DPP

DAILY PRACTICE PROBLEMS

Class : XIIth **Subject : PHYSICS**

Date : **DPP No. : 7**

Topic :-Electric charges and fields

1. Two spherical conductors A and B of radii 1 mm and 2 mm are separated by a distance of 5 cm and are uniformly charged. If the spheres are connected by a conducting wire then in equilibrium condition, the ratio of the magnitude of the electric fields at the surfaces of spheres A and B is

   a) 1:2 b) 2:1 c) 1:4 d) 4:1

2. Consider a neutral conducting sphere. A positive point charge is placed outside the sphere. The net charge on the sphere is then

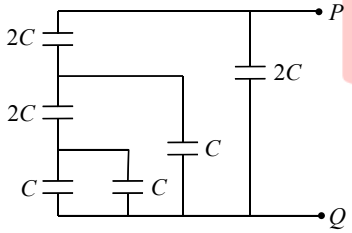
   a) Negative and distributed uniformly over the surface of the sphere

   b) Negative and appears only at the point on the sphere closest to the point charge

   c) Negative and distributed non-uniformly over the entire surface of the sphere

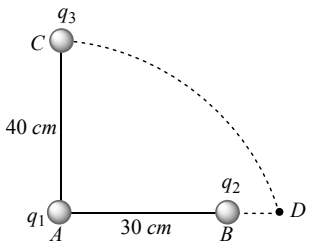
   d) Zero

3. The resultant capacitance of given circuit is



   a) $3C$ b) $2C$ c) C d) $\frac{C}{3}$

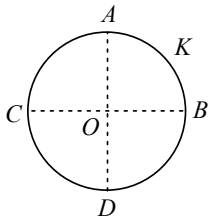
4. Two charges q_1 and q_2 are placed 30 cm apart, as shown in the figure. A third charge q_3 is moved along the arc of a circle of radius 40 cm from C to D. The change in the potential energy of the system is $\frac{q_3}{4\pi\varepsilon_0}k$, where k is



   a) $8\,q_2$ b) $8\,q_1$ c) $6q_2$ d) $6q_1$

5. A thin metal plate P is inserted half way between the plates of a parallel plate capacitor of capacitance C in such a way that it is parallel to the two plates. The capacitance now becomes
a) C b) $C/2$ c) $4C$ d) None of these

6. Two protons are a distance of $1 \times 10^{-10} cm$ from each other. The forces acting on them are
a) Nuclear force and coulomb force
b) Nuclear force and gravitational force
c) Coulomb force and gravitational force
d) Nuclear, coulomb and gravitational force

7. 

A thin conducting ring of radius R is given a charge $+Q$. The electric field at the centre O of the ring due to the charge on the part AKB of the ring is E. The electric field at the centre due to the charge on the part $ACDB$ of the ring is
a) E along KO b) 3 E along OK c) 3 E along KO d) E along OK

8. Which of the following statement is correct?
a) Electric field is zero on the surface of current carrying wire.
b) Electric field is non-zero on the axis of hollow current carrying wire
c) Surface integral of magnetic field for any closed surface is equal to μ_0 times of total algebraic sum of current which are crossing through the closed surface
d) None of the above

9. The charge given to any conductor resides on its outer surface, because
a) The free charge tends to be in its minimum potential energy state
b) The free charge tends to be in its minimum kinetic energy state
c) The free charge tends to be in its maximum potential energy state
d) The free charge tends to be in its maximum kinetic energy state

10. A 10 μF capacitor is charged to a potential difference of 1000 V. The terminals of the charged capacitor are disconnected from the power supply and connected to the terminals of an uncharged $6\mu F$ capacitor. What is the final potential difference across each capacitor
a) 167 V b) 100 V c) 625 V d) 250 V

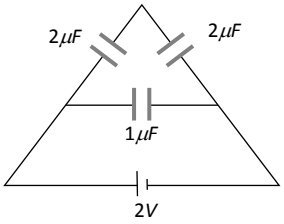
11. The plates of a parallel plate condenser are pulled apart with a velocity v. If at any instant their mutual distance of separation is d, then the magnitude of the time of rate of change of capacity depends on d as follows
a) $1/d$ b) $1/d^2$ c) d^2 d) d

12. If a dielectric substance is introduced between the plates of a charged air-gap capacitor. The energy of the capacitor will
    a) Increase
    b) Decrease
    c) Remain unchanged
    d) First decrease and then increase

13. Two capacitors each of capacity $2\mu F$ are connected in parallel. This system is connected in series with a third capacitor of $12\mu F$ capacity. The equivalent capacity of the system will be
    a) $16\mu F$
    b) $13\mu F$
    c) $4\mu F$
    d) $3\mu F$

14. The top of the atmosphere is at about 400 kV with respect to the surface of the earth, corresponding to an electric field that decreases with attitude. Near the surface of the earth, the field is about 100 Vm^{-1}. Still, we do not get an electric shock as we step out of our house into the open house because (assume the house to be a steel cage so that there is no field inside)
    a) There is a potential difference between our body and the ground
    b) 100 Vm^{-1} is not a high electric field so that we do not feel the shock
    c) Our body and the ground forms and Equipotential surface
    d) The atmosphere is not a conductor

15. The charge on any one of the $2\mu\ F$ capacitors and $1\mu\ F$ capacitor will be given respectively (in $\mu\ C$) as



    a) 1,2
    b) 2,1
    c) 1,1
    d) 2,2

16. A 4 μF capacitor, a resistance of 2.5 $M\Omega$ is in series with 12 V battery. Find the time after which the potential difference across the capacitor is 3 times the potential difference across the resistor. [Given $\ln(2) = 0.693$]

    a) 13.86 s
    b) 6.93 s
    c) 7 s
    d) $^{14\ s}$

17. A cube of metal is given a positive charge Q. For the above system, which of the following statements is true
    a) Electric potential at the surface of the cube is zero
    b) Electric potential within the cube is zero
    c) Electric field is normal to the surface of the cube
    d) Electric field varies within the cube

18. 100 capacitors each having a capacity of $10\mu F$ are connected in parallel and are charged by a potential difference of 100 kV. The energy stored in the capacitors and the cost of charging them, if electrical energy costs 108 $paise\ per\ kWh$, will be

a) $10^7\ joule$ and 300 $paise$ b) 5×10^6 joule and 300 $paise$

c) 5×10^6 joule and 150 $paise$ d) $10^7 joule$ and 150 $paise$

19. Four metal conductors having different shapes

1. A sphere 2. Cylindrical
3. Pear 4. Lightning conductor

Are mounted on insulating stands and charged. The one which is best suited to retain the charges for a longer time is

a) 1 b) 2 c) 3 d) 4

20. Two identical conducting spheres carrying different charges attract each other with a force F when placed in air medium at a distance $'d'$ apart. The spheres are brought into contact and then taken to their original positions. Now the two spheres repel each other with a force whose magnitude is equal to that of the initial attractive force. The ratio between initial charges on the spheres is

a) $-(3+\sqrt{8})$ only b) $-3+\sqrt{8}$ only

c) $-(3+\sqrt{8})$ or $(-3+\sqrt{8})$ d) $+\sqrt{3}$