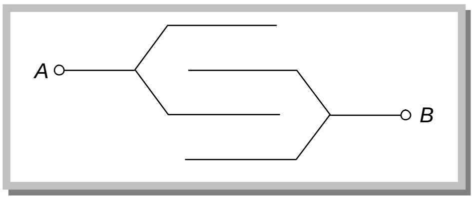
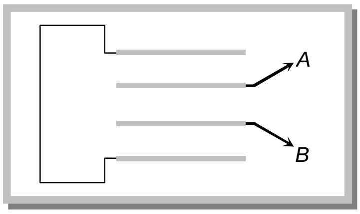
WORK SHEET - 9 CAPACITORS

1. 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



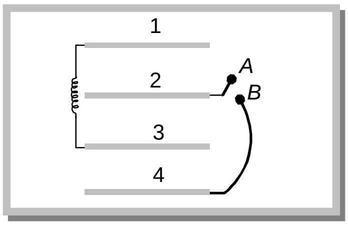
(a) $\frac{4\varepsilon_0 A}{d}$ (b) $\frac{3\varepsilon_0 A}{d}$ (c) $\frac{2\varepsilon_0 A}{d}$ (d) $\frac{\varepsilon_0 A}{d}$

2. 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



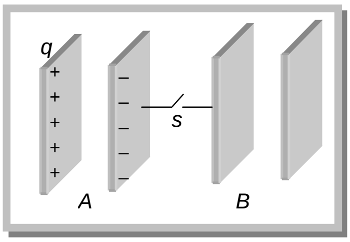
(a) $\frac{3\varepsilon_0 A}{d}$ (b) $\frac{2\varepsilon_0 A}{d}$ (c) $\frac{2}{3}.\frac{\varepsilon_0 A}{d}$ (d) $\frac{3}{2}.\frac{\varepsilon_0 A}{d}$

3. 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) $\frac{2\varepsilon_0 A}{3d}$

4. 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

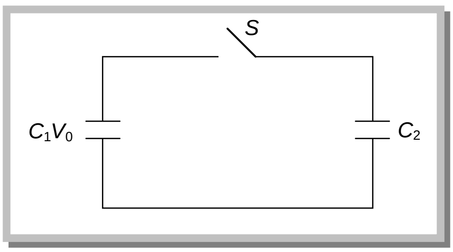


(a) Zero (b) $q/2$ (c) q (d) $2q$

5. 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

6. 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

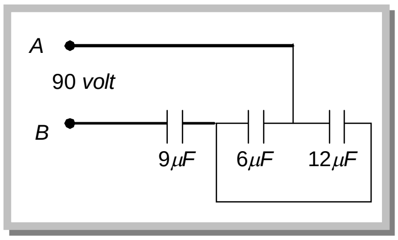


(a) $(C_1 + C_2)/C_1$ (b) $C_1/(C_1 + C_2)$ (c) C_1C_2 (d) C_1/C_2

7. 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) $7C/2$ (b) $3C/7$ (c) $7C/3$ (d) $9C/4$

8. 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

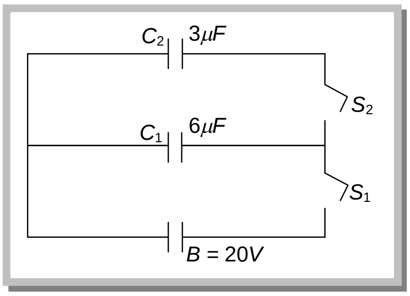
9. A parallel plate capacitor of capacitance C is connected to a battery and is charged to a potential difference V. Another capacitor of capacitance 2C is connected to another battery and is charged to potential difference 2V. The charging batteries are now disconnected and the capacitors are connected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

10. 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

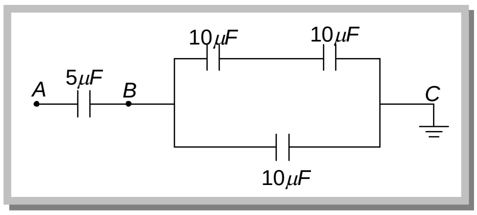
(a) 50 V, 50 V (b) 80 V, 20 V (c) 20 V, 80 V (d) 75 V, 25 V

11. 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

12. 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

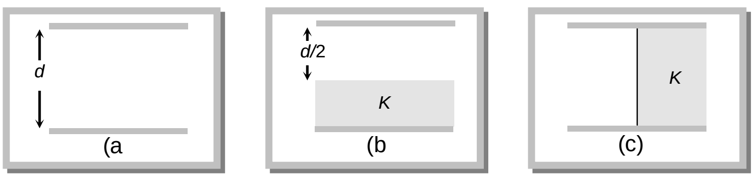
13. A 10 μF capacitor and a 20 μF capacitor are connected in series across a 200 V supply line. The charged capacitors are then disconnected from the line and reconnected with their positive plates together and negative plates together and no external voltage is applied. What is the potential difference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

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

14. 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) $\frac{(V_0 - V)}{V_0}$

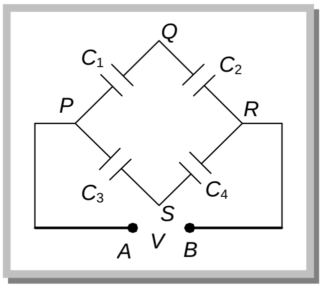
15. The capacitance of a parallel plate condenser is C_1 (fig. a). A dielectric of dielectric constant K is inserted as shown in figure (b) and (c). If C_2 and C_3 are the capacitances in figure (b) and (c), then



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

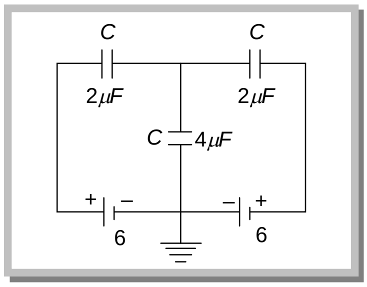
(c) Both C_2 and $C_3 < C_1$ (d) $C_1 = C_2 = C_3$

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



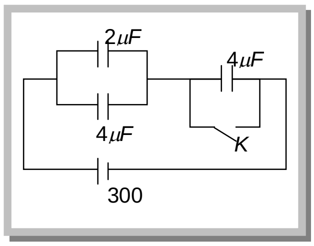
(a) $\frac{(C_2 - C_1)}{C_1}V$ (b) $\frac{(C_4 - C_3)}{C_3}V$ (c) $\frac{(C_2C_3 - C_1C_4)V}{(C_1 + C_2 + C_3 + C_4)}$ (d) $\frac{(C_4C_1 - C_2C_3)V}{(C_1 + C_2)(C_3 + C_4)}$

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



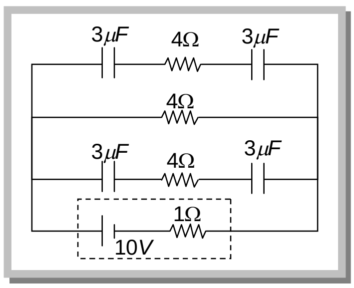
(a) 6 μC (b) 12 μC (c) 18 μC (d) 24 μC

18. 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



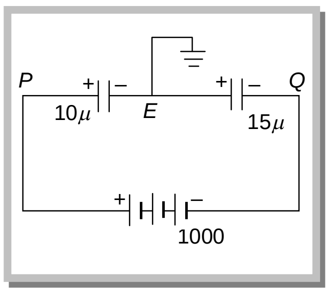
(a) 800μC (b) 1800μC (c) 1200μC (d) 1600μC

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



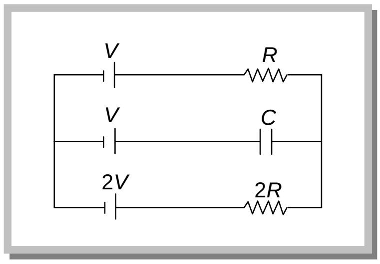
(a) 3μC (b) 6 μC (c) 9μC (d) 12μC

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



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

21. 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) $\frac{2V}{3}$

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

(a) Fraction of stored energy after 1 second is 16/25

(b) P.d. between the plates after 2 seconds will be $32\,V$

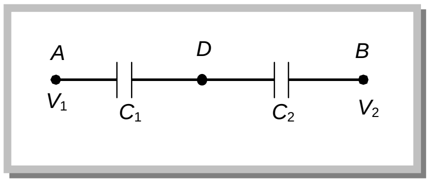
(c) P.d. between the plates after 2 seconds will be $20\,V$

(d) Fraction of stored energy after 1 second is $\frac{4}{5}$

23. 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

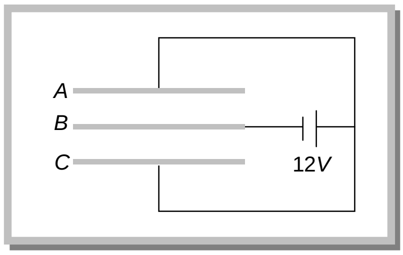
(a) 1.5, 2.5, 8 (b) 2,3,7 (c) 2,4,6 (d) 1,5,6

24. 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



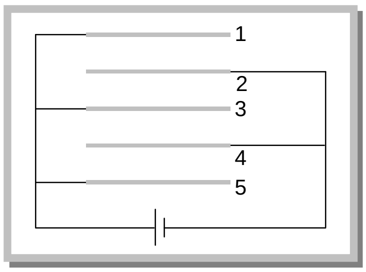
(a) $\frac{1}{2}(V_1 + V_2)$ (b) $\frac{C_2V_1 + C_1V_2}{C_1 + C_2}$ (c) $\frac{C_1V_1 + C_2V_2}{C_1 + C_2}$ (d) $\frac{C_2V_1 - C_1V_2}{C_1 + C_2}$

25. 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



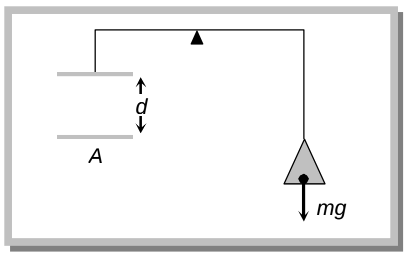
(a) $1.6 \times 10^{-9}\,J$ (b) $2.1 \times 10^{-9}\,J$ (c) $5 \times 10^{-9}\,J$ (d) $7 \times 10^{-9}\,N$

26. 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



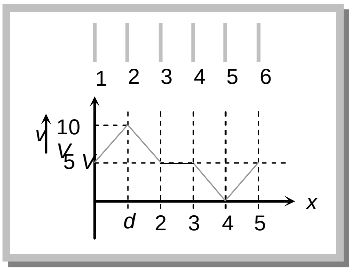
(a) $-q, +q, -q, +q$ (b) $-2q, +2q, -2q, +q$ (c) $-q, +2q, -2q, +q$ (d) None of the above

27. 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



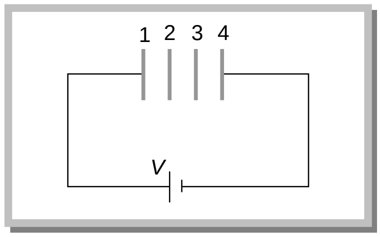
(a) 150 V (b) 188 V (c) 225 V (d) 310 V

28. 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)



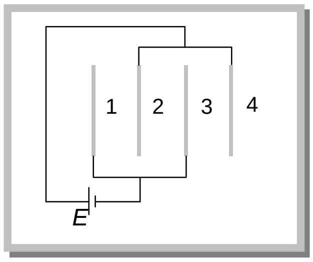
(a) $\frac{2\varepsilon_0 A}{d}$ (b) $\frac{\varepsilon_0 A}{d}$ (c) $\frac{3\varepsilon_0 A}{d}$ (d) $\frac{4\varepsilon_0 A}{d}$

29. 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

30. 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) $\frac{\varepsilon_0 A}{d}E$

KEY

1.	**B**	**2.**	**D**	**3.**	**D**	**4.**	**A**	**5.**	**B**
6.	**A**	**7.**	**D**	**8.**	**C**	**9.**	**C**	**10.**	**B**
11.	**C**	**12.**	**C**	**13.**	**A**	**14.**	**C**	**15.**	**A**
16.	**D**	**17.**	**A**	**18.**	**B**	**19.**	**D**	**20.**	**C**
21.	**C**	**22.**	**A**	**23.**	**C**	**24.**	**C**	**25.**	**B**
26.	**B**	**27.**	**B**	**28.**	**B**	**29.**	**C**	**30.**	**D**