BCM SCHOOL, BASANT AVENUE, DUGRI ROAD, LUDHIANA

CLASS – XII PHYSICS

1. A 4μF capacitor is charged by a 200 V supply. It is then discontented from the supply, and is connected to another uncharged 2μF capacitor. How much electrostatic energy of the first capacitor is lost in the form of heat and electromagnetic radiation?

2. Three point charges q, 2q and n*q* are placed at the vertices of an equilateral triangle. If the potential energy of the system is zero. Find the value of n.

3. Two tiny spheres carrying charges 1.5 μ*C* and 2.5 μ*C* are located 30 cm apart. Find the potential and electric field at the mid-point of the line joining the two charges.

4. A charge Q is distributed over the surfaces of two concentric hollow spheres of radii r and R (R>>r), such that their surface charge densities are equal. Derive the expression for the potential at the common center.

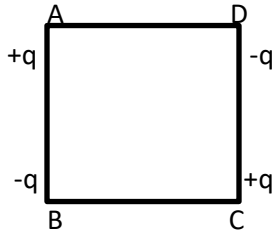
5. Two isolated metallic spheres S_1 and S_2 of radii 1cm and 3 cm respectively are charged such that both have the same charge density ($\frac{2}{\pi}$ x 10^{-9}) C/m^2. They are placed far away from each other and connected by a thin wire. Calculate the new charge on sphere S_1.

6. Four charges are arranged at the corners of a square ABCD of side d.

(i) Find the work required to put together this arrangement.

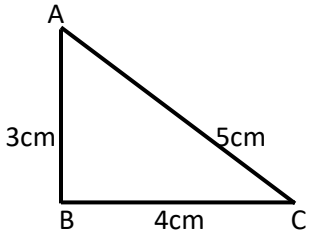
(ii) A charge q_0 is brought to the center E of the square, the four charges being held fixed at its corners.

(iii) Computer the work required in rearranging this arrangement of two another similar square arrangement of the charges such that side of the square now becomes 2d.



7. A series combination of n_1 capacitors, each of value C_1, is charged by a source of potential difference 4V. When another parallel combination of n_2 capacitors, each of value C_2, is charged by a source of potential difference V, it has the same (total) energy stored in it, as the first combination has. The value of C_2, in terms of C_1, is then

8. A 12 cm wire is given a shape of a right angled triangle ABC having sides 3 cm, 4 cm and 5 cm as shown in the figure. The resistance between two ends (AB,BC,CA) of the respective sides are measured only by one by a multimeter. Find the ratio of these resistances.



9. Two wire of the same metal have same length, but their cross-section are in the ratio 3 : 1. They are joined in series. The resistance of thicker wire is 10 Ω. find the total resistance of the combination will be

10. Two thin concentric and coplanar spherical shells, of radii a and b (b>a) carry charges, q and Q, respectively. Find the magnitude of the electric field, at a point distant x, from their common center for

11. A simple pendulum consist of a small sphere of mass m suspended by a thread of length l. The sphere carries a positive charge q. The pendulum is placed in a uniform electric field of strength E directed vertically upwards. With what period will the pendulum oscillate if the electrostatic force acting on the sphere is less than the gravitational force? Assume oscillations to be small.

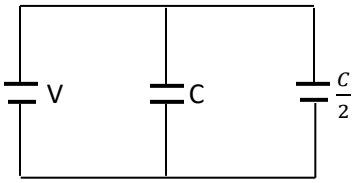
12. A short electric dipole has a dipole moment of 16×10^{-9} C-m. The electric potential due to the dipole at a point at a distance of 0.6 m from the center of the dipole, situated on a line making an angle of 60^0 with the dipole axis is

13. A +3.0 nC charge Q is initially at rest at a distance of r_1 = 10 cm from a +5.0 nC charge q fixed at the origin. The charge Q is moved away from q to a new position at r_2 = 15 cm. In this process work done by the field is:

14. Two metal spheres, one of radius R and the other of radius 2 R respectively have the same surface charge density σ. They are brought in contact and separated. What will be the new surface charge densities on them?

(a) $\sigma_1 = \frac{5}{6}\sigma, \sigma_2 = \frac{5}{2}\sigma$ (b) $\sigma_1 = \frac{5}{2}\sigma, \sigma_2 = \frac{5}{6}\sigma$ (c) $\sigma_1 = \frac{5}{2}\sigma, \sigma_2 = \frac{5}{3}\sigma$ (d) $\sigma_1 = \frac{5}{3}\sigma, \sigma_2 = \frac{5}{6}\sigma$

15. Two condensers, one of capacity *C* and the other of capacity *C* / 2, are connected to a *V* volt battery, as shown.



The work done in charging fully both the condensers is

(a) $2\,CV^2$ (b) $\frac{1}{4}\,CV^2$ (c) $\frac{3}{4}\,CV^2$ (d) $\frac{1}{2}\,CV^2$

16. A parallel plate capacitor of capacitance C is connected to a battery and is charged to a potential difference V. Another capacitor of capacitance 2 C is similarly charged to a potential difference 2 V. The charging battery is then disconnected and the capacitors are connected in parallel to each other in such a way that the positive terminal of one is connected to the negative terminal of the other. The final energy of the configuration is

(a) Zero (b) $\frac{3}{2}\,CV^2$ (c) $\frac{25}{6}\,CV^2$ (d) $\frac{9}{2}\,CV^2$

17. The plates in a parallel plate capacitor are separated by a distance d with air as the medium between the plates. In order to increases the capacity by 66% a dielectric slab of dielectric constant 5 is introduced between the plates. What is the thickness of the dielectric slab?

(a) $\frac{d}{4}$ (b) $\frac{d}{2}$ (c) $\frac{5d}{8}$ (d) d

Assertions and Reasons

(a) If both assertion and reason are true and reason is the correct explanation of assertion
(b) If both assertion and reason are true but reason is not correct explanation of assertion
(c) If assertion is true but reason is false
(d) If both assertion are reason are false.

18. **Assertion:** When charged capacitors are connected in parallel, the algebraic sum of charges remains constant but there is loss of energy.

Reason: During sharing of charges, heat loss takes place.

19. **Assertion:** The capacitance of a conductor does not depend on the charge given to it.

Reason: The capacitance depends only on geometry and size of conductor.

20. **Assertion:** Capacity of a parallel plate capacitor remains unaffected on introducing a conducting or insulating slab between the plates.

Reason: In both the cases, electric field intensity between the plates increases.