

TANYA WADHWA

Bhathnagar Int. Schol.

PHYSICS - Term 1

CODE - 042 (S) A

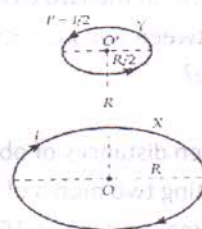
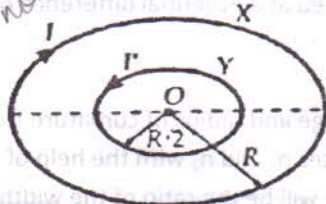
General Instructions

- Qns. 1 - 5 one mark each
- Qns. 6 - 10 two marks each
- Qns. 11 - 22 three marks each
- Qns. 23 four marks
- Qns. 24 - 26 five marks each

2) Define 1 Farad
 ✓ Draw equipotential surface for point & line charge

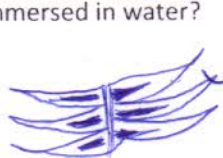
- 1) What is the value of critical angle for a material of refractive index $\sqrt{2}$?
- 2) Which special characteristic of light is demonstrated only by the phenomenon of polarisation?
- 3) In which position is the potential energy of a magnet kept in a uniform magnetic field (a) zero (b) minimum?
- 4) A certain potential difference V is applied across a conductor of length l . If V is doubled and l is halved, what happens to its drift velocity?
- 5) A proton is placed in a uniform electric field directed along the positive X axis. In which direction will it tend to move?
- 6) A convex lens made up of glass of refractive index 1.5 is dipped in turn in (i) a medium of μ 1.61 (ii) a medium of μ 1.33. Will it behave as a diverging or converging lens in the two cases? How will the power change in the two media?
- 7) Using Huygens's principle explain Snell's law of refraction.
- 8) Draw graphs showing the variation of inductive reactance and capacitive reactance with frequency of applied alternating current.
- 9) State the factors on which the induced emf in a coil rotating in a uniform magnetic field depends.
- 10) Compare the variation of intensity of magnetisation with applied magnetic field for a paramagnetic and a diamagnetic material by drawing graphs.
- 11) State Gauss's law. Using the law, prove that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it.
- 12) Using Ampere's circuital law, derive an expression for the magnetic field due to a long solenoid at a point inside the solenoid on its axis.
- 13) A galvanometer can be converted into a voltmeter of a certain range by connecting a resistance of 980Ω in series with it. When a resistance of 470Ω is connected in series, the range is halved. Find the resistance of the galvanometer.
- 14) a) Two circular coils X and Y are placed in a horizontal plane with their centres coinciding with each other as shown. What must be the value of current I in coil Y to make the total magnetic field at the common centre of the two coils, zero?
 b) With the same currents flowing in the two coils, if the coil Y is now lifted vertically upwards through a distance R , what would be the net magnetic field at the centre of coil Y ?

$R \rightarrow D$ away from normal



- 15) Draw a labelled ray diagram of astronomical telescope in the near point position. Write the expression for its magnifying power.
- 16) What is the effect on the interference fringes in YDSE when
 - a) screen is moved away from the plane of the slits?
 - b) Separation between the slits is halved?
 - c) The apparatus is immersed in water?

$I = neAv_d$



16) what is hysteresis, draw a labelled graph & explain

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17) Deduce the conditions for constructive and destructive interference in YDSE.

OR

State the condition for diffraction of light to occur. In the single slit diffraction experiment how would the width and intensity of central maximum change if

- (a) red light is used instead of blue light.
- (b) slit width is increased.

18) When an inductor L and resistance R in series are connected across 12 V, 50 Hz supply, a current of 0.5A flows in the circuit. The current differs in phase from applied voltage by $\pi/3$ radian. Calculate the value of R.

19) Establish the relationship between 'average value' and 'peak value' of an a.c.

20) A cell of emf 4.2 V and internal resistance r is connected to two external resistances R_1 and R_2 . The current in the circuit is measured in four different situations (i) without external resistances (ii) with R_1 only (iii) with R_1 and R_2 in series (iv) with R_1 and R_2 in parallel. Currents measured are 0.42 A, 4.2 A, 1.05 A and 1.4 A, but not necessarily in that order. Identify the currents corresponding to the four cases and calculate r, R_1 and R_2 .

21) In a potentiometer arrangement a cell of 1.2 v gives a balance point at 30 cm length of the wire. The cell is now replaced by another cell of emf E. the ratio of emf of two cells is 1.5. Calculate the difference in balancing lengths in the two cases.

22) E.M waves with wavelength

- λ_1 is used in satellite communication
- λ_2 is used to kill germs in water purifier
- λ_3 is used to take photographs in foggy weather
- λ_4 is used to detect leakage of oil in underground pipelines

Name the part of E.M spectrum to which these radiations belong. Also arrange the wavelengths in ascending order of their magnitude.

$$\xi = I(R + r)$$

$$\frac{180}{3} = 60^\circ$$

$\lambda_1 < \lambda_2 < \lambda_3 < \lambda_4$

23) At an airport Seema and her aunt were asked to walk through a doorway for security reasons. A beep sound was heard when Seema's aunt passed through it because she wore a gold chain. Seeing her aunt panic, Seema consoled her and explained the need for security check. She also gave her the reason for the beep. What two values are shown by Seema? On what principle does a metal detector work? Explain.

24) (A) Derive an expression for the electric field intensity and electric potential, due to an electric dipole at a point on the equatorial line.

(B) The net capacitance of three identical capacitors connected in series is $1\mu\text{F}$. What is their net capacitance if connected in parallel?

OR

(A) Two metal plates form a parallel plate capacitor of capacitance C. The distance between the plates is d.

- (i) A metal sheet of thickness $d/2$ and of same area is inserted between the plates. What is the ratio of capacitances in the two cases?
- (ii) A sheet of dielectric constant κ , thickness $d/2$ and of same area is inserted between the plates. What is the ratio of capacitances in the two cases?

(B) A charge of $2C$ moves between two points maintained at a potential difference of 1V. What is the energy acquired by the charge?

25) (A) Obtain a relation between distances of object, image and radius of curvature from the central point of a spherical surface separating two media of ref. indices n_1 and n_2 with the help of a suitable ray diagram.

(B) The ratio of intensity at max and min is 16:9. What will be the ratio of the widths of the two slits in YDSE?

OR

(A) Deduce the expression for the refractive index of glass in terms of angle of the prism and angle of minimum deviation.

(B) Determine the angular separation between central maximum and first order maximum of diffraction pattern due to a single slit of width 0.25 mm when light of wavelength 5890 \AA is incident on it normally.

~~Handwritten scribbles and a box containing $I = I_m \sin \omega t$~~

$\lambda_m = \lambda n$

Handwritten notes at the bottom of the page.

5 } 26) (A) Derive an expression for the average power consumed in a series LCR circuit in which the phase difference between V and I is ϕ .

(B) A coil of wire of certain radius has 600 turns and a self-inductance of 108 mH. What will be the self-inductance of another coil with 500 turns?

OR

(A) Deduce an expression for the ratio of secondary voltage to primary voltage in terms of number of turns in the two coils. How is this ratio related to currents in the two coils in an ideal transformer?

(B) An armature coil consists of 20 turns of wire, each of area = 0.09m^2 and total resistance $15.0\ \Omega$. It rotates in a magnetic field of $0.5\ \text{T}$ at a constant frequency of $150/\pi\ \text{Hz}$. Calculate the value of maximum induced emf produced in the coil.

✓ A) Metre Bridge exp. Principle & working

25) B) what is sustain interference, give conditions for sustain interference