THE PRODUCTION OF X-RAYS

ATOMIC STRUCTURE

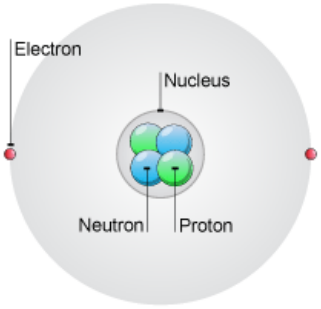
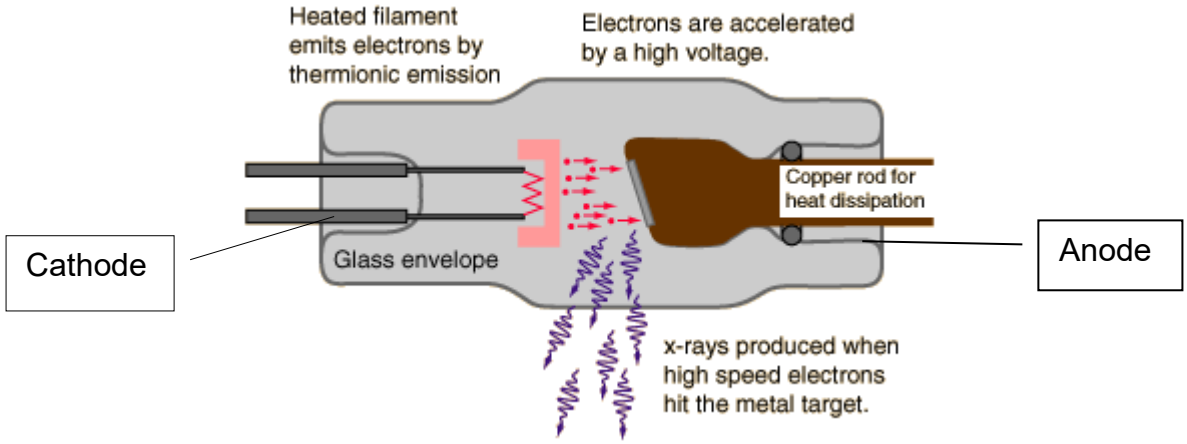


DIAGRAM OF A SIMPLE X-RAY TUBE



The x-ray tube is a sealed vacuum system designed to produce x-ray photons on demand

This is a cross section of a basic x-ray tube. It has two ends – a cathode and an anode.

The cathode consists of a thin wire filament – much like a light bulb. The anode is comprised of an area of tungsten (the target area) with a cooling system attached.

A very high voltage (in the order of kilovolts – kV) is applied between the two ends of the x-ray tube effectively making the cathode end negatively charged and anode end positively charged.

When the exposure switch is depressed, a small electrical current (in the order of milli-amperes) is passed though the wire filament of the cathode and (just like a light bulb) this becomes hot. This heating process effective boils off the orbiting electrons and gives them enough energy to escape from the bonds of the atom. This process is called “thermionic emission”.

The electrons (being negatively charged) accelerate across the tube towards the positive charged anode tungsten target. The collision between the tungsten atoms and the electrons produce x-rays and heat.