Electrostatics: $\mathcal{E}_{pe}$ and V

1) $V_A = 10\,000\,V$

$V_B = -30\,000\,V$

$V_C = -30\,000\,V$

$V_D = 2\,000\,V$

$V_E = 50\,V$

$\left(V = \frac{\mathcal{E}_{pe}}{Q} \right)$

2) a. $\Delta V = V - V_0 = 4V$

b. $\Delta \mathcal{E}_{pe} = q\,\Delta V = -1.6\times10^{-19}\,J\,(4V) = -6.4\times10^{-19}\,J$

3) a. $\Sigma \vec{F} = 0$ (constant speed)

$F = F_e = qE = 1.0\times10^{-2}\,N$

b. $W = Fd = 1.2\times10^{-2}\,J$

c. $W = \Delta \mathcal{E}_{pe} = 1.2\times10^{-2}\,J$

d. $\Delta V = \frac{\Delta \mathcal{E}_{pe}}{q} = 3.0\times10^{3}\,V$

e. $\Delta V = \frac{\Delta \mathcal{E}_{pe}}{q} = \frac{Fd}{q} = \frac{qEd}{q} = Ed$

$\Delta V = Ed$ (in a UNIFORM FIELD!)

4) $W_{nc}^{\,0} = \Delta \mathcal{E}_k + \Delta \mathcal{E}_p$

$\Delta \mathcal{E}_k = -\Delta \mathcal{E}_p$

$\Delta \mathcal{E}_k = -q\,\Delta V$

$\mathcal{E}_k - \mathcal{E}_{k0}^{\,0} = -q\,\Delta V$

$\mathcal{E}_k = -1.60\times10^{-19}\,C\,(-1.0V)$

$\mathcal{E}_k = 1.60\times10^{-19}\,J$

5) $\mathcal{E}_k = -q\,\Delta V$ (from 4)

$\frac{1}{2}mv^2 = -q\,\Delta V$

$v = \sqrt{\frac{-q\,\Delta V}{\frac{1}{2}m}}$

$v = 1.4\times10^{4}\,m/s$

6) $\mathcal{E}_k = -q\,\Delta V$ (from 4)

$\mathcal{E}_k = -(-1.60\times10^{-19})(1.0V)$

$\mathcal{E}_k = 1.60\times10^{-19}\,C$ ← ?

7) $\mathcal{E}_k = -q\,\Delta V$ (from 4)

$\frac{1}{2}mv^2 = -q\,\Delta V$

$v = \sqrt{\frac{-q\,\Delta V}{\frac{1}{2}m}}$

$v = 5.9\times10^{5}\,m/s$