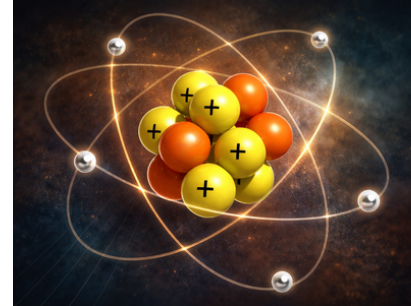


RADIATION SAFETY AWARENESS

1 What is radiation?

- Radiation is invisible to the human eye
- It is simply a form of energy
- Radiation comes from **unstable** compounds that are **decaying**, and **X-ray generators**



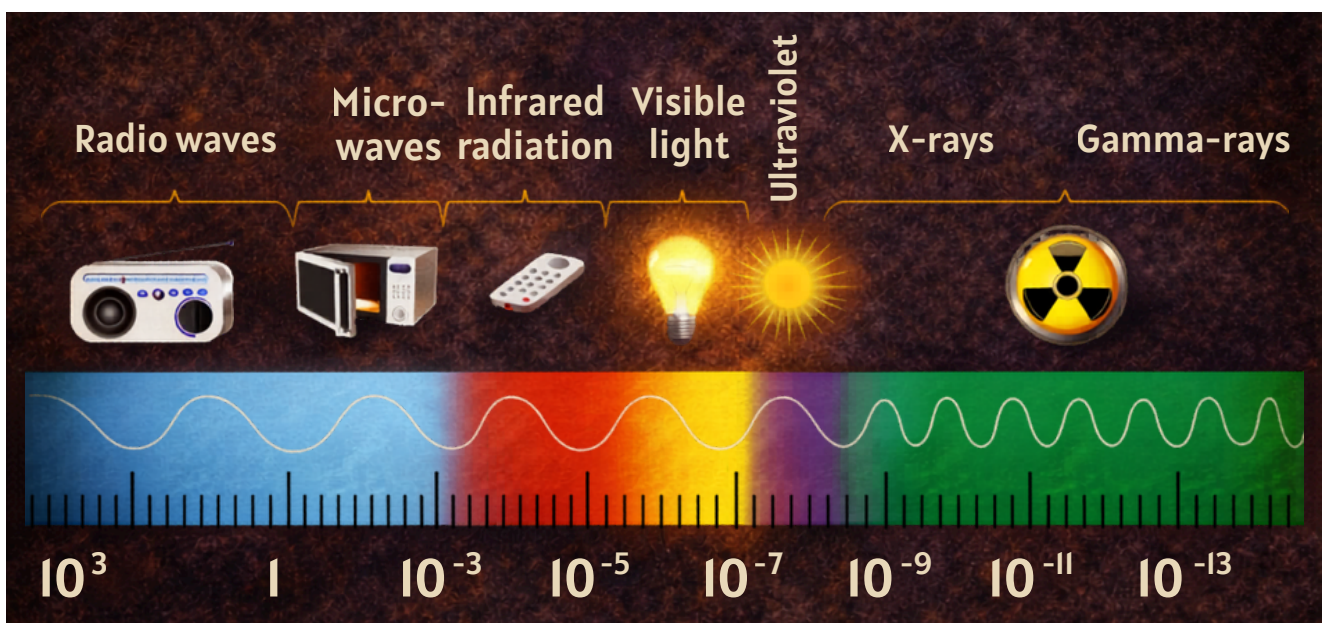
2 Where does it come from?

- Radiation comes from many different sources, some artificial, some natural
- Many places have more than one type
- Radiation from radioactivity and radiation from X-ray generators



3 Radiation vs Radioactivity

- Radiation is the transfer of energy through space
- Includes light, infra-red, radio waves, ionising radiation, and cosmic waves
- Represented by the Electromagnetic Spectrum



4 Is it dangerous?

- Yes and no
- All radiation used in industry is to be treated with caution
- In industry we use a range of different sources so care needs to be taken when working around them
- Radiation exposure can cause illnesses, genetic defects, and death

5 Radioactive devices in industry

- Underfill/overflow Detection Gauges to detect compliance with beverages
- Nuclear density and slurry gauges
- Coal scanners
- X-ray for food security
- X-ray for prison/courtrooms
- X-ray for aviation security
- X-ray for border security



6 Radioactive materials in industry

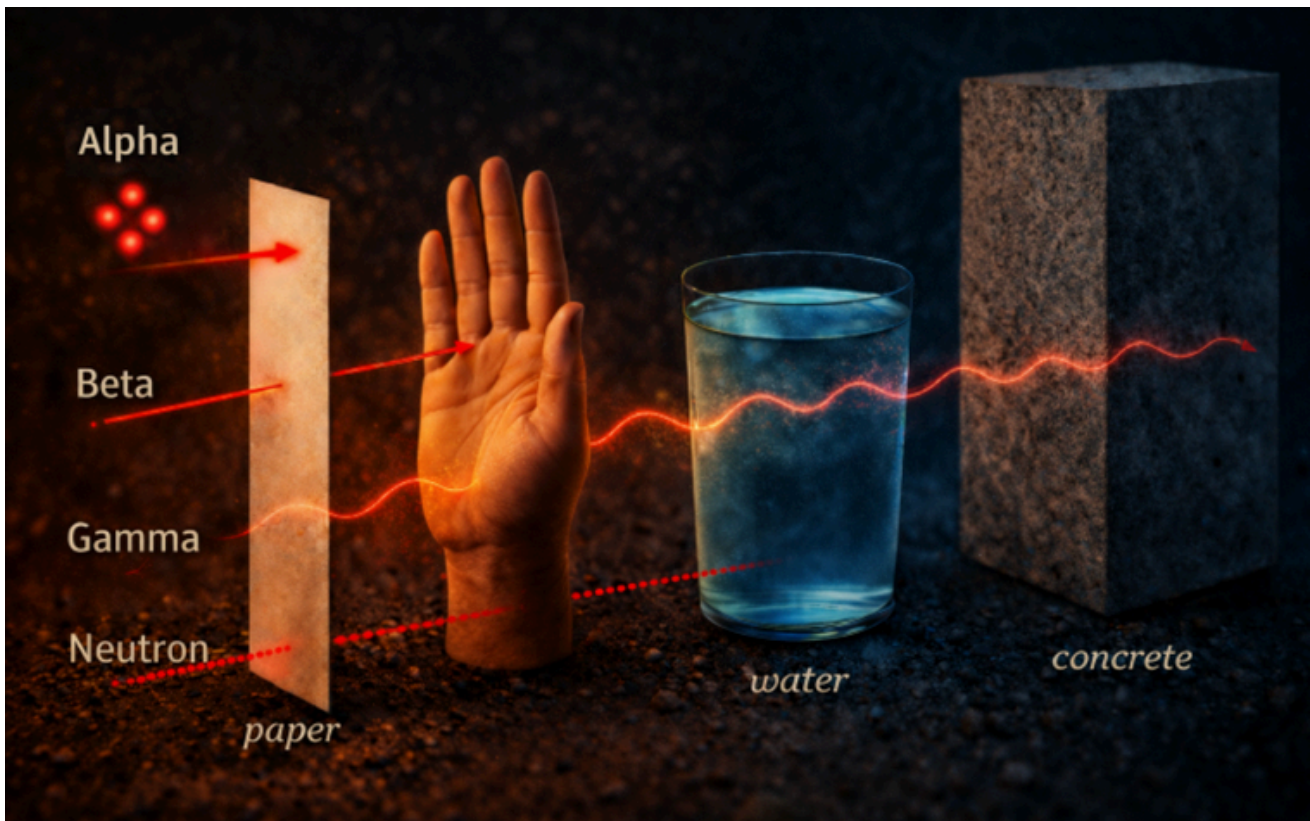
- A few, but the most common are:
 - Americium – 241
 - Caesium – 137

7 How the device works

- All industrial gamma / X-ray devices work off the same basic principle
- We have a radiation source on one side of the product being tested, and a detector on the other side
- We simply measure the 'drop off' in energy as it passes through the product

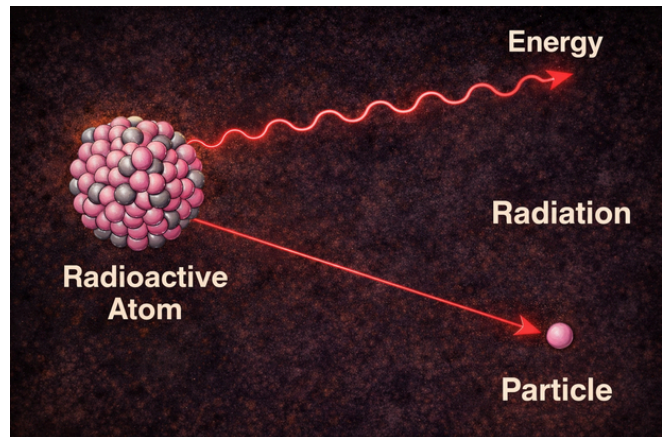
8 Is the device always radioactive?

- You can't turn radiation off (but the X-rays can)
- However, you can 'shield' people from the radiation
- We use heavy lead shields or curtains to protect us
- No shield = dangerous



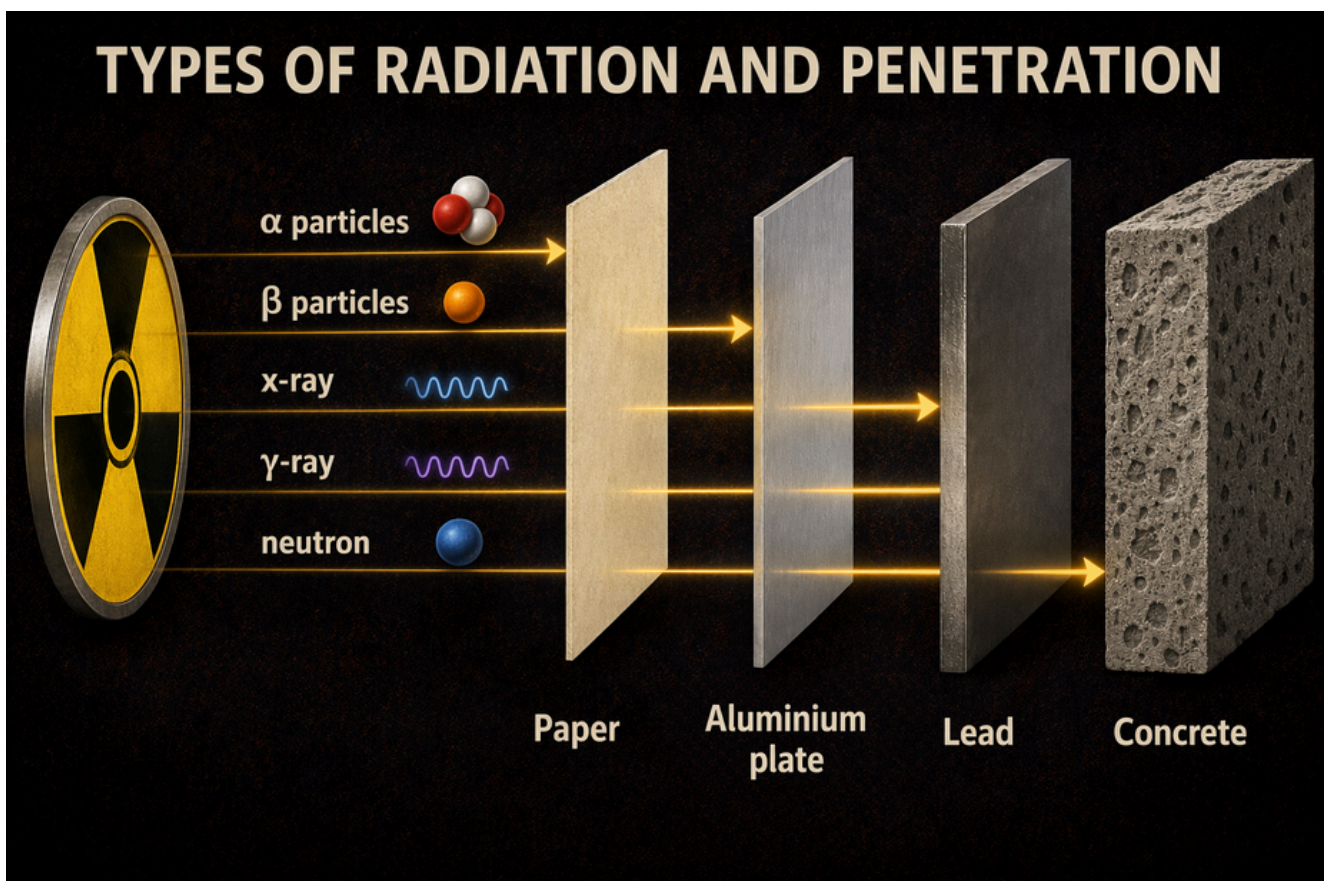
9 Radiation – a closer look

- Radiation is an invisible form of energy that can be quite dangerous
- Radiation comes from the natural decay of radioactive materials
- As they decay (break down) they release radiation



10 Types of radiation

- There are four types of radiation used in industry:
 - Alpha
 - Beta
 - Gamma
 - Neutron



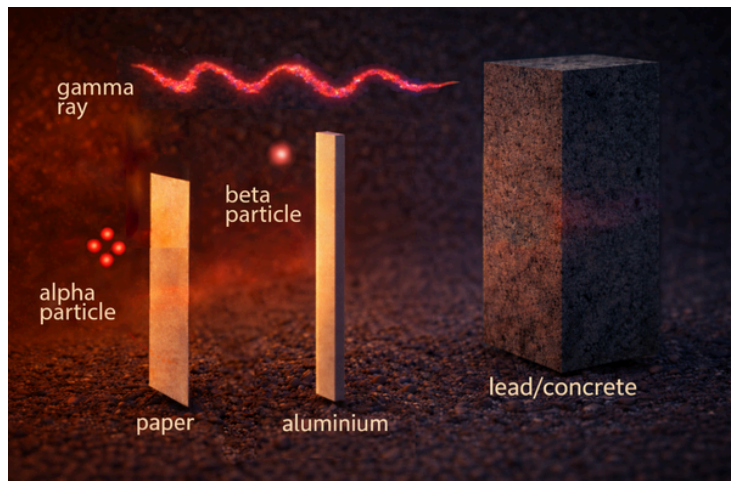
11 Alpha radiation

- Your smoke alarms at home use alpha radiation
- Its a very safe form of radiation, unless you ingest the material



12 Beta radiation

- Beta is more 'grunty' than alpha so this will penetrate the human skin and organs
- We don't use beta radiation much in industry, so let's move on



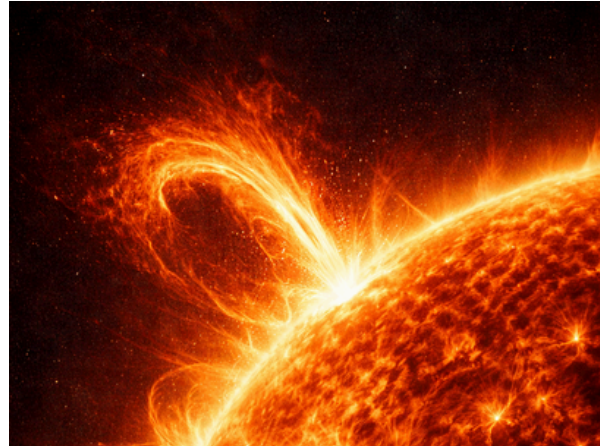
13 Gamma Radiation / X-ray

- This is the bad boy!
- Gamma radiation will pass through your body and organs
- Over exposure to gamma radiation / X-ray can cause illness and even death
- X-ray can be considered similar to gamma for our purposes



14 Neutron radiation

- Considered a relatively safe form of radiation
- Neutron is used widely in industry to measure how wet things are (e.g. the civil engineering, extractive, and geotechnical industries)
- Also comes from the sun



15 Why do we need to know this?

- Radiation is invisible so we never really know if its there or not
- Damaging effects can 'accumulate' in your body without you even knowing it
- However if we follow basic safety principles then it will be fine



16 How to be safe around the device

To be safe around the device we simply need to follow three things:

- **Time** – how long we spend round the device
- **Distance** – how far away we are
- **Shielding** – using the shield when not in use



17 Safety around the device – Time

- The more time we spend close to the radiation source, the more radiation we are likely to absorb
- Only go there if you need to!
- Keep exposure to the minimum

18 Safety around the device – Distance

- The further you stand away the better it is for you
- If you double your distance from the source, you reduce the exposure by four times
- Try to always keep AT LEAST 1m away from the devices at all times



19 Safety around the device – Shielding

- The device has built in lead shields, which are your last line of defence
- If the shield fails / breaks, there will be radiation leakages
- When the device is not being used, the shields will be in place



20 What could happen if we get too close?

- If the shields are activated, it is safe to be > 1m away
- If we get too much radiation accumulated over a period of time, then we may experience delayed effects
- E.g. cancers, sterility, genetic mutations for future generations



21 Licensing requirements

- Source License for the Company, which is granted by the ORS
- Multiple Source Licenses for large organisations with geographical spread, where a suitable 'contact' is appointed who must be contactable for auditing and emergency purposes
- Managing Entity (ME) must appoint an RSO that has sufficient knowledge of the device, and effectively controls the use, access and Radiation Safety Plans (RSP)
- Each branch or depot that has an X-ray or Radioactive device must have an RSO (i.e. at least one RSO per branch which uses or stores the device)
- 'Use' Licenses for certain devices, and service and repair techs.

22 Hazard ID

- Mechanical damage to the source via machinery or other accident
- Any accident that has the potential to cause damage needs to be reported to the RSO immediately
- These are radiation sources, and we all want you to go home in one piece...



23 The Radiation Safety / Management Plan (RSP/RMP)

- This is a company specific document that details everything about the sources
- Maintained by the RSO
- You are urged to read this document



And remember

- Always play it safe!
- Eliminate, isolate, minimise where possible!