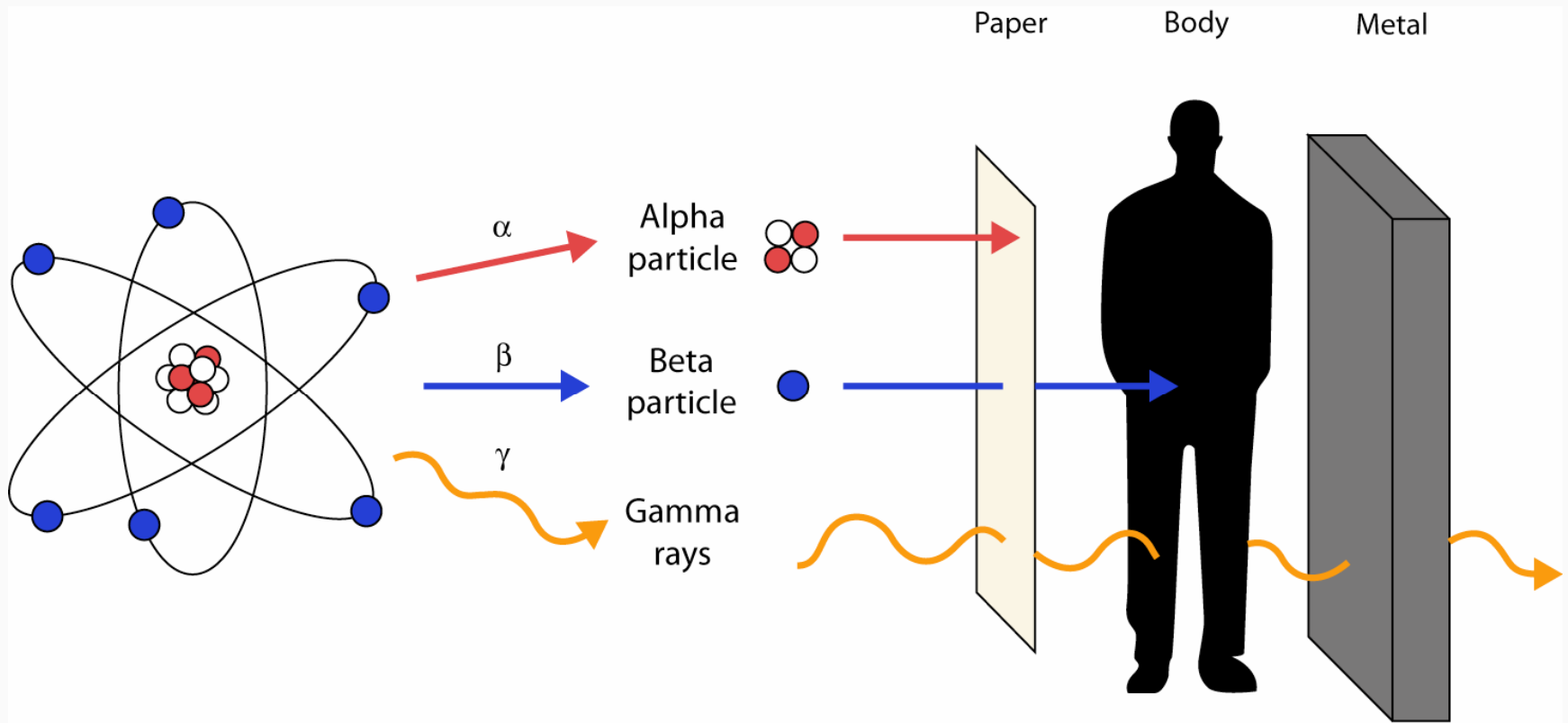
- Alphas, betas, neutrons
- Not very penetrating

- **Electromagnetic**

- X rays, gamma rays
- Penetrating

- Radiation terror uses both **particulate** and **electromagnetic** ionizing radiation

# Three Types of Ionizing Radiation: Gamma Rays



# *Sources of Ionizing Radiation: Beta Particle*

## ■ **Radionuclides**

- Are atoms that spontaneously undergo radioactive decay
- Emit radiation upon decay
- Are characterized by mode of decay and half-life
- Are always “on”

## ■ Machines

- Electron and X-ray sources
- Can be switched on and off

## ■ Radiation terror uses radionuclides



## *Some Important Dirty Bomb Radionuclides*

### ■ **Cobalt-60 (5.3 year half-life)**

- Therapy, research, industrial radiography, food irradiation
- 13,000 curies max source

### ■ **Cesium-137 (30 year half-life)**

- Research, industrial radiography, irradiators
- 200 curies max source

# *Orphaned Sources*

- Orphaned sources
  - Lost radioactive material

## *Some Important Dirty Bomb Radionuclides*

- **Iridium-192 (74 day half-life)**
  - Therapy, industrial radiography
  - 25 curies max source
- **Americium-241 (432 year half-life)**
  - Industrial radiography
  - 1 curie max source

## ■ External

- Radiation source is **outside** the body
- Most risk from **X rays** or **gamma rays**
  - ▶ Are able to penetrate into the body

## ■ Internal

- Radiation source is **inside** the body
- Most risk from **alpha** and **beta particles**
  - ▶ Deposit a lot of energy over short distances