

SAMPLE PAPER FOR FIRST TERM (2015-16)

CLASS XII

SUBJECT – PHYSICS

General Instructions:

- All questions are compulsory.
- There is no overall choice. However, an internal choice has been provided in all questions of five marks. You have to attempt only one of the choices in such questions.
- Question numbers 1 to 5 are very short answer type questions, carrying one mark each.
- Questions numbers 6 to 10 are short answer type questions carrying two marks each.
- Question numbers 11 to 22 are also short answer type questions, carrying 3 marks each.
- Question number 23 is value based type question, carrying four marks.
- Question numbers 24 to 26 are long answer type questions, carrying five marks each.
- Use of calculators is not permitted. However, you may use log tables, if necessary.

You may use the following physical constants wherever necessary.

$$c = 3 \times 10^8 \text{ ms}^{-1}$$

$$h = 6.6 \times 10^{-34} \text{ Js}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$$

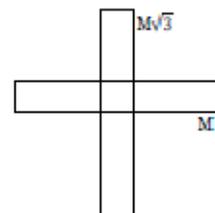
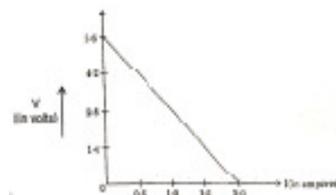
$$1/4\pi\epsilon_0 = 9 \times 10^9 \text{ N m}^2\text{C}^{-2}$$

$$\text{Avogadro number } N_A = 6.023 \times 10^{23} \text{ mol}^{-1}$$

$$\text{Mass of the neutron} = 1.675 \times 10^{-27} \text{ kg}$$

$$\text{Boltzmann constant, } k = 1.38 \times 10^{-23} \text{ J K}^{-1}$$

- 1 Draw equipotential surfaces for an electric dipole.
- 2 If a wire is stretched to double its original length, and same current is passed, how is the drift velocity affected?
- 3 An electron beam moving vertically upward experience a magnetic force towards south. What is the direction of magnetic field?
- 4 Draw a graph to show the variation of impedance of a series RLC circuit with frequency of A.C. signal.
- 5 Given n resistors each of resistance R , how will you combine them to get the ratio of the maximum to minimum resistance?
- 6 1000 spherical droplets each of radius r have been charged to have a potential V each. If all these droplets were to coalesce to form a single large drop, what would be the potential of this large drop?
- 7 Two concentric spheres of radii a and b ($a < b$) carry charges q and Q . Find the potential at a point distant R such that (i) $R < a$, (ii) $a < R < b$ and (iii) $R > b$
- 8 4 cells of identical emf E , internal resistance r , are connected in series to a variable resistor. The following graph shows the variation of terminal voltage of the combination with the current output:
(i) What is the emf of each cell used?
(ii) For what current from the cells, does maximum power dissipation occur in the circuit?
- 9 Two magnets of magnetic moments M and $M\sqrt{3}$ are joined to form a cross. The combination is suspended in a uniform magnetic field B . The magnetic moment M now makes an angle of θ with the field direction. Find the value of angle θ .



- 10 A battery of emf E and internal resistance r is connected to a variable resistor R . Draw a graph to show the variation of terminal potential difference with variation in R . Can terminal potential difference of a cell be greater than its emf?

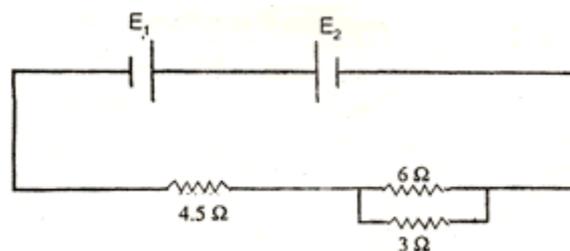
OR

Draw the current versus potential difference characteristic for a cell. How can the internal resistance of the cell be determined from this graph?

- 11 An electron is moving at 10^6 m/s in a direction parallel to a current of 5 A, flowing through an infinitely long straight wire, separated by a perpendicular distance of 10cm in air. Calculate the magnitude of the force experienced by the electron. What is the direction of this force?

12 An a.c. source is connected across a pure capacitor. Find the phase difference between current and voltage.

13 Two cells E_1 and E_2 in the given circuit diagram have an emf of 5 V and 9 V and internal resistance of 0.3Ω and 1.2Ω respectively. Find the current in 3Ω resistance and terminal p.d. across 5V cell.



14 Write an expression for magnetic moment of a circular coil of N turns and radius R carrying current I . A circular coil of N turns and radius R carries a current I . It is unwound and rewound to make another coil of radius $3R$. Find the current required in this coil so that magnetic moments are same in both cases.

15 A capacitor is charged with a battery and then its plate separation is increased without disconnecting the battery. What will be the change in (a) Charge stored in the capacitor? (b) Energy stored in the capacitor? (c) Potential difference across the plates of the capacitor? (d) Electric field between the plates of the capacitor?

16 State Gauss's Theorem. Using Gauss's theorem to establish that the magnitude of electric field intensity at a point due to an infinite plane sheet with uniform charge density σ is independent of the distance of the field point.

17 Figure shows the network of capacitors. For supply $V_{AB}=300$ V, determine the charge and voltage across each capacitor.



18 Define mutual inductance. Obtain an expression for the mutual inductance between a long straight wire and a square loop of side 'a' lie in the same plane X-O-Y.

19 The electron drift arises due to the force experienced by electrons in the electric field inside the conductor. A force causes acceleration in accordance with Newton's second law. Why then do the electrons acquire a steady average drift speed but no acceleration? What is the path of electrons along a straight line between successive collisions in the presence of an electric field?

20 Two devices A and B are connected independently to a variable frequency alternating voltage source. The current in A leads the applied voltage whereas the current in B lags the applied voltage. i) Identify the circuit element A and B. ii) How will the current in these circuit elements change if the applied frequency is decreased?

21 Briefly explain the principle of working of an ac generator. What is the maximum emf produced by it?

22 Explain, with the help of a labelled diagram, the principle and construction of a cyclotron.

23 You switched on the radio set to listen to your favourite music but found that reception was not clear. You adjusted the tuner in the set till you hear the music clear.

(iii) What are the components of tuning circuit in a radio?

(ii) Name the phenomenon involved here.

(iii) What value can be associated with this?

24 (a) Use Ampere's circuital law to find an expression for magnetic field inside a long solenoid.

(b) A proton, a deuteron and an alpha particle having same K.E. enter perpendicular to a uniform magnetic field. Find the ratio of radii of the circular paths.

OR

(a) Explain, giving reasons, the basic difference in converting a galvanometer into

(i) a voltmeter and (ii) ammeter.

(b) An aeroplane with a wing span of 10m is flying horizontally with a speed of 200m/s from east to west at a place where earth's field is 0.3gauss and angle of dip 60° . Find the induced emf.

25 (i) Derive mirror equation for a concave mirror.

(ii) What is the minimum distance between image and its real image formed by a convex lens of focal length 20cm?

(iii) What is the effect on nature of convex lens ($m = 3/2$) and its focal length if it is dipped in a liquid of refractive

index 4/3?

OR

Distinguish between the magnetic properties of para, diamagnetic and ferromagnetic substances in terms of i) susceptibility ii) permeability iii) coercivity Give one example of each of these materials. Draw magnetic field lines near a diamagnetic and paramagnetic substance.

26

Is current density, a vector or a scalar quantity? Deduce the relation between current density and potential difference across a current carrying conductor of length l , area of cross current density, in a conductor vary with

(a) Increase in potential gradient?

(b) Increase in temperature?

(c) Increase in length?

(d) Increase in area of cross-section?

(Assume that the other factors remain constant in each case.)

OR

(a) State the principle of a potentiometer. What happens to balancing length if

(i) series resistance with galvanometer is increased, (ii) shunt resistance across secondary cell is decreased.

(b) Write the condition of balance in a Wheatstone bridge. In the given Wheatstone bridge the current in the resistor $3R$, is zero.

Find the value of R , if the carbon resistor, connected in one arm of the bridge, has the colour sequence of red, red and orange.

The resistance, of BC and CD arms, are now interchanged

and another carbon resistance is connected in place of R so that the current through the arm BD is again zero.

Write the sequence of colour bands of this carbon resistor.

Also, find the value of current through it.

