

## Assignment 1 -ANSWER KEY

### 1 MARK QUESTIONS

1. The current which comes into play in the region in which the electric field (or electric flux) is changing with time is called displacement current.

$$I_d = \epsilon_0 d\phi_E / dt$$

2. The accelerated charge produces the electromagnetic waves. They have the transverse nature. The electromagnetic waves are a non-mechanical wave which moves with speed equals to the speed of light.

3. Whenever changing the electric flux ( $\Phi_E$ ) in the region encircled by loop, then magnetic field is induced.

4(c)

5. (b)

6 (c)

7. Light waves are electromagnetic in nature. They do not require a material medium for propagation. So, the light can travel in vacuum. On the other hand, sound waves require a material medium for propagation. They are mechanical waves and cannot travel in vacuum.

8. Yes, displacement current is also a source of magnetic field like the conduction current .

9. LASER-Light amplification by stimulated emission of radiation

RADAR-Radio detection and ranging.

10. (iv) Both electric and magnetic field vectors are parallel to each other.

11. Yes, EM waves carry both energy and momentum.

12. (a) X rays - used in in detection of fractures in bones.

(b) Gamma rays- used in radio therapy for treatment of cancer.

13. UV rays

14. Refer Ncert

### ASSERTION REASON BASED QUESTIONS

15. (a)

16. (c)

17.(b)

## CASE STUDY BASED QUESTIONS

18. (I)B                                      (II)B                                      (III) C                                      (IV) B                                      (V) A

### 2 MARKS QUESTIONS

19. In a microwave oven, the frequency of microwaves is selected to match the resonance frequency of water molecules, so that the energy from the waves is transferred efficiently to the kinetic energy of the molecules. This raises the temperature of any food containing water. (a) The atoms of the metallic container are set into forced vibrations by the microwaves. Due to this, energy of the microwaves is not efficiently transferred to the metallic container. Owing to this, food in metallic containers cannot be cooked in a microwave oven.

(b) The molecules of the glass container do not respond to the frequency of microwaves. Due to this, energy from the microwaves is not transferred to the glass container and hence it does not get hot in a microwave oven.

20.  $\lambda_1$  - Microwave

$\lambda_2$  - ultraviolet

$\lambda_3$  - infrared

Ascending order -  $\lambda_2 < \lambda_3 < \lambda_1$

### 3 MARKS QUESTIONS

21. IR radiation • It is used in infrared photography • TV remote as a signal carrier • Heat therapy for muscular pain or sprain.

Microwaves • It is used in Radio and Television communication system • It is used in cellular phones (Voice communication)

UV radiation • It is used to destroy bacteria in sterilizing the surgical instruments. • It is used in Burglar alarm • It is used to detect the invisible writing, finger prints.

22. Refer notes of study material/Ncert

23.(i) Microwaves are suitable for RADAR systems that are used in aircraft navigation. These rays are produced by special vacuum tubes, namely klystrons and magnetron diodes. (ii) Infrared rays are used to treat muscular strain. These rays are produced by hot bodies and molecules.

(iii) X-rays are used as a diagnostic tool in medicine. These rays are produced, when high energy electrons are stopped suddenly on a metal of high atomic number.