1. Test Bank, Question 13

Pulling the plates of an isolated charged capacitor apart:

- increases the capacitance
- increases the potential difference
- does not affect the potential difference
- decreases the potential difference
- does not affect the capacitance

2. Test Bank, Question 6

The capacitance of a parallel-plate capacitor with plate area $A$ and plate separation $d$ is given by:

- $\varepsilon_0 d/A$
- $\varepsilon_0 d/2A$
- $\varepsilon_0 A/d$
- $\varepsilon_0 A/2d$
- $\varepsilon d/\varepsilon_0$

3. Test Bank, Question 49

A battery is used to charge a parallel-plate capacitor, after which it is disconnected. Then the plates are pulled apart to twice their original separation. This process will double the:

- capacitance
- surface charge density on each plate
- stored energy
- electric field between the two places
- charge on each plate

4. Test Bank, Question 20

Two conducting spheres have radii of $R_1$ and $R_2$ with $R_1$ greater than $R_2$. If they are far apart the capacitance is proportional to:
5. *Chapter 25, Problem 4

The plates of a spherical capacitor have radii 37.2 mm and 40.0 mm. (a) Calculate the capacitance in picofarads. (b) What must be the plate area in square centimeters of a parallel-plate capacitor with the same plate separation and capacitance?

(a) Number 59.129417553061 Units pF
(b) Number 186.987594741664 Units cm^2

6. *Chapter 25, Problem 5

Assume that a drop of mercury is an isolated sphere. What is the capacitance in picofarads of a drop that results when two drops each of radius \( R = 3.17 \) mm merge?

Number 0.444386948424 Units pF

significant digits are disabled; the tolerance is +/-2%

7. *Chapter 25, Problem 15

In Fig. 25-31 a 27 V battery is connected across capacitors of capacitances \( C_1 = C_6 = 5.0 \mu F \) and \( C_3 = C_5 = 2.0C_2 = 2.0C_4 = 5.0 \mu F \). What are the (a) potential \( V_3 \) across and (b) charge \( q_3 \) (in C) on capacitor 3?

(a) Number 7.714285714286 Units V
(b) Number 0.000038571429 Units C
**8. *Chapter 25, Problem 21***

In Fig. 25-36, the capacitances are \( C_1 = 0.94 \, \mu F \) and \( C_2 = 3.6 \, \mu F \), and both capacitors are charged to a potential difference of \( V = 83 \, V \) but with opposite polarity as shown. Switches \( S_1 \) and \( S_2 \) are now closed. (a) What is now the potential difference between points \( a \) and \( b \)? What now is the charge in microcoulombs on capacitor (b) 1 and (c) 2?

![Figure 25-36](image)

(a) Number 48.62995947137 Units V  
(b) Number 45.71215890308 Units \( \mu C \)  
(c) Number 175.067841409692 Units \( \mu C \)

**9. *Chapter 25, Problem 73***

Figure 25-58 shows a four-capacitor arrangement that is connected to a larger circuit at points A and B. The capacitances are \( C_1 = 10 \, \mu F \) and \( C_2 = C_3 = C_4 = 22 \, \mu F \). The charge on capacitor 1 is 26 \( \mu C \). What is the magnitude of the potential difference \( V_A - V_B \) ?

![Figure 25-58](image)

Number 4.490909090909 Units V

Significant digits are disabled; the tolerance is +/-2%

**10. Test Bank, Question 45***

The quantity \( \frac{1}{2} \varepsilon_0 E^2 \) has the dimension of:

- energy/farad
- energy/coulomb
- energy
- energy/volume
11. *Chapter 25, Problem 35

Assume that a stationary electron is a point of charge. What is the energy density $u$ of its electric field at radial distances (a) $r = 8.20 \text{ mm}$, (b) $r = 8.20 \mu \text{m}$, (c) $r = 8.20 \text{ nm}$, and (d) $r = 8.20 \text{ pm}$?

(a) Number 2.030844258845E-21 Units J/m$^3$
(b) Number 2.030844258845E-9 Units J/m$^3$
(c) Number 2030.844258844652 Units J/m$^3$
(d) Number 2030844258844652 Units J/m$^3$

12. *Chapter 25, Problem 37

The parallel plates in a capacitor, with a plate area of 9.70 cm$^2$ and an air-filled separation of 3.10 mm, are charged by a 8.90 V battery. They are then disconnected from the battery and pulled apart (without discharge) to a separation of 6.80 mm. Neglecting fringing, find (a) the potential difference (in V) between the plates, (b) the initial stored energy, (c) the final stored energy, and (d) the work required to separate the plates.

(a) Number 19.522580645161 Units V
(b) Number 1.096739104839E-10 Units J
(c) Number 2.405750294485E-10 Units J
(d) Number 1.309011189646E-10 Units J

13. *Chapter 25, Problem 38

In the figure 25-29, a potential difference of $V = 130$ V is applied across a capacitor arrangement with capacitances $C_1 = 10.2 \mu$F, $C_2 = 6.28 \mu$F, and $C_3 = 12.9 \mu$F. What are (a) charge $q_3$ in microcoulombs, (b) potential difference $V_3$, and (c) stored energy $U_3$ for capacitor 3 in joules, (d) $q_1$, (e) $V_1$, and (f) $U_1$ for capacitor 1, and (g) $q_2$, (h) $V_2$, and (i) $U_2$ for capacitor 2?

![Figure 25-29](image-url)

(a) Number 940.672566371682 Units $\mu$C
(b) Number 72.920353982301 Units V
(c) Number 0.034297088261 Units J
(d) Number 582.212389380531 Units $\mu$C
(e) Number 57.079646017699 Units V
(f) Number 0.016616238546 Units J
14. Test Bank, Question 51

A dielectric slab is slowly inserted between the plates of a parallel plate capacitor, while the potential difference between the plates is held constant by a battery. As it is being inserted:

- the capacitance and the charge on the plate increase but the potential difference between the plates remains the same
- the capacitance and the charge on the positive plate decrease but the potential difference between the plates remains the same
- the capacitance, the potential difference between the plates, the charge on the positive plate all decrease
- the potential difference between the plates increases, the charge on the positive plate decreases, and the capacitance remains the same
- the capacitance, the potential difference between the plates, and the charge on the positive plate all increase

15. *Chapter 25, Problem 50

Figure 25-49 shows a parallel-plate capacitor of plate area $A = 10.2 \text{ cm}^2$ and plate separation $2d = 7.39 \text{ mm}$. The left half of the gap is filled with material of dielectric constant $\kappa_1 = 26.9$; the top of the right half is filled with material of dielectric constant $\kappa_2 = 40.7$; the bottom of the right half is filled with material of dielectric constant $\kappa_3 = 58.5$. What is the capacitance (in F)?

![Diagram of parallel-plate capacitor with three dielectric layers]

Number \text{4.574760483053E-11 Units F}

Significant digits are disabled; the tolerance is +/-2%

16. *Chapter 25, Problem 55

The space between two concentric conducting spherical shells of radii $b = 2.20 \text{ cm}$ and $a = 1.10 \text{ cm}$ is filled with a substance of dielectric constant $\kappa = 23.7$. A potential difference $V = 19.0 \text{ V}$ is applied across the inner and outer shells. Determine (a) the capacitance of the device, (b) the free charge $q$ (in C) on the inner shell, and (c) the charge $q$ (in C) induced along the surface of the inner shell.
17. *Chapter 25, Problem 70

A slab of copper of thickness $b = 2.59$ mm is thrust into a parallel-plate capacitor of plate area $A = 2.56$ cm$^2$ and plate separation $d = 7.34$ mm, as shown in Fig. 25-57; the slab is exactly halfway between the plates. (a) What is the capacitance after the slab is introduced? (b) If a charge $q = 4.03$ µC is maintained on the plates, what is the ratio of the stored energy before to that after the slab is inserted? (c) How much work is done on the slab as it is inserted?

![Figure 25-57](image)

(a) Number 5.798613489919E-11 Units F
(b) Number 1.101736563085E-9 Units C
(c) Number 1.055249788271E-9 Units C

18. *Chapter 25, Problem 77

In Figure 25-59, two parallel-plate capacitors $A$ and $B$ are connected in parallel across a 660 V battery. Each plate has area 79.0 cm$^2$; the plate separations are 1.00 mm. Capacitor $A$ is filled with air; capacitor $B$ is filled with a dielectric of dielectric constant $\kappa = 4.70$. Find the magnitude (in N/C) of the electric field within (a) the dielectric of capacitor $B$ and (b) the air of capacitor $A$. What are the free charge densities $\sigma$ on the higher-potential plate of (c) capacitor $A$ and (d) capacitor $B$? (e) What is the induced charge density $\sigma'$ on the top surface of the dielectric?

![Figure 25-59](image)

(a) Number 4.771941322105E-13 Units F
(b) 1.545263157895 Units
(c) Number -9.278785952407 Units J

(a) Number 660000 Units N/C or V/m
(b) Number 660000 Units N/C or V/m
(c) Number 0.000005841 Units C/m$^2$
(d) Number 0.0000274527 Units C/m$^2$
(e) Number -0.0000216117 Units C/m$^2$