Ch5 Review - Solutions Set1

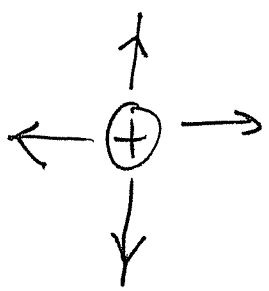
1, a) $E = F/q = \frac{KQ}{R^2} = \frac{(9\times10^9)(8\mu C)}{(0.3)^2} = 800000 \, N/C$

b) $V_{0.4m} = \frac{W}{q} = \frac{PE}{q} = \frac{\frac{KQQ}{R}}{q} = \frac{KQ}{R} = \frac{(9\times10^9)(8\mu C)}{(0.4)} = 180000 \, J/C$

This tells us ~~that~~ what the voltage @ $d=0.4m$ is (compared to infinity), or that the potential difference between ∞ and $d=0.4m$ is.

Δ potential $= \Delta V = V_{0.4m} - V_{\infty} = \quad - 0$

$\Delta V = 180000 \, J/C$.

c) 

d) $F = \frac{KQQ}{R^2} = \frac{(9\times10^9)(8\mu C)(2\mu C)}{(0.25)^2}$

$= 2.304 \, N$

e) $V = \frac{KQ}{R}$ $\quad \Delta V = V_B - V_A = \frac{(9\times10^9)(8\mu C)}{0.3} - \frac{(9\times10^9)(8\mu C)}{0.6 m}$

$= 240000 - 120000$

$= 120000 \, V$

as the question does not specify that it wants $V_B - V_A$, either $V_B - V_A$ or $V_A - V_B$ is fine.

1 f) You'll need to find how much energy it picks up between pt A + B.

$$\Delta \text{Energy} = \Delta PE = PE_B - PE_A = \frac{KQQ}{R} - \frac{KQQ}{R}$$

$$= \frac{(9\times10^9)(8\mu C)(1.6\times10^{-19}C)}{(0.3\,m)} - \frac{(9\times10^9)(8\mu C)(1.6\times10^{-19})}{(0.6\,m)}$$

$$= 3.84\times10^{-14}\,J - 1.92\times10^{-14}$$

$$= 1.92\times10^{-14}\,J$$

$\Delta \text{Energy} = \Delta KE$ → Basically the electron will be attracted to the ⊕ $8\mu C$ charge so $PE_{lost} = KE_{gained}$.

$$\Delta KE = KE_f - KE_i = KE_f - 0 = KE_f$$

$$\Delta KE = \frac{1}{2}mv^2.$$

$$V = \sqrt{\frac{(\Delta KE)(2)}{m}} = \sqrt{\frac{(1.92\times10^{-14}J)(2)}{9.11\times10^{-31}}}$$

$$V = 2.05\times10^{8}\,m/s$$

Set1

1g) $PE = \frac{KQQ}{R} = \frac{(9\times10^9)(8\mu C)(1.6\times10^{-19}C)}{(0.4\,m)}$

$= -2.88\times10^{-14}\ J$

PE @ ∞ = 0

h) $\text{WORK DONE} = \Delta PE = PE_f - PE_i = PE_f - 0 = PE_f$

$= \frac{KQQ}{R} = \frac{(9\times10^9)(8\mu C)(1.6\times10^{-19}C)}{(0.4\,m)}$

$= 2.88\times10^{-14}\ J$

☑ makes sense as PE depends on q.

Ch5 Solutions

Set 1

2/ a) $E = V/d = \frac{70V}{0.3m} = 233\ V/m$.

b) $E = F/q \rightarrow F = E \cdot q = (233)(1.6 \times 10^{-19} C) =$

$F = 3.73 \times 10^{-17}\ N$

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c) WORK DONE = ΔVoltage × q $\quad (V = W/q)$

$= (70V)(1.6 \times 10^{-19} C)$

$= 1.12 \times 10^{-17}\ J$.

d) WORK DONE = $\Delta KE = \frac{1}{2} m v^2$.

$$vel = \sqrt{\frac{(2)(\text{WORK DONE})}{m}} = 4.95 \times 10^{6}\ m/s$$

e) similar to d) but m is different, about $\sqrt{2000}$ times slower as m is 2000 times larger.

$$vel = \sqrt{\frac{(2)(\text{WORK DONE})}{m}} = 1.1 \times 10^{5}\ m/s$$

f) F_g is so small that it has little effect.