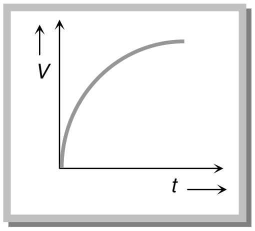
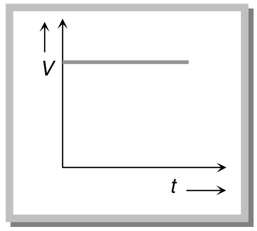
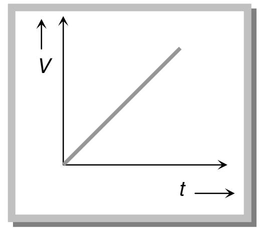
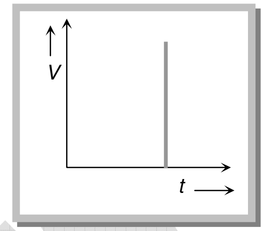
Capacitor Assignment

1. If on charging a capacitor current is kept constant then the variation of potential *V* of the capacitor with time *t* is shown as

(a) 

(b) 

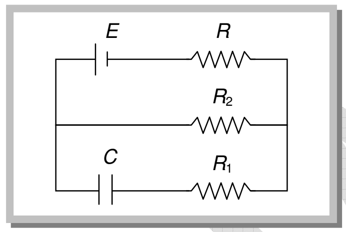
(c) 

(d) 

2. Two capacitors of capacitance 2 and $3\mu F$ are joined in series. Outer plate first capacitor is at 1000 *volt* and outer plate of second capacitor is earthed (grounded). Now the potential on inner plate of each capacitor will be

(a) 700 *Volt* (b) 200 *Volt* (c) 600 *Volt* (d) 400 *Volt*

3. In the given figure each plate of capacitance *C* has partial value of charge



(a) *CE* (b) $\frac{CER_1}{R_2 - R}$ (c) $\frac{CER_2}{R_2 + R}$ (d) $\frac{CER_1}{R_1 - R}$

4. A parallel plate capacitor has plate area *A* and separation *d*. It is charged to a potential difference V_0. The charging battery is disconnected and the plates are pulled apart to three times the initial separation. The work required to separate the plates is

(a) $\frac{3\varepsilon_0 AV_0^2}{d}$ (b) $\frac{\varepsilon_0 AV_0^2}{2d}$ (c) $\frac{\varepsilon_0 AV_0^2}{3d}$ (d) $\frac{\varepsilon_0 AV_0^2}{d}$

5. A charged 100μF capacitor is discharged through a 10 $k\Omega$ resistor. The ratio $\frac{\text{Charge on the capacitor after 1 second}}{\text{Original charge on the capacitor}}$ is

(a) (1 – 1/*e*) (b) ln 2 (c) (1 – ln 2) (d) 1/*e*

6. The area of the plates of a parallel plate capacitor is *A* and the distance between the plates is 10 *mm*. There are two dielectric sheets in it, one of dielectric constant 10 and thickness 6 *mm* and the other of dielectric constant 5 and thickness 4 *mm*. The capacity of the condenser is

(a) $\frac{12}{35}\varepsilon_0 A$ (b) $\frac{2}{3}\varepsilon_0 A$ (c) $\frac{5000}{7}\varepsilon_0 A$ (d) 1500 $\varepsilon_0 A$

7. A 500 μF capacitor is charged at a steady rate of 100 $\mu C/sec$. The potential difference across the capacitor will be 10 *V* after an interval of

(a) 5 *sec* (b) 20 *sec* (c) 25 *sec* (d) 50 *sec*

8. The space between the plates of a parallel plate capacitor is filled completely with a dielectric substance having dielectric constant 4 and thickness 3 *mm*. The distance between the plates in now increased by inserting a second sheet of thickness 5 *mm* and dielectric constant *K*. If the capacitance of the capacitor so formed is one-half of the original capacitance, the value of *K* is

(a) 10/3 (b) 20/3 (c) 5/3 (d) 15/3

9. A capacitor of capacitance 160 μF is charged to a potential difference of 200 *V* and then connected across a discharge tube, which conducts until the potential difference across it has fallen to 100 *V*. The energy dissipated in the tube is

(a) 6.4 *J* (b) 4.8 *J* (c) 3.2 *J* (d) 2.4 *J*

10. A 0.1 μF capacitor filled completely with a dielectric and it is charged until the p.d. between the plates becomes 25 *V*. Then the charge is shared with a similar capacitor which has air as dielectric. The potential difference falls to 15 *V*. The dielectric constant of the first capacitor is

(a) 2.5 (b) 1.5 (c) 7.5 (d) 5.5

11. A parallel plate capacitor of plate area A and plate separation d is charged to potential V and then the battery is disconnected. A slab of dielectric constant K is then inserted between the plates of the capacitors so as to fill the space between the plates. If Q, E and W denote respectively, the magnitude of charge on each plate, the electric field between the plates (after the slab is inserted) and work done on the system in the process of inserting the slab, then state incorrect relation from the following

(a) $Q = \frac{\varepsilon_0 AV}{d}$ (b) $W = \frac{\varepsilon_0 AV^2}{2Kd}$ (c) $E = \frac{V}{Kd}$ (d) $W = \frac{\varepsilon_0 AV^2}{2d}\left(\frac{1}{K} - 1\right)$

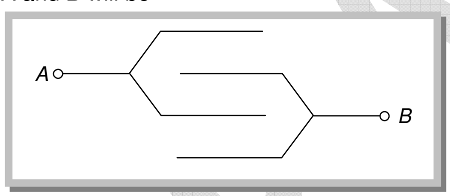
12. A dielectric slab of thickness d is inserted in a parallel plate capacitor whose negative plate is at $x = 0$ and positive plate is at $x = 3d$. The slab is equidistant from the plates. The capacitor is given some charge. As x goes from 0 to $3d$

(a) The magnitude of the electric field remains the same
(b) The direction of the electric field remains the same
(c) The electric potential increases continuously
(d) The electric potential increases at first, then decreases and again increases

13. A capacitor of capacitance C_0 is charged to a potential V_0 and then isolated. A small capacitor C is then charged from C_0, discharged and charged again; the process being repeated n times. Due to this, potential of the larger capacitor is decreased to V. Value of C is

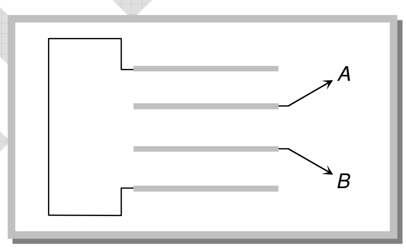
(a) $C_0\left[\frac{V_0}{V}\right]^{1/n}$ (b) $C\left[\left(\frac{V_0}{V}\right)^{1/n} - 1\right]$ (c) $C\left[\left(\frac{V}{V_0}\right) - 1\right]^n$ (d) $C\left[\left(\frac{V}{V_0}\right)^n + 1\right]$

14. If four plates each of area A are arranged according to the given diagram with distance d between neighboring plates then the capacitance of the system between A and B will be



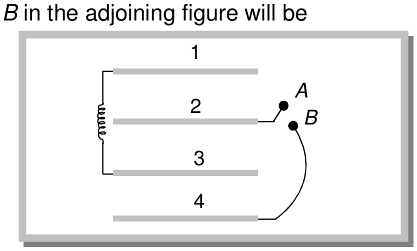
(a) $\frac{4\varepsilon_0 A}{d}$ (b) $\frac{3\varepsilon_0 A}{d}$ (c) $\frac{2\varepsilon_0 A}{d}$ (d) $\frac{\varepsilon_0 A}{d}$

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



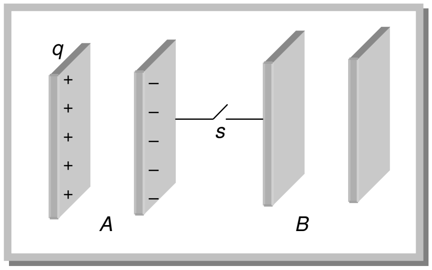
(a) $\frac{3\varepsilon_0 A}{d}$ (b) $\frac{2\varepsilon_0 A}{d}$ (c) $\frac{2}{3}.\frac{\varepsilon_0 A}{d}$ (d) $\frac{3}{2}.\frac{\varepsilon_0 A}{d}$

16. The equivalent capacity between A and B in the adjoining figure will be



(a) $\frac{\varepsilon_0 A}{d}$ (b) $\frac{3}{2}\frac{\varepsilon_0 A}{d}$ (c) $\frac{2\varepsilon_0 A}{d}$ (d) $\frac{2\varepsilon_0 A}{3d}$

17. Consider the situation shown in the figure. The capacitor A has a charge q on it whereas B is uncharged. The charged appearing on the capacitor B a long time after the switch is closed is

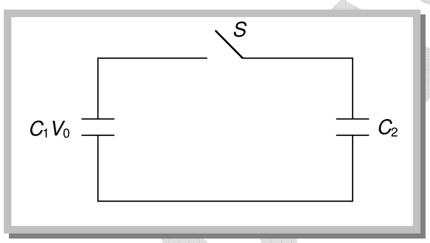


(a) Zero (b) $q/2$ (c) q (d) $2q$

18. Two capacitors of capacitances $3\mu F$ and $6\mu F$ are charged to a potential of $12V$ each. They are now connected to each other, with the positive plate of each joined to the negative plate of the other. The potential difference across each will be

(a) $6V$ (b) $4V$ (c) $3V$ (d) Zero

19. A capacitor of capacity C_1 is charged to the potential of V_0. ON disconnecting with the battery, it is connected with a capacitor of capacity C_2 as shown in the adjoining figure. The ratio of energies before and after the connection of switch S will be

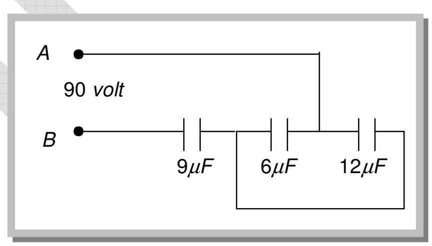


(a) $(C_1 + C_2)/C_1$ (b) $C_1/(C_1 + C_2)$ (c) C_1C_2 (d) C_1/C_2

20. The two metallic plate of radius *r* are placed at a distance *d* apart and its capacity is *C*. If a plate of radius *r*/2 and thickness *d* of dielectric constant 6 is placed between the plates of the condenser, then its capacity will be

(a) 7*C*/2 (b) 3*C*/7 (c) 7*C*/3 (d) 9*C*/4

21. The capacity of the capacitors are shown in the adjoining fig. The equivalent capacitance between the points *A* and *B* and the charge on the 6 μF will be



(a) 27 μF; 540 μC (b) 15 μF; 270 μC (c) 6 μF; 180 μC (d) 15 μF; 90 μC

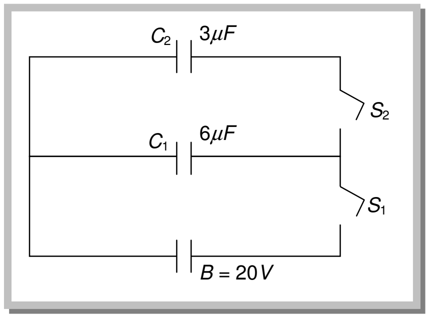
22. A parallel plate capacitor of capacitance *C* is connected to a battery and is charged to a potential difference *V*. Another capacitor of capacitance 2C is connected to another battery and is charged to potential difference 2*V*. The charging batteries are now disconnected and the capacitors are 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) $\frac{25CV^2}{6}$ (c) $\frac{3CV^2}{2}$ (d) $\frac{9CV^2}{2}$

23. Two identical parallel plate capacitors are connected in series to a battery of 100 *V*. A dielectric slab of dielectric constant 4.0 is inserted between the plates of second capacitor. The potential difference across the capacitor will now be respectively

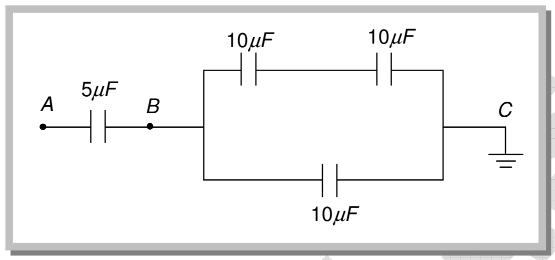
(a) 50 *V*, 50 *V* (b) 80 *V*, 20 *V* (c) 20 *V*, 80 *V* (d) 75 *V*, 25 *V*

24. In the circuit shown here $C_1 = 6\mu F$, $C_2 = 3\ \mu F$ and battery $B = 20\ V$. The switch S_1 is first closed. It is then opened and afterwards S_2 is closed. What is the charge finally on C_2



(a) 120 μC (b) 80 μC (c) 40 μC (d) 20 μC

25. In the give circuit if point C is connected to the earth and a potential of + 2000 V is given to the point A, the potential at B is



(a) 1500 V (b) 1000 V (c) 500 V (d) 400 V

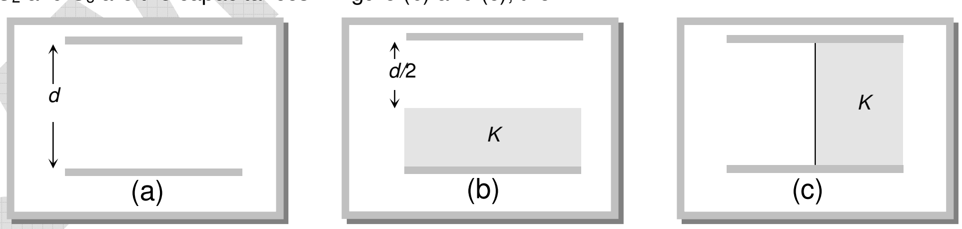
26. A 10 μF capacitor and a 20 μF capacitor are connected in series across a 200 V supply line. The charged capacitors are then disconnected from the line and reconnected with their positive plates together and negative plates together and no external voltage is applied. What is the potential difference across each capacitor

(a) $\frac{800}{9}V$ (b) $\frac{800}{3}V$ (c) 400 V (d) 200 V

27. An uncharged capacitor with a solid dielectric is connected to a similar air capacitor charged to a potential of V_0. If the common potential after sharing of charges becomes V, then the dielectric constant of the dielectric must be

(a) $\frac{V_0}{V}$ (b) $\frac{V}{V_0}$ (c) $\frac{(V_0 - V)}{V}$ (d) $\frac{(V_0 - V)}{V_0}$

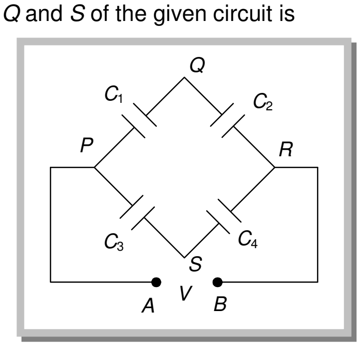
28. The capacitance of a parallel plate condenser is C_1 (fig. a). A dielectric of dielectric constant K is inserted as shown in figure (b) and (c). If C_2 and C_3 are the capacitances in figure (b) and (c), then



(a) Both C_2 and $C_3 > C_1$ (b) $C_3 > C_1$ but $C_2 < C_1$

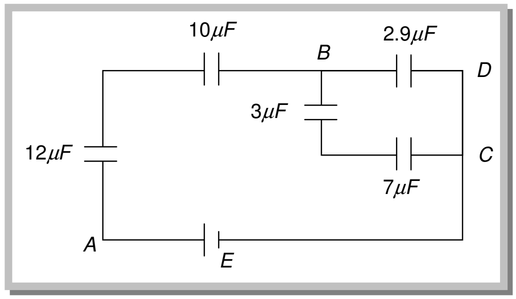
(c) Both C_2 and $C_3 < C_1$ (d) $C_1 = C_2 = C_3$

29. The potential difference between the points Q and S of the given circuit is



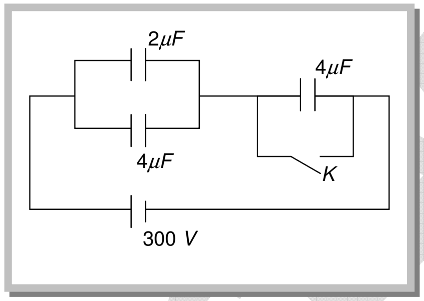
(a) $\frac{(C_2 - C_1)}{C_1}V$ (b) $\frac{(C_4 - C_3)}{C_3}V$ (c) $\frac{(C_2C_3 - C_1C_4)V}{(C_1 + C_2 + C_3 + C_4)}$ (d) $\frac{(C_4C_1 - C_2C_3)V}{(C_1 + C_2)(C_3 + C_4)}$

30. Five capacitors are connected as shown in the diagram. If the p.d. between *A* and *B* is 22 *V*, the emf of the cell is



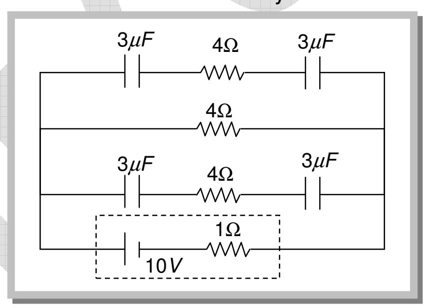
(a) 26 *V* (b) 42 *V* (c) 38 *V* (d) 46 *V*

31. In the circuit shown in the figure the amount of charge that will flow through any section of the connecting wires to the battery when the key *K* is closed is



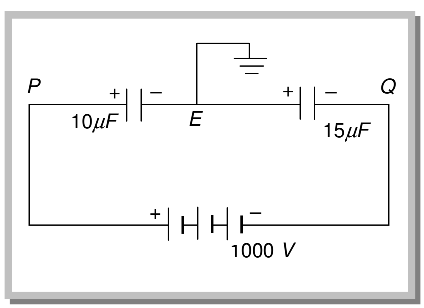
(a) 800μC (b) 1800μC (c) 1200μC (d) 1600μC

32. In the following figure, the charge on each condenser in the steady state will be



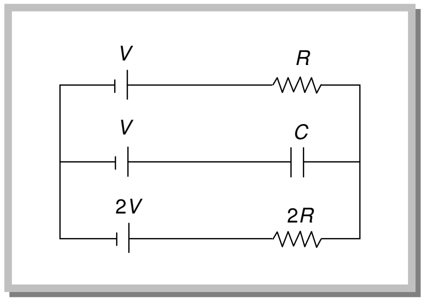
(a) 3μC (b) 6 μC (c) 9μC (d) 12μC

33. The figure shows a circuit with *E* as the earthing of the common plate. The potentials at *P* and *Q* are



(a) 0*V*, – 1000 *V* (b) 1000 *V*, 0 *V* (c) + 600 *V*, – 400 *V* (d) + 400 *V*, – 600 *V*

34. In the given circuit, with steady current, the potential drop across the capacitor must be



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

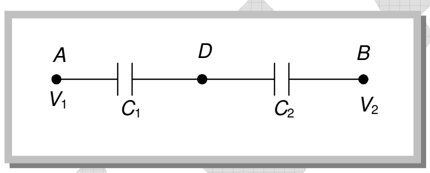
35. A parallel plate capacitor is charged to a potential difference of $50V$. It is discharged through a resistance. After 1 second, the potential difference between plates becomes $40V$. Then

(a) Fraction of stored energy after 1 second is 16/25
(b) P.d. between the plates after 2 seconds will be $32V$
(c) P.d. between the plates after 2 seconds will be $20V$
(d) Fraction of stored energy after 1 second is $\frac{4}{5}$

36. The equivalent capacitance of three capacitors of capacitance C_1, C_2 and C_3 connected in parallel is 12 units and the product $C_1C_2C_3 = 48$. When the capacitors C_1 and C_2 are connected in parallel the equivalent capacitance is 6 units. Then the capacitance are

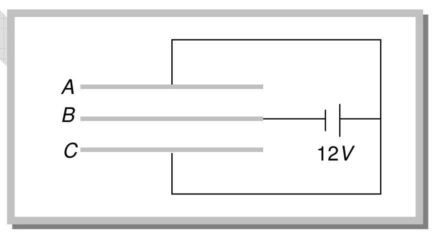
(a) 1.5, 2.5, 8 (b) 2,3,7 (c) 2,4,6 (d) 1,5,6

37. Two condensers C_1 and C_2 in a circuit are joined as shown in figure. The potential of point *A* is V_1 and that of *B* is V_2. The potential of point *D* will be



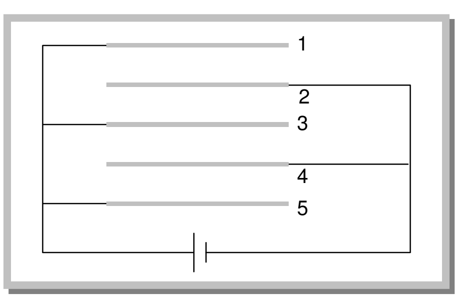
(a) $\frac{1}{2}(V_1 + V_2)$ (b) $\frac{C_2V_1 + C_1V_2}{C_1 + C_2}$ (c) $\frac{C_1V_1 + C_2V_2}{C_1 + C_2}$ (d) $\frac{C_2V_1 - C_1V_2}{C_1 + C_2}$

38. Three plates *A*, *B*, *C* each of area 50 cm^2 have separation 3 *mm* between *A* and *B* and 3 *mm* between *B* and *C*. The energy stored when the plates are fully charged is



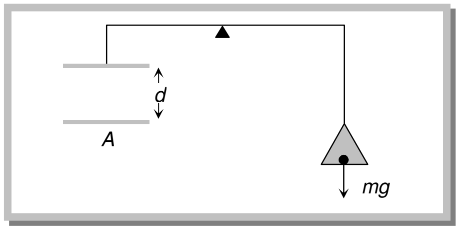
(a) 1.6×10^{-9} *J* (b) 2.1×10^{-9} *J* (c) 5×10^{-9} *J* (d) 7×10^{-9} *N*

39. Five identical plates are connected across a battery as follows. If the charge on plate 1 be $+q$, then the charges on the plates 2, 3, 4 and 5 are



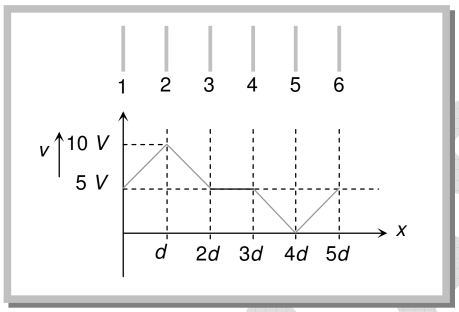
(a) $-q, +q, -q, +q$ (b) $-2q, +2q, -2q, +q$ (c) $-q, +2q, -2q, +q$ (d) None of the above

40. One plate of a parallel plate capacitor is suspended from a beam of a physical balance as shown in the figure. The area of each plate is 625 cm^2 and the distance between these plates is 5 *mm*. If an additional mass 0.04 *gm* is placed in the other pan of the balance, then the potential difference required between the plates to keep it in equilibrium will be



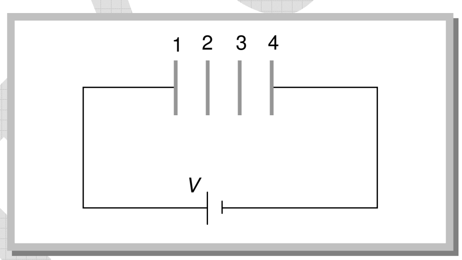
(a) 150 *V* (b) 188 *V* (c) 225 *V* (d) 310 *V*

41. The *V* versus *x* plot for six identical metal plates of cross-sectional area *A* is as shown. What will be the equivalent capacitance between 2 and 5 (The plates are placed with a separation *d*)



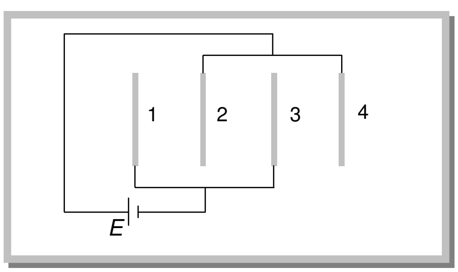
(a) $\frac{2\varepsilon_0 A}{d}$ (b) $\frac{\varepsilon_0 A}{d}$ (c) $\frac{3\varepsilon_0 A}{d}$ (d) $\frac{4\varepsilon_0 A}{d}$

42. Two parallel metal plates are inserted at equal distances into a parallel plate capacitor as shown in the figure. Plates 1 and 4 are connected to a battery of emf ε. With reference to the positive plate of the battery at zero potential, the potential of other plates are respectively



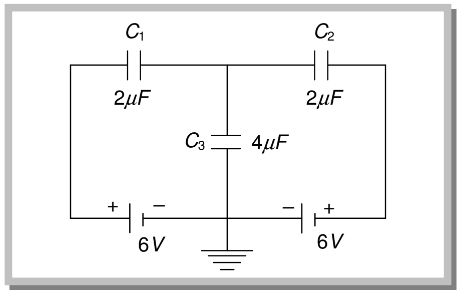
(a) 0, *V*, *V*, *V* (b) $0, \frac{V}{2}, \frac{V}{3}, V$ (c) $0, \frac{V}{3}, \frac{2V}{3}, V$ (d) 0, 0, 0, 0

43. Four plates, each of area *A* and each side are placed parallel to each other at a distance *d*. A battery is connected between the combinations 1 and 3 and 2 and 4. The modulus of charge on each plate is



(a) $\frac{2\varepsilon_0 A}{d}E$ (b) $\frac{3\varepsilon_0 A}{d}E$ (c) $\frac{2\varepsilon_0 A}{3d}E$ (d) $\frac{\varepsilon_0 A}{d}E$

44. Three capacitors are connected as shown in figure. Then the charge on C_1 is



(a) 6 μC (b) 12 μC (c) 18 μC (d) 24 μC

45. Three capacitors of capacitance $3\mu F$, $10\mu F$ and 15 μF are connected in series to a voltage source of 100 V. The charge on 15 μF is

(a) 25 μC (b) 100 μC (c) 200 μC (d) 280 μC

46. A parallel plate capacitor has capacitance C. If it is equally filled with parallel layers of materials of dielectric constant K_1 and K_2 its capacity becomes C_1. The ratio of C_1 to C is

(a) $K_1 + K_2$ (b) $\frac{K_1 K_2}{K_1 - K_2}$ (c) $\frac{K_1 + K_2}{K_1 K_2}$ (d) $\frac{2K_1 K_2}{K_1 + K_2}$

47. A capacitor of capacity C_1, is charged by connecting it across a battery of e.m.f. V_0. The battery is then removed and the capacitor is connected in parallel with an uncharged capacitor of capacity C_2. The potential difference across this combination is

(a) $\frac{C_2}{C_1 + C_2}.V_0$ (b) $\frac{C_1}{C_1 + C_2}.V_0$ (c) $\frac{C_1 + C_2}{C_2}.V_0$ (d) $\frac{C_1 + C_2}{C_1}.V_0$

48. Two capacitors with capacitances C_1 and C_2 are charged to potentials V_1 and V_2 respectively. When they are connected in parallel, the ratio of their respective charges is

(a) $\frac{V_1^2}{V_2^2}$ (b) $\frac{V_1}{V_2}$ (c) $\frac{C_1^2}{C_2^2}$ (d) $\frac{C_1}{C_2}$

49. Two condensers of capacity 0.3 μF and 0.6 μF respectively are connected in series. The combination is connected across a potential of 6 *volts*. The ratio of energies stored by the condensers will be

(a) $\frac{1}{2}$ (b) 2 (c) $\frac{1}{4}$ (d) 4

50. Three capacitors of capacitances 3 μF are connected once in series and another time in parallel. The ratio of equivalent capacitance in the two cases $\left(\frac{C_s}{C_p}\right)$ will be

(a) 1 : 9 (b) 9 : 1 (c) 1 : 1 (d) 1 : 3