PHYSICS

ELECTROSTATICS AND CAPACITORS

41. Two charged spherical conductors of radius R_1 and R_2 are connected by a wire. Then the ratio of surface charge densities of the spheres $\left(\frac{\sigma_1}{\sigma_2}\right)$ is

(1) $\frac{R_1^2}{R_2^2}$ (2) $\frac{R_1}{R_2}$

(3) $\frac{R_2}{R_1}$ (4) $\sqrt{\left(\frac{R_1}{R_2}\right)}$

42. Twenty seven drops of same size charged at 200 V each. They combine to form a bigger drop. Calculate the potential of the bigger drop.

(1) 1980 V (2) 660 V

(3) 1320 V (4) 1520 V

43. If potential (in volts) in a region is expressed as $V(x, y, z) = 6xy - y + 2yz$, the electric field (in N C^{-1}) at point (1, 1, 0) is

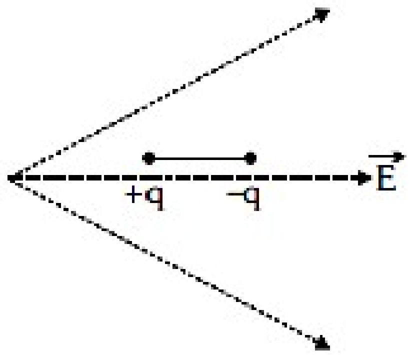
(1) $-(6\hat{i}+5\hat{j}+2\hat{k})$

(2) $-(2\hat{i}+3\hat{j}+\hat{k})$

(3) $-(6\hat{i}+9\hat{j}+\hat{k})$

(4) $-(3\hat{i}+5\hat{j}+3\hat{k})$

44. A dipole is placed in an electric field as shown. In which direction will it move?



(1) Towards the right as its potential energy increase

(2) Towards the left as its potential energy will increase

(3) Towards the right as its potential energy will decrease

(4) Towards the left as its potential energy will decrease

45. Each corner of a cube of side l has a negative charge, $-q$. The electrostatic potential energy of a charge q at the centre of the cube is

(1) $-\frac{4q^2}{\sqrt{2}\pi\varepsilon_0 l}$ (2) $\frac{\sqrt{3}q^2}{4\pi\varepsilon_0 l}$

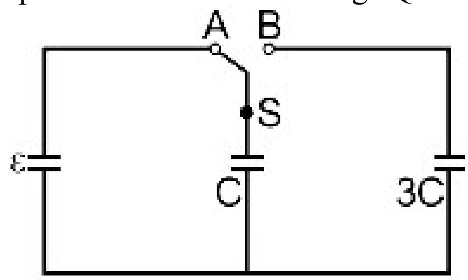
(3) $\frac{4q^2}{\sqrt{2}\pi\varepsilon_0 l}$ (4) $-\frac{4q^2}{\sqrt{3}\pi\varepsilon_0 l}$

46. Two equal capacitors are first connected in series and then in parallel. The ratio of the equivalent capacities in the two cases will be

(1) 4 : 1 (2) 2 : 1

(3) 1 : 4 (4) 1 : 2

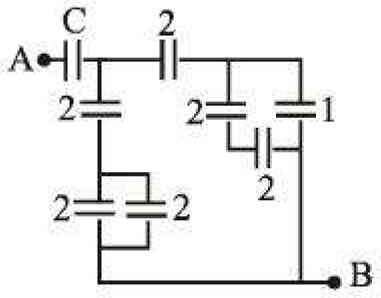
47. In the figure shown, after the switch S is turned from position A to position B, the energy dissipated in the circuit in terms of capacitance C and total charge Q is



(1) $\frac{1}{8}\frac{Q^2}{C}$ (2) $\frac{3}{8}\frac{Q^2}{C}$

(3) $\frac{5}{8}\frac{Q^2}{C}$ (4) $\frac{3}{4}\frac{Q^2}{C}$

48. In the circuit shown, find C if the effective capacitance of 82. The whole circuit is to be 0.5 μF. All values in the circuit are in μF.



(1) $\frac{7}{11}$ μF

(2) $\frac{6}{5}$ μF

(3) 4μF

(4) $\frac{7}{10}$ μF

49. Three capacitors each of 4 μF are to be connected in such a way that the effective capacitance is 6 μF. This can be done by connecting them

(1) all in series

(2) all in parallel

(3) two in parallel and one in series

(4) two in series and one in parallel

50. A parallel plate capacitor is made by stacking n equally spaced plates connected alternatively. If the capacitance between any two adjacent plates is C then the resultant capacitance is

(1) (n + 1)C

(2) (n – 1)C

(3) nC

(4) C