

Class: XII

Subject: Physics

Assignment No. 2

1. What are the elements of earth magnetic field at a place?
2. a) Differentiate between dia, para, ferro magnetic substance with two examples each.  
b) Draw susceptibility versus temperature graph.
3. What is displacement current? Derive its value from Maxwell – Ampere relation.
4. Draw the e.m spectrum with their frequencies. Mention two uses of each radiation.
5. If a shunt of value  $1/n$  times the galvanometer resistance applied to a moving coil galvanometer. By what factor will its current sensitivity change?
6. What is difference between electric field produced by induction and those produced by static charges?
7. A rectangular conducting loop moves horizontally in a uniform magnetic field  $B$  perpendicular to its plane: i) Will there be any induced current in the loop or any work required to move the loop if the loop is completely in the field ? ii) What if the loop is stationary and the field changes with time?
8. A metal rod 1.5 m long rotates about its one end in a vertical plane at right angles to the magnetic meridian. If the frequency is 20 rev/sec, find the emf induced between the ends of the rod.
9. The magnetic flux linked with the loop of wire of area vector  $A=30i+16j+23k$  cm is 6 micro Wb. Calculate the magnetic field acting at right angle to the plane of the loop of the wire.
10. a) Self induction is called the inertia of electricity. Explain.  
b) Give two applications of eddy current.  
c) How does the self inductance of a coil change when the number of turns in the coil is decreased and an iron rod is introduced into it? Justify your answer.
11. Find S.I of a solenoid of length 30cm, area of cross section  $3.14 \text{ cm}^2$  and number of turns /unit length 50. What happens to its value if the core is made of soft iron core?
12. A coil of number of turns  $N$ , area  $A$  is rotated at a constant angular speed  $\omega$ , in a uniform magnetic field  $B$  and connected to a resistor  $R$ . Deduce expression for i) maximum emf induced in the circuit ii) power dissipation in the coil.
13. In a certain oscillating LC circuit, the total energy is converted from electrical energy in the capacitor to magnetic energy in the inductor in  $1.50 \mu\text{sec}$ . What are the period of oscillation and the frequency of oscillation? How long after the magnetic energy is a maximum, will it be a maximum again?
14. Find the rms and average value for household voltage of peak value  $V_0$ .
15. When a lamp is connected to an alternating voltage supply, it lights with the same brightness as when connected to a 12V dc battery. What is the peak value of alternating voltage source?
16. A 60Hz ac generator operates in a series LCR circuit which has an rms current of 1A. The following rms voltages are found across the resistor, capacitor and inductor respectively,  $V_R=55V$ ,  $V_C= 32V$ ,  $V_L=48V$ . a) Determine the source voltage and the phase angle between the current and the voltage b) Determine the values of  $L$ ,  $C$  and  $R$ .
17. Obtain the resonant angular frequency  $\omega$  of a series LCR circuit with  $L=2H$ ,  $C=32\mu F$  and  $R=10\Omega$ . What is the Q-factor of this circuit?
18. For circuits used for transporting electric power, a low power factor implies large loss in transmission. Explain.

19. Power factor can often be improved by the use of a capacitor of appropriate capacitance in the circuit. Explain.
20. Suppose that the lower half of a concave mirror- reflecting surface is covered with an opaque material. What effect will this have on the image of an object placed in front of the mirror?
21. Monochromatic light falls at an angle of incidence  $i$  on a slab of a transparent material. Refractive index of this material being  $\mu$  for the given light. What should the relation between  $i$  and  $\mu$  be so that the reflected and refracted ray are mutually perpendicular?
22. Consider a ray of light passing through prism (angle  $A$ ) in the position of minimum deviation  $\delta$ . Find the angles of incidence and refraction.
23. Derive the Lens maker's for a concave lens.
24. A thin converging lens of focal length  $f$  is placed between an object and a screen fixed at a distance  $D$  apart. Show that if  $D > 4f$ , there are two positions of the lens at which a sharp image of the object is formed on the screen.
25. A thick biconvex lens  $\mu=1.5$  has a thickness 8cm and radii of its front and rear surfaces are 4cm and 5cm respectively. A point object is kept at such a distance from the front surface of the lens that a real image is formed at distance  $20/7$  from the rear surface. Find the distance of the object from the front surface.
26. Two identical but independent monochromatic sources of light cannot be coherent. Why?
27. What change in interference pattern takes place in YDSE if i) the experiment is performed under water instead of air ii) one of the slits is covered with a transparent sheet ?
28. Discuss the diffraction at single slit for situations  $\lambda < d$ ,  $\lambda < d$ ,  $\lambda = d$ ,  $\lambda > d$ .
29. A single slit is illuminated with a parallel beam of light of wavelength  $6900\text{\AA}$  diffraction pattern is obtained on a screen 1.2m from the slit. The distance between positions of zero intensity on both sides of central maxima is found to be 3.5mm. Find the width of the slit, angle of diffraction for 3<sup>rd</sup> order bright fringe, angular width of the third order fringe, assuming small angles of diffraction.
30. In USA, household power supply is done at 110 V, 60 Hz while in India the same is done at 220 V, 50 Hz. A student of science justifies it saying that the former is a developed country. Comment on his value system vis a vis scientific temper.
31. It is preferred to generate a.c at 50Hz or 60 Hz only. Why?
32. What factors decide resolving power of telescope and microscope? Which physical principle determines resolving power of optical instruments?

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