Video Lecture #1 – Chapter 18.1 - Introduction to Electric Potential Energy in a Constant Electric Field

Thank You, Puja Patel, for these notes.

Chapter 18 sections 18.1 - 18.2 – electrical energy & electric potential energy

$F_g \Rightarrow PE_g$

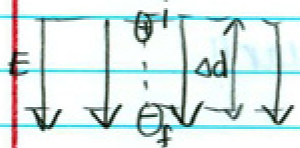
$F_e \Rightarrow PE_{ele}$ Electric potential Energy

COE ⇒ PE_{ele}, PE_g, KE, PE_e

$PE_g = mgh$ h = verticle height above zero line

$\Delta PE_{ele} = -qE\Delta d$ q = charge; use +/-

E = constant electric field



Δd = displacement parallel to electric field
same direction = ⊕ opposite = ⊖

dimensions of ΔPE_{ele} ⇒ Nm ⇒ J

Video Lecture #2 – Chapter 18.1 - page 669 #2 - A Problem Determining the Change in Electrical Potential Energy in a Constant Field

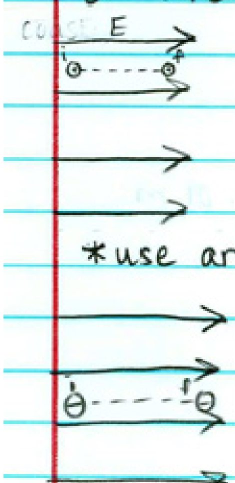
p.669 #2 $\Delta PE_{ele} = ??$ $\Delta d = 2.0\,cm \left(\frac{1\,m}{100\,cm}\right) = 0.02\,m$

$E = 215\,\frac{N}{C}$ $\Delta PE_{ele} = -qE\Delta d$

$= -(1.6\times10^{-19})(215)(0.02\,m)$

$= -6.88\times10^{-19}$

$\Delta PE_{ele} \approx -6.9\times10^{-19}\,J$ – gaining KE.



use an electron

the charge is changed from ⊕ → ⊖

$\Delta PE_{ele} = -qE\Delta d$

$= -(-1.6\times10^{-19})(215)(0.02)$

$= 6.88\times10^{-19}$

$\Delta PE_{ele} \approx 6.9\times10^{-19}\,J$

PEg for atomic particles is Negligible

– it is gaining PEele, it is losing KE.

Video Lecture #3 – Chapter 18.1 - Introduction to the Electric Potential Energy between Two Point Charges

PEele between 2 point charges

$PE_{ele} = \frac{kq_1q_2}{r}$ ⊕ ⊖

*getting more & more ⊖ so, getting smaller!

Video Lecture #4 – Chapter 18.2 - Introduction to Electric Potential Difference in a Constant Electric Field

Electric potential difference, ΔV

$$\boxed{\Delta V = \frac{\Delta PE_{ele}}{q}}$$ *energy between w/out the test charge

dimensions = $\frac{J}{C}$ = Volt, V

$$\Delta V = \frac{\Delta PE_{ele}}{q} = \frac{-qE\Delta d}{q} = -E\Delta d$$

$\boxed{\Delta V = -E\Delta d}$ constant E field. Scalar!!

Video Lecture #5 – Chapter 18.2 - Introduction to Electric Potential Difference due to a Point Charge

$$\Delta V = \frac{\Delta PE_{ele}}{q} = \frac{1}{q}\left(PE_{ele,f} - PE_{ele,i}\right)$$

$$= \frac{1}{q}\left(\frac{Kq_1q_2}{r_f} - \frac{Kq_1q_2}{r_i}\right)$$

$$= \frac{Kq}{r_f} - \frac{Kq}{r_i}$$

$r_i \approx \infty$

$\frac{1}{r_i} \approx \frac{1}{\infty} = 0$

$\boxed{\Delta V = \frac{Kq}{r}}$ for a point charge

$\Delta V \quad r_i \approx \infty \rightarrow V_f$

Video Lecture #6 – Chapter 18.2 - page 673 #1 - A Problem Finding the Electric Potential Difference due to a Point Charge

p. 673 #1) $\Delta V = ??$ $r_f = 1.0\,cm\left(\frac{1\,m}{100\,cm}\right) = 0.01\,m$

$r_i \approx \infty$

$$\Delta V = \frac{Kq}{r}$$

$$= \frac{(8.99\times10^{9})(1.60\times10^{-19})}{(0.01)}$$

$$= 1.4384\times10^{-7}$$

$$\boxed{\Delta V \approx 1.4\times10^{-7}\,V}$$

Video Lecture #7 – Chapter 18.2 - Page 673 #2 - A Problem Finding the Electric Potential Difference due to Two Point Charges

p. 673 #2 $q_1 = 5.0\,nc\left(\frac{1\,c}{1\times10^{9}\,nc}\right) = 5\times10^{-9}\,c$ $r = 35.0\,cm$

$q_2 = -3.0\,nc\left(\frac{1\,c}{1\times10^{9}\,nc}\right) = -3\times10^{-9}\,c$

$\Delta V = \frac{kq}{r}$

$\Delta V_t = \Delta V_1 + \Delta V_2$

$= \frac{kq_1}{r_1} + \frac{kq_2}{r_2}$

$= \frac{(8.99\times10^{9})(5\times10^{-9})}{\frac{0.35}{2}} + \frac{(8.99\times10^{9})(-3\times10^{-9})}{\frac{0.35}{2}}$

$= 256.857 - 154.11$

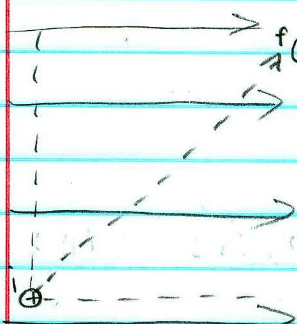
$= 102.7428571\ V$

$\Delta V_t \approx 1.0\times10^{2}\ V$

Video Lecture #8 – Chapter 18.1 - page 669 #5 - A Problem Finding the Change in Electric Potential Energy in a Constant Electric Field

p. 669 #5 $E = 250\,\frac{N}{C}$ $q = 12\,\mu C\left(\frac{1\,c}{1\times10^{6}\,\mu c}\right) = 1.2\times10^{-5}$

ΔPE_{ele} (20.0 cm, 50.0 cm)



$\Delta PE_{ele} = -qE\Delta d$

$= -(1.2\times10^{-5})(250)(0.2)$

$= -6\times10^{-4}$

$\Delta PE_{ele} \approx -6.0\times10^{-4}\ J$

Video Lecture #9 – Has no lecture notes.