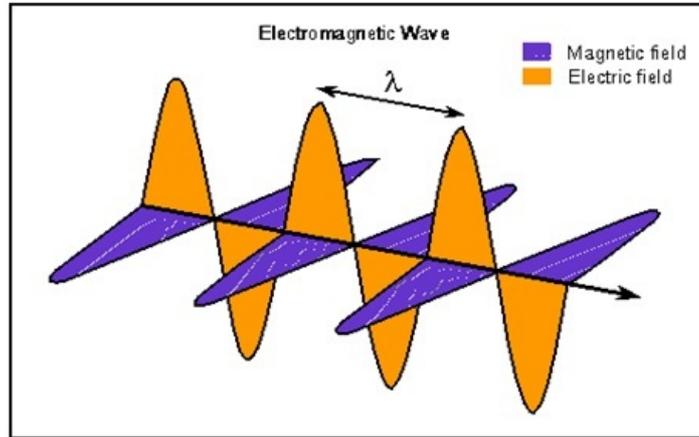


# ELECTRO-MAGNETIC RADIATION

Previous chapter: 5. RADIATION

**Electro-magnetic radiation** is, in terms of classical theory, **the flow of energy at the universal speed of light** through free space or through a material medium in the form of the electric and magnetic fields that make up electromagnetic waves such as radio waves, visible light, and gamma rays. In such a wave, time-varying electric and magnetic fields are mutually linked with each other at right angles and perpendicular to the direction of motion. An electro-magnetic wave is characterized by its intensity and the frequency  $\nu$  of the time variation of the electric and magnetic fields.



In terms of the modern quantum theory, electro-magnetic radiation is **the flow of photons** (also called light quanta) through space. Photons are packets of energy  $h\nu$  that always move with the universal speed of light. The symbol  **$h$  is Planck's constant**, while **the value of  $\nu$  is the same as that of the frequency** of the electromagnetic wave of classical theory. Photons having the same energy  $h\nu$  are all alike, and their number density corresponds to the intensity of the radiation. Electromagnetic radiation exhibits a multitude of phenomena as it interacts with charged particles in atoms, molecules, and larger objects of matter. These phenomena as well as the ways in which electromagnetic radiation is created and observed, the manner in which such radiation occurs in nature, and its technological uses depend on its frequency  $\nu$ . The spectrum of frequencies of electromagnetic radiation extends from very low values over the range of radio waves, television waves, and microwaves to visible light and beyond to the substantially higher values of UV light, X rays, and gamma rays.

Next chapter: 5.1.1 Magnetic Spectrum  
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