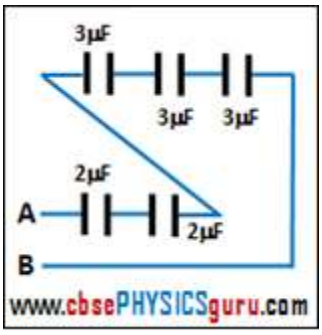
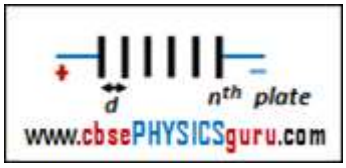
COMBINATION OF CAPACITORS

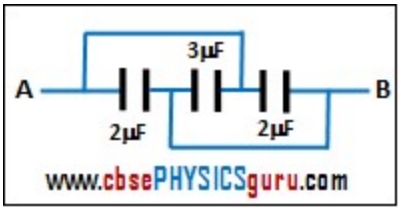
1. Three capacitors each of capacitance 9 pF are connected in series. The potential difference across the first capacitor if the combination is connected to a 120 V supply is:
   (a) 20 V (b) 30 V **(c)** 40 V (d) 120 V
2. The equivalent capacitance between A and B in given figure is:
   (a) 0.5 μF (b) 1.5 μF (c) 13 μF (d) 4.5 μF



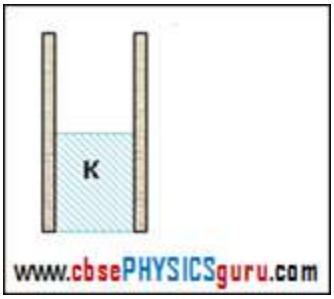
3. If N identical plates, each of area A and separation d are connected as shown in figure, the resultant capacitance is:
   (a) $\frac{\varepsilon_0 A}{d(N+1)}$ **(b)** $\frac{\varepsilon_0 A}{d(N-1)}$ (c) $\frac{\varepsilon_0 A}{dN}$ (d) $\frac{\varepsilon_0 AN}{d(N-1)}$



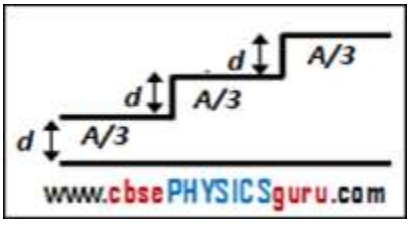
4. The total capacitance of the circuit between points A and B as shown in the figure is:
   (a) 7 μF (b) 5 μF (c) 0.75 μF (d) 1.5 μF



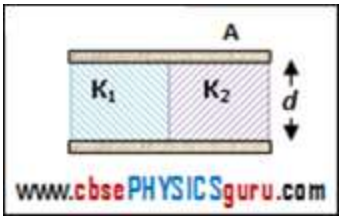
5. A capacitor half-filled with a dielectric constant 4 as shown in figure has a capacitance of 10 μF. Its capacitance without the dielectrics will be:
   (a) 8 μF (b) 6 μF **(c)** 4 μF (d) 2 μF



6. A capacitor is made of a flat plate of area A and second plate having a stair like structure as shown in figure. The width of each stair is A/3 and height is d. The capacitance of the system is:
   (a) $\frac{5\varepsilon_0 A}{18d}$ (b) $\frac{9\varepsilon_0 A}{16d}$ (c) $\frac{11\varepsilon_0 A}{15d}$ **(d)** $\frac{11\varepsilon_0 A}{18d}$

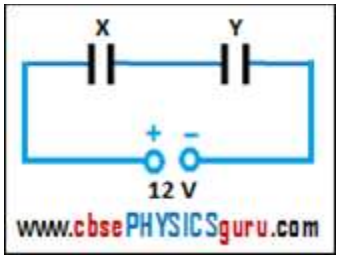


7. Two dielectric slabs of dielectric constants K_1 and K_2 have been filled in between the plates of a capacitor as shown in figure. The capacitance of the capacitor is:
   (a) $\frac{\varepsilon_0 A}{d}(K_1+K_2)$ **(b)** $\frac{\varepsilon_0 A}{2d}(K_1+K_2)$ (c) $\frac{2\varepsilon_0 A}{d}(K_1+K_2)$ (d) $\frac{\varepsilon_0 AK_1K_2}{2d(K_1+K_2)}$

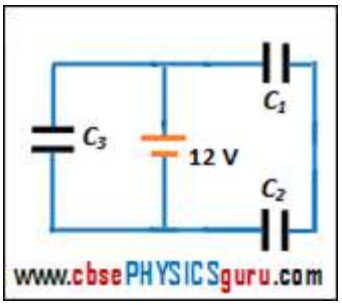


8. Series equivalent of two capacitors of equal capacitances is C_1 and their parallel equivalent is C_2. The ratio C_1/C_2 is:
(a) 1/4 (b) 1/3 (c) 1/2 (d) 2/5

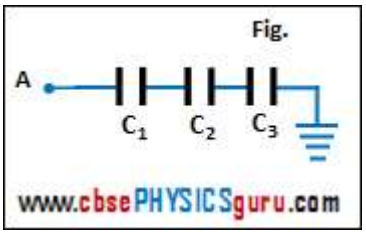
9. Two parallel plate capacitors X and Y as shown in figure, have the same area of plates and same separation between them. X has air between the plates while Y contains a dielectric medium of K = 4. The potential differences between the plates of X and Y are respectively:
(a) 6 V, 6 V (b) 8.4 V, 3.6 V **(c)** 9.6 V, 2.4 V (d) 10 V, 2 V



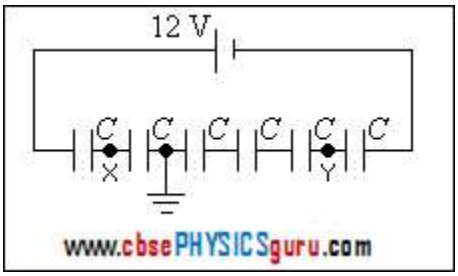
10. Three identical capacitors C_1, C_2 and C_3 of capacitance 6 μF each are connected to a 12 V battery as shown in the figure. The charge on each capacitor is:
(a) q_1 = 36 μC, q_2 = 36 μC, q_3 = 36 μC (b) q_1 = 72 μC, q_2 = 72 μC, q_3 = 36 μC (c) q_1 = 18 μC, q_2 = 18 μC, q_3 = 36 μC **(d)** q_1 = 36 μC, q_2 = 36 μC, q_3 = 72 μC



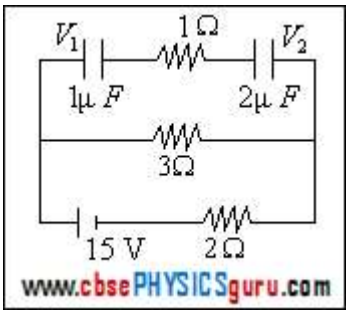
11. Calculate the potential difference across the capacitor C_2 in the circuit shown in the figure. Given potential at A is 90 V, C_1 = 20 μF, C_2 = 30 μF, C_3 = 15 μF:
(a) 20 V (b) 30 V (c) 45 V (d) 60 V



12. The potential of points X and Y respectively are:
(a) 4 V, – 2 V (b) – 6 V, 2 V **(c)** 2 V, – 6 V (d) – 3 V, 6 V



13. The values of V_1 and V_2 respectively are:
(a) 3 V, 6 V **(b)** 6 V, 3 V (c) 3 V, 3 V (d) 2 V, 1 V



14. In the circuit shown, (*i*) A current of 0.9 Amp flows through 2 Ω resistor when steady state is reached (*ii*) A potential drop of 4.2 V appears across the resistance of 2.8 Ω (*iii*) A potential drop of 1.8 V appears across the capacitor *C* (*iv*) A potential drop of 4.2 V appears across the capacitor *C*. The correct alternative is:
(a) *i*, *ii*, *iii* (b) *i*, *ii*, *iv* (c) *ii*, *iii*, *iv* (d) *i*, *iii*, *iv*