



# All 'Bout Physics

(Youtube channel)

MODEL QUARTERLY EXAM - SEP 2022

STD: XII

Max. Marks: 70

Subject: PHYSICS

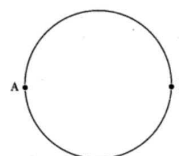
Time: 3:00 Hrs

## PART-I

Answer all the questions.

(15 × 1 = 15)

- Which is scalar quantity  
(a). Electric field (b). Electric flux (c). dipole moment (d). Momentum
- If the voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion.  
(a). Q remains the same, C is doubled (b). Q is doubled, C doubled  
(c). C remains the same, Q doubled (d). Both Q and C remain same
- Rainbow is formed due to which of the following?  
(a). By scattering of sunlight through water droplets present in the atmosphere.  
(b). By dispersion of sunlight through water droplets present in the atmosphere  
(c). By reflection of sunlight through water droplets present in the atmosphere  
(d). None of the above
- Two coherent monochromatic light beams of intensities I and 4I are superposed. The maximum and minimum possible intensities in the resulting beam are  
(a). 5I and I (b). 5I and 3I (c). 9I and I (d). 9I and 3I
- The speed of light in an isotropic medium depends on,  
(a). it's intensity (b). it's wavelength  
(c). the nature of propagation (d). It's direction of propagation
- In a Young's double-slit experiment, the slit separation is doubled. To maintain the same fringe spacing on the screen, the screen-to-slit distance D must be changed to,  
(a). 2D (b). D/2 (c).  $\sqrt{2}D$  (d).  $D/\sqrt{2}$
- A wire of resistance 2 ohms per meter is bent to form a circle of radius 1m. The equivalent resistance between its two diametrically opposite points, A and B as shown in the figure is  
(a).  $\pi \Omega$  (b).  $\pi/2 \Omega$ . (c).  $2\pi \Omega$  (d).  $\pi/4$
- A toaster operating at 240 V has a resistance of 120  $\Omega$ . The power is  
(a) 400 W (b) 440 W (c) 480 W (d) 240 W
- The circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is  
(a) 1.0 amp – m<sup>2</sup> (b) 1.2 amp – m<sup>2</sup>  
(c) 0.5 amp – m<sup>2</sup> (d) 0.8 amp – m<sup>2</sup>



10. The force experienced by a particle having mass  $m$  and charge  $q$  accelerated through a potential difference  $V$  when it is kept under perpendicular magnetic field  $B$  is
- (a).  $\sqrt{\frac{2q^3BV}{m}}$  (b).  $\sqrt{\frac{q^3B^2V}{2m}}$  (c).  $\sqrt{\frac{2q^3B^2V}{m}}$  (d).  $\sqrt{\frac{2q^3BV}{m^3}}$
11. Which of the following electromagnetic radiations is used for viewing objects through haze fog  
(a). Infrared (b). microwave (c). gamma rays (d). X-rays
12. The dimension of  $\frac{1}{\mu_0\epsilon_0}$   
(a).  $[LT^{-1}]$  (b).  $[L^2T^{-2}]$  (c).  $[L^{-1}T]$  (d).  $[L^{-2}T^2]$
13. In an oscillating LC circuit, the maximum charge on the capacitor is  $Q$ . The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is  
(a)  $\frac{Q}{2}$  (b)  $\frac{Q}{\sqrt{2}}$  (c).  $\frac{Q}{\sqrt{3}}$  (d).  $\frac{Q}{3}$
14. A circular coil with a cross-sectional area of  $4 \text{ cm}^2$  has 10 turns. It is placed at the centre of a long solenoid that has 15 turns/cm and a cross-sectional area  $10 \text{ cm}^2$ . The axis of the coil coincides with the axis of the solenoid. What is their mutual inductance?  
(a).  $7.54 \text{ uH}$  (b).  $8.54 \text{ uH}$  (c).  $9.54 \text{ uH}$  (d).  $10.54 \text{ uH}$
15. In an AC circuit containing only inductor, current  
(a). leads the voltage by  $\pi/2$  (b). leads the voltage by  $\pi$   
(c). lags the voltage by  $\pi/2$  (d). zero

## PART-II

**Answer any six questions. Question number 24 is compulsory.  $(6 \times 2 = 12)$**

16. The electric field lines never intersect. Justify.
17. State Snell's law/law of refraction.
18. Mention the differences between interference and diffraction.
19. Define ampere.
20. State Lenz's law.
21. Give two uses of IR radiation.
22. What is meant by wattless current?
23. A cell supplies a current of  $0.9 \text{ A}$  through a  $2\Omega$  resistor and a current of  $0.3 \text{ A}$  through a  $7\Omega$  resistor. The internal resistance of the cell is
24. **Light travelling through transparent oil enters in to glass of refractive index 1.5. If the refractive index of glass with respect to the oil is 1.25, what is the refractive index of the oil?**

**PART - III****Answer any six questions. Question number 33 is compulsory. ( $6 \times 3 = 18$ )**

25. What are Fraunhofer lines? How are they useful in the identification of elements present in the Sun?
26. How will you induce an emf by changing the area enclosed by the coil?
27. Discuss briefly the basic properties of electric charges.
28. Derive the relation between  $f$  and  $R$  for a spherical mirror.
29. Explain the conversion of galvanometer into voltmeter.
30. Calculate the electric flux through the rectangle of sides 5cm and 10cm kept in the region of a uniform electric field  $100 \text{ NC}^{-1}$ . The angle  $\theta$  is  $60^\circ$ .  
What is the electric flux?
31. State Kirchhoff's current & voltage rule.
32. What is Fresnel's distance? Obtain the equation for Fresnel's distance.
- 33. An ideal transformer has 460 and 40,000 turns in the primary and secondary coils respectively. Find the voltage developed per turn of the secondary if the transformer is connected to a 230 V AC mains. The secondary is given to a load of resistance  $10^4 \Omega$ . Calculate the power delivered to the load.**

**PART - IV****Answer all questions. Draw diagrams wherever necessary. ( $5 \times 5 = 25$ )**

34. (a). Derive an expression for electrostatic potential due to an electric dipole.  
[OR]  
(b). Discuss the working of cyclotron in detail.
35. (a). Obtain the condition for bridge balance in Wheatstone bridge.  
[OR]  
(b). Obtain the equation for Path difference and band width in Young's double slit experiment.
36. (a). Derive the expression for resultant capacitance, when capacitors are connected in series and in parallel.  
[OR]  
(b). Derive the mirror equation and the equation for lateral magnification.
37. (a). Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.  
[OR]  
(b). Write down the Maxwell equations in integral form.

38. (a). Explain the construction and working of the transformer.

[OR]

(b). Deduce the relation for the magnetic induction at a point due to an infinitely long straight conductor carrying current.

*All the very best*

With regards,

**K. V. HARI KRISHNA M.Sc., M.Phil., B.Ed.,**

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