DPP

DAILY PRACTICE PROBLEMS

Class : XIIth **Subject : PHYSICS**
Date : **DPP No. : 9**

Topic :-ELECTROSTATIC POTENTIAL AND CAPACITANCE

1. Two spheres of radii R_1 and R_2 joined by a fine wire are raised to a potential V. Let the surface charge densities at these two spheres be σ_1 and σ_2 respectively. Then the ratio $\frac{\sigma_2}{\sigma_1}$ has a value

   a) $\frac{R_1}{R_2}$ b) $\frac{R_2}{R_1}$ c) 1 d) $\left(\frac{R_2}{R_1}\right)^2$

2. A parallel plate capacitor is made by stocking n equally spaced plates connected alternately. If the capacitance between any two plates is x, then the total capacitance is,

   a) nx b) n/x c) nx^2 d) $(n-1)x$

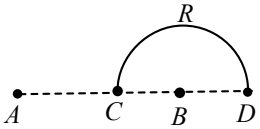
3. Capacitance of a parallel plate capacitor becomes $\frac{4}{3}$ times its original value, if a dielectric slab of thickness $t = \frac{d}{2}$ is inserted between the plates [d is the separation between the plates]. The dielectric constant of the slab is

   a) 4 b) 8 c) 2 d) 6

4. The capacitance of a spherical condenser is 1 μF. If the spacing between two spheres is 1 mm, the radius of the outer sphere is

   a) 3 m b) 7 m c) 8 m d) 9 m

5. Charges +q and –q are placed at points A and B respectively which are a distance $2L$ apart, C is the mid-point between A and B. The work done in moving a charge $+Q$ along the semicircle CRD is

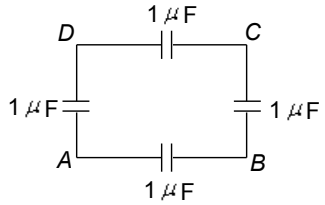


   a) $\frac{qQ}{4\pi\varepsilon_0 L}$ b) $\frac{qQ}{2\pi\varepsilon_0 L}$ c) $\frac{qQ}{6\pi\varepsilon_0 L}$ d) $-\frac{qQ}{6\pi\varepsilon_0 L}$

6. A parallel plate air capacitor has a capacitance 18 μF.If the distance between the plates is trapled and a dielectric medium is introduced, the capacitance becomes 72 μF. The dielectric constant of the medium is

   a) 4 b) 9 c) 12 d) 2

7. Four capacitors are connected as shown in figure. The equivalent capacitance between A and B is

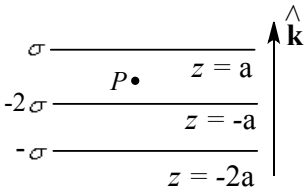


a) 4 μF b) 0.25 μF c) 0.75 μF d) 1.33 μF

8. The capacitance of a metallic sphere is 1 μF, then its radius will be

a) 10 m b) 1.11 km c) 9 km d) 1.11 m

9. Three large parallel plates have uniform surface change densities as shown in the figure. Find the electric field at point P.



a) $\frac{-4\sigma}{\varepsilon_0}\hat{k}$ b) $\frac{4\sigma}{\varepsilon_0}\hat{k}$ c) $\frac{-2\sigma}{\varepsilon_0}\hat{k}$ d) $\frac{2\sigma}{\varepsilon_0}\hat{k}$

10. Two charges -10C and +10 C are placed 10 cm apart. Potential at the centre of the line joining the two charges is

a) Zero b) 2 V c) -2 V d) None of these

11. The ratio of momenta of an electron and proton which are accelerated from rest by a potential difference 50 V is

a) $\frac{m_e}{m_p}$ b) $\sqrt{\frac{m_e}{m_p}}$ c) $\frac{m_p}{m_e}$ d) $\sqrt{\frac{m_p}{m_e}}$

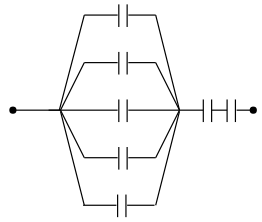
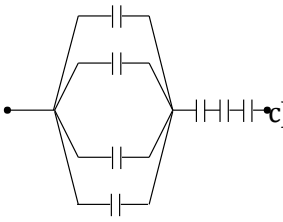
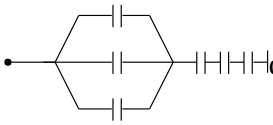
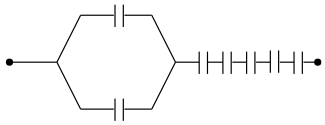
12. Large number of capacitors of rating 10 μF/200 V are available. The minimum number of capacitors required to design a 10 μF/700 capacitor is

a) 16 b) 4 c) 8 d) 7

13. Two charged spheres of radii $R_1$and R_2 having equal surface charge density. The ratio of their potential is

a) R_1/R_2 b) R_2/R_1 c) $\left(\frac{R_1}{R_2}\right)^2$ d) $\left(\frac{R_2}{R_1}\right)^1$

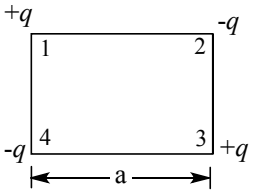
14. Seven capacitors each of the capacitance 2μF are be connected in a configuration to obtain an effective capacitance of $\frac{10}{11}$μ F. Which of the combination (S) shown in figure will achieve the desired result?

a)  b)  c)  d) 

15. Two identical metal plates are given positive charges Q_1 and Q_2 ($< Q_1$) respectively. If they are now brought close together to form a parallel plate capacitor with capacitance C, the potential difference between them is

a) $\frac{Q_1 + Q_2}{2C}$ b) $\frac{Q_1 + Q_2}{C}$ c) $\frac{Q_1 - Q_2}{C}$ d) $\frac{Q_1 - Q_2}{2C}$

16. Identify the wrong statement.
    a) The electrical potential energy of a system of two protons shall increase if the separation between the two is decreased.
    b) The electrical potential energy of a proton-electron system will increase if the separation between the two is decreased.
    c) The electrical potential energy of a proton-electron system will increase if the separation between the two is increased.
    d) The electrical potential energy of system of two electrons shall increase if the separation between the two is decreased.
17. The work required to put the four charges at the corners of a square of side a, as shown in figure, is

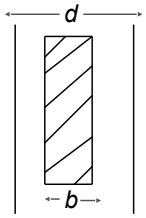


a) $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{a}$ b) $-\frac{2.6}{4\pi\varepsilon_0}\frac{q^2}{a}$ c) $+\frac{2.6}{4\pi\varepsilon_0}\frac{q^2}{a}$ d) None of these

18. A parallel plate capacitor with air between the plates has a capacitance of 9 pF. The separation between its plates is d. The space between the plates is now filled with two dielectrics. One of the dielectrics has dielectric constant $K_1 = 3$ and thickness $\frac{d}{3}$ while the other one has dielectric constant $K_2 = 6$ and thickness $\frac{2d}{3}$.capacitance of the capacitor is now

a) 1.8 pF b) 45 pF c) 40.5 pF d) 20.25 pF

19. A slab of copper of thickness b is inserted in between the plates of parallel plate capacitor as shown in figure. The separation between the plates is d if $b = d/2$, then the ratio of capacities of capacitors after and before inserting the slab will be



a) $\sqrt{2}:1$ b) $2:1$ c) $1:1$ d) $1:\sqrt{2}$

20. If the electric flux entering and leaving an enclosed surface respectively is ϕ_1 and ϕ_1, then, charge enclosed in closed surface is

a) $\frac{\phi_2 - \phi_1}{\varepsilon_0}$ b) $\frac{\phi_1 + \phi_2}{\varepsilon_0}$ c) $\frac{\phi_1 - \phi_2}{\varepsilon_0}$ d) $\varepsilon_0(\phi_2 - \phi_1)$