

SECTION REVIEW

1. What is the difference between $\Delta PE_{electric}$ and $PE_{electric}$?
2. In a uniform electric field, what factors does the electrical potential energy depend on?
3. Describe the conditions that are necessary for mechanical energy to be a conserved quantity.
4. Is there a single correct reference point from which all electrical potential energy measurements must be taken?
5. A uniform electric field with a magnitude of 250 N/C is directed in the positive x direction. A $12\text{ }\mu\text{C}$ charge moves from the origin to the point (20.0 cm, 50.0 cm). What is the change in the electrical potential energy of the system as a result of the change in position of this charge?
6. What is the change in the electrical potential energy in a lightning bolt if 35 C of charge travel to the ground from a cloud 2.0 km above the ground in the direction of the field? Assume the electric field is uniform and has a magnitude of $1.0 \times 10^6\text{ N/C}$.
7. The gap between electrodes in a spark plug is 0.060 cm. Producing an electric spark in a gasoline-air mixture requires an electric field of $3.0 \times 10^6\text{ V/m}$. What minimum potential difference must be supplied by the ignition circuit to start a car?
8. A proton is released from rest in a uniform electric field with a magnitude of $8.0 \times 10^4\text{ V/m}$. The proton is displaced 0.50 m as a result.
 - a. Find the potential difference between the proton's initial and final positions.
 - b. Find the change in electrical potential energy of the proton as a result of this displacement.
9. In a thunderstorm, the air must be ionized by a high voltage before a conducting path for a lightning bolt can be created. An electric field of about $1.0 \times 10^6\text{ V/m}$ is required to ionize dry air. What would the breakdown voltage in air be if a thundercloud were 1.60 km above ground? Assume that the electric field between the cloud and the ground is uniform.
10. Explain how electric potential and potential difference are related. What units are used for each one?
11. **Critical Thinking** Given the electrical potential energy, how do you calculate electric potential?
12. **Critical Thinking** Why is electric potential a more useful quantity for most calculations than electrical potential energy?