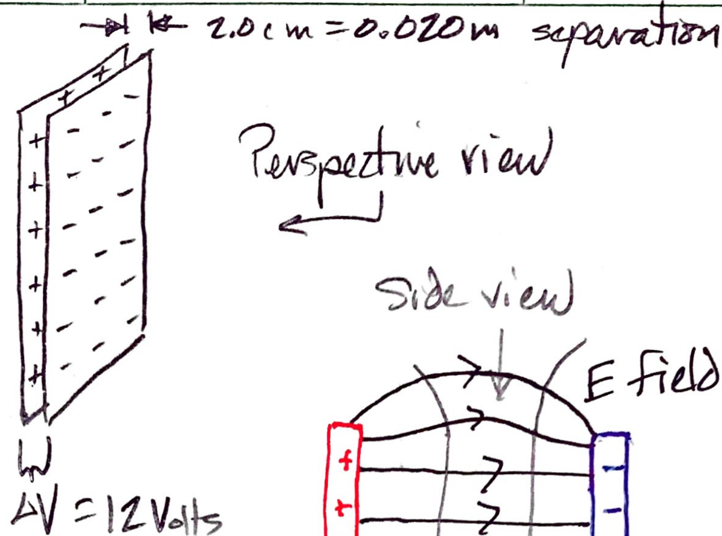
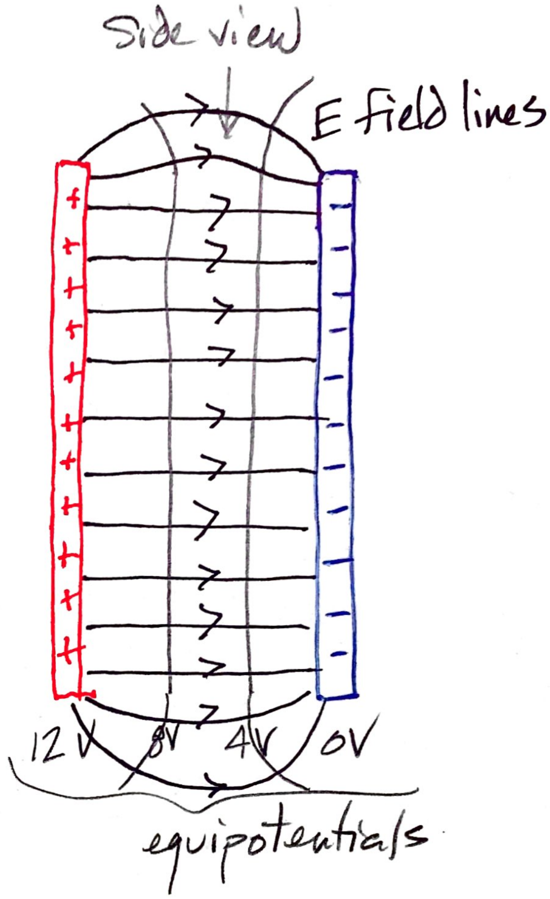
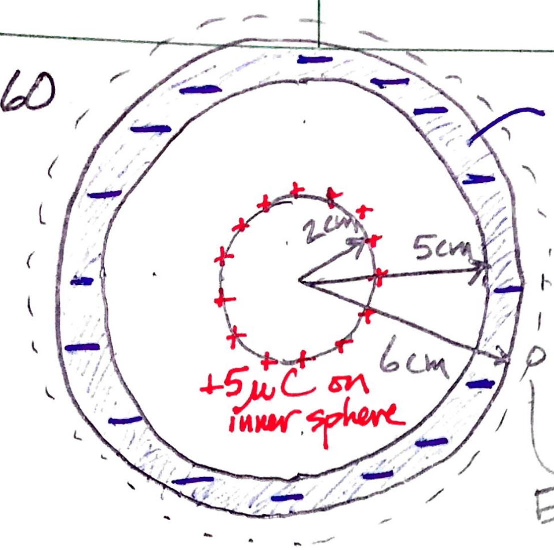
7.58


2.0 cm = 0.020 m separation
ΔV = 12 Volts
Perspective view


side view
E field lines
12 V
8V
4V
0V
equipotentials

7.60



−5μC on shell

$V_\infty = 0.$

$E=0$, so $V = -\int E \cdot dr \; \boxed{= 0\,V}$

a) Find V at spherical shell.
Based on $E=0$ outside of shell (no internal charge for a Gaussian sphere surrounding it.), $\boxed{V=0.}$
Could also solve as $V = V_- + V_+ = \frac{kQ}{r} + \frac{kQ}{r} \; \boxed{= 0.}$

b) For the sphere inside, $E = \frac{kQ}{r^2}$ based on Gauss's law & q internal.
Therefore, $\Delta V = -\int_{.05}^{.02} E \cdot dr = -kQ\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$
(V=0 at 0.05m) $= (9e9)(5e{-6})\left(\frac{1}{0.02} - \frac{1}{0.05}\right)$
$= \boxed{1.35e6\ V}$

c) For any point between the two spheres:
$\Delta V = -\int_{.05}^{a} E \cdot dr = kQ\left(\frac{1}{a} - \frac{1}{0.05}\right)$
(V=0 @ 0.05m) $= \boxed{45000\left(\frac{1}{a} - 20\right)}$

d) Inside the sphere, $E=0$, so no change in V in there. We still had to do Work/charge (ΔV) to get there – it's just not any more difficult to move around once you're in there. So, $V_{interior}$ = V at 0.02m = $\boxed{1.35e6\,V}$

e) Outside of spheres (as in part a), $E=0$, so no ΔV from ∞, where $\boxed{V=0.}$