The Golden rules of electrostatics.

The first Golden rule of electrostatics:
Only negative charge moves in static electricity

The second Golden rule of electrostatics:
Like charges repel and unlike charges attract.

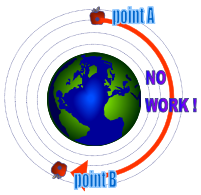
The third Golden rule of electrostatics:
Charges distribute themselves evenly on the surface of objects.

If you follow these rules you don't need to memorize anything else for sketches & diagrams.

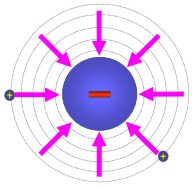
32

Lines of potential, "g" and "E"

Gravitational fields



Electrical fields



33.4

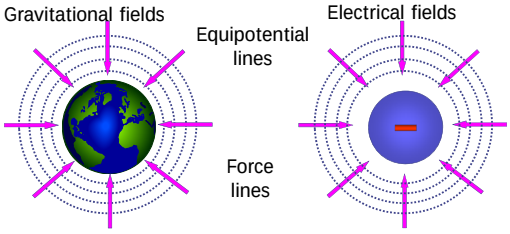
electric fields like gravitational fields

Gravitational fields

Equipotential lines

Force lines

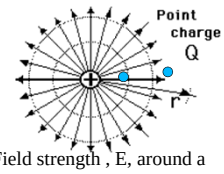
Electrical fields



Only when the charge moves from one equipotential line to another is work done!
Equipotential lines and lines of force act at 90° to each other

33.4

Electric fields a special case



Field strength , E, around a point charge gets smaller as you move away from it

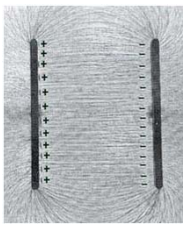
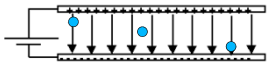


Photo of actual field visualized between charged plates

Electric field is uniform between the parallel charged plates.



Force on each of these 3 test charges is the same.

33.2

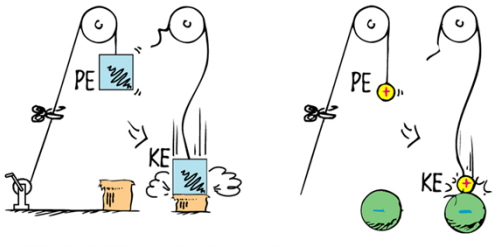
Field strength comparison

- Gravitational Force
- Mass; m [kg]
- Field Strength; g [newtons/kg] = [m/s^2]
- Gravitational Field Strength
- g= F_g/m

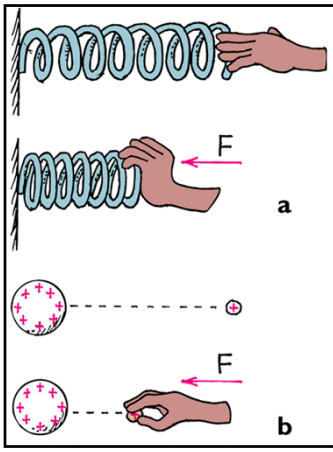
- Electric Force
- Charge; q [Coulombs]= [C]
- Field Strength; E [Newtons/Coulomb]
- Electric Field Strength
- E = F_e/q

33.4

Electric potential is like gravitational potential



33.4



Spring stores PE when work is done to it.

The Charged particle stores PE when work is done to it.

33.4

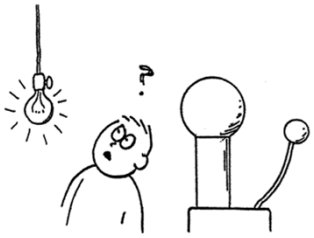
Potential difference of fields

- Gravitational PE
- PE_g is work done "over" a distance.
- ΔPE_g= Work
- $\Delta PE_g = mg\,\Delta h$
- $\Delta PE_g = F_g\,\Delta h$
- ΔPE_g "difference per unit mass is,...
- $\Delta PE_g/m = mg\Delta h/m$

$$V = W/q$$

- Electric PE
- PE_e is work done "over" a distance
- ΔPE_e= Work
- $\Delta PE_e = q\,E\,d$
- $\Delta PE_e = F_e\,d$
- PE_e "difference per unit charge is,...
- $\Delta PE_e/q = q\,E\,d/q$
- Electric Potential Difference = work/q = W/q
- Electric Potential Difference is "Voltage"

33.5



Which is more dangerous.

1. touching a faulty 110-volt light bulb?
2. touching a Van de Graaff generator charged to 100,000 volts?

33.5

House Line Voltage
110 Volts

Van de Graff Voltage
~40,000 Volts

V = work/charge

V = w/q

$V = W/q$

$V = W_{/q}$

Small voltage with a lot of charge able to flow

Large voltage with very little charge able to flow

It is the charge flow that kills you, we call this "flowing charge" electrical current.

33.5

Activity; Charges, Energy, Voltage class notes.

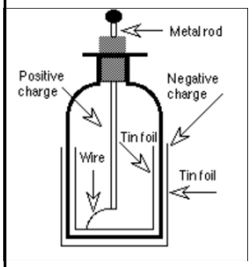
In this diagram you can see the individual cells that make up the battery.

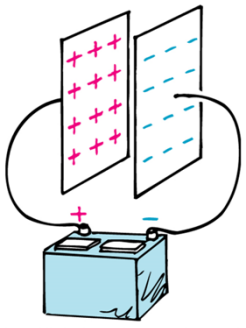
- Pg. 430 Class set of texts.
- Pair up
- Finish as an activity write up for homework.
- Don't need to type.

33.5

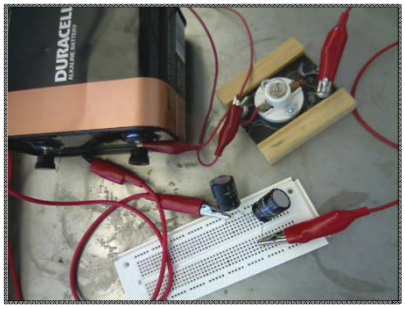
Electrical energy storage

Capacitor





33.6



In series: (2) 2200μF capacitors, 6 V battery , 1.3 V bulb.