HOLIDAY ASSIGNMENT

CLASS-XII

PHYSICS

Assignment 1

1. Two charges of magnitudes -2Q and +Q are located at points (a,0) and (4a,0) respectively. What is the electric flux due to these charges through a sphere of radius 3a with its centre at the origin? 1

2.Why is the potential inside a hollow spherical charged conductor constant and has the same value as on its surface? 1

3. Plot a graph showing variation of current versus voltage for the material GaAs. 1

4. Why do we prefer a potentiometer to measure the emf of a cell rather than a voltmeter? 1

5. If a point charge is rotated in an arc of radius r around a charge q. What will be the workdone? Explain. 1

6. A battery has an emf of 10 V and internal resistance is observed to be 3 Ω and is connected to a resistor. If the current flowing in the circuit is 0.5 A, find the resistor? Also calculate the terminal voltage when the circuit is closed. 2

7. What is the net flux of the uniform electric field $E=3\times10^3$ N/C Along x axis through a cube of side 20 cm oriented so that its faces are parallel to the coordinate planes? 2

8. You are required to select a carbon resistor of resistances 47 KΩ×10% from a large collection . What should be the sequences of colour bands used to code it? 2

9. The potential V due to a charge distribution at a point (x,y) given by $V= - 4X^2 + 3Y$. Calculate the electric field at the point (1,1) 2

10. Derive the expression for the potential energy of an electric dipole moment **p** in an electric field **E**. 2

11. Net capacitance of three identical capacitors in series is 1 μF. What will be their net capacitance if connected in parallel? Find the ratio of energy stored in the two configurations if they are both connected to the same source. 3

12.Draw the circuit diagram of a potentiometer which can be used to determine the internal resistance ® of a given cell of emf (E). Describe a method to find the internal resistance of a primary cell. 3

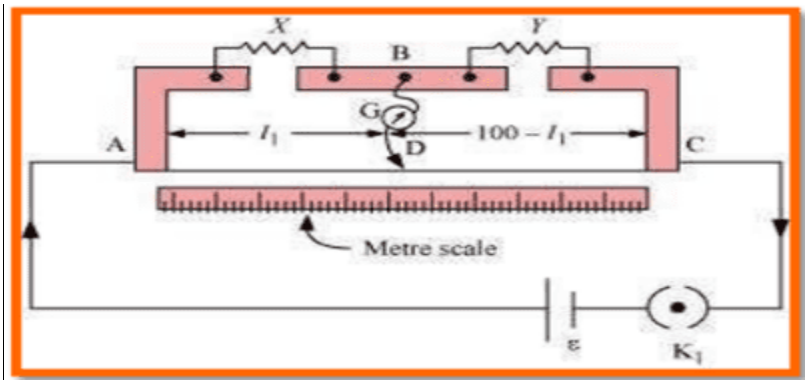
13. In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm, what is the emf of the second cell? Write two applications of potentiometer. 3

14. A hollow conductor has a tiny hole cut into its surface . Show that the electric field in the hole is $\sigma/2\varepsilon_0\,\mathbf{n}$, where n is unit vector in the outward normal direction and σ is the surface charge density near the hole. 3

15. Find the expression for the electric field strength at a distant point situated along the equatorial line of an electric dipole. 3

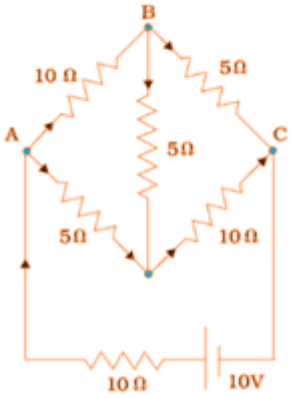
16. In the metre bridge shown below in the figure, 39.5 cm is found to be the balance point from the end A with X resistor having a value of 12.5 Ω. a)Calculate the value of the resistor Y .

b) State the reason behind making the connections between the resistors in a Wheatstone bridge or meter bridge of thick copper strips. c*)* Calculate the new balance point of the bridge above if M and N are interchanged. 5



17. a) State Kirchoff's laws.

b)Calculate the current through each resistor.



2+3=5

Project : Prepare lab file.

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PHYSICS

Assignment 2

Section A 1×5=5

1. Sketch the equipotential surface for a point charge.

2. What are superconductor?

3. Electric field inside a conductor is zero. Explain.

4. Draw a plot showing the variation of i) electric field and potential with distance r due to a point charge.

5. How much work is done in moving a charge of 500 μC between two point on an equipotential surface?

Section B **2×5=10**

6. Write the expression for the workdone on an electric dipole moment p in turning it from its position of stable equilibrium to a position of unstable equilibrium in a uniform electric field E.

7. ABCD is a square of side 0.2m. Charges of 2nC, 4nC and 8nC are placed at the corners A,B,C,D respectively. Calculate the work required to transfer a charge of 2nC from corner D to centre of the square.

8. Twenty seven drops of same size are charged at 220 V each. They coalesce to form a bigger drop. Calculate the potential of bigger drop.

9.Three charges –q,Q and –q are placed at aequal distances on a straight line . If the potential energy of the system of these charges is zero. What is Q:q?

10. Using Gauss's theorem derive the expression for electric field at any point in between two oppositly parallel charged plate(charge density σ)

Section C **3×5=15**

11. A parallel plate capacitor of 300 μF is charged to 200 V . If the distance between the plates is halved,what will be the potential difference between the plates and what will be the change in stored energy?

12. An electric dipole of length 20 cm having charge 3×10^{-3} C placed at 60^{o} with respect to a uniform electric field experiences a torque of magnitude 6 Nm. Calculate the potential energy of the dipole.

13. Define the term current density of a metallic conductor. Deduce the relation between current density(J) and the conductivity(σ) of the conductor, when an electric field E is applied to it.

14. Derive the expression for the capacitance of a parallel plate capacitor when a dielectric slab of constant K and thickness t=d/2 but of same area as that of the plates is inserted between the capacitor plates.(dis the separation between the plates)

15. A potentiometer wire of length 1 m has a resistance of 15 ohm . It is connected to a 5V battery in series with a resistance 5 ohm. Determine the emf of the primary cell which gives a balancedpoint at 60 cm.

Section D **5×2=10**

16. a) Derive the balanced condition of wheatstone bridge.

b) State with a suitable diagram the principle on which the working of metrebridge based on.

17.a)Why two equipotential surfaces cross each other?

b) A hollow cylindrical box of length 1M and area of cross-section 25square cm is placed in a three dimensional co-ordinate system at a distance 1m from origin whose axis lying along x axis. The electric field in the region is given by **E**= 50x **i** where E is in N/C and x is in m. Find i) net flux through cylinder.

ii) Charge enclosed by the cylinder

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Assignment 3

Section A **1×5=5**

1. Define the term mobility of charge carrier in conductor.

2. Can electric potential at any point be zero, while the field is not zero?

3.When is a wheatstone bridge most sensitive?

4.Define electric flux.

5. What is the flux through a surface which encloses a dipole?

Section B **2×5=10**

6. Establish the relation between electric current and drift velocity.

7. What is the relation between charges q_1,q_2,q_3 if the electric flux through surface S_2 is 8 times than surface S_1

8. What is the advantage of using thick metallic strips to join wires in a potentiometer?

9. Derive the expression for electric field at any point on the axis of a dipole.

10. State the Kirchhoff's Law.

Section-C **(3x5) = 15**

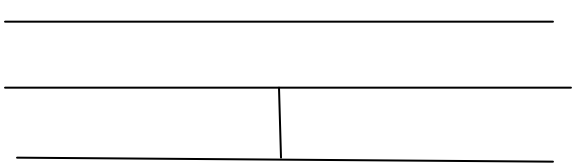
11. Two identical capacitors are connected in parallel across a battery of potential 50 V. The battery is then disconnected and the space between the plates of one capacitor is completely filled with a material of dielectric constant 4. Find the potential across the second capacitor.

12. A point charge of 10^{-8} C is situated at the origin of co-ordinates. Find the potential difference between the points A(4,4,2) and B(1,2,2)

13. A spherical conducting shell of inner radius r1 and outer radius r_2 has a charge Q. A charge q is placed at the centre of the shell.

a) What is the surface charge density on the i) inner surface, ii) outer surface of the shell

b) Write the expression for electric field at a point $x>r_2$ from the centre of the shell.

14. 

Three dielectric slabs of dielectric constants K1, K2, K3 have been put in between the plates of capacitor as shown in the figure. Determine the equivalent capacitance.

15. What is Electrostatic Shielding? Give one practical application.

Section- D **(5x2) = 10**

16. Derive the electrostatic energy stored in a capacitor. Calculate the common potential across the combination of two capacitors with capacitances C1 & C2 are charged to potentials V1 & V2 respectively and then connected in parallel. Also find the change in electrostatic energy from its initial value.

17. State Gauss theorem in electrostatics.

Use this theorem to find the electric field due to a spherical shell of radius R and charge density σ. I) at a point inside the shell, ii) at a point outside the shell.