ANSWERS Assignment 2

1 MARK QUESTIONS

1. (d) 2. (a) 3. (d) 4. (d)

5.Infrared waves are known as heat waves because they produce heat.

When Electromagnetic waves hit body the mass is lost by the momentum is conserved that is transferred from Electromagnetic waves to the body.

ASSERTION REASON BASED QUESTIONS

6.B 7.B 8.B

CASE STUDY BASED QUESTIONS

9.(I)(b) 54MHz to 890 MHz

(II)(d) microwave oven

(III)(d) 700 – 400 nm

(IV) refer study material/Ncert

(V) The very harmful ultraviolet rays coming from the sun are absorbed by the ozone layer in the atmosphere which is at an altitude of 40 – 50 km from the earth's surface. And due to which very less ultraviolet light rays from the sun reach the earth. Ultraviolet rays are very harmful to humans which may cause skin cancer. In this way, the ozone layer in the atmosphere plays a very protective role.

2 MARKS QUESTIONS

10. Infrared red waves are the waves which are having frequency lower than the frequency of visible light range. This infrared wave causes the electrons, whole atoms or molecules also of that material. Due to such increased vibrations the internal energy of the material gets increased and thereby increases in the temperature of the material and heat is generated. Because of this reason infrared waves are also called the heat waves.

Visible rays come next to infrared radiation in electromagnetic spectrum having shorter wavelength.

The radiations next to infrared radiations, having longer wavelengths will be microwaves

11. As we know that, the direction of electromagnetic wave is perpendicular to both electric and magnetic fields. Here, electromagnetic wave is travelling in z-direction, then electric and magnetic fields are in xy-direction and are perpendicular to each other. Frequency of waves, n = 30 MHz = 30 X 10^6 Hz Speed, c = 3X10^8 m/s Using the formula, c = n.λ Wavelength of electromagnetic

waves, $\lambda = c/n = (3x10^8)/(30 x10^6) = 10$ m Thus, the wavelength of electromagnetic waves is 10 m.

12.(a)(i)Microwaves range-1GHz-2GHz (ii)UV rays-range 10^{15}-10^{17} Hz

(b) $U_E = \mathbf{1/2}\in_o \boldsymbol{E}^2$ $U_B = B^2/2$; $\mathbf{c} = 1/\sqrt{\mu_o \in_o}$

E=BC ; Thus ,$U_E = \mathbf{1/2}\in_o (BC)^2 = B^2/2\ \mu_o$

3 MARKS QUESTIONS

13.(i) Consider a plane perpendicular to the direction of propagation of the wave. An electric charge, on the plane will be set in motion by the electric and magnetic fields of EM wave, incident on this plane. This is only possible, if EM wave constitutes momentum and energy. Thus, this illustrates that EM waves carry energy and momentum.

(ii) Microwaves are produced by special vacuum tube like the klystron, magnetron and Gunn diode. The frequency of microwaves is selected to match the resonant frequency of water molecules, so that energy is transformed efficiently to increase the kinetic energy of the molecules. Thus, facilitating the food to cook properly.

(iii) Uses of infrared rays (a) In knowing the molecular structure and therapy to heal muscular pain. (b) In remote control of TV, VCR, etc.

14. **Microwave** It is produced by special vacuum tubes such as klystron, magnetron and gun diode. The frequency range of microwaves is 10^9 Hz to 10^{11}Hz. These waves undergoes reflection can be polarized. It is used in radar system for aircraft navigation, speed of the vehicle, microwave over for cooking and very long distance wireless communication through satellite.

- **X-Ray** It is produced when there is sudden stopping of high-speed electrons at high atomic number target, and also by electronic transitions among the innermost orbits of atoms. The frequency range of X-rays is from 10^{17} Hz to 10^{19} Hz. X-rays have more penetrating power than ultraviolet radiation. X-rays are used extensively in studying structures of inner atomic electron shells and crystal structures. It is used in detecting fractures, diseased organs, formation of bones and stones, observing the progress of healing bones. Further, in a finished metal product, it is used to detect faults, cracks, flaws and holes.
- **Radio Waves** They are produced by accelerated motion of charges in conducting wires. The frequency range is from a few Hz to 109 Hz. They show reflection and diffraction

15.(i) The decreasing order of wavelengths of electromagnetic waves is Microwaves > Infrared > Ultraviolet radiation > γ -rays (ii) Microwaves -They are used in RADAR devices. γ -rays- It is used in radio therapy.

16. Refer study material

17.Refer study material