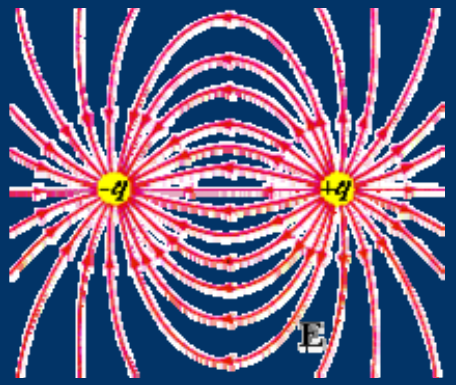
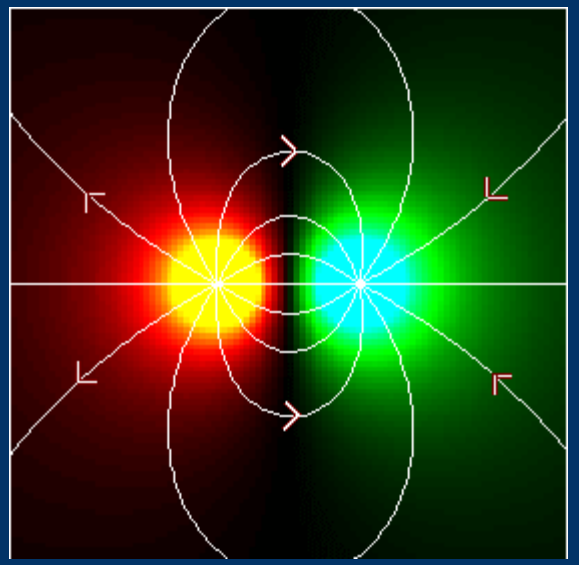
Regents Physics

- Electric Fields
  - Direction





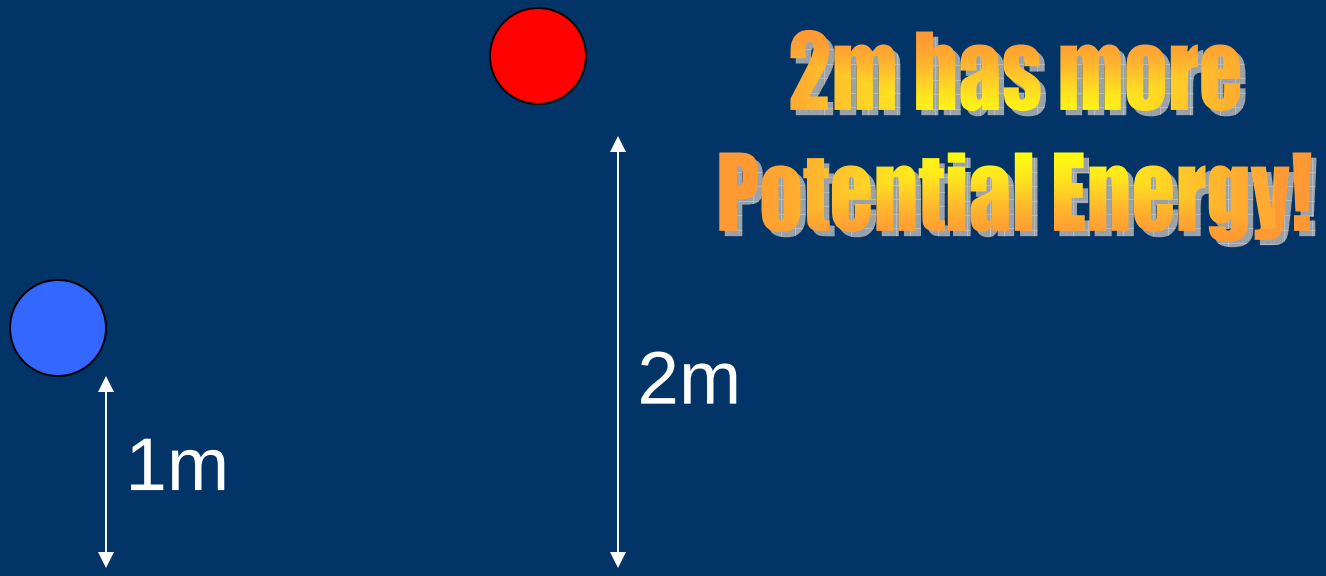
Gravitational and Electric Fields..*are they similar?*

- *Answer the following:*
  - What happens to the strength of gravity as you move further away from Earth?

It get's Weaker!

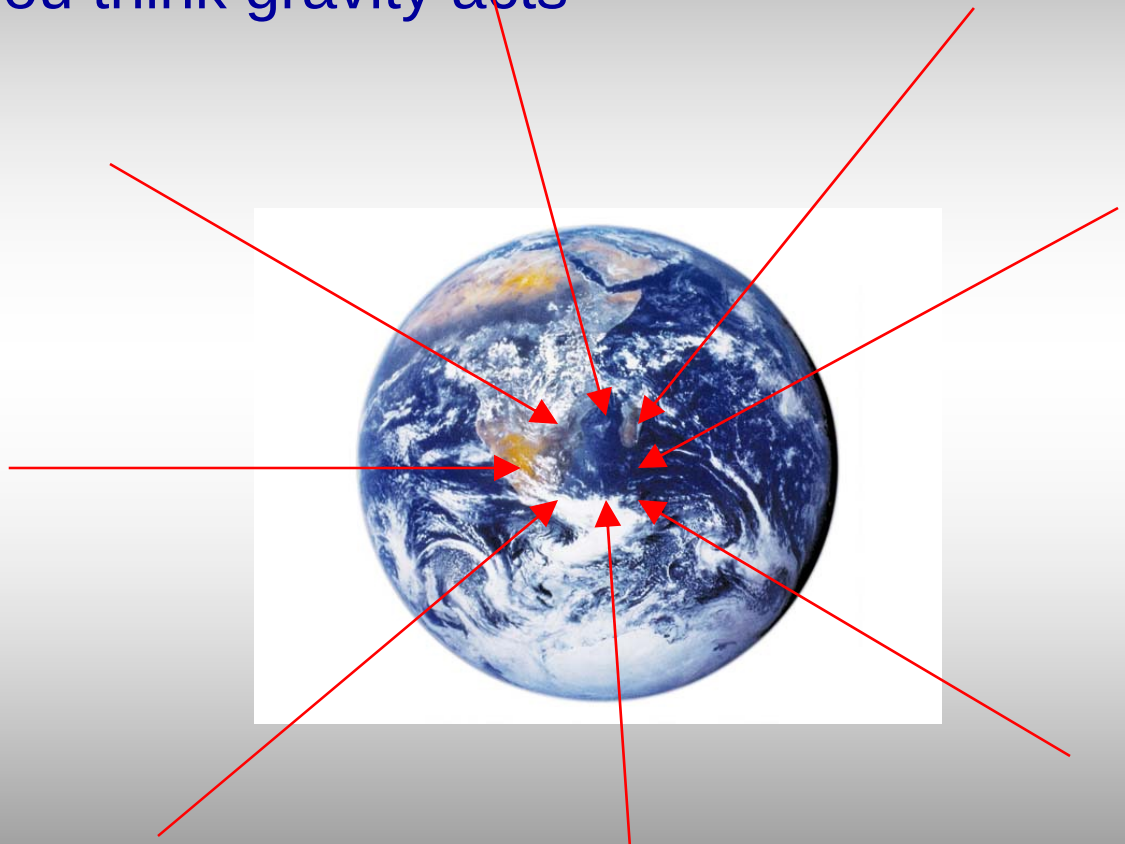
Gravitational and Electric Fields..*are they similar?*

- Compare an object held at 1m above the Earth verses 2m above the Earth. What's different? (hint..think energy)



Gravitational and Electric Fields..*are they similar?*

– Draw Earth and sketch arrows to represent how you think gravity acts



Chapter menu Resources

Objectives

- **Calculate** electric field strength.
- **Draw** and **interpret** electric field lines.
- **Calculate** electric field potential difference

End Of Slide

Electric Field Strength

- An **electric field** is a region where an electric force on a test charge can be detected.
- The SI units of the electric field, *E,* are newtons per coulomb (N/C).
- The direction of the electric field vector, **E,** is in the direction of the electric force that would be exerted on a small positive test charge.

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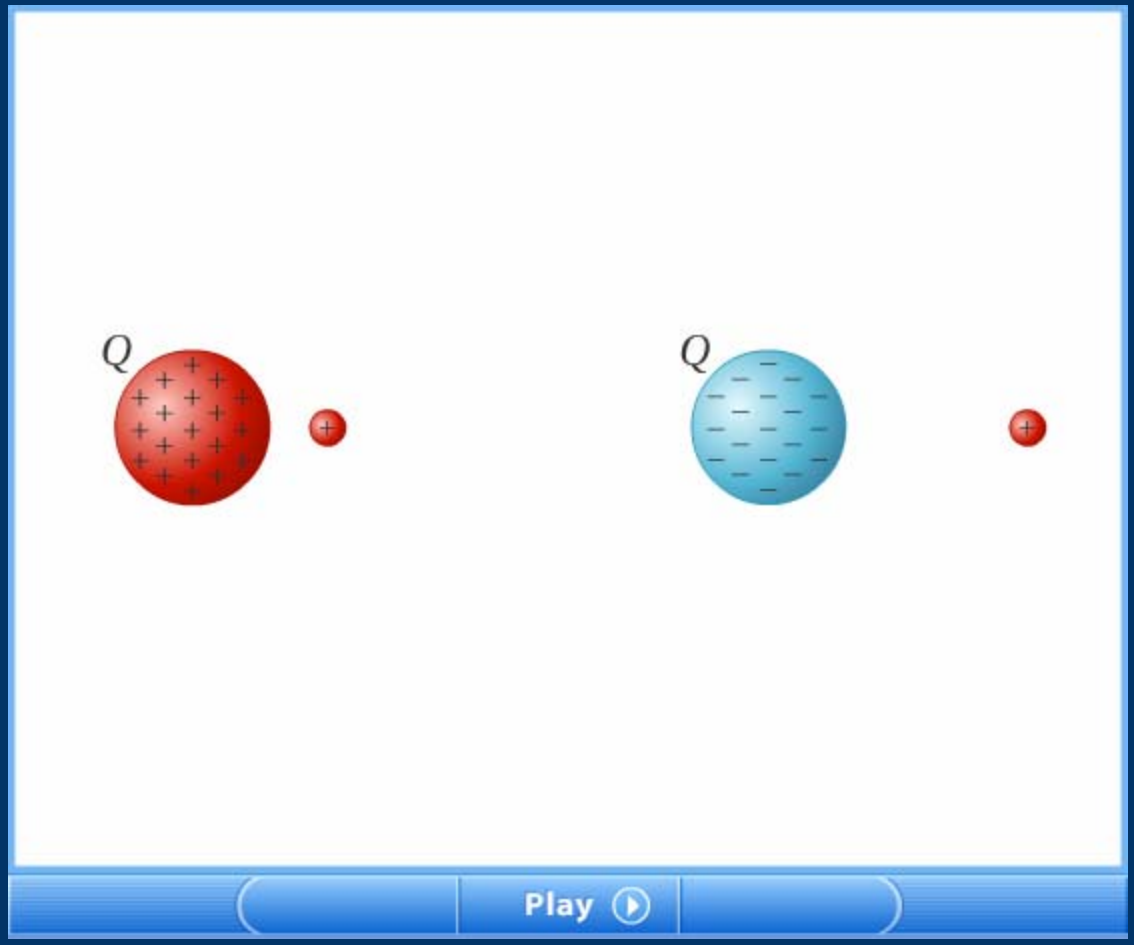
Electric Fields and Test Charges



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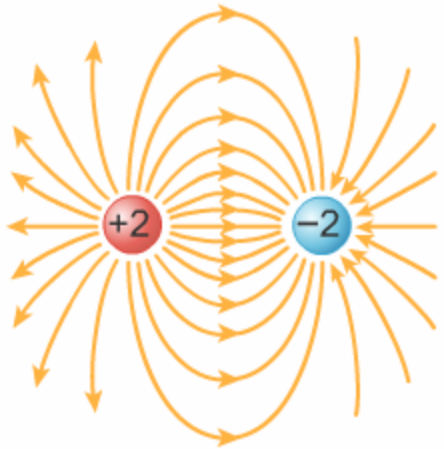
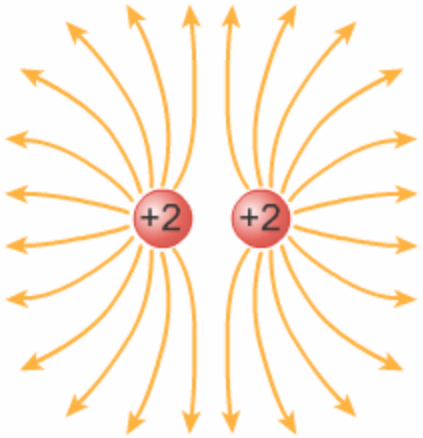
Rules for Drawing Electric Field Lines





Rules for Drawing Electric Field Lines

The lines must begin on positive charges or at infinity and must terminate on negative charges or at infinity.

The number of lines drawn leaving a positive charge or approaching a negative charge is proportional to the magnitude of the charge.

No two field lines from the same field can cross each other.

Play

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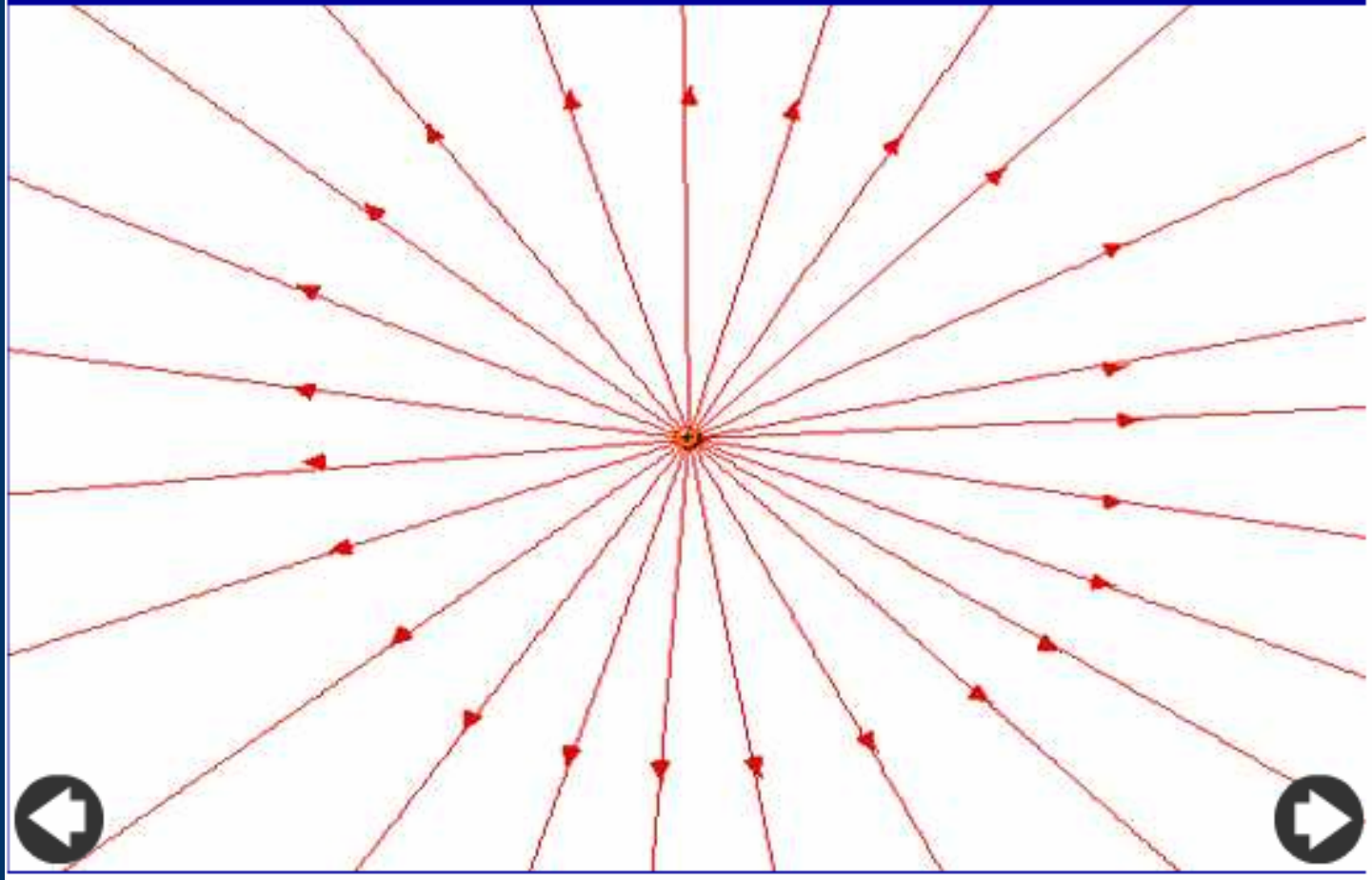
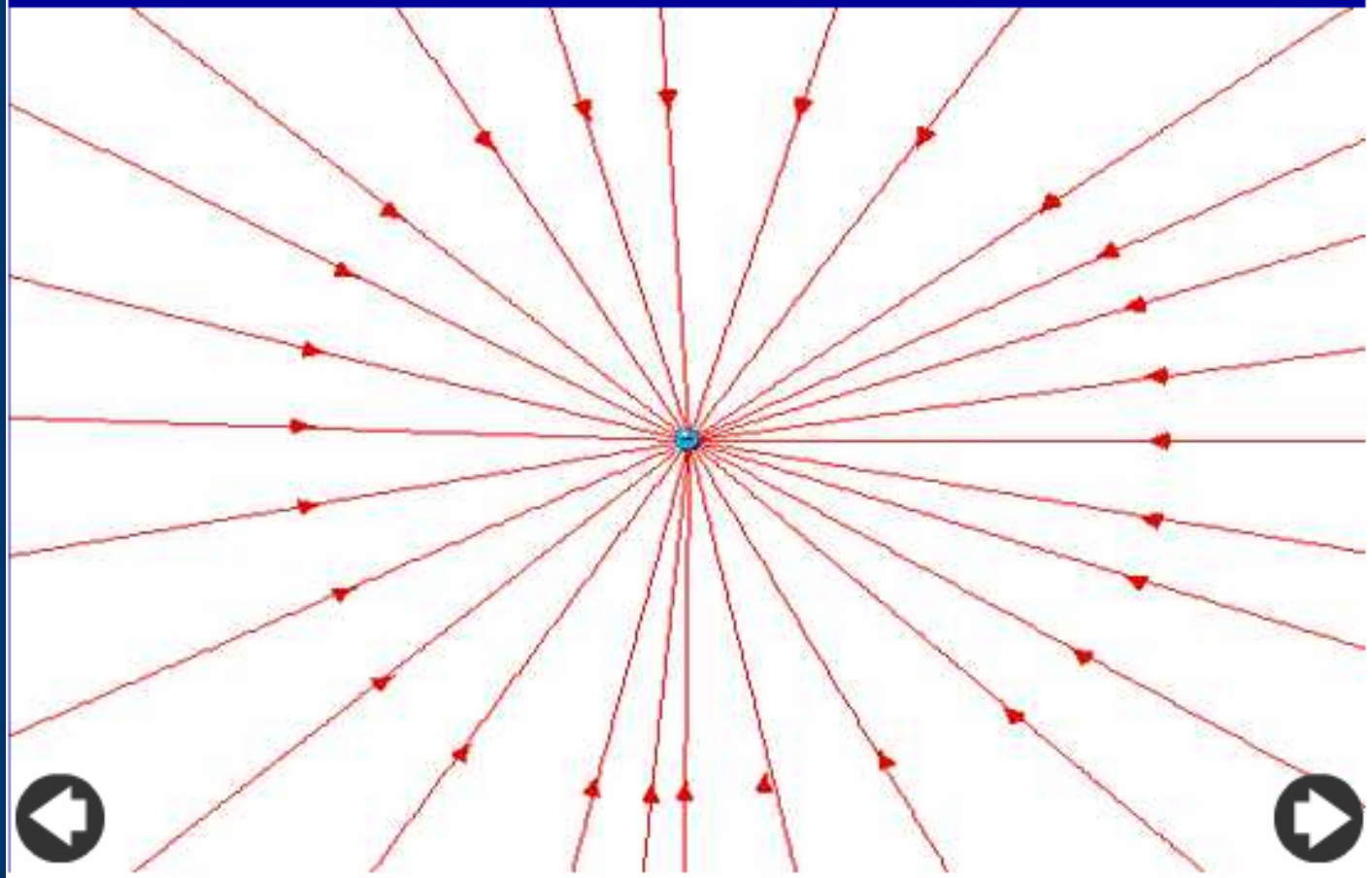
Electric field for a positive point charge



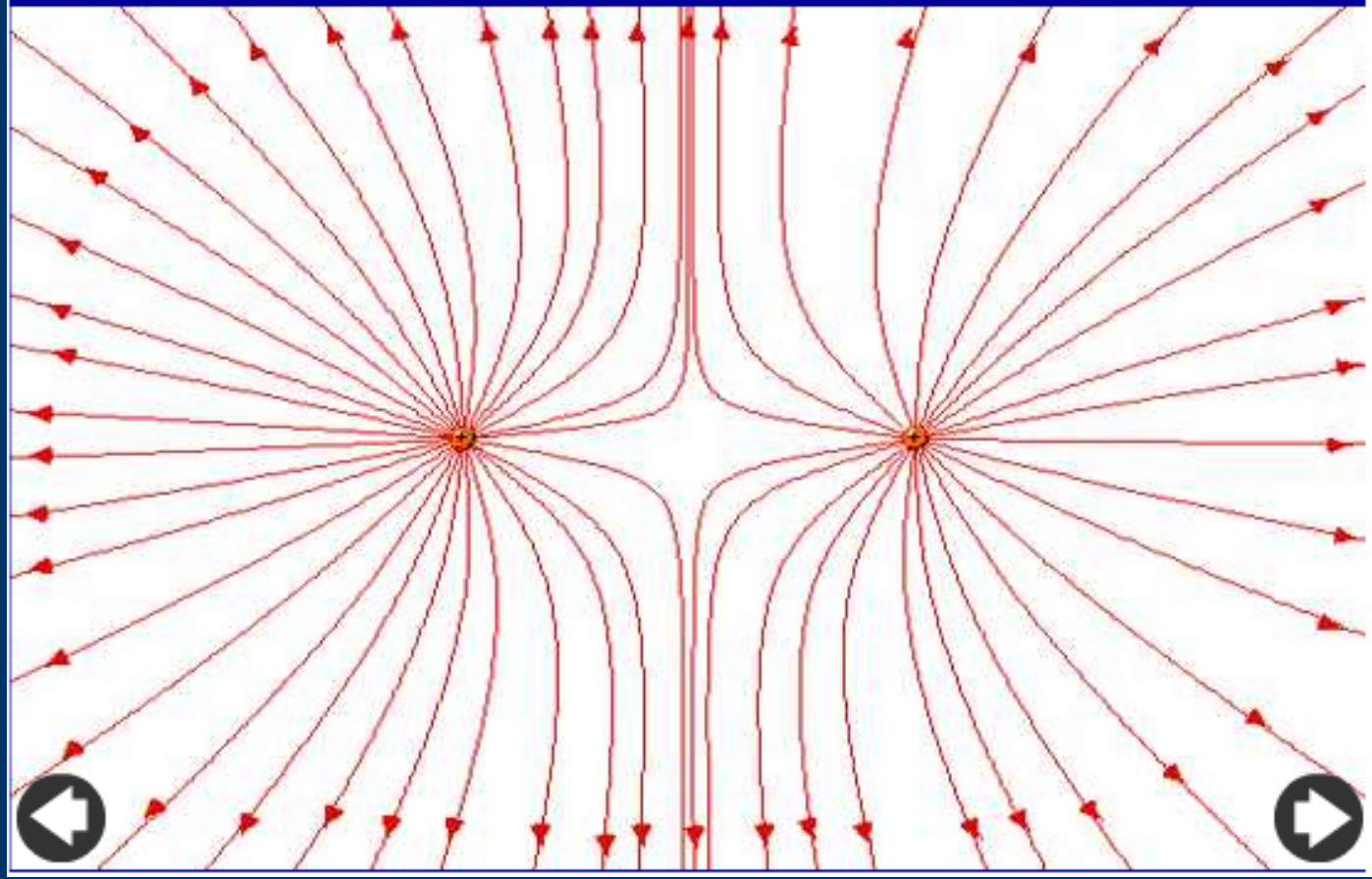
Chapter menu Resources

Electric field for a negative point charge



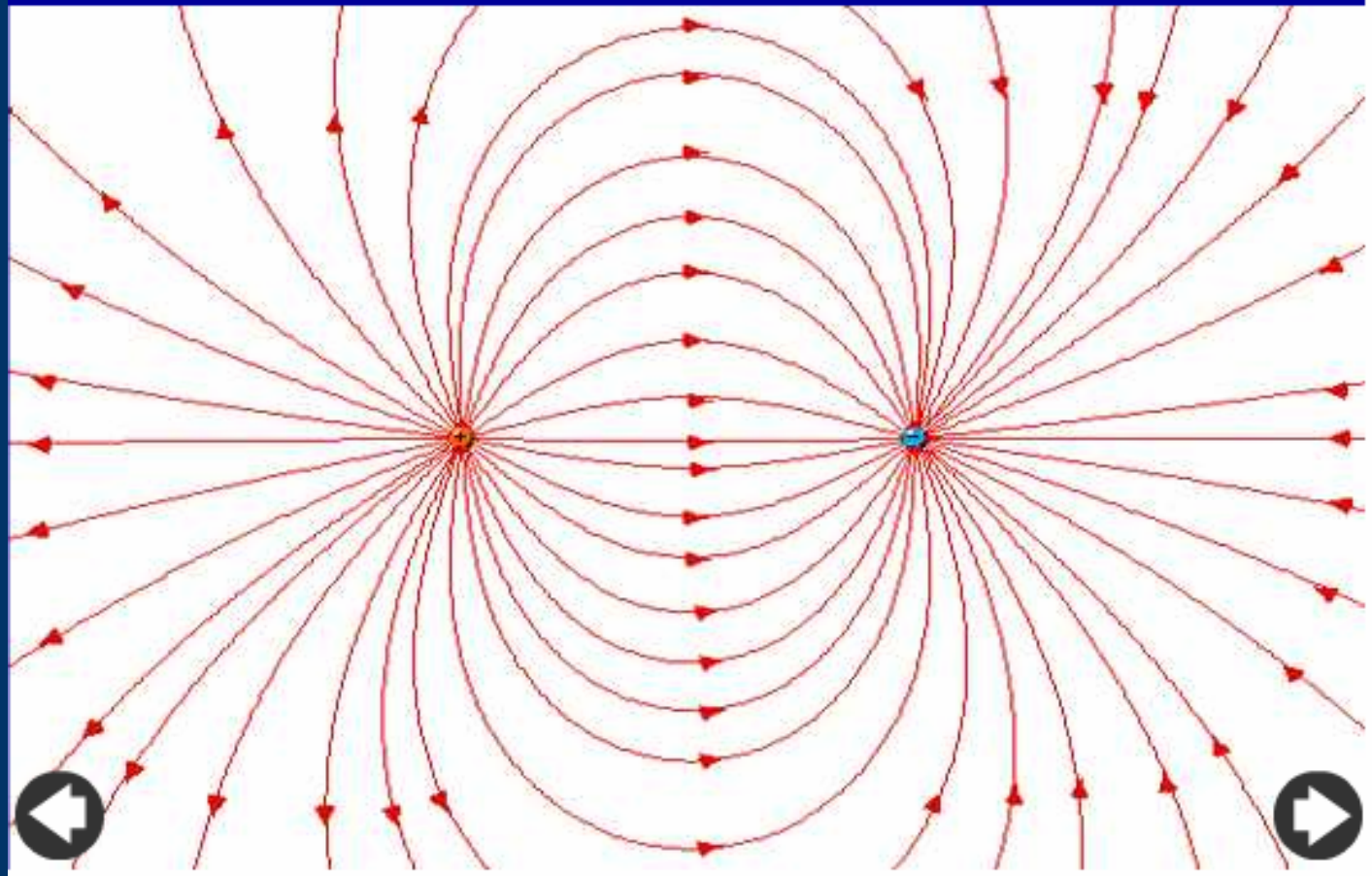
Chapter menu Resources

Electric field for two positive point charges



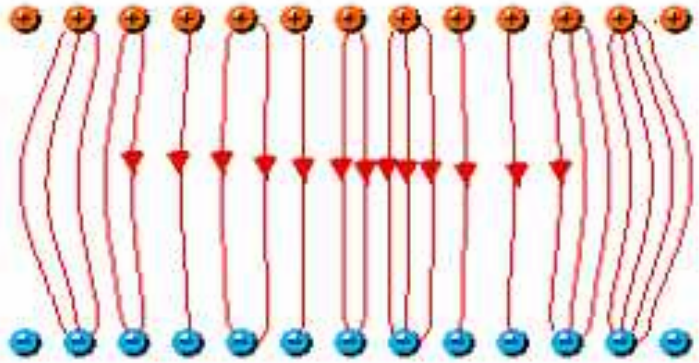
Chapter menu Resources

Electric field for two opposite point charges



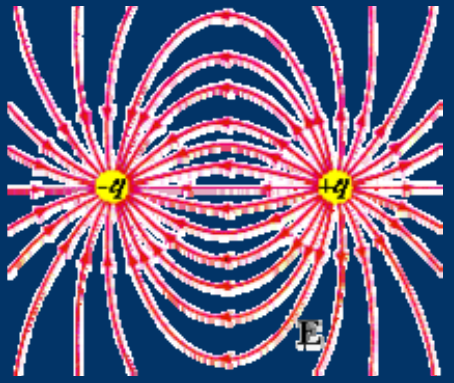
Chapter menu Resources

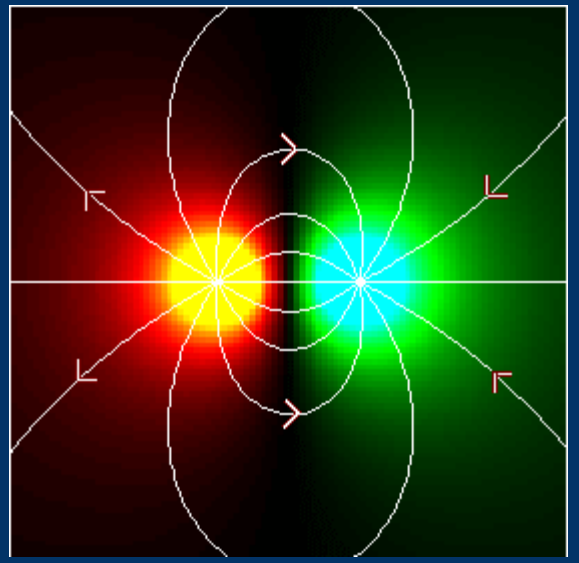
Electric field for two oppositely charged parallel plates



Regents Physics

- Electric Fields
  - Strength
  - Potential Difference





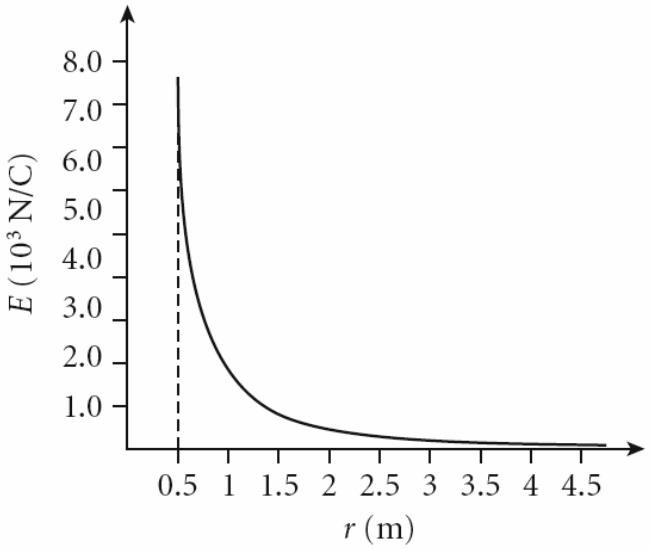
Gravitational and Electric Fields..*are they similar?*

- *Answer the following:*
  - What happens to the strength of gravity as you move further away from Earth?

It get's Weaker!

Electric Field Strength

Electric fields are similar to gravitational fields. Charges affect one another via electric fields; masses affect one another via gravitational fields.



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Chapter me

Measuring Electric Fields

- ***Electric Field Strength***, ***E***, is the force on a stationary positive test charge per unit charge in an electric field

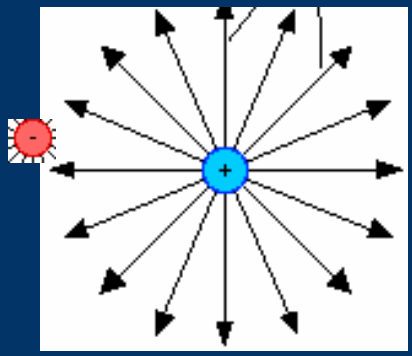
$$\mathbf{E} = \frac{F_e}{q}$$

Electric Field Strength [click]
Equipotential Lines [click]

$\mathbf{F_e}$ is the electrostatic force, in newtons (N)
q is the charge in Coulombs (C)
E is the electric field strength in N / C
It's a vector quantity

Sample Problem

- What is the force on an electron that is 0.5 m away from a positive 2C point charge?
- What is the electric field strength at this point?



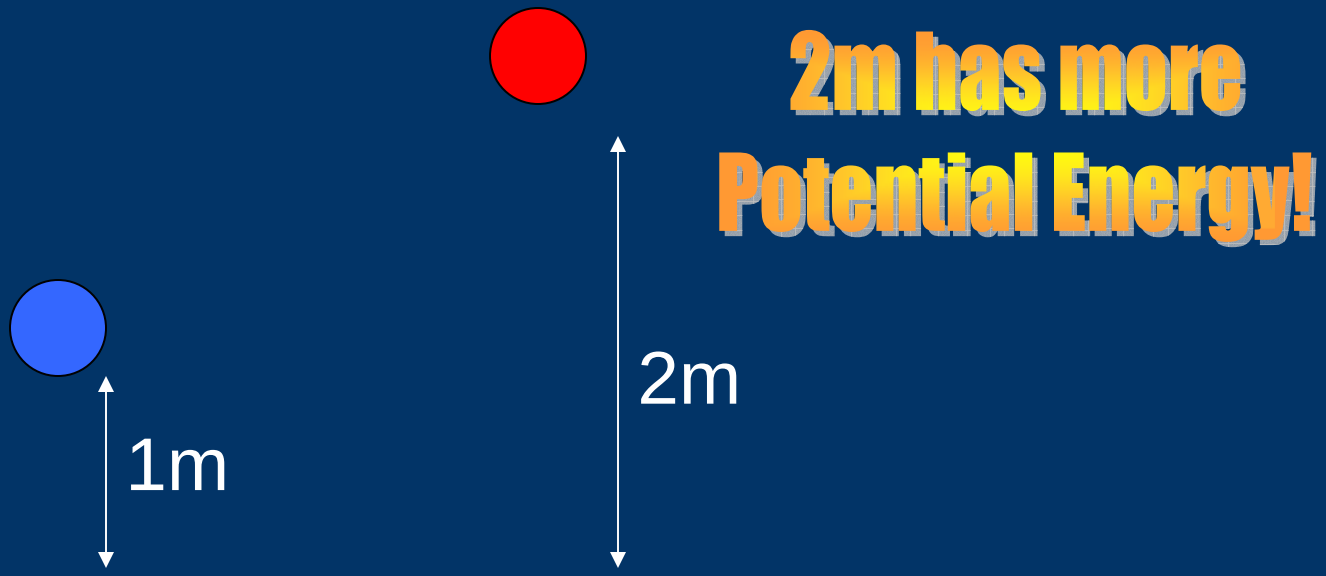
POTENTIAL DIFFERENCE

Just as work is done when a mass is moved in a gravitational field (because a force is necessary); work is also done when a charge is moved in an electric field. When work is done energy is transferred.

Chapter menu Resources

Gravitational and Electric Fields..*are they similar?*

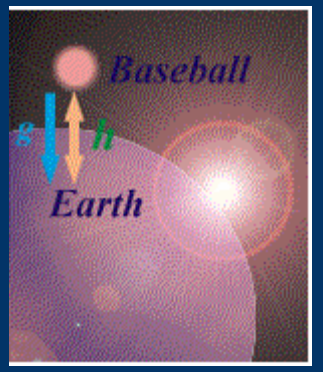
– Compare an object held at 1m above the Earth verses 2m above the Earth. What's different? (hint..think energy)



Potential Difference equation

$$V = \frac{W}{q}$$

Voltage
Is like
Gravitational PE

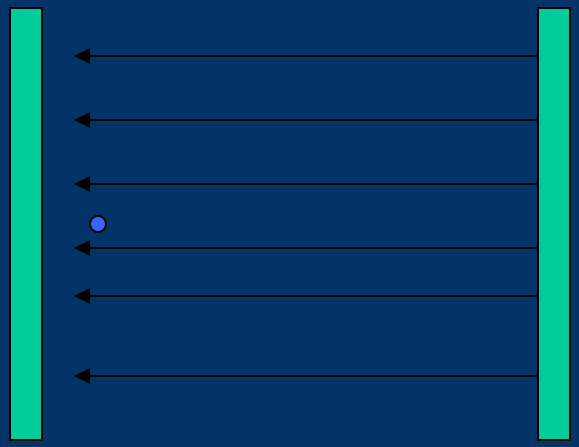


W is work done in joules J
q is the charge in coulombs C
V is the potential difference J / C

Charged Parallel Plates [click]

Practice problem

- Moving a point charge of 3.2×10^{-19} C between plates in an electric field requires 4.8×10^{-18} J of energy. What is the potential energy difference between these points?



$q = 3.2 \times 10^{-19}$ C

$W = 4.8 \times 10^{-18}$ J

$V = ?$

Multiple Choice

1. In which way is the electric force similar to the gravitational force?

A. Electric force is proportional to the mass of the object.

B. Electric force is similar in strength to gravitational force.

C. Electric force is both attractive and repulsive.

D. Electric force decreases in strength as the distance between the charges increases.

Multiple Choice, *continued*

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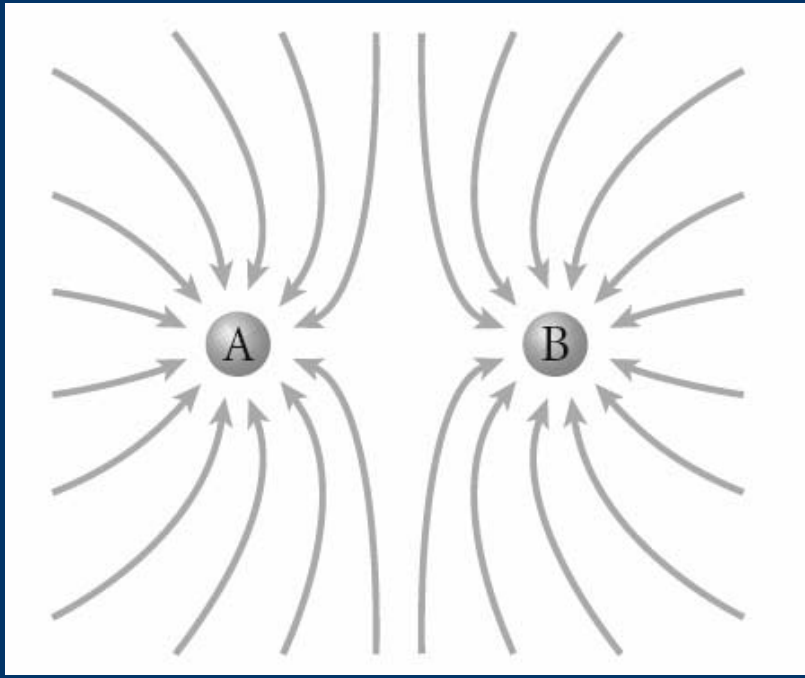
Multiple Choice, *continued*



2. What must the charges be for A and B in the figure so that they produce the electric field lines shown?

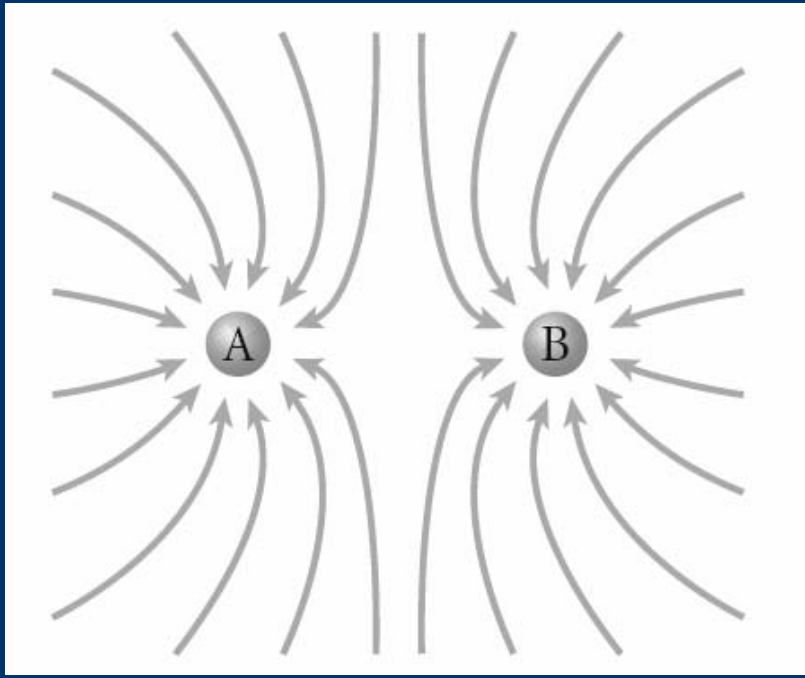
F. A and B must both be positive.

G. A and B must both be negative.

H. A must be negative, and B must be positive.

J. A must be positive, and B must be negative.

Multiple Choice, *continued*



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