Chapter 18

**Sections 18.1 - 18.2 - Electric Potential Energy**

Feq \rightarrow PEG

F_{eel} \rightarrow PEE_ee

Electric Potential Energy

COE \rightarrow PEE_ee, PEG, KE, PEE

PEG = mgh

h = vertical height above zero line

\( \Delta PEE_ee = -qE \Delta d \)

q = charge; use +/-

E = Constant Electric Field

\( \Delta d = \text{displacement parallel to electric field} \)

same direction = \( \oplus \)

opposite = \( \ominus \)

dimensions of \( \Delta PEE_ee \Rightarrow \text{nm} \Rightarrow J \)

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

\[ \Delta PEE_ee = ?? \]

\[ \Delta d = 2.0 \times 10^{-2} \text{ m} \]

\[ E = 215 \text{ N/C} \]

\[ \Delta PEE_ee = -qE \Delta d \]

\[ = -1.6 \times 10^{-19} (215) (0.02 \text{ m}) \]

\[ = -6.68 \times 10^{-19} \text{ J} \]

\[ \Delta PEE_ee \approx -6.9 \times 10^{-19} \text{ J} \]

- gaining KE.

*use an electron*

- the charge is changed

\[ \Delta PEE_ee = -qE \Delta d \]

\[ = -1.6 \times 10^{-19} (215) (0.02) \]

\[ = 6.68 \times 10^{-19} \text{ J} \]

\[ \Delta PEE_ee \approx 6.9 \times 10^{-19} \text{ J} \]

- it is gaining PEE_ee, it is losing KE.

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

\[ PEE_ee \text{ between 2 point charges} \]

\[ \text{PEG between} \]

\[ \frac{kg_1g_2}{r} \]

*getting more and more \( \Theta \), getting smaller.
Video Lecture #4 – Chapter 18.2 - Introduction to Electric Potential Difference in a Constant Electric Field

\[
\Delta V = \frac{\Delta PE}{e} \quad \text{energy between without the test charge.}
\]

\[
\text{dimensions } = \frac{1}{C} = \text{Volt, V}
\]

\[
\Delta V = \frac{\Delta PE}{q} = -\frac{q \Delta \phi}{q} = -E \Delta d
\]

\[
\Delta V = -E \Delta d \quad \text{Constant E field. Scalar!!}
\]

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

\[
\Delta V = \frac{\Delta PE}{q} = \frac{1}{q} (P E_{E_1} - P E_{E_2}) = \frac{1}{q} \left( \frac{k q_1 q_2}{r_f} - \frac{k q_1 q_2}{r_i} \right)
\]

\[
= \frac{k q_1 q_2}{r_i} - \frac{k q_1 q_2}{r_f} \quad r_i \rightarrow \infty \quad r_f \quad \Delta V \quad r_i \rightarrow \infty \rightarrow V_f
\]

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

\[\text{(6.473 #1) } \Delta V = ?? \quad r_i = 1.0 \text{cm} \left( \frac{1 \text{m}}{100 \text{cm}} \right) = 0.01 \text{ m} \]

\[
\Delta V = \frac{k q}{r} \quad r_i \rightarrow \infty
\]

\[
= (8.99 \times 10^9) (1.40 \times 10^{-1} a) \quad (0.01)
\]

\[
= 1.4384 \times 10^{-7}
\]

\[\Delta V \approx 1.4 \times 10^{-7} \text{ V} \]
Video Lecture #7 – Chapter 18.2 - Page 673 #2 - A Problem Finding the Electric Potential Difference due to Two Point Charges

\[ \Delta V = \frac{Kq_1}{r_1} + \frac{Kq_2}{r_2} \]

\[ = \frac{8.99 \times 10^9}{0.35} (5 \times 10^{-9}) + \frac{8.99 \times 10^9}{0.35} (-3 \times 10^{-9}) \]

\[ = 256.857 - 154.11 \]

\[ = 102.742857 \text{ V} \]

\[ \Delta V \approx 1.0 \times 10^2 \text{ V} \]

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

\[ \Delta PE_{ele} = q \times E \times \Delta d \]

\[ = (1.2 \times 10^{-5}) (250) (0.2) \]

\[ = 6 \times 10^{-4} \text{ J} \]

\[ \Delta PE_{ele} \approx 6 \times 10^{-4} \text{ J} \]

Video Lecture #9 – Has no lecture notes.