

Sample Paper – 2012
Class – XII
Subject – PHYSICS (Theory)

Time allowed: 3 hours

Maximum Marks: 70

General Instructions:

(i) All questions are compulsory..

(iii) Q.No. 1 to 8 are very short answer type questions, carrying one mark each.

(iv) Q.No numbers 9 to 18 are short answer type questions, carrying two marks each.

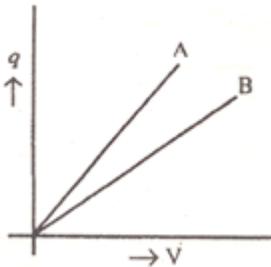
(v) Q.No. 19 to 27 are also short answer type questions, carrying three marks each.

(vi) Q.No. 28 to 30 are long answer type questions, carrying five marks each.

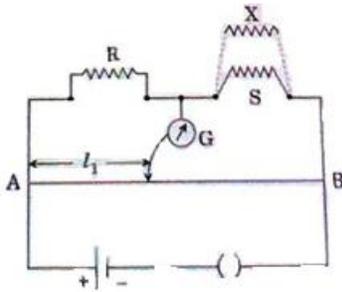
(viii) You may use the following values of physical constants wherever necessary

$c=3 \times 10^8$ m/s $h=6.6 \times 10^{-34}$ Js $e=1.6 \times 10^{-19}$ C $N_A = 6.023 \times 10^{23}$ /mole $m_n = 1.67 \times 10^{-27}$ kg $\mu_0 = 4\pi \times 10^{-7}$ T-m/A $m_e = 9 \times 10^{-31}$ kg

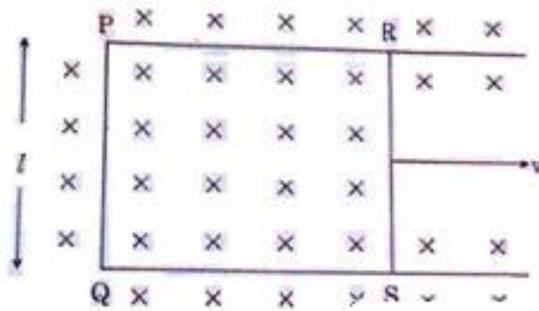
1. Why a D.C voltmeter and D.C ammeter cannot read alternating current?
2. What is the electrostatic potential due to an electric dipole at an equatorial point? Is there a electric field?
3. An electron does not suffer any deflection while passing through a region of uniform magnetic field. What is the direction of the magnetic field?
4. A convex lens is placed in water. Will the focal length change? Explain
5. The electric field between two parallel plates of capacitor changes with time, a current begins to flow in between the plates. Write the related law.
6. The stopping potential in an experiment on photoelectric effect is 1.5 V. What is the maximum kinetic energy of the photo electrons emitted?
7. When ${}_3^7\text{Li}$ is bombarded with a certain particle, two alpha particles are produced. Identify the bombarding particle.
8. Draw the diode circuit of OR gate.
9. Define electric flux. Write its SI unit. A charge q is enclosed by a spherical surface of radius R . If the radius is reduced to half, how would the electric flux through the surface change?
10. The given graph shows the variation of charge q versus potential difference V for two capacitors. The two capacitors C_1 and C_2 have same plate separation but the plate area of C_2 is double than that of C_1 . Which of the lines in the graph correspond to C_1 and C_2 and why?



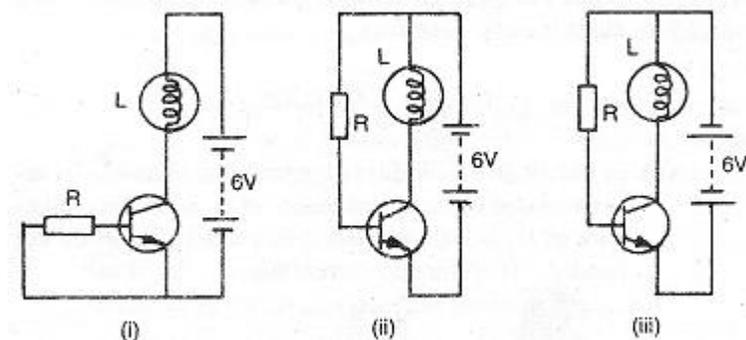
11. In a meter bridge balance point is found at a distance l_1 with resistances R and S as shown in figure. When an unknown resistance X is connected in parallel with resistance S , the balance point shifts to a distance l_2 . Find the expression for X in terms of l_1 , l_2 and S .



12. Define current sensitivity and voltage sensitivity of a galvanometer. Increasing the current sensitivity may not necessarily increase the voltage sensitivity of a galvanometer. Justify.
13. When 100 volts d.c is applied across an inductor, a current of 1A flows through it. If the same inductor is connected across 100 v a.c. source, a current reduces to 0.5 A. Why is the current reduced in later case? Calculate the reactance.
14. Write two characteristics of a transformer. Diagrammatically represent step-up and step-down transformer.
15. Name the part of the electromagnetic spectrum to which waves of wavelength (i) 1\AA and (ii) 10^{-2} belong. Using the relation $\lambda T = (0.29 \text{ cm}) K$, obtain in the characteristic Kelvin temperature corresponding to these two wavelengths. (i) X-rays, (ii) Microwaves
16. Define refractive index of a transparent medium. A ray of light passes through a triangular prism. Plot a graph showing the variation of the angle of deviation with the angle of incidence
17. A radioactive isotope has a half life of T years. How long will it take the activity to reduce to (i) 3.125 % and (ii) 1 % of its original value?
18. Write the function of (i) Transducer and (ii) Repeater in the context of communication system.
- OR**
- Why can't we transmit modulating signals using antenna? Give two practical reasons.
19. Show that an electric dipole kept in uniform electric field does not experience force but experiences a torque. Deduce an expression for torque. Draw electric lines force for an electric dipole.
- OR**
- A parallel plate capacitor is charged by a battery. After some time the battery is disconnected and a dielectric slab of dielectric constant K is inserted between the plates. How would (i) the capacitance, (ii) the electric field between the plates and (iii) the energy stored in the capacitor, be affected? Justify your answer.
20. Figure shows a rectangular conducting loop PQSR in which arm RS of length 'l' is movable. The loop is kept in a uniform magnetic field 'B' directed downward perpendicular to the plane of the loop. The arm RS is moved with a speed 'v'. (a) the emf induced across the arm RS (ii) the external force required to move the arm, and (iii) the power dissipated as heat.



21. In Young's double slit experiment, monochromatic light of wavelength 630 nm illuminates the pair of slits and produces an interference pattern in which two consecutive bright fringes are separated by 8.1 mm. Another source of monochromatic light produces the interference pattern in which the two consecutive bright fringes are separated by 7.2 mm. Find the wavelength of light from the second source. What is the effect on the interference fringes if the monochromatic source is replaced by a source of white light?
22. Define (a) work function (b) threshold wavelength (c) stopping potential. Draw the respective graphs with stopping potential.
23. (i) Draw a labeled ray diagram to show the formation of image in an astronomical telescope for a distant object
(ii) Write two distinct advantages of a reflecting type telescope over a refracting type telescope
24. On the basis of energy level diagram, identify the P-type semi conductor & N-type semi conductor. How does its width change when the junction is (i) forward biased, and (ii) reverse biased?
25. Define mean life of a radioactive sample. Deduce its relation with decay constant and half life.
26. Draw a plot of the variation of amplitude versus ω for an amplitude modulated wave. Define modulation index. Find the modulation index of an AM wave for which the maximum amplitude is 'a' while the minimum amplitude is 'b'.
27. In only one of the circuits given below the lamp "L" light glow. Identify which circuit is it? Give reason for your answer? A germanium diode is preferred to a silicon one for rectifying small voltages. Explain why?



28. Draw a schematic sketch of a cyclotron. Explain briefly how it works and how it is used to accelerate the charged particles. (i) Show that time period of ions in a cyclotron is independent of both the speed and radius of circular path. (ii) What is resonance condition? How is it used to accelerate the charged particles?

OR

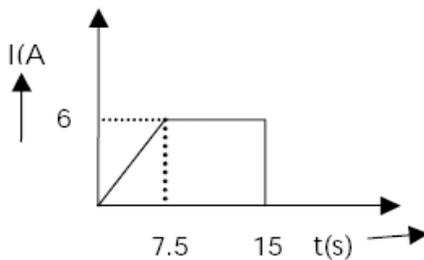
(i) Derive an expression for the magnetic field at a point on the axis of a current carrying circular loop. (ii) A galvanometer can be converted into a voltmeter of certain range by connecting a resistance of 980Ω in series with it. When the resistance is 470Ω connected in series, the range is halved. Find the resistance of the galvanometer

29. (i) For a ray of light traveling from a denser medium of refractive index n_1 to a rarer medium of refractive index n_2 , prove that $c = \sin^{-1}(n_2/n_1)$. Where c is the critical angle of incidence for the media
(ii) Explain with the help of a diagram, how the above principle is used for transmission of video signals using optical fibres.

OR

- (i) With the help of a suitable ray diagram, derive the mirror formula for a concave mirror.
(ii) Consider coaxial system of two thin convex lenses of focal length f each separated by a distance d . Draw a ray diagram for image formation corresponding to an object at infinity placed on the principal axis in the following cases. (i) $d < f$ (ii) $d = f$ (iii) $f < d < 2f$ (iv) $d = 2f$

30. Plot of current I versus time interval is given below. Find the charge that flows through the wire during this time period. Derive the expression for the drift velocity of electrons in the wire. A conductor of length l is connected to a D C source of potential V . If the length is tripled by stretching it, Keeping V constant. Explain how the following factors vary in the conductor. (i) drift speed of the electrons (b) resistance (c) conductivity



OR

Define potential gradient. Using this concept explain the method for finding the internal resistance of a primary cell using a potentiometer. Write two possible causes of potentiometer giving only one sided deflection. Can one measure the internal resistance of a secondary cell? Give reason.

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