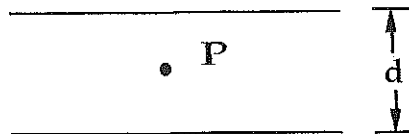


# H.K.C. Ch. 21 Practice Test



Capacitors

1.

Two flat parallel plates are  $d = 0.40$  cm apart. The potential difference between the plates is 360 V. The electric field at the point P at the center is approximately

- a. 90 kN/C      b. 3.6 kN/C      c. 0.9 kN/C      d. zero      e.  $3.6 \times 10^5$  N/C
2. If a capacitor of capacitance  $2.0 \mu\text{F}$  is given a charge of 1.0 mC, the potential difference across the capacitor is
- a. 0.50 kV      b. 2.0 V      c.  $2.0 \mu\text{V}$   
d. 0.50 V      e. none of these.
3. You want to store  $10^{10}$  excess electrons on the negative plate of a capacitor at 9.0 V. How large a capacitance must you use?
- a.  $0.014 \mu\text{F}$       b.  $0.18 \mu\text{F}$       c. 0.18 nF      d. 14 pF      e. 5.6 pF
4. A parallel-plate capacitor has square plates of side 8.0 cm separated by 0.80 mm. If you charge this capacitor to 15 V, the amount of charge transferred from one plate to the other is
- a. 71 nC      b. 7.1 nC      c. 1.1 pC      d. 1.1 nC      e. 7.1 pC
5. A coaxial cable consists of a wire of radius 0.30 mm and an outer conducting shell of radius 1.0 mm. Its capacitance per unit length is approximately
- a. 17 nF/m      b. 0.11 nF/m      c. 92 pF/m      d. 23 pF/m      e. 46 pF/m
6. The capacitance of a parallel-plate capacitor
- a. is defined as the amount of work required to move a charge from one plate to the other.  
b. decreases if a dielectric is placed between its plates.  
c. is independent of the distance between the plates.  
d. has units of J/C.  
e. is independent of the charge on the capacitor.
7. When you insert a piece of paper ( $\kappa = 3.7$ ) into the air between the plates of a capacitor, the capacitance
- a. increases.  
b. decreases.  
c. does not change.  
d. could increase, decrease, or not change depending on the dielectric constant of the paper.  
e. does none of these.

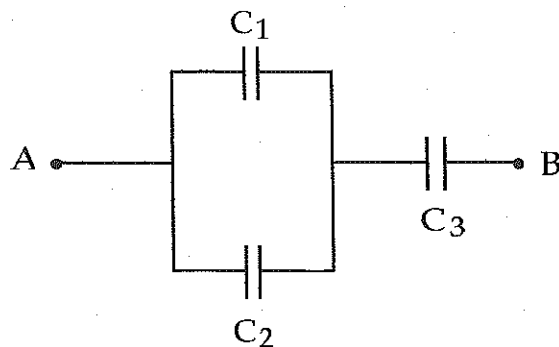
8.



Two identical capacitors A and B are connected across a battery, as shown. If mica ( $\kappa = 5.4$ ) is inserted in B,

- both capacitors will retain the same charge.
  - B will have the larger charge.
  - A will have the larger charge.
  - the potential difference across B will increase.
  - the potential difference across A will increase.
9. If a dielectric is inserted between the plates of a parallel-plate capacitor that is connected to a 100-V battery, the
- voltage across the capacitor decreases.
  - electric field between the plates decreases.
  - electric field between the plates increases.
  - charge on the capacitor plates decreases.
  - charge on the capacitor plates increases.
10. A parallel-plate capacitor has square plates of side 12 cm and a separation of 6.0 mm. A dielectric slab of constant  $\kappa = 2.0$  has the same area as the plates but has a thickness of 3.0 mm. What is the capacitance of this capacitor with the dielectric slab between its plates?
- 28 pF
  - 21 pF
  - 16 pF
  - 37 pF
  - 53 pF
11. If you increase the charge on a parallel-plate capacitor from  $3\ \mu\text{C}$  to  $9\ \mu\text{C}$  and increase their separation from 1 mm to 3 mm, the energy stored in the capacitor changes by a factor of
- 27
  - 9
  - 3
  - 8
  - $1/3$
12. You attach a 30-pF capacitor across a 1.5-V battery. How much energy is stored in the capacitor?
- $3.4 \times 10^{-11}\ \text{J}$
  - $4.5 \times 10^{-11}\ \text{J}$
  - $6.7 \times 10^{-11}\ \text{J}$
  - $3.4 \times 10^{-8}\ \text{J}$
  - $4.5 \times 10^{-8}\ \text{J}$
13. You charge a  $4.0\text{-}\mu\text{F}$  capacitor to 150 V. How much additional energy must you add to charge it to 300 V?
- 0.60 mJ
  - 0.14 J
  - 18  $\mu\text{J}$
  - 0.30 mJ
  - 0.28 J

14.



You connect three capacitors as shown in the diagram. The effective capacitance of this combination when  $C_1 = 5.0 \mu\text{F}$ ,  $C_2 = 4.0 \mu\text{F}$ , and  $C_3 = 3.0 \mu\text{F}$  is approximately

- a.  $0.44 \mu\text{F}$       b.  $2.3 \mu\text{F}$       c.  $3.5 \mu\text{F}$       d.  $5.2 \mu\text{F}$       e.  $12 \mu\text{F}$

15. The charge on each capacitor in a set of capacitors in parallel is

- a. directly proportional to its capacitance.      b. inversely proportional to its capacitance.  
c. independent of its capacitance.      d. the same.  
e. none of these.

16. You connect two capacitors  $C_1 = 15 \text{ pF}$  and  $C_2 = 30 \text{ pF}$  in series across a 1.5-V battery. The potential difference across capacitor  $C_1$  is approximately

- a. 0.50 V      b. 1.0 V      c. 1.5 V      d. 0.33 V      e. 0.67 V

17. A  $1.0\text{-}\mu\text{F}$  capacitor and a  $2.0\text{-}\mu\text{F}$  capacitor are connected in series across a 1200-V source. The charge on each capacitor is

- a. 0.40 mC      b. 0.80 mC      c. 1.2 mC      d. 1.8 mC      e. 3.6 mC

