

ANITY, PV

First Terminal Examination 2015 - 2016

Class - XII
Subject - Physics

PRANAV
BATRA

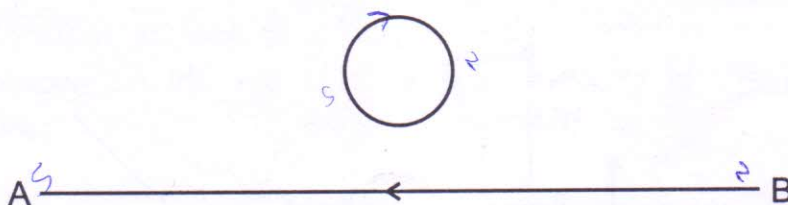
Time : 3 Hours

Max. Marks : 70

General Instructions :

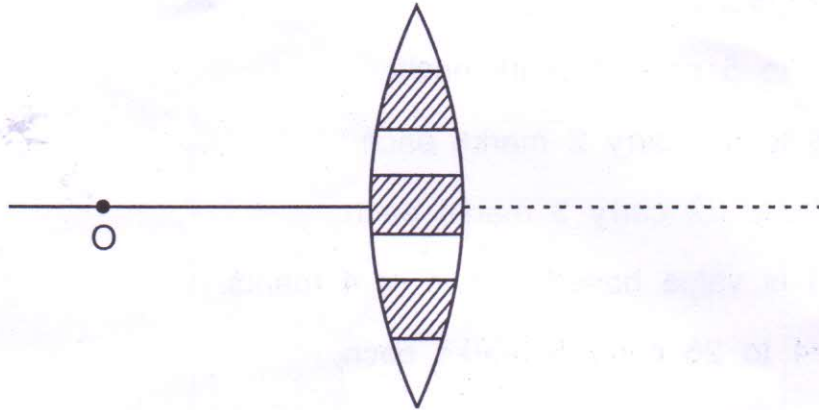
1. Questions 1 to 5 carry 1 mark each.
2. Questions 6 to 10 carry 2 marks each.
3. Questions 11 to 22 carry 3 marks each.
4. Question 23 is value based and is of 4 marks.
5. Questions 24 to 26 carry 5 marks each.
6. All questions are compulsory.

1. Using the concept of force between two infinitely long parallel current carrying conductors, define one ampere of current. $F = 2 \times 10^{-7} \text{ N}$
2. Two equal balls having equal positive charge 'q' coulombs are suspended by two insulating strings of equal length. What would be the effect on the force when a plastic sheet is inserted between the two?
3. The electric current flowing in a wire in the direction from B to A is decreasing. Find out the direction of the induced current in the metallic loop kept above the wires as shown. *clockwise*



4. Two wires one of manganin and other of copper have equal length and equal resistance. Which one of these wires will be thicker? $R = \rho \frac{l}{A}$ $A = \frac{\rho l}{R}$
5. Will the focal length of a lens for red light be more, same or less than that for the blue light?
6. Sketch a graph showing variation of reactance of :
 - (a) A capacitor
 - (b) Inductor with frequency of the applied voltage

7. The lens shown in the figure below is made of two different transparent materials. A point of object 'O' is placed on its axis. How many images of the object will be formed? Explain with ray diagram. *(3 marks)*

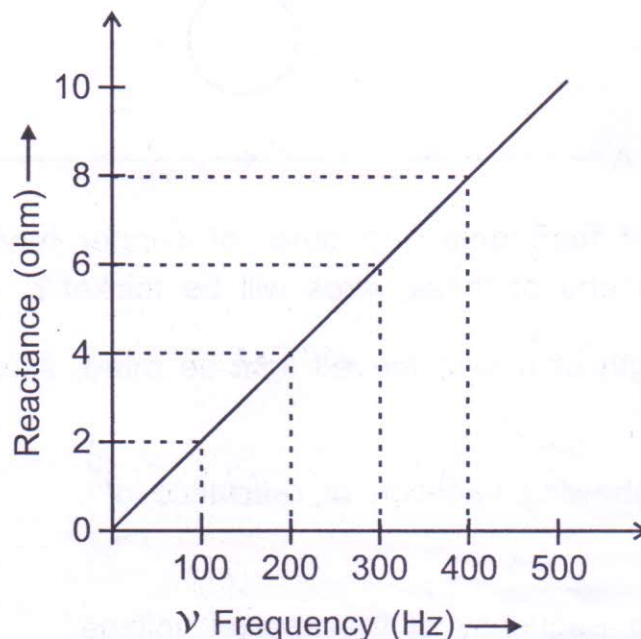


8. Define current sensitivity of a galvanometer. Write its SI unit.
9. Two 120 V light bulbs, one of 25 W and other of 200 W were connected in series across a 240 V line. One bulb burnt out almost instantaneously. Which one was burnt and why?

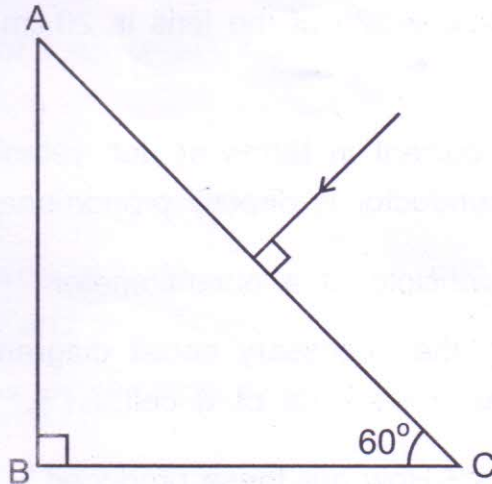
$$P = VI$$

$$\frac{25}{120} = I$$

$$\frac{200}{120} = I$$
10. What are the factors on which the capacity of a parallel plate capacitor with dielectric depends? *Amount of dielectric, ϵ_r , thickness of dielectric, dist. b/w plates*
11. Figure given below shows how the reactance of an inductor varies with frequency. Calculate the value of the inductance of the inductor using the information given in the graph. What do you mean by reactance?

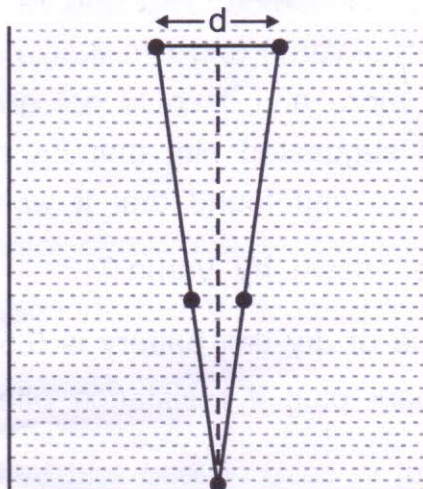


12. Trace the path of a ray of light passing through a glass prism (ABC) as shown in figure. If the refractive index of glass is $\sqrt{3}$, find out the value of the angle of emergence from the prism.



$$\frac{\mu_2 \sin i}{\mu_1 \sin r} = \frac{\mu_2 \sin i}{\mu_1 \sin r}$$

13. A circular coil of N turns and radius R carries a current I . It is unwound and rewound to make another coil of radius $\frac{R}{2}$, current I remaining same. Calculate the ratio of the magnetic moment of the new coil and the original coil.
14. Two long parallel straight wires X and Y separated by distance of 5 cm in air carry currents of 10 A and 5 A respectively in opposite direction. Calculate the magnitude and direction of the force on a 20 cm length of the wire Y .
15. A jar of height 'h' is filled with a transparent liquid of refractive index μ . At the centre of the jar on the bottom surface is a dot. Find the minimum diameter of the disc, such that when placed on the top surface symmetrically to the center, the dot is invisible.



16. Deduce lens maker formula for a thin biconvex lens. An equi-convex lens has radius of curvature 20 cm each. If $\mu = 1.5$, find its focal length.

17. The image obtained with a convex lens is erect and its length is four times the length of the object. If the focal length of the lens is 20 cm, calculate the object and image distances. $f = 20 \text{ cm}$ $m = 4$

18. Derive expression for current in terms of drift velocity of e^- . Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons.

19. State the underlying principle of a potentiometer.

Describe briefly, giving the necessary circuit diagram, how a potentiometer is used to measure the internal resistance of a cell.

20. What are eddy currents? How are these produced? In what sense are eddy currents considered undesirable in a transformer and how are these reduced in such device?

21. An inductance of 0.1 H, a resistance of 25 ohm and a capacitor of 25 mF are connected in series to an AC source whose emf is represented by the equation, $E = 310 \sin 314 t$, then calculate :

- (a) Reactance of the circuit.
- (b) Impedance of the circuit and.
- (c) The current.

22. Define the term magnetic permeability of a magnetic material. Write any two characteristic of a magnetic substance if it is to be used to make a permanent magnet. Give an example of such a material.

23. Rajeev purchased a second hand motorbike and he fixed a 6 V dry cell battery to start it but could not. His friend Varun told him that a simple 6 V battery will not work as its internal resistance is more and it could not give a desired current of 30 A to start the spark plug. Varun suggested him that he should use a lead acid battery of 6 V instead. Rajeev did so and found that it worked perfectly.

- (a) What are the qualities shown by Varun?
- (b) If the internal resistance of dry cell battery is 0.5Ω , what maximum current can be provided to the spark plug if resistance offered by spark plug is $20 \text{ m}\Omega$?
- (c) What will be the current in case of lead-acid battery if its resistance is 0.01Ω ?

24. (a) Discuss the principle and working of an AC generator. Derive relation for the emf induced.
- (b) A coil of 100 turns is rotating with a frequency of $\frac{40}{\pi}$ rpm in a magnetic field of 5 T. If the area of loop is 300 cm^2 , find the peak emf induced in it. *msr 04*

OR

- (a) Discuss the working of a transformer. *KS 600*
- (b) A transformer converts a voltage of 2200 V into 220 V. Number of turns in primary coil is 5000 and its efficiency is 90%. If output power is 8 kW, find :
- (i) Number of turns in secondary
- (ii) Input power
25. State Ampere's Circuital law. Use it to find an expression for magnetic field due to :
- (a) A long solenoid *MONI REBA*
- (b) At a point due to cylindrical conductor. *wire*
- (Discuss all cases) Draw graph between ' \vec{B} ' and 'r'. *graph*

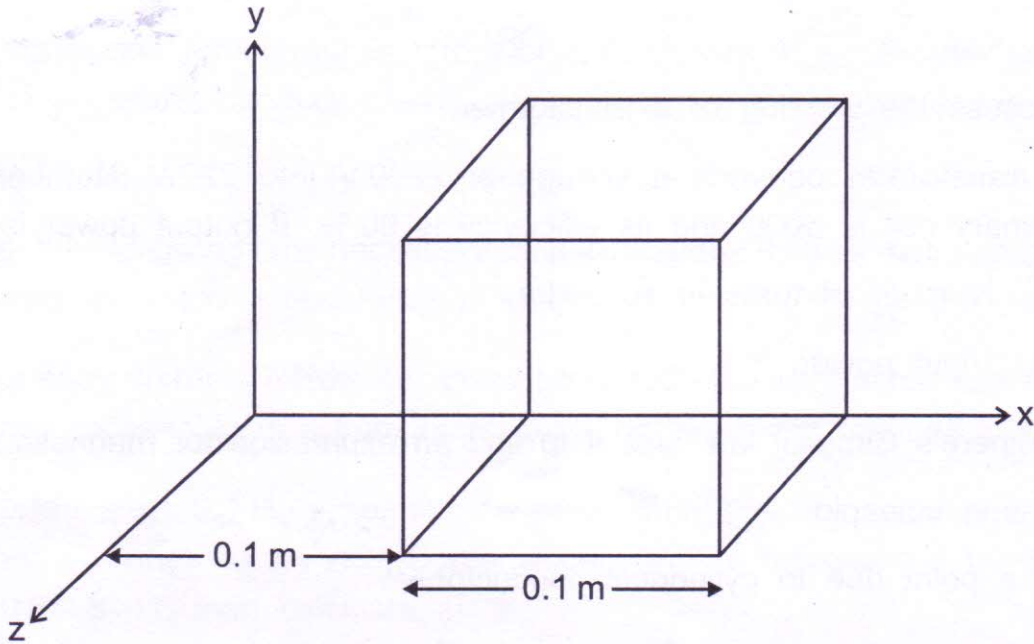
OR

- (a) Derive an expression for torque on a current carrying rectangular loop. When is this torque maximum?
- (b) A proton and an α particle having same K.E. enters normally in a ' \vec{B} '. Find ratio of the radius of path to be followed by them.
26. Derive an expression for the energy stored in a parallel plate capacitor with air as the medium between its plates. *v. do*
- Air is now replaced by a dielectric medium of dielectric constant K. How does it change the total energy of the capacitor if :
- (a) The capacitor remains connected to the same battery? *MSR 04*
- (b) The capacitor is disconnected from the battery?

OR

- (a) Define electric flux. Write its SI unit.

- (b) An electric dipole of dipole moment $20 \times 10^6 \text{ Cm}$ is enclosed by a closed surface. What is the net flux coming out of the surface?
- (c) The electric field components due to a charge inside the cube of side 0.1 m are as shown below :



$E_x = \alpha x$, where $\alpha = 500 \text{ N/C-m}$ $E_y = 0$, $E_z = 0$.

Calculate :

- (i) The flux through the cube, and
 (ii) The charge inside the cube.

$$\frac{2 \times 4 \times 10^{-7} \times 10 \times \frac{1}{\epsilon_0} \times 2 \times 10^{-2}}{2 \times 1 \times 10^{-2}} = 4 \times 10^{-5}$$

2×10^{-7}

$$\int \frac{6}{100} + \frac{2}{100}$$

$$\frac{6}{100} \Rightarrow \frac{200}{\epsilon_0}$$

$$\frac{6}{5 \times 10^{-1} + 2 \times 10^{-3}}$$

$$\frac{5}{10} + \frac{2}{100}$$

***** $\frac{50+2}{100} = \frac{52}{100}$

$$\frac{6}{100} \Rightarrow \frac{600}{52}$$