Class XII
First Term Examination 2014-2015
Subject: Physics
Set B2

Time: 3 hrs. MM: 70

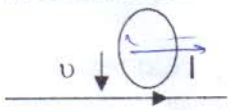
Instructions:

A. All questions are compulsory.
B. There are 26 questions in total. Questions 1 to 5 carry one mark each, questions 6 to 10 carry 2 marks each, questions 11 to 22 carry 3 marks each, question no. 23 is value based question and question 24 to 26 carry 5 marks each.
C. Use of calculators is not permitted.

1. If potential difference V applied across a conductor is increased to 2V, how will the drift velocity of the electrons change? 1

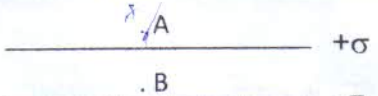
2. An object is held at the principal focus of a concave lens of local length F. Where is the image formed? 1

3. Predict the direction of induced current in a metal ring when the ring is moved towards a straight conductor with constant speed υ. The conductor is carrying current I in the direction shown in the figure. 1



4. A charged particle moving in a uniform magnetic field penetrates a layer of lead and thereby loses one half of its K.E. How does the radius of curvature of its path change? 1

5. Two plane sheets of charge densities +σ and -σ are kept in air as shown. What are the electric field intensities at pts A and B? 1



6. An ammeter of resistance 0.80 Ω can measure current upto 1.0 A. (i) What must be the shunt resistance to enable the ammeter to measure current upto 5.0A? (ii) What is the combined resistance of the ammeter and the shunt? 2

7. How does a charge q oscillating at certain frequency produce electromagnetic waves? Sketch the variation of electric & magnetic fields for an electromagnetic wave propagating along the Z-direction. 2

OR

Select the wavelength range, and name the electromagnetic waves, that are used in:

(i) Radar system for Aircraft navigation.

(ii) Earth satellite to observe growth of crops.

8. Show that during the charging of a parallel plate capacitor, the rate of change of charge on each plate equals ϵ_0 times the rate of change of electric flux (ϕ_E) linked with it. What is the name given to the term $\epsilon_0 \frac{d\phi_E}{dt}$? 2

9. Write the vector form of forces acting between two charges q_1 and q_2 having $\vec{r}_1$ and $\vec{r}_2$ as their position vectors respectively. 2

10. Draw the current versus potential difference graph for a cell. How can internal resistance of the cell be determined from this graph? 2

11. A circular brass loop of radius 'a' and resistance 'R' is placed with its plane perpendicular to a magnetic field which varies with time as $B=B_o \sin \omega t$. Obtain the expression for the induced current in the loop. 3

12. A series circuit contains a resistor of 20 Ω, a capacitor and an ammeter of negligible resistance. It is connected to a source of 220 V, 50 Hz. If the reading of the ammeter is 2.5A, calculate the reactance of the capacitor. 3

OR

You are given an air coil, a bulb, an iron road and a source of electricity. Suggest a method to find whether the given source is d.c. or a.c. Explain your answer.

13. Draw a labeled ray diagram of an astronomical telescope for the near point adjustment. You are given three lenses of power 0.5D, 4D, 10D. State, with reason, which two lenses will you select for constructing a good astronomical telescope. 3

14. Derive the expression for the refractive index of the material of the prism in terms of the angle of the prism and the angle of minimum deviation. 3

15. A convex lens of focal length 0.2m and made of glass (μ=1.50) is immersed in water (μ=1.33). Find the change in the focal length of the lens. 3

16. Define the term resistivity of a conductor. Show that the resistance of a conductor is given by 3

$R = \frac{ml}{ne^2 \tau A}$, where the symbols have their usual meanings.

17. Using Bio-Savart's law, derive an expression for the magnetic field intensity at the centre of a current carrying circular coil. Indicate the direction of the magnetic field. 3

12) b) In DC on inserting iron rod, there will be no change in the bulb

An electric dipole is held in uniform electric field. 3

(i) Show that the net force acting on it zero.

(ii) The dipole is aligned parallel to the field. Find the work done in rotating it through an angle of 180^0.

19. With the help of labelled diagram, explain the working & principle of a moving coil galvanometer. 3

20. Using Gauss's law obtain the expression for the electric field due to a uniformly charged thin spherical shell of radius R at a point outside the shell. Draw a graph showing the variation of electric field with r, for r>R and r<R. 3

21. How does the mutual inductance of a pair of coils change when: 3

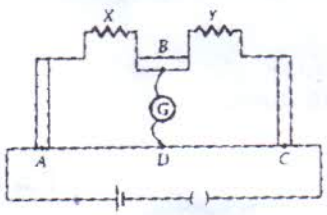
(i) The distance between the coils is increased?

(ii) The number of turns in each coil is decreased?

(iii) A thin iron sheet is placed between the two coils, other factors remaining the same?

Justify your answer in each case.

22. In a meter bridge the balance point is found to be at 39.5 cm from the end A, when the resistor Y is of 12.5 Ω. Determine the resistance of X. Determine the balance point of the bridge above if X and Y are interchanged. What happens if the galvanometer and cell are interchanged at the balance point of the bridge. 3



23. One day Priyanka went to the market with her mother in a metro rail. At the metro station, they were made to walk through a door way of a metal detector for security reason. Priyanka passed through it and started waiting for her mother to come she heard a long beep when her mother passed through metal detector. Priyanka was surprised why the metal detector beeped in case of her mother. She asked the duty staff who told her that It was due to the bunch of metal keys lying in the purse of her mother. Both Priyanka and her mother were satisfied with the security system. 4

(a) What values were displayed by Priyanka?

(b) On what principle does a metal detector work?

24. (a) At room temperature (27^0C) the resistance of a heating element is 100 Ω. What is the temperature of the element if the resistance is found to be 117 Ω, give that temperature coefficient of resistor material is 1.70×10^{-4} $^oC^{-1}$ 5

(b) A cell of emf (ε) and internal resistance (r) is connected across a variable external resistance (R). Plot graph to show variation of (i) ε with R (ii) Terminal p.d. of the cell (V) with R.

OR

Define the term potential gradient. Using this concept, explain the method for comparison of emfs of two primary cells using a potentiometer. Write two possible causes of potentiometer giving only one-sided deflection.

25. (a) A coil of N turns and radius R carries a current I. It is unwound and rewound to make another coil of radius R/2, current remaining the same. Calculate the ratio of the magnetic moments of the new coil and the original coil. 5

(b) Why does a paramagnetic substance display greater megnetisation for the same magnetising field when cooled.

OR

(a) Permanent magnets are made of special alloys while the cores of temporary magnets are made of soft iron. Why?

(b) Define angle of dip. How does angle of dip change as one goes from magnetic pole to magnetic equator of the earth?

26. (a) Derive an expression for the energy stored in a parallel plate capacitor. Hence show that electric field E is a source of energy with energy density $\frac{1}{2}\epsilon_0 E^2$. 5

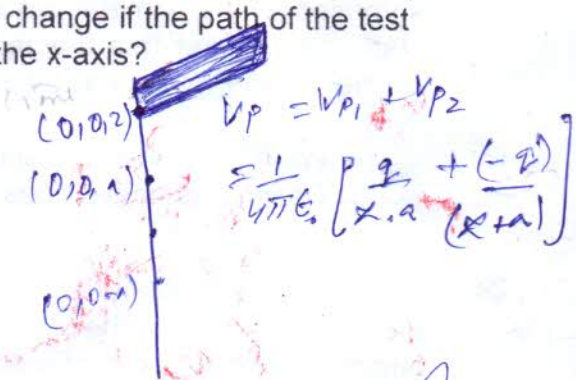
(b) Explain why the polarization of a dielectric reduces the electric field inside the dielectric. Hence define dielectric constant.

OR

Two charges - q and +q are located at point (0,0,-a) and (0,0,a) respectively.

(i) What is the electrostatic potential at the points (0,0,z) and (x,y,0)?

(ii) How much work is done in moving a small test charge from the point (5,0,0) to (-7,0,0) along the x-axis?. Does the answer change if the path of the test charge between the same points is not along the x-axis?



Equitorial plane par dipole ki wajah se potential 0 hota hai
Potential is a state function