Chapter 24 - Capacitance and Dielectrics

Physics 207

1. $\frac{1}{C} = \frac{1}{C_{ab}} + \frac{1}{C_{bc}}$

where $C_{ab} = 4\pi\epsilon_0 \frac{ab}{b-a}$

and $C_{bc} = 4\pi\epsilon_0 \frac{(b+t)c}{c-b-t}$

2. a) $C_{eff} = \frac{(\alpha+1)\epsilon_0 x^2}{2d}$

2. b) $U = \frac{(\alpha+1)\epsilon_0 x^2}{4d} V^2$

2. c) $U = \frac{\epsilon_0 x^2}{2d} V^2$

3. a) $C_{eff} = \frac{\epsilon_0 x^2}{d-a}$

3. b) $C_{eff} = \frac{\kappa\epsilon_0 x^2}{\kappa(d-a)+a}$

3. c) No change

4. a) $Q_1 = C_1 V$

$Q_2 = C_2 V$

4. b) $Q_1 = \frac{C_1 - C_2}{C_1 + C_2} C_1 V$

$Q_2 = \frac{C_1 - C_2}{C_1 + C_2} C_2 V$

5. a) $C_{eff} = \frac{1}{3} C_1$

5. b) $Q_{top} = Q_{bot} = \frac{1}{3} C_1 V_0$

$Q_{right} = \frac{2}{9} C_1 V_0$

5. c) $V_{cd} = \frac{1}{9} V_0$

6. $C_{eff} = (\sqrt{3} - 1)\frac{C}{2}$

7. $C_{eff} = 96\ \mu\text{F}$