14 examples

		ΔV
1) 50 V −	100 V +	50 V
0 V −	50 V +	50 V
−25 V −	25 V +	50 V
−50 V −	0 V +	50 V
−75 V −	−25 V +	50 V

3) $C = \frac{|Q|}{|V|}$ $\sigma = \frac{Q}{A}$ $V = E \cdot d$

$E_{\text{parallel plates}} = \frac{\sigma}{\varepsilon_0}$

$Q = \sigma A$ $V = \frac{\sigma d}{\varepsilon_0}$

$C = \frac{\sigma A}{\frac{\sigma d}{\varepsilon_0}} = \varepsilon_0 \frac{A}{d}$

b) $C = \varepsilon_0 \frac{(0.1\,m)^2}{(0.005\,m)}$

$= 1.77 \times 10^{-11}\,F$

4) a) $\mathcal{E}_{emf} = (1.5\,V)(4)$

$= 6.0\,V$

b) $emf = 3.0\,V$

c) $C = \frac{|Q|}{|V|} = \frac{Q}{\frac{kQ}{R}} = \frac{R}{k}$

$= 4\pi\varepsilon_0 R$

b) $C = \frac{(0.1\,m)}{k} = 1.11 \times 10^{-11}\,F$

5) $E = k\frac{2\lambda}{r}$ $\Delta V = -\int_a^b \vec{E} \cdot d\vec{r}$

$= -k\int \frac{2\lambda}{r}\,dr$

$= -2k\lambda \ln\left|\frac{b}{a}\right| = -2k\frac{Q}{L}\ln\left|\frac{b}{a}\right|$

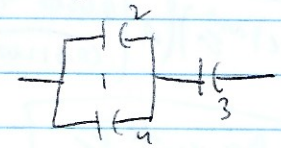
$C = \frac{|Q|}{|V|} = \frac{L}{2k\ln\left(\frac{b}{a}\right)}$

6) $C_{eq} = \left(\frac{1}{3.0\,\mu F} + \frac{1}{6.0\,\mu F} + \frac{1}{8.0\,\mu F}\right)^{-1}$

$= 1.6\,\mu F$

7) $\frac{250}{50} = 5$ capacitors in parallel

8)



$C_{eq} = \left((2.0\,\mu F)^{-1} + (3\,\mu F)^{-1}\right)^{-1}$

$= 2.0\,\mu F$

a) a) $C = \frac{Q}{V}$ $Q = CV = (100 \times 10^{-6}\,F)(220\,V)$

$= 2.2 \times 10^{-2}\,C$

b) $PE_c = \frac{1}{2}CV^2 = \frac{1}{2}(100\,\mu F)(220\,V)^2$

$= 2.42\,J$

c) $PE_g = mgh = PE_c$

$h = \frac{PE}{mg} = \frac{2.42\,J}{(0.1\,kg)(9.8\,m/s^2)}$

$= 2.5\,m$

(b) a) $PE_c = \frac{1}{2}QV^2$

$= \frac{1}{2}$

$C = \frac{Q}{V} = \varepsilon_0 \frac{A}{d}$

$V = \frac{Qd}{\varepsilon_0 A}$

PE_c is [illegible] quadrupled

doubled $PE = \frac{1}{2}\frac{Q^2}{C}$

no (+) work to pull apart the plates, which are attracted to each other

11) $C_0 = \frac{l}{2k\ln\left(\frac{b}{a}\right)}$

$$C = \frac{Kl}{2k\ln\left(\frac{b}{a}\right)}$$

$$\frac{C}{l} = \frac{\frac{Kl}{2k\ln\left(\frac{b}{a}\right)}}{l} = \frac{(1.35)}{2\left(9 \times 10^{9}\ \frac{Nm^2}{C^2}\right)\left(\ln\left(\frac{(3.66 \times 10^{-3}\ m)\frac{1}{2}}{(0.812 \times 10^{-3}\ m)\frac{1}{2}}\right)\right)}$$

$$= \boxed{4.98 \times 10^{-11}\ F/m}$$