



Case Based Questions

Q.No.1: Attempt any 4 sub parts from the following question. Each sub part carries 1 mark.

The phenomenon of making a region free from any electric field is called electrostatic shielding. It has got a variety of applications. One such is During the lightning thunderstorm, it is advised to stay inside the car and not under trees or in the open ground because the outer metallic body of the car acts as an electromagnetic shield from the lightning.

- (i) The total charge inside a conductor is
 - (a) Non-zero
 - (b) Zero
 - (c) Depends on the electric field
 - (d) Depends on the electric field present inside the conductor.
- (ii) Electric field lines
 - (a) are always perpendicular to the surface of a conductor
 - (b) are always along the tangential direction to the conductor
 - (c) are always zero inside the conductor
 - (d) None of the above
- (iii) The first step involved in using Gauss's law is
 - (a) Choose a closed Gaussian surface
 - (b) Calculate the electric field
 - (c) Estimate the size of the surface
 - (d) None of the above
- (iv) The amount of flux moving radially outward depends on
 - (a) Surface area of the gaussian surface
 - (b) Charge present inside the gaussian surface
 - (c) Both the above
 - (d) None of the above
- (v) A point charge of $2\mu C$ is placed at center of Faraday cage in the shape of a cube with a surface of 9 cm edge. The number of electric field lines passing through the cube normally will be
 - (a) $2.25 \times 10^5 \text{ Nm}^2/C$
 - (b) $2.50 \times 10^5 \text{ Nm}^2/C$
 - (c) $2.25 \text{ Nm}^2/C$
 - (d) none of the above

Q.No.2: Attempt any 4 sub parts from the following question. Each sub part carries 1 mark.

Total internal reflection has various applications in daily life be it the sparkling of diamond or the formation of mirage. All the phenomena can be explained on the basis of total internal reflection only. The common thing about all the phenomena is the critical angle.

(i) The relationship between the critical angle and the refractive index is given by

(a) $\mu = \sin i_c$

(b) $\mu = \frac{1}{\sin i_c}$

(c) $\sqrt{\mu} = \sin i_c$

(d) $\mu = \sqrt{\frac{1}{\sin i_c}}$

(ii) The necessary condition for total internal reflection is that the light should be incident on the surface of

- (a) Rarer to denser medium
- (b) Denser to Rarer medium
- (c) Both the above
- (d) None of the above

(iii) The outer concentric shell in fiber optic is called

- (a) cladding
- (b) core
- (c) coat
- (d) mantle

(iv) In case of an optical fiber the core has the material of refractive index n_1 and the cladding has the refractive index as n_2 . which of the following gives the correct relationship between n_1 and n_2

- (a) $n_1 > n_2$
- (b) $n_1 = n_2$
- (c) $n_1 < n_2$
- (d) Both (b) and (c)

(v) A fish looks from the bottom of the fish tank up at the surface of the water. If the minimum angle to the vertical resulting in total internal reflection is 25° . What is the index of refraction of water in the tank

- (a) 2.37
- (b) 1.90
- (c) 0.49
- (d) 1.12

Q.No.3:

Attempt any 4 sub parts from the following question. Each sub part carries 1 mark.

A soap bubble when seen on bright daylight is seen to exhibit different colors. This is predominantly due to the interference of white light. This naturally occurring phenomenon is called as interference in thin films.

(i) The necessary condition for the interference of light is that

- (a) The two sources must be Coherent
- (b) The two sources must be in the same direction.
- (c) The two sources must be perpendicular to each other
- (d) None of the above

(ii) Coherent sources are the one which

- (a) Originates from the same source
- (b) Originates from different source
- (c) Terminates at the same point
- (d) None of the above

(iii) The main principle used in Interference is

- (a) Heisenberg's Uncertainty Principle
- (b) Superposition Principle
- (c) Quantum Mechanics
- (d) Fermi Principle

(iv) When Two waves of the same amplitude add constructively, the intensity becomes

- (a) Double
- (b) Half
- (c) Four Times
- (d) One-Fourth

(v) The shape of the interference pattern depends on the

- (a) Distance between the slits
- (b) Distance between the slits and the screen
- (c) Wavelength of light
- (d) Shape of the slit