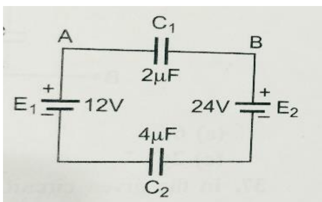
Capacitance

1. There are 27 drops of a conducting fluid. Each has a radius r and they are charged to a potential V_0. These are combined to from a bigger drop. Its potential will be:
   (a) V_0 (b) $3V_0$ (c) $9V_0$ (d) $27V_0$
2. 1000 small water drops each of radius r and charge q coalesce together to from one spherical drop. The potential of the bigger drop is larger than that of the smaller one by a factor:
   (a) 1000 (b) 100 (c) 10 (d) 1
3. The capacitance of a parallel plate condenser does not depend upon:
   (a) area of the plates
   (b) medium between the plates
   (c) distance between the plates
   (d) metal of the plates
4. The force between the plates of a parallel plate capacitor of capacitance C and distance of separation of the plates d with a potential difference V between the plates is:
   (a) $CV^2/2d$ (b) $C^2V^2/2d^2$ (c) C^2V^2/d^2 (d) V^2d/C
5. A parallel plate capacitor is made by stacking n equally spaced plates connected alternately. If the capacitance between any two plates is C, then the resulting capacitance is:
   (a) C (b) nC (c) (n-1)C (d) (n+1)C
6. Two parallel metal plates carry charge +Q and -Q respectively. A test charge q_0 placed between them experiences a force F. Now the separation between the plates is doubled, then the force on the test charge will be:
   (a) F (b) 2F (c) F/2 (d) F/4
7. A 2μF capacitor is charged to a potential of 200 V and then isolated. When it is connected in parallel with a second capacitor which is uncharged, the common potential becomes 40 V. The capacitance of the second capacitor is:
   (a) 2μF (b) 4μF (c) 8μF (d) none of these
8. Three capacitors of capacitances 12μF each are available. The minimum and maximum capacitances which may be obtained from these are:
   (a) 12μF, 36μF (b) 4μF, 12μF (c) 4μF, 36μF (d) 0μF, ∞μF
9. Two capacitors C_1 and C_2 are connected in a circuit as shown in figure. The potential difference $(V_A - V_B)$ is:



   (a) 8 V (b) -8 V (c) 12 V (d)-12 V

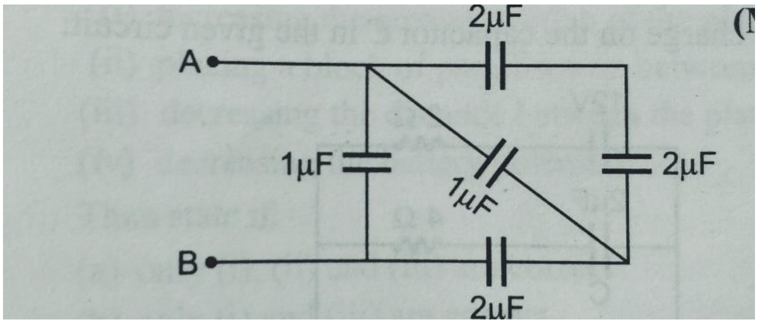
10. If K is the dielectric constant of a medium and ε_0 permittivity of free space, then the energy stored per unite volume of the medium is given by:
(a) $1/2K^2\varepsilon_0^2/E$ (b) $1/2K\varepsilon_0^2E$ (c) $1/2K\varepsilon_0/E^2$ (d) $1/2K\varepsilon_0E$

11. Force acting upon a charged particle kept between the plates of a charged capacitor is F. If one of the plates of the capacitor is removed, force acting on the same particle will become:
(a) 0 (b) F/2 (c) F (d) 2F

12. A parallel plate capacitor has plates with area A and separation d. A battery charges the plates to a potential difference V_0. The battery is then disconnected and a dielectric slab of thickness d is introduced. The ratio of energy stored in the capacitor before and after the slab is introduced, is:
(a) K (b) 1/K (c) A/d^2K (d) d^2K/A

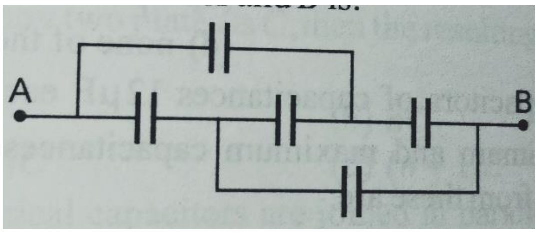
13. n capacitors each having capacitance C and breakdown voltage V are joined in series. The capacitance and the breakdown voltage of the combination are:
(a) C and V (b) nC and nV (c) nC and V/n (d) C/n and nV

14. Total capacity of the system of capacitors shown in the figure between the point A and B is:



(a) 1 μF (b) 2 μF (c) 3 μF (d) 4 μF

15. Five identical capacitors, each with capacitance C are connected as shown in the figure. Then, the equivalent capacitance between A and B is:

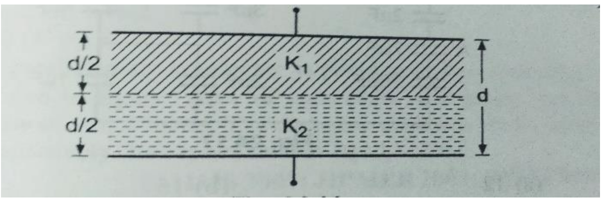


(a) C (b) 5C (c) C/5 (d) 3C

16. The capacity of a parallel plate capacitor depends on:
(a) nature of the metal of the plates
(b) thickness of the plates
(c) distance between the plates
(d) potential difference between the plates

17. A parallel plate condenser with plate area A and separation d is filled with two dielectric materials as shown in the given below. The dielectric constants are K_1 and

K_2 respectively. The capacitance will be:



(a) $\varepsilon_0 A/d(K_1 + K_2)$ (c) $2\varepsilon_0 A/d/(K_1K_2/K_1 + K_2)$

(b) $\varepsilon_0 A/d(K_1 + K_2/K_1K_2)$ (d) $2\varepsilon_0 A/d(K_1 + K_2/ K_1K_2)$

18. A capacitor is charged to store an energy U. The charging battery is disconnected. An identical capacitor is now connected to the first capacitor in parallel. The energy in each of the capacitors is:

(a) U/2 (b) 3U/2 (c) U (d) U/4

19. The capacity of a parallel plate capacitor depends on:

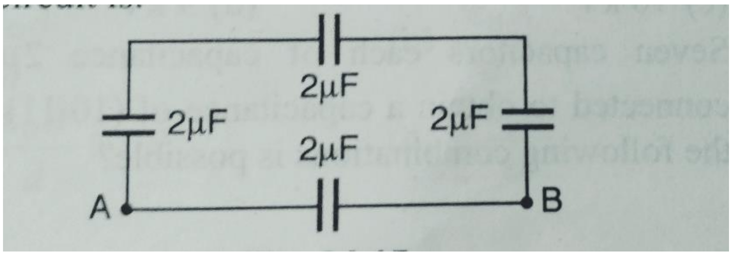
(a) nature of the metal of the plates

(b) thickness of the plates

(c) distance between the plates

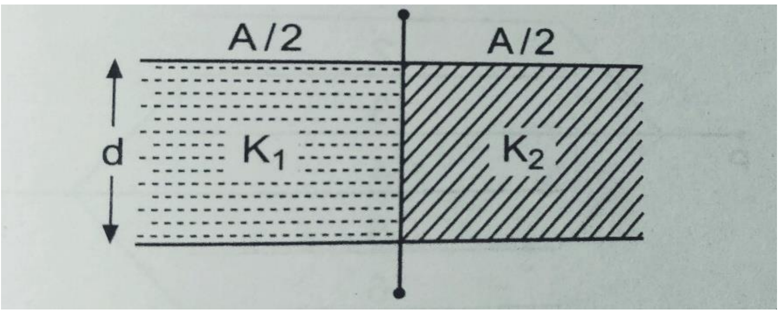
(d) potential difference between the plates

20. The equivalent capacitance between the point A and B in the given circuit is:



(a) 8 μF (b) (8/3) μF (c) 6 μF (d) 2 μF

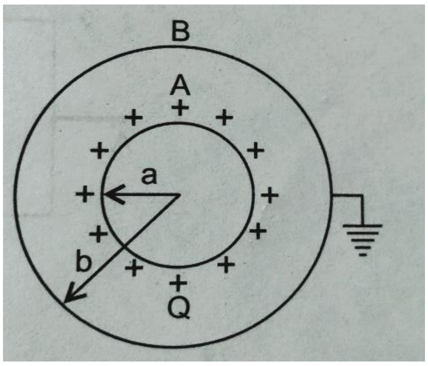
21. A parallel plate condenser is filled with two dielectric as shown in figure. Area of each plate is A metre^2 and the separation is d meter. The dielectric constants are K_1 and K_2 respectively. Its capacitance in farad will be:



(a) $\varepsilon_0 A/d(K_1 + K_2)$ (b) $\varepsilon_0 A/d(K_1 + K_2/2)$ (c) $\varepsilon_0 A/d2(K_1 + K_2)$ (d) $\varepsilon_0 A/d(K_1 - K_2/2)$

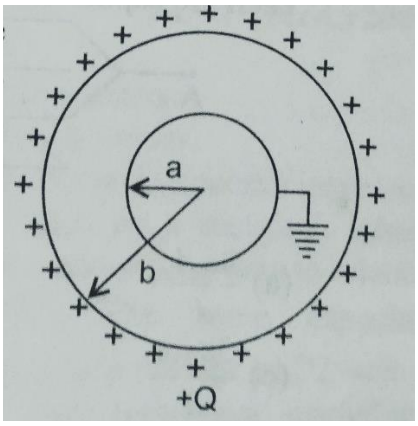
22. Two spherical conductors A and B of radii a and b (b > a) are placed concentrically in air. A is given a charge +Q while B is earthed. Then the equivalent capacitance of the

system is:



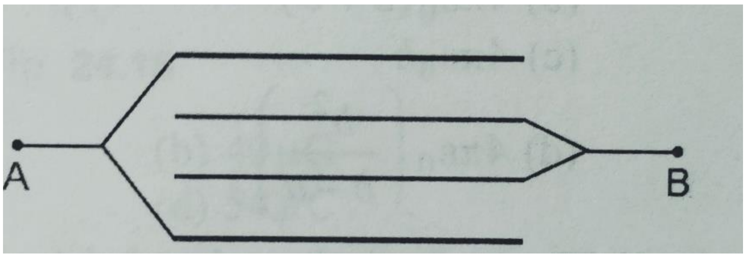
(a) $4\pi\varepsilon_0(ab/b - a)$ (b) $4\pi\varepsilon_0(a + b)$ (c) $4\pi\varepsilon_0 b$ (d) $4\pi\varepsilon_0(b^2/b - a)$

23. Four metallic plates, each with a surface area of one side A. are placed at a distance d from each other. The alternating plates are connected to point A and B as shown in figure. Then the capacitance of the system is:



(a) $\varepsilon_0 A/d$ (b) $2\varepsilon_0 A/d$ (c) $3\varepsilon_0 A/d$ (d) $4\varepsilon_0 A/d$

24. Four metallic plates each with a surface area of one side A, are placed at a distance d from each other. The two outer plates are connected to one point A and the two other inner plates to another point B as shown in the figure. Then, the capacitance of the system is:



(a) $\varepsilon_0 A/d$ (b) $2\varepsilon_0 A/d$ (c) $3\varepsilon_0 A/d$ (d) $4\varepsilon_0 A/d$

25. An uncharged parallel plate capacitor having a dielectric of constant K is connected to a similar air-cored parallel capacitor charged to a potential V. The two share the charge and the common potential is V'. The dielectric constant k is:

(a) $V' - V/ V' + V$ (b) $V' - V/ V'$ (c) $V' - V/ V$ (d) $V' - V/ V'$

26. A parallel plate capacitor is charged and the charging and the charging battery is then disconnected. If the plates of the capacitor are moved further apart by means of insulating handles, then which of the following is not correct?

(a) The capacitance decreases.

(b) The charge on the capacitor increases.

(c) The voltage across the plates increases.

(d) The electrostatic energy stored in the capacitor increases.

27. A capacitor of capacity C_1 is charged upto potential V volt and then connected in parallel to an uncharged capacitor of capacity C_2. The final potential difference across each capacitor will be:

(a) $C_2V/C_1 + C_2$ (b) $C_1V/C_1 + C_2$ (c) $(1+C_2/C_1)V$ (d) $(1-C_2/C_1)V$

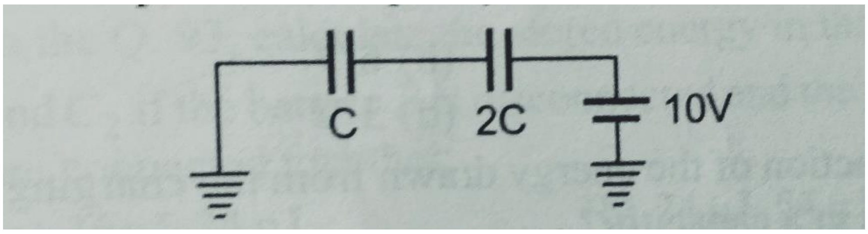
28. What fraction of the energy drawn from the charging battery is stored in a capacitor?

(a) 75% (b) 100% (c) 25% (d) 50%

29. 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

30. In the circuit shown in the figure, C = 6 μF. The charge stored in the capacitor of capacity C is:



(a) zero (b) 90 μC (c) 40 μC (d) 60 μC

31. A sheet of aluminium foil of negligible thickness is introduced between the plates of a capacitor. The capacitance of the capacitor:

(a) increases (b) decreases (c) becomes infinite (d) remains unchanged

32. If a dielectric substance is introduced between the plates of a charged air-gap capacitor, the energy of the capacitor will:

(a) decreases (c) increases

(b) remains unchanged (d) first decreases and then increases

33. A parallel plate condenser with a dielectric of dielectric constant K between the plates has a capacity c and is charged to a potential v volt. The dielectric slab is slowly removed from between the plates and then reinserted. The net work done by the system in this process is:

(a) zero (c) $2KC/(1 + K)$

(b) $C(K + 1)$ (d) none of these

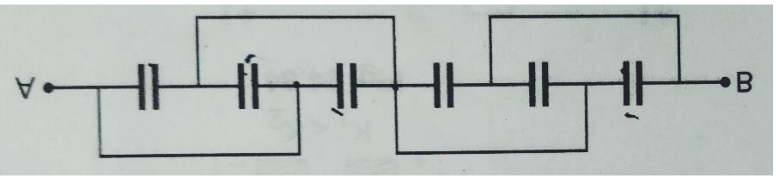
34. Three capacitance each of capacitance C and of breakdown voltage V are joined in series. The capacitance and breakdown voltage of the combination will be:

(a) 3C, V/3 (b) C/3, 3V (c) 3C, 3V (d) C/3, V/3

35. Energy stored per unit volume of a parallel plate capacitor having plate area A and plate separation d when charged to a potential of V volts is (air space in between the plates):

(a) $1/2C^2V^2$ (b) $q^2/4C$ (c) $1/2\varepsilon_0(V/d)$ (d) $1/2\varepsilon_0(V^2/d^2)$

36. All capacitors used in the diagram are identical and each is of capacitance C. Then, the effective capacitance between the point A and B is:



(a) 1.5C (b) 6 C (c) 1 C (d) 3 C