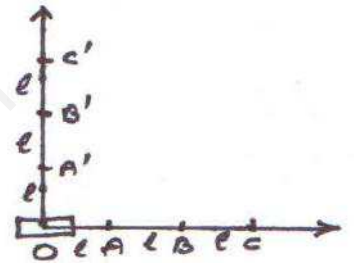


ELECTRIC POTENTIAL & CAPACITANCE

1. A charge Q is placed on a large spherical conducting shell of radius R . Another small conducting sphere of radius r carrying charge q is introduced inside the large shell and is placed at its centre. Find the potential difference between two points, one lying on the sphere and the other on the shell.
2. Two metal spheres of radii 'a' and 'b' are far apart but are connected by a wire. Their combined charge is Q . Determine the charge on each of the conductor and also show that the potential on each of the conductor is $V = Q / (a+b)$.
3. The following data was obtained for the dependence of the magnitude of the electric field with distance, from a reference point O within the charge distribution in the shaded region.

Field point	A	B	C	A'	B'	C'
$ E $	E	$E/8$	$E/27$	$E/2$	$E/16$	$E/54$



- (I) Identify the charge distribution.
 - (II) If the potential due to this charge distribution has a value 'V' at the point A. What is its value at the point A'.
4. Calculate the voltage needed to balance an oil drop carrying **10** electrons when located between the plates of a capacitor which are **5 mm** apart. The mass of the oil drop is 3×10^{-16} kg.
 5. Explain why the polarization of a dielectric reduces the electric field inside the dielectric.
 6. The potential at a point distant x due to some charges situated on the x axis is given by $V(x) = 20/(x^2 - 4)$ Volt. Calculate electric field intensity at point $x = -2$ m.
 7. A spherical shell of radius b with charge q is expanded to radius a . Find the work done by the electrical forces in the process?
 8. n small drops of same size are charged to V Volt each. They coalesce to form a bigger drop. Calculate the potential at the bigger drop.
 9. Two spheres of radius R and $2R$ are charged, so that both of these have same surface charge density σ . The spheres are located away from each other and are connected by a thin conducting wire. Find the new charged density on sphere of radius R .
 10. A parallel plate capacitor with air between the plates has a capacitance $5\mu\text{F}$. The separation between the plates is now divided equally and the space between them is filled with mediums of dielectric constant 3, 5 and 8. Calculate the new value of capacitance.