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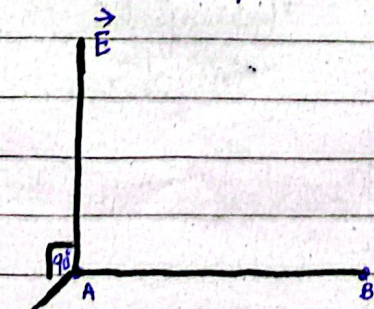
Batch no: 410

Question No1Answer No1Electromagnetic radiation (EMC)Introduction

It is the form of energy which travel from one object to another object with the speed of light ($3 \times 10^8 \text{ m/s}$) in a vacuum in a form of electromagnetic waves. These waves consist of oscillating electric magnetic field. ~~that makes~~ Electromagnetic radiation plays a crucial role in various natural processes and is also used in many technologies that are part of modern life.

Nature of electromagnetic waves

These waves does not required a medium and can propagate through a vacuum. It consists of oscillating electric and magnetic field that are perpendicular to each other and to the direction of wave travel.



So, we can say that $\vec{E} \perp \vec{B}$

Electromagnetic wave spectrum

Electromagnetic radiation is classified based on wavelength or frequency in several categories, collectively forming the electromagnetic spectrum.

Name	Wavelength	Frequency
(i) Radio waves	10^3	10^1
(ii) Micro waves	10^{-2}	10^8
(iii) Infrared waves radiation	10^{-5}	10^{12}
(iv) Visible light	0.5×10^{-6}	10^{15}
(v) Ultraviolet radiation	10^{-8}	10^{16}
(vi) X-rays	10^{-10}	10^{18}
(vii) Gamma rays	10^{-12}	10^{20}

The energy carried by electromagnetic radiation depends on the frequency and wavelength of the wave.

High frequency waves, such as X-rays and gamma rays, carry more energy, which makes them capable of penetrating matter and causing ionization. Similarly, low-frequency waves such as radio waves carry less energy and having longer wave length, which are not harmful for human beings and are controllable waves.

Applications of electromagnetic radiation:

Electromagnetic radiation (EMR) plays a vital role in numerous

applications that impact our daily lives and drive technological advancements across various fields. Some of them are given below.

(i) **Radio waves:** Radio waves have long wavelengths and are primarily used for communication such as in radio, wifi ~~etc~~ and mobile phones etc..

(ii) **Micro waves:** Micro waves have shorter wavelength than radio waves. They were widely used in several technologies like in cooking or baking of foods in microwave ovens, radar system for navigation and tracking.

(iii) **Infrared radiation:** Infrared radiation is known for its heat properties, and has several important applications such as thermal imaging (night vision, firefighting and military purpose such as detecting speed, size and location of an object), remot controls and heating purposes.

(iv) **Visible light** It is the only part of electromagnetic spectrum, which human eye can perceive. Such as visible light help us to interact with environment, medical purposes, light bulb etc.

- (v) Ultra violet radiation: UV radiation has higher energy than visible light and it is commonly used in sterilization and disinfection ~~also~~ (water purification, air sterilization and disinfect surfaces in medical and food industries), tanning bed etc.
- (vi) X-rays: X-rays have high energy and are widely used in medical imaging (X-rays to detect human organs, MRI, ultrasound) and for security purpose in airports to scan luggages and detect concealed objects.
- (vii) Gamma rays: It has shortest wavelengths and highest energy, which are primarily used in cancer treatment, medical purpose and in industrial testing purposes.

Conclusion

These are the electromagnatic spectrum from which human beings can study to get and explore the universe. It is essential for humans to study these in a scientific manner to contribute innovative ideas and advancements that benefit the world.