chapter 25 :

Q1

$\vec{E} = 20 * 10^3 \frac{N}{C}$

$W = 5 kJ$

$Q = 0.2\ C$

ⓐ in the same direction of $\vec{E}$

ⓑ $W = F * d \Rightarrow \quad F = Eq$

$\therefore d = \frac{W}{F} = \frac{W}{Eq} = \frac{5 * 10^3}{20 * 10^3 * 0.2} = 1.25 m$

ⓒ $\Delta V = E \cdot d = 20 * 10^3 * 1.25 = 25 kV$

the sign negative

$= -25 kV$

ⓓ $V_i = -2000 V$ $\quad \Delta V = -25 kV$

$V_f = ?!$ $\quad V_f - V_i = \Delta V$ $\quad \boxed{V_f = -27 kV}$

$V_f + 2k = -25k$

Q2

Proton → Constant velocity.

$V_i = 100V$

$V_f = -50V$

(a) $\frac{W}{Q} = \Delta V$ $\therefore W = -(V_f - V_i)Q$

$= -(-50 - 100) * 1.6 \times 10^{-19}$

$W = +2.4 \times 10^{-17} J$

(b) since V = constant.

$\therefore a = 0$ $\therefore \sum F = 0$

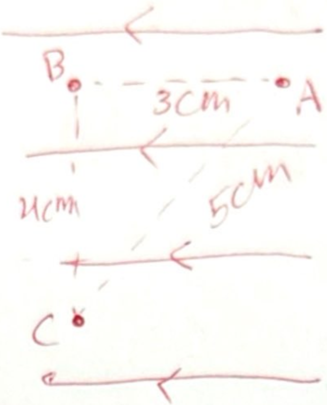
$F_{elect} + F_{ext} = 0$

$\therefore F_{ele} = -F_{ext}$.

$\therefore W_{ext} = -W_{elec}$

$= -2.4 \times 10^{-17} J$.

Q3



(a) $V_{AB} = E \cdot d$

$= E\, d \cos\theta$

$\theta = \text{zero}.$

$V_A - V_B = 6\times10^{3} \times 3\times10^{-1}(1)$

$= 180\,V$

A: higher voltage than B

(b) $\Delta V = V_A - V_C = V_{AB} + V_{BC}$

$= 180 + \underbrace{0}_{\text{equipotential line}} = 180\,V$

C: is at Lower electrical potential than A.

(c) $V_B - V_C = 0$ has the same potential.

Q4

$q = 0.1\,\mu C$

V_{BA} : negative

$\therefore W$ = positive

ⓐ $W_{A\to B} = \Delta V_{AB}\, q$

$= 180 \times 0.1 \times 10^{-6}$

$= +18 \times 10^{-6}\,J$.

ⓑ $W_{B\to A} = -W_{A\to B}$

$= -18 \times 10^{-6}\,J$

ⓒ sinc $V_{BC} = 0$

$\therefore W_{BC} = 0$

ⓓ $W_{CB} = 0$.

Q5

Figure 24.4

$\Delta V = 0\,V$ all points lie on an equipoten line.

Q6

(a) $\Delta V_{A \to B}$ $V_A = 100V$

$V_B = -20V$

$\Delta V_{AB} = V_A - V_B$

$= 100 - {-20} = 120\,V$

(b) $W_{A \to C} = V_{AC} \times q$

$= (V_A - V_C) \times q$

$= (100 - 100) \times (0.5)$

$= 0\,J$

(c) V negative charge attract to the same charge.

(d) i positive charge repel with the positive charge (same)

Q7

$Q_0 = -0.5\mu C$

object $\Rightarrow$ $m = 5mg$ $\quad q = -0.8nC$

from A ($V_A = -800V$) To B ($V_B = 100V$)

what v ?!

Solution:

$$\Delta V_{AB} = V_A - V_B$$

$$= -800 - 100 = -900$$

$$W = f \cdot d = q\Delta V$$

$$\Rightarrow m a * d = q \Delta V$$

$$m \frac{\Delta v}{\cancel{\Delta t}} * v * \cancel{\Delta t} = q \Delta V \qquad v_i = 0$$

$$m v^2 = q V_{BA}$$

$$v = \sqrt{\frac{q V_{BA}}{m}} = \sqrt{\frac{0.8*10^{-9} * 900}{5*10^{-3}}}$$

$$= \sqrt{144 * 10^{-6}} \ m/s$$

Q8

$\Delta V = 70\, mV$

ⓐ $\Delta U = \Delta V q$

$= 70 \times 10^{-3} \times 1.6 \times 10^{-16}$

$= 1.12 \times 10^{-20}\, J$

ⓑ $W = \Delta U = 1.12 \times 10^{-20}\, J$.

Q9

$v_i = 10^4\, m/s$ $\quad v_f = 10^3$ $\quad d = 5.11 \times 10^{-6}\, m$

$V_f = !!$

→ Conservation of energy.

$\Delta K.E = q \Delta V = \Delta U = W$

$\frac{1}{2} m_e (v_f^2 - v_i^2) = \cancel{m} q \Delta V$

$\frac{\frac{1}{2}(9.11 \times 10^{-31})((10^{4})^2 - (10^{3})^2)}{1.6 \times 10^{-19}} = \Delta V$

$\Delta V = V_f = 2.84 \times 10^{-4}\, V$