INTRODUCTION TO BIOLOGY

What is biology?

Biology is a study of living things or organism.

Living things include bacteria, fungi, animals, plants etc.

Biology is derived/comes from two Greek words;

Bios – means "Life"

Logos – means "study"

The people who study biology are called Biologist. Very small organism are called microorganism. The simplest living things are made up of one cell these are called unicellular organism e.g. bacteria, protozoan and amoeba (also are called microscope organism). Large organisms are made up of many cells these are called multicellular organism e.g. fish, trees, man.

WHAT IS LIFE

Life is the state of living which plants, animals, and other living organisms have before they die. The basic unit of life is cell. All living things are made up of cell, cell are so small that they cannot be seen with marked eye.

BRANCHES OF BIOLOGY

There are two main branches of biology

(1) Botany – Study of plants

(2) Zoology – Study of animals only

However there are many minor branches of biology. That deal with different aspects of living things

Example;

BRANCHES	AREA OF STUDY

1.Anatomy	Physical structure of organisms
2.Cytology	Deals with cell
3.Ecology	Relation between organisms and their Environment
4.Mycology	Deals with fungi
5.Taxonomy	How organisms are named and groups
6.Physiology	How organisms body parts function
7.Parasitology	Deals with parasites
8.Immunology	The body defense against infections and disease

IMPORTANCE OF STUDYING BIOLOGY

1. It helps a man to understand himself/herself better
2. Knowledge of biology enables human being to conserve the environment.
3. It helps man to evaluate environment uses such as pollution, global warming and environmental degradations.
4. Biology help to understand cause, symptoms, method of transmission, prevention, and treatment of diseases this improve the standard of living.
5. It provides answer to fundamental questions.
6. It helps us to enter in careers such as medicine, agriculture, reproductive, health and genetic Engineering.
7. Biology helps us appreciate nature.

THE RELATIONSHIP BETWEEN BIOLOGY AND OTHER SUBJECT FIELD

Biology related to many other field of study such as agriculture, medicine, pharmacy such as veterinary, medicine and nutrition.

1. **AGRICULTURE**

Biology research finding on crops and livestock have led to improve agriculture production.

2. **MEDICINE AND PHARMACY**

Medicine is the study of prevention and treatment and cure of disease.

3. **NUTRITION**

Biology is used by dieticians to determine the kind of diets suitable for people with different health problems.

4. **FORESTRY**

Biologists have developed varieties of trees that grow well in dry areas, also that mature fast so as to prevent desertification.

CHARACTERISTICS OF LIVING THINGS

Living things have characteristics which make them different from non- living thing. These are;

1. **NUTRITION/ FEEDING**

All living things take in food or make their own food. Food enables living things to grow, develop and carry out on life process.

2. **RESPIRATION**

Respiration is a process by which food substances are broken down to produce useful energy in a cell.

3. **EXCRETION**

Is the process by which excess waste or harmful material resulting from the chemical reaction occur in body cell are removed out of body.

4. **SENSITIVITY/ IRRITABILITY**

It is the ability of an organism to detect and respond to a change in its environment

5. **GROWTH**

Growth is an increase in size and mass of an organism that becomes more complicated and more efficient.

6. **MOVEMENT/ LOCOMOTION**

Is an action of changing posture or position of an organism. Movement which involve the whole body is called locomotion. E.g. Animals but plants just show movement in term of growth of their body parts. E.g. roots, shoots and leaves.

7. **REPRODUCTION**

Is the process where by living things give rise to new individuals of their own kinds. This ensures that there is continued existence of the species and life forms.

Non- Living things are referred to as *inanimate*

Living things are referred to as *animate*

SCIENTIFIC PROCESS IN BIOLOGY

Biology is a practical science that involves carrying out experiment, observation, measuring and experimentation are skills that we need when studying Biology, and we use our sense organs to make observation.

These organs are;

1. The eyes for seeing
2. The nose for smelling
3. The ears for hearing
4. The tongue for tasting
5. The skin for feeling

Scientific measurements are taken using specific instrument and units.

Some basic biological measures are

MEASURE	INSTRUMENT	SI UNIT
Mass	Beam balance/Digital balance	Kilogram (kg)
Time	Watch	Second (s)
Length	Ruler	Meter (m)
Temperature	Thermometer	Kelvin (K) - Degrees Celsius -Degree Fahrenheit

In biological investigation like in any other scientific research, methods are listed. The scientific method is a set of steps that scientist use to study things.

Those methods are

1. Problem identification

2. Formulation of hypothesis

3. Experimentation

4. Observation and data collection

5. Interpretation of data.

6. Conclusion

Problem identification

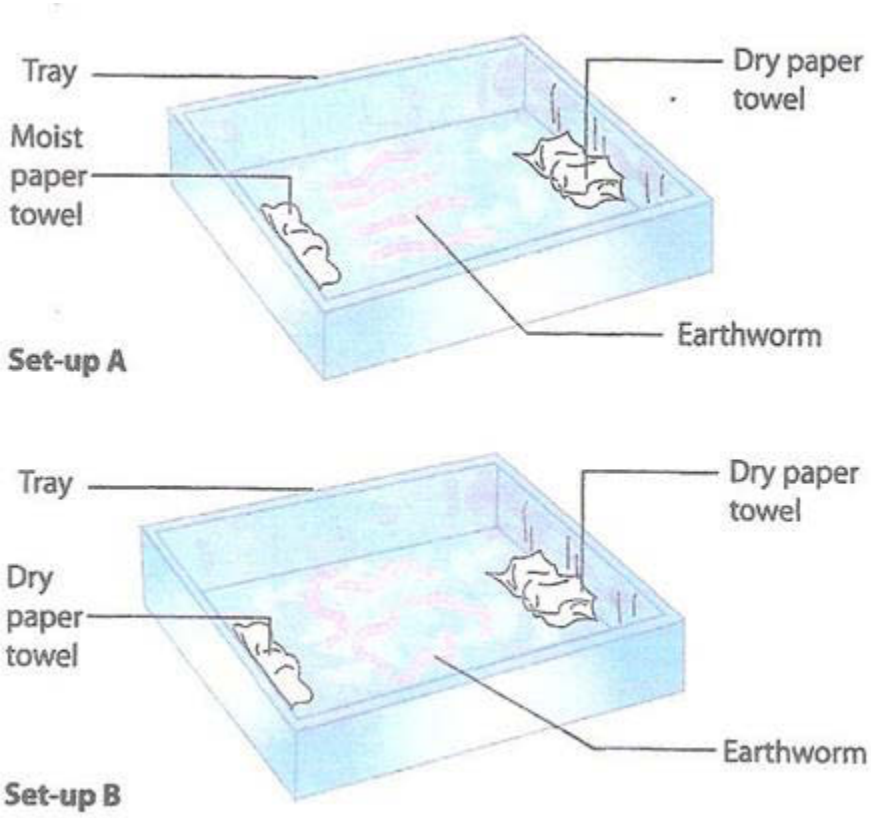
In day today life one time comes across question which require explanation or problem which needs solution or something to prove e.g. it is observed that buffaloes in Serengeti park are dying at great rate what would be the cause of death or there is poor harvesting or Earth warms are mostly found in the soil wells handed are as why?

Formulation of hypothesis

A hypothesis is a suggestion of the answer to the question asked. It is an intelligent guess that tries to explain as an observation for example Earth worms prefer shaded areas because in the soil shaded there is more moist. A hypothesis can't be termed as a biological acceptable to explain action. Therefore experiment should be designed, proved or disapproved. If hypothesis is correct we say it is accepted, if disapproved we say rejected

Experimentation

An experiment is a test that is carried out under controlled conditions to determine whether a hypothesis is correct or not. In any experiment there is control experiment and experiment test. Example of experiment; Earth worms prefer moist or dry condition



Observation and data collection

The scientists observe what happens from the time the experiment was set up to the time it ends. It is important to note all the changes made from the beginning to the end of the experiment and recording

Interpretation of data

At the end of experiment the scientist analyses the observations and Data recorded. The scientist may look for pattern or in the data .

Conclusion

A conclusion is a statement that summarizes what a scientist has learnt from an experiment. When scientist read conclusion, they taste whether the data or information collected support the hypothesis (accepted) or not support the hypothesis (reject), if so another hypothesis must be formulated and repeat the whole experiment.

BIOLOGY LABORATORY

A laboratory is a special room designed for carrying out scientific experiment. A biology laboratory is a special building designed for carrying out biological experiments. A laboratory should have adequate space for carrying out experiment, proper lighting, good ventilation, source of water, means of heating and adequate space for storing apparatus, chemicals and specimens.

LABORATORY RULES

In biology laboratory we use hazardous chemical, fragile equipment or dangerous specimens. For this reason, it's important to follow a certain rules and regulation for our safety and safety for others.

These rules are;

1. Do not go into the laboratory in the absence of a teacher or laboratory technician.
2. Do not handle or use apparatus, chemicals or specimens in the absence of a teacher.
3. Do not taste/ eat substances during experiment
4. Know the location of all exits
5. Do not leave experiment unattended
6. Turn off gas and water taps when not in use
7. Do not burn substances towards other people in the laboratory
8. Do not take laboratory equipments, chemicals or specimens out of the laboratory
9. Do not play or run in the laboratory
10. Read the labels or containers before using the contents. Do not interchange label.
11. Dispose all waste materials after all experiment.
12. After each experiment clean all the equipments you have used
13. Avoid touching yourself while performing experiment, clean your hands with soap and water after Experiment.
14. Do not touch electrical equipment with wet hands.
15. If you don't understand something ask your teacher.
16. Know the location and operation procedure of all safety equipment e.g. First aid and fire extinguishers.
17. Dress properly for laboratory activities, tie back long hairs. Do not wear dangling Jewelers, Sandals. Shoe must cover a leg completely.
18. Report all accidents immediately to your teacher or technician
19. Never use dirty, chipped or cracked equipment.
20. Handle live spacemen carefully. if an animal bites or insect stings you, report the accident to your teacher

Distinguishing the biology laboratory from other facilities

The biology laboratory is different from other school facilities such as classroom, library or physics and chemistry laboratory.

A class room has desk and chairs, students are taught in a class room.

A library has variety of reading materials some libraries have tables and chairs where we can sit and read.

A biology laboratory has models, specimens, cage, aquaria and chart which may not be in physics or chemistry laboratory.

Some of unique things found in biological laboratory are preserved specimens of organisms such as insect, micro organism and plants.

WARNING SIGNS/ SAFETY SYMBOLS

These are warning signs that are found on apparatus and chemical containers in the laboratory. Some may be found in or on the boxes used to hold either chemicals or apparatus. These signs must be obeyed in order to ensure safety in the laboratory before one uses a chemical, one should know whether that chemical is Toxic, Corrosive, Flammable, Oxidant, Explosive, Harmful or Irritant.

TOXIC

Toxic substances are dangerous and may cause death immediately or after a few days. When handling toxic substances one should be very careful. In case a chemical gets into contact with your skin it should be washed out with a lot of water.

CORROSIVE

Corrosive substances can burn one's skin. They can cause blindness in case they come into contact with the eyes. Example Of corrosive are sulphuric acid, hydrochloric acid, nitric acid, and concentrated alkalis e.g. Sodium hydroxide, potassium hydroxide, ammonium hydroxide.

FLAMMABLE

These are substances which can catch fire easily. The substances should never be brought near open flammable

OXIDANT

These are chemical that can accelerate burning in the presence of an oxidizing agent, a small fire can be made bigger. Example in the heating of potassium permanganate mixed with saw dust

EXPLOSIVE

An explosion is a forceful rapid reaction, which involves throwing off of particles at high speed. Chemicals carrying the sign of explosive may cause explosion if not handled carefully and according to the instruction.

HARMFUL/IRRITANT

These are chemicals which can make you sick but it does not kill you, it can cause illness. This substance may not kill immediately, but may have effects after long exposure.

BIOLOGY APPARATUS

Biology apparatus are the tools and equipments needed in order to study Biological experiments effectively.

APPARATUS		USES
1.	Hand lens	Used to magnify specimen/object.
2.	Sweep nets	Used to catch small flying organisms. E.g. Butter flies, housefly
3.	Fishing nets	For catching fish and aquatic animals
4.	Petri-dish	Is a shallow glass where specimen are put for close observation
5.	Mortar and pestle	Is small hard bowl used for crashing or grinding substances
6.	Crucible	Is a container in which substances are heated to very high temperature
7.	Thermometer	Used to measure temperature
8.	Dissecting Kit	Is a kit that contain all tools for making dissection of specimen
9.	Spirit – burner Bunsen – burner	Used as a source of heat

10.	Dropper	Used to add liquid during experiment
11.	Spatula	Used for taking some substance from the container
12.	Test tube holder	Used to hold test tube
13.	Test tube	Used to hold and heat chemicals
14.	Test tube rack	Storing test tube
15.	White tiles	Used to put specimen during experiment that involve colour changes
16.	Watch glass	Is a shallow dish that used as evaporating surface or cover for beaker

THE MICROSCOPE

The microscope is an instrument used to magnify very small specimen so that can be seen clearly.

THERE ARE TWO TYPES OF MICROSCOPE

1) Light microscope

2) Electron microscope

Light microscope can magnify object up to 2000 times. This is the type of microscope that is commonly used in school laboratory.

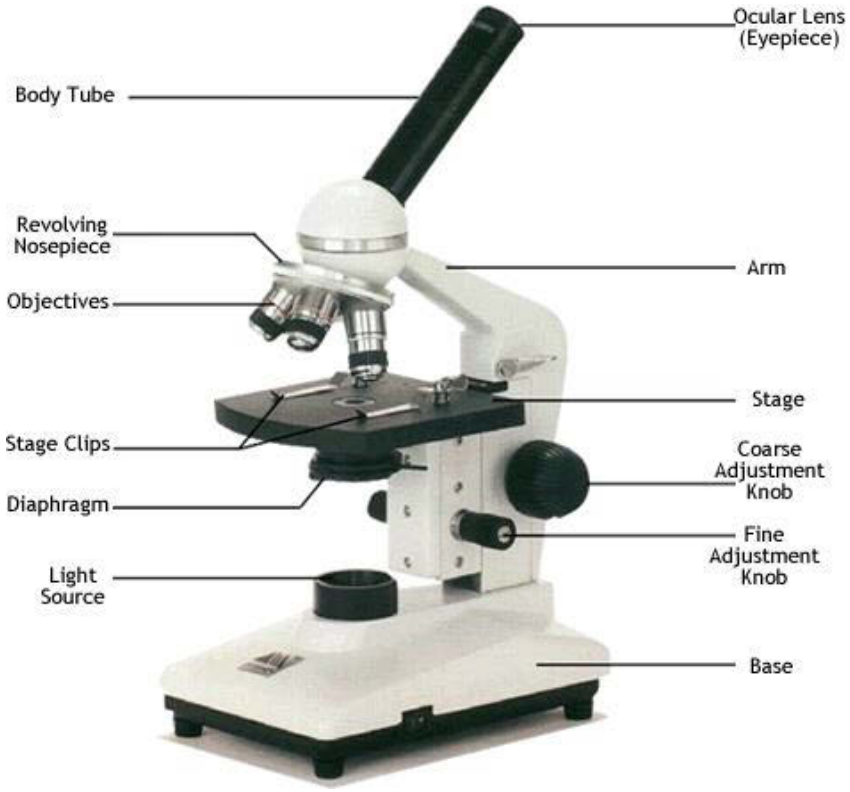
Electron microscope can magnify a specimen up to 50000 times.

PARTS OF A LIGHT MICROSCOPE AND THEIR FUNCTION

1)	Eye piece	Has a lens which magnify specimen
2)	Body tube	Support the objective revolving nose piece
3)	Rotating nose piece	Support the objective lens
4)	Objective lens	Magnify the specimen under observation.It has three lenses, lower power, medium power and high power
5)	Course adjustment knob	Raises or lowers the body tube in order to bring the image into focus
6)	Arm	Support the body tube, knobs, stage diaphragm and mirror. It's one of the part which is held when moving the microscope

7)	Fine adjustment	Raises or lowers the body tube in order to bring the image into sharp focus
8)	Ocular tube	The tube allow light to pass straight from the objective lens to the eye piece lens

THE STRUCTURE OF THE LIGHT MICROSCOPE



How to use light Microscope

1. Place the microscopes on the laboratory bench or table make sure it's not near the edge.
2. Mount the specimen on a microscope slide, cover it with the cover slip.
3. Make sure that the low power objective lens is on line with the eyepiece lens.
4. Place the slide with the specimen on the stage.
5. While looking through the eyepiece, use your hand to adjust the stage so the light is directed at the specimen on the stage.
6. Adjust the course adjustment knob to bring the specimen focus.
7. Adjust the fine adjustment knob to bring the specimen into sharp focus.

8. Rotate the nose piece to a lighter power objective lens if you want to observe more details on the specimen.

How to care for light Microscope

1. Turn the adjustment knobs slowly, always start with course adjustment knob.
2. Always lift microscope using both hands, one hand holding the arm and other holding the base.
3. When not in use cover the microscope with clean cloth and store it in a dry, dust free space
4. Clean dirty lenses using lens tissue or soft cloth.
5. Don't place the microscope at the edge of the table or bench as it could be knocked over.
6. When not in use for a long time remove the lenses and put them in desiccators.
7. Don't touch the microscope with wet hands
8. Don't touch the surface of the mirror of the lens with your fingers.
9. Lubricate moving parts regularly.
10. Always use a cover slip in order to protect the lens of the microscope from the substances in the specimen.
11. Remove the slides from the stage immediately after use.

SAFETY IN OUR ENVIRONMENT

FIRST AID AND SAFETY

First aid is an immediate assistance care given to a sick or injured person before getting professional medical help.

IMPORTANCE OF FIRST AID

- It helps to save life.
- It helps to prevent the victim's condition from becoming worse.
- It also promotes recovery.
- It helps reduce pain and suffering.
- It helps to reassure the victim/ to restore confidence to the victim.

THE FIRST AID KIT

The first aid kit is the small box which contains items that are for providing first aid. This box should be clearly labeled "first aid" and stored in a safe and easily accessible place for instance on a shelf, on the wall in a laboratory or in a staff room.

COMPONENTS OF FIRST AID KIT AND THEIR USES

SN	ITEM	USE
1	Plaster or adhesive bandage	Covering small wounds
2	Sterile gauze	Covering wounds to protect them from dirty and germs
3	Antiseptic	Cleaning wounds to kill germs
4	Soap	Washing hands/ wounds and equipment
5	pain killers	Relieving pain Note: they should be placed regularly
6	scissor and razor blade	Cutting dressing materials
7	safety pins	Securing bandage
8	Bandages	Keeping dressing in place and immobilizing injured limbs
9	cotton wool	Cleaning and drying wounds
10	Thermometer	Taking body temperature
11	Disposable sterile gloves	Preventing direct contact with victim's body fluids
12	petroleum jelly	Smoothing chapped skin
13	Torch	As a source of light
14	Whistle	Blown to call for help
15	Spirits	To kill germs in wound

The following are First Aid procedures that can help people in various situations;

Bee sting

Treatment

When a person is stung by a bee sting remains on the skin.

Remove the sting by scraping gently using a blunt object such as a plastic card

- Do not use your fingers or sharp object because this makes Bee sting to release more venom into the body.
- Wash the sting area with soap and water.
- Apply baking soda paste or salt water on the bee sting.
- The sting acidic baking soda/salt is base and it neutralizes the acid.
- Apply a cold compress to relieve pain and swelling

Note:

If a victim develops allergic reaction, take the person to hospital immediately.

Electric shock

This is a sudden painful feeling that somebody gets when electricity passes through the body. Electric shock is caused by touching or stepping an exposed naked electricity live cable

Treatment

Remove the patient from the source of the danger.

1. Switching off the electricity current
2. Protecting yourself with a dry insulation materials such as rubber gloves or wrap your hand in dry clothing
3. Loosen any light clothing around the neck, chest and waist
4. Start artificial respiration immediately if the victim is unconscious
5. Take the patient to the hospital immediately

Shock

This is the sudden violent disturbance of the mind or emotions.

Causes of Shock

- Bad news

- A frightening traumatic scene
- Severe illness
- Dehydration
- Severe allergic reaction
- Heavy bleeding inside the body

Treatment

1. Have the person lie down with his feet higher than his head. However if he/she has a severe head injury put him/her a half sitting position.
2. Stop any bleeding
3. If the person feels cold, cover him with a blanket.
4. If he/she is conscious and able to drink, give him/her sips of water or other soft drinks.
5. Keep calm and rescue the person

Note:

If the person is conscious, lay he/she on his/her side with head low lifted back and to one side. If they seem to be shocked pull his/her tongue forward with your finger. Do not give him/her anything by the mouth until become conscious.

Wounds

Treatment

1. First wash your hand with soap and water, then wash the abrasions gently and dry it
2. Apply some gentian violet solution (GV) to keep it clean and dry more quickly
3. When cleaning the wound be careful to clean all the dirty lift up and clean under any flaps of skin
4. After the wound has been cleaned, place a piece of clean gauze or cloth over the top

Bleeding

a) Nose bleeding

Nose bleeding may occur as a result of

1. Blowing the nose too hard as a result of dried mucus
2. A punch direct to the nose from another person
3. High blood pressure
4. Air pressure changes

Treatment

- Sit quietly
- Blow the nose firmly for 10 minutes or until bleed stops. It is advised to breathe through mouth.
- If this does not control bleeding, pack the nostril a wrap of cotton. Leaving part of outside the nose if possible. First wet the cotton with hydrogen.

Vomiting

To vomit is to remove food from the stomach through the mouth. It can be caused by food poisoning, contaminated water, fever or excessive eating.

Treatment

The person should get adequate rest. Give lots of fluids make a re-hydration drink by mixing 1 liter of clean water, 1.5 spoon of salt and 4 to 5 spoon of sugar.

Muscle cramps and sprains

1. **Sprains**

   It's possible to know whether a hand or foot is bruised, sprained or broken, it helps to have an x- ray. To release pain and swelling, keep the sprained part raised high. Put the ice, wrapped in a cloth or plastic bag or cold wet cloth over the swollen joint for 20 to 30 minutes. Once even hour (when the swelling is no longer getting worse, soak the sprain in hot water several times a day.

Muscle cramps

Muscle cramp is sudden, involuntary and painful contraction of a single muscle or group of muscle. The cause of muscle cramps include

1. Poor coordination of the muscle during exercise
2. Cold
3. Excessive loss of salt and body fluids due to too much sweating ,severe diarrhea or persistent vomiting (Dehydration)

Treatment foot muscle cramps

- Help the victim to stand
- When the first contraction is over, let the victim sit down.
- Straight on the victim knee and draw his or her foot firmly and steadily upward towards the shin
- Massage the muscle
- Get the medical help if the cramps do not stop

POISONING

A poison is any substance that causes harm if it's swallowed, inhaled or absorbed into the body. If the poison has been breathed in, move the person outside where there is plenty of fresh air, if the victim is not breathing start mouth breathing to move resuscitation.

If the poison has been swallowed, give a glass of milk or water or both. This helps to dilute and neutralize the poison, don't introduce vomiting if the poison is a corrosive. Introduce vomiting if the poison is none corrosive substances. Vomiting can be induced by putting your finger in the victim's throat or by making the victims gargle soap water or raw egg yolk, take the person to hospital immediately.

EXERCISE

WRITE TRUE OR FALSE

1. You should induce vomiting, if a person has swallowed kerosene TRUE.
2. First aid helps to rescue the victim TRUE.
3. You should remove bee stings, using a needle FALSE.
4. Before taking a snake bite victim to hospital you must first capture the snake TRUE.
5. It is important to reduce the rate at which poison spread in the body TRUE.
6. You should move a victim of electric shock using a metal object FALSE.
7. A person who is nose bleeding should lie down TRUE.
8. We can use clean water, salt and sugar to make a re-hydration drink for person who has vomited TRUE.

SAFETY AT HOME AND SCHOOL

Many accidents occur in our schools as well as at home, children handicapped are more to get accidents. The common accidents at home and school including drowning poisoning, choking, cuts and scratches, falls, bites and electric shock.

Common accidents and how to prevent them

Accident	Preventing and safety and how to prevent them
Fire burns and scalds	Switch off Bunsen burners and cookers which not in use
Drowning	- Don't go swimming alone - Use a bridge when crossing rivers and streams**EXERCISE** **WRITE TRUE OR FALSE**

	1. You should induce vomiting, if a person has swallowed kerosene TRUE. 2. First aid helps to rescue the victim TRUE. 3. You should remove bee stings, using a needle FALSE. 4. Before taking a snake bite victim to hospital you must first capture the snake TRUE. 5. It is important to reduce the rate at which poison spread in the body TRUE. 6. You should move a victim of electric shock using a metal object FALSE. 7. A person who is nose bleeding should lie down TRUE. 8. We can use clean water, salt and sugar to make a re-hydration drink for person who has vomited TRUE. - Avoid going near water bodies when its dark - Don't allow children to play near the water bodies - Cover or fence all pools of water in the home or school
Falls	- always walk careful - avoid playing dangerous games like climbing trees and walls - put up signs to indicate where there stairs or steps - do not run unnecessarily - wipe spilled liquids on the floor immediately - do not leave fruits and vegetable peels on the floor
Poisoning	- label all containers clearly - store all poisonous substances in a safe lockable place when not in use
Choking	- do not talk while eating - sit up right when eating or drinking - eat slowly and do not take part in eating competition - do not give children small objects to play with as they could put them in the mouth
Bites and stings	- don't irritate animals

	- stay away from beehives and wasp net - cut bushes and fall grasses that could have dangerous animals
Cuts and stretches	- store sharp tools in the safe place - property dispose of broken glass and empty tins - do not walk bare foot outside - do not plant thorny bushes very near - do not give children sharp objects to play with
Electric shock	- switch off electrical appliance that are being used - do not touch electrical equipments with your hands - ensure all electrical appliances are properly installed - do not push sharp object in to electric switch

WASTE DISPOSAL

Waste: Refers to materials which are not needed.

Waste disposal: is way in which get rid of waste materials

TYPES OF WASTE

We can classify waste according to its state

1. Solid waste
2. Liquid waste
3. Gaseous waste
4. Sludge waste

Solid waste

Is a hard waste material e.g. House hold, garbage, mining waste, plastic, paper, glass, scrap metal, waste, used tires, empty cans and construction waste.

Liquid waste

Liquid waste include urine, water from bathrooms, water from kitchen after washing utensils, liquid also come from industries e.g. chemical liquid waste.

Gaseous waste

This is waste in gaseous form for example ammonia, carbon dioxide and sulphur dioxide gases from materials and lead from petrol in motor vehicle. Gaseous waste is a major risk factor for both acute and chronic respiratory diseases.

Sludge waste

This is a thick soft and wet waste material usually a viscous material (flowing material) e.g. human waste, industrial waste which contain between $30^0/_0$ to $70^0/_0$ water. Waste from living things is biodegradable. They can be decomposed by bacteria and other living organisms. E.g. food remain, paper and cotton clothes waste material such as plastics, glass, metal are non-biodegradable.

Waste disposal

Waste disposal refers to collection, transportation, processing, re-use and other activities that help us to get rid of waste. This helps to reduce adverse effects of waste on human health, animal's health and environment.

Basic principle of waste disposal

The principles that can help us to better manage waste, these are:

1. **Reducing** amount of waste we produce, for example we do not have to buy plastic bags each time we go shop we can carry a woven basket instead.
2. **Re- using** items instead of throwing them away for instance we can use an empty margarine container to store sugar.
3. **Recycling** waste materials – some waste can be changed to other product for example, broken glass can be melt and use to make new glass bottles.

Importances of waste disposal

1. It helps to provide pleasing environment.
2. It eliminates or reduces bad air.
3. It minimizes the spread of infections and disease.
4. To prevent accident

Methods of waste disposal

1. Burning

Waste such as papers, plastic, carton – boxes, empty milk packet, bread wrappers, are burnt to ashes.

2. Burying

This is used to dispose inorganic refuse such as empty containers of insecticides, used torch batteries, broken bottles, pots, plates, cups and spoon.

Burying can take the following form

- Pit latrine

The sewage in pit is decayed by bacteria, when the pit is full it's covered with soil and a new latrine is dug.

-Tipping and landfills

When car [truck] come and collect waste and take it to dumping site we called it *tipping*

Damping can be in form of a *dump* or *landfill*.

A landfill is place where solid waste buried in the ground.

3. Animals feeds

Organic refuse such as vegetable, fruit, potato and banana peelings, cabbage, and spinach leaves are feed to goats, sheep, cattle, poultry and also pigs. Bones are dried and ground into powder which is dog food.

4. Compost manure

After separating inorganic refuse from organic. A place of one meter deep is dug where the organic refuse is dumped to decompose, to keep away flies reduce smell and other health hazards, a thin layer of wood ashes and sock is used to cover the refuse. After the refuse decomposes, it's used by farmer as compost manure which adds soil fertile.

5. Recycling

To recycle is to turn waste materials into useful ones that can be used again. Plastic, glass, paper, metal and rubber are the items that can be recycled for example paper can be converted to tissue paper or news print paper, worn out tires can be retreated and re- used, plastic items old glass bottles can be crushed and made into new bottles.

6. Incinerating

To incinerate is to burn something until it is completely destroyed. This process is carried out in an incinerator. Incinerator is usually done for hazardous material such as clinical waste.

7. Garbage collection

Garbage collection in urban areas is done by local authorities, local authorities provide refuse bins which are commonly placed at strategic places in towns. Garbage disposal are through landfill and incineration.

THE EFFECTS OF POOR WASTE DISPOSAL

1. Provide breeding places for disease causing organisms. e.g. empty container after rain become breeding places e.g. mosquito, cockroaches.
2. Poor waste disposal causes air pollution result to respiratory diseases.
3. Can cause accident in home e.g. fresh peeling of fruits and vegetable, and potatoes on the floor can cause slippery and falls down breaking his/her leg, broken glass can cut people.
4. Organic wastes when decompose cause bad smell.
5. Causes epidemic diseases such as cholera and typhoid.
6. Can harm wildlife and domestic animals. E.g. when cow eat plastic bags, suffocate or block the digestive system and cause death.
7. Block of drainage system can cause flooding
8. Degrade the natural beauty of the environment.

How to reduce waste product

1. Use cloth instead of paper to wipe surface e.g. window and furniture. It's much cheaper in the long run and reduces the amount of waste paper in the environment.
2. Invest in a set of cloth or woven shopping bags.
3. Buy rechargeable batteries and a battery charger instead of disposable batteries.
4. Collect and use plastic container to store food.
5. Initiate awareness campaigns in your community on the proper ways of disposing waste.
6. Use plastic that can be recycled or re – used and buy products made from recycled materials

Symbol of recycled material

Why waste product is a problem

- People's bad habits for example dumping waste on foot paths, on the roadside and using excessive packaging for example wrapping a piece of candy to layers of plastic.
- Inadequate disposal facilities make waste disposal a problem.
- Failure by the local authorities to enforce effective punishment on those who failed to practice proper waste disposal.
- Poor infrastructure/ poor settlement planning render waste collection.

Why increase of waste output now today?

- Increase of population and new settlement.
- Increased consumption rate of more disposable packaging and foot waste.
- Technical advancement cause nuclear waste.

HEALTH AND IMMUNITY

HEALTH AND IMMUNITY

Health - Is a state of physical, mental and social well being. Health can be affected by factors such as diet, Physical fitness, hygiene, stress, heredity, environment, medicine and immunity.

Immunity – Is the ability of the body to resist infections and disease. Immunity builds the body's defense against infectious diseases. Through this, it helps us to remain healthy.

TYPES OF IMMUNITY

Basically there are two types of immunity namely:

1. Natural immunity
2. Artificial immunity

(a) NATURAL IMMUNITY

This is also referred to as immunity that an individual is born with. Natural immunity is divided into two types;

1. **Natural Active Immunity**

The body makes it's own antibodies especially after an attack by disease causing micro-organism, adults have this kind of immunity.

2. **Natural Passive Immunity**

The body develops an immune system during development of the foetus (unborn baby) i.e. the antibodies from the mother pass to the foetus. After the baby is born the antibodies from the mother pass to the baby through sucking of the first milk (colostrum). This immunity last only for a few month.

(b) ARTIFICIAL IMMUNITY

This is the type of immunity an individual acquires in course of life time. This type of immunity is also referred to as *acquired immunity.*

Artificial immunity is of two parts;

1. **Artificial Active Immunity**

This immunity is acquired through immunization or vaccination using vaccine. A vaccine is a preparation containing dead or weaken disease cause organism, some vaccines are injected in the body while other are taken orally.

2. **Artificial Passive Immunity**

Artificial passive immunity is acquired when antibodies produced by individual are injected into a second individual.

This immunity provides an instant response but it is short term because the antibodies used are not the body's own, so no more cells are created. Such immunity is used for potentially fatal diseases such as rabies and tetanus.

The immune system enables the study to recognize foreign materials, in response to antigens in the bodies. Immune system produce chemical substance called antibodies, Antibodies fight against invade micro organism.

Factors that can lead to lowering of body body Immunity

1. Lack of a proper balanced diet (poor nutrition)
2. Inhibitory effects of drug and chemical to the white blood cells.
3. In ability of the body to produce antibodies and the white blood cells
4. Lack of vaccination/immunization
5. Incomplete treatment
6. Genetic disorders
7. Extreme stress
8. Damage to the skin.
9. Destruction of immune system by pathogen e.g. HIV (Human immunodeficiency Virus.)

PERSONAL HYGIENE AND GOOD MANNER

Personal hygiene is the practice of keeping one self clean all the time by maintaining a clean body from head to toe. Personal hygiene also includes good grooming e.g. wearing well fitting clothes good for you. To be able to maintain high standards of personal hygiene you must be having good manners.

GOOD MANNER

Is a kind of behavior that is socially accepted it includes honesty, respect for others, politeness and helpfulness.

PRINCIPAL OF PERSONAL HYGIENE

1. Wash your body every day
2. Always wear clean clothes
3. Wash hands with soap and clean water after visiting the toilet and before eating.
4. Brush your teeth at least twice a day in the morning and before you sleep. Wash your mouth with clean water after eating.

5. Keep the environment clean. The environment include your bedroom, home, village, desk, classroom and school
6. Cover your mouth and nose with a clean handkerchief or tissue when you sneeze or cough
7. Keep your nails short and clean
8. Do not share handkerchief, towel and clothes especially underwear.
9. Wash your hair at least once a week comb it every day or keep it well plaited
10. Change your bedding regularly
11. Wear comfortable and well fitting clothes
12. Do not spit on the ground spit on handkerchief
13. Avoiding picking your nose and biting your nails.
14. Avoid touching other people's hand fluids
15. Relieve yourself in a clean toilet

REQUIREMENT OF PERSONAL HYGIENE AND GOOD MANNER

1. Listen to advice from people who have good personal hygiene and good manners and learn from them , good advice help us to improve ourselves**.**
2. Acquire the items needed to keep yourself and learn how to use your environment and those things include soap, towels, combs, brushes, basins and teeth brushes.

IMPORTANCE OF PERSONAL HYGIENE AND GOOD MANNER

- Personal hygiene is important for good health. Ring worms and lice are spread because people do not practice personal hygiene.
- Personal hygiene and good manners make a person acceptable and respectable in the society.
- Personal hygiene and good manners are also important for personal appearance. A well groomed and well mannered person is more attractive than a dirty and ill mannered one.
- Maintaining personal hygiene and good manner make us good role models for other people in the society.

MAINTAINING PROPER PERSONAL HYGIENE DURING PUBERTY STAGE

PUBERTY

Is the stage when children begin to mature biologically and psychologically and their bodies become capable of reproduction. It usually occurs between ages 10 and 14 in girls and ages between 12 and 16 in boys .

During this time the body develops secondary sexual characteristics which create difference between males and female. Puberty leads to adolescence.

Adolescence is transitional period between childhood and adulthood

CHANGES IN GIRLS AT PUBERTY STAGE

1. Body size increase rapidly
2. Breasts develops
3. Hair grows in the armpits and pubic area
4. Waist narrows and hips broaden.
5. Menstruation begins
6. Pimples may develop on the face
7. Sweat and oil glands become more active leading change in body
8. High pitched voice

CHANGES IN BOYS AT PUBERTY STAGE

1. Body size increase rapidly
2. Reproductive organs enlarge
3. Muscles grow
4. Hair grows on the face (beards) and in the armpits and pubic areas
5. Shoulder and chest broaden and voice deepens
6. Wet dreams begin and sperm production begins
7. Pimples may grow/develop on the face
8. Sweat and oil glands become more active leading to change the body odour.

   - So it's very important to maintain personal hygiene so as to prevent oduor and disease during puberty

   - Also aim at being well behaved all the time by taking the following measures

   - Resist negative peer pressure
   - Get counseling from a reliable person
   - Apologize if you hurt other people's feelings
   - Do not engage in sexual activities before marriage.
   - Strive to be respectful to your elders even when you disagree with them.
   - Get involved in positive extracurricular activities e.g. sports, debating and drama.
   - Avoid engage on:

     - Taking drug (drug abuse)

     - Sexual affair

     - Being rude to elders

INFECTION AND DISEASE

Disease is a condition that interferes with the normal functioning of the body. It can affect the whole body or only part of it.

When disease is caused by microorganisms they are known as infection disease or communicable disease.

Communicable disease is disease which can be spread from one person to another. They are caused by pathogen such us virus, bacteria, protozoan and fungi. Example of communicable diseases is AIDS, Malaria, Cholera, Tuberculosis, Typhoid, Ring worms.

Vectors are organisms which carry pathogens e.g. fleas, mosquitoes, bee, tsetse fly.
Communicable diseases are classified according to their occurrence.

1. EPIDEMIC DISEASES

   These are outbreaks of communicable disease which affect a large number of people in a short period of time, e.g. Cholera, Typhoid, Meningitis and plague.

2. PANDEMIC DISEASES

   These are communicable diseases which affect a whole country, continent or the whole words e.g. HIV/ AIDS

3. ENDEMIC DISEASES

These are communicable diseases which regularly occur in a particular area and is difficult to get rid of e.g. Malaria, gonorrhea, Syphilis, Bilharzia.

Disease can be grouped also depending on the cause e.g.

SN	CAUSE	DISEASE e.g.
1	Bacterial disease	Typhoid, Cholera, TB, Gonorrhea
2	Viral diseases	AIDS, Polio, measles, small pox, chicken pox.
3	Protozoan diseases	Amoeba dysentery, Trypanosomiasis (sleeping sickness), malaria
4	Fungal diseases	Ring worms, candidiasis, athletes
5	Genetic disease (inherited diseases)	Hemophiliac, sickle cell, anemia, down syndrome, albinism

6	Worm diseases	Elephantiasis, bilharzia (schistosomiasis)
7	Hormonal diseases	Diabetes mellitus, diabetes inspidus
8	Malnutrition diseases	Kwashiorkor, obesity, marasmus, Goitre, Anaemia, Rickets

Diseases also can be grouped according made of transmission e.g.

	Air borne disease	Tuberculosis, common cold, influenza, whooping cough
	Weather bone disease	Cholera, Typhoid fever, Schistosomiasis
	Contaminated blood	HIV/AIDS, Malaria
	Physical contract(contagious disease)	Ring worms, Scabies

Routes through which disease causing agents enters our bodies are mouth, nose, penis, vagina, anus, skin, open wounds.

Non infections (non communicable) diseases. These are diseases which can't be transmitted from one person another e.g. sickle cell, anemia, Albinism, kwashiorkor, arthritis, skin cancer, diabetes.

Diseases can broadly divide in to two categories: -

1. Communicable diseases (infection diseases)
2. Non communicable disease(non infection diseases)

COMMON INFECTION DISEASES

SN	DISEASE	CAUSAL AGENT	CLINICAL FEATURES	MODE OF TRANSMISSION	METHODS OF PREVENTION AND CONTROL
1	Measles	Virus	Inflammation of respiratory track, fever, contact rash	Inhalation and contact	vaccination
2	Cholera	Bacteria called *Vibrio cholera* through	Diarrhea, vomiting, weight loss, muscle	Contaminated food and water	Wash hand after toilet and before and after eating, boil drinking

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		contaminated food and water	cramps, wrinkled skin		water, wash fruit before eat, eat hot food vaccine, medical treatment
3	Meningitis	Bacteria and virus	Fever, headache, vomiting	Droplets from one person when coughing sneezing	Isolation of patient, vaccination, medicine treatment
4	Tuberculosis	Bacteria called bacterium tuberculosis	Prolonged cough, blood stained, sputum, fever, poor appetite, weight loss, night sweat	Spread by droplets when coughing or sneezing	Vaccination, patient should cover nose and mouth when coughing or sneezing medical treatment
5	Plague	Bacteria called *Yersinia pestis*	Inflammation of lymph node, fever, internal bleeding, body aches, coughing and shortness of breath	Spread by fleas found on rats.	Vaccination, eliminating rats and medical treatment
6	Bilharzia (Schistosomiasis)	Blood flukes (Schistosoma) (flatworm)	Blood stained-faeces and urine, abdominal pain, diarrhea, fever, tiredness, enlarged liver and spleen	Spread by water, snails, contain parasites larvae	Killing snails, proper disposal of sewage, wearing protective shoes in water- lodged area, draining stagnant water and medical treatment
7	Malaria	Protozoa called	Chills, fever, sweating,	Transmitted by female anopheles	Killing mosquito,

		Plasmodium	vomiting, pain in joint, headache, abdominal pain.	mosquito	sleeping under mosquito nets ,draining stagnant water, cutting down trees, using mosquito spray and anti-malaria drugs treatments
8	Scabies	Microscopic mites	Intense itching rashes and burning on the skin and sore on the skin.	Spread skin to skin contact at sharing clothes towel and bedding	Good personal hygiene, wash contaminated clothes on hot water and dry them in the sun, avoid sharing personal items, medical treatment
9	Rabies	virus	Fever, difficult in swallowing, restlessness, loss of feeling, vomiting, fever, and hydrophobia	Bites or saliva from infected animals, organ transplant from infected people	Vaccination kill suspected carnies immediately, medical treatment
10	Diabetes	Insulin disorder, genetic disorders, excessive body weight	Fatigue, weight loss, excessive hunger, poor healing of wounds, frequently urination		Control body weight, regular exercise, stop alcohol, and stop smoking, diet restriction, insulin injection.
11	Cancer	Abnormalities in the genetic materials result of mutation or due to carcinogens	Usually skin swelling (tumors), bleeding, pain, ulcers , cough, weight loss,		Avoid getting in contact with carcinogens e.g. tobacco smoke and radiation, surgery to remove the

		such as tobacco smoking, chemical, infections, hereditary.	poor appetite, excessive sweating.		tumor, chemotherapy, radiation therapy, immunotherapy, hormonal therapy
12	Tetanus	Bacteria called *Clostridium tetanus*	Affect nervous lock jaw painfully spasms	Contain with bacterium in soil	Vaccination, avoid rusting equipment, cover wound when contact with soil animal dung
13	Typhoid	Bacteria called *Salmonella typh*i	Vomiting, diarrhea, high fever	Contaminated water and food	Improve sanitation, general hygiene, water protection, boil drinking water, proper use of toilet, immunization treatment
14	Dysentery	Caused by bacteria called S*higella* and protozoan called *Entamoeba histolytica*	Severe diarrhea, profuse bleeding, diarrhea of *shigella* is not sever	Contaminated food and water	Improve sanitation, boil drinking water, re-hydration, drugs Antibiotic

HIV/ AIDS STI'S AND STD'S

HIV AND AIDS

HIV – Is an abbreviation of Human Immunodeficiency Virus

AIDS – Acquired immune deficiency syndrome.

HIV and AIDS are often thought of as two separate diseases but they are not. AIDS is a disease but HIV is the virus that can cause it.

People who infected with HIV are said to be HIV [+]. Blood contain white blood cell [lymphocytes] some of it called T-helper cell. So when illness came can't be thought off. This illness / infections are called opportunistic infections. E.g. Pneumonia, TB, and malaria. Once more serious infections enter the body a person is said to have AIDS. Although it is often said that person die of AIDS, they actually die of infections that AIDS prevents them from fighting.

TRANSMISSION OF HIV

HIV is transmitted via body fluids such as blood, breast milk, vaginal secretions, sweat, saliva, tears.

The most common ways of HIV transmission are:

1. Sexual intercourse with an infected person
2. Blood transfusion from a infected donor
3. Organ transplants from an infected donor
4. An infected mother to her child during pregnancy, birth or breast feeding
5. Using unsterilized surgical or skin piercing instruments, such as scalpels, needles and circumcision blades that have been used on an affected person
6. Sharing toothbrushes, shaving blades or nail cutter with infected person.

NOTE: HIV is not spread by casual contact such as hugging, shaking hands, or touching unless both people have bleeding wounds.

SYMPTOMS OF HIV/ AIDS

1. Loss of body weight by over 5kg two months
2. Persistent fever that lasts for longer than month
3. Painless flat hard lumps growing on the skin
4. Diarrhea for longer than a month
5. Rashes on the skin
6. White layer in the mouth and throat
7. Swollen glands, especially in the neck and armpits
8. Coughing for more than one month
9. Shortness of breath gradually getting worse
10. Genital rashes

EFFECTS OF HIV AND AIDS

People with HIV and AIDS get opportunistic infections and disease, for example: -

1. Chest infections e.g. pneumonia, TB
2. Brain infections leading to mental confusion, severe headache and feet
3. Stomach or gut infections leading to severe diarrhea

4. Skin cancer i.e. *Kaposi sarcoma*

PREVENTION AND CONTROL OF HIV/ AIDS

1. Avoid promiscuous sex partner prostitutes, commercial sex workers (avoid irresponsible sexual behavior abstain from sexual intercourse (if not marriage) be faithful to one sexual partner, use condom during sexual intercourse
2. Wear disposable gloves when touching peoples' body fluid
3. Use sterilized instruments during surgery, circumcision and delivery
4. Only screened blood and organs should be used for transfusion and transplants
5. Go for HIV test in order to know your status and health
6. Do not share tooth brushes and shaving blades
7. People with HIV and AIDS should be given Anti—retro viral drugs (ARVS) which help them to slow down infections.
8. Pregnant women should attend pre natal clinic where they can be treated to prevent mother to child transmission
9. HIV positive mothers should not breast feed their new born babies

RISKY SITUATION, BEHAVIOUR AND PRACTICES

These are activities and situation that put us at greater risk of being infected with STIS, STDS and HIV these include: –

- Transfusion using unscreened blood
- Drinking alcohol, smoking using other drugs such as bangi, heroin and cocaine
- Having immoral friends who influence to use drug abuse, engage in sex earlier
- Having many sexual partners having unprotected sex
- Sharing sharp object and toothbrushes.

HOW TO AVOID RISKY PRACTICES BEHAVIOUR AND SITUATION

- Abstain from sex before marriage.
- Be faithful to one sexual partner.
- Do not share sharp object.
- Avoid drug abuse, learn to resist peer pressure.
- Do not accept gifts or favors from members opposite sex
- Avoid staying in dark/ privacy area during night alone
- Avoid risk place e.g. bars, night club, casino

CARE AND SUPPORT FOR PEOPLE LIVING WITH HIV AND AIDS (PLWHA)

People with HIV and AIDS can live health life for a long time if they get proper care and support we can care for them and supported them in the following ways:

- Give them well balanced meals in adequate quantities.
- Allow them to rest when they feel unwell.

- Taking them to a health centre as soon as they start developing signs of illness.
- Provide them with ARVS, allow them to work.
- Behaving in a loving way towards them and listen them.
- Counseling them to stop behavior that worsen
- Not discriminating against them or stigmatizing
- Hiding them from the public, denying them education or health services
- Chasing them away from home
- Refuse to share utensils or rooms with them
- Care and support gives People Living With HIV and AIDS (PLWHA) hope, good health piece of mind, long life strength to work and comfort.

IMPORTANCE OF HEALTH CARE FOR STIS, STDS AND OPPORTUNISTIC DISEASES

- Discrimination leads to depression, loneliness, loss of performance at work and school.
- Early testing and treatment will help to treat or slow down the development of the infection or disease in its early stage
- Proper treatment can save life and prevent long term effects such as infertility
- Healthcare professionals can give appropriate counseling on how to manage the infections
- Testing gives peace of mind
- Proper health care reduces the chance of infecting other people.

CELL STRUCTURE AND ORGANIZATION

The Cell is a basic unit of life.

- All living things are composed of cells which carry out the process that make the organism lives entity.
- All cells are basically the same in chemical composition. All life processes take place in the cells.
- Some organisms are made up of many cells and are called multicellular organisms e.g. man, pine tree, locust. Others have one cell e.g Amoeba, they are called unicellular organisms.
- All cells are microscopic, its membrane bound it has structures that are site for chemical reaction called organism.
- They have ability to replicate, since they contain the genetic materials. So these are characteristics of cell.

TYPES OF CELLS

There are two basic types of cells

- ***Prokaryotic cells***
- ***Eukaryotic cells***

Prokaryotic cells are found in organisms which do not have membrane bound organelles, they do not have nucleus.

Prokaryotes are mostly single celled organisms such as bacteria and blue green bacteria.

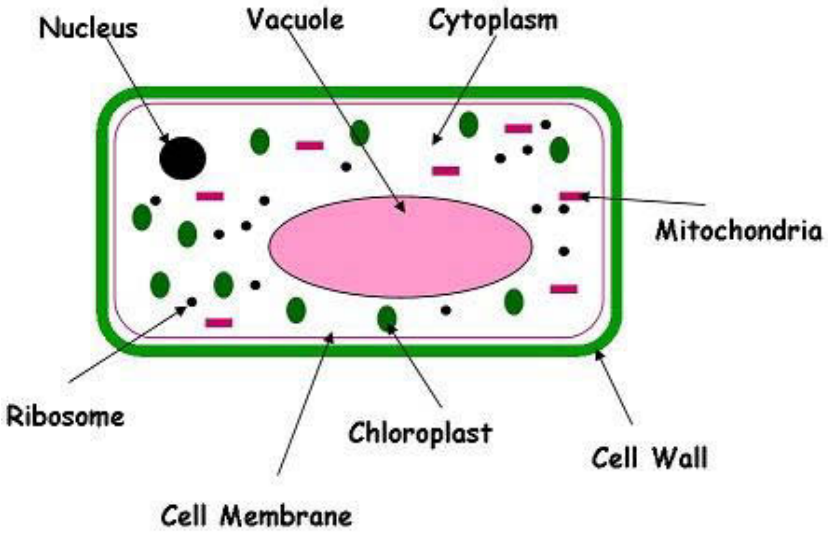
Eukaryotic cells are cells which have a membrane bound nucleus. They contain specialized membrane bound organelles

Eukaryotic cells can be found in a single celled organism such as Amoeba or they can be found in multicellular organisms.

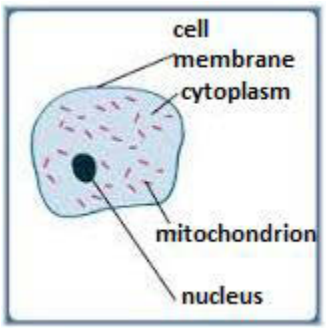
ANIMAL AND PLANT CELLS

Both animals and plants differ in structure and function in order to be able to meet the requirements of each organism.

Plant cell



Animal cell



FUNCTION OF THE PARTS OF ANIMAL CELL

1. CELL MEMBRANE

- Is also known as plasma membrane or plasma lemma.
- Is thin layer that encloses the whole cell

Function of cell membrane

- Communicate with other cells.
- It allows selective movement of substances into and out of the cell. It is said to be a selectively permeable membrane or differential membrane
- It encloses the contents of the cell.

2. CYTOPLASM

This is jelly- like substance made up of water and dissolved chemical substances. The cytoplasm is the site for many chemical reactions in the cell. Cell organelles such as the vacuoles, nucleus and mitochondria are suspended in the cytoplasm. The movement of cytoplasm is known as *cytoplasmic stream.*

3. NUCLEUS

This is a round or oval organelle suspended in the cytoplasm. The nucleus is made up of nucleolus and fluid called *nucleoplasm.* It is surrounded by a membrane called the *nuclear membrane*.

Functions of nucleus

- To determine the chemical processes that take place in the cell.
- To control the functions of all parts of the cell
- To determine the cell size, shape and function
- To determine the hereditary characteristic of a cell

4. MITOCHONDRION

The function of mitochondrion is the site for respiration , reactions which yield energy for the cell.

FUNCTION OF THE PARTS OF PLANT CELL

1. **CELL WALL**

- This is a strong covering made of cellulose.
- The cell wall is fully permeable. It allows the passage of water and minerals, gases (freely permeable).
- Protects and gives the cell a definite shape

2.**CHLOROPLAST**

- They are sites of photosynthesis
- It Contains green pigment called chlorophyll.
- Chlorophyll absorbs the light energy needed for photosynthesis

3. **VACUOLE**

Vacuoles maintain a balance between water molecules and solute molecules in the cell; contain color pigments, which give color to flower.

The fluid inside vacuole is known as cell sap.

4. **MITOCHONDRIA**

The function of mitochondria is the site for respiration , reactions which yield energy for the cell.

5. **NUCLEUS**

This is a round or oval organelle suspended in the cytoplasm. The nucleus is made up of nucleolus and fluid called *nucleoplasm.* It's surrounded by a membrane called the *nuclear membrane*.

6. **CYTOPLASM**

This is jelly like substance made up of water and dissolved chemical substances. The cytoplasm is the site for many chemical reactions in the cell. Cell organelles such as the vacuoles, nucleus and mitochondria are suspended in the cytoplasm. The movement of cytoplasm is known as *cytoplasmic stream.*

7. **RIBOSOMES**

This is the site of protein synthesis.

SIMILARITIES BETWEEN PLANT AND ANIMAL CELL

- Both have cell membrane.
- Both have cytoplasm.
- Both have nucleus.
- Both have vacuoles, ribosomes and mitochondria.

Differences between plant cell and animal cell

Plant cell	**Animal cell**
Has a cell wall	No cell wall
Has chloroplast	Lacks chloroplast
Have definite shape	Have no definite shape
Has a large permanent vacuole	Has small temporary vacuole
They are normally large	They are usually smaller
They store oil, proteins, starch	They store fats and glycogen

CELL DIFFERENTIATION

- Cells have different functions and features that make them better suited to carry out these functions. This is called *cell differentiation*.
- Most living things are made up of many structurally and physiologically adapted different kinds of cells.
- These cells perform specific function and this is referred to as *cell specialization*.

- **Cell differentiation** refers to the way cells are adapted so that they can carry out function efficiently.

TISSUE

A tissue is a group of similar cells performing the same function. Basically there are two types of tissue.

Animal tissue e.g. epithelial tissue, muscular tissue, blood tissue, nerve tissue, skin tissue.

Plant tissue e.g. meristematic tissue, parenchyma tissue, collenchyma tissue, vascular tissue(xylem tissue, phloem tissue).

ORGAN

An organ is a functional unit formed by a group of specialized tissue.

Animal organ: - heart, kidney, liver, brain, tang, stomach

Plant organ: - roots, leavers, flower, stem

SYSTEM

System is made up of organs that work together to perform a certain function.

Examples of system are Respiratory system, digestive system, reproductive system, hormonal system, skeletal system and blood circulatory system, nervous system.

ORGANISM

An organism is the individual living organism e.g. Animal and Plant.

An organism is made up of different systems working together therefore there is special

Tissue

Organization from the cell → tissue → organ → system → Organism

Importance of cell differentiation

Cell differentiations leads to division of labour.

Division of labour means each cell does a specific function. This helps the body to carry out all life processes at the same time and more efficiently.

To achieve this, cells must become specialized to carry out special functions.

* Study more about specialized cell for different function e.g.

White blood cell (WBC) can change their shape to engulf and destroy harmful pathogen.

Red blood cell (RBC) for transporting oxygen (they are biconcave and lack nucleus)

Sperm cell – Fertilizes the female egg (have tails for swim pointed head for easy penetration)

Root hair cells – for absorb water and mineral salts (have extended portion helps to increase surface area for absorption)

Guard cell – control open and close of stomach (the inner wall is thinker than outer)

Palisade cell – makes it to expand irregularly

CLASSIFICATION OF LIVING THINGS

Classification is a grouping of organisms based on their similarities and differences organisms that are similar are placed in one group. These similarities could be in terms of ancestry structure or the way they carry out life processes such as feeding and reproduction.

Classification is a branch of biology that deals with the grouping of living organisms according to their structure, way of life and origin.

TAXONOMY

It is a branch of biology that deals with classifying organisms.

TAXONOMIST

A person (biologist) who studies about classification.

TAXON

Is any named established group in the ranks of classification.

IMPORTANCE OF CLASSIFYING LIVINGTHINGS

1. There are millions of livings things in the world, grouping them make it easy to study and identify them.
2. Scientific names enable scientist to identify organisms easily, no matter which part of the world they are in.
3. It easier to study organisms in a group, because the members of a group have many things in common.
4. Classification enables scientists to make predictions.
5. It provides an organized system in which newly identified similar organism can be fitted in future
6. It helps man arrange the information about living organisms in an orderly manner to avoid confusion.

CLASSIFICATION SYSTEM

There are two main types of biological classification namely: -

1. Artificial classification
2. Natural classification

ARTIFICIAL CLASSIFICATION

Artificial classification system is grouping of organism according to observable features. For example presence of legs or wings based on bees, birds and bats would be grouped together because they have wings. Snakes, earth worm and snails would also be grouped together because they do not have legs.

Artificial classification also involves classifying organisms according to their size how they move, where they live or what they eat.

Advantage of artificial classification

- It straight forward and easy to use
- It can be done very fast
- Artificial classification is less costly than natural.

Disadvantage of artificial classification

-Some organisms that are dissimilar in their internal make up are grouped together because of the resemblance of their external features.

-Some similar organisms are put in different groups because they do not have a lot of physical remembrance.

-It is less accurate because it uses only few observable characteristics.

-Artificial classification depends a lot on what the scientist is interested in therefore it varies from person to person.

NATURAL CLASSIFICATION

In this system classification is based on evolutionary relationship and presence of large number of common and similar characteristics feature that show homology and analogy structure.

Homologous structures: Are the structure having the same origin but perform different function. Eg, Forelimbs of whale and forelimbs of man .

Analogous structure; Are structure having different origin but perform the same function. Eg, Wings of birds and wings of insect

Advantage of natural classification

1. It gives a lot of information of living things
2. It is most accurate
3. It is universal
4. It avoids confusion

Disadvantage of natural classification

1. It requires a lot of time

2. It needs high skills
3. It is difficult to classify
4. It is expensive
5. It is not stable.

Difference between artificial and natural classification

1. Artificial is not accurate and natural is most accurate
2. Artificial is cheap while natural is expensive
3. Artificial classify living organism according to the external features while natural classification classify living organism according to the internal features.

4. Artificial does not require scientific skills while natural classification requires scientific skills and knowledge.

MAJOR GROUP OF LIVING ORGANISM

There are five major groups of living organism

1. Kingdom animalia eg. Cow, cockroach
2. Kingdom plantae eg. Maize tree, peas
3. Kingdom monera eg. Bacteria
4. Kingdom protoctista eg. Amoeba
5. Kingdom Fungi eg. yeast

RANKS OF CLASSIFICATION

1. Kingdom
2. Phylum or Division
3. Class
4. Order
5. Family
6. Genus

-Kingdom has a greatest variety of organism

-At kingdom level, organism shows few features in common as you move down the rank each unit has lesser and lesser organisms and the members of each unit have more and more features in common.

At the species level organisms are least varied but share more features. Members of the same species can interbreed and produce viable off spring that can turn reproduce. But organisms from different species do not usually interbreed different species. Do not interbreed because of differences in genetic makeup, physical features, size and geographical location. However these are few exceptions to this rule. Dogs and Wolves can interbreed to produce viable offspring.

In table below some few common organisms have been classified from kingdom to species level. This should guide you in classifying other organisms.

CLASSIFICATION OF SOME COMMON ORGANISM

TAXONOMY UNIT	HUMAN BEING	DOG	MAIZE PLANT	EUCALYPTUS TREE
Kingdom	Animalia	Animalia	Plantae	Plantae
Phylum or division	Chordata	Chordata	Spermatophyta	Magnoliophyta
Class	Mammalia	Mammalia	Argiospermae	Magnoliopsida
Order	Enirate	Carnivore	Graminales	Myrtalesa
Family	Hominidae	Canidae	Graminales	Myrtaceae
Genus	Homo	Canis	Zea	Eucalyptus
Species	Sapiens	Familiars	Mays	Regnans
Scientific name	*Homo sapiens*	*Canis familiaris*	*Zeamays*	*Eurcalyptus regnans*

KINGDOM

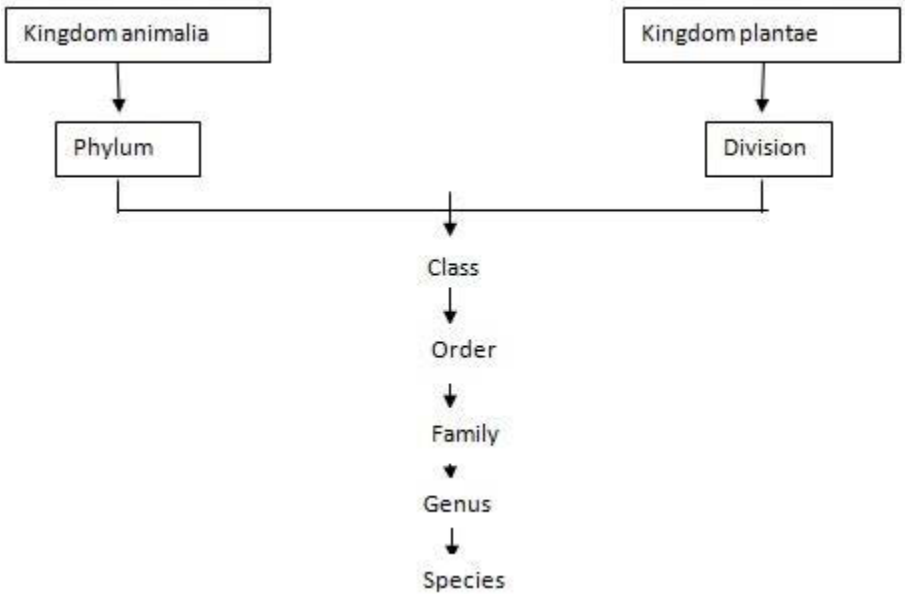
For example human being and donkey

Kingdom Animalia is subdivided into phyla or phylum in singular

Kingdom plantae subdivided into division, The phyla or division are further subdivided into class, each classes is subdivided into orders every order is subdivided into families and families are subdivided into genera (genus in singular)

A genus is subdivided into species. Kingdom, phylum, divisions, classes, orders, families, genera and species are ranks of classification and are called units or taxa.

The following flow chart shows how kingdom plantae and kingdom Animalia are subdivided



BINOMIAL NOMENCLATURE

Nomenclature is a system of naming organism where by every name is made up of two Latin words.

This system was divided into two parts

The first part of the name represents the genus it is also called the genetic name.

The second part of the name represents the species it is also called the specific names

For example: The specific name of human being is *Homo sapiens*. Homo is generic name and sapiens is the specific name. The following rules are observed when writing scientific names.

1. The generic name is written before the specific name
2. The generic name must start with capital letter.
3. The specific name is written in small letter

4. In publisher document such as books scientific name is written in italics eg, *Zea mays* and *Homo sapiens* when hand written or typed the names should be underlined.

SCIENTIFIC NAMES OF SOME COMMON ORGANISMS

COMMON NAME	SCIENTIFIC NAME
Coconut plant	Cocos nucifera
Mango tree	Mangifera Indica
Garlic plant	Allium sativum
Pea plant	Pisum sativum
Domestic cat	Felis catus
Housefly	Musca domestica
Lion	Panthera leo
Donkey	Equus asinus

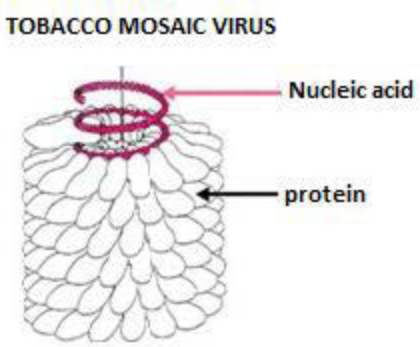
VIRUSES

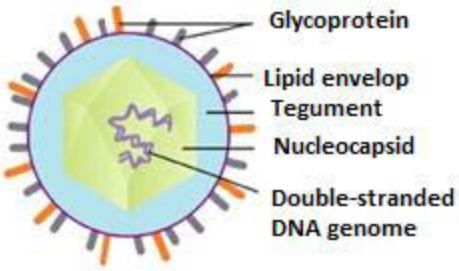
A virus is an extremely small micro organism.

It is smaller than a living cell. A virus is not a cell

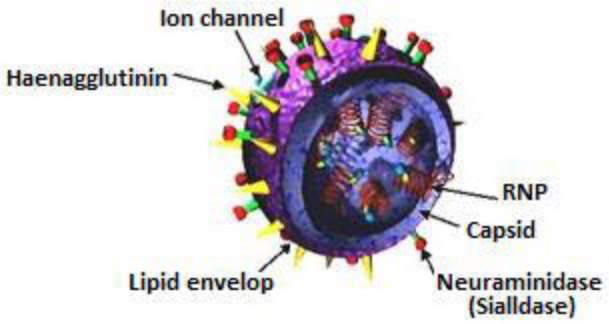
The study of viruses is called virology

Different types of viruses:

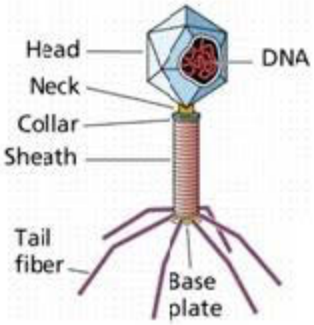




Structure of the varicella-zoster virus particles



Influenza



Bacteria phage virus

STRUCTURE OF VIRUSES

A virus has a very simple structure consisting of genetic material with a protein shell. The protein shell is called a capsid. Viruses do not have a nucleus or complex membrane cell organelles. Some viruses have viral envelopes.

There are membranes enclosing the host cell.

Viruses cannot reproduce its own. It must attack a host cell and uses the material in that cell to reproduce.

This is called oblige parasitism.

CHARACTERISTICS OF VIRUSES

- Viruses do not grow, feed, excrete or respire. Viruses exist in a dormant state when outside a host cell.

They show no signs of life; they can stay that way for months or even years.

- A virus particle outside a host cell is called a virion. The virion attacks and cause diseases.
- Viruses are host specific, this means that a certain type of virus only attacks a certain host for example. The viruses affect only certain type of white blood cell in human being.

Advantages of viruses

-Virus is important in the study of cellular and molecular biology. They are used by scientist to manipulate and investigate the function of cell.

-Some viruses are used to make vaccine. For example, the first vaccine against small pox was a small dose of virus that causes cow pox, which is milder infection. On recovering from cow pox, the body had antibodies that could resist both cow pox and small pox.

-Bacteria phages are viruses that attack bacteria they help in attacking bacterial infections and diseases.

Disadvantage of virus

1. Viruses are pathogens, they cause disease and infections such as rabies, muscles, chickenpox and polio also they destroy living cell.
2. They can reproduce very fast, leading to large scale epidemics.
3. Viruses can attach themselves often and this become difficult to destroy for example there are many different types of viruses that cause the common cold and influenza. This makes it difficult to develop vaccines or cures for these infections.

KINGDOM MONERA

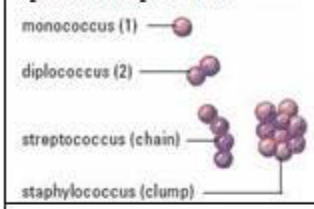
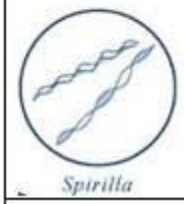
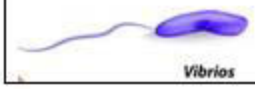
This kingdom monera consists of bacteria and blue green bacteria. The scientific study of bacteria is called bacteriology.

CHARACTERISTICS OF BACTERIA

1. They are prokaryotic.
2. They are unicellular, some bacteria stick together to form chain or clusters called colonies.
3. Some are free – living while others are parasites or saprophytes. Free living bacteria are those which exist on their own for example in sewage or soil. Parasitic bacteria are those which live on other organism and get their food from them for example in human beings and animals.

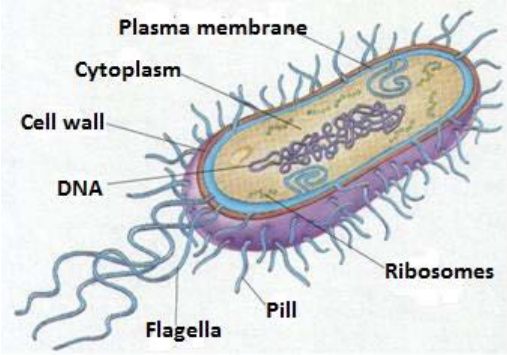
   Saprophytes bacteria grow and get their food from died organic matter.

4. Free living bacteria have flagella for movement.
5. Bacteria have a slimy outer layer. This layer helps to protect the bacteria
6. They produce either asexually by binary fission or through spores or sexually through conjugation.
7. Bacteria occur in various shapes.

Shape	Name	Example
Spherical shaped virus 	Cocci (singular coccus)	Diplococcic found in pair, e.g. bacteria cause pneumonia and gonorrhoea, staphylococcus found in clump e.g. the bacteria that cause sore throat
 Rod shaped bacteria	Bacillus (singular bacilli)	Mycobacterium tuberculoses cause tuberculosis. Escherichia soil found in gut of human being and can cause cramping, Diarrhoea, and Urinary infection Salmonella typhi causes typhoid, clostridium tetani cause tetanus
	Spirillum bacteria	Treponema pallidum cause syphilis
	Vabrio	Vibrio cholerae cause cholera

A bacterium consists of nucleic materials suspended in the cytoplasm. (no nucleus)

The cytoplasm is enclosed by fold cell membrane; a cell wall and slim layer enclose the cell membrane.



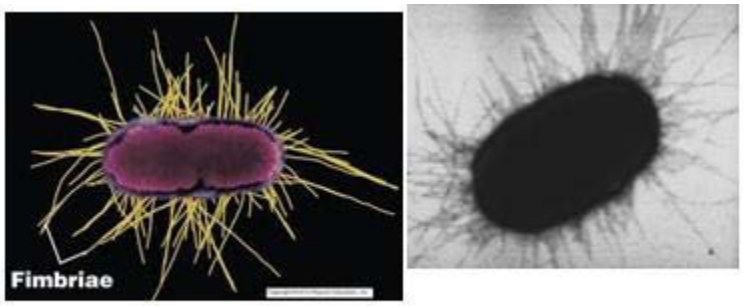
Basic structure of bacteria

Pathogenic bacteria

These are bacteria that can cause disease, some of the diseases caused by bacteria are fire blight, ring rot and tobacco mosaic in plant and TB, typhoid, tetanus, cholera, syphilis and gonorrhea in animals.

Fimbriae or pili

These are hair like structure found on the surface of the bacteria. The hairs attach themselves to the host to that they cannot be removed easily for example. Escherichia coli produce fimbria that attaches themselves the living of the urinary track or the intestines.



Fimbriae or pili

FLAGELLA

These are long tail like structures that help some pathogenic bacteria to move to a site where they can services

TOXINS

Some bacteria produce toxin (poisonous) compound that harm hosts. In human these toxins cause effects such as vomiting diarrhea, fever and muscle cramps for instance, toxins released by salmonella bacteria can cause severe diarrhea.

Invasion and colonization

Some bacteria attack themselves and become resistant to modes of treatment for examples, the bacterium they causes tuberculosis has become resistant to many antibiotics by transforming itself.

RESISTANCES

Some types of bacteria release a substance known as *bio film* that protects them from harmfully substances such as drugs.

NON-PATHOGENIC BACTERIA

Those are bacteria that are harmless even when they are on a plant or animal body.

CHARACTERISTICS OF NON- PATHOGENIC BACTERIA

1. Some non – pathogenic bacteria feed on substance that are harmfully to the environment and in the process neutralize them, for example, they neutralize petroleum waste from petroleum industries, disease and pesticide there by making the environment safe.
2. Bacteria such as rhizobium that are formed in the root nodules of leguminous plants, clostridium and Azotobacter help to convert atmospheric nitrogen to nitrates, plant need nitrate for their growth.
3. Bacteria in the stomach of ruminant animals such as goats and cows secret enzyme that help in the digestion of cellulose which forms a large part of the body of ruminant.
4. Bacteria in the animal gut manufacture vitamins K and B
5. Lactic acid bacteria produce lactic acid as a result of fermentation of carbohydrates. This is important in the production of fermented food and alcoholic drinks.
6. Autotrophic bacteria carry out photosynthesis.

ADVANTAGE OF KINGDOM MONERA

1. Bacteria that neutralize harmfully substance help clean the environment.
2. Bacteria found in the gut help animals to digest food and break it down into a form that can be absorbed into the body.
3. Vitamins produced by bacteria are important for the health of animals include man.
4. Fermentation is used in the production of yoghurt,vinegar and alcohol.
5. Controlled fermentation is used in the curing tea and tobacco and retting of flax, help to treat and preserve these products

   Retting of flax is important in the production of fibre.

6. Some bacteria are used to produce antibiotics which are used to treat bacterial infections.
7. During photosynthesis autotrophic bacteria release oxygen into the atmosphere, oxygen in vital for the respiration in all living things.

DISADVANTAGE OF KINGDOM MONERA

1. Bacteria cause infection and disease in animal some of these are fatal.
2. A bacteria disease in crop cause decrease production and losses to farmers.
3. Bacteria cause food to decay and spoil
4. Due to Denitrifying bacteria in the soil convert nitrates to nitrogen. This reduces the nutrients available of plants.

CHARACTERISTIC OF KINGDOM PROTOCTISTA

1. They are eukaryotic.
2. Most are unicellular organisms. Only a few are multicellular.
3. Most live in or near water or in moist places.
4. Some are autotrophic (produce their own food) while others are heterotrophic (obtain nutrients from other organisms)
5. Some are mobile while others are stationery.
6. Some reproduce sexually and other asexually.
7. Many of them have locomotory structures such as cilia and flagella.

PHYLA OF THE KINGDOM PROTOCTISTA

The following table shows some of the phyla of kingdom protoctista.

Phylum	**Example**
Rhizopoda/Amoebozoa	Amoeba

Apicomplexa	Plasmodium
Euglenophyta	Euglena
Ciliophera	Paramecium
Zoomastigina	Tryponasoma

AMOEBA

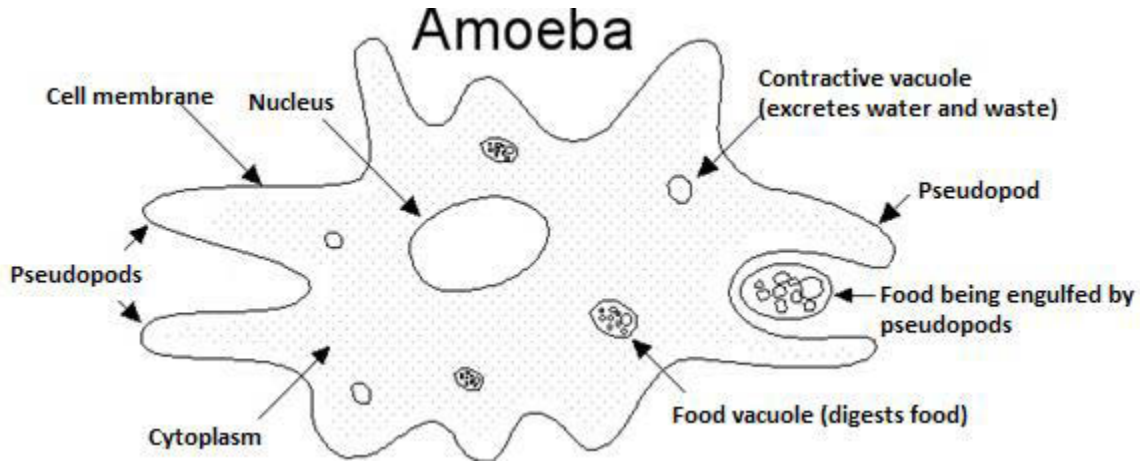
Amoeba is free living, unicellular organisms, are found at the bottom of ponds and lichen.

CHARACTERISTICS OF AMOEBA

1. Amoeba has two layers of cytoplasm the outer layer called ectoplasm and the inner layer is called endoplasm.

   Endoplasm is more fluid and contains granulose and vacuoles.

2. Amoeba is aquatic. They can be found in fresh water.
3. They use **pseudopodia** (cell extensions) for locomotion and to engulf food particles.
4. Contractile vacuoles regulate the amount of water in the fresh water amoeba.
5. A temporally food vacuole is formed to hold and digest food particles.
6. Waste products such as urea and ammonia are excreted by simple diffusion.
7. Oxygen and carbon dioxide are exchanged by simple diffusion.
8. Amoeba reproduce by binary fission



Advantage of Amoeba

Amoeba is commonly used in laboratories to study cell structure and function.

Disadvantage of Amoeba

Amoeba can cause diseases for example Entamoeba histolytica cause amoeba dysentery in human.

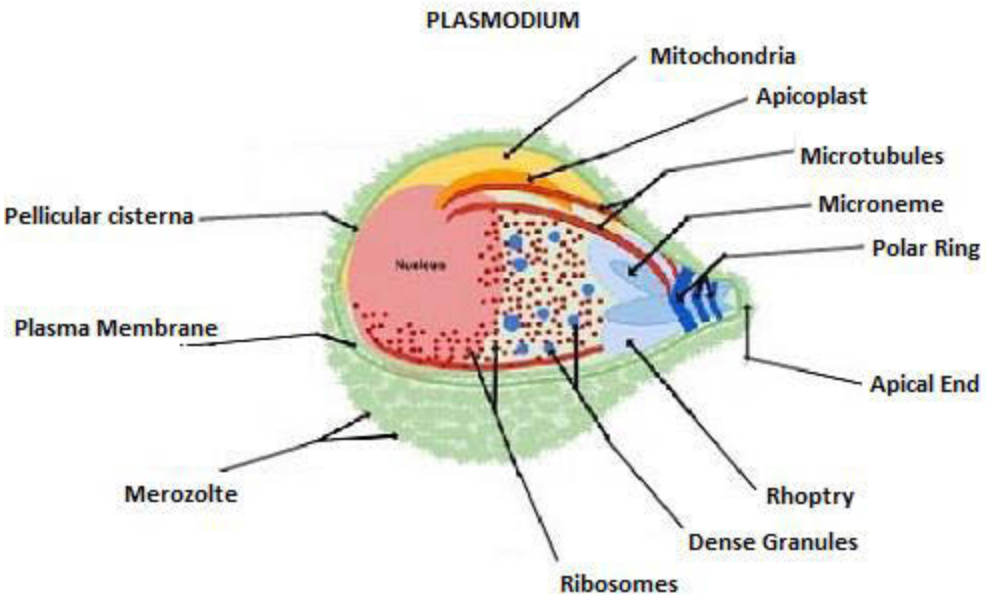
PLASMODIUM

Plasmodium is the parasite that can cause malaria in human being.

Plasmodium is transmitted by anopheles mosquito and sand flies (vectors) and the mammalian, birds and reptiles are hosts.

CHARACTERISTICS OF PLASMODIUM

1. They are unicellular.
2. They are parasitic, with very complex life cycles involving the host and the vector
3. They produce sexually in the vector and asexually when a plasmodium enters the human body. It attacks the red blood cells and the liver.

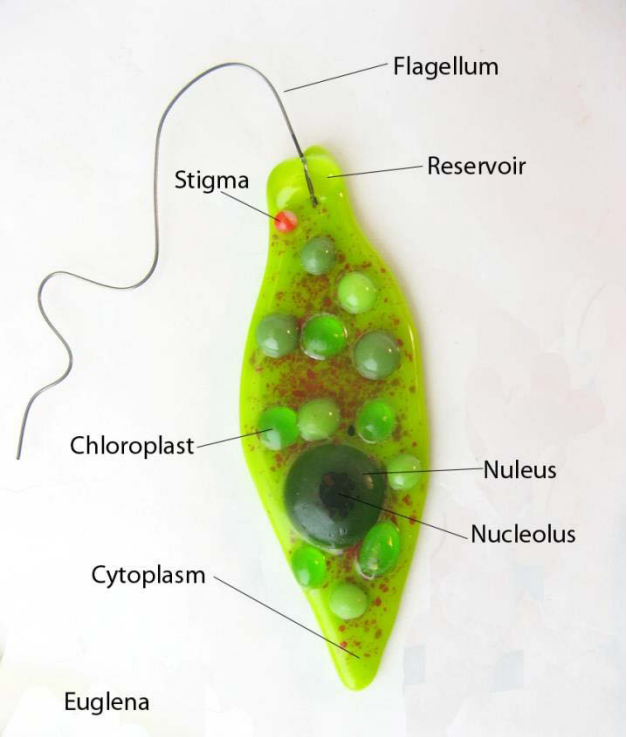


Effect of plasmodium

Plasmodium parasites cause malaria, can lead to inflammation of the spleen, miscarriage and anaemia due to the destruction of the red blood cells. Severe malaria cause death.

EUGLENA

Euglena are characterized by the green scum that appears on stagnant water



CHARACTERISTICS OF EUGLENA

1. They are unicellular.
2. They are found on both fresh water and salt water
3. Euglena move using flagella.
4. Some have chloroplasts for photosynthesis while others are heterotrophs.
5. They reproduce asexually
6. Some euglena have *pellicle*, the pellicle is flexible layer within the cell membrane. The pellicle helps euglena to change shape.

ADVANTAGE OF EUGLENA

Euglena is used to treat sewage because of their unique capacity to change from being autotrophic when the euglena photosynthesis produce oxygen when they are heterotrophic they use oxygen. This help to keep oxygen levels balanced in sewage treatment plant.

Euglena called phytoplankton are important source of good for many types of aquatic micro – organism.

Phytoplankton they produce large quantities of oxygen during photosynthesis.

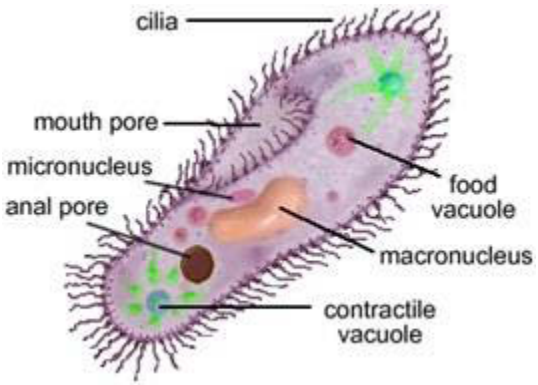
DISADVANTAGE OF EUGLENA

Euglena blooms can be harmful to fish these are sudden increase in the number of microorganisms in the water.

PARAMECIUM

Characteristics of paramecium

1. They are unicellular and shipper – shaped.
2. Paramecia are heterotrophic.
3. They live in water
4. They use cilia to move
5. Their bodies are covered with a pellicle
6. Food enters the organism through an open called the oval groove.
7. Paramecia feed on bacteria and microorganisms.
8. They reproduce either sexually or asexually
9. Contractile vacuoles regulated the amount of water in the cytoplasm.



Paramecium

Advantage of paramecia

-Paramecia are eaten by small water animals

Disadvantage of paramecia

-*Balantidium coli* are a type of paramecia that cause disease.

It invades and destroys the living things intestine, causing diseases called *balantidiasis*