St. Mary's School, Dwarka

Holidays Homework

Class XII

Subject: Physics

Objective:

1) **To revise the concepts already taught in the class.**
2) **To enhance your numerical ability**
3) **To give an exposure to HOTS questions related to the topic.**

Homework: Write the seven experiments of section A based on the meter bridge, potentiometer and galvanometer in your practical file and submit it on the reopening of the School.

Research about the Physics project allotted to you.

. Please file these assignments in a folder. Don't do this H.W in your C.W notebook

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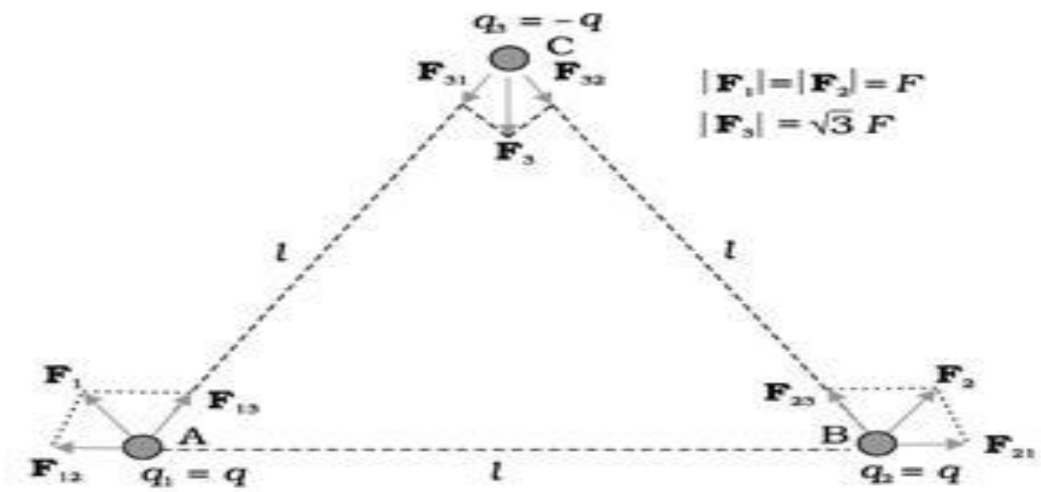
Electrostatics and current electricity

Q1. Two charges, one +5 μC and another –5 μC are placed 1 mm apart. Calculate the dipole moment. 1

Q2. A charge *q* is placed at the centre of the line joining two equal charges Q. Show that the system of three charges will be in equilibrium if *q* – Q/4. 2

Q3. How many electrons should be removed from a coin of mass 1.6g, so that it may just float in an electric field of intensity 10^9 NC^{-1}, directed upward? 2

Q4. Consider the charges *q*, *q* and –*q* placed at the vertices of an equilateral triangle, as shown in figure. What is the force on each charge? 3



Q5. Two point charges q_1 = +0.2C and q_2 = +0.4C are placed 0.1m apart. Calculate the electric field at (a) the midpoint between the charges. (b) A point on the line joining q_1 and q_2 such that it is 0.05 m away from q_2 and 0.15m away from q_1. 3

Q6. A charge is distributed uniformly over a ring '*a*'. Obtain an expression for the electric intensity E at a point on the axis of the ring. Hence show that for points at large distances from the ring, it behaves like a point charge. 3

Q7. Two charges 3×10^{-8}C and 2×10^{-8} C are located 15 cm apart. Find the point on the line ,joining the two charges , where the electric potential is zero. Define electric potential and state its SI unit . 3

Q8. A point charge causes an electric flux of -1.0×10^{3} Nm^2 /C to pass through a spherical Gaussian surface of 10.0 cm radius centred on the charge. (i) If the radius of the Gaussian surface was doubled, how much flux would pass through the surface ? (ii) What is the value of the point charge ? 3

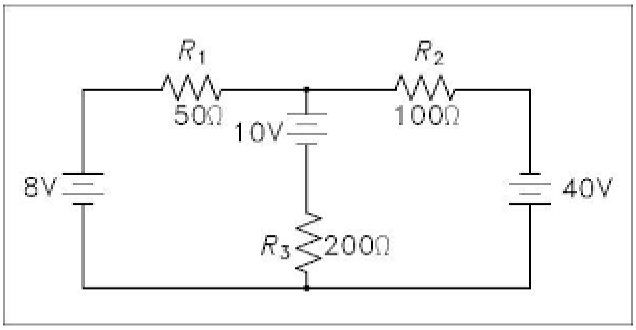
Q9. Three capacitors of capacitances 3 pF,6pF and 9 pF are connected in parallel. (i) What is the total capacitance of the combination? (ii) Determine the charge on each capacitor if the combination is connected to a 90V supply. 3

Q10(i). Define electric flux and give its SI unit. If the electric field intensity is E=6i + 3j+4k, calculate the electric flux through a surface of area 15 units in X-Z plane.(ii) Find the amount of work done in rotating an electric dipole of dipole moment 3×10^{-8}Cm, from its position of stable equilibrium ,to the position of unstable equilibrium , in a uniform electric field of intensity 10^4N/C. 3

Q11.(i) Draw a graph showing the variation of electric potential with distance r due to a point charge. (ii) A point of 2.0 μC is at the centre of a cubic Gaussian surface 9.0 cm on edge. What is the net electric flux through the surface. (iii) What is the angle between the direction of the electric field intensity and electric dipole moment vector at any (a) axial point and (b) equatorial point of an electric dipole? 3

Q12. A cylindrical metallic wire is stretched to increase its length by 20%. Calculate the percentage change in its resistance. 3

Q13. State Kirchhoff's voltage law. How it is different from the current law. Determine the current in each branch of the network shown in the figure. 3



Q14. Determine the current in each branch of the network shown in the figure using the Kirchoff's law.

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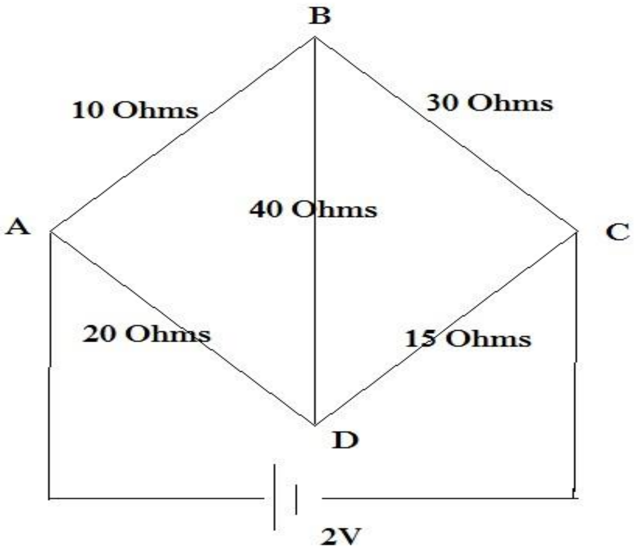
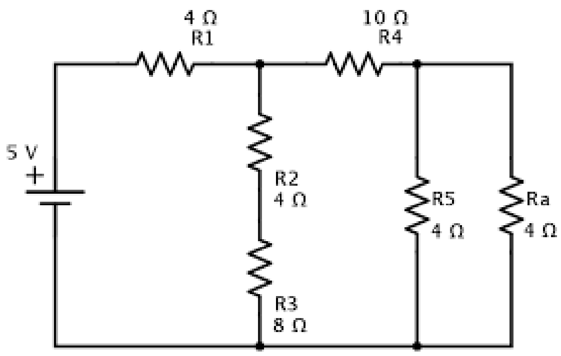


Figure 8.1

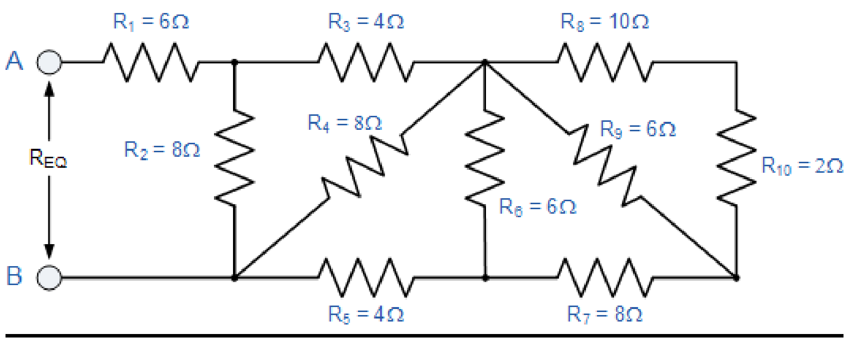
Q15. Explain conductivity of a substance. Give its S.I unit. How does it vary with temperature for (i) semiconductors (ii) insulators (iii) conductor 3

Q16. A wire of resistance 20 ohm is stretched to double its original length. Calculate its new resistance & resistivity. 3

Q17 Find the net resistance of the network shown and the total current flowing in the circuit . 3



Q18. Find the net resistance of the network shown :



MAGNETIC EFFECTS OF CURRENT

1. An electron and a proton are moving along the same direction with the same kinetic energy. When they pass through a uniform magnetic field perpendicular to the direction of their motion, they describe paths of the same radius. Is this statement true or false? 1
2. Uniform electric and magnetic fields are produced pointing in the same direction. An electron is projected in the direction of the fields. What will be the effect on the kinetic energy of the electron due to the two fields? 1
3. A particle of mass m and charge q moves at right angles to a uniform magnetic field. Plot a graph showing the variation of the radius of the circular path described by it with the increase in its (a) charge, (b) kinetic energy, where, in each case other factors remain constant. Justify your answer. 2
4. A charged particle having a charge q, is moving with a speed v along the x-axis. It enters a region of space where an electric field E along y-axis and a magnetic field B, both are present. The particle, on emerging from this region, is observed to be moving along the x-axis only. Obtain an expression for the magnitude of B in terms of v and E. Also give the direction of B. 2
5. A long wire is first bent into a circular coil of one turn and then into a circular coil of smaller radius having n turns. If the same current passes in both the cases, find the ratio of the magnetic field produced at the centre in the two cases. 2
6. Two wires of equal lengths are bent in the form of two loops. One of the loops is square shaped whereas the other loop is circular. These are suspended in uniform magnetic field and the same current is passing through them. Which loop will experience greater torque? 2
7. Does the torque on a planar current loop in a magnetic field change, when its shape is changed without changing its area? i) Why are pole pieces of galvanometer made concave?

8 What type of materials are used for making permanent magnets transformer cores? Give two reasons for each. 2

9 Show that the far field of a solenoid resembles that of a bar magnet. Hence define the magnetic moment of a solenoid. 2

10 A long cylinder of radius Ro is carrying a current Io, which is uniformly distributed over its cross section. Derive an expression for the magnitude of magnetic field inside as well as outside the wire. Plot a curve to show the variation of magnetic field with radial distance. 3

11. Draw a labelled diagram and explain the construction and working of a moving coil galvanometer. Define its current and voltage sensitivity and explain how it can be increased. 3

(b) A galvanometer with a coil resistance of 5 ohm can tolerate a maximum current of 10mA. Explain how this can be converted into an ammeter of range 1A. 3