

# The electromagnetic spectrum (1)

## ELECTROMAGNETIC WAVES

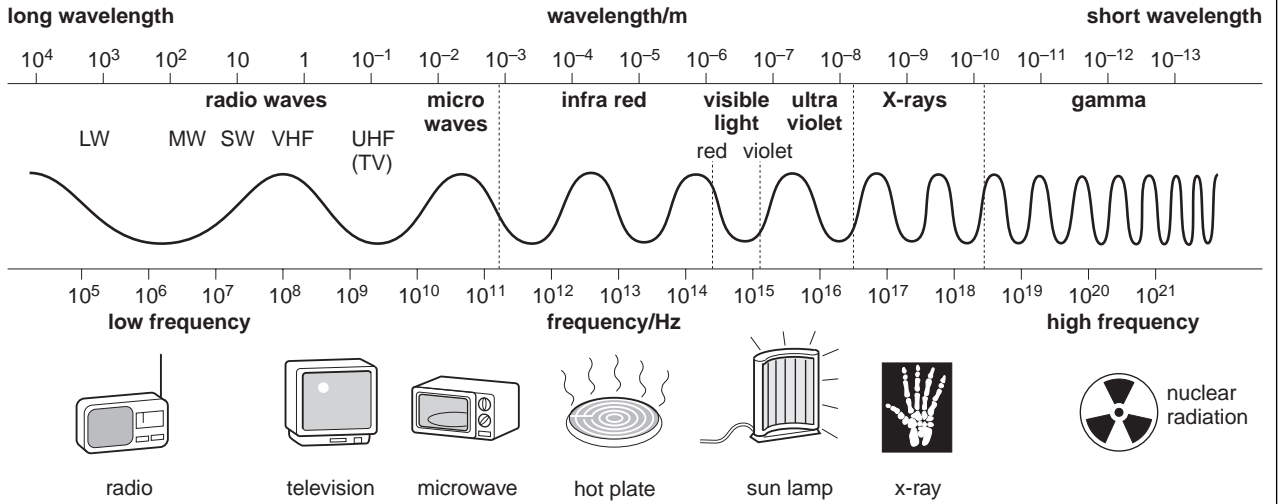
Visible light is just one small part of the **electromagnetic spectrum**.

All electromagnetic waves:

- transfer energy from place to place
- travel in a vacuum at the 'speed of light'  $3 \times 10^8$  m/s
- are transverse waves and can be *polarised*
- exhibit basic wave properties. (They can be reflected, refracted, diffracted, and create interference patterns.)

The properties of the groups of waves within the electromagnetic spectrum vary because of their different frequencies and wavelengths.

The diagram below summarises the most important features of the different regions of the spectrum.



## GAMMA RAYS

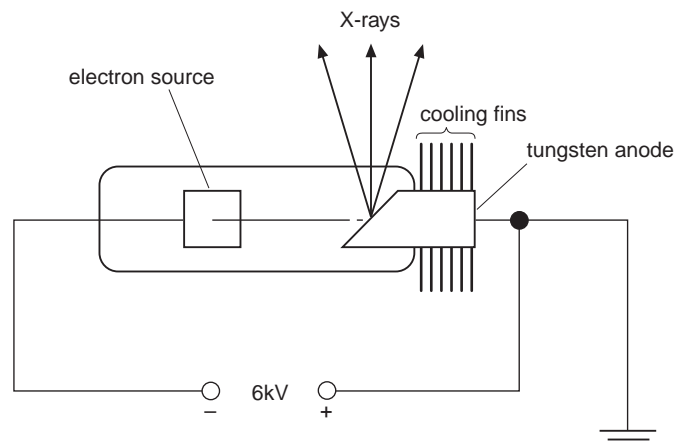
Gamma rays are high frequency rays emitted from some radioactive materials.

They:

- are highly penetrating and can easily pass through body tissue
- can damage living cells, possibly causing cancer
- can with closely monitored dosages be used to treat/kill certain types of cancer (radiotherapy)
- can be used to kill micro-organisms in food so that it will keep for longer (irradiation)
- can be used to irradiate surgical instruments to sterilise them

## X-RAYS

X-rays are produced when fast moving electrons strike a metal plate such as tungsten.



They penetrate certain parts of the body such as tissue but not bone or teeth, and so are used to produce shadow pictures in order to detect faults such as breakages or cracks. X-rays can be dangerous: over exposure to X-rays can harm certain parts of the body such as sex organs. To avoid this operators of X-ray machines in hospitals and industry stand behind a lead screen which shields them from accidental exposure to the X-rays.