

Properties of Electromagnetic Radiation

Electromagnetic radiation is a form of energy propagated in the form of electromagnetic waves. The important properties are given below:

1. Electromagnetic radiation consists of time varying electric field and magnetic field, which are mutually perpendicular to each other and also perpendicular to the direction of propagation.
2. Electromagnetic waves are transverse in nature and hence they can exhibit polarization.
3. Electromagnetic radiation does not require any material medium for its propagation and can travel through vacuum.
4. All electromagnetic waves propagate in vacuum with the same velocity, known as the velocity of light,

$$C=3 \times 10^8 \text{ m/s}$$

5. In a material medium, the velocity of electromagnetic radiation depends on the refractive index of the medium and is less than that in vacuum.
6. The electric field intensity E and magnetic field intensity B are related by
$$E = cB$$
7. Electromagnetic radiation carries energy and momentum, and the flow of energy is given by the Poynting vector.
8. Electromagnetic waves exert radiation pressure when incident on a surface due to the transfer of momentum.
9. Electromagnetic radiation exhibits wave–particle duality.
10. The energy of a photon is directly proportional to its frequency and is given by $E = h\nu$

11. Electromagnetic radiation covers a wide range of wavelengths and frequencies called the electromagnetic spectrum, extending from radio waves to gamma rays.
12. Electromagnetic radiation can undergo reflection, refraction, diffraction, interference and scattering.
13. High-frequency electromagnetic radiation such as X-rays and gamma rays has ionizing power.

