

# KARNATAKA RADIOLOGY EDUCATION PROGRAM

## **RADIATION PHYSICS**

Electromagnetic radiation is the transport of energy through space as a combination of electric and magnetic fields.

Rutherford's model suggested that electrons orbit the nucleus in a manner similar to planets orbiting the sun, but it didn't explain why electrons don't spiral into the nucleus due to attraction. Bohr's model, on the other hand, proposed that electrons exist in specific energy levels or shells around the nucleus.



**Bohrs Model** 



### Atom

Atoms of all elements are made up of three basic building blocks, protons, neutrons, and electrons. Protons are positively charged particles, neutrons are uncharged particles, and both are heavy in the subatomic scheme of things.



Atomic number : Number of protons in atom
Atomic mass: Total number of Protons and Neutrons
Neutral state : Number of protons are equal to
electrons

### Electrostatic force : Force of attraction between protons and electrons



The electrostatic force is an attractive and repulsive force between particles are caused due to their electric charges. Positive charged nucleus and negative electrons, balanced by centrifugal force of revolving electrons.

Electron binding energy, also called ionization potential, is the energy required to remove an electron from an atom, a molecule, or an ion.

#### IONIZATION

process by which electrically neutral atoms or molecules are converted to electrically charged atoms or molecules (ions) through gaining or losing electrons.

#### RADIATION

Radiation is energy that moves from one place to another in a form that can be described as waves or particles.

There are two kinds of radiation: non-ionizing radiation and ionizing radiation. Non-ionizing radiation has enough energy to move atoms in a molecule around or cause them to vibrate, but not enough to remove electrons from atoms. Examples of this kind of radiation are radio waves, visible light and microwaves.



Particle radiation is the radiation of energy by means of fast-moving subatomic particles. Particle radiation is referred to as a particle beam if the particles are all moving in the same direction, similar to a light beam.

There are four major types of radiation: alpha, beta, neutrons, and electromagnetic waves such as gamma rays.

Electromagnetic radiation is a form of energy that propagates as both electrical and magnetic waves traveling in packets of energy called photons.

WAVE CONCEPT OF EMR : A changing magnetic field will induce a changing electric field and vice-versa—the two are linked. These changing fields form electromagnetic waves. Electromagnetic waves differ from mechanical waves in that they do not require a medium to propagate.

As a wave, it is represented by velocity, wavelength, and frequency.

PARTICLE CONCEPT OF EMR : Light is an EM wave since the speed of EM waves is the same as the speed of light.

As a particle, EM is represented as a photon, which transports energy.

WHAT IS ELECTROMAGNETIC SPECTRUM



**Types of Electromagnetic Radiation** 

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