Hoërskool Birchleigh

CO-VIVA SOUTH AFRICA

Grade 8

Natural Science

TERM 3 for 2021

RESOURCE BOOKLET

Grade 8 please take note: Reading work is considered as a form of homework therefore it is **very important** to read your notes or textbook **every day** to help you understand the work better or identify imminent problems**.**

Day 3 and 4 **Grade 7 content: Energy and Change:**

Potential energy

· potential energy is energy that is stored in a system, such as in a stretched rubber band, a weight balanced on the edge of a table, a cell (battery), fuel.

· there is also potential energy in food [all energy is measured in a unit called the joule (J)]. The energy content in foods is usually labelled on food packaging.

Kinetic energy

· kinetic energy is the energy that a body has when it is moving, such as when a rubber band snaps back, a weight falls off a table, wind blows, water falls, a vehicle moves, current flows through a circuit (electricity).

Potential and kinetic energy in systems

· potential and kinetic energy are involved in:

-- mechanical systems *[a system is a set of parts working together]* - (such as - scissors cutting paper, a bent ruler can flick a pellet across the classroom, cricket ball hit by a bat).

-- thermal (heating) systems- (such as - a candle heating cold water in a can, a cup of tea losing heat to the surroundings).

-- electrical systems- (such as - a cell/ battery in a circuit can activate a motor, buzzer or a small torch bulb).

-- biological systems- (such as - a horse eats a plant and can move or pull a cart, energy being passed along a food chain).

Law of conservation of energy

· energy can neither be created nor destroyed but can be converted from one form to another.

· energy can be transferred in a system when different parts of the system interact with one another and cause changes. **e.g. Kettle boiling water.**

· energy can also be transferred from one system to another such as from an electrical system to a mechanical system in a motor.

Please read your notes that was discussed in class: Grade 7 energy: reading homework

Day 5

Did you understand the work?

Answer the following questions in your workbook: Grade 7 energy activity:

1. State the law of conservation of energy. 2
2. Can energy be transferred from one system to the next? 1
3. Name 4 systems energy can be transferred in. 4
4. Define potential energy. 1
5. Define kinetic energy. 1

Total: 9

Day 6 and 7 Topic 1: Static Electricity

Let us learn Terminology!

Term	Definition
Electron	Negatively charged sub-atomic particle that moves around on the outside of the atom's nucleus, in orbitals indicated as symbol e^-.
Proton	Positively charged sub-atomic particle inside the nucleus indicated as symbol p^+.
Neutron	Neutral sub-atomic particle inside the nucleus indicated as symbol n^0.
Friction	Rubbing of two materials against each other.
Transfer	Move from one place to the other.
Static electricity	Electric charge trapped on the surface of an object.
Stationary	Not moving.
Charge	Physical property of matter that causes it to experience a force.
Electric current	Flow of charges.
Repel	Push away e.g. Like (same) charges. + + / - -
Attract	Come together e.g. Unlike (opposite) charges. + -
Spark/ Shock	Discharge (Release) of a big amount of electrons. Electrons jump over the gap from one material to the next. Heat and speed caused by the fast moving electrons causes a spark.
Conductor	Material that lets charge flow through it e.g. metal.
Insulator	Material that does not allow charge to flow through it e.g. plastic.

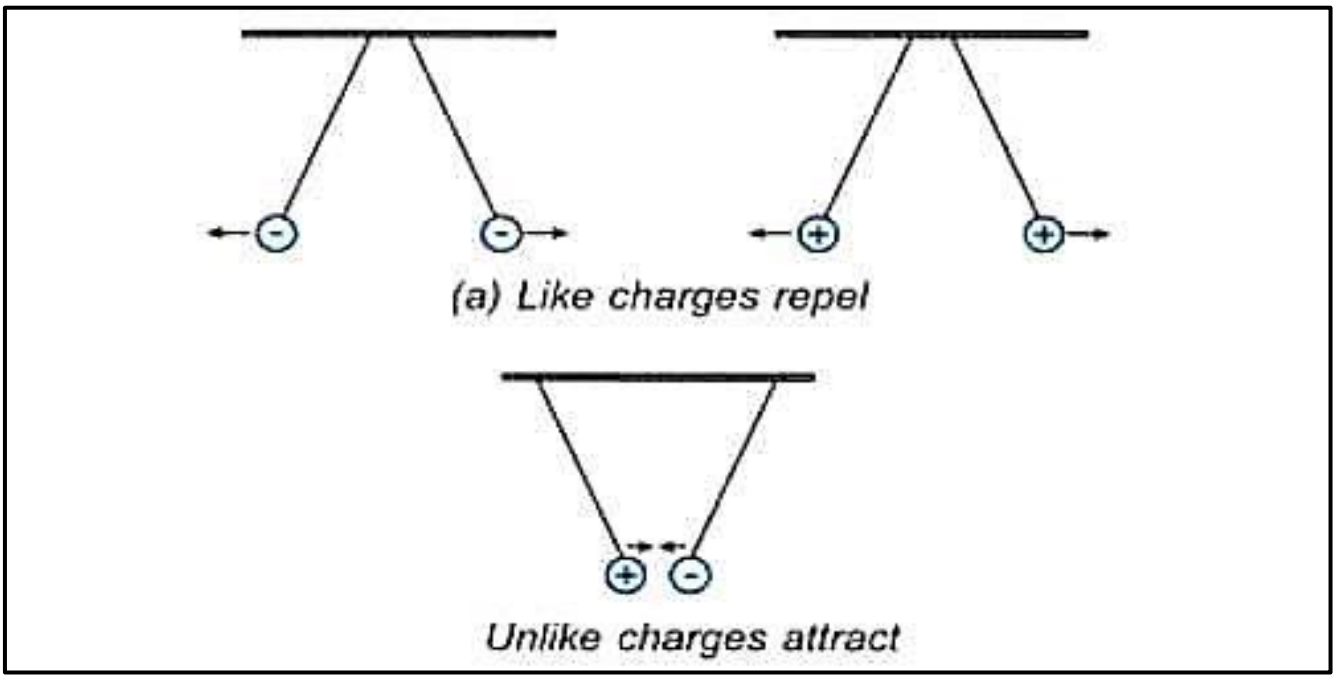
Day 8 and 9

Let us read!

Read Pages 102-105 (Do not read activities)

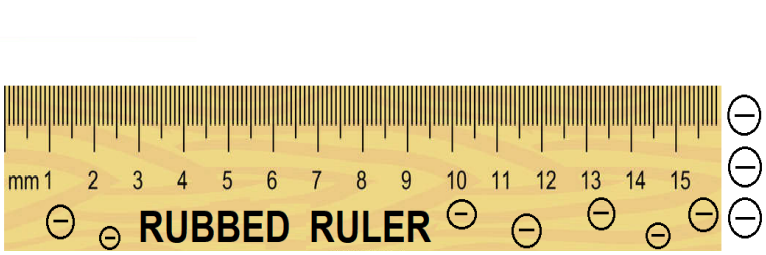
Let us sum it up!

- **Electrons** are **negatively charged** and are **attracted** by the **positively charged protons** in the nucleus.
- When the **number of protons and electrons are the same** the **atom** is **neutral**.
- **Electrons** that are **furthest** away from the nucleus are held very loosely, and these electrons can be **rubbed off**, through friction, from the material. The electrons that were given off to the next material stay motionless/static.
- **Protons and neutrons** that are held inside the nucleus **can NOT be rubbed off** or you cannot add protons or neutrons.
- Objects with the **same (like) charges** e.g**. – and – or + and + will repel** (push each other away).
- Objects with **opposite (unlike) charges** e.g. **– and + will attract** each other.

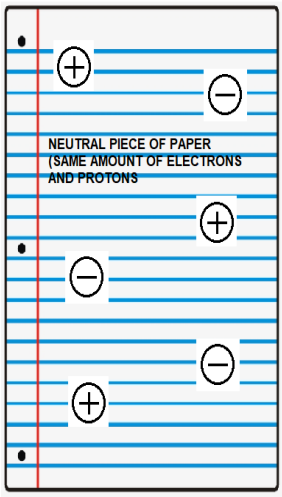


- When **friction** between two materials occurs, a **large amount of electrons** can **move** from one object to the next and this can cause a massive amount of **electrons** to discharge or **jump** from one material to next **releasing heat**. This is what we know as a **spark/ shock**.
- **Conductors conduct charge, Insulators do not conduct charge.**

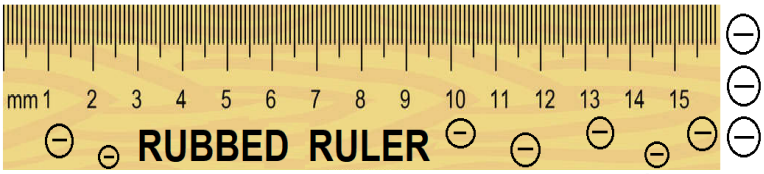
HOW A NEUTRAL PIECE OF PAPER IS ATTRACTED BY A NEGATIVELY CHARGED RULER



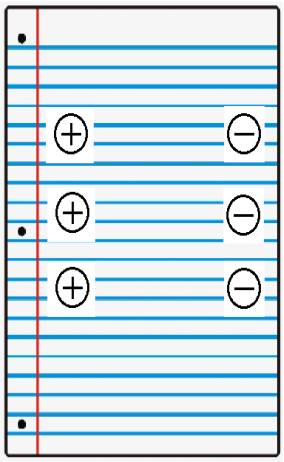
NEGATIVELY CHARGED RULER GAINED ELECTRONS FROM A WOOL/ NYLON CLOTH THAT THE RULER WAS RUBBED WITH.



If you bring the negatively charged ruler closer to the neutral piece of paper the following happens.



Attract



Repel

The electrons in the paper move to the furthest side, away from the ruler's electrons. Because the ruler's electrons repel the paper's electrons, it exposes the protons. The protons attract the electrons of the ruler. The paper then 'sticks' to the ruler.

Please read your notes/textbook that was discussed in class: Reading homework

Tips from the teacher:

Sparks are more present in dry air (winter) than moist air (summer) because moist air (water vapour) spreads the electrons across the air.

Day 10

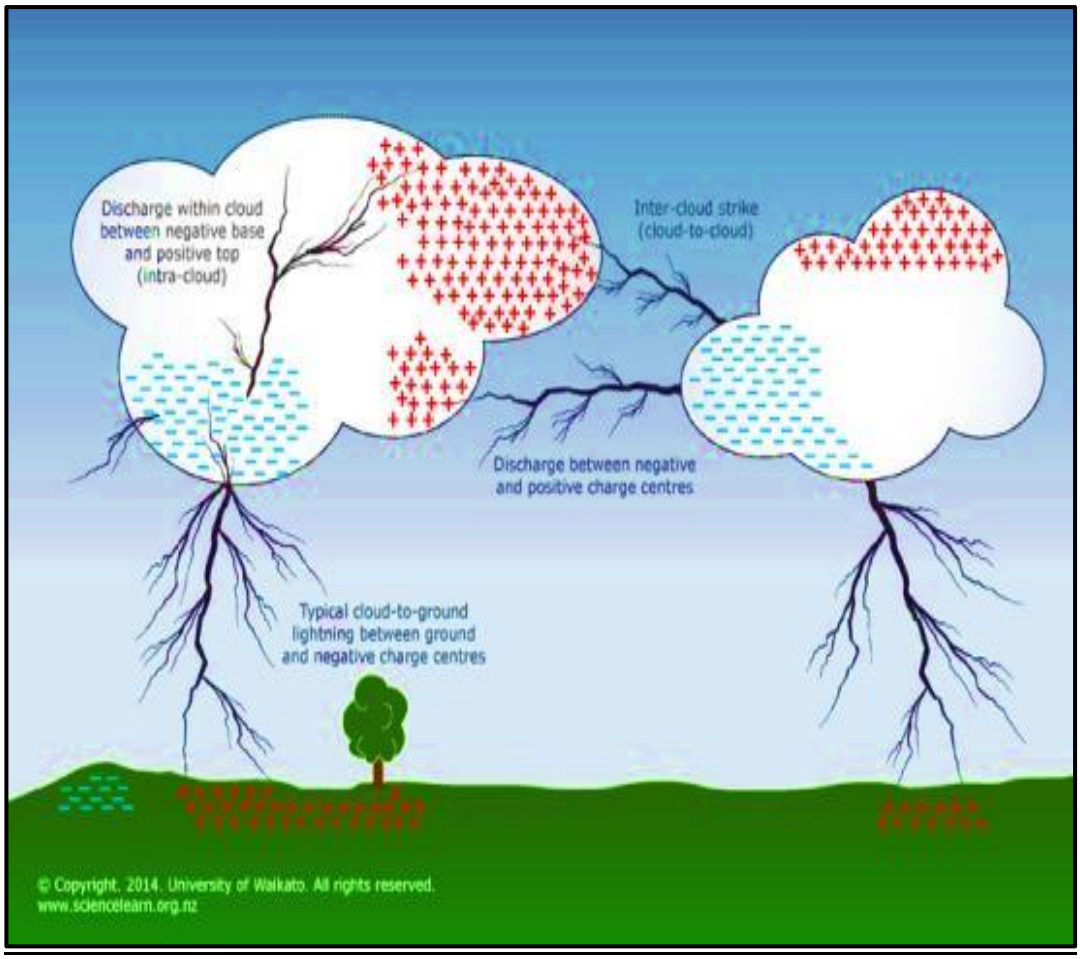
Did you understand the work?

Answer Exercise 1 on Page 105 in your workbook.

Day 11

Topic 1: Static Electricity: Cultural Myths

Term	Definition
Myth	Different stories that have been told by different cultures over hundreds of years, not a fact.



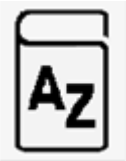
Homework:

Read Page 105 on cultural myths on lightning and summarize it in your workbook, you can add your own stories your families have told you about lightning.

If possible do research on the following and write it in your workbook:

What do I do if I am in the middle of a thunderstorm with lightning striking constantly? How do I prevent from getting struck by lightning if I am outside?

Day 12 ,13,14 Topic 2: Energy transfer in electrical systems



Let us learn Terminology!

Term	Description
Current	Flow of electrical charges.
Circuit	System for transferring electrical energy.(If a circuit is closed, energy is transferred. If the circuit is open, energy is not transferred).
Circuit components	Any device in an electric circuit e.g. resistors, light bulbs, conducting wire, and switches.
Chemical energy	Chemical substance undergo chemical reaction to change into other substances.
Potential energy	Energy possessed by an object because of its position to other objects.
Kinetic energy	Energy an object possesses due to its motion (movement).
Cell	Source of stored chemical potential energy.
Battery	Two or more cells.
Conducting wire	Metal like copper usually insulated in plastic that conducts electricity form one point to the next.
Switch	Controls electric current. Open switch does not let electric current flow through circuit, the switch is “off”. Closed switch completes the circuit and lets current flow through the circuit, the switch is “on”.
Open circuit	Let current pass through circuit.
Closed circuit	Does not let current pass through circuit.
Resistance	Preventing (opposing) the flow of current. All components in a circuit has some resistance to the flow of charges in a circuit even conducting wires.
Resistor	Electrical component that reduces the flow of current through a circuit. The higher the resistance of the resistor, the more the current is reduced (decreased).
Heating effect	A current passes through a thin resistance wire therefore resistance of the flow of current is very high, wire becomes hot.
Light bulb	Converts electrical energy to light and or heat energy through the heating effect.
Incandescent light bulb	Light bulb which uses the heating effect to produce light. Through the heating effect the tungsten filament wire becomes white hot and glows because of the inert gas.
Energy saving light bulb	Use less energy to produce light e.g. fluorescent lamps, LED (light emitting diodes) not necessarily using a filament.
Input device	Component that provides the energy e.g. cell or battery
Process device	Component which carries the flow of charges e.g. switch and conducting wires.
Output device	Component which changes the kinetic energy into a different form e.g. light bulb.

Overheating circuit	Too large current passes through conducting wires, risk of melting plastic insulation causing a fire in the house.
Fuse	Safety device. Short length metal wire with high resistance but low melting point, wire melts when current becomes too high, current does not flow when wire melts off.
Short circuit	Insulation of wires get worn out and bare wires touch, causing electricity to run through this path of low resistance and overheat. This can cause a fire if your home does not have a circuit breaker or if the appliance does not have a fuse.
Magnet	Piece of metal that has two magnetic poles and a magnetic field around it.
Magnetic field	Space around a magnet where it will experience a magnetic force.
Compass	Magnet that turns freely around its center. The magnetic fields of the earth lets the compass' end point to the North pole of the earth.
Electromagnet	Temporary magnet made by coiling insulated copper wire around a piece of metal and letting a current flow through the wire. When the current is switched off the magnetism stops e.g. solenoids, electromagnetic cranes in scrapyards, generators, transformers, electrical buzzers, headphones.
Electrolysis	Process where an electric current is sent through a solution to break it down into its composing elements.
Series	One pathway for the current to pass through the circuit.
Parallel	More than one pathway for the current to pass through the circuit.

Day 15 , 16,17

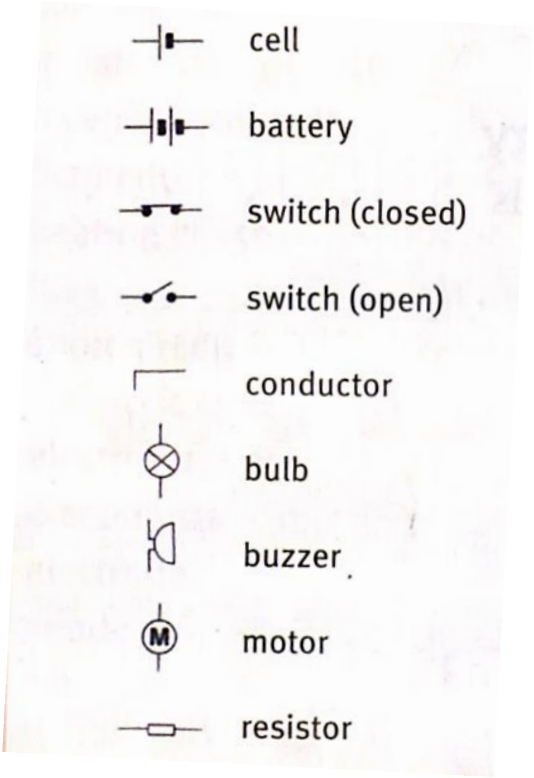
Let us read!

Read Pages 106-117 (Do not read activities)

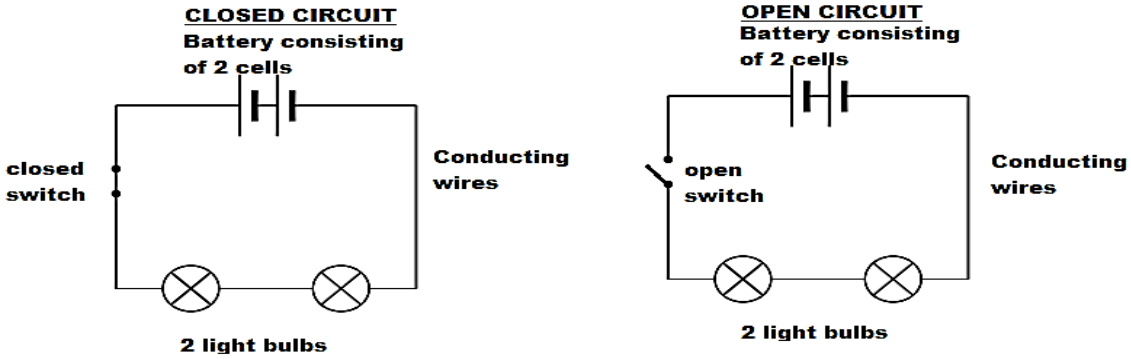
Day 18, 19, 20

Let us sum it up!

- **Circuit component symbols**

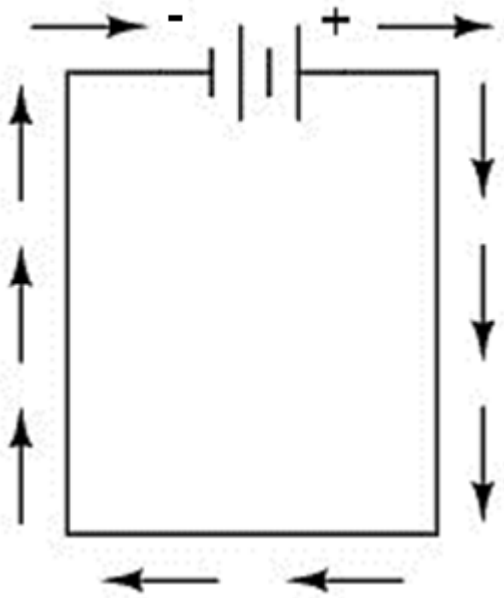


- A circuit is a system for transferring electrical energy or charges.
- A closed circuit implies that the switch is “on” and charges are flowing provided by an energy source like a cell.
- An open circuit implies that the switch is “off” and no current is flowing.



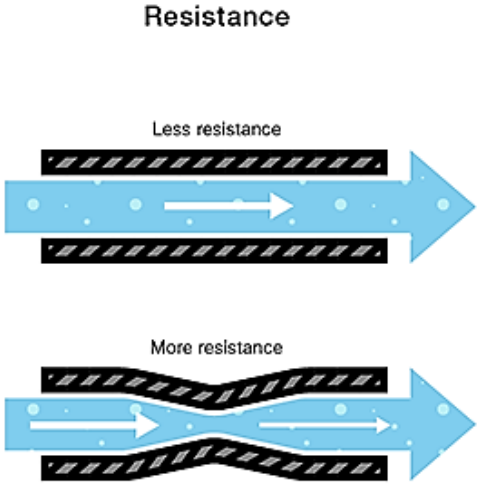
- A cell or battery provides the source of chemical potential energy and converts it into kinetic energy caused by the chemical reactions within a cell.

- An electrical current will flow in a closed system. Electrical charges (electrons) will flow directly from the positive terminal of the cell, through the circuit by conducting wires, to the negative terminal of a cell.

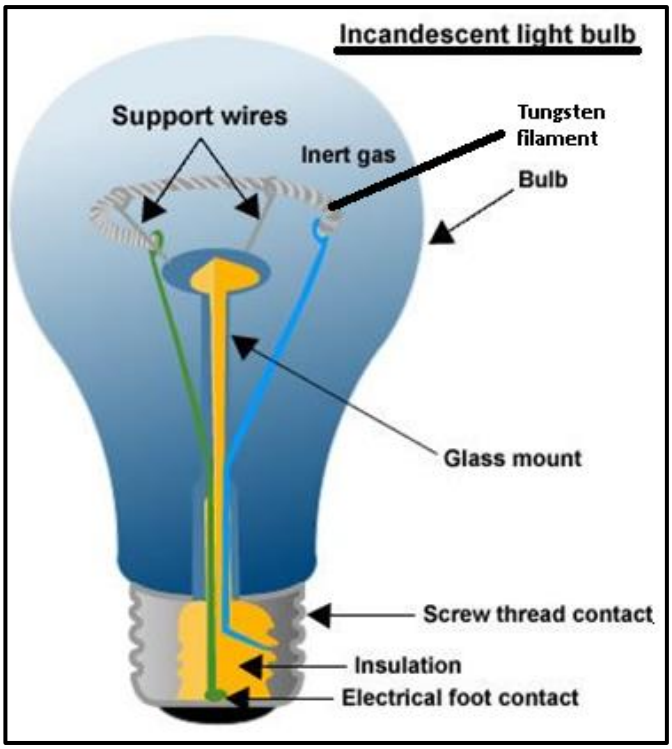


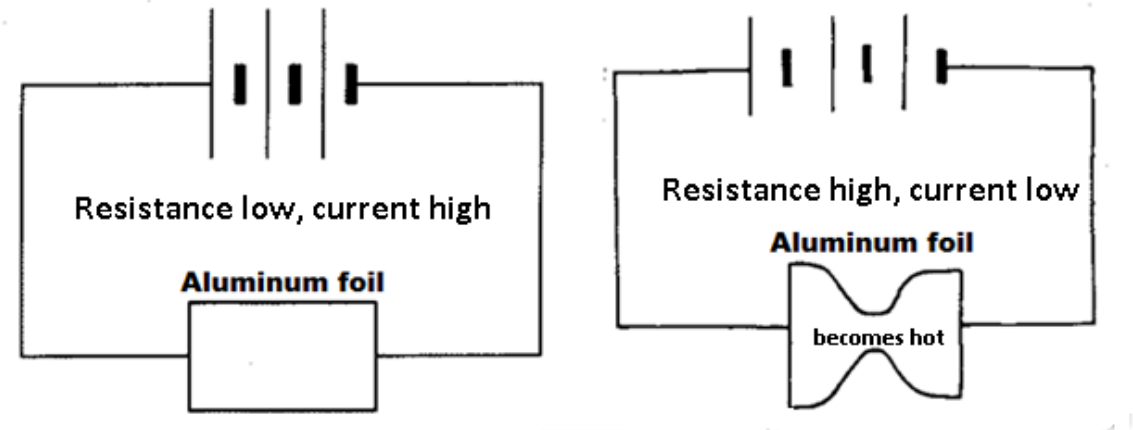
  - Particles (charges) bump against each other constantly. If the conducting wire is thin/narrow, the particles bump more against each other, less particles can flow through circuit. If the conducting wire is thick/wide, the particles bump less against each other and more particles can flow easily through circuit.

<u>Water analogy of resistance</u>

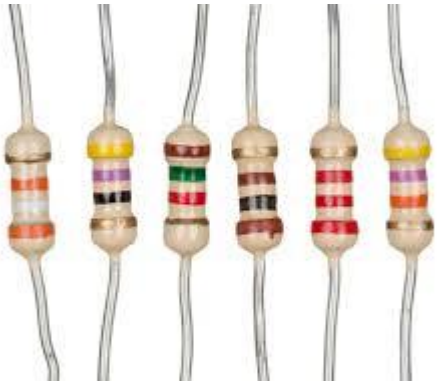


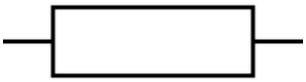
- Resistance preventing/ opposing a current through conducting wires.
  The higher the resistance, the more the current is reduced, the hotter the wire becomes. The lower the resistance, the greater the current. All components in a circuit have some level of resistance, some components more than others. Some components provide useful output energy in the form of heat like the nichrome wire in toasters, a stove, kettle, incandescent light bulb filament, geyser element using the heating effect.



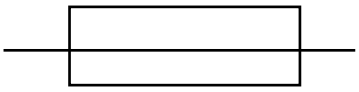


- Appliances need resistors so that the appliance does not overload with current and break. Resistors reduce the amount of current flowing through a circuit.



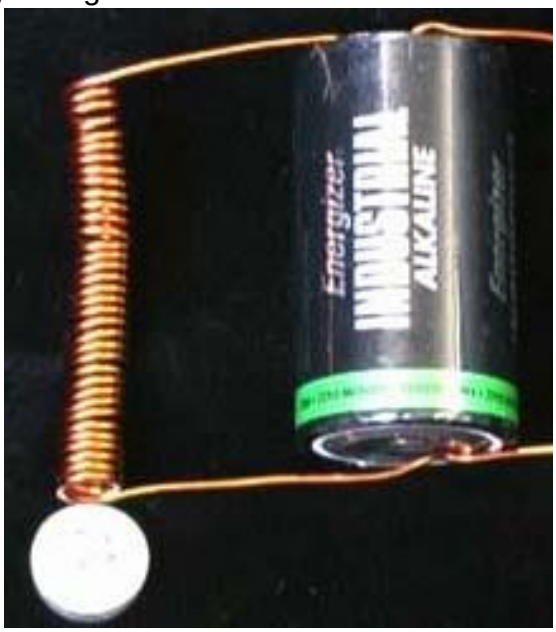


- A fuse is a short length metal that melts when a circuit overheats. A fuse's wire has a high resistance and low melting point, therefore as soon as the wire becomes just a little bit hot, the wire melts and stops the flow of current preventing a fire from occurring.



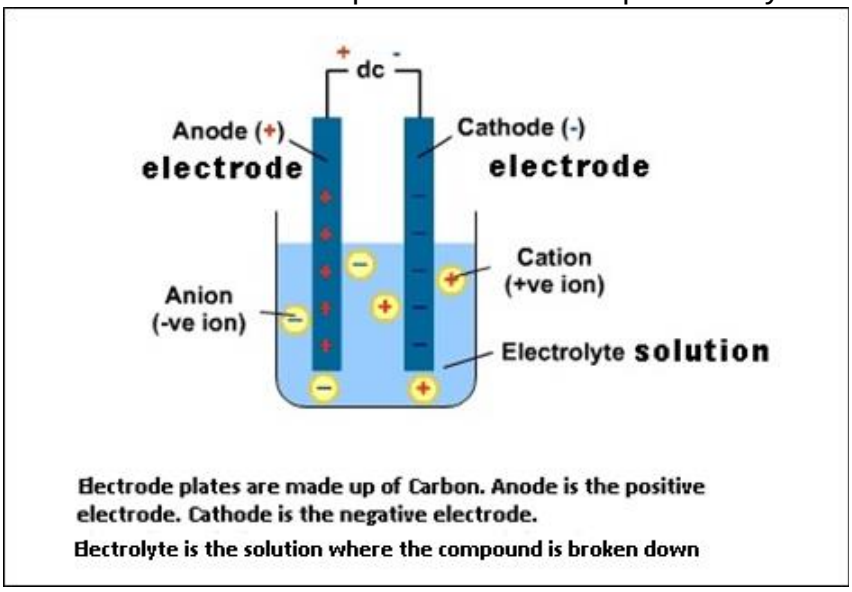
- Short circuits happen when worn out conducting wires touch (because the insulated plastic are worn out) letting current flow through this path of lowest resistance to the ground. If there is no fuse or circuit breaker in your house, a fire might occur or you might get shocked and die if you touch the bare wires.

- An electromagnet is formed when insulated copper wire is coiled around a piece of metal (for example a nail coiled with copper wire) and sending an electric current through the copper wire thus creating a magnetic field around the nail.



- An electromagnet is a temporary magnet, and the magnetism stops if the current stops.

- Electrolysis is when an electric current is sent through a solution, and the compound is broken down into the elements the compound was made up of initially.



Please read your notes/textbook that was discussed in class: Reading homework

Tips from the teacher:

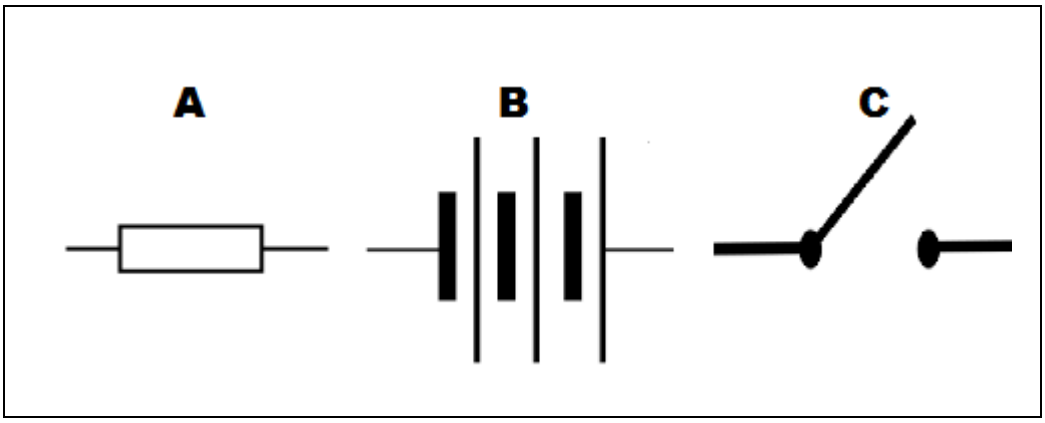
1. All circuit components have some level of resistance but not all circuit components are resistors.
2. Always indicate the direction of the current if you draw circuit diagrams. Remember no current will flow if there is no source of energy / if the switch is open/ conducting wires don't touch or if there is an error in your circuit like a light bulb that's not working.
3. Know your circuit components on P.108 in your textbook.
4. Do not get confused with conventional current (Gr10 work). For now electrons flow from the positive terminal of your cell, through the circuit, to the negative terminal of your cell.

Day 21

Did you understand the work?

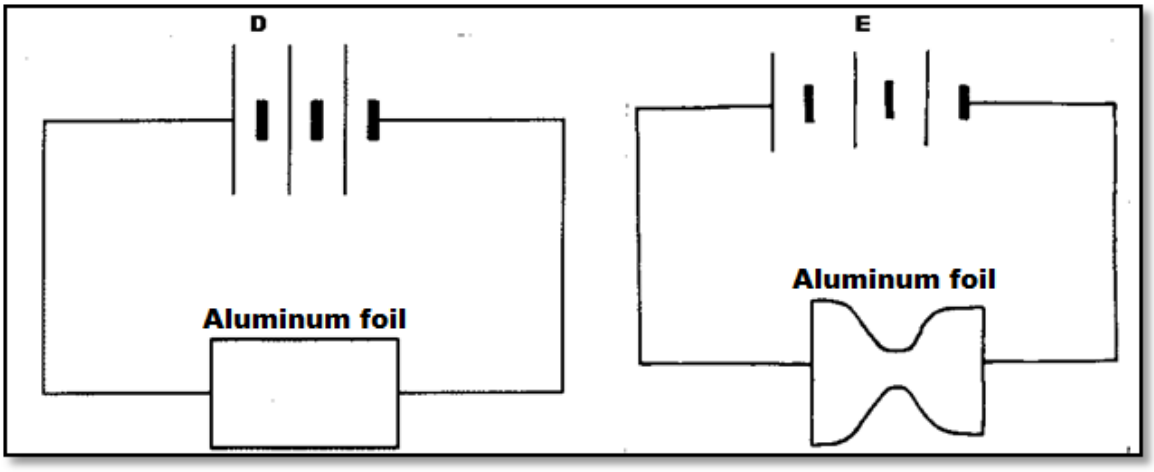
Answer the following questions in your workbook: Energy transfer Activity:

1. Provide names for the circuit components in the diagrams below and describe each component's function. Write the letter with your answer e.g. D: buzzer, to warn people.



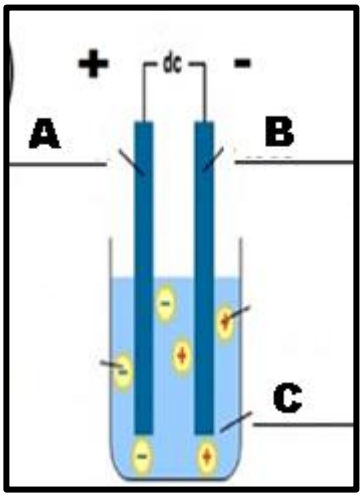
(6)

2. Indicate the level of resistance in the diagrams below. Write the letter with your answer e.g. F- low resistance.



(2)

3. Explain the heating effect in a light bulb. (2)



4. Complete the process of electrolysis by labelling A to C in the diagram above. (3)
5. Draw a circuit diagram with an open switch, 3 cells, 2 light bulbs. Indicate the direction of the current. (5)

Day 22, 23, 24 Topic 3: Series and Parallel circuits

Let us learn Terminology!

Term	Definition
Series	One pathway for the current to pass through the circuit.
Parallel	More than one pathway for the current to pass through the circuit.
Circuit board	Holder onto which circuit components are connected.

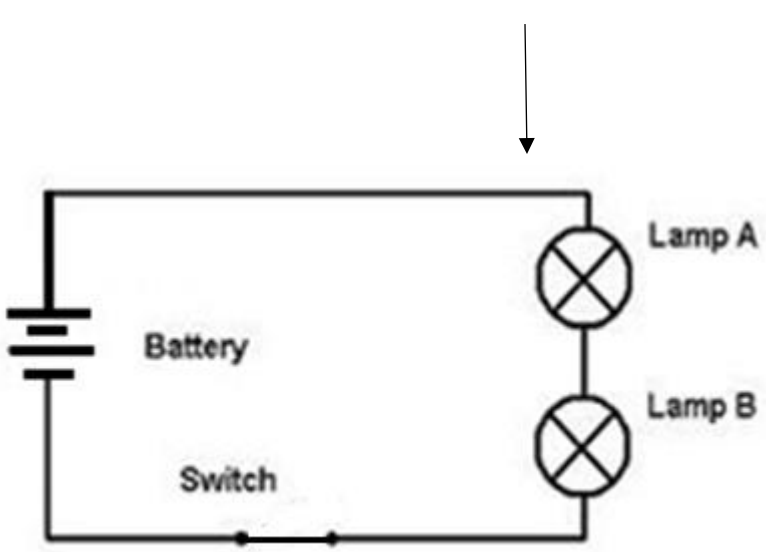
Let us read!

Read Pages 118 – 124 (Do not read activities)

Day 25 and 26

Let us sum it up!

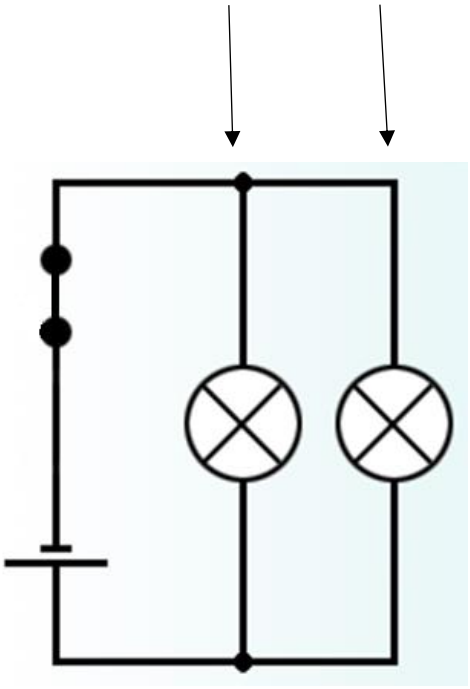
- **Series circuit** is where the current has only **one pathway** to pass through.



- If you **add a resistor** (or light bulb) in **series**, the **overall current decreases** because you are adding more light bulbs (light bulbs will glow dimmer in series) **but** the **current** is the **same anywhere** in the circuit.
- **Advantage** of **light bulbs** in **series** is that **one switch switches** on **all** the light bulbs.
- **Disadvantages** of **light bulbs** in **series** is that if **one light bulb stops working** the **current will stop** and the **more light bulbs** you add, the **more the current** is **reduced**, therefore the **light bulbs** will **glow dimmer**.

- **Parallel circuit** is where there is **more than one pathway** for the current to pass through.

MORE THAN ONE PATHWAY



- If you **add a resistor** (or light bulb) in **parallel**, the **overall current increases** (more light bulbs does not glow dimmer in parallel).The **current** is the **same anywhere** in the circuit.
- **Advantage** of **light bulbs** in **parallel** is that you can have **more than one switch that switches on light bulbs individually or** all light bulbs can be switched on at the **same time**.
- Another **advantage** is if **one light bulb stops working** the **other lightbulbs** carry on **shining.**
- **Disadvantages** of **more light bulbs** in **parallel,** the **energy source** like a **battery does not last that long.**
- Except for light bulbs as output devices, **other output devices** such as **LEDs, electric motors and alarms work** using much more **complex circuits.**

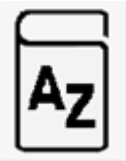
Please read your notes/textbook that was discussed in class: Reading homework

Day 27 and 28

Did you understand the work?

Answer Page 121 Activity 3 and Page 125 Exercise 1 in your workbook.

Day 29, 30, 31 Topic 4: Visible light



Let us learn Terminology!

Term	Description
Luminous object	Object that emits light through radiation. In other words an object that shines.
Radiation	Emissions of energy as electromagnetic waves or as moving sub-atomic particles or charges.
Electromagnetic waves	Are created as a result of vibrations between an electric field and magnetic field. These waves can travel through anything.
Light minute	Distance light travels in a minute. It takes the sun's rays 8 minutes to reach the earth.
Light year	Distance light travels in a year. Our nearest star, apart from the sun, is 4 light years away.
Receptor cells	Receive signals or in other words, it detects light.
Retina	Innermost, light sensitive tissue layer of the eye.
Wavelength	Distance between two identical points.
Frequency	Number of waves that pass a certain point in one second.
Refraction	Direction of light changes as it passes through a medium.
Dispersion	White light is spread out into different wavelengths of colours.
Spectrum	Range of colours that visible white light dispersed into namely Red, Orange, Yellow, Green, Blue, Indigo and Violet (ROYGBIV). All colours have different wavelengths and frequencies.
Reflection	Throwing back by a body or surface of light, heat or sound and not absorbing it.
Opaque	Object that you can not see through, light can also not pass through object .Usually casts a shadow e.g. wall.
Transparent	Object that allows light to pass through it so that objects behind it can be seen e.g. glass
Translucent	Semi-transparent. Allowing light to pass through it but mostly you can not see through it e.g. frosted/sanded glass and sunglasses
Incidence ray	Light ray that enters the object or, in other words, light ray that strikes a surface.

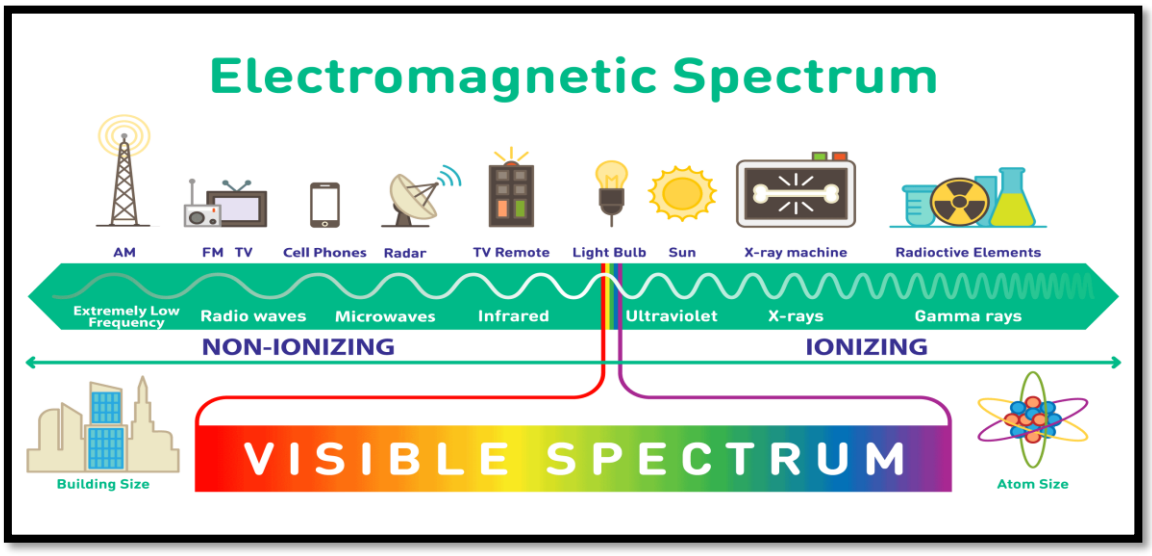
Incidence angle	Angle between the incidence ray and the normal.
Normal	Dotted line that is drawn perpendicular (90°) to your smooth surface at the incidence ray.
Reflective ray	Corresponding to the incidence ray, your reflective ray is the light ray that is reflected by a surface.
Reflective angle	Angle between normal and reflected ray.
Nerve impulse	Signal that travels along the length of a nerve.
Medium	Intervening substance through which sensory impressions are conveyed or physical forces are transmitted, or in other words, an object.
Convex lens	Lens that is thicker at the middle. Light that pass through the lens are brought closer together.
Concave lens	Lens that is thinner at the middle. Light that pass through the lens are spread out.

<u>Let us read!</u>

Read Pages 126-137 (Do not read activities, except for Activity 6 on P.136)

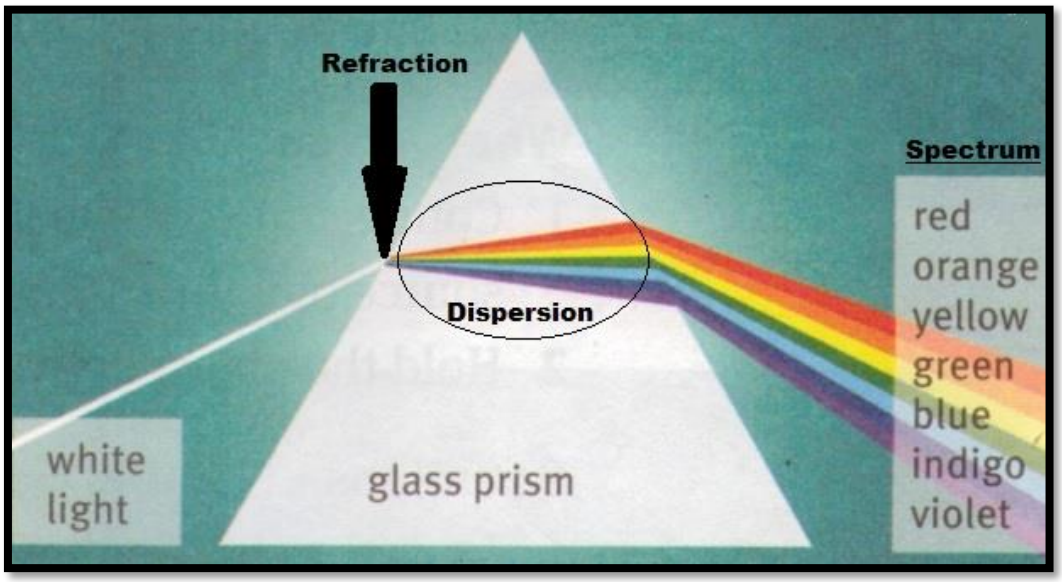
<u>Day 32,33,34,35,36</u>

<u>Let us sum it up!</u>

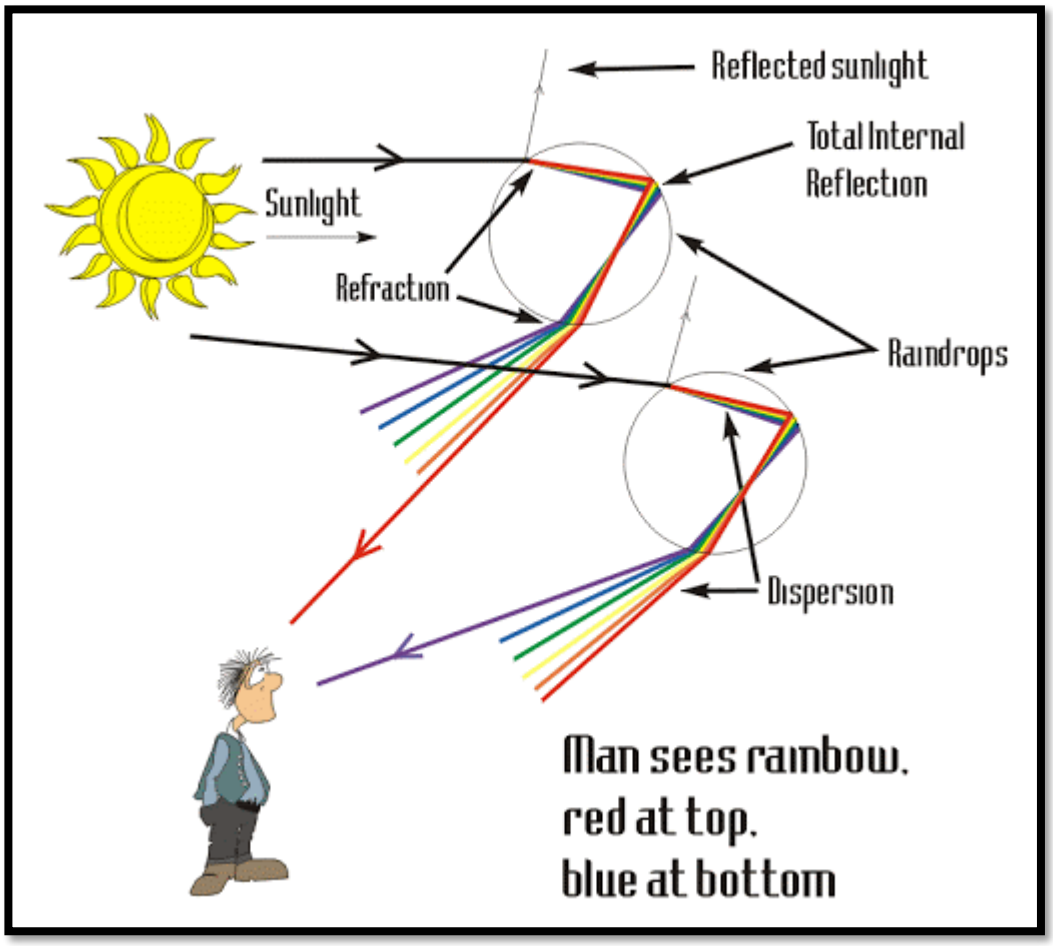


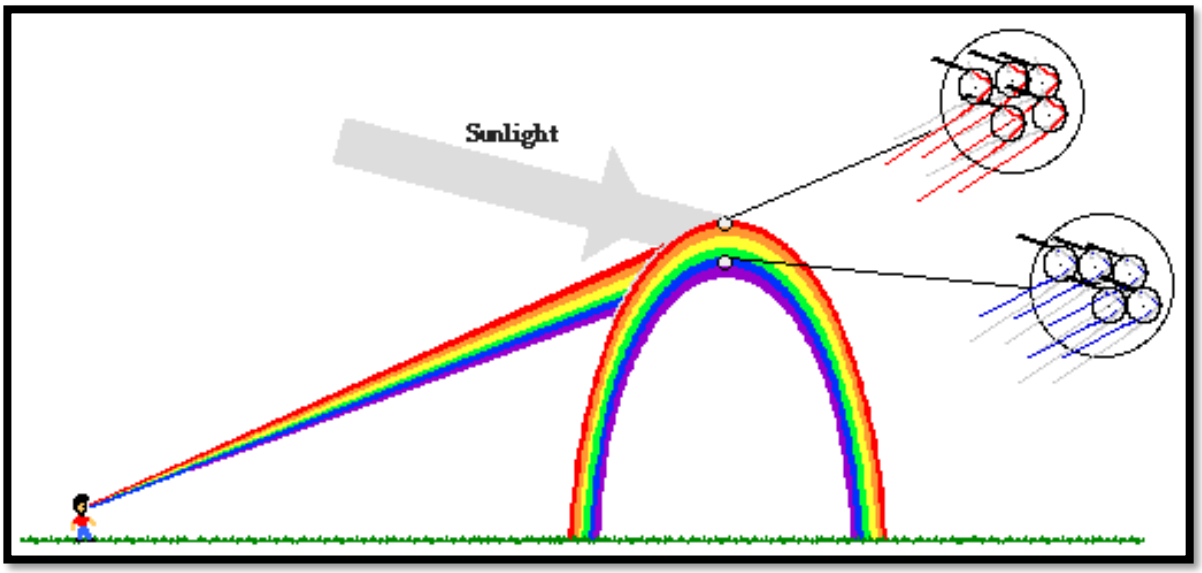
Electromagnetic spectrum diagram just for interest purposes, you do not have to study it.

- Light emitted from luminous objects like the sun and light bulbs are transferred through radiation in straight lines travelling in an empty space at 300 000 kilometres per second (km/s).
- Light and heat form part of the electromagnetic spectrum of energy and travels through space as electromagnetic waves.
- The sun is approximately 150 million kilometres away from the earth.
- Visible light has short wavelengths and high frequencies. That is the light which we as humans can see on the electromagnetic spectrum of energy.

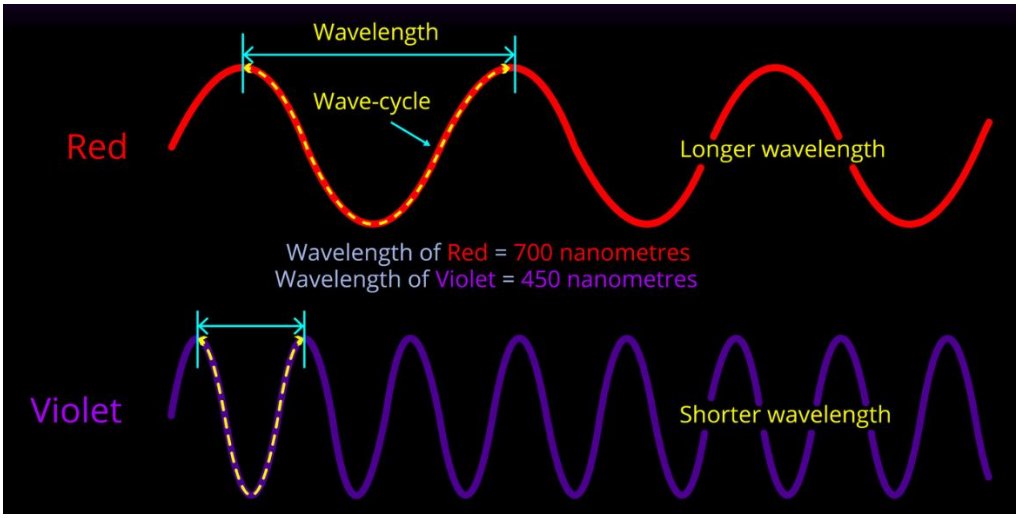


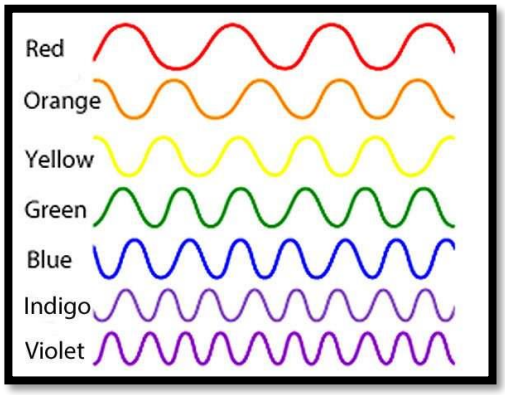
- A rainbow of different colours is formed when sunlight shines through a raindrop and is refracted (bent) and then reflected, and eventually refracted while exiting a raindrop's surface. If white light disperses (spreads out) into Red, Orange, Yellow, Green, Blue, Indigo and Violet then that is called the Spectrum of Visible white light.



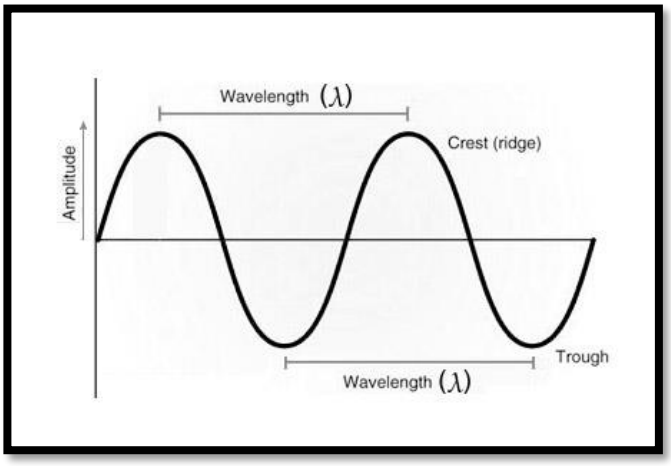


- Red has the longest wavelength, move slowest (least amount of energy), and therefore has the lowest frequency. Red is refracted least.
- Violet has the shortest wavelength, move fastest (most energy), and therefore has the highest frequency. Violet is refracted most.



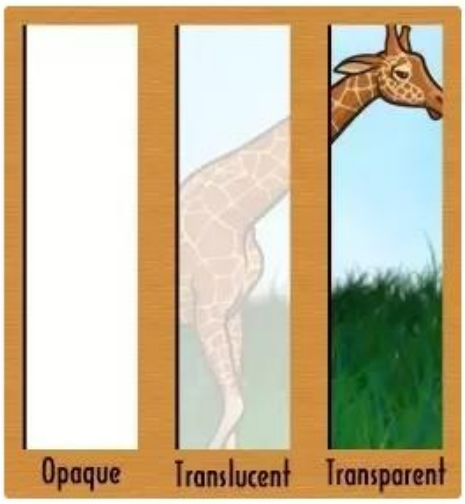


Do not study the ROYGBIV wavelength diagram above

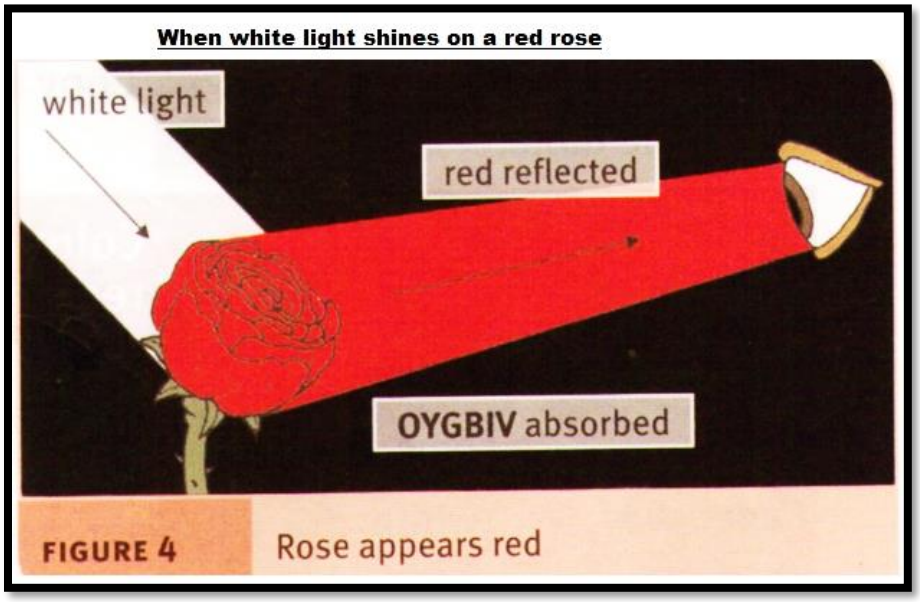


- Light can not pass through an opaque object. An opaque object usually casts a shadow. You can not see through an opaque object.

- Light can pass through transparent objects and you can see through it. A transparent object usually does not cast a shadow.

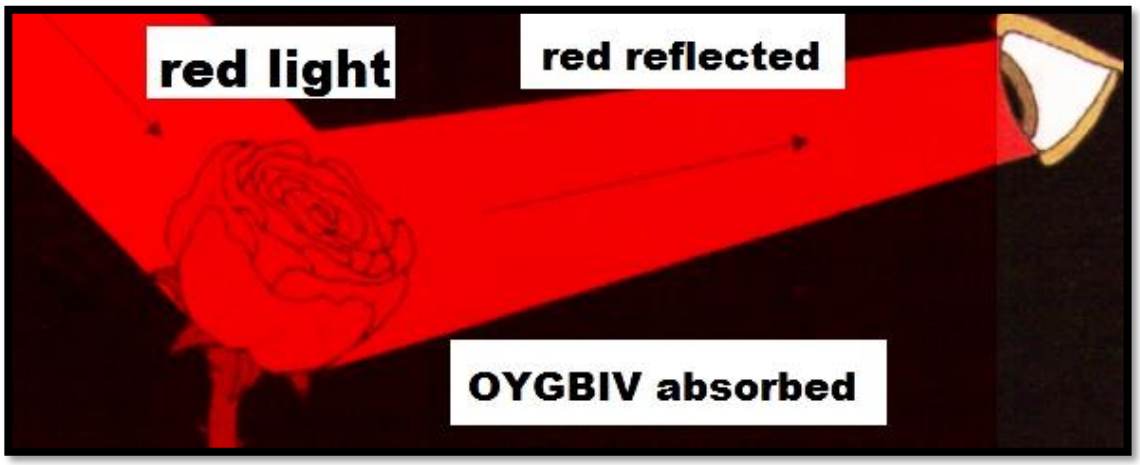


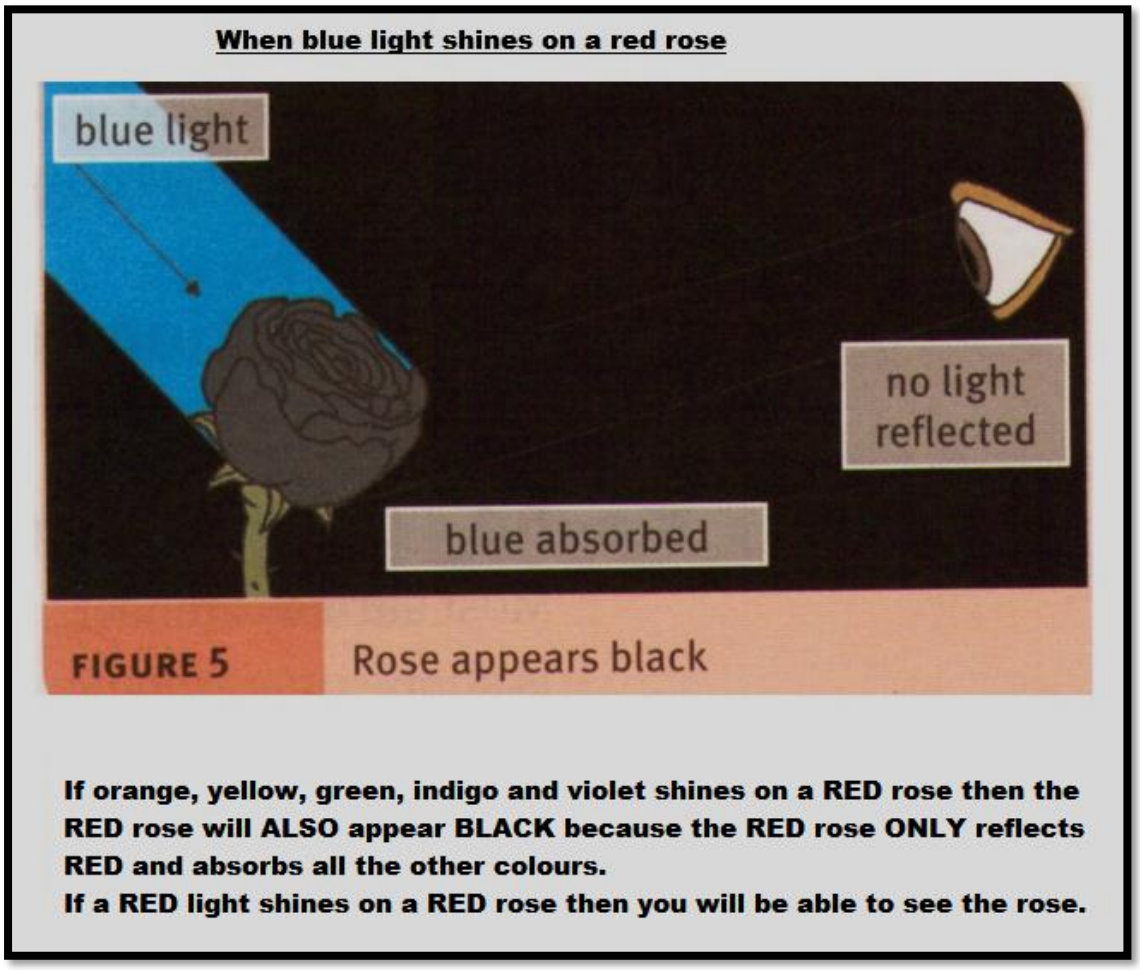
- Colour is a specific frequency wavelength of white light that is absorbed by the receptor cells in the retina of your eye and turned into an electric impulse. This impulse is then sent to your brain via an optic nerve and interpreted as a certain colour.
- If you see a colour of an object when white light shines on it, you are seeing the colour that is reflected back to your eye. The rest of the spectrum of white light is absorbed by the object.



- If an object appears black, then all colours of the spectrum of white light (ROYGBIV) and the heat is absorbed by the object. That is why you wear black in winter, because it absorbs all the heat and you feel warmer.
- If an object appears white, then all the colours of the spectrum of white light and the heat is reflected away from the object. That is why you wear white in summer, because it reflects all the heat and you feel cooler.

- If you shine <u>white light or light that is the same colour as the object</u>, onto the object, then the colour of the object will be reflected to your eye. The rest of the light spectrum will be absorbed by the object.





- When light enters a rough surface the reflection will always be scattered.

- On a smooth surface, the angle at which the ray hits the surface, the ray will reflect at the same angle.
- You subtract the angle at which the ray hits the surface from 90 ° to work out the angle of incidence.
- When light enters a smooth surface the angle of reflection will always be the same as the angle of incidence. i = r

Reflection of light from a smooth surface

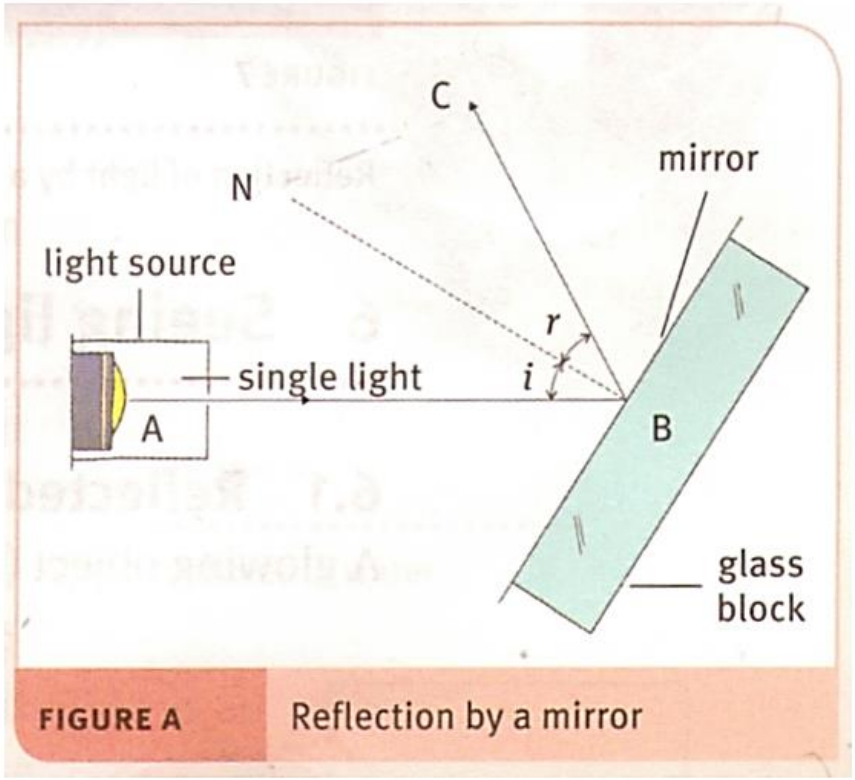


FIGURE A Reflection by a mirror

AB = Incidence ray
i = Incidence angle
N = Normal line
BC = Reflected ray
r = Reflected angle

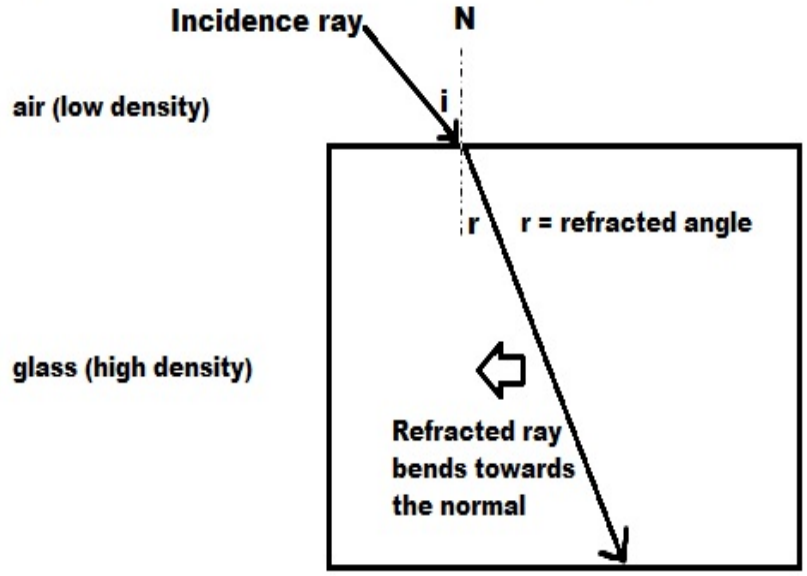
Example:

If light enters a smooth surface at 40°, what will the incidence and reflected angle be?

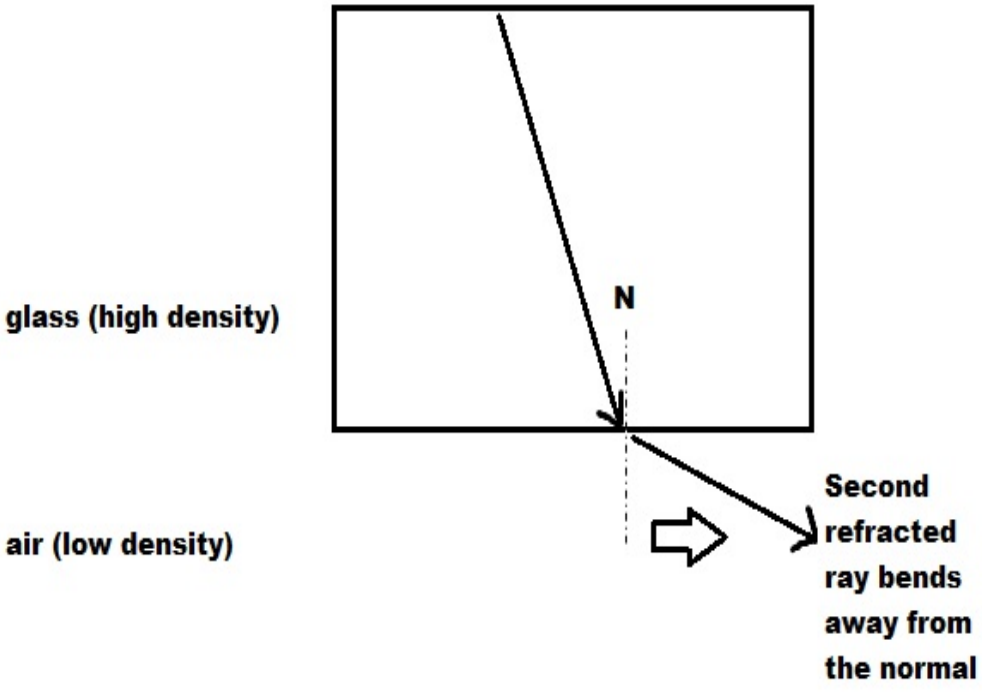
i = incidence angle
= 90°- 40°
= 50°

r = reflected angle
= 90°- 40°
= 50°

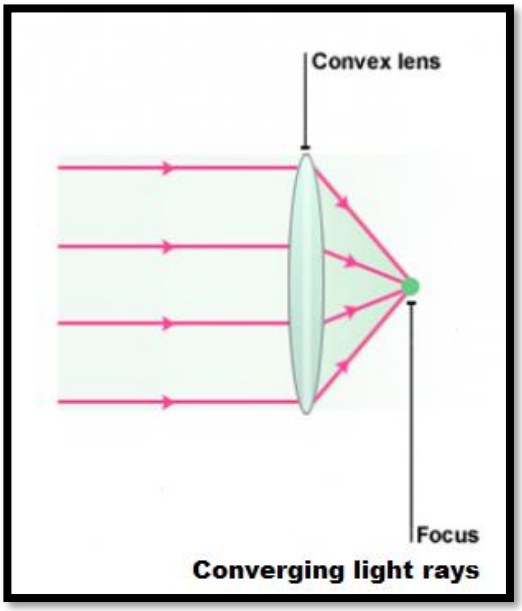
Light from a low (air) to a high (glass) density medium: bends towards the normal.



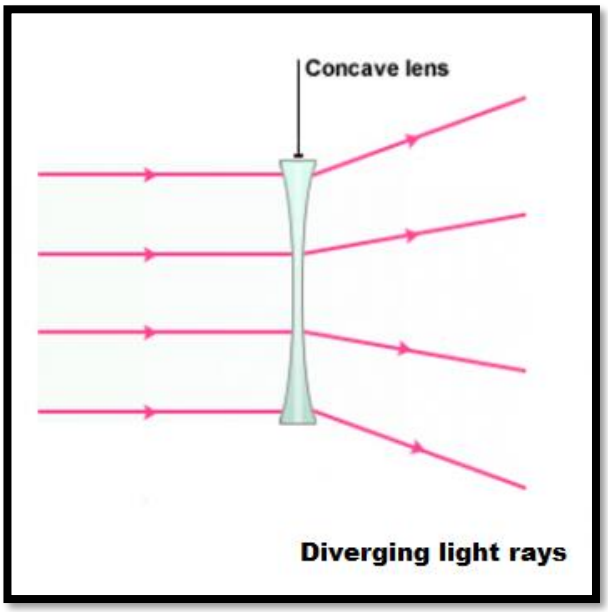
Light from a high (glass) to a low (air) density medium: bends away from the normal.



- A convex lens bends and focuses the light to a point. The light is convergent (it comes together to a point). If a glass bottle is broken and lying in a field the sun's rays are also focused to a point, that point becomes so hot that a veld fire can start.



- A concave lens spreads the light out (diverge).



Please read your notes/textbook that was discussed in class: Reading homework

Tips from the teacher:

1. The normal line is sometimes called the “Perpendicular” line.
2. Opaque is pronounced OH-PAY-G (G for gift).
3. Seeing different colours other than the spectrum of white light (e.g. brown) has to do with mixing different spectrum colours and those colours are then being reflected back to your eye at the same time.
4. The spectrum of white light is a specific order, you can not change the order… it is Red, Orange, Yellow, Green, Blue, Indigo, Violet. (ROYGBIV). I remember the order by the following rhyme:
   There’s a boy called “**ROY**”, “**G**”irls before “**B**”oys, the letter “**I**” comes before the letter “**V**”.
   Remember in a test or exam you must write the colours out, you can’t just write ROYGBIV.
5. It is very important to understand if you only shine light that is the SAME colour as the object (e.g. shine green light on a green car) OR WHITE light on an object (e.g. white light on a green car), then you will be able to see the colour of the object. All other colours of light that are shone on the object is absorbed by the object and the object will appear black.
6. If you have more than one incidence and reflective angle, then it will be called i_2 and r_2
7. Remember to show all your calculations when working out incidence and reflected angles.
8. ONLY for interest sake: Insects see colours differently than us, they can see ultraviolet light. Snakes can sense infrared light.

Day 37,38, 39

Did you understand the work?

1. Answer Page 129 Activity 2 in your workbook (the diagram is already there if you shine a light beam through a prism).
2. Exercise different light, different colour objects:

   Predict what will happen in the following scenarios if a certain type of light is shone on a certain colour object. Copy the table over in your workbook:

Object	Colour in white light	Colour in red light	Colour in blue light	Colour in green light
A leaf	green			
Cloth	blue			
Paper cup	white			
Charcoal	black			
Sunflower petal	yellow			

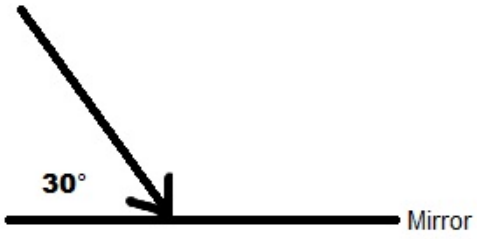
(15)

3. Calculate angles:

Calculate the angle of incidence and reflection in each of the following mirror scenarios.

Remember to draw all components and label your components. Copy diagrams in workbook:

a)



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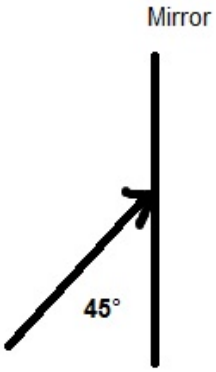
b)



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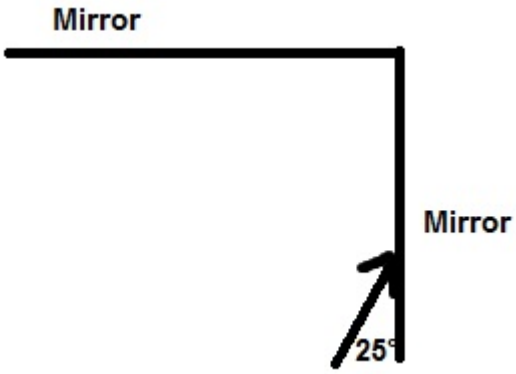
c)



(4)