1. The concept of positive and negative charges was introduced by

1)Max Planck
2)Benjamin Franklin
3)Newton
4)None

Ans: 2

2. When the distance between two charged particles is halved, the coulomb force between them becomes,

1) one-half
2) one-fourth
3) double
4) four times

Ans: 4

3.When a charge is given to a conductor the distribution of charge over its surface depends, on

1) shape of the conductor
2) size of the conductor
3) mass of the conductor
4) none

Ans: 1

4. Two charges are at distance ‘d’ apart in air, coulomb force between them, is F. If a dielectric material of dielectric constant K is placed between them, the coulomb force now becomes

1) F/K
2) FK
3) F/K^2
4) K^2F

Ans: 1

5. In charging by friction

1) law of conservation of charge holds good
2) law of conservation of charge fails
3) law of conservation of energy holds good
4) none

Ans: 1

6. Two charges at some distance in water experience a force F if water between them is removed, the new force becomes 80F. The dielectric constant of water is

1) 80
2) 1/80
3) $80^{1/2}$
4) $(80)^2$

Ans: 1

7. A charge Q is placed at the mid point of the line joining two similar positive equal charges q and q. The charges q will be in equilibrium if Q is equal to

1) – q
2) q/4
3) –q/4
4) q

Ans: 3

8. Two identical spheres charged with 200 μC and –200 μC are kept at a distance. The force acting on them is f_1. They are connected using an insulated conductor and then conductor is removed. The force f_2 acting on them now will be

1) equal to f_1
2) more than f_1
3) zero
4) infinite

Ans: 3

9. ‘n’ identical mercury droplets charged to the same potential ‘v’, combines to form a single bigger drop. The potential of the new drop will be

1) nV
2) V/n
3) $n^{2/3}V$
4) nV^2

Ans: 3

10. The electric field intensity due to a hollow spherical conductor is maximum

1. outside the sphere
2. on the surface of the sphere
3. at any point inside the sphere
4. only at the center of the sphere

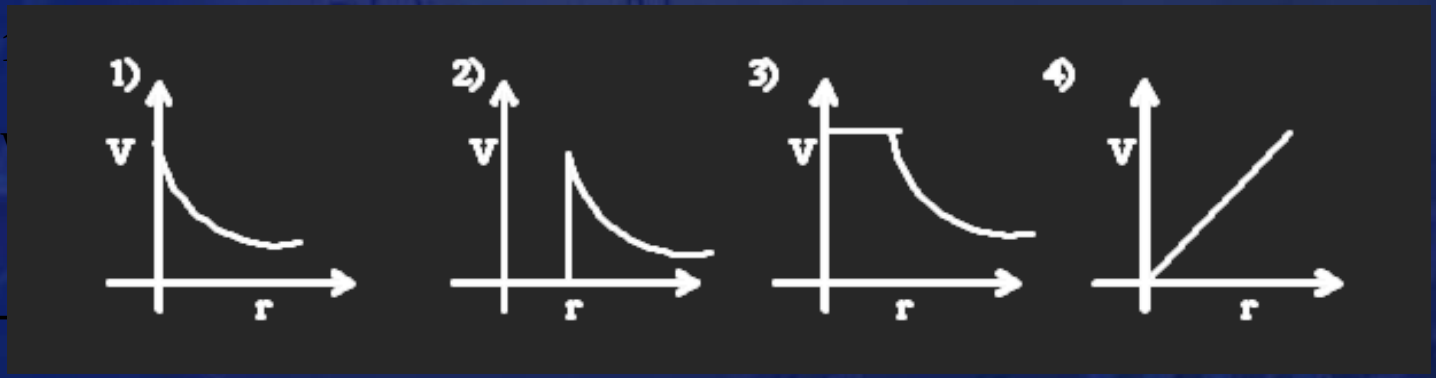
Ans: 2

11. A charged oil drop remains stationary when situated between two parallel horizontal metal plates 25mm apart and a of 100V is applied to the plates. Find the charge on the drop if it has a mass of 5×10^{-15}kg. ($g=10m/s^2$)

1) 1.25×10^{-17}c
2) 1.25×10^{-16}c
3) 1.25×10^{-19}c
4) 1.25×10^{-18}c

Ans: 1

12. Let V denotes the potential of an electric field at a point distant ‘r’ from the centre of a hollow sphere of radius r. The variation of V w.r.t. ‘r’ is as shown by the following graphs. Select the correct answer.



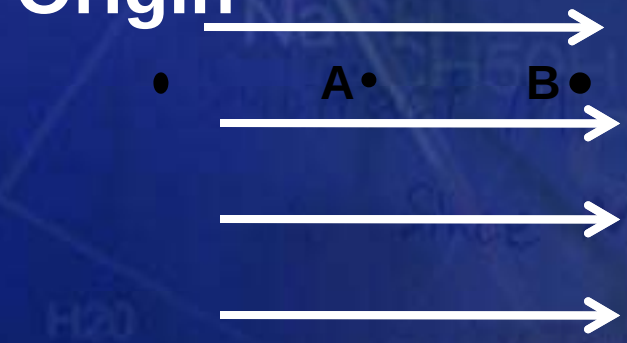
Ans: 3

13. An infinite number of charges each equal to 1nc are placed along the x-axis at x = 1m, x=2m, x=4m, x=8m ----------. The electric intensity at x=0 due to this set of charges is,

1) ∞
2) 0
3) $12 NC^{-1}$
4) $120\ NC^{-1}$

Ans: 3

14. A and B are two points in a uniform electric field E shown in the figure. If potential at A and B are denoted by V_A and V_B, then,



1) $V_A > V_B$

2) $V_A < V_B$

3) $V_A = V_B$

4) $V_A = V_B = 0$

Ans: 1

15. Suppose the electrostatic potential at some points in space are given $V(x)=x^2-2x$. What is the electrostatic field strength at x = 1 ?

1) zero

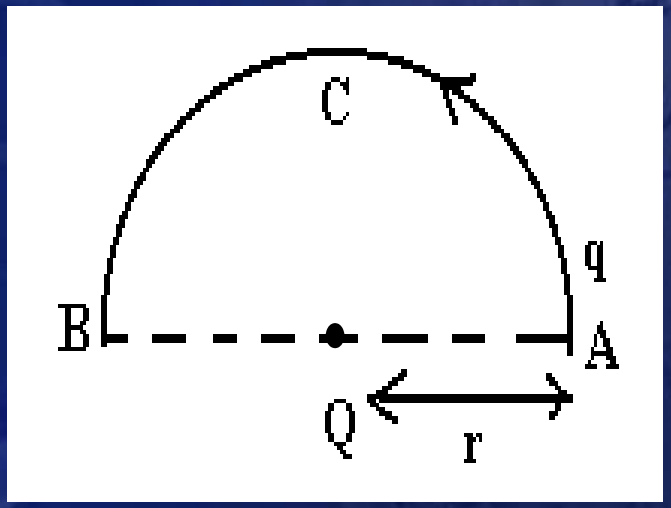
2) –2

3) 2

4) 4

Ans: 1

16. Two small spheres, carrying charged Q and q are pulled r meter apart and they interact with a force F. If one of the sphere is taken around the other one in a semi circular path ACB, the work done will be



1) F . 2r 2) F . πr

3) F / πr 4) 0

Ans: 4

17. If an electric dipole is placed in a uniform electric field , it experiences :

1. torque only
2. net force only
3. both torque and net force
4. neither torque nor net force

Ans: 1

18. Electric field strength E due to a short dipole at a distance r from it are related as

1. $E \alpha r^{-1}$
2. $E \alpha r^{-2}$
3. $E \alpha r^{-3}$
4. $E \alpha r^{-4}$

Ans: 3

19. If electric field in a region is radically outward with magnitude E = Ar, the charge contained in a sphere of radius r centered at the origin is

1) $\frac{1}{4\pi\varepsilon_o} Ar^3$

2) $4\pi\varepsilon_o \, Ar_3$

3) $\frac{1}{4\pi\varepsilon_o} \frac{A}{r^3}$

4) $\frac{4\pi\varepsilon_o \, A}{r^3}$

Ans: 2

20. If E_a be the electric field strength due to a short dipole on the axial line and E_e be that on the quatorial line at the same distance from the dipole, then :

1. $2E_a = E_e$
2. $E_a = 2E_e$
3. $E_a = E_e$
4. none of the above

Ans: 2

21) If the electric flux entering and leaving an enclosed surface respectively is ϕ_1 and ϕ_2, the electric charge inside the surface will be

1) $\frac{\phi_1 + \phi_2}{\varepsilon_0}$

2) $(\phi_1 \times \phi_2)\, \varepsilon_0$

3) $(\phi_1 + \phi_2)\, \varepsilon_0$

4) $(\phi_1 - \phi_2)\, \varepsilon_0$

Ans: 4

22. What happens when soap bubble is charged positively ?

1. it collapses
2. its radius increases
3. its radius decreases
4. none of the above

Ans: 2

23. The electric field at a distance R due to charge q is E. If the same charge is placed on the copper sphere of radius R, the electric field strength at the surface of the conductor will be

1. E/4
2. E/2
3. E
4. 2E

Ans: 3

24. The angle between the electric dipole moment and the electric field strength due to it on the equatorial line is

1. 0°
2. 90°
3. 180°
4. none of the above

Ans: 3

25. What is the direction of the lines of force at any point on the equipotential surface?

1. Parallel to it
2. Normal to it
3. be inclined
4. none of the above

Ans: 2

26. E = - dV/dr. Here negative sign signifies that

1. E is opposite to V
2. E is negative
3. E increases when V decreases
4. E is directed in the direction of decreasing V

Ans: 4

27. A spherical conductor of radius R, placed in air, is given a charge Q. Then the potential at a point inside the conductor and at a distance R/2 from its centre is

1) $V = \frac{1}{4\pi\varepsilon_0} \frac{Q}{R}$

2) $V = \frac{1}{4\pi\varepsilon_0} \frac{Q}{2R}$

3) $V = 4\pi\varepsilon R$

4) $V = 4\pi\varepsilon_0 R$

Ans: 1

28. Two spherical conductors of radii 4m and 5m are charged to the same potential.

If σ_1 and σ_2 are the respective values of the surface density of charge on the two conductors, then the ratio σ_1/σ_2 is

1. 16/25
2. 25/16
3. 4/5
4. 5/4

Ans: 4

29. A parallel plate capacitor has a capacitance C. The separation between the plates is doubled and a dielectric slab of dielectric constant K is introduced between the plates. If the capacitance now becomes 2C, the value of dialectic constant K is

1. 2
2. 1
3. 4
4. 8

Ans: 3

30. A parallel plate capacitor with air as dielectric is charged to a potential V_1. It is then connected to identical uncharged parallel plate capacitors with a dielectric having dielectric constant K. If the common potential of both the capacitors is V_2, then

1) $K = \dfrac{V_1 - V_2}{V_1 - V_2}$

2) $K = \dfrac{V_1 - V_2}{V_2}$

3) $K = \dfrac{V_1}{V_1 - V_2}$

4) $K = \dfrac{V_1 - V_2}{V_1}$

Ans: 2

31. The distance between plates of parallel plate capacitor is d. A metal plate of thickness t=d/2 is placed between the plates. Then

1. the capacitance remains the same
2. the capacitance doubles
3. the capacitance halves.
4. the capacitance increases by four times.

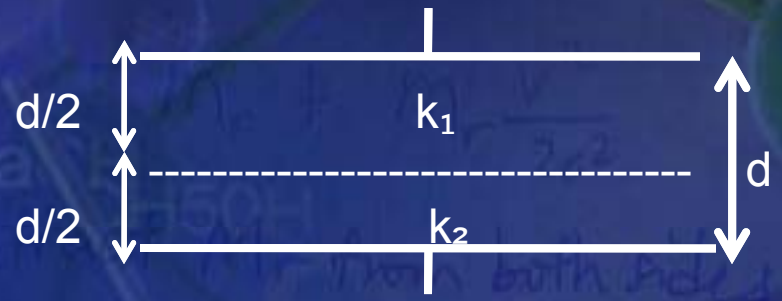
Ans: 2

32. A parallel plate capacitor consists of two metal plates each of area 1 m^2, separated by 0.2 cm in air. If the capacitor is connected to a battery of 500 V, the electric field between the plates is

1. 125 kV m^{-1}
2. 250 kVm^{-1}
3. 500 kVm^{-1}
4. 100 kVm^{-1}

Ans: 2

33. A parallel plate capacitor is filled with two dielectrics constant k_1 and k_2 respectively the area of each plate is A and the separation between the plates is d. The capacitance of the capacitor is given by



1) $\dfrac{\varepsilon_0 A\ (K_1 + K_2)}{d}$

2) $\dfrac{\varepsilon_0 A\ (K_1 + K_2)}{2d}$

3) $\dfrac{\varepsilon_0 A\ 2\ (K_1 \times K_2)}{d\qquad (K_1 + K_2)}$

4) $\dfrac{\varepsilon_0 A\qquad (K_1 - K_2)}{d\qquad\qquad 2}$

Ans: 3

34. A parallel plate capacitor of capacitance 4μF is fully charged using a battery of 10V. it is then disconnected form the battery and connected in parallel with an uncharged capacitor. If the potential difference across the capacitor is now found to be 4V, the capacitance of the second capacitor is

1. 6μF

2. 10μF

3. 15μC

4. 3μF

Ans: 1

35. 125 water drops of equal radius and equal capacitance C, coalesce to form a single drop of capacitance C^{l}, The relation between C and C^{l} is

1. $C^{l} = 125c$
2. $C^{l} = C$
3. $C^{l} = C/125$
4. $C^{l} = 5C$

Ans: 4

36. A parallel plate air capacitor consists of two circular plates of 1cm^2 area each and separated by a distance of 1 mm. If the gap between the plates is doubled, the capacitance changes to.

1. double the original value
2. Half the original value
3. one-fourth the original value
4. Anyone of these.

Ans: 2

37. Three identical capacitors (of capacitance C each) are connected in series and this combination is connected in parallel with one more identical capacitor. Then the capacitance of the whole combination is

1. 3C

2. 4C/3

3. 3C/4

4. 2C

Ans: 2

38. Three condensers each of capacity C microfarads are connected in series. A exactly similar set is connected in parallel to the first one. The effective capacity of the combination is 4 microfarads. Then the value of C in microfarads is

1) 8

2) 6

3) 4

4) 2

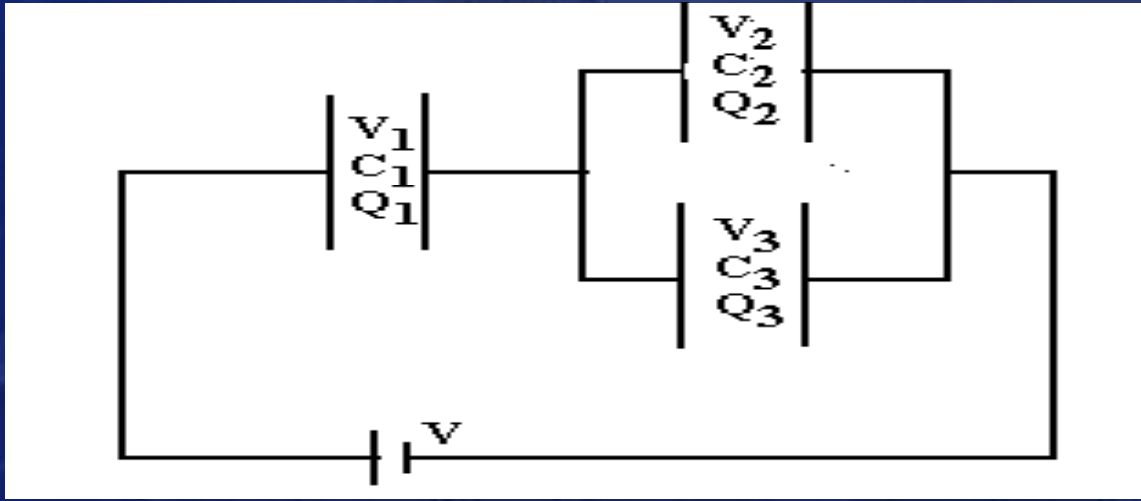
Ans: 2

39. Consider two conductors that have capacities 2 and 3 units. Suppose they are charged until their potentials are 4 and 5 units respectively. If these two conductors are now connected to each other, they will attain a common potential of (in volts)

1) 2.3
2) 3.2
3) 4.6
4) 6.4

Ans: 3

40. In the diagram given below, the correct conditions will be



1. $Q_1 = Q_2 = Q_3$
&
$V_1 = V_2 = V_3 = V$

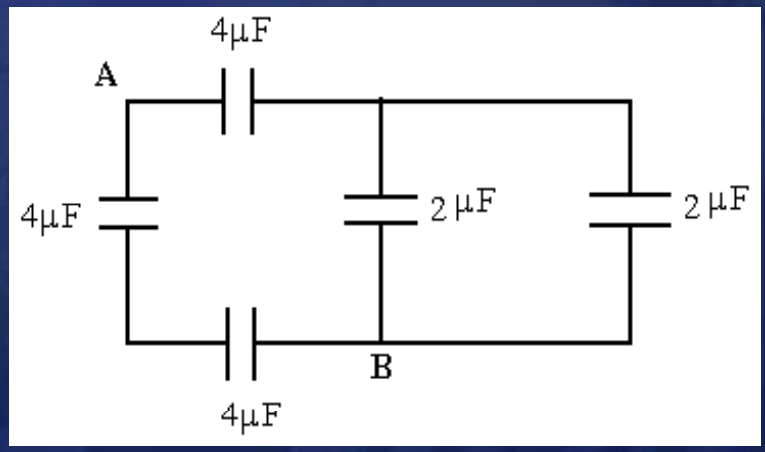
2. $Q_1 = Q_2 + Q_3$
&
$V = V_1 + V_2 + V_3$

3. $Q_1 = Q_2 + Q_3$
&
$V = V_1 + V_2$

4. $Q_3 = Q_2$ &
$V_2 = V_3$

Ans: 3

41. In the shown, the effective capacitance between A & B is



1) 8μF 2) 4μF

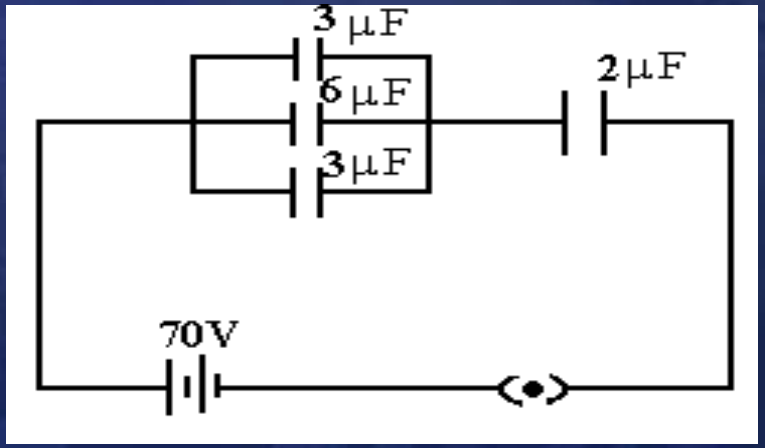
3) 3μF 4) 3μF

Ans: 2

42. The P.d across 2μF in the given fig is

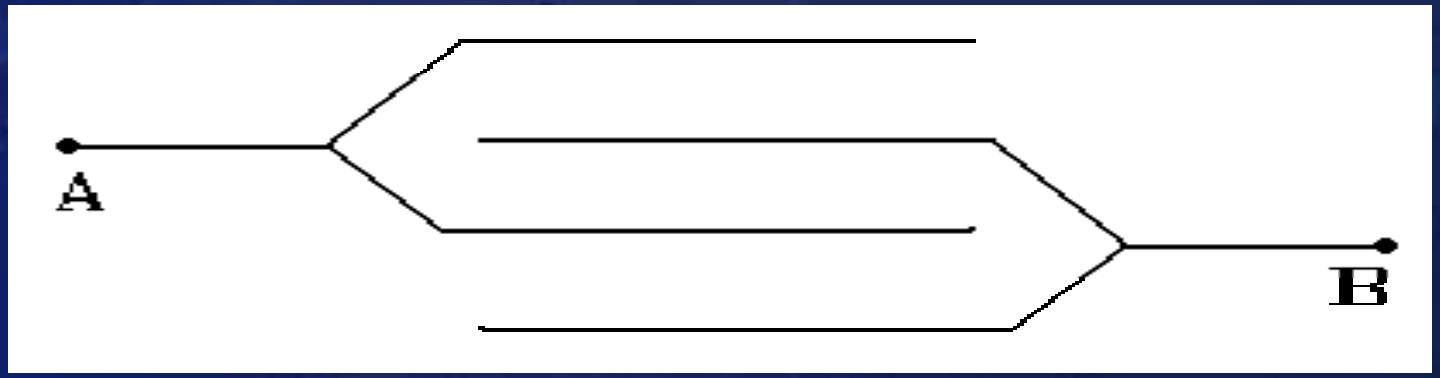
1) 10v 2) 60v

3) 28v 4) 56v



Ans: 2

43. Four metallic plates, each with a surface area of one side A, are placed at a distance d from each other. The alternate plates are connected to points A & B as shown in fig. Then capacitance of the system is



1) $\frac{\varepsilon_0 A}{d}$

2) $\frac{2\varepsilon_0 A}{d}$

3) $\frac{3\varepsilon_0 A}{d}$

4) $\frac{4\varepsilon_0 A}{d}$

Ans: 3

44. The difference in the effective capacitance of the two similar capacitors when joined in series and parallel is 6μF. What is the capacitance of each capacitor?

1) 2μF

2) 4μF

3) 8μF

4) 16μF

Ans: 2