Masses in Potentials

Consider 3 equal masses sitting in different gravitational potentials:

A) Constant, zero potential
B) Constant, non-zero potential
C) Linear potential ($V \propto x$) but sitting at $V = 0$

Which statement is true?

1. None of the masses will accelerate
2. Only B will accelerate
3. Only C will accelerate
4. All masses will accelerate, but B will have the largest acceleration
5. All masses will accelerate, but C will have the largest acceleration

Masses in Potentials

(3) Only C (in linear potential) will accelerate

When you think about potential, think "height." For example, near the Earth:

$$U = mgh \text{ so } V = gh$$

Constant potential (think constant height) thus will not cause acceleration. The value of the potential (height) is irrelevant.

Positive Charge

Place a positive charge in an electric field. It will move from

1. higher to lower *electric potential*; lower to higher *potential energy*
2. higher to lower *electric potential*; higher to lower *potential energy*
3. lower to higher *electric potential*; lower to higher *potential energy*
4. lower to higher *electric potential*; higher to lower *potential energy*

Positive Charge

(2) From higher to lower potential and higher to lower potential energy

Objects always move to reduce their potential energy. Positive charges do this by moving towards a lower potential:

$$U = qV$$

Negative Charge

Place a negative charge in an electric field. It will move from

1. higher to lower *electric potential*; lower to higher *potential energy*
2. higher to lower *electric potential*; higher to lower *potential energy*
3. lower to higher *electric potential*; lower to higher *potential energy*
4. lower to higher *electric potential*; higher to lower *potential energy*

Negative Charge

(4) From lower to higher potential and higher to lower potential energy

Objects always move to reduce their potential energy. Negative charges do this by moving towards a higher potential:

$$U = qV$$

Potential and Energy

Which is true?

I. It takes positive work to bring like charges together.

II. Electric field lines always point in the direction of decreasing electric potential.

III. If a negative charge moves in the direction of the electric field, its potential energy decreases.

1. II only.
2. II and III only.
3. I, II and III.
4. I and II only.
5. I only.

Potential and Energy

(4) I and II Only

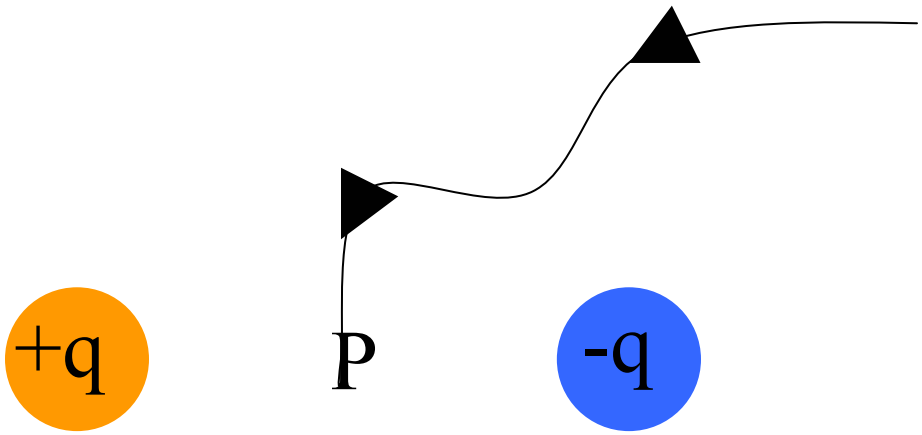
I. It takes positive work to bring like charges together. TRUE

II. Electric field lines always point in the direction of decreasing electric potential. TRUE

III. If a negative charge moves in the direction of the electric field, its electric potential energy decreases. FALSE – potential decreases so potential energy increases ($U = qV$)

Two Point Charges

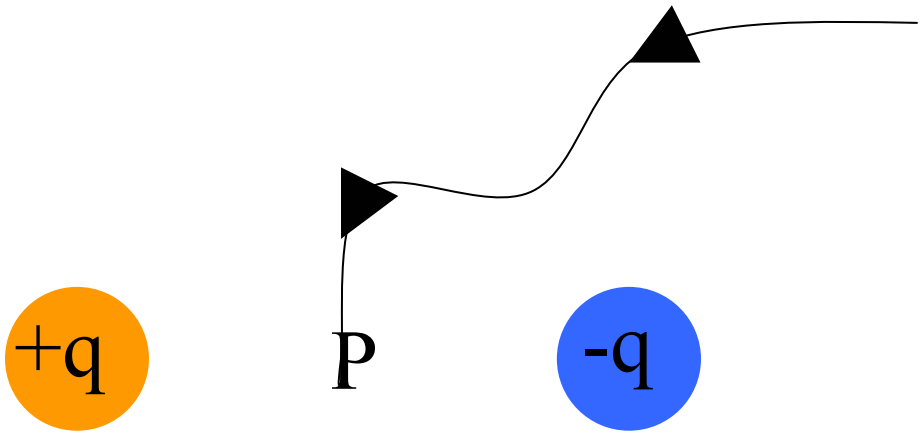
The work done in moving a positive test charge from infinity to the point P midway between two charges of magnitude +q and –q:



1. is positive.
2. is negative.
3. is zero.
4. can not be determined since not enough information is given.
5. I don't know

Two Point Charges

(3) Work from ∞ to P is zero



The potential at ∞ is zero.
The potential at P is zero because equal and opposite potentials are superimposed from the two point charges (remember: V is a scalar, not a vector)

Potential Landscape

If I think of the electric potential as a mountain range, then the electric field points:

1) Up the mountain sides
2) Down the mountain sides
3) Around the mountain sides
4) I don't know

Potential Landscape

(2) The electric field points the fastest way down the potential mountain – in the same way that the gravitational field tells you to come down