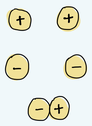
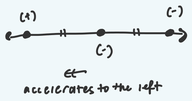
Lightning
flow of charges through air } hits best conductor

▲ Lightning rod has to be buried in the ground (not insulated)

Charge (Q)

1. (+) and (-) charge
2. Like charges repel unlike other like charges
3. Electrostatic forces get weaker as the distance between the charges increase





SI unit : coulomb (C)

The Sub-atomic Particles			
Relative size	Name	Mass (Kg)	Charge (C)
	Proton	1.67×10^{-27}	$+1.602 \times 10^{-19}$
	Neutron	1.67×10^{-27}	0
not to scale	Electron	9.11×10^{-31}	-1.602×10^{-19}

only e^- moves as protons are in the nucleus

no charge: (-) = (+)

Charge is quantized: nothing can have a smaller charge than 1.6x10^19C

Everything has charge that is a multiple of 1.6x10^-19C

Objects are not naturally charged: neutral state

Conservation of charge

Total electric charge in an isolated system never changes. Charge cannot be destroyed or created just transferred

neutral

neutral + (-)/(+) → attraction
unlike charges → repulsion

Electron deficiency

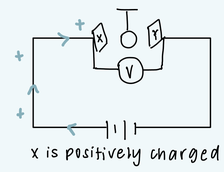
LHS: negatively charged
RHS: deficient of e^- → (+) charged

$$N_e = \frac{Q_T}{Q_e}$$

Q_T: total electric charge of an object

Q_e: -1.6×10^{-19}

Static Electricity



X is positively charged

Electric field

region in which electric charge experiences a force

- point in direction of (+) charge
- vector qty

direction of E_{field} = direction of F_e on a positive test charge

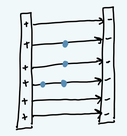
point (+)
point (-)

never cross each other
(forms ⊥ with (+)/(-))

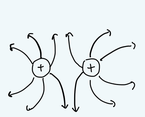
Density of field lines indicate charge strength

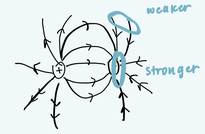
(∴ = stronger)

Electric field strength closer to ⊖ an electric line are denser

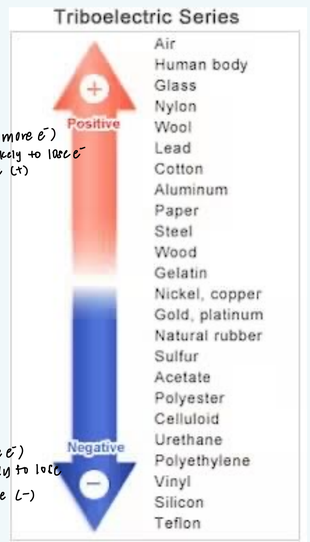


Electric field has the same strength at all points





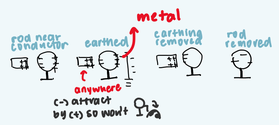
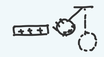
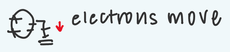
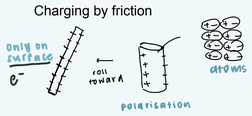
Triboelectric Series



(have more e^-) more likely to lose e^- and be (+)

(have more e^-) more likely to lose e^- and be (-)

Air
Human body
Glass
Nylon
Wool
Lead
Cotton
Aluminum
Paper
Steel
Wood
Gelatin
Nickel, copper
Gold, platinum
Natural rubber
Sulfur
Acetate
Polyester
Celluloid
Urethane
Polyethylene
Vinyl
Silicon
Teflon

	Conductor	Insulator (likely to receive e^-)
	A substance where charge carriers within it move around through a substance relatively easily when another object is brought near	A substance where charge carriers within it cannot move around through a substance relatively easily when another object is brought near
Charging	1) Induction redistribution of charges within an object under the influence of a nearby charged object  2) Contact 	1) Earthing / contact  A polythene rod can be given a negative charge by rubbing with it a cloth, as electrons are transferred from it to the rod in the process of rubbing. [1] Thus, the rod gains electrons in the charging process. [1] However, a copper rod cannot be charged by rubbing as electrons are free to move through the conductor. [1] Any electrons gained by the conductor can easily be lost back to the material in contact, and any electrons lost by the conductor to the material in contact can be easily gained back. [1]
Discharging 	1) Friction 	1) Heating ionizes the, air around conductor into ions ↗ knock e^- off H_2O  2) Humidity ionized H_2O allows charges to be discharged ↳ aircon rooms are less humid

Application

- (-) spray paint → droplets spread out

Structured qns

contact

1) Electrons flow from A to B
   ↳ A|B is left with a +|- net charge
2) Like/unlike charges attract/repel
   ↳ A & B will attract/repel

non-contact (induction)

1) right/left side becomes +|- charged due to the attraction of e^-
   (-) movement of e^-
   (+) electron deficiency
2) Net attractive/repulsion force as the left/right side of A is nearer to B
   ↳ A and B attract/repel