

# ***General Physics***

***Radiology Techniques Department***

**1st Class**

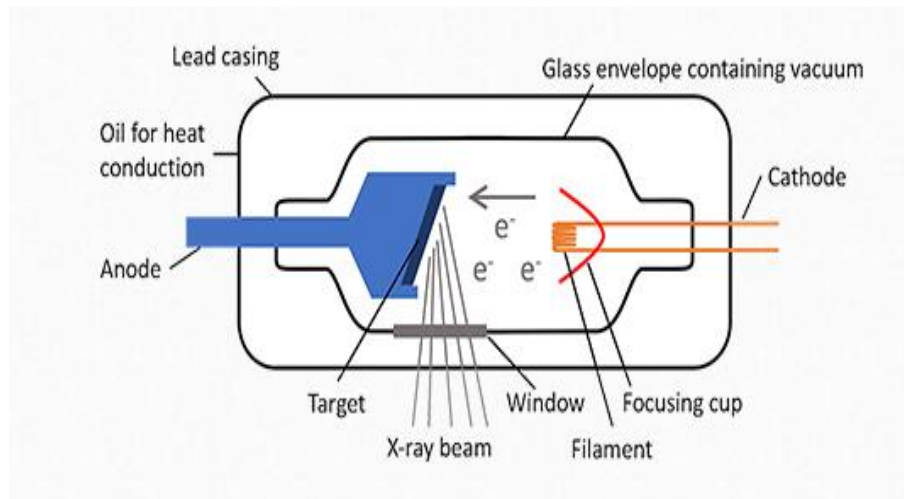
***Al-Mustaqbal University college***

***Lecture : X-ray production***

**2020/2021**

## ***X-ray production***

The production of x-rays requires a rapidly moving stream of electrons that are suddenly decelerated or stopped. The source of electrons is the cathode, or negative electrode. Electrons are stopped or decelerated by the anode, or positive electrode. Electrons move between the cathode and the anode because there is a potential difference in charge between the electrodes.



### ***Properties of X-ray radiation***

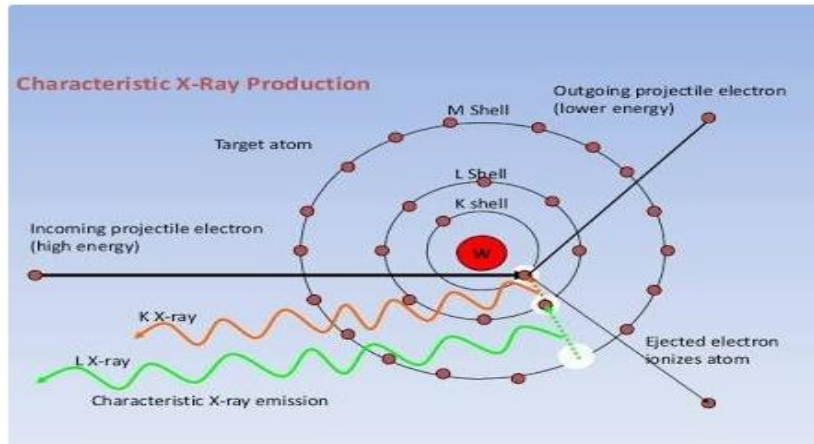
- Like visible light but shorter wavelength (higher frequency)
- Produce fluorescence in some materials
- Uncharged • Reflected and refracted like light

- Affect photographic film
- Heavier elements like Ca absorb x-rays
- Produce ionization in materials
- X-rays are a type of electromagnetic radiation.
- Other types of electromagnetic radiation are radio waves, microwaves, infrared, visible light, ultraviolet, and gamma rays.
- The types of radiation are distinguished by the amount of energy carried by the individual photons.
- All electromagnetic radiation consists of photons, which are individual packets of energy. For example, a household light bulb emits about  $10^{21}$  photons of light (non-ionizing radiation) per second.
- The energy carried by individual photons, which is measured in electron volts (eV), is related to the frequency of the radiation.
- Different types of electromagnetic radiation and their typical photon energies are listed in the table on the next slide.

## ***Characteristic X- Ray***

- It is important to distinguish between the energy of individual photons in an X-ray beam and the total energy of all the photons in the beam.
- It is also important to distinguish between average power and peak power in a pulsed X-ray device.

- Typically, the individual photon energy is given in electron volts (eV), whereas the power of a beam is given in watts (W).
- An individual 100 keV photon has more energy than an individual 10 keV photon.



## ***X-Rays and Ionization***

Radiation-producing devices produce X-rays by accelerating electrons through an electrical voltage potential and stopping them in a target.

- Many devices that use a high voltage and a source of electrons produce X-rays as an unwanted byproduct of device operation. These are called incidental X-rays.