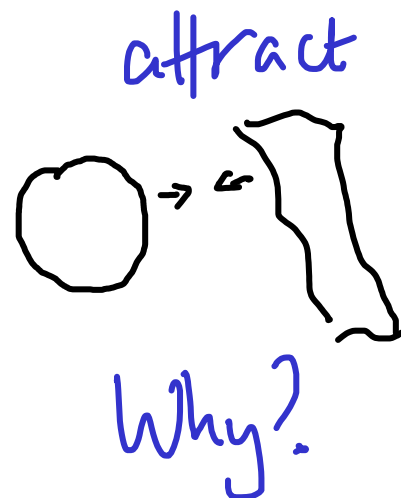


Electric Charges

Dr K M Hock

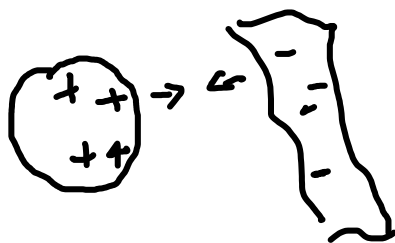


The wood lost some electrons,
to the plastic.

To explain,

imagine the electrons have a
special property (like weight or colour)

tiny particles
on atoms



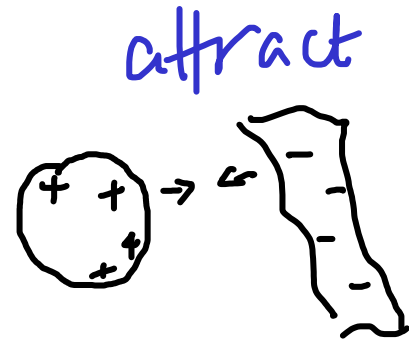
called
"negative charge"

In the wood, atoms short of electrons
have "positive charge".

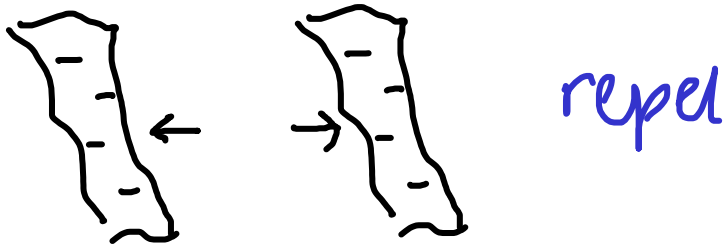
Charge : measured in units of coulomb
(C).

Attract and Repel

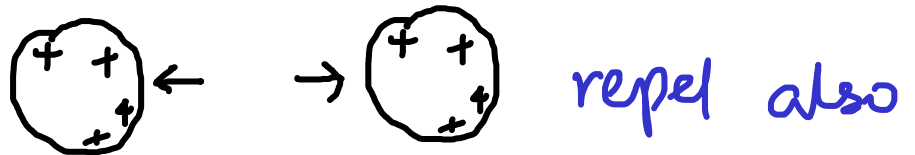
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But



and



So

like charges repel
unlike charges attract

Electric Field

Dr K M Hock

Put some +ve charge on a ball.

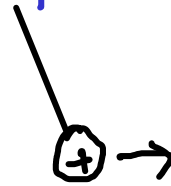


Bring a smaller ball with +ve charge.

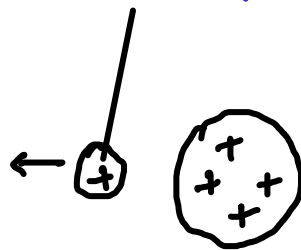


test charge

Like charges repel \rightarrow force on ball:



Try another side;



Force is there too.

Electric field

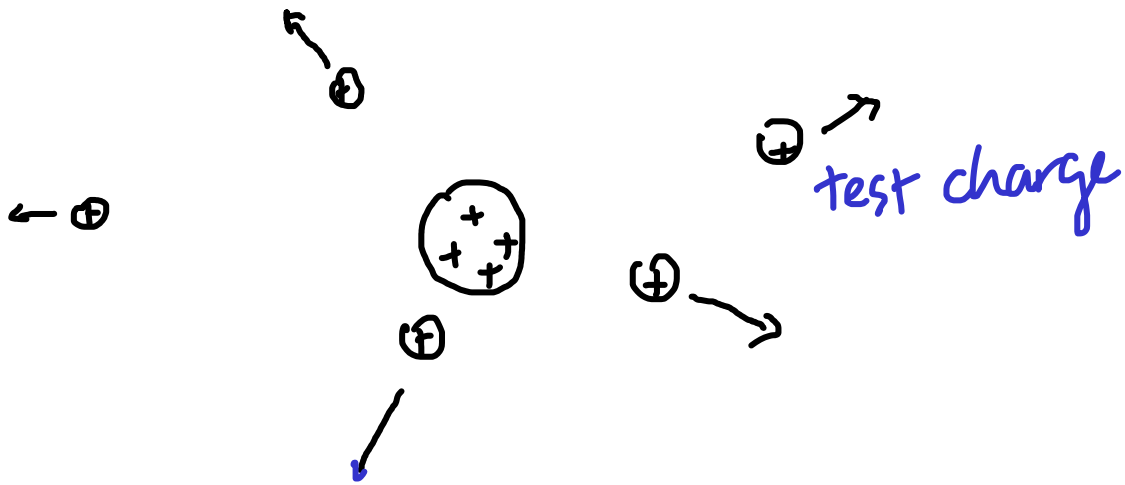
- region of space where an electric force acts.

draw the electric field of an isolated point charge and recall that the direction of the field lines gives the direction of the force acting on a positive test charge

Field Lines

Dr K M Hock

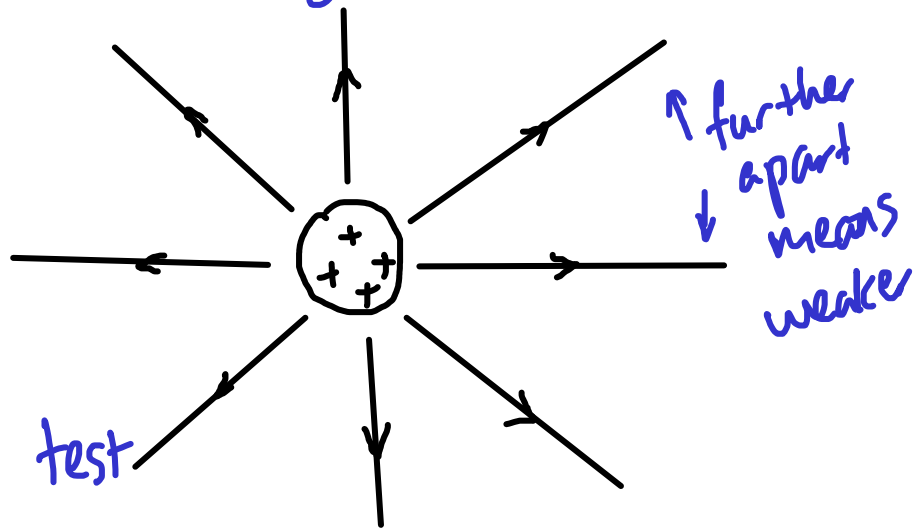
Direction of forces



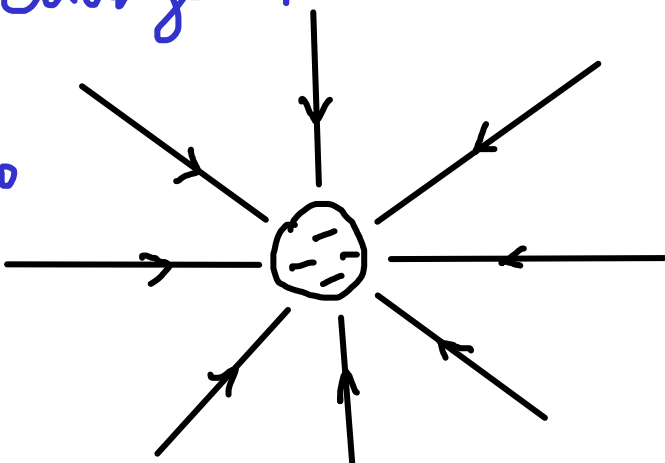
To show direction everywhere, use field lines:

Note:

Arrows are for forces on POSITIVE test charges.



goes into -ve charge

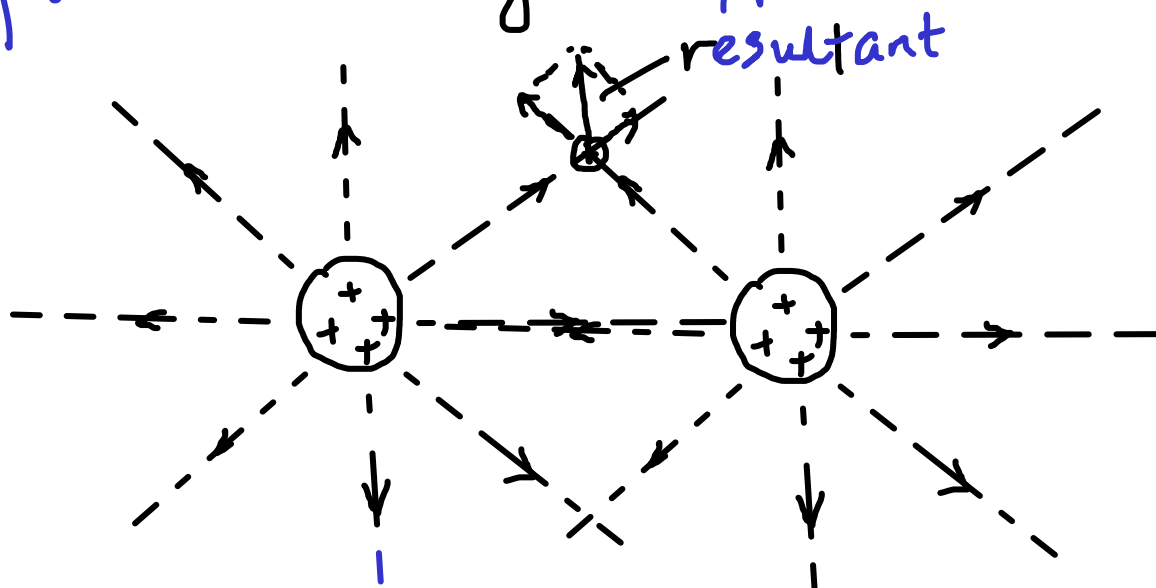


So field lines from negative charge reversed.

Field from 2 charges

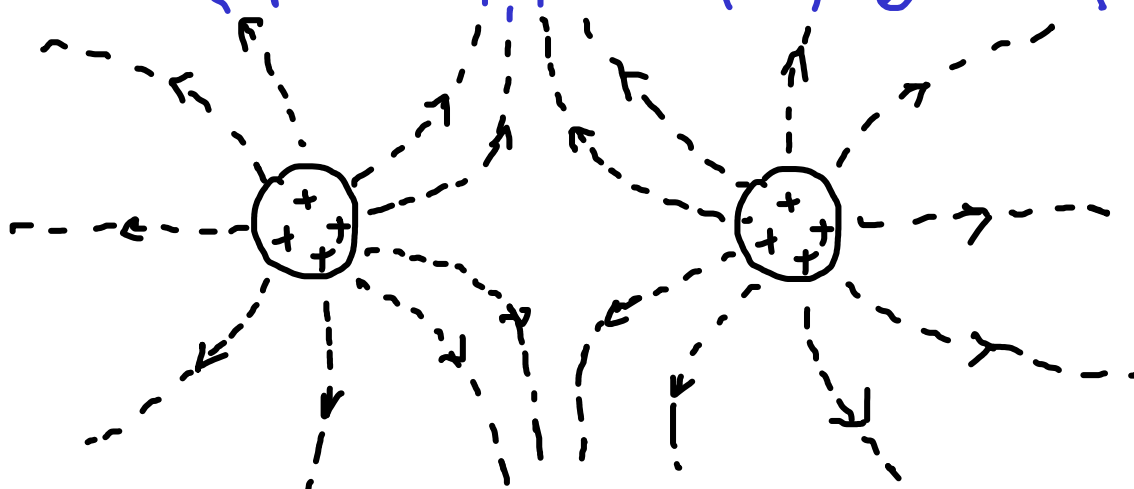
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Put a test charge at A

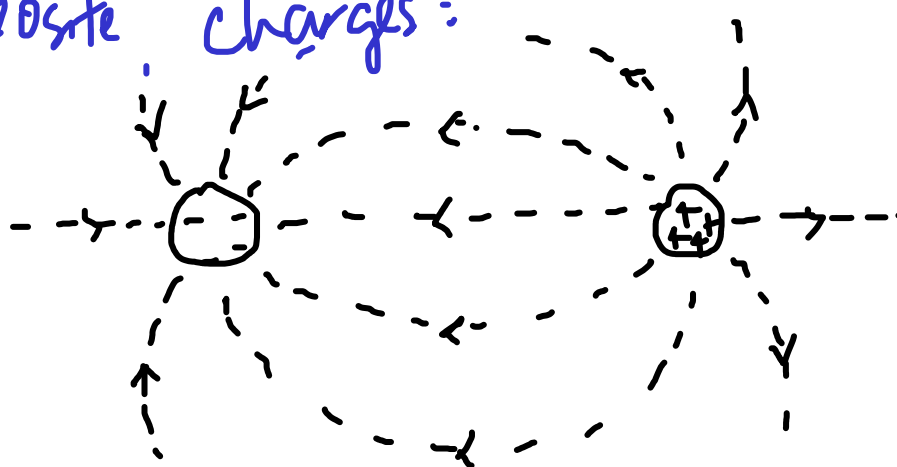


Resultant force different from either field.

Combined field



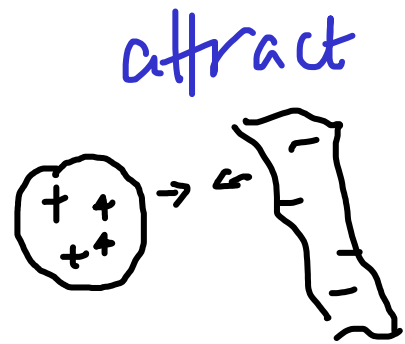
For opposite charges:



Charging by Rubbing

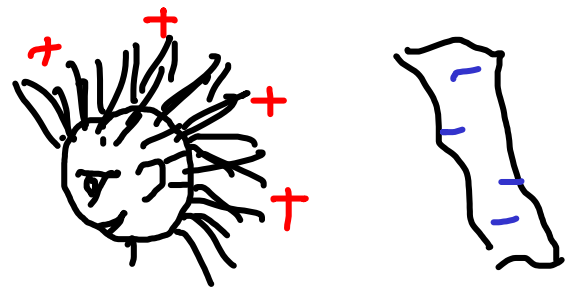
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Possible only in less humid places, like England.



electrons transferred from wood to plastic

(In Singapore, charge would be lost to water droplets in the air.) *lost to quickly*



electrons transferred from hair to towel

(Objects must be insulators or charges may flow away.)

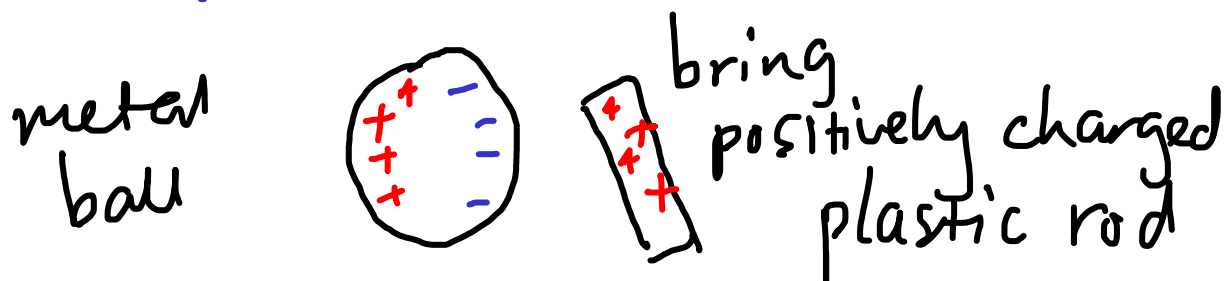
Charging by Induction

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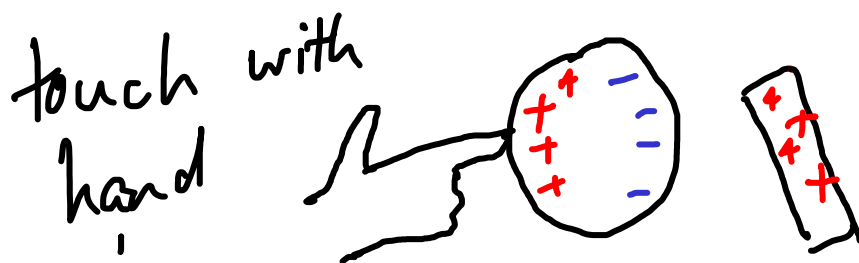
In metal, some electrons can move around:



+ve charge in rod attracts electrons in ball.



Leaves +ve charge on far side.



slightly conducting, some electrons flow:

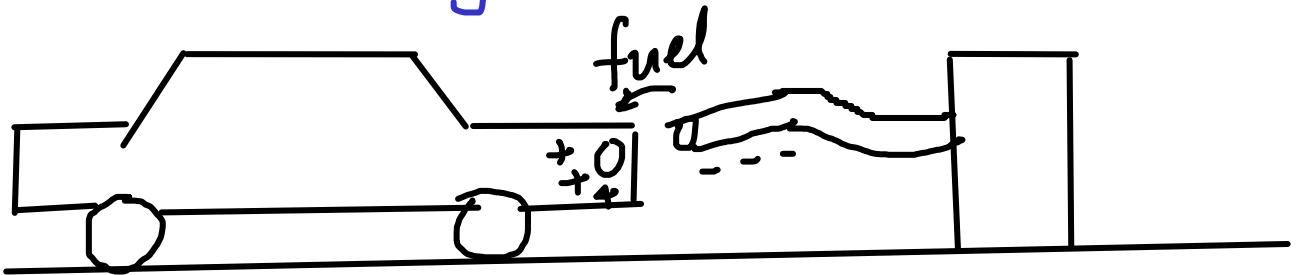


ball gains charge - by induction

Electrostatic Hazard

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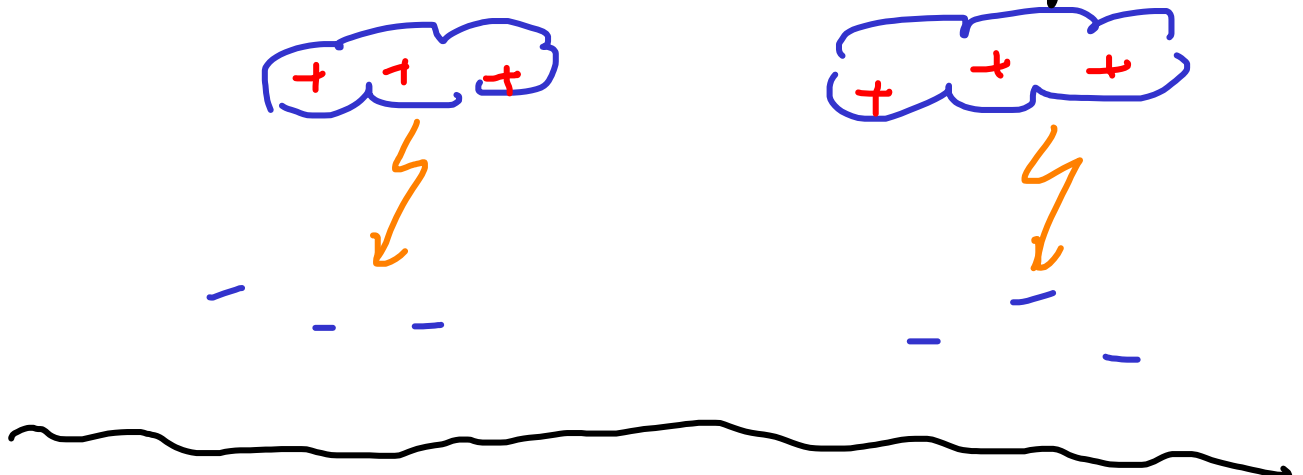
Car refueling - Sparks \rightarrow Explode



Friction from flowing petrol gives charge to nozzle and car.

Voltage build up can cause electrons to jump (spark) between nozzle and car \rightarrow petrol explodes.

Lightning \leftarrow charging from friction between water droplets and dust particles



Use of Electrostatic Charging

Dr K M Hock

Photocopier

