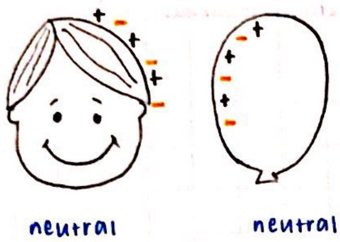
Static electricity

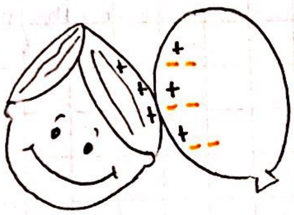
ELECTROSTATIC CHARGING OF INSULATORS BY FRICTION

Balloon Activity

1. Before rubbing, both balloon and hair are electrically neutral. This means that they have the same amount of protons and electrons.

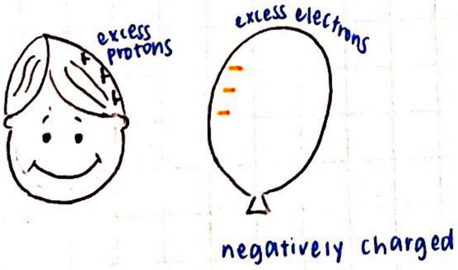


2. When the balloon and hair are rubbed against each other, friction causes electrons to move from the hair to the balloon.

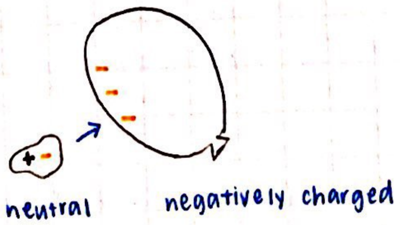


3. The balloon has excess electrons and become negatively charged.

4. The hair has excess protons and become positively charged.



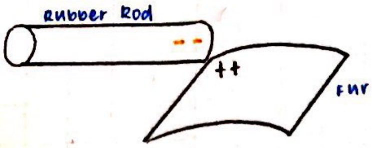
5. The negatively charged balloon attracts the protons in the aluminium foil and cause it to move towards the balloon.



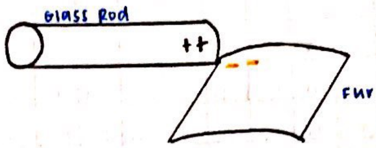
In conclusion,

during the rubbing with fur...

- the charged rubber rod became negatively charged.
- the charged glass rod became positively charged.



Fur transferred electrons to rubber rod.



Glass transferred to electrons to fur.

Conclusion

The two types of electric charges are positive (protons) and negative (electrons).

- Insulators such as rubber, plastic, glass can gain excess charges by rubbing.
- During rubbing, friction causes electrons to move from one insulator to another. However, the protons do not move at all.
  - ↳ found in outer shell.
  - ↳ easiest to move.
  - ↳ found in the nucleus.
- The insulator with excess protons become positively charged.
- The insulator with excess electrons becomes negatively charged.
- Unlike charges attract.
- Like charges repel.

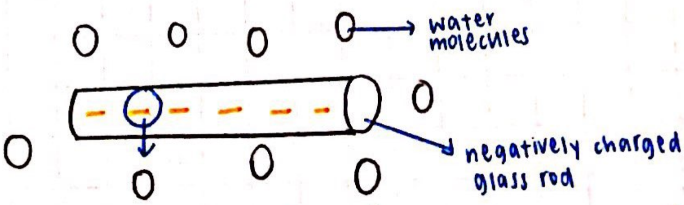
How do we discharge a charged insulator?

① Excess charges remain static on an insulator after rubbing.

② Excess charges can be discharged by contact with water, ions / connection to earth.

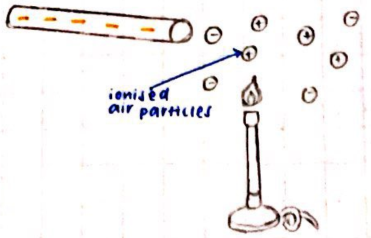
Discharging by contact with water?

- Water molecules are conductors of electricity.
- The water molecules will transfer the excess charges away from the negatively charged glass rod.
- This will cause the glass rod to become neutral.



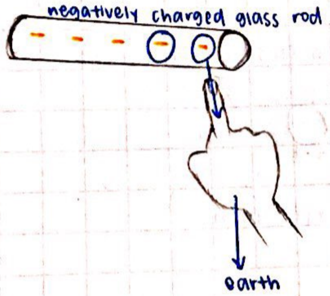
Discharging by contact with ions

- Heating causes the air particles to become ions.
- The ions will transfer the excess charges away from the negatively charged glass rod.
- This will cause the glass rod to become neutral.



Discharging by contact with connection to earth

- The excess electrons on the negatively charged glass rod will move to the hand touching it and go to earth.
- This will cause the glass rod to become neutral.



Hazards of Static Electricity

1. Electrostatic discharge near flammable substances.

- The human skin becomes electrically charged due to friction from rubbing with the surrounding air / clothes. This causes electrons to be transferred to the skin which remain static on the skin.
- A discharge of the static electrons on the skin occurs when there is a connection to earth which produces a spark.
- When a static discharge occurs near flammable substance, a fire may occur. To prevent this, vehicles are earthed with a metal wire before refuelling.

2. Electrostatic discharge from clouds (Lightning strikes)

- A thunder cloud becomes electrically charged due to friction between water molecules in the cloud and the surrounding air particles.

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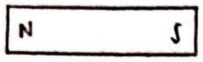
- Excess electrons tend to gather at the bottom of the cloud. This repels the electrons near the earth's surface and causes the earth surface to be positively charged.

- When the cloud has a large accumulation of excess electrons, it ionises the air particles nearby which provides a conducting path for the electrons in the cloud to reach the earth, resulting in lightning strike.

ELECTRIC FIELD

a) Magnet on its own

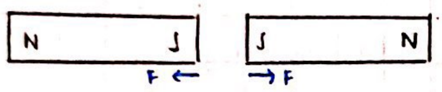


no force is experienced.

b) Electric charge on its own.

no force is experienced.

c) Magnet near another like pole.

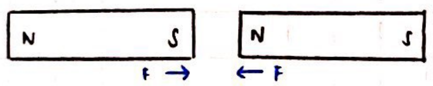


repulsive force is experienced.

d) Electric charge near another like charge

repulsive force is experienced.

e) Magnet near another unlike pole



attractive force is experienced.

f) Electric charge near another unlike charge

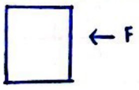
attractive force is experienced.

Conclusion

A force is exerted when another magnet / electric charge enters the force field of the original magnet / electric charge.

Recap!

① What is a force?
↳ it is a push / a pull

② What are examples of contact force?
↳ Applied force 

③ What are examples of non-contact force?
↳ Magnetic force
↳ Electric force

Different types of force field

① Force field (general)

↳ A force field is a region in which a particle experiences a force.

② Gravitational field

↳ A gravitational field is a region in which a mass experiences a gravitational force.

③ Magnetic field

↳ A magnetic field is a region in which a magnetic material experiences a magnetic force.

④ Electric field

↳ An electric field is a region in which an electric charge experiences an electric force.

Representing electric field

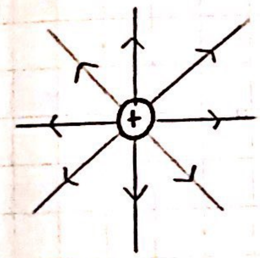
1) An electric field can be drawn using lines with arrows.

2) The arrows on the force field show the direction of the force that acts on another small positive charge which enters the field.

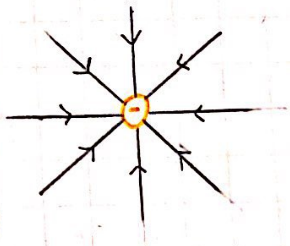
3) The areas of electric field with closer field lines mean that the force exerted is stronger.

Electric field pattern

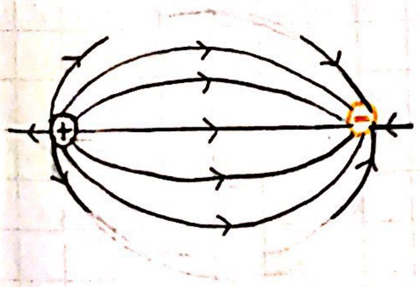
① Single positive charge



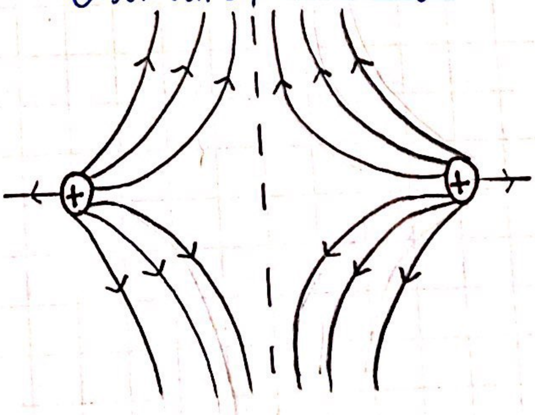
② Single Negative charge



③ Between a positive and negative charge



④ Between 2 positive charge



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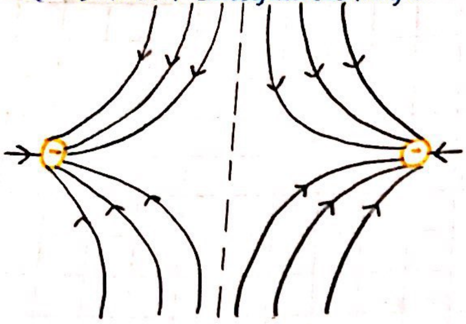
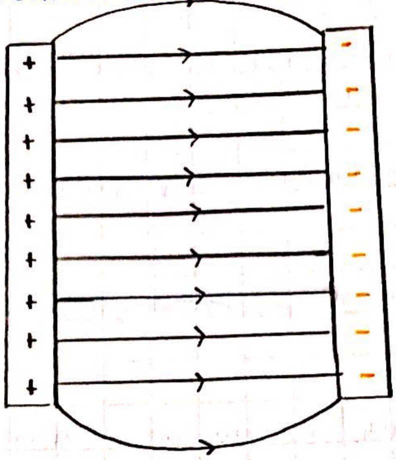
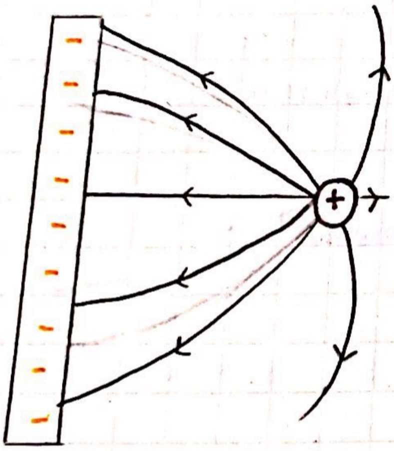
⑤ Between 2 negative charges



⑥ Between 2 unlike charged plates



⑦ Between a single charge and a charged plate



~~Checklist~~ :

1) Every field line has an arrow.

2) Field lines do not cross each other.

3) Every point on the charge has only one field line.

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Current Electricity

ELECTRIC CURRENT

What are electric charges?

- The 2 types of electric charges are positive and negative.
- Electric charges are found in batteries and electrons.
- The S.I unit is coulomb (C).

What is an electric current?

- An electric current is defined as the rate of flow of electrical charges.
- The S.I unit is Ampere (A).
- Formula to find current:

$Q = I \times t$

Q : charge [C]
I : current [A]
t : time [s]

What does 1A of current mean?

It means that 1 coulomb of electrical charge is flowing per second.

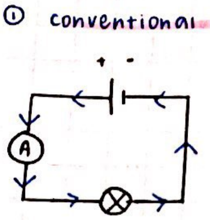
How do we measure an electric current?

- An ammeter is used to measure the strength of an electric current in a circuit.
- The ammeter is connected in series to the circuit.
- A series connection means that there is only one path for electric charges to flow.

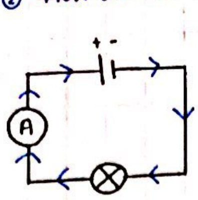
Types of current flow

Draw the direction of each type of current flow:

① Conventional current (+) to (-)



② Flow of electron (-) to (+)



VOLTAGE

Relationship between current and voltage

- As voltage of the battery increases, the amount of current flowing in the circuit increases.
- As voltage of the battery decreases, the amount of current flowing in the circuit decreases.

What does voltage mean ?

- Voltage refers to the amount of energy needed to drive 1 coulomb of electric charge.

Formula for voltage

$E = V \times Q$

E : energy [J]
V : voltage [V]
Q : charge [C]

How do we measure voltage?

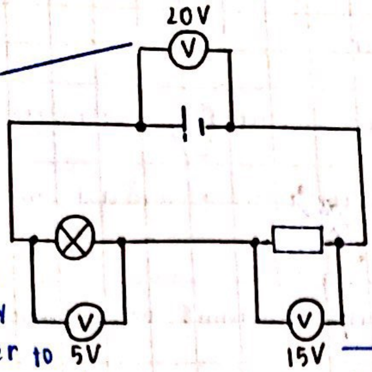
- Every component (batteries, bulbs, resistors etc) in the circuit has a voltage.
- A voltmeter is used to measure voltage across a component.
- The voltmeter is connected in parallel across the component.
- A parallel connection means that there are multiple paths for electric charges to flow.

Types of voltage

2 : diff   2 : sim

- 2 types of voltage are electromotive force (e.m.f) and potential difference (p.d).
- e.m.f of a battery is the amount of <u>energy</u> needed to drive <u>one</u> coulomb of electric <u>charge</u> around a <u>complete</u> circuit.
- p.d of a battery is the amount of <u>energy</u> needed to drive <u>one</u> coulomb of electric <u>charge</u> through the <u>component</u>.

Example



The battery has an e.m.f of 20V.

This means 1C of charge will receive 20J of energy from the battery in order to move arounq the complete circuit.

The resistor has a p.d of 15V. This means 1C of charge uses 15J of energy to move through the resistor.

The bulb has a p.d of 5V. This means 1C of charge uses 5J of energy to move through the bulb.

RESISTANCE

Relationship between current and total resistance

- As the total resistance increases, the amount of current flowing decreases.
- As the total resistance decreases, the amount of current flowing increases.

Relationship between p.d and resistance

- In a series circuit, the component with higher resistanie will have a higher p.d.
- In a series circuit, the component with lower resistance will have a lower p.d.

What is resistance? → $R = \frac{V}{I}$

Resistance of a component is defined as the ratio of the potential difference across a component to the current flowing through the component.

Formula for resistance

$V = I \times R$

V : voltage [V]
I : current [A]
R : resistance [Ω]

How do we measure the resistance of a component?

- All electrical load such as bulbs, resistors, motors in the circuit have resistance.
- Components such as batteries, wires, ammeter and switches are assumed to have zero resistance.
- Both voltmeter and ammeter are used to measure the resistance of a component.

What is a resistor?

- A resistor is a conductor in a circuit that is used to control the amount of current flowing in a circuit.
- There are 2 types of resistors: fixed and variable resistors.

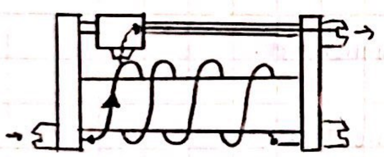
RESISTANCE, LENGTH & CROSS SECTIONAL AREA

Resistance of wire and its length

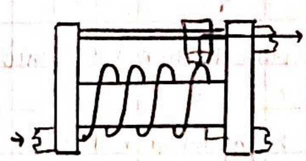
- The resistance of a wire is directly proportional to the length of a wire.

L↑, R↑
L↓, R↓

Variable resistor and its length of wire



The knob is shifted to the left, the current flow through short length of wire. Hence the variable resistor has low resistance.



The knob is shifted to the right, the current flow through more length of wire. Hence the variable resistor has higher resistance.

Resistance of wire and its cross-sectional area

- The resistance of a wire is inversely proportional to the cross-sectional area of a wire.

A↑, R↓
A↓, R↑

dc circuit

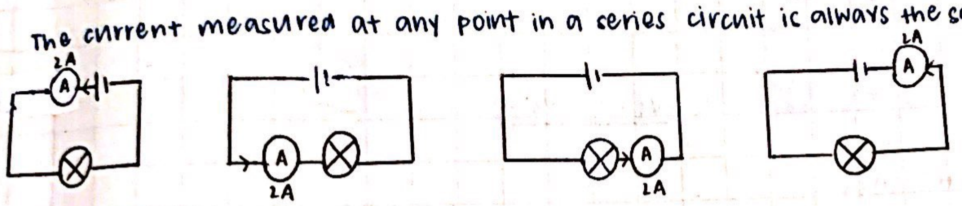
In A Series Circuit

A series connection means that there is only one path for electric charges to flow.

Current in a series circuit

$\boxed{I_T = I_1 = I_2}$

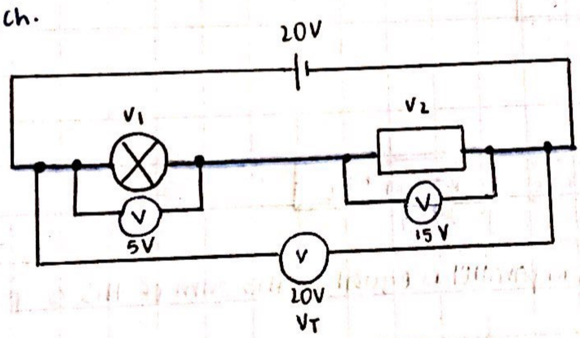
The current measured at any point in a series circuit is always the same.



Voltage in a series circuit:

$\boxed{V_T = V_1 + V_2}$

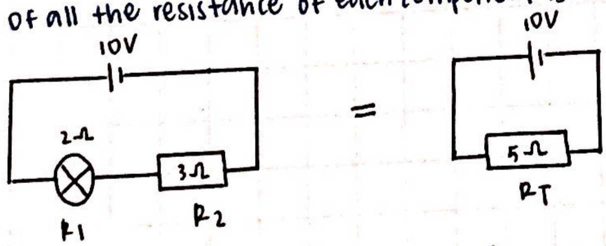
The sum of all the potential difference across each component is equal to the potential difference across the whole branch.



Resistance in a series circuit:

$\boxed{R_T = R_1 + R_2}$

The sum of all the resistance of each component is equal to the total resistance of the circuit.



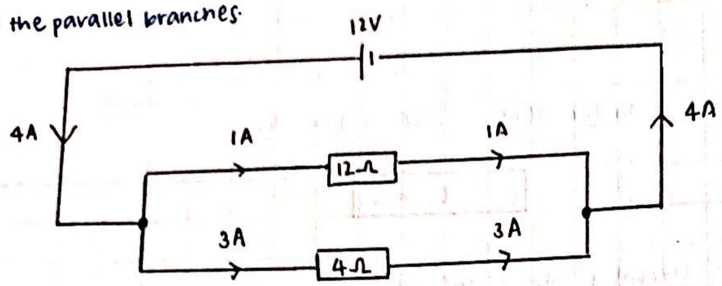
In a parallel circuit

A parallel connection means that there are multiple paths for electric charge to flow.

Current in a parallel circuit

$\boxed{I_T = I_1 + I_2}$

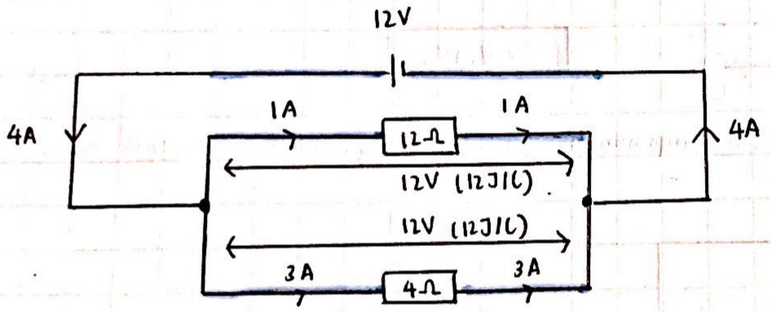
The sum of all the current in each of the parallel branches is equal to the total current flowing into the parallel branches.



Voltage in a parallel circuit

$\boxed{V_T = V_1 = V_2}$

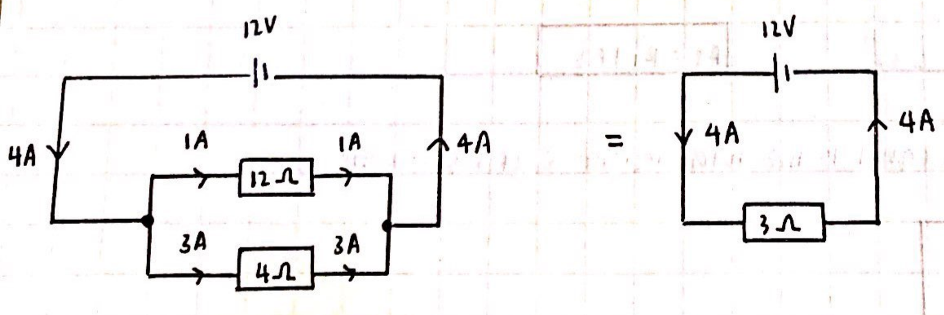
The p.d across separate parallel branch is the same.



Resistance in a parallel circuit

$\boxed{\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}}$

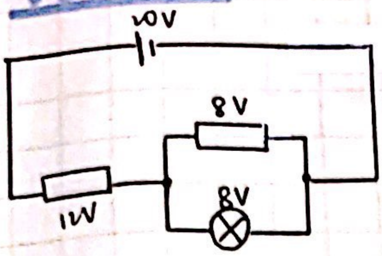
The reciprocal of the total resistance for all of the resistors in parallel is equal to the sum of the reciprocal of each resistor's resistance.



$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$
$$= \frac{1}{12} + \frac{1}{4}$$
$$= \frac{1}{3}$$
$$\therefore R_T = 3\Omega$$

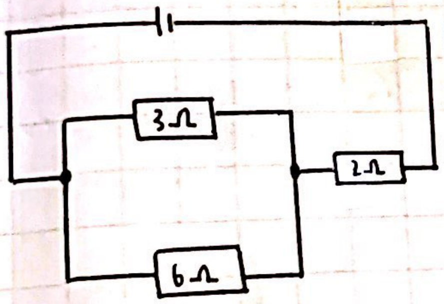
Series and Parallel Combined circuits

Voltage



$\boxed{V_T = V_S + V_P}$

Resistance



$\boxed{R_T = R_S + R_P} \rightarrow \frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$

practical electricity

POWER & ENERGY

What is Power?

- Power is defined as energy converted per unit time
- S·I unit is Watt (W)
- Formula:

① $P = I \times V$

② $E = P \times t$

S·I unit

P : Power : W (Watt)
I : Current : A (Ampere)
V : Potential Difference : V (Voltage)
} ①

unit for cost ($)

P : Power : W : kW
E : Energy : J : kWh
t : Time : S : h
} ②

What is Energy?

- Energy is defined as the capacity to do work
- Formula:

① Joules

$E = P \times t$

(J) = (W) x (S)

② kWh

$E = P \times t$

(kWh) = (kW) x (h)

Cost of using Electricity

Cost = (kWh) x cost per kWh

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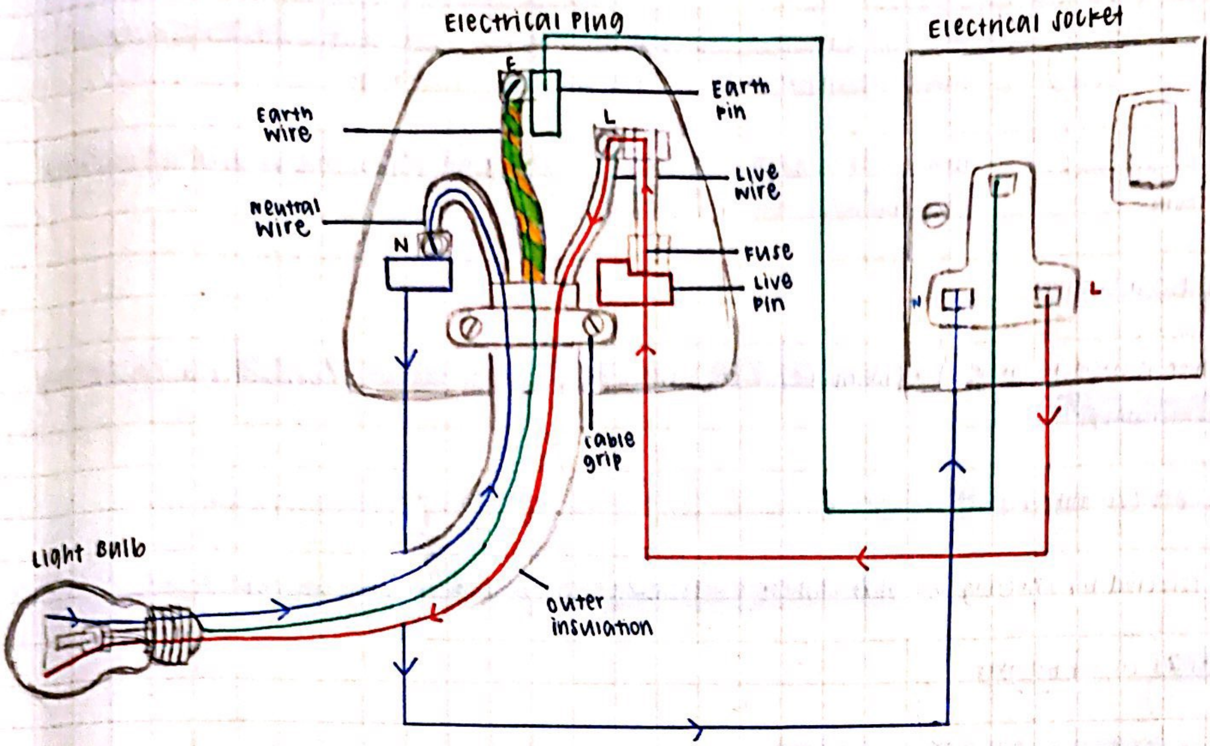
SAFETY FEATURES IN HOUSEHOLDS



How does current flow from the socket to the plug and the appliance?

① current will flow from the socket to the live pin, fuse, live wire and then to the appliance.

② current will flow from the appliance to the neutral wire and pin and back to the socket.

③ No current flows in the Earth wire at all times when the appliance is working normally.

L: send current to appliance

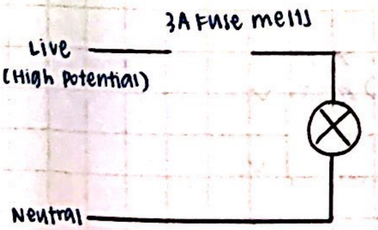
N: Receive current from appliance

E: safety wire that is connected to the metal case of appliance.

Function of a fuse

A fuse is used to disconnect the appliance from the high potential live wire when current exceeds the fuse rating.

Why must the fuse be connected to the live wire?

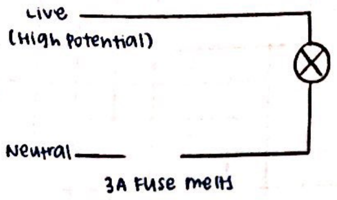


When a short circuit occur within the light bulb due to a fault, the current flowing will become high and exceed the 3A fuse rating.

The high current will melt the fuse and cause an open circuit. Hence the bulb does not light up.

It is safe to touch and repair the bulb as the bulb is disconnected from the high potential live wire.

Why connecting the fuse to neutral wire is dangerous?



When the fuse is at the neutral wire, the high current will melt the fuse and cause an open circuit. Hence the bulb does not light up.

However, it is dangerous to touch and repair the bulb as the bulb is still connected from the high potential live wire.

Function of a circuit Breaker

A circuit breaker is used to disconnect the appliance from the high potential live wire when current exceeds the circuit breaker's rating.

Selecting the fuse / circuit breaker rating

The rating is selected by choosing the next highest whole number above the working current.

2 Advantages of circuit breaker

① circuit breaker responds faster than the fuse.

② circuit breaker does not need to be replaced after it has open the circuit.

Summary - fuse & circuit breaker

- Both fuse and circuit breaker are always connected to the live wire.
- Both will disconnect the circuit when current exceed their rating.

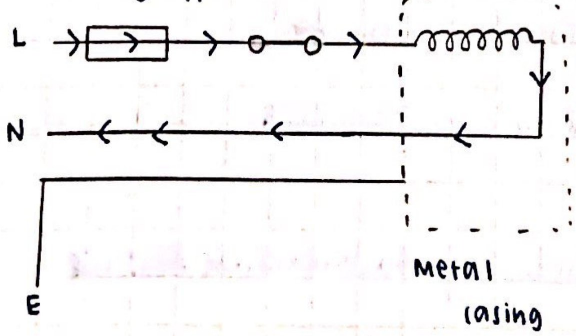
Function of an earth wire

When a fault occurs in the appliance and causes the live wire to touch the metal casing, the earth wire provides of almost zero resistance for the current to flow to earth instead of to the user touching the metal casing.

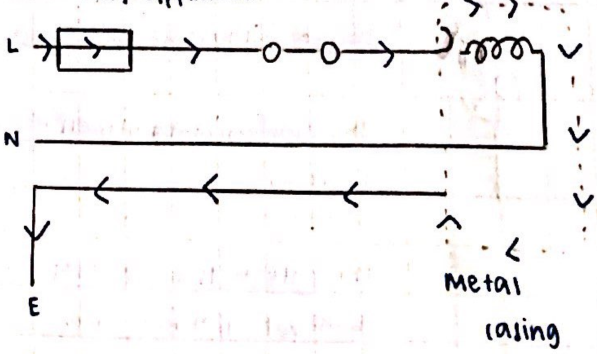
Since the earth wire has almost zero resistance, this causes a large current to flow through the fuse and exceed the fuse rating. The fuse will then disconnect the appliance from the high potential live wire.

Hence the person touching the metal casing is saved from electrocution.

working appliance:

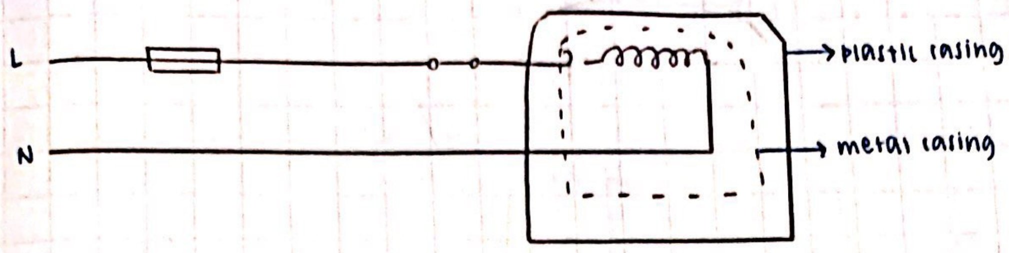


faulty appliance:



When is double insulation needed?

Appliances that have 2-pins require double insulation. This means that the outer casing and internal wiring is covered with a layer of insulation. This prevents anyone touching the outer casing from being electrocuted in the event of a fault which makes the metal parts live.



Summary - earth wire & double insulation

- Appliances with an outer metal casing requires an earth wire to be connected to it.
- Appliances with double insulation do not require the earth wire.

MAGNETISM
magnetism

Properties of magnets

properties of magnets

1. All magnets have 2 poles.
2. Like poles repel
3. Unlike poles attract.
4. Magnets attract magnetic materials such as Iron, steel, cobalt and Nickel.
5. A freely suspended magnet comes to rest in a north-south direction.

What is meant by the term "magnetic north pole"?

The north pole is defined as the magnetic pole which points to the north when a magnet is freely suspended.

How do we test for magnetism?

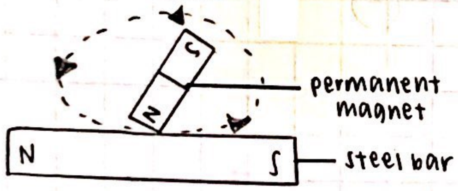
In order to determine whether an object is a magnet, we check for repulsion with another magnet.

If attraction occurs, metal A can either be a magnet or a magnetic material.

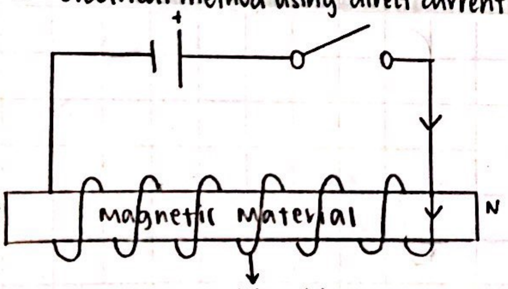
If repulsion occurs, metal A must be a magnet.

How do we magnetise magnetic materials?

① Stroking method



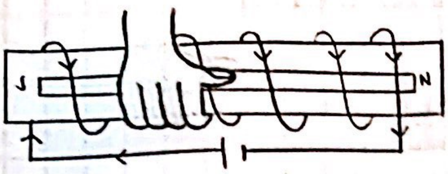
② Electrical method using direct current



a. place magnetic material inside a solenoid.
b. connect solenoid to a D.C supply and close the switch.
c. as current flows through the solenoid, the magnetic material is magnetised.

How do we determine the poles of an electromagnet?

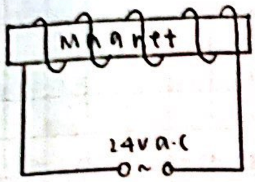
The Right Hand Grip Rule is used to determine the poles of an electromagnet.



1. Grip the solenoid using the right hand.
2. Curl the fingers in the direction of the current in the coils.
3. Stick out the right thumb and it points to the North pole.

How do we demagnetise a permanent magnet?

1. Heating the magnet and letting it cool in an East-West direction.
2. Hammering the magnet in an East-West direction.
3. Electrical method using an alternating current.



Step 1: place magnet inside a solenoid in an East-West direction.

2: connect solenoid to an a.c supply.

3: Remove magnet with the current still flowing in the solenoid.

Permanent and Temporary Magnets

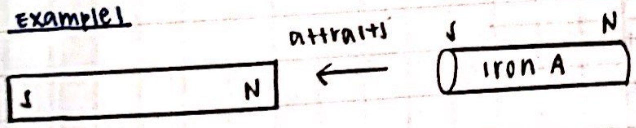
	Soft magnetic materials	Hard magnetic materials
Examples	Iron	Steel
Properties	Easy to magnetize & demagnetize	Difficult to magnetize & demagnetize
Used to make	Temporary magnets	Permanent magnets

magnetic induction

What are induced magnets?

A magnetic material becomes an induced magnet when it is near or in contact with another magnet.

Examples



- When Iron A is near the magnet, the N-pole of the magnet induces a S-pole in Iron A.
- Iron A becomes an induced magnet and is attracted to the magnet as unlike poles attract.

applications:

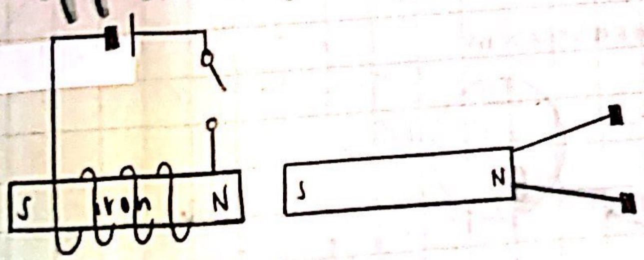


Fig 1.1

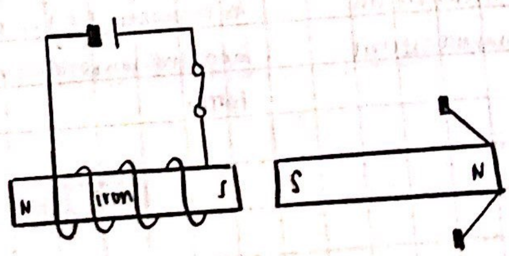


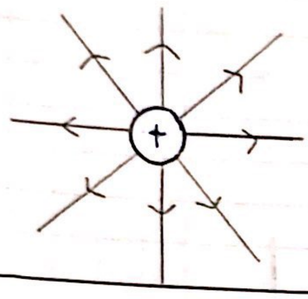
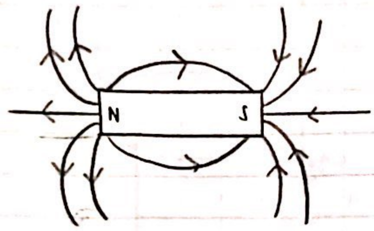
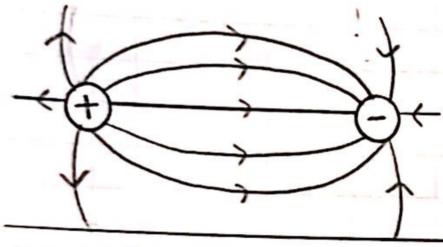
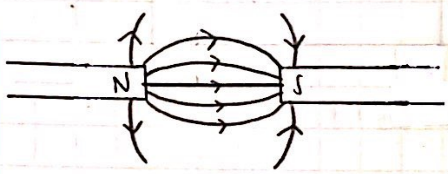
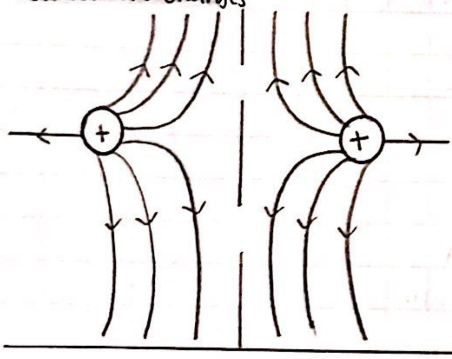
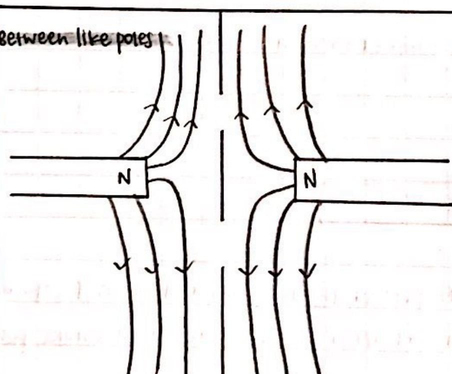
Fig 1.2

a) Explain why the magnet moves towards the iron rod when the switch is opened in Fig 1.1.
The south pole of the magnet will induced a north pole on the right side of the iron bar. The iron bar becomes an induced magnet and attract the magnet and cause it move to the left as unlike poles attract.

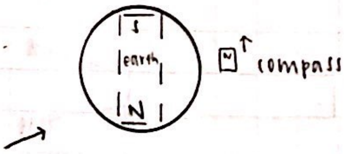
b) Explain why the magnet moves away from the iron rod when the switch is closed in Fig 1.2.
When the switch is closed, current flows into the coil and magnetises the iron core with a south pole on the right side. Hence, the magnet will be repelled by the magnetised iron core and move to the right as like poles repel.

magnetic field of magnet

Summary of field patterns

• out of + • in to − Electric Field pattern	• out of N • in to S Magnetic Field pattern
Single charge 	Single Magnet 
Between unlike charges 	Between unlike poles 
Between like charges 	Between like poles 
Definition of electric field: An electric field is a region where an electric charge experiences an electric force.	Definition of magnetic field: An magnetic field is a region where a magnetic material experiences a magnetic force.

CHECKLIST
- 8 lines around each charge
- 7 lines around each pole.
- Arrows drawn on each line.
- Field lines cannot cross.



Conclusion
- when the magnet is absent, the compass will point to the geographical north due to Earth's magnetic field.
- when the magnet is present, the compass will point in the same direction as the magnet's magnetic field.

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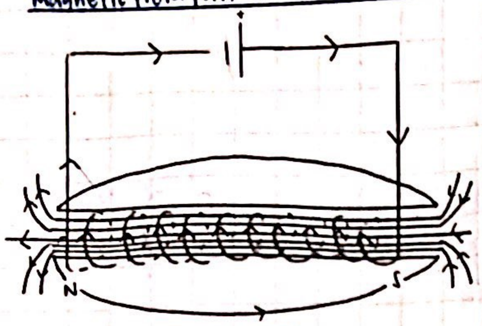
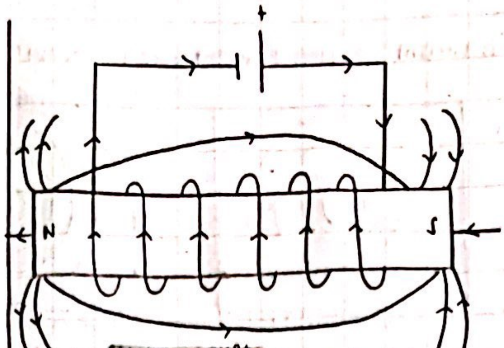
Magnetic field pattern of a solenoid



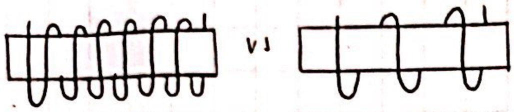
solenoid containing current



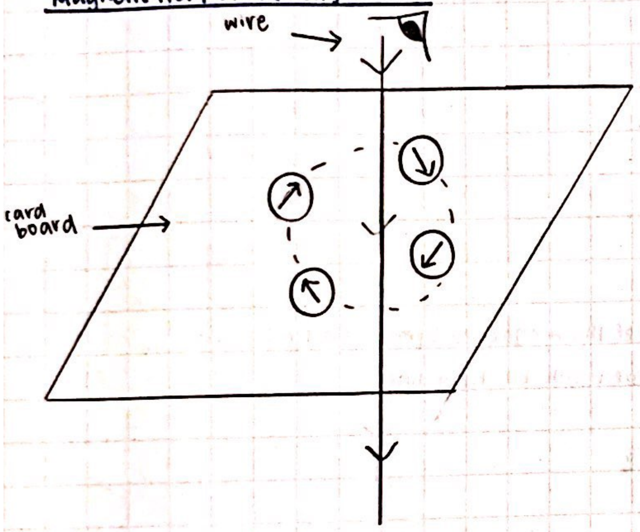
Electromagnet

What are some ways to increase the magnetic field of the solenoid?

1. Increase the current in the coil.
2. Increase the number of turns of coil.

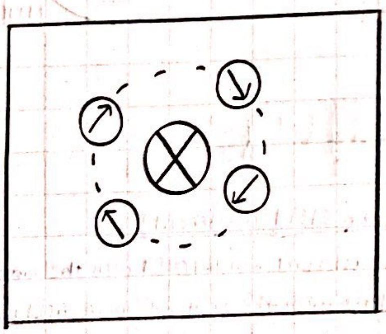


Magnetic field of a straight wire



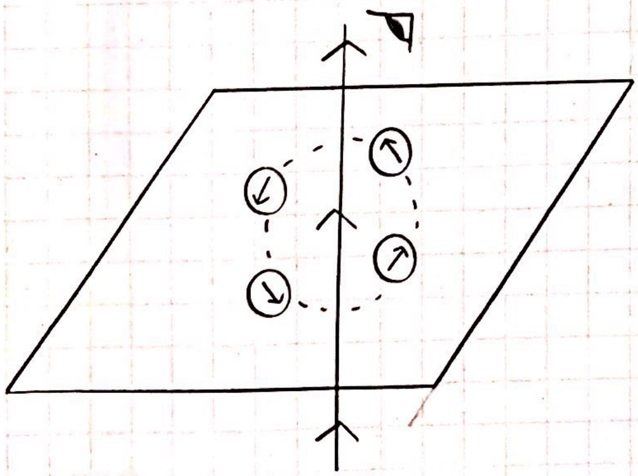
current flows down the wire through the card board.

→ current flows into the paper.

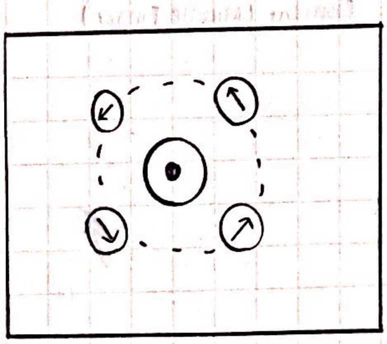


compass point in a clockwise direction.

→ current flows out of the paper.



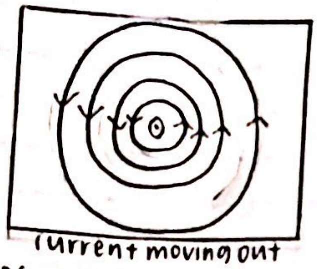
current flows up the wire through the cardboard.

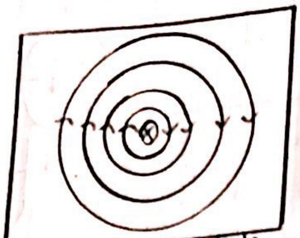


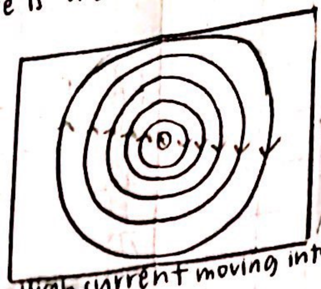
a) Summary

- The magnetic field around a current carrying straight wire is circular.

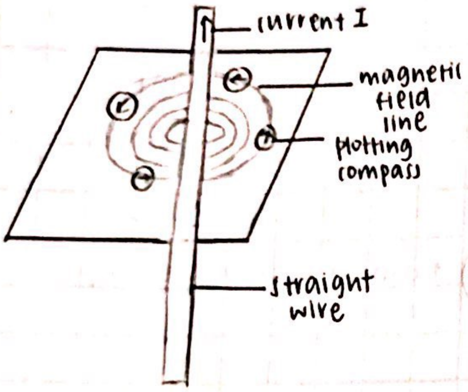
b)

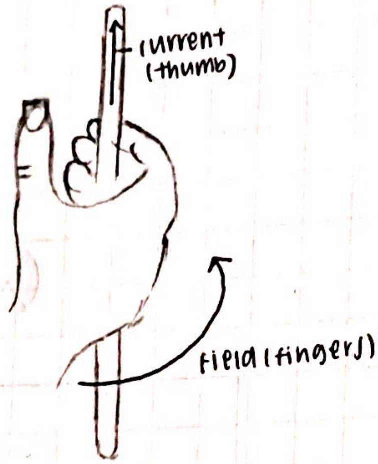






NOTE: The direction of the circular magnetic field is determined by the right hand rule.



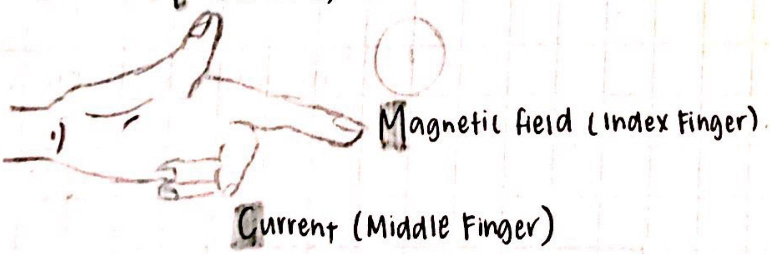


motor effect

Why is there a force on the electric current?

The magnetic field of the current will interact with the magnetic field of the magnet and produces a force on the wire. The force will act from the area with more field lines to the area with less field lines.

Fleming's Left Hand Rule is used to determine the direction of the force



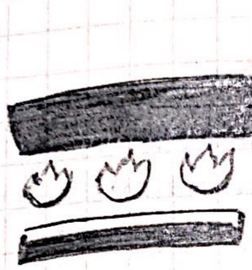
Transfer of thermal energy

conduction

what is Heat Transfer by conduction?

- It is the process of transferring heat without any movement of the medium.

Examples of good & poor conductors of heat?

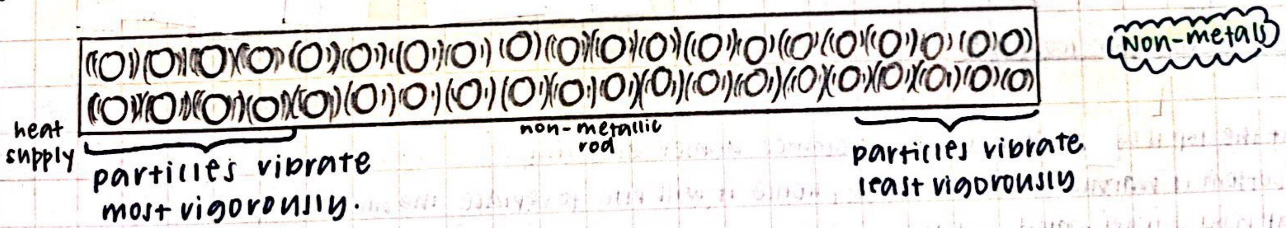


→ Handles are made of plastic, which are poor conductors of heat. This conduct heat slowly to the hand holding the handle.

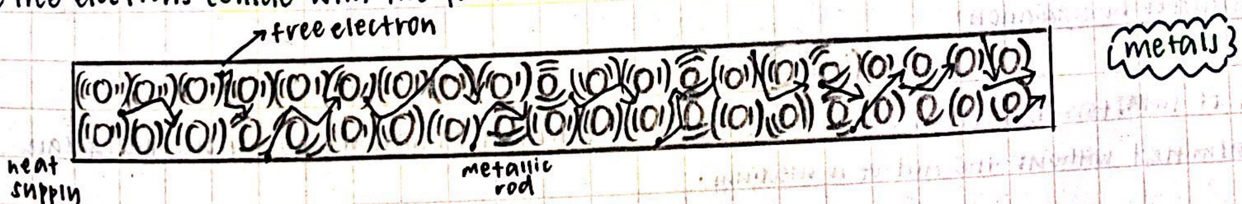
→ Base of pots are made of metal, which are good conductors of heat. This conducts heat quickly to the food inside the pot.

How does conduction work?

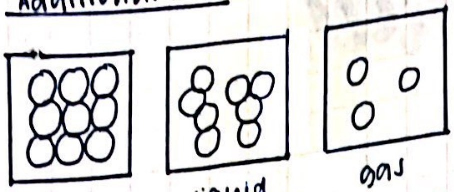
① using particle vibration
- The particles at the hotter end gain kinetic energy and vibrate more vigoursly.
- The particles collide with the neighbouring particles and transfer energy to them.
- This process continues from particle to particle until the particles at the cold end starts to vibrate vigorously.



② using free electron diffusion (for metals only)
- The free mobile electrons at the hotter end gain kinetic energy and move to the cold ends of the metal.
- The free electrons collide with the particles at the cooler end and cause them to vibrate vigorously.



Additional note



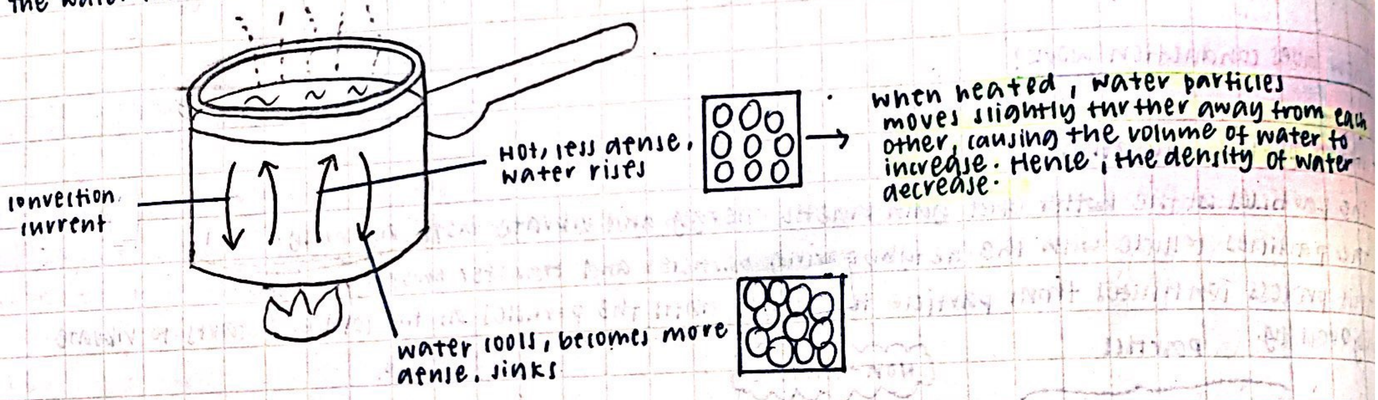
convection

What is Heat Transfer by convection?

- It is the process of transferring heat through bulk movements of fluids due to difference in density.

How is convection used for heating?

- When water at the bottom is heated, it expands, becomes less dense and rise.
- The water at the top is cooler and denser, hence it will sink to replace the water that has risen.
- The water that sinks will get heated and the cycle repeats, setting up a convection current.



How is convection used for cooling?

- When air at the top is cooled, it contracts, becomes denser and sink.
- Air at the bottom is warmer and less dense, hence it will rise to replace the air that sank.
- The air that rises will get cooled and the cycle repeats, setting up a convection current.

radiation

What is Heat Transfer by Radiation?

- It is the process of transferring heat through the emission of infrared radiation waves from the surface of all bodies, transmitted without the aid of a medium.

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Heat Emitters and Heat Absorbers

- infra-red radiation is absorbed by all cold surfaces at low temperature.
- infra-red radiation is emitted from all hot surfaces at high temperature.

Types of surfaces

- Black → Rough & dull texture
  → Good ability to emit heat
  → Good ability to absorb heat

- White → smooth & shiny texture
  → Poor ability to emit heat
  → Poor ability to absorb heat

Factors affecting the rate of radiation

(1) colour
→ Dull black surfaces are good emitters & absorbers of heat.
→ shiny white surfaces are poor emitters & absorbers of heat.

(2) Temperature
→ surfaces with higher temperature emits more heat.

(3) Surface area of surface
→ Increased surface areas allow more heat to be emitted / absorbed

Standard answering technique

(1) statement [· good / poor · conductor / absorbers / emitter]
(2) elaborate the direction of heat transfer [fast/slow]
(3) by conduction / ~~convection~~ / radiation → absorb / emit

Kinetic model of matter

BROWNIAN MOTION

What is the Kinetic Model of Matter?
The model states that the tiny particles that make up matter are always in constant and random motion.

What is Brownian Motion?
Whenever large particles are suspended in fluids (liquid / air), the large particles are seen moving randomly. The random motion is known as Brownian motion.

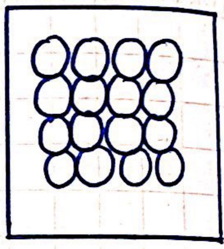
Brownian Motion experiments provides evidence that tiny fluid particles which cannot be seen by the eye are in constant and random motion.

States of Matter

① Solid
- distance : very closely packed
- pattern : regular
- no. of particles per unit vol. : very large
- movement : vibrate about fixed positions
- attractive forces : very strong

very high densities

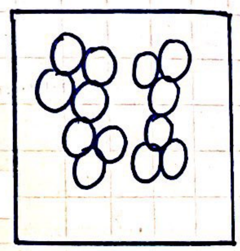
fixed volumes & shapes



② Liquid
- distance : closely packed
- pattern : Random
- no. of particles per unit vol. : large
- movement : free to move about within the liquid
- attractive forces : strong

moderately high densities

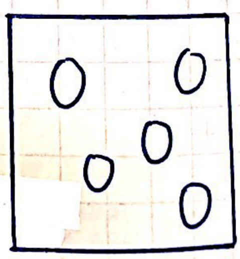
fixed volumes but take the shape of the container



③ Gas
- distance : very far apart
- pattern : Random
- no. of particles per unit vol. : very small
- movement : move about randomly & independently at very high speeds
- attractive forces : very weak

very low densities

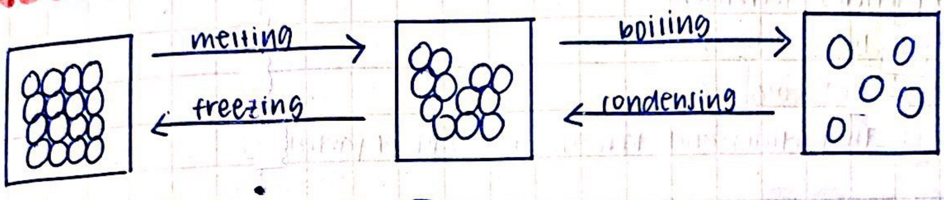
no fixed vol / shape, highly compressible.



☆ When temp ↑, particles move faster & more vigorously.

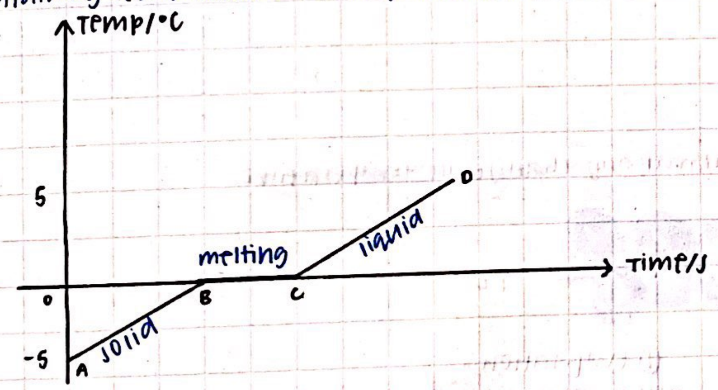
thermal properties of matter

RECAP



melting

A beaker containing ice is heated. Its temperature is recorded with time as shown.



(a) melting point = 0°C

(b) what happens to the heat energy during

(i) AB : Heat energy is absorbed by the ice and converted to internal kinetic energy of particles.

(ii) BC : Heat energy is absorbed by mixture and is converted to internal potential energy.

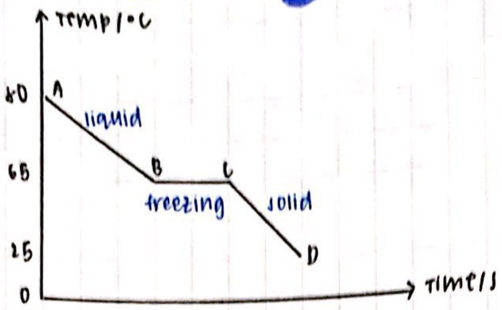
(iii) CD : Heat energy is absorbed by the water and is converted to internal kinetic energy of particles.

(c) Explain why the temp. does not increase during BC.

↳ Heat energy is used to overcome the forces of attraction between particles and increases the internal potential energy of the particles.

Freezing

A beaker containing liquid wax is left to cool.



(a) Freezing point = 65°C

(b) What happens to the heat energy during

(i) AB : Heat energy is lost and IKE of particles decreases.

(ii) BC : Heat energy is lost and IPE of particles decreases.

(iii) CD : Heat energy is lost and IKE of particles decreases.

(c) Explain why the temp. does not increase during BC.

↳ Heat is lost to form the FoA between the particles and decreases the IPE of particles.

evaporation

It is the change of state from liquid to gas.

boiling

It is the change of state from liquid to gas without any change in temperature.

differences

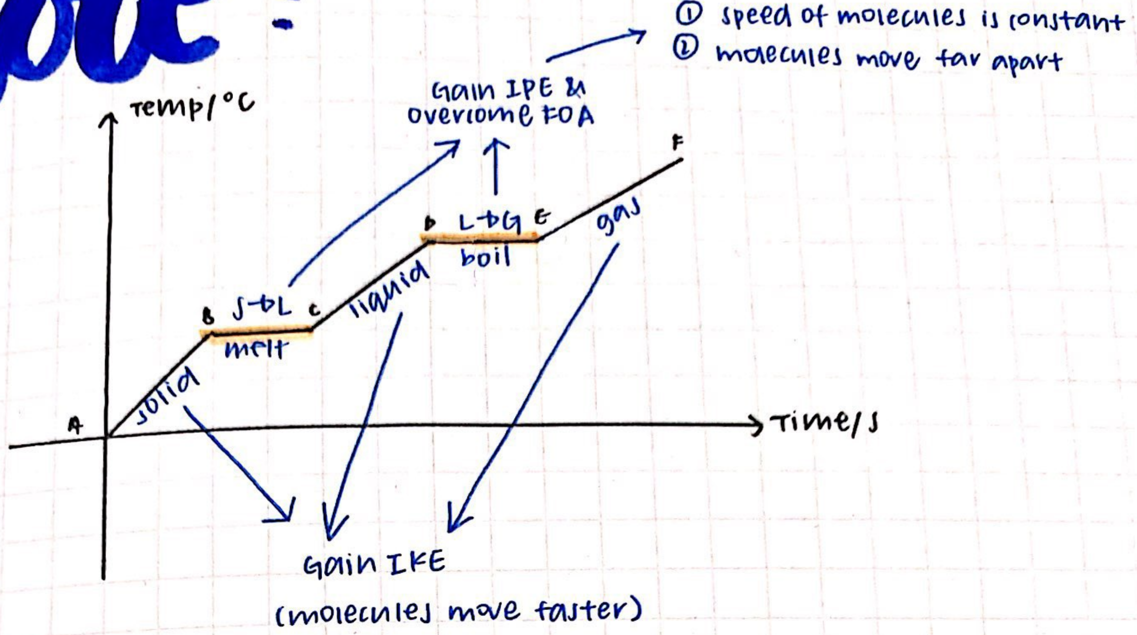
① Boiling
- occurs at a fixed temp.
- Quick process
- Takes place throughout the liquid
- Bubbles are formed in the liquid
- Temp. does not change
- Thermal energy supplied by an energy source.

② Evaporation
- occurs at any temp.
- slow process
- Takes place on surfaces.
- No bubbles are formed in the liquid
- Temp. may change
- Thermal energy supplied by surroundings.

how does evaporation cause cooling?

This is because when evaporation takes place, particles with higher KE leaves the liquid surface. This leaves behind liquid particles with much lower KE and hence the remaining liquid feels cool.

note :



Internal Energy → total energy of all the particles in the substance.

- Internal KE ↓ depend on temp.
- Internal PE ↓ depend on change of state