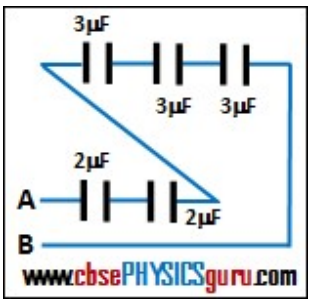
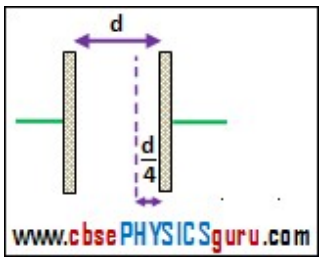
Assignment - Capacitor

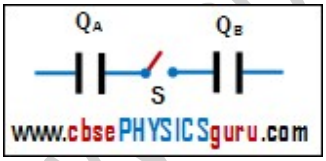
1. You are assigned a task of protecting a sensitive instrument from the strong electrostatic field in is environment. How will you accomplish it?
2. A large, hollow metallic sphere X is charged to a potential of 40 volt and a small sphere Y to a potential of 20 volt. Sphere Y is then placed inside X and connected to sphere X by a wire. In which direction will the charge flow?
3. When a battery is connected across the capacitor, are the charges on the plates always equal and opposite even for plates of unequal size?
4. A voltmeter is connected across the plates of a charged capacitor. If the separation between the plates of the capacitor is increased, what will be the effect on the reading of the voltmeter?
5. The capacitance a parallel plate air-capacitor increases from 2 μF to 10 μF when a dielectric plate is inserted between the plates. What is the dielectric constant of the plate?
6. A capacitor can store 48 μC of charge whenever a potential difference of 12.0 V is applied. (a) What is the capacitance of this capacitor? (b) How much charge will this capacitor store when a potential difference of 72.0 V is applied?
7. Determine the area of the plates of a parallel plate capacitor of capacity 1F and with separation between the plates 1.0 mm? What is the order of capacitance of ordinary capacitances?
8. A parallel plate capacitor is made of two parallel plates, each of which has an area of 1.0 m^2, and which are separated by 1.0 mm of air. (a) What is the capacitance of this capacitor? (b) If the gap between the plates is filled with a mica (dielectric constant K = 4), what will be its new capacitance?



9. A parallel plate air capacitor has circular plates of radius R. What should be the distance between the plates of this capacitor if it has the same capacitance as that of an isolated sphere of radius R?
10. What will be the total capacitance of the circuit between points A and B as shown in the figure?
11. N identical capacitors are joined in parallel across a battery of emf V. These capacitors are disconnected and then joined in series. What will be the new potential difference across the series combination of the capacitors?
12. The distance between the plates of a parallel plate capacitor of capacitance C is d. A thin metallic sheet is introduced between the plates of the capacitor as shown in the figure. Determine the new capacitance.



13. Two capacitors, one with charge Q_A and the other with charge Q_B, are connected as shown in the figure. How will the charges on the capacitors change when the switch S is closed?



14. An 80 μF capacitor is charged by a 50 V battery. The capacitor is disconnected from the battery and then connected across another uncharged 320 μF capacitor. Calculate the charge on the second capacitor.
15. Two spheres of different radii charged to different potential are connected by a conducting wire. Will the total energy increase or decrease?
16. A dielectric slab of dielectric constant K is inserted between the plates of a parallel plate capacitor with battery remaining connected to it. What will be the effect on (a) capacitance (b) charge (c) potential energy stored (d) electric field between the plates?
17. A 4 μF capacitor is charged by a 200 V supply. It is then disconnected from the supply, and is connected to another uncharged 2 μF capacitor. How much electrostatic energy of the first capacitor is lost in the form of heat and electromagnetic radiation?
18. Net capacitance of three identical capacitors in series is 2μF. What will be their net capacitance if connected in parallel? Find the ratio of energy stored in the two configurations if they are connected to the same source.

19. The series combination of two identical capacitors X and Y, each of capacitance C is connected to a battery of emf ε. A dielectric slab of dielectric constant K is inserted between the plates of capacitor Y. What will be the ratio of potential differences across X and Y after introduction of dielectric slab in Y.
20. Three capacitors of 2μF, 3μF and 4 μF are connected in series and charged by a potential of 130 volts. Calculate the potential difference across each capacitor.
21. When two capacitors of capacitance C_1 and C_2 are connected in series, the net capacitance is 3 μF; when connected in parallel, its value is 16 μF. Calculate the value of C_1 and C_2.
22. Eight identically charged drops are joined to form bigger drop. By what factor the charge and potential change?
23. The graph shown in figure shows the variation of charge verses potential difference for two capacitors C_1 and C_2 .The capacitors have same plate separation, but the plate area of C_2 is double that of C_1.Identify the graphs corresponding to C_1& C_2 and why?
24. A parallel plate capacitor of plate area A and plate separation d is filled with two dielectrics as shown in figure. Calculate the capacitance of the capacitor.
25. Each of three capacitors of 1 μF, 2μF and 3μF can withstand a voltage of 150V, are connected in series. A supply of 450 V is applied across the combination. Which capacitor will burst, if any?
26. After connecting the battery, a dielectric of constant 5 is filled between the plates of the capacitor C_1 only. After some time the same dielectric is removed from C_1 and filled in the capacitor C_2. Find the ratio of the energy stored in the system in two cases.