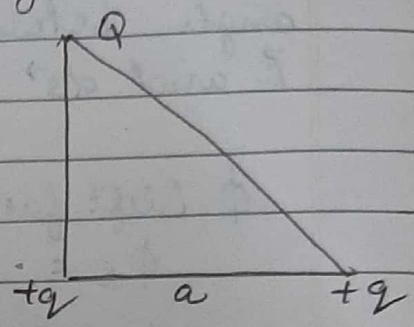


Physics

Chapter - 2 Assignment - 1

Q1. Three charges Q , $+q$ and $+q$ are placed at the vertices of a right angled triangle (Isosceles) as shown in figure.

The net electrostatic energy of the configuration is zero, if Q is equal to?



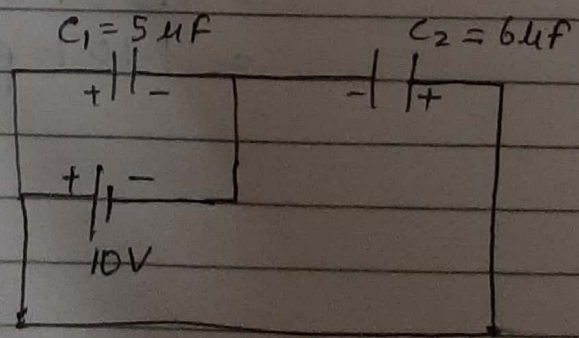
Ans: $-\frac{2q}{2+\sqrt{2}}$

Q2. Derive the expression for the electric potential at any general point at the distance 'r' from the centre of a dipole.

Q3. Eight identical spherical drops, each carrying a charge 1 nC are at a potential of 900 V each. All these drops combine together to form a single large drop. Calculate the potential of this large drop. (Assume no wastage of any kind and take the capacitance of a sphere of radius 'r' as proportional to r).

(Ans: 3600 V)

Q4. Calculate the charge supplied by the battery in the arrangement shown,



Ans: $110\ \mu\text{C}$

GOOD WRITE

Q5. Where is the energy stored in a capacitor? Derive an expression for the energy density of an electric field.

Q6. Two identical capacitors of 12 pF each are connected in series across a battery of 50V. How much electrostatic energy is stored in the combination? If these were connected in parallel across the same battery how much energy will be stored in combination now. Also find charge drawn from battery in each case.

Ans: ($U_s = 7.5 \times 10^{-10} \text{ J}$, $q_s = 3 \times 10^{-10} \text{ C}$)
($U_p = 3 \times 10^{-8} \text{ J}$, $q_p = 1.2 \times 10^{-9} \text{ C}$)

Q7. Explain why the polarization of dielectric reduced the electric field inside the dielectric. Hence define dielectric constant.

Q8. Deduce expression for the capacitance of a parallel plate capacitor when a conducting slab is inserted between its plates.

Q9. A parallel plate capacitor, of capacitance 20 μF , is connected to a 100V supply. After sometime the battery is disconnected and the space between the plates of capacitor is filled with a dielectric of dielectric constant 5. Calculate the energy stored in capacitor

- i) before
- ii) after, the dielectric has been put in between the plates.

Q10. Three concentric metallic shells A, B and C of radii a, b and c ($a < b < c$) have surface charge densities $+\sigma, -\sigma, +\sigma$ respectively.

- i) Find potential of three shells A, B, C
- ii) If shells A & C are at same potential, obtain relation between radii a, b, c .

