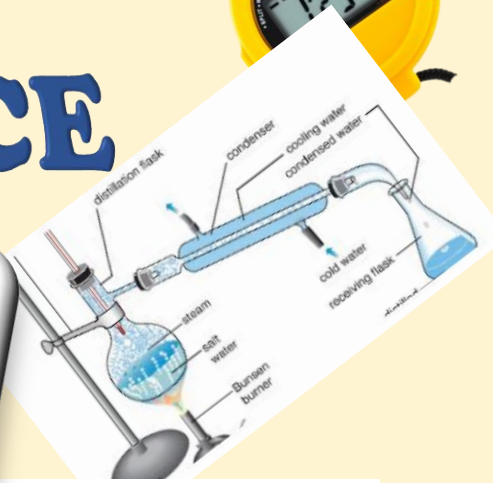
COMPETENCE BASED CURRICULUM

Junior secondary school

RATIONALISED GRADE 7

INTEGRATED SCIENCE



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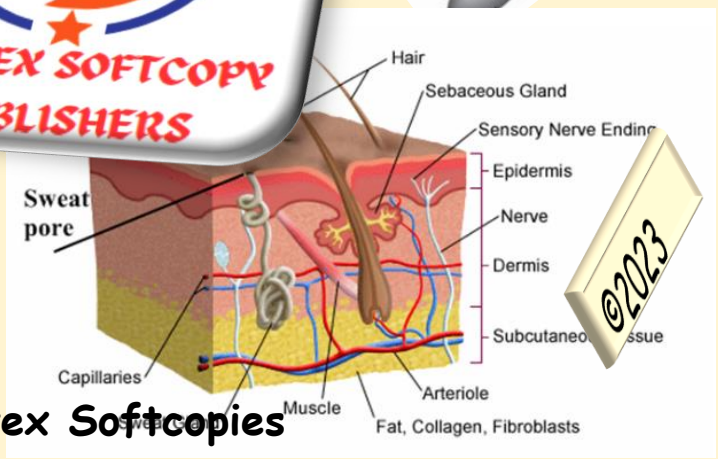

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STRAND 1 SCIENTIFIC INVESTIGATIONS.

1.1 Introduction to Integrated Science.

Meaning & Components of integrated science.

To integrate is to bring together or to combine parts of something into a whole.
Integrated science means the study of five basic natural sciences which are Physics, Chemistry, Biology, Earth Science and Astronomy and how they overlap.
Biology -deals with the study of living things.
Physics – deals with the study of matter and energy.
Chemistry - a branch of science which deals with the study of nature, properties, and composition of matter

Importance of Integrated Science in Daily Life.

Scientific knowledge has allowed us to develop new technologies, solve problems and make informed decisions. Some uses of science in different fields are as follows:

- **Transportation**.
  - ☞ Science has made the world a global village for example, bicycles, cars and aircrafts are invented of science. Therefore, people and goods can be transported easily and faster.
- **Medicine**.
  - ☞ Most equipment used in medical field are scientific inventions. Examples include stretchers, electrocardiogram (ECG) machines and magnetic resonance imaging (MRI) machines etc.
- **Agriculture**.
  - ☞ In agriculture field science has major contributions such as the machines like tractors, drip irrigation system, sprinklers irrigation system among others.
- **Communication**.
  - ☞ Mobile phones and computers are scientific inventions used majorly in communication.
- **Construction**.
  - ☞ Construction of building is based on science and technology. Machines used in construction works such as motor graders, bulldozers are scientific inventions.

1.2 Laboratory Safety.

- ✓ The school laboratory designs should be in such a way that learners can perform experiments safely.
- ✓ Learners must also be careful when handling materials and when using equipment in the laboratory.
- ✓ The table below shows common hazards and the accidents they can cause in the laboratory.

Hazard	Accident caused.
Acids and bases (chemicals)	▪ These can irritate or burn the eyes and the skin. ▪ They can also cause respiratory complications.
Corrosives.	▪ These can cause severe burns on contact.
Electrical hazards (heating apparatus)	▪ Electricity can cause electric shock, burns, fires and even explosions.
Glass apparatus	▪ These can cause cuts and bruises.

Common Hazards and their symbols in the laboratory.

- Besides the laboratory acting as a store for chemicals and apparatus, many experiments are done in the laboratory. Hence there are many hazard symbols in the laboratory to help learners take necessary precautions against dangers and hazards.
- The following are hazard symbols, their meaning and interpretations.

Hazard symbol	Meaning	Interpretation
	***Corrosive***	✓ The substance can destroy living tissues and equipment on contact. **Caution!** Do not breathe in vapour; avoid contact with skin and eyes.
	***Oxidizer***	✓ The substance can ignite flammable and combustible materials or worsen existing fires thus make firefighting more difficult. **Caution!** Keep away from such flammable and combustible materials.
	***Poisonous***	✓ The substance is hazardous when inhaled, swallowed or exposed to the skin. It may even lead to death. **Caution!** Avoid contact with the human body and immediately consult a physician in case of contact.

	***Radioactive***	✓ The substance has measurable radioactivity. **Caution!** Avoid exposure to the substance.
	***Flammable***	✓ The substance can easily catch fire. **Caution!** Keep away from open flames, sources of heat and sparks.
	***Toxic***	✓ The substance is toxic, will contaminate the environment and affects aquatic animals. **Caution!** Avoid contact with human body and water bodies. Immediately consult a doctor in case of contact.
	***Harmful or irritating.***	✓ This substance can cause harm or irritation to human beings. **Caution!** Avoid contact with the human body and immediately consult a doctor in case of contact.
	***Carcinogenic***	✓ This substance is capable of causing cancer. **Caution!** Avoid exposure to the substance.

Common Accidents in the Laboratory and Related First Aid measures.

The following are the causes of common laboratory accidents.

- ❍ Cuts are caused by broken glass apparatus (for example test tubes or glass tunings), tools (for example dissecting instruments or cutters) or sharp edges.
- ❍ Carelessness in handling hot objects for example tripod stands, glassware, metal rods or plates), hot liquids, Bunsen burner flame or lighted matches.
- ❍ Learners' mischievous behaviour of pouring chemicals to others that result into chemical spillage.
- ❍ Learner's unintentionally rubbing their eyes with hands contaminated with chemicals.
- ❍ Accidental ignition of flammable liquids.
- ❍ Drinking liquids or inhaling fumes accidentally.

- ∗ The effects of common laboratory accidents include ***burns*** and ***scalds***, ***cuts*** and ***ingestion*** of harmful substances.
- ∗ In case of an accident, proceed using the **PIA** rule where:
- ∗ **P:** PROTECT- move the causality to a safe place.
- ∗ **I:** INFORM-report to the appropriate authority.
- ∗ **A:** ASSIST-give the necessary help.

Keep calm.

Keep the casualty warm.

Do not move the causality if you are unaware of the seriousness of the situation.

- ***All laboratories should have a first aid kit. The first aid kit should contain the following:***
  - An instruction manual giving general guidance.
  - Individually wrapped sterile adhesive dressings in a variety of sizes.
  - Sterile eye pads with bandages for attachment.
  - Triangular bandages.
  - Safety pins.
  - A bottle that contains eye drops.
  - A First Aid manual.
  - Scissors.
  - Gloves.
  - Antiseptic.
- **The Table below shows common laboratory accidents and related first aid measures.**

Common accident	Meaning	First Aid.
Cuts.	Sharp or pointed objects penetrate the skin causing cuts. Cuts result in bleeding.	- Wash the wound using clean water. - Disinfect the wound. - Apply an antiseptic solution to the wound. - Place a dressing and a bandage to hold it in place.

		- Go to a health centre in case the cut needs stitches.
Burns and Scalds.	**Burns** are soft tissue injuries caused by chemical hazards, electrical hazards or radiation. **Scalds** are soft tissue injuries caused by hot liquid or steam.	- Run the burnt area under cold tap water with low pressure for 10-15 minutes. - Study the size, depth and location of the burnt areas. If necessary, proceed to a health centre. - Cover the burn with a loose gauze dressing or a clean piece of cloth. Do not puncture blisters. **Note;** ❍ In case of chemical burns, remove any clothing contaminated by the chemical, as long as it is not stuck to the skin. Do not apply any lotion or any other remedy to the burnt area. ❍ In case of electrical burns, ensure the following - Before starting First Aid, stop the flow of electricity. - The rescuer must be on a rubber or wooden surface. - Remove the injured person from the source of electricity using a plastic or wooden object, as these do not conduct electricity.
Ingestion of harmful substances	Harmful substances can enter the body through the mouth by swallowing.	***If the victim is unconscious:*** ➢ Ask for urgent medical assistance. ➢ Put the casuality in recovery position. ➢ Loosen the clothing and wrap the victim in a warm blanket. ➢ **Do not** induce vomit. If the victim vomits, clear up the respiratory tract (cover your fingers) with fabric to clean the victim's mouth). ➢ Do not administer anything orally to an unconscious victim. ➢ Do not try to neutralize the toxic product.

		If the victim is conscious and the toxic substance is corrosive; - Make the victim drink plenty of water. - **Do not** induce vomit. - Take the victim to a health centre.

Safety measures and regulations in the laboratory.

When working in the laboratory, you must observe the following safety rules:

- Work carefully as carelessness can cause accidents as well as inaccurate results.
- Wear gloves, laboratory aprons and safety glasses.
- Never eat or drink in the laboratory.
- Tie back loose hair, roll back and secure open sleeves and neckties and make sure you wear shoes that fully cover your feet.
- Do not carry out laboratory experiments at home or in the dormitories unless directed to do so by your class teacher.
- Carefully read chemical labels and understand the hazard symbol on them.
- Listen carefully to your teacher's instructions on when and how to use safety equipment such as glasses, protective aprons, fire extinguishers and fire blankets.
- Make sure you know where the nearest fire alarm is in your school laboratory.
- Do not begin an experiment until the teacher instructs you to do so.
- Do not touch substances unless the teacher instructs you to do so. What looks harmless may be dangerous.
- Wash your hands with soap and running water after handling chemical substances. Some chemical substances are poisonous.
- Heat materials in suitable containers only, such as Pyrex glass container that can resist breakage.
- Always keep the open end of the test tube pointed away from the learners and yourself when heating chemicals because the fumes produced may be harmful.
- Pick up hot objects carefully using tongs or insulated materials.
- Make sure that you turn off the heat source when not in use to conserve energy.
- Always unplug electric cords by pulling out the plug and not the cord.
- Check that there are no flammable substances near the burner. Flammable substances will cause fire if exposed to a flame.
- After each experiment, tidy up your working area, clean all equipment and put them in their respective storage areas.
- Report any accidents, broken equipment and damaged facilities to your teacher. In this way, you will be taking responsibility for your safety and for those who use the laboratory after you.
- If a chemical gets into your eyes, wash it out with running water for about 12 minutes and then visit a health centre or hospital for further medical attention.
- If you inhale poisonous gases or vapour, move outside the laboratory for fresh air. Immediately seek medical assistance.

- In case of electric shock, immediately cut off the electric power source using an insulated object.
- In case of a fire outbreak, use sand, fire blankets and fire extinguishers to put out the fire.

1.3 Laboratory apparatus and Instruments.

Basic Science Skills.

- Science involves processes that are part of a scientific method.
- Scientists approach problems in various ways which have several processes that are common to them. These commonly used processes are called **science process skills**.

a.) Manipulative skills and abilities.

✓ These include skills in handling materials and apparatus in a scientific investigation.
✓ They also involve the ability to follow instructions and make accurate observations.

Examples.

- *Using and handling scientific apparatus.*
- *Cleaning and maintaining scientific apparatus properly and safely.*
- *Handling specimens properly and safely.*
- *Mixing primary colours to create more colours.*

b.) **Observation skills**.

✓ This is the most common basic skill in science. Scientists make observations by using the five senses. Good observation skills are helpful in learning other science process skills.

Example.

- *Making observations using the sense of touch.*
- *Creating observation about a coin using the five senses.*

c.) **Classification skills**.

✓ After observing, it is important to identify he similarities and differences and to group objects.

Examples.

- *Using a magnet to classify objects as either magnetic or nonmagnetic.*
- *Using a balance and sorting objects according to mass.*

d.) **Measuring skills**.

✓ Measuring is very important in collecting, comparing and interpreting data.
✓ It helps us to classify and communicate with others.

Examples.

- *Finding the mass of different liquids that have the same volume.*
- *Using technology to find the speed of a vehicle.*
- *Measuring the distance that a person travel.*

e.) Communication skills.

- ✓ Important so that it becomes possible to share our experiences.
- ✓ One can do this by using graphs, diagrams, maps and spoken word.

Examples.

- *Creating a line graph showing the relationship between speed and time.*
- *Discussing possible errors with other classmates.*

f.) Predicting skills.

- ✓ A prediction is an educated guess based on good observation and making a conclusion about an observed event or prior knowledge.

Examples.

- *Predicting what is in a box based on the sense of touch.*
- *Writing an assumption about the effect of increasing salt on the buoyancy of an egg.*

g.) Conclusion skills also called inferring skills

- ✓ A conclusion is an explanation based on observation. It is a link between what you observe and what you already know.

Example

- *Writing a conclusion at the end of each investigation.*
- *Creating conclusions about observations made about a particular object, for example, I conclude that it is a solid and not a liquid.'*

International System of Units (SI) for basic and derived quantities.

- ✍ Products such as sugar, milk, salt are purchased from shops in specific quantities or units of measure.

Basic and derived units of measurement.

- ✓ In 1971 the fourth General Conference on Weights and measures identified seven (7) quantities as basic quantities. This formed the basis of the **International System of Units** abbreviated as **SI units** from French name ***Syteme Internationale d'unites.***

What are Basic quantities?

- ✓ ***A basic quantity*** is one whose unit can be defined without referring to other quantities.
- ✓ The basic quantities are:
  - Length.
  - Mass.
  - Time.
  - Temperature.
  - Electric current.

- ✓ The table below shows the basic quantity unites and their symbols.

Basic quantity	SI unit	Symbol
Mass	Kilogram	**kg**
Length	Metre.	**m**
Time	Second	**s**
Temperature	Kelvin	**K**
Electric current	Ampere	**A**

What are Derived Quantities?

- ✓ Derived quantities are quantities that are calculated from two or more measurements.
- ✓ Derived quantities cannot be measured directly.
- ✓ Derived quantities an only be calculated.

Examples of derived quantities are:

- Volume.
- Density.
- Area.

- ✓ **Volume** =length x width x height (m x m x m) or m^3 (cubic metres).
- ✓ **Density** = Mass / Volume (Kg/m^3)
- ✓ **Area** (square or rectangle) = Length x width (m x m) or m^2 (square metres)

Applying the International System of Units (SI)

❍ **Mass.**

- Mass is the amount of matter in an object.
- Mass is measured in milligrams (mg), grams (g), kilograms (kg) and tonnes (t).

❍ **Length**.

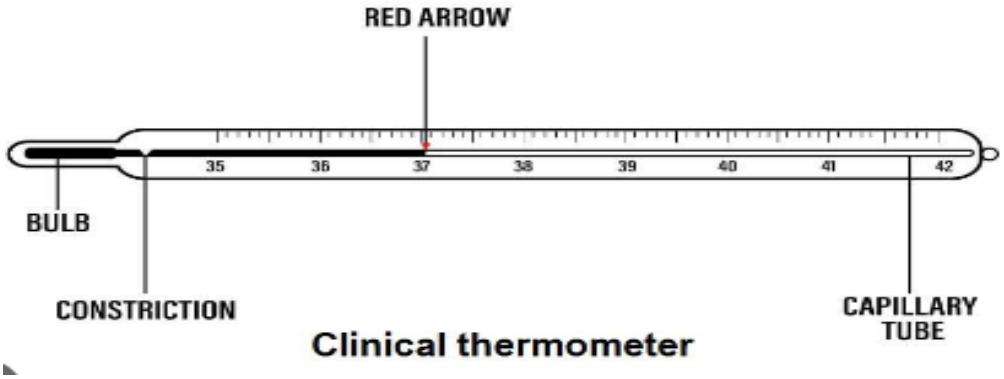
- Length is defined when we measure how long something is.
- It is the distance between two points.
- The units for measurement of length are millimeter (mm), centimeter (cm), Metre (m) and Kilometres (km)

❍ **Time**.

- Time is measured using a digital or analogue clock.
- The basic unit of measuring time is seconds (s).
- Larger units of time are minutes (min) and hours (hr).

❍ **Temperature**.

- An instrument that measures temperature is called a **thermometer**.
- Temperatures is measured in
  - ☞ Degrees Celsius (**^{0}C.)**
  - ☞ Degree Fahrenheit (**^{0}F**.)
  - ☞ Kelvin (**K**)
- The thermometer that measures our body temperature id called a clinical thermometer. The scale used or unit of measurement used is the Celsius scale (**^{0}C.)**
- A clinical thermometer reads temperatures from 35^{o}C to 42 ^{o}C.



Clinical thermometer

- There are other thermometers that measure temperature of other materials such as laboratory thermometer which has a range from -10 ^{o}C to 110 ^{o}C.

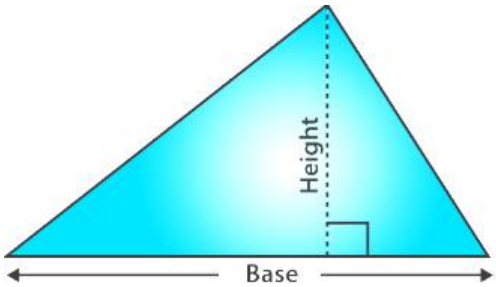
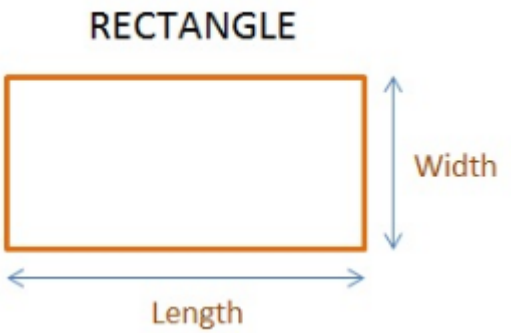
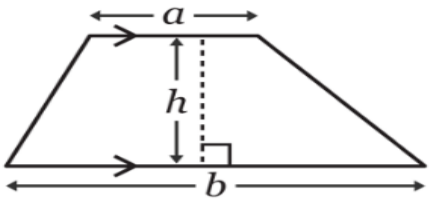
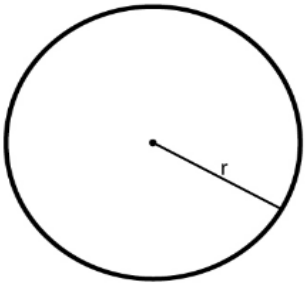
❍ **Electric current.**

- An electric current is the rate of flow of charge through a given point in an electric circuit.
- The SI unit for measuring the magnitude of an electric current is **Amperes** (**A**).

❍ **Area**.

- Area is the measure of the size of a surface.
- Two length measurements usually describe area hence presented in square units.
- The basic unit of measuring area is square metres (m^2)
- Area can also be expressed in square millimeters (mm^2), square centimeters (cm^2) and square kilometres (km^2).

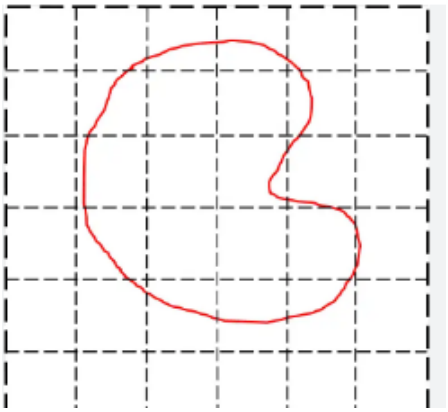
- ***Area of regular shapes***

Types of formula	Shapes
Triangle Area = $^1/_2$ x base x perpendicular height = $^1/_2$ bh	
Rectangle Area=length x width =***lw***	
Trapezium Area = Area = **$^1/_2$** (sum of parallel side) x perpendicular distance between the lines = **$^1/_2$ (a+b)h**	$A = \frac{1}{2}(a + b)h$ 
Circle Area = πr^2	

- ***Area of irregular shapes.***

✍ Area of an irregular shape can be estimate by first subdiving the shape into small regular shapes.

✍ The small regular shapes used can be of 1 cm length.



✍ **The area of the whole shape can be calculated as follows.**

- *Count the number of whole squares.*
- *Count the squares which are either half or more than half.*
- *Add the total number of complete squares to half the total number of the incomplete squares. For example, in the above picture*

Full squares=5
Number of squares that are more than half or half =6 then divide by 2 =3
Approximated are=5+3 = 8 square units.

❍ **<u>Volume</u>**.

- It is the amount of space an object occupies.
- Objects can be solids like a brick or liquid like water.
- Apparatus that measure volume of a liquid include;
  - Measuring spoon.
  - Measuring jug.
  - Measuring cylinder.
- The SI unit for measuring volume is **cubic metre (**m^3)
- Volume can also be measured in other units such as;
  - Cubic centimetres (cm^3)
  - Cubic millimetres (mm^3)
- **Common units for measuring liquid volume include**
  - *Litres.*
  - *Milliliters.*

❍ **<u>Density</u>**.

- It is the heaviness of a substance in relation to their volume. Therefore, density is mass per unit volume.
- Mass can be measured in kilograms (kg) while volume is measured in cubic metre (m^3)
- Since mass is measured in **kg** and volume is measured in **m^3**, the SI unit for density is **kg/m^3**.
- Density can also be expressed in grams per cubic centimetre (**g/cm^3**)

Laboratory apparatus and instruments.

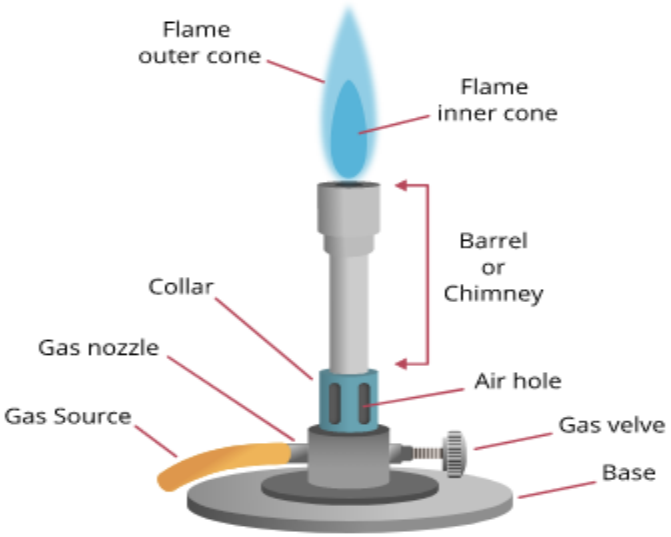
❍ **Apparatus and Instruments for Heating.**

- Most common source of heat in the laboratory is the Bunsen burner.
- Other heat sources include portable burners, kerosene stoves, spirit lamps, candles and electric hot plates.

Spirit lamp	***Candle***	***Electric hot plate***	***Portable burner***	***Kerosene stove***
				

Observing A Bunsen burner.

Parts of a Bunsen burner



Functions of the parts of a Bunsen burner.

Part	Function
Collar	*Regulates amount of air entering the Bunsen burner through the air hole.*
Air hole	*Allows air to enter the chimney. (air mixes with the gas making flame hotter and blue.*
Chimney (barrel)	*Raises the flame to a suitable height for burning.*
Base	*Supports the Bunsen burner and prevent it from toppling.*
Gas hose	*The flexible hose pipe connects the Bunsen burner and the gas tap.*
Flame	*A hot glowing mass of ignited gas that is generated by something on fire.*
Gas inlet	*Controls the flow of gas to the Bunsen burner.*

❍ **Apparatus and Instruments for Measuring Mass.**

- Various instruments are used to measure mass.
- Mass can be measured using a beam balance, electronic balance and weighing balance.

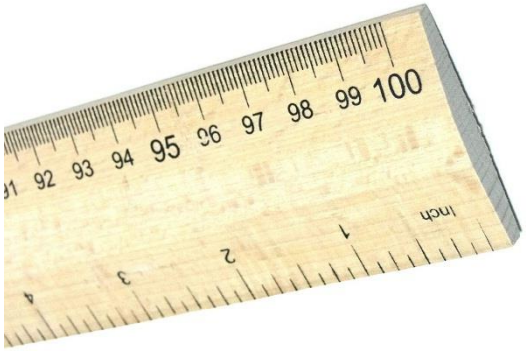
Electric balance	Beam balance	Weighing balance
		

❍ **Apparatus and Instruments for Temperature.**

- Temperature is defined as the hotness or coldness of any object or substance.
- Kelvin (K) is the SI units for temperature.
- Apart from Kelvin, temperature is also measured using the Celsius scale **(°C)** and Fahrenheit scale **(°F)**
- A laboratory thermometer is the instrument used to measure temperature in the laboratory.

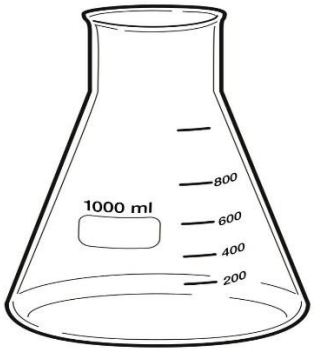
❍ **Apparatus and Instruments for Measuring Length.**

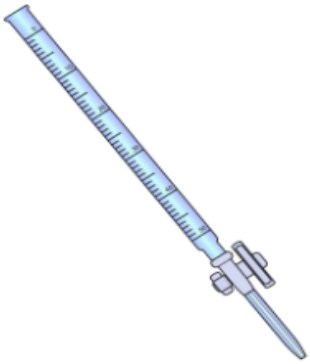
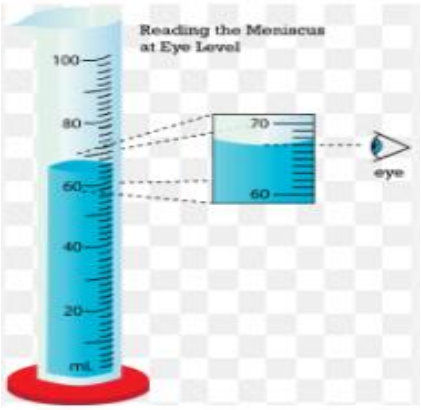
- Length of an object in the laboratory is mostly measured using the metre rule, 15 cm ruler, 30 cm ruler and the tape measure.

Metre rule	Tape measure
 *Part of metre rule.*	

❍ **Apparatus and Instruments for Measuring Volume.**

- In the laboratory various instruments are used to measure volume of liquids.
- Examples of these instruments include:
  - Conical flask.
  - Syringe.
  - Beaker.
  - Burette.
  - Graduated cylinder.
  - Pipette.
  - Volumetric flask.

Conical flask	*Syringe*	*Beaker*
		

 ***Burette***	***Graduated cylinder*** 	***Pipette*** 
Volumetric flask 		

❍ **Apparatus and Instruments for Measuring weight.**

- Weight is the pull of gravity on a mass of a body.
- The pull of gravity is the force that pulls objects towards the centre of the earth.
- The SI unit of weight is Newton (**N**)
- A **spring balance** is commonly used to measure weights of objects in the laboratory.

Spring balance


❍ **Apparatus and Instruments for Measuring time.**

- In the laboratory, a clock, wristwatches and stopwatches are commonly used to measure time.
- The SI units for measuring time is seconds (s).
- Time can also be measures using other dimensions such as minutes and hours.

Clock	Wristwatch	Stop watch
		

❍ **Apparatus and Instruments for Magnification.**

❖ **<u>Hand lens.</u>**

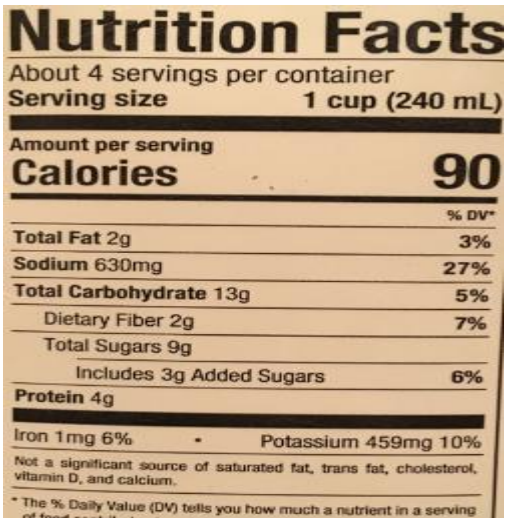
- It is a lens of specified magnification fixed on a frame.
- When a hand lens is moved up (far) and down (close) over a specimen, it enlarges up to the sharpest image where you can clearly view the specimen and the viewer can observe particular details.
- Hand lens have a limited magnification of between X5 and X10.

❖ **<u>Microscope.</u>**

- A microscope is an instrument used to magnify (enlarge) small objects for clear visibility.
- Plant and animal cells are too small to be viewed with naked eyes, therefore a microscope is used to view the cells.

Packaging Labels on Quantities or Products.

- Packaging labels can be used to pass information about a certain type of products such as chemicals or food materials.
- A food label is a piece of paper or other materials marked or inscribed and attached to a food package.
- It contains a variety of information about the nutritive value of the food label.



Nutrition Facts

About 4 servings per container

Serving size **1 cup (240 mL)**

Amount per serving

Calories **90**

	% DV*
Total Fat 2g	3%
Sodium 630mg	27%
Total Carbohydrate 13g	5%
Dietary Fiber 2g	7%
Total Sugars 9g	
Includes 3g Added Sugars	6%
Protein 4g	

Iron 1mg 6% • Potassium 459mg 10%

Not a significant source of saturated fat, trans fat, cholesterol, vitamin D, and calcium.

* The % Daily Value (DV) tells you how much a nutrient in a serving

A food packages Label

❍ **<u>Information that are found on a packaging label.</u>**

- *Name under which the product sells.*
- *The manufacture and expiry date.*
- *Lis of ingredients. Ingredients are things that are combined to make a particular product.*
- *The quantity of product in the package.*
- *Any special storage instructions.*
- *Instructions for use, where necessary.*

What is the importance of reading Packaging labels?

- Labels help the consumers to make the right choices on what to buy.
- Labels guide on how to use, store and what to avoid while using the product.
- Labels inform consumers of the products' name, quantity, ingredients, manufacturing and expiry date.
- Labels also help people with allergies, especially food allergies, to make informed choices and know what to avoid.

STRAND 2 MIXTURES, ELEMENTS & COMPOUNDS.

- **A mixture** is a combination of two or more substances put together resulting to a mass.
- Mixtures are commonly used in daily life such as soil, coffee and air.
- Soil is a mixture of sand, stone, clay, salts and living organisms.
- Air is a mixture of different gases such as oxygen, nitrogen, carbon dioxide, water vapour and other gases.
- The substances that are combined to form a mixture are called **components.**

Types of Mixture.

- **Homogeneous mixture.**
  - It appears uniform to the eyes.
  - Homogenous mixtures form a uniform composition.
  - Example, cement is a homogenous mixture of different solids such as limestone, shells and chalk among others.
  - Other homogeneous mixtures are steel (iron and carbon) and bronze (copper and tin).

- **Heterogeneous mixture**.

- Heterogeneous mixture is a mixture made up of a non-uniform composition.
- If you take two samples from different parts of the mixture they will not be identical.
- For example, you can differentiate rice (solid) from salt (solid) in the mixture.
- Other heterogeneous mixtures include salt and sand, sand -sugar, salt -gravel mixtures.

In some cases, two or more substances are mixed together to form a special kind of mixture.

- For example, when you mix salt (solid) and water (liquid), the solid seems to disappear in the water. This process is called **dissolving** and it forms **a solution**.
- When a solid dissolve in a liquid, the liquid is called **a solvent** and the solid that dissolves is called **a solute**.
- A solution is a special type of mixture that is **homogenous** and so you cannot tell the difference between the components of a solution.
- Water and sand forms a heterogeneous mixture. One can easily separate the sand from water.
- Milk (liquid) mixes with water (liquid) completely to form a uniform mixture. Therefore, this mixture is homogeneous.
- Oil (liquid) mixes with water (liquid) to form a new substance that is not uniform. Both substances of the mixture can be seen. Therefore, this mixture is heterogeneous.
- A gas-gas mixture is comprised of various gases, for example, the air we breathe is a combination of oxygen, nitrogen, carbon dioxide, water vapour and other gases.
- The air we breathe is therefore a homogeneous mixture.

Pure and Impure substances.

- When two pure substances are mixed together, they form a mixture.
- A mixture is an impure substance. Therefore, a pure substance is any material that is not a mixture at all.
- The melting and boiling points of pure and impure substances can be determined.

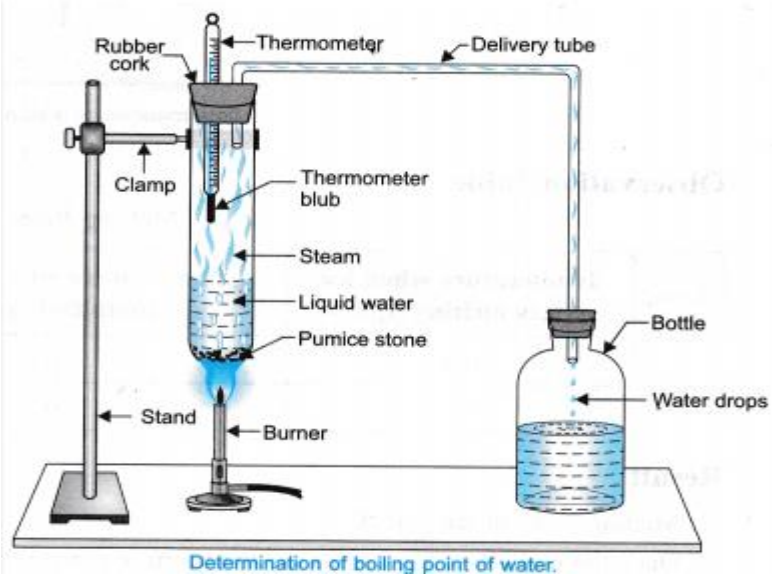
Melting point of pure substances (Ice).

- It is the temperature at which a solid change into liquid state.
- The melting point of ice is the temperature at which ice is converted from its solid state to its liquid state.
- Heat from a heat source is used to melt the ice.
- The thermometer helps to note the temperature at which the ice melts.
- After the initial and final readings are taken, it will be observed that once the ice attained its melting temperature (0^oC), the temperature remains the same until all the ice is converted into liquid state.
- Pure solids have specific melting points. Therefore, it means that ice is a pure substance.

Melting point of Impure substances (Candle wax).

- The melting point of candle wax is the temperature at which the solid materials turns into liquid (by heating it).
- The melting point of candle wax ranges between 46^oC to $68\ ^oC$. Therefore, it means that candle wax is an impure substance.
- Impure substances do not have specific melting points. The presence of impurities affects the melting point of the substances.

Determining Boiling points of Pure and Impure substances.

- 

Determination of boiling point of water.

Requirements for the experiment

1. Boiling tube.
2. Thermometer.
3. Heating apparatus.
4. Distilled water.
5. A spatula.
6. Salt and water.

Procedure for the experiment above.

- Put about $10cm^3$ of distilled water on a boiling tube.
- Close the tube with a stopper that has two holes.
- Pass a thermometer through one hole. Immerse the thermometer bulb into the water.
- Push and 'L' shaped tube through the other hole as shown above.
- Heat the apparatus using a small flame.
- Observe the changes in temperature and record your observations.
- Cool the apparatus and remove the stopper.
- Add a spoonful of salt to some water/ stir to dissolve all the salt to form a salty water solution.
- Repeat the above experiment using a salty water solution in place of pure distilled water.
- Observe changes in temperature, record your observation. What conclusion have you made.
- At what temperature does water (pure water) boil?
- At what temperature does water with dissolved salt (impure water) boil/
- Compare your observations.

Observations and conclusion & Explanation.

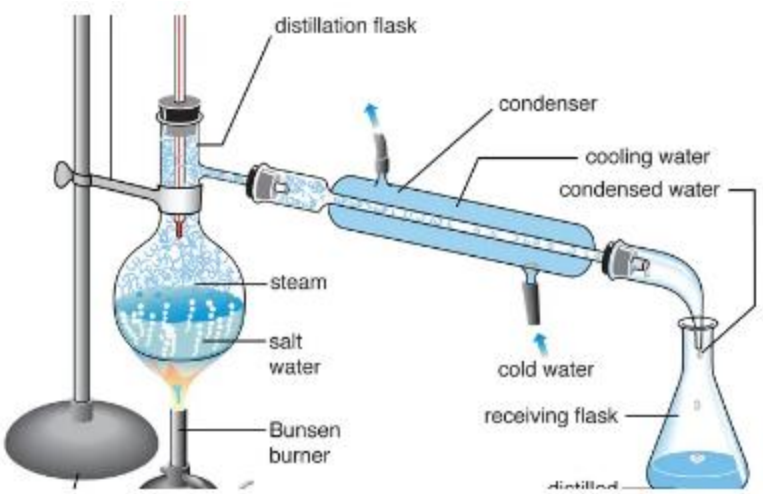
- When distilled water is heated, the temperature of the water rises to about 100^oC.
- After this, the temperature remains constant (not changing) for some time. The heat absorbed changes liquid water into water vapour or steam.
- Pure water has a definite or specific boiling point.
- Salty (impure) water has a range of boiling temperatures above 100^oC.
- Impurities cause a rise in temperatures of the boiling point of liquids.
- The greater the impurities in the given solution, the higher the boiling point. Therefore, we can use the boiling point to determine the purity of a liquid.

Separating Mixtures using different methods.

- Different methods can be used to separate various mixtures.
- Each method is suitable for separating a particular mixture.

a.) **Separating mixtures through distillation**.

- ***Requirements***.
  - A spatula.
  - Water.
  - A measuring jar.
  - A thermometer.
  - Common salt.
  - Distillation flask
  - Condenser.



❍ ***Procedure***.

- Add about 25cm^3 of water to common salt in a distillation flask.
- Shake the mixture carefully to dissolve the salt.
- Set up the apparatus as shown above.
- Heat the mixture until only a little solution remains in the distillation flask.

Questions from the experiment.

1. Through which process does the steam change to liquid in the collecting jar?
2. What is the term used to refer to the water that is collected in the receiving flask?
3. Why is cold water used in the condenser?
4. What is the substance that is left in the boiling tube after the water has evaporated?

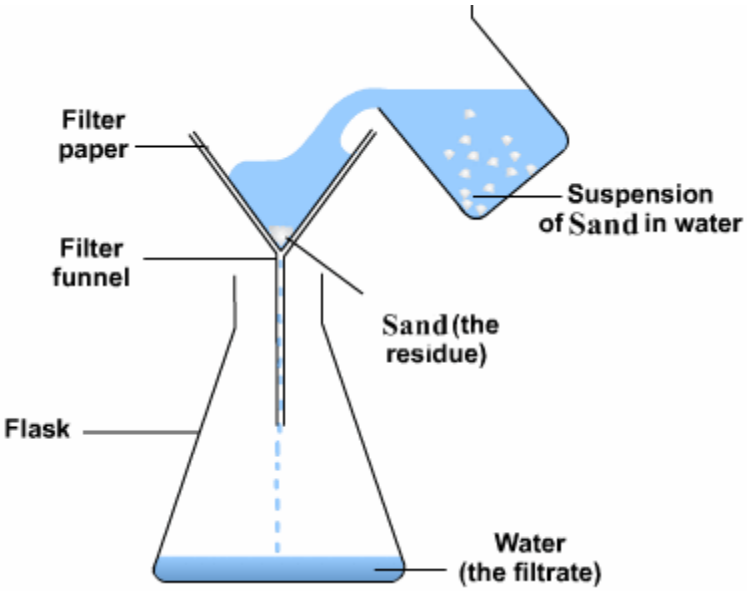
❍ ***Observation and explanation.***

✓ Simple distillation is successful when the substances in the mixture have different boiling points such as water and salt.
✓ The process of distillation is used to get salt and water from the salt-water mixture.
✓ It involves heating a liquid to form vapour which is then cooled back to the liquid.
✓ The liquid is obtained by condensing the vapour.

b.) Separating mixtures through filtration.

❍ ***Requirements.***

- A filter funnel.
- Conical flask.
- Filter paper.
- Water.
- Fine sand particles.



❍ ***Procedure.***

- Get a filter paper and fold it into a cone.
- Clamp the filter funnel.
- Add sand into a conical flask that contains warm water and stir. Pour the mixture into the filter funnel and observe. Record your observations.
- Question from the experiment.

1. What observation did you make?
2. What made it possible for the mixture to separate?
3. What is the purpose of the filter paper?
4. What is the name of the liquid that passes through the filter paper?
5. Give the name of the solid particles trapped by the filter paper.

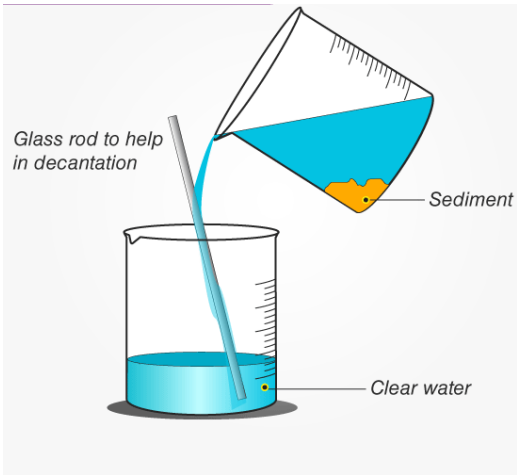
❍ ***Observations and explanation***

✓ Filter paper is made up of porous materials that allow liquids to pass through but traps solid particles during **filtration**.
✓ The liquid obtained through the filter paper is called **filtrate**.
✓ In the experiment water is the filtrate.
✓ The filter paper traps solid particles.
✓ The solid particles trapped is called **residue**.
✓ In the experiment sand particles form the residue.
✓ Sand is insoluble in water and therefore it does not dissolve in water.

c.) Separating mixtures through decantation.

❍ ***Requirements***.

- Sand particles.
- Water.
- Two beakers.



❍ ***Procedure.***

- Mix sand and water in a beaker.
- Stir the mixture.
- Leave the mixture to stand for some time until the sand settles at the bottom of the beaker.
- Carefully, pour the water (liquid) into the other beaker.
- Pour the water in such a manner that the insoluble material (sand) remains in the fisrt beaker.
- Discuss and record your observations.

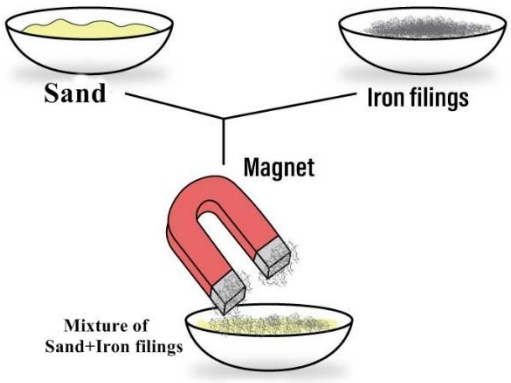
❍ ***Observation and explanation.***

- **Decantation** is the process of separating insoluble solid particles from a liquid, for example, sand from water.
- After leaving the mixture to stand for some time, the heavy particles of sand settle at the bottom of the beaker, however the water collected is not clear as it contains some solids and dirt.
- Decantation can also separate two insoluble liquids such as paraffin and water. The liquid at the top is poured off in a different container.

d.) Separating mixtures using a magnet.

❍ ***Requirements***.

- Iron fillings.
- Sand.
- A magnet.
- A bowl.



❍ ***Procedure***.

- Put the iron fillings in a bowl.
- Add some sand into the bowl.
- Mix the two substances. Describe the mixture.
- Pick the magnet and hold it slightly above the mixture.
- Observe what happens. Record your observations.

Questions from the experiment.

1. What do you notice on the surface of the magnet?
2. Why did the magnet pick the iron filings and not the sand?
3. What kind of mixture is a magnet used to separate?

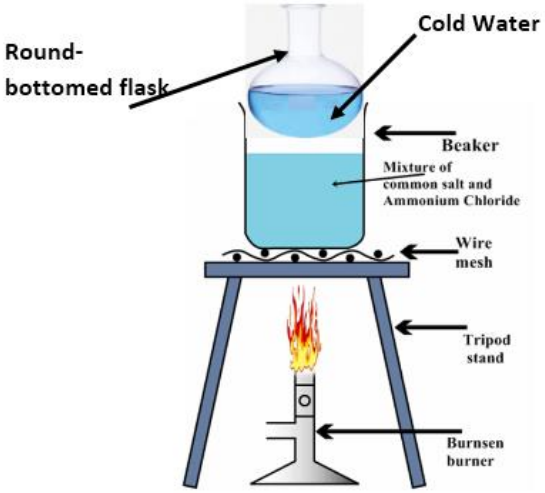
❍ **Observation and Explanation.**

✓ A magnet is used to separate materials attracted to it from those not attracted to it.
✓ Materials that are attracted to a magnet are called **magnetic materials.**
✓ In the experiment above, a magnet attracts iron filings because iron filings are magnetic.
✓ A magnet does not attract sand as it is nonmagnetic.
✓ Therefore, the magnet will attract iron filings and separate them from the sand.

e.) Separating mixture using sublimation.

❍ ***Requirements***.

- Sodium chloride.
- Ammonium chloride.
- Bunsen burner.
- Wire gauze.
- Watch glass.
- Beaker.
- Cold water in a round bottomed flask.



❍ ***Procedure***.

- Mix sodium chloride (common salt) and ammonium chloride in a glass beaker.
- Cover the beaker with a round-bottomed flask containing cold water.
- Heat the mixture gently and observe what happens. Record your observation.

Questions from the experiment.

1. What happens to the mixture when heated?
2. What happens to the surface of the round-bottomed flask?
3. Describe the work of the cold water in the round-bottomed flask.

❍ **Observation and explanation.**

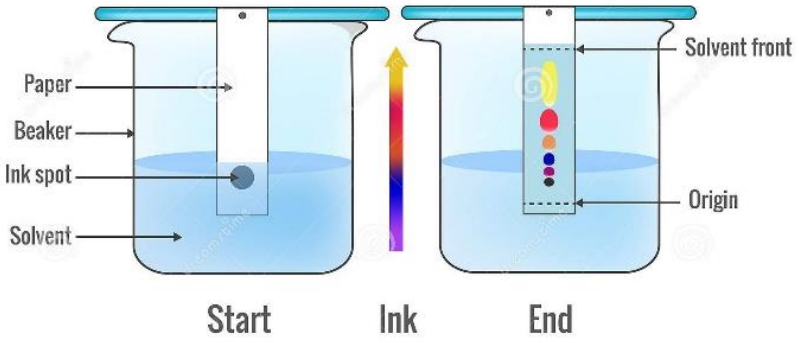
✓ Ammonium chloride form white fumes which condense into a white solid on the cooler surface of the round-bottomed flask and the beaker.
✓ Sodium chloride (salt) remains in the beaker.
✓ Sublimation is the direct change of a solid into gas after heating and vapour into solid on cooling without passing through the liquid state.
✓ A sublimate is the solid formed when a vapour cools.

f.) Separating mixture through paper Chromatography.

❍ ***Requirements***.

- Chromatography paper.
- Ink.
- Dyes.
- Colouring agents.
- Water and small plate or bowl with a flat bottom.

Paper Chromatography



❍ ***Procedure***.

- Draw a line with a pencil on the chromatography paper and place spots of ink or dye on the pencil line.
- Place the paper uprightly in water (solvent) in the small plate or bowl with flat bottom.
- As the paper is lowered into the solvent, some dye spread on the paper. As the solvent soaks up the paper, it carries the mixture with it. Different components of the mixture will move at different rates. This separates the mixture.
- The paper continues to absorb the solvent and the dye spreads further up the paper.
- Compare your observations with those of others, make your conclusion.

❍ ***Observation and explanation.***

✓ **Paper chromatography** is a method used to separate Coloured mixtures into their different parts.
✓ Paper chromatography is commonly used to separate pigments, dyes and ink.
✓ Paper chromatography works because ink contains different colours.

g.) Separating mixture through solvent extraction.

❍ ***Requirements***.

- Piece of plain paper.
- Evaporating dish.
- Mortar and pestle.
- Nuts.

❍ ***Procedure***.

- Remove outside covering of the grounds.
- Put the nuts in a mortar and grind them using pestle.
- Add propanone and continue grinding for a while.
- Leave the mixture to settle, and then decant the resulting solution into an evaporating dish.
- Leave the solution in the sun for some time.
- Smear a drop of the remaining solution on a piece of paper.
- Hold the paper towards light and try to look through it.
- Discus and record your observation.

Questions from the experiment.

1. Explain why the solvent is used in the extraction of oil from nuts.
2. Name other seeds that can be used in place of nuts.

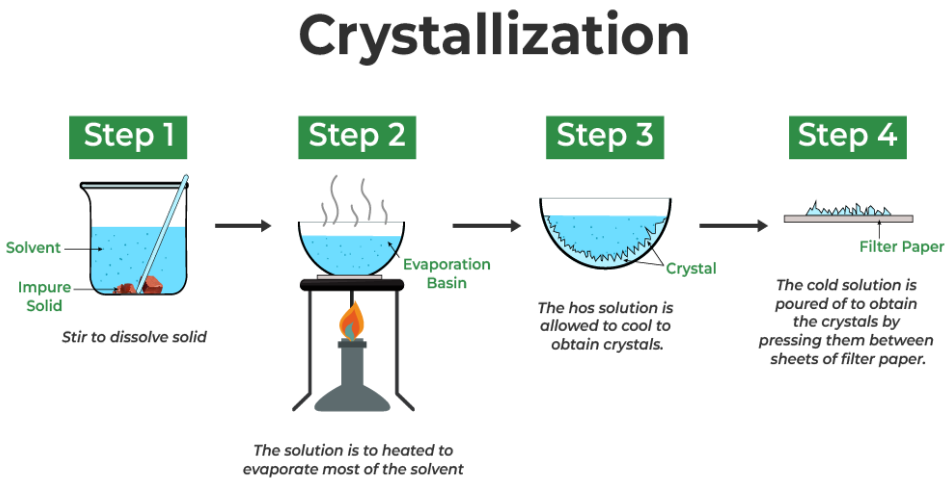
❍ ***Observation and explanation.***

✓ **Solvent extraction** is the use of a solvent to dissolve a substance from a mixture to separate the components of the mixture.
✓ **A solvent** can selectively dissolve one or more of the components of a mixture.
✓ **Propanone** is a solvent for oil and therefore dissolves oil from the nuts.
✓ When you put propanone solution in the sun, it quickly evaporates, leaving oil behind.
✓ Oil seed like corn, sunflower, castor oil and cotton seed can be used in place of nuts.

h.) Separating mixtures through crystallization.

❍ ***Requirements***.

- Water in a beaker.
- Some salt.
- A heat source.
- Filter paper.
- Glass bowl.



❍ ***Procedure***.

- Place 50ml water in a beaker.
- Add salt to it and stir.
- Heat the solution.
- Continue adding salt to the solution.
- After some time, there will be a point at which no more salt can dissolve in water. This stage is called ***saturation point*** and the solution in known as a ***saturated solution***.
- ***Therefore, a saturated solution is a solution that can no longer dissolve any more solute***.

- Filter the salt with the help of a filter paper.
- Collect the filtrate in a glass bowl and cool it.
- Record your observation.

❍ ***Observation and explanation.***

✓ In the experiment, some fine crystals are formed in the bowl.
✓ Crystallization is a separation method used to separate a solid that has dissolved in a liquid.
✓ A solid, for example **salt(solute),** is dissolved in a liquid, for example **water, (solvent)** making a solution.
✓ The solute is added to the solvent until no more of it dissolved. This makes the solution saturated.
✓ As the solvent evaporates from the saturated solution, the solid will come out of the solution and crystals will start to form.
✓ Collect the crystals and allow them to dry.

Applications of Separating Mixtures in day-to-day life.

✓ We filter dirty water through a piece of cotton cloth to obtain clean water at home. However, we should always boil such water to kill germs before drinking it.
✓ We filter tea leaves from the tea before taking the tea.
✓ Decantation separates the cream from milk. Cream rises to the top of the liquid and is easily skimmed off.
✓ Fractional distillation is used in some industries to separate components of mixtures that have different boiling points. Example is crude oil refining. Crude oil consists of products with different boiling points. The components of crude oil include:
    - Petrol- a fuel for petrol engines.
    - Kerosene-used in cooking stoves and lamps.
    - Gas oil, lubricating oil, paraffin wax and bitumen or tar used for tarmacking roads.
✓ Fractional distillation is used to separate liquid air into its major components of nitrogen and oxygen.
✓ Chromatography can be used to find out which flavouring has been added to food.
✓ Extraction of oil from nuts uses the solvent extraction method.

ACIDS, BASES AND INDICATORS.

- Substances such as lemon, oranges juice and vinegar taste sour. These is because they substances contains **acids**. The chemical nature of these substances is **acidic**. The acids in them are natural.
- Some substances taste bitter with their solutions filling soapy when rubbed between the fingers when touching. These are **bases**. Their chemical nature is **basic**.

Plant extracts as acid-base indicators.

- To determine if a substance is acidic or basic, we use **indicators.**
- Indicators change colour when added to a solution contain either a n acidic or basic substance.
- ***Turmeric***, ***litmus*** among others are some of the naturally occurring indicators.

Cautions:

- ***Do not taste anything unless the teacher asks you to do so.***
- ***So not touch anything unless the teacher asks you to do so.***

❍ **Preparing and using Plant Extract indicators.**

Requirements.

- Red cabbage.
- A mixer or blender.
- Water.
- Filter paper.
- Common solutions such as lemon, milk, vinegar and bleach.

Procedure.

- Cop some red cabbage and put it in a mixer or blender.
- Add water to it.
- Mix until juice is formed.
- Strain(filter) this mixture in to a beaker. This is the natural indicator.
- Use the prepared red cabbage indicator to test whether the household solutions are acidic or basic.
- What observations did you make?
- What can you conclude from your observations?

Observation and explanation.

- ✓ Acidic substances change colour of the solution from purple to red or pink.
- ✓ Neutral substances turn the purple solution to blue.
- ✓ Basic substances change the colour of the purple solution to green or yellow.
- ✓ Therefore, red cabbage is a natural indicator.

Categories of different household solutions.

- Indicator are substances that change colour when added to acidic or basic solutions.
- Common indicators used in the laboratory are:
    - ✶ *Litmus paper.*
    - ✶ *Phenolphthalein.*
    - ✶ *Methyl orange.*
- Litmus indicator solution turns red in acidic solutions, blue in basic solution and purple in neutral solutions.
- ***Colour changes of litmus paper indicators in different solutions.***

	Red litmus paper	Blue litmus paper.
Acidic solution	***Stays red***	***Turns red***
Neutral solution	***Stays red***	***Stays blue***
Basic solution	***Turns blue***	***Stays blue***

✶ ***The table below shows colour of Methyl Orange and Phenolphthalein in acidic, neutral and basic solutions.***

Indicator	Acidic solution	Neutral solution	Basic solution
Methyl Orange	***Red***	***Yellow***	***Yellow***
Phenolphthalein	***Colourless.***	***Colourless***	***Pink***

Strength of Acids and Bases.

❍ **pH scale and pH chart.**

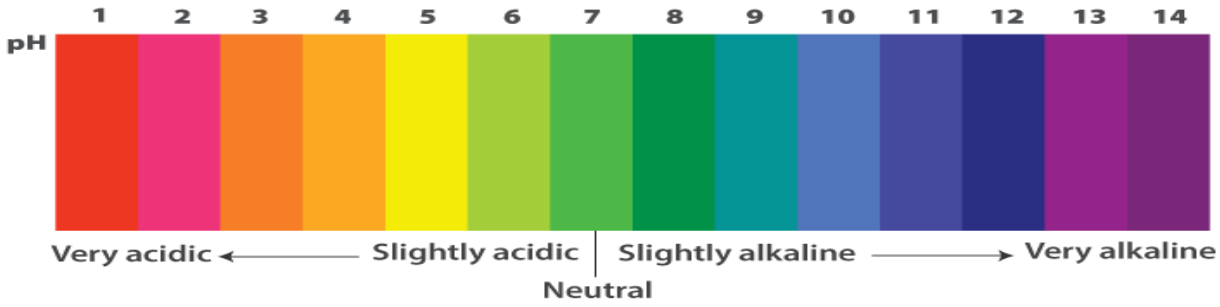
- pH stands for potential of Hydrogen.
- It is used to find the numeric value of the level of acidity or basicity of a substance.
- It is the most common and trusted way to measure how acidic or basic a substance is.
- The chemical properties of many solutions enable them to be divided into three categories-**acidic, basic or neutral solutions.**
- The pH scale is used to measure acidity and basicity (alkalinity).
    - ↳ Solutions with a pH **less** than 7 are acidic.
    - ↳ Solutions with a pH of 7 are neutral.
    - ↳ Solutions with a pH **more** than 7 are basic (alkaline).

- The pH scale reads from value 0-14.
- Solutions with pH less than 3 are **strong acids**.
- Solutions with pH values of 3-6 are **weak acids**.
- Solutions with a pH value of 7 are **neutral**.
- Solutions with a pH value of more 8-11are **weak bases**.
- Solutions with a pH value of 11-14 are **strong bases**.

Hydrochloric acid	lemon	vinegar	Apple tomato	banana	milk	Water blood			Soap Baking soda	ammonia		Drain cleaner	Alkali/base
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Universal Indicator

- A universal indicator is a mixture of a variety of other indicators.
- A universal indicator can measure the approximate pH of a solution.
- if a universal indicator is added to a solution, it changes to a colour showing the pH of the solution.



❍ Acids, Bases and Indicators in Real life.

- Acids and bases are widely used in our daily life such as in agriculture, food preparation and medicine.

❖ Uses of acids.

- Vinegar has various household uses such as preservation.
- Citric acid is important part of lemon juice and orange juice; it can also be used in food preservation.
- Sulphuric acid is widely used in batteries that are used to start the engines of automobiles.
- Industrial production of dyes, paints and fertilizers involve the use of Sulphuric acids and nitric acid.
- Phosphoric acid is a key ingredient in many soft drinks.

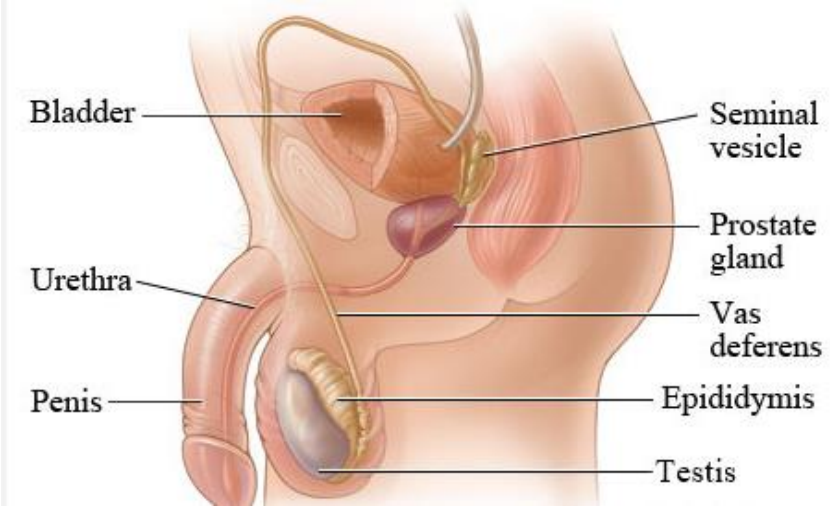
❖ Uses of bases.

- Manufacturing of soaps and paper involves the use of sodium hydroxide.
- Calcium hydroxide is used to manufacture bleaching powder.
- Magnesium hydroxide is commonly used as a laxative. It also reduces excess acidity in the human stomach and is therefore, used as an antacid.
- Slaked lime can neutralize any excess acidity in soils.

STRAND 3 LIVING THINGS AND THEIR ENVIRONMENT.

3.1 Parts of the Human Reproductive system and their functions.

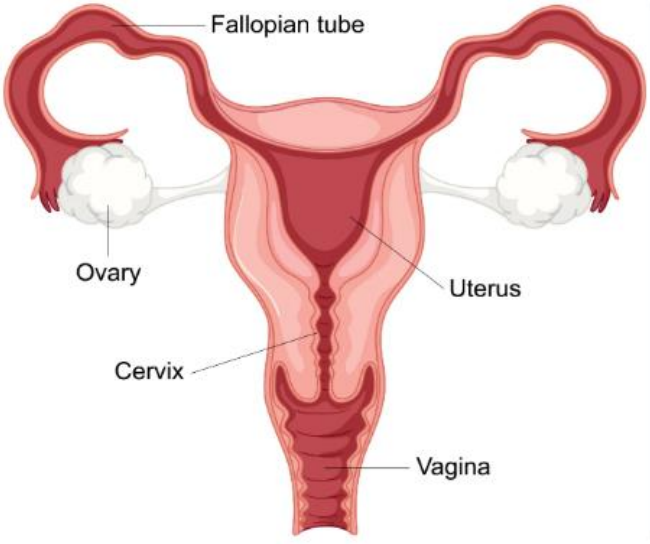
Male reproductive system.



Testis - Use to produce sperms.
Penis - used to transfer and deposit sperms into the female vagina during copulation.
- Used for urination.

Urethra – it is the passageway for urine and for semen**.**
Epididymis – stores sperms.

Female Reproductive System.



Vagina – acts as passageway for child birth.
Uterus – This is where implantation takes place.
Oviduct (fallopian tube)– this is where fertilization takes place.
Ovaries - produce ova and secrete hormones.

Changes occurring in boys and girls at puberty.

- Changes that can be seen during puberty are called physical changes.
- However, at puberty there are also emotional and social changes that occur but unlike the physical changes, they cannot be seen.

Physical changes during puberty.

	Physical changes in Boys		Physical changes in girls.
1	Increase in weight and height	1	Increase in weight and height.
2	Chest and shoulders broaden.	2	The hip region broadens.
3	Growth of hair on the face or chin(beards)	3	Breasts enlarge.
4	They experience wet dreams.	4	Hair grows under the armpits and around the pubic area.
5	Growth of hair on the chest, under the armpits and around the pubic area.	5	Pimples may appear on the face.
6	Pimples may appear on the face.	6	Menstruation begins.
7	Breaking of voice. The voice becomes deeper.	7	

Emotional changes in puberty.

- The physical changes that take place at puberty may in turn lead to emotional changes.
- Emotional changes mainly affect the feelings and behaviour of adolescents.
- The following are emotional changes experienced by boys and girls:
  - ✓ Identity crisis.
  - ✓ Feeling shy.
  - ✓ Mood swings.
  - ✓ Attraction to the opposite sex.

a) **Mood swings**-adolescents may experience hormonal changes which may make them feel angry, aggressive, anxious or easily offended. Most of them are happy for a while but easily get irritated and sad over little issues.

b) **Feeling shy**-adolescents may feel shy about the changes in their bodies. Girls may feel shy about enlargement of breasts. Some may wear heavy clothes to hide their breasts. Boys may feel shy to speak because of their deep voice. They may also feel embarrassed because of wet dreams.

c) **Attraction to the opposite sex**-adolescent boys get attracted to girls whereas girls get attracted to boys.

d) **Identity crisis**-this is a state where adolescents may not be sure of whether they are children or adults. They may also want to be recognised by everybody. Adolescents may not want to be guided on what to do because they think they are adults.

Social changes in Boys and Girls in puberty.

- Physical and emotional changes may affect how adolescents relate with those around them.

i. **Peer pressure**-adolescent boys and girls always feel like they should have a sense of belonging. This leads them to creating small groups called peer groups. Positive peer groups lead to development of good habits. Negative peer groups may lead to bad behavior such as drug abuse.

ii. **Seeking for independence**-adolescents may want more freedom to make their own decisions and choose what they want.

iii. **Risk taking**-adolescents always want to try new experiences without minding the consequences.

iv. **Forming new social groups**-adolescents may choose friends with whom they share common interests.

Personal Hygiene needs during puberty.

- During puberty, adolescents may sweat and this may lead to bad odour.
- It is important to observe general personal hygiene.
- Good personal hygiene reduces risk of illness.
- When we observe personal hygiene, we feel good and look presentable.

3.2 Human Excretory System.

Skin and Urinary system.

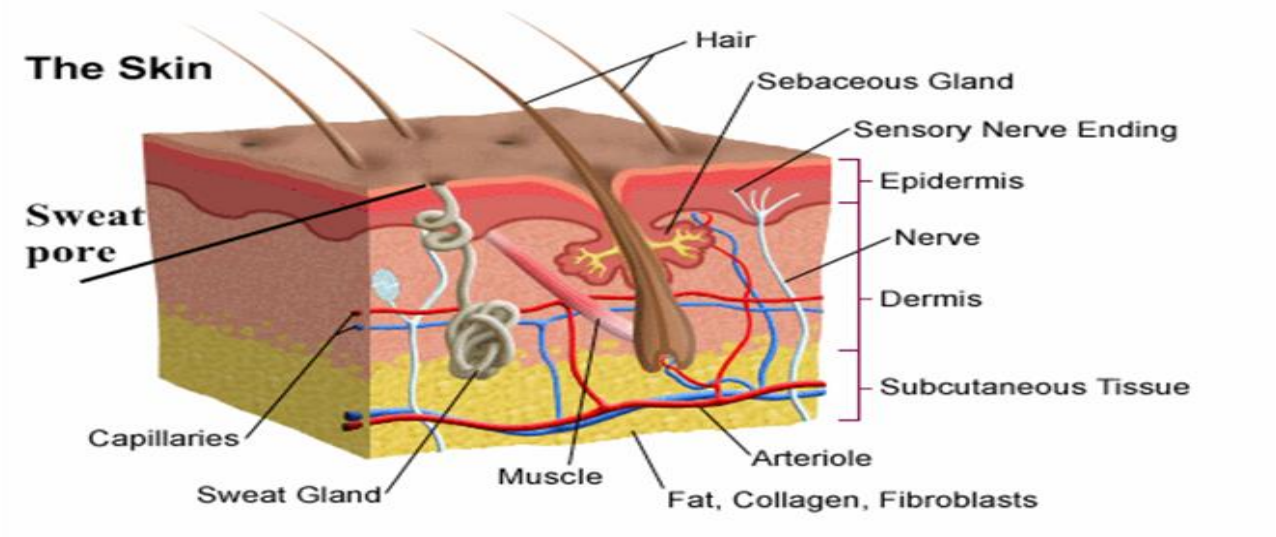
- Excretion is the process by which living organisms remove waste products from their bodies.
- The excretory system removes waste from the body in human beings.
- Examples of waste in the human body include:
  - ***Urine.***
  - ***Salt.***
  - ***Excess water.***
  - ***Carbon dioxide.***

Importance of excretion.

- Excretion helps to remove harmful waste products from the body. This prevents them from accumulating to toxic levels which can cause sickness or death.

The Skin.

External parts of the Skin.



- The skin is the largest body organ.
- The parts of the skin are:
  - ✓ ***Hair***.
  - ✓ ***Sweat glands***.
  - ✓ ***Epidermis.***

Functions of the Human skin.

The human skin has the following functions.

- It covers the whole body protecting against heat, light, injury and infection.
- It helps to make vitamin D when exposed to the sun. Vitamin D is important in the body.
- The skin helps to regulate the body temperature. It also helps to prevent dehydration and protect one from the harmful effects of too much heat or cold.
- The skin is a sensory organ. It allows the body to feel warm, cold, pressure, itchy and pain.
- New skin cells form at the base of the epidermis. The epidermis also gives the skin its colour.
- The skin has hair which covers the body providing warmth and protecting the skin. The hair such as eyebrows and eyelashes protects the eyes and contributes to a persons' appearance.
- The sweat pores allow sweat to get out of the body.

<u>Waste products excreted through the Skin.</u>

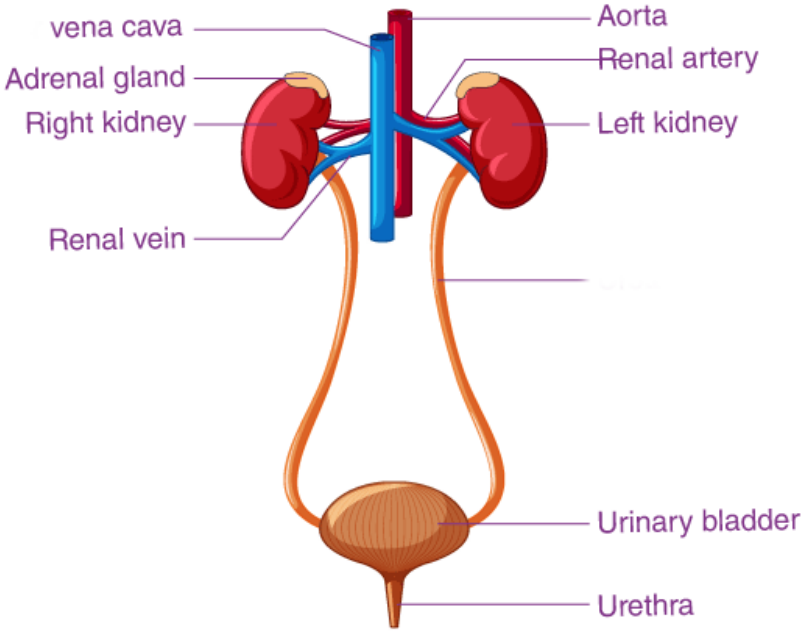
- Epidermis of the skin contains tiny pores through which sweat leaves the body.
- Sweat consists of mainly water and salts.
- Sweating eliminates excess water and some salts from the body.

Healthy lifestyle that promote skin health.

The health of the skin can be improved by doing the following.

1. Drinking plenty of water-this helps to keep the skin stay hydrated.
2. Protect it from the sun-exposing the skin to the sun can cause wrinkles, age spots and other skin problems increasing the risk of skin cancer. Avoid direct sunlight when the sun rays are strong.
3. Avoid smoking. Smoking makes the skin look older and contributes to wrinkles.
4. Keep the skin gentle by doing the following.
   - ✓ Avoid strong soaps and detergents that remove oil from the skin, instead use mild cleansers.
   - ✓ Shave carefully to protect your skin. Apply shaving cream, lotion or gel before shaving.
   - ✓ After washing or bathing, gently pat your skin dry with a towel so that some moisture remains on your skin.
5. Eat a healthy diet-eat plenty of fruits, vegetables and whole grains.
6. Manage tress- Stress can make one's skin more sensitive. This can trigger acne breakouts and other skin problems.
7. Exercise regularly- exercising increase blood flow and nourishes skin cells.

Parts of the Urinary system.



- The Urinary system consists of:
  - ✧ ***Kidneys.***
  - ✧ ***Vessels serving the kidney.***
  - ✧ ***Ureters.***
  - ✧ ***Urinary bladder.***
  - ✧ ***Urethra.***

Part	Function
Vessels serving the kidney	✧ *Carry urea in the blood stream to the kidney, where it is removed along with water and other wastes in the form of urine.*
Kidneys	✧ *They are a pair of reddish-brown organs that are bean shaped.* ✧ *They are the organs that filter the blood, remove the wastes and excrete the waste in the urine.*
Urinary bladder	✧ *It is a hollow organ located in the lower abdomen that is triangular in shape.* ✧ *The urinary bladder is a temporary storage place for urine.*
Ureters	✧ *These are narrow tubes that carry urine from the kidney to the urinary bladder.* ✧ *Humans have two ureters, one attached to each kidney.*
Urethra	✧ *This tube allow urine to pass outside the body from the urinary bladder.*

Functions of the Urinary system.

- Kidneys filter urea, salts and excess water from the blood.
- After the waste materials are filtered by the kidneys, they combine to form urine.
- Urine flows out of the kidney through the ureters into the urinary bladder.
- The bladder acts as a temporary store of urine. When it gets full, one feels the urge to pass out urine through a process called **urination**.
- Urine flows from the bladder into the urethra and out of the kidney.

<u>Cause and prevention of kidney disorder.</u>

- ✧ A kidney disorder is a term used to include any kidney abnormality.
- ✧ Kidney disorders can affect the ability of the body to clean blood, filter out extra water from the blood and control pressure.
- ✧ The disorder can also affect the production of red blood cells.
- ✧ Examples of kidney disorders are:
  - ↳ *Kidney stones.*
  - ↳ *Nephritis.*
  - ↳ *Kidney failure.*
  - ↳ *Chronic kidney diseases*.

<u>Causes of Kidney Disorders</u>.

- Diseases of the immune system, for example diabetes.
- Long-lasting illness such as HIV and AIDS and hepatitis B.
- Some infections that affect kidney may come from other parts of the urinary tract, such as the bladder, ureter or urethra.
- Defects prefect at birth may block the urinary tract or affect the kidneys.

The following are ways of preventing Kidney disorders.

1. Drinking enough water-dehydration reduces blood flow to your kidneys which can damage them.
2. Eating a healthy diet-a healthy diet id goo for your kidneys.
3. Controlling blood pressure- high blood pressure can damage the kidney and increase the chances of getting kidney diseases.
4. Managing blood sugar- high blood sugar levels can cause blood vessels inside the kidney to become narrow and clogged. This can cause damage to the blood vessels and harm the kidneys.
5. Exercising- exercise can help one to maintain a healthy weight, control blood pressure, build strength and endurance and lower the chances of getting diabetes and kidney diseases.
6. Avoid smoking- smoking may cause certain diseases in the kidneys.
7. Using medicines when necessary- using too much medication may cause kidney diseases.
8. Reducing salt intake- too much salt is associated with high blood pressure.
9. Managing stress- managing stress and anxiety can lower your blood pressure which is good for your kidneys.
10. Managing regular health check-ups -to detect any kidney problems early.

Healthy lifestyles that promote kidney health.

- Maintaining kidney healthy is very important for overall health and general well-being.
- The following are some of the ways that help to keep the kidney healthy.
    - Exercising.
    - Controlling blood sugar.
    - Monitoring blood pressure.
    - Monitoring weight and eating a healthy diet.
    - Drinking plenty of fluids.
    - Avoid smoking.
    - Having regular medical checkups.

STRAND 4 FORCE AND ENERGY.

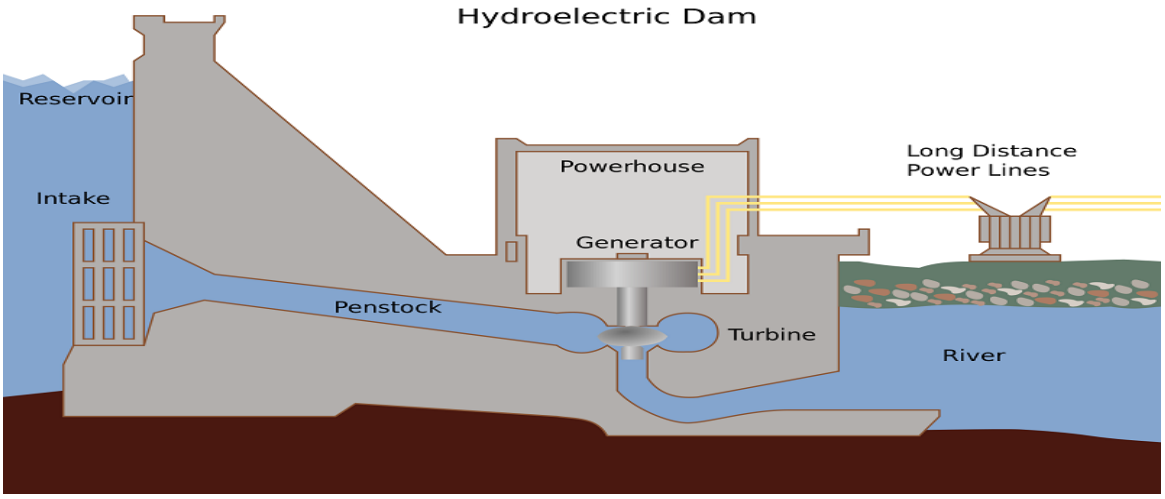
4.1 Electrical Energy.

Sources of Electrical electricity

- Electricity is one of the basic forms of energy.
- Electricity in motion is called electric current.
- Electricity can be obtained from various sources which includes the following:

❍ **Hydroelectric power**

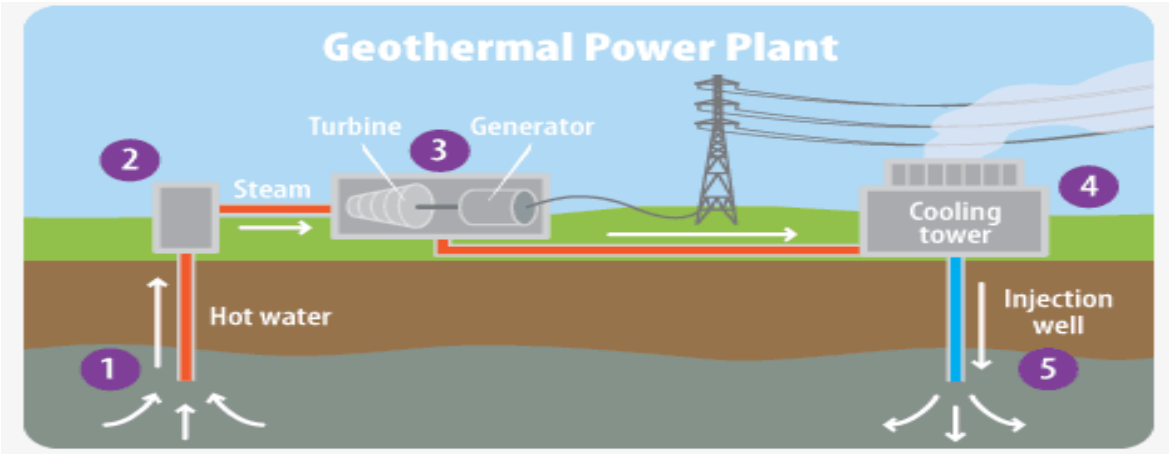
- ☞ This is production of electricity using the force of moving water.
- ☞ Water is held behind a dam and released through a turbine.
- ☞ The turbine spins or rotates a generator that produces electricity.
- ☞ An example of a hydroelectric power plant in Kenya is the **Masinga Hydroelectric Dam.**



Hydroelectric dam

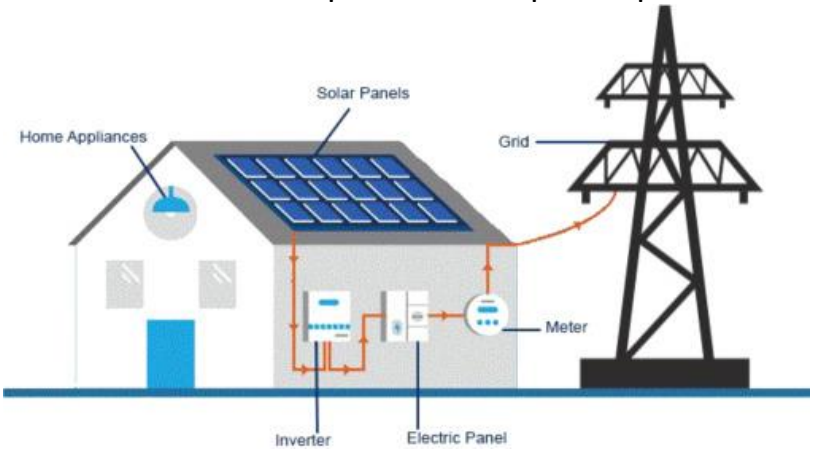
❍ **Geothermal power.**

- ☞ This is the production of electricity using steam.
- ☞ This comes steam from the reservoirs of hot water below the earth's surface.
- ☞ The steam spins a turbine which drive an electrical generator that produces electricity.
- ☞ An example of a geothermal power plant in Kenya is the **Olkaria Geothermal Power Plant.**



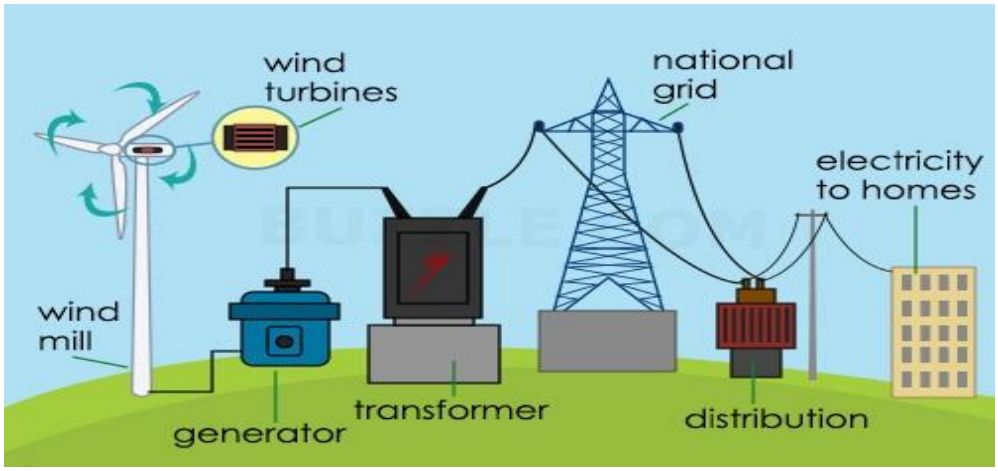
❍ **Solar power.**

- ☞ This is energy we get from the sun.
- ☞ A solar panel is used to trap this form of energy.
- ☞ Solar energy is then used for lighting up homes and to heat water.
- ☞ An example of a solar power plant in Kenya is the Garissa Solar Plant.



❍ **Wind power**.

- ☞ This is the production of electricity from wind.
- ☞ When the wind blows, it spins blades on a wind turbine or windmill.
- ☞ This generates electricity.
- ☞ An example of a wind power project in Kenya is the Lake Turkana Wind Project.



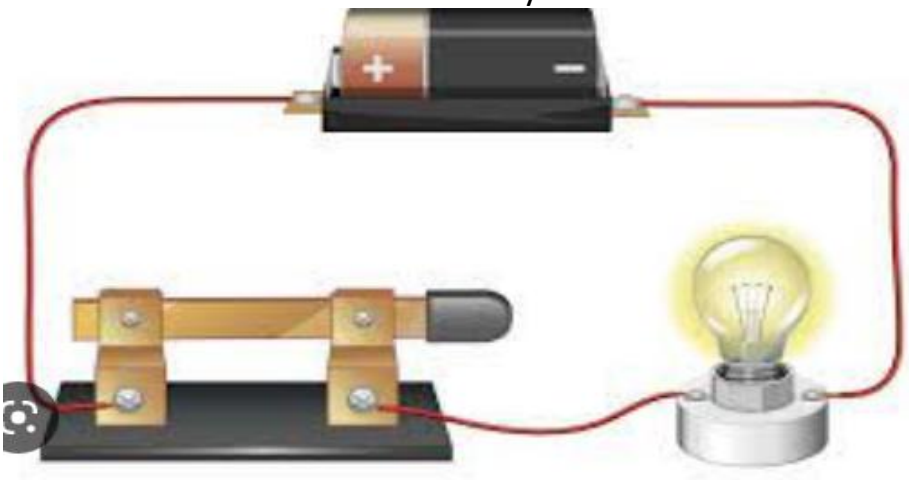
Simple Electrical Circuits.

- **<u>An electric circuit</u>** is a complete path in which electric current flows from one terminal to another.
- An electric circuit has a source of energy such as dry cells, current conductors or wires, a bulb and a switch.

Dry cells	
Current conductor or wire	
Bulbs with bulb holder	
Switch	
Ammeter	

Voltmeter	

- We make electricity by creating an electric circuit.
- For example, when you flip the switch on in the house, you are completing the electrical circuit. This causes electricity to flow and turn on the light bulb.



- When devices are connected in a circuit one after the other, the circuit is called a **series circuit**.
- A series circuit has only one path which the charges flow.
- A parallel circuit had more than one path through which charges can flow.
- The instrument which measures **voltage** is known as a **voltmeter**. Voltage refers to electrical force that would drive electric current between two points.
- A voltmeter is connected in parallel at two pints where the potential difference is measured.
- When cells are connected in parallel, the current flowing through the circuit is the same. Therefore, the brightness of the bulbs remains the same regardless of the number of dry cells.
- When you increase the number of bulbs in a series circuit, the brightness of the bulbs decreases.
- Bulbs arranged in parallel are brighter than bulbs arranged in series.
- The instrument that measures the electric current flowing in a circuit is an **ammeter**.
- An ammeter is connected in series with a circuit so that the current being measured flows through the ammeter.
- A bulb connected to two cells in series is brighter than a bulb connected to two cells in parallel.

Electrical Appliances in our Locality.

Identifying Electrical appliances in our Locality.

- Electrical appliances are devices that use electricity to work.
- They are found in various places in our locality such as at homes, offices, hospitals and schools among other places.
- They include the following appliances:

☞ Electric cooker.
☞ Pressure cooker.
☞ Iron box.
☞ Fan.
☞ Television.
☞ Printer.
☞ Electric kettle.
☞ Laptop.
☞ Desktop computer.
☞ Refrigerator.
☞ Phone.
☞ Radio.
☞ Heater.
☞ Washing machine.
☞ Electric oven.
☞ Electric guitar.
☞ Air conditioner.

Safety measures when handling electrical appliances.

- Safety measures are put in place when handling electrical appliances to prevent any dangers brought about by electricity.

Possible danger of electricity.	Safety measure to apply
Overloading a single socket	Do not overload a single socket
Inserting metallic objects or fingers into the sockets.	Do not insert objects or fingers into sockets
In case of a power outage or leakage.	Switch of the main switch.
Naked exposed electric copper wires	Insulate or mask the naked wires or cables.
Wet hands	Dry your hands.
Illegal connection.	Do not connect electricity illegally.

Using spoiled, broken or defective appliances.	Repair broken appliances, devices and sockets.
Splash water near sockets	Do not splash water near sockets.

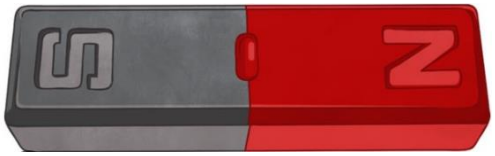
Safety measures to observe when using electrical appliances.

- We should switch off the main switch when not using any electrical appliance.
- We should repair broken appliances, devices and sockets.
- We should not touch naked wires with bare hands.
- We should not handle electrical appliances or switches with wet hands.
- We should not over load a sing socket.
- We should not insert objects or fingers into sockets.
- We should not splash water near sockets and switches.
- We should not attempt to connect electricity illegally.

4.2 Magnetism.

Magnetism.

- A magnet pulls objects towards it or pushes objects away from it.
- When a magnet pulls something, it **attracts** it.
- When a magnet pushes something away from it, it **repels** it.
- Magnets can move, pull or push magnetic objects without touching them. This invisible force is called **magnetism**.



Identify Poles of a Magnetic.

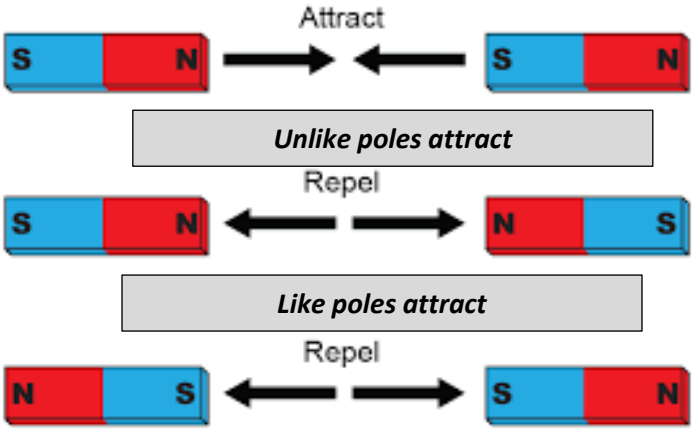
- When you place iron fillings on a sheet of paper and place a magnet bar on the sheet of paper, you will observe that the iron fillings are attracted more towards the region close to the two ends of the magnet bars.
- Poles of a magnet are said to be near the end of the magnet bars.
- All magnets have two ends that are called magnetic poles.
- These are North pole and South pole.
- Most magnets are labelled N and S where N stands for North pole while S stands for south pole.
- The magnetic force of a magnet is strongest at the poles. This means that the poles attract and repel more than the other parts of the magnet.

Magnetic and Non-magnetic materials.

- A magnet attracts some materials.
- Materials attracted by a magnet are called **magnetic materials**.
- Magnetic materials include objects such as iron, steel, nickel and cobalt.
- Some materials are not attracted by a magnet. These materials are called non-magnetic materials. They include objects such as plastic, wood, copper and Aluminium.

The force between like and unlike poles.

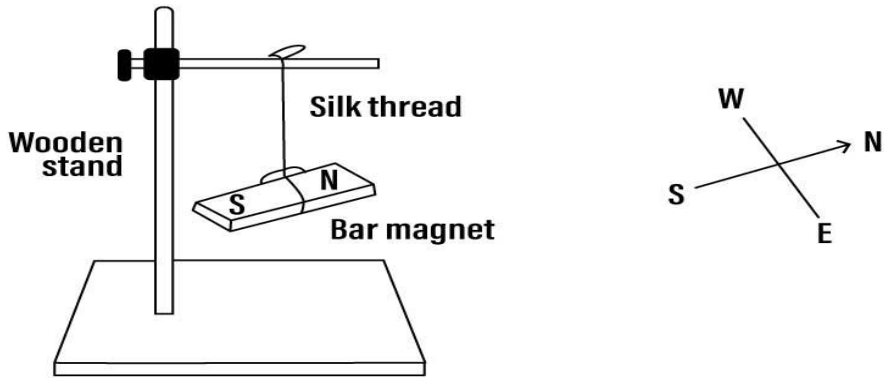
- When you move closer two magnet bars suspended using a thread you will observe that some sides repel and other attract each other.
- You notice that the North pole of one magnet and the south pole of the other magnet pull each other and stick together. This is called attraction. This shows that the unlike poles of magnet attract.



- The **north pole** of one magnet pushes a way the **north pole** of another magnet. this is called **repulsion**. This shows like poles of magnet repel.
- Similarly, the **south pole** of one magnet pushes a way the **South pole** of another magnet.
- This also shows that like poles of a magnet repel.
- This experiment shows the law of **attraction** and **repulsion**.

Finding the Direction of A freely suspended Magnet.

- When you suspend a bar magnet freely in the middle using a string it will turn until it stops.
- The magnet aligns itself to the Earth's North pole and South poles when it stops.
- The magnetic pole pointing towards the Earth's North magnetic pole is the magnet's North pole.
- The magnetic pole pointing towards the Earth's South magnetic pole is the magnet's South pole.



A freely suspended magnet rests in north-south direction

Uses of Magnets in day-to-day life.

- Magnetic recording media-computers have hard disks that record data on a thin magnetic coating.
- Credit, debit and ATM cards-all of these cards have a magnetic strip on one side.
- Common televisions and computer monitors-some televisions and computer screens contain a device that has an electromagnet.
- Electric guitars-they use magnetic devices to convert the vibration of guitar strings into electric currents that they amplify.
- Speakers -most speakers use magnets to generate sounds.
- Medicine-Hospitals use magnetic devices (magnetic resonance imaging) to spot problems in a patient's organ.
- Toys- magnets are often used in children's' toys.
- Picking up magnetic items-iron nails, staples, tacks and paper clips that are either too small, too hard to reach or too small for fingers to hold can be picked using magnets. Some screw drivers are magnetized for this purpose.

Topical questions.

1. Explain how material get charged?
2. Which two ways can you use to give objects charges?
3. What are the dangers of static charges?
4. How can we keep safe from the dangers of lightning?
5. How can you create awareness to prevent damages caused by lightning?
6. What are the sources of electricity?
7. What are the differences between conductors and non-conductors of electricity?
8. Identify electrical appliances used in your area.
9. Describe safety measures you would observe when using electrical appliances.

10. What are some of the uses of electricity in your environment?
11. Name 4 magnetic and 4 non-magnetic material in your locality.
12. How do you identify magnetic materials in your environment?
13. What will happen when the North Pole and south pole of different magnets are brought together?
14. How are magnets used in day-to-day life?
15. Iron fillings and pins accidentally fell into maize flour. Explain how you would separate the two materials to obtain pure maize floor.
16. Ruth tried to pick a sweet using a magnet. Explain what happened and why it happened.
17. Rotich took a soda from a refrigerator in town. He noticed that the door quickly locked and sealed itself. Give the reason for this.