

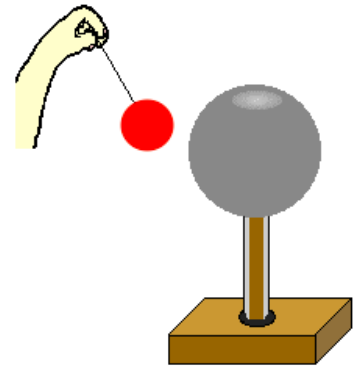
## Electric Potential Energy Lesson Notes

### Learning Outcomes

- What causes an electric charge to move?
- How can you identify the location of high and low electric potential energy?

### Electric Field Concept ... Revisited

- The charged sphere of a Van de Graaff generator exerts a force upon a nearby balloon even when it is not in physical contact with the balloon. The balloon is said to have experienced a **field force**.
- The charged sphere has created an **electric field** - an alteration of the electrical properties of the surrounding space.
- Other charged objects, like the balloon, that enter that space feel the effects of that space and interact differently because of the electrical field that has been established.



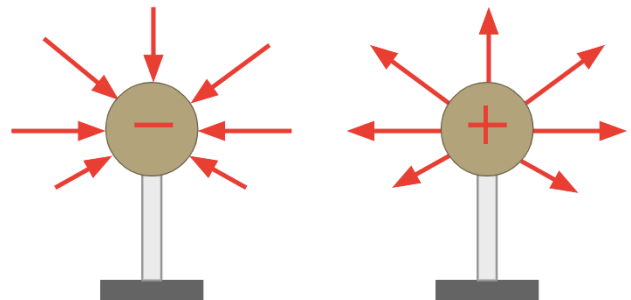
### Direction of the Electric Field

Electric field is a **vector quantity** ... it has a direction.

By definition, the direction of the electric field at any given location is the direction that a **+ test charge** would be pushed or pulled when placed at that location.

By logical extension, the electric field vector is directed

- towards negative source charges, and
- away from positive source charges.

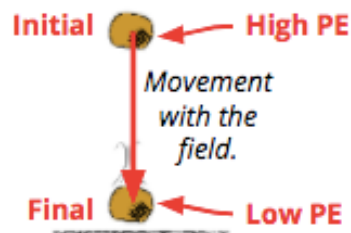


### A Gravitational Analogy

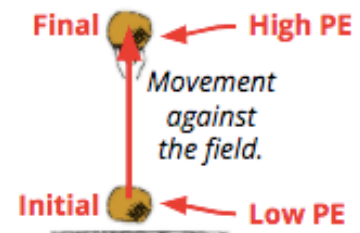
The gravitational field near the Earth's surface is directed downward.

Objects naturally move in the direction of the field. But work is required to move an object against the field.

Gravity does work on masses to move them from high PE locations to low PE locations.

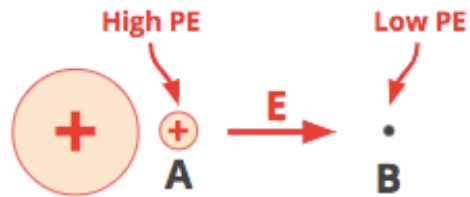


Work is required to move a mass upward. The work done increases the PE of the mass.

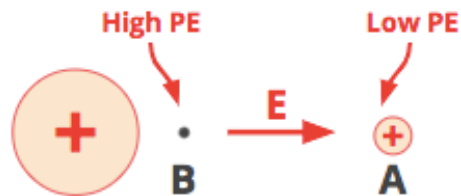


## Electric Potential Energy (Surrounding a + Source

A charge naturally moves in the direction of an electric field; work done by an external object is not required. The field is moving the charge from high PE to low PE.

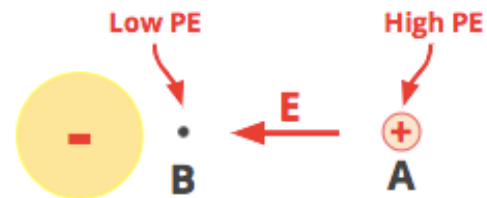


Work by an external force is required to move a charge against an electric field; this work increases the energy of the charge from low PE to high PE.

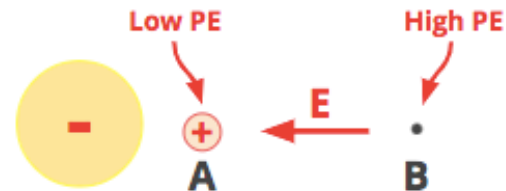


## Electric Potential Energy (Surrounding a - Source

A charge naturally moves in the direction of an electric field; work done by an external object is not required. The field is moving the charge from high PE to low PE.



Work by an external force is required to move a charge against an electric field; this work increases the energy of the charge from low PE to high PE.



**AAAAA**



A positive test charge will naturally move in the direction of the electric field, from high PE to low PE.

This is away from a positive source charge and towards a negative source charge.



For a positive charge to move against the field, work must be done by an external source, moving it from low PE to high PE.

This is towards a positive source charge and away from a negative source charge.