Etege Menen Girls' Boarding Secondary School

Biology Department

Grade 9



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SECOND SEMESTER CONTENTS

3.5 The circulatory system

- Heart
- Blood Vessels
- Blood

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CIRICULATORY SYSTEM

- **Circulatory system** is a system in which oxygen, digested food and other nutrients transport to all part of body.
- All organism do not have specialized circulatory system. Small, single celled organism relies on simple diffusion to exchange material between the environment and their cells.
- **Large animals have smaller surface area to volume** ratio so that simple diffusion is less effective to transport substance.
- Large animals like humans need very complicated transport systems called **blood circulatory system.**
- **CIRCULATION** is the movement of blood and other fluid through blood vessels to all parts of the body.
- The human transport system is the blood circulatory system

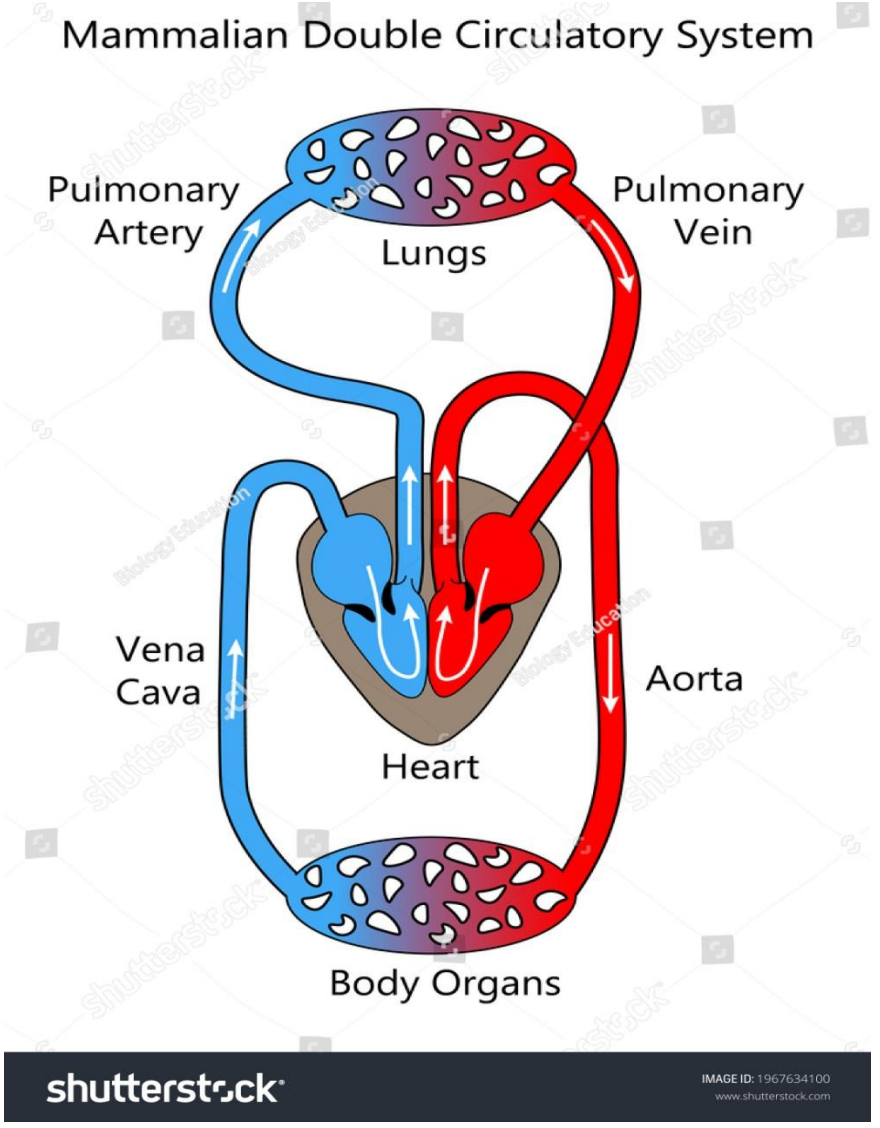
Double circulation

Pulmonary circulation

- Important to exchange oxygen and carbon dioxide
- The pathway of blood between heart to lung
  1. **Right ventricle**
  2. **Pulmonary artery**
  3. **lung**
  4. **pulmonary vein**
  5. **left auricle**

Systematic circulation

- Is the pathway of blood form heart to all part of the body
- Supply oxygen rich blood to all part of the body

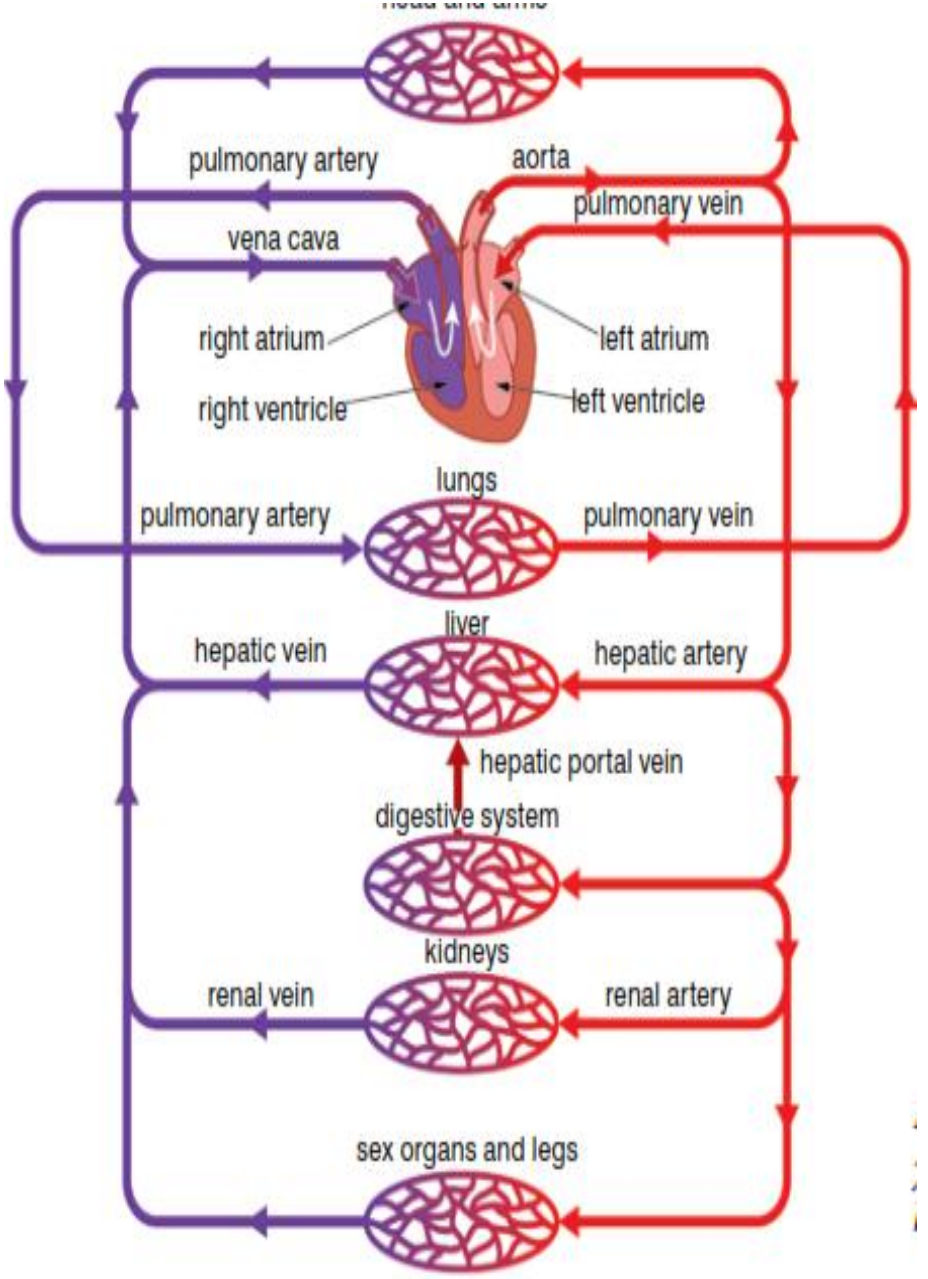


Systematic circulation can be divided into

1. **Hepatic circulation** the pathway of blood between heart to liver
2. **Renal circulation** the pathway of blood between heart to kidney
3. **Coronary circulation** the pathway of blood between heart to heart muscle
4. **Hepatic portal circulation** carries digestive nutrient from the digestive system to the heart through the liver

Components of human circulatory system

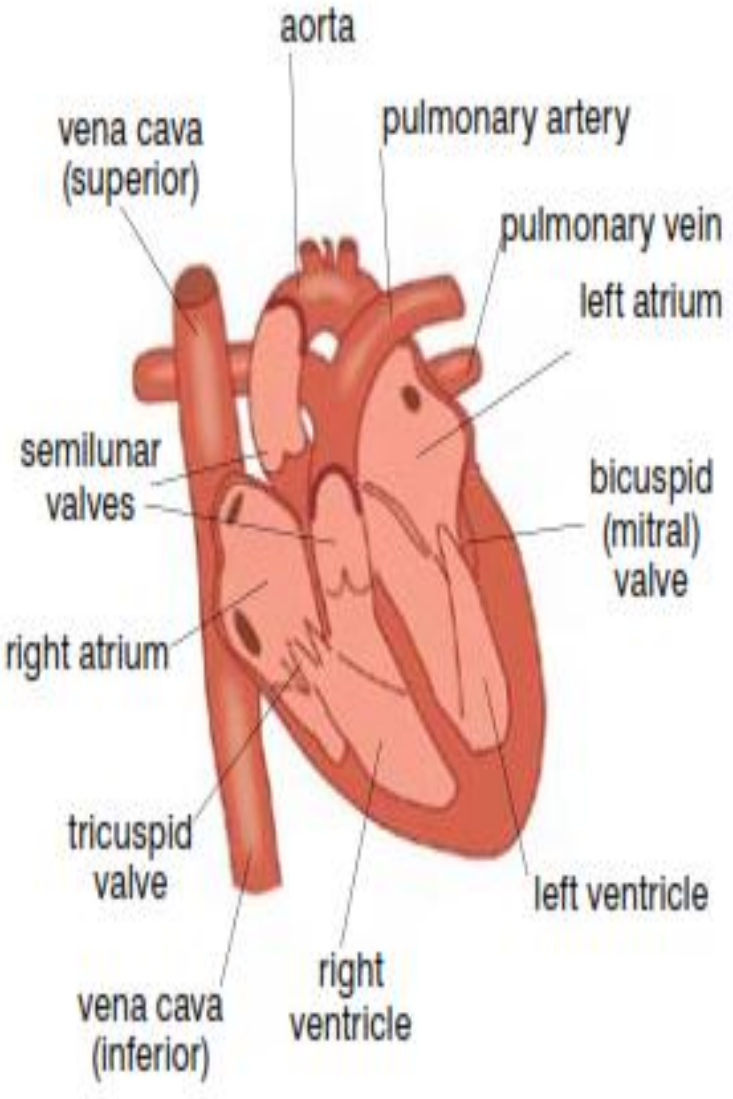
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Human heart.

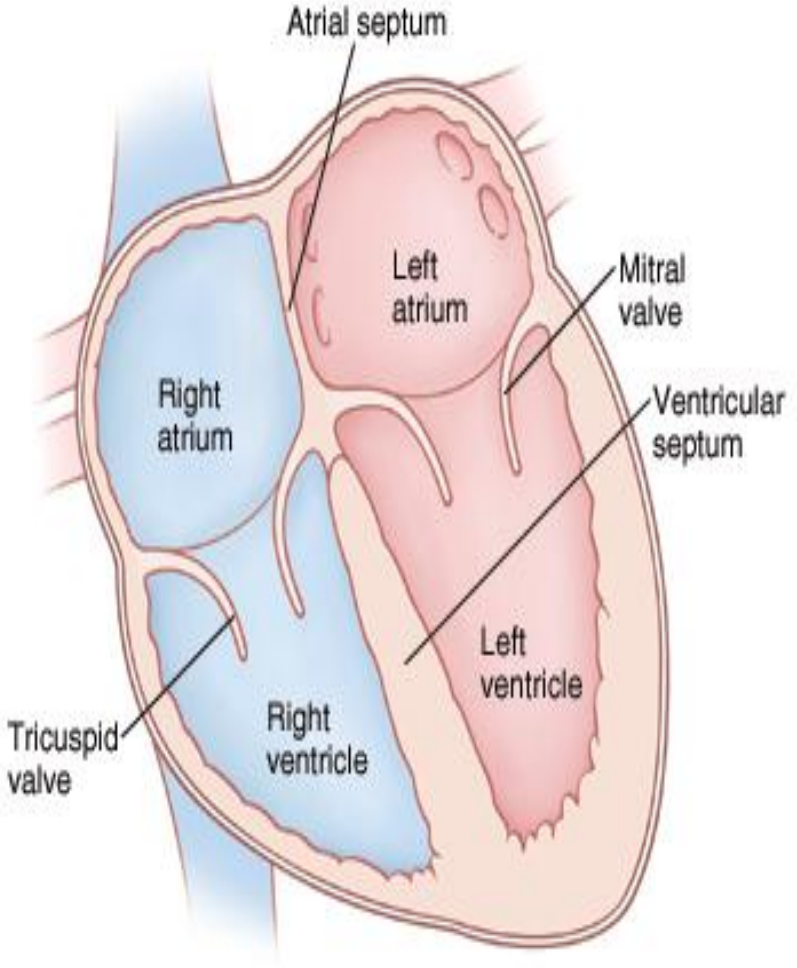
- It has three elements
  - Heart (pump)
  - Blood vessels (pipe)
  - Blood (medium)

  HUMAN HEART
- Made up of **cardiac tissue**
- It is a muscular blood pumping organ
- Human heart Surrounded by a double membrane called **pericardium**
- **It has four chamber**
  - **Two atria (auricles)** upper chamber
  - **Two ventricles** lower chamber



Chamber of the heart

- **The right auricle** receive **deoxygenated blood** from all part of the body through vena cava
- **The left auricle** receive oxygenated blood from lung through pulmonary vein
- **T**he **right ventricle** pump **deoxygenated blood** to **lung** whereas **left ventricle** pump **oxygenated blood** to all part of the body
- **Left ventricle** is the **thickest chamber** of the heart because it pumps blood longer distance
- The left side of the heart separate from the right side by **septum**
- **T**he muscle of the heart supplied oxygenated blood by **coronary artery**



Systolic blood pressure

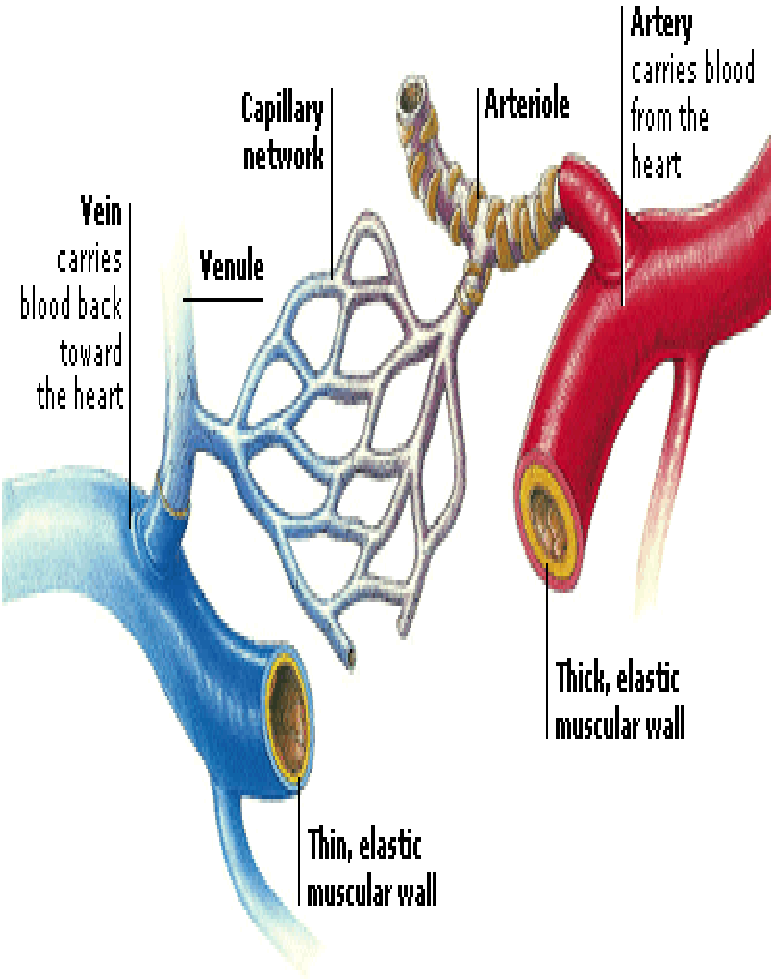
- The contraction of the heart chamber is stimulated specialized tissue called **pacemaker**
- An instrument used to listen the heart beat is **stethoscope**
- An average heart rate of human being is **72 times** per minute**.**
- **Systolic blood pressure**
  - Pressure formed by the **contraction heart chamber**
  - Forced blood out of the heart into arteries
  - Blood pressure at highest reading
- **Diastolic blood pressure**
  - Pressure exerted by the **relaxation of the heart chamber**
  - Blood pressure at lowest reading
  - Fills the chamber of the heart with blood
- The **normal blood pressure** of human being is **120mmHg/80** mmHg
- The **nominator** is systolic and **denominator** is diastolic Pressure
- Highest reading (120) systolic and Lowest reading (80) diastolic

Valves of the heart

- **Valves** the structure of the heart prevent the back flow of blood
- **Tricuspid valve**
  - the valve between right atrium and right ventricle
  - prevent the back flow of blood from right ventricle to right atrium
- **Bicuspid (mitral) valves**
  - The valve between left atrium and left ventricle
  - Prevent the back flow of blood from left ventricle and left auricle
- **Simi-lunar valve**
  - Found at the opening of pulmonary artery and aorta
  - Prevent the back flow of blood into ventricle

Blood vessel

- **Blood vessel** are the pathways through which transportation of material takes place
- **There are three main type of blood vessels**
  - **Arteries:** carry blood away from the heart
  - **Veins:** carry blood back to the heart
  - **Capillaries:** site of exchange of substance within the body



ARTRIES

- Carry blood **away from the heart**
- Thick and elastic wall
- Thick muscle layer
- Have elastic fiber
- Small /narrow/ lumen
- Blood flow rapid
- High pressure and pulsate
- No valves

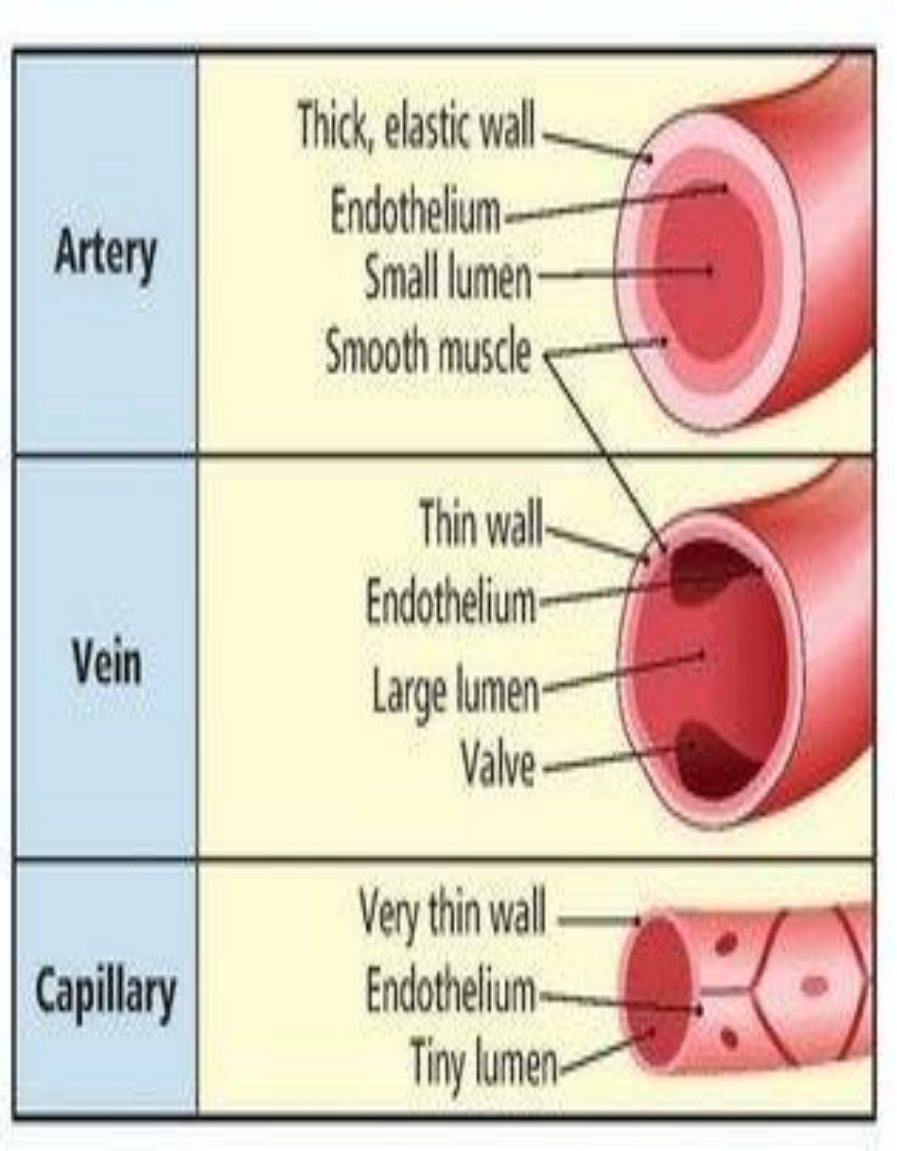
- Mostly deep seated
- Carry oxygenated blood **except**
  - ✓ **Pulmonary artery** carry **deoxygenated** blood to lung
  - ✓ **Umbilical artery** carry **deoxygenated** from fetus to placenta
- Largest artery **aorta** smallest **arterioles**

VAINS

- Carry blood **back to the heart**
- Thin wall
- Thin muscle layer
- No elastic fiber
- Big /wider/ lumen
- Blood flow slowly
- Low pressure and pulsate
- Have valves
- Mostly superficial
- Carry deoxygenated blood except
  - **Pulmonary vein** return **oxygenated back** from lung to heart
  - **Umbilical vein** carries **oxygenated** blood placenta to fetus
- Largest vein vena cava smallest venules

CAPILLARIES

- Narrow thin walled blood vessels
- Connects arteries and with veins
- Take blood to the tissue and cell
- **Site of exchange of substance** within the body
- Wall one cell thick
- Blood flow slowly
- **Mix oxygenated and deoxygenated** blood
- No valve



BLOOD

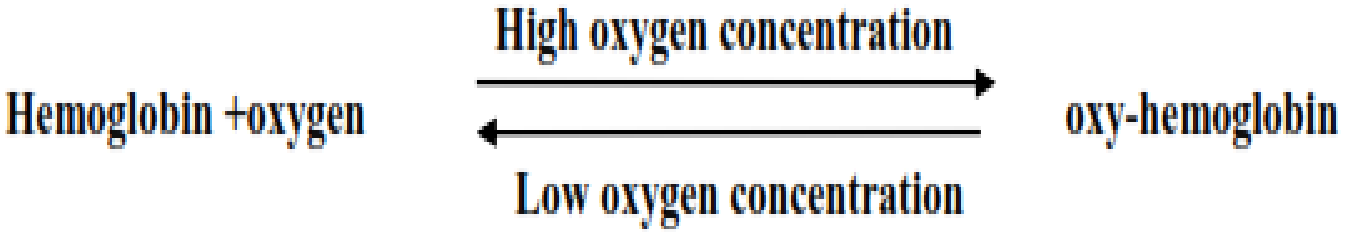
- **BLOOD** is a fluid tissue that carries nutrient, respiratory gases, metabolic wastes and other substance
- **Blood contains**
  1. **Plasma** : transport nutrients , carbon dioxide, hormones, enzymes and nitrogenous waste
  2. **Blood cells**
     - ✓ **Red blood cells:** used to transport oxygen
     - ✓ **White blood cells:** used to defense the body against disease
     - ✓ **Platelets**: important in blood to clot at the site of a wound

PLASMA

- **A** pale yellow **liquid part of the blood**
- 90% of the plasma is water
- 10% consists dissolved and suspended substance
- Transport nutrients, CO2, hormones, enzymes and nitrogenous waste
- Contain plasma protein such as fibrinogen, prothrombin and Thrombin

RED BLOOD CELLS (ERYTHROCYTES)

- **Biconcave /disk/** shaped non nucleated cell
- Live 100-120 days in your body
- Worn out red blood cell destroyed and removed by **liver** and **spleen**
- Thin surface membrane for ease of diffusion
- Used to transport oxygen and carbon dioxide back into the lung
- RBC formed in the **bone marrow**
- Contain a red pigment called **hemoglobin**
- Hemoglobin contain iron, the lack of iron in diet cause **anemia**
- Hemoglobin is a complex protein which carries oxygen



Adaptation of RBC to carry oxygen

1) **Contain hemoglobin**
2) Does **not have nucleus** to carry more room for hemoglobin.
3) Have **biconcave disk shape** increase surface area for diffusion of oxygen
4) **Thin surface membrane** for ease of diffusion

WHITE BLOOD CELL (LEUCOCYTES)

- Collarless, irregular shaped and nucleated
- **Produced** in **bone marrow, lymph nodes** and **spleen**
- Fewer white blood cell then red blood cell
- Much bigger then red blood cell
- **Used to defense the body against disease**
- White blood cell can be classified
  - **Phagocytes** a group of white blood cell that engulf and ingest infection microbes
  - **Lymphocytes** group which help to produce antibodies

PLATLATES (THROMBOCYTES)

- Collarless and non-nucleated
- **Important in blood to clot at the site of a wound. This is very important**
  1. Prevents the body from bleeding to death from a simple cut
  2. Also protect the body from the entry of pathogen through open wound
  3. Protect the new skin as it grows

Human blood group

- **ABO** blood group system
- **Four major blood group in humans'**
  - Blood group **A**
  - Blood group **AB**
  - Blood group **B**
  - Blood group **O**
- **Antigens** are special protein which are found on the red blood cell
  - Antigen allow cells to recognize each other
  - Blood group **determine by** the type of **antigen** on the red blood cell

1) **"A"** blood contain **"A"** antigen
2) **"B"** blood contain **"B "** Antigen
3) **"AB"** blood contain **"A'** and **"B"** antigen
4) **"O"** blood **do not contain antigen**

- **Antibody** are protein which are produces the body **to fight foreign antigen** and found in the plasma of the blood
- Two type of antibodies against antigen. These are **anti-A** and **anti B**
- **Agglutination** is incompatibility of antigen and antibody in blood group
- Blood groups that mix without agglutination are called **compatibility**

Transfusion of blood group

Blood group	Antigen	Antibody	Can be transferred (donate) into	Can received blood from
A	A	Anti-B	A and AB	A and O
B	B	Anti-A	B and AB	B and O
AB	A and B	NONE	AB only	A, B,AB,O
O	NONE	Anti A and B	A,B,AB,O	O only

Rh factors

- There is another antigen found on the surface of RBC called **Rh antigen**
- A person who do have this antigen is called Rh^+ (Rh positive)
- A person who do not have this antigenic called Rh^- (Rh negative)
- **Rh system in relation to marriage**

Mother		**Father**
• **Rh^+**	→	**Rh^+** no problem
• **Rh^-**	→	**Rh^-** no problem
• **Rh^-**	→	**Rh^+** **may be a risk** Why?
• **Rh^+**	→	**Rh^-** no problem

COMMON PROBLEM OF CIRCULATORY SYSTEM

ANEMIA

- It is caused by have **too few red blood cells** in the body, or the levels of the oxygen-carrying red pigment **hemoglobin in blood are too lows.**
- Most commonly caused by the lack of iron in the diets
- Treated by eating iron rich diets such as liver, meat, egg, green leaf vegetable
- **Girls are more likely to be anemic then boys** because they lost iron in their menstrual bleeding

HYPERTENSION

- High blood pressure above**140/90 mmHg**
- Caused by various reason such as
- Age. Over weightiness
- High consumption of salt
- Drug addiction
- Diabetics etc.
- Can be reduce and controlled by;
- Eating less fat and salt
- Regular exercise
- Avoid use of drug etc

Unit 4
MICRO-ORGANISM AND DISEASE

4.1. MICRO-ORGANISM

- Are organisms too small to be seen with the naked eye
- Micro- organisms can be seen with the aid of microscope
- Micro-organism have useful and harmful aspects

Useful aspect of micro-organism

- Decay and recycling of nutrients
- Used in the making of food, Such as injera, ergo and eyib
- Produce alcoholic drinks such as beer, wine and tej
- Important in genetic engineering

Harmful aspect of micro-organism

- Cause disease in plant ,animals and humans
- Food poisoning bacteria cause spoilage of food
- Micro-organism includes bacteria's, viruses. Molds. Yeast

BACTERIA

- Bacteria are a single called organisms
- Smaller then the smallest animal and plant cells
- Are unicellular and prokaryotic organisms
- Bacterial cell have many similarities to animal and plant cell. They are made up of
- cell wall, cell membrane, cytoplasm and genetic material
- Some bacteria have **flagella(for movement)**and **capsule** (for protection)
- Bacteria are classified based on shape into **rod shaped(bacilli), round(cocci), comma(vibro)** and spiral
- Bacteria can also be classified into **gram positive** and **gram negative** based on **gram stain**
- Gram stain is a **differential stain** used to classify bacteria into two
- Different bacteria have different cell walls which take up the stain differently

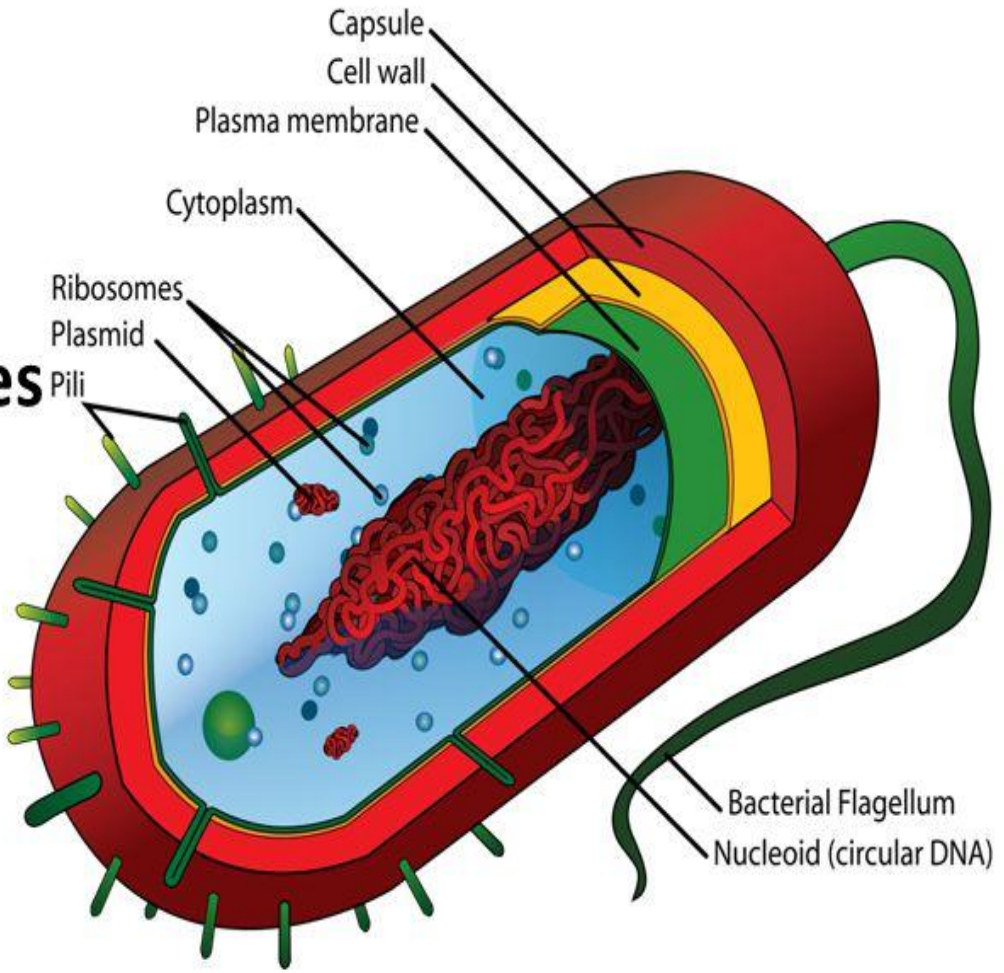
Structure of Bacteria

Essential structure

- Cell wall
- cell membrane
- Cytoplasm
- Nuclear material

Particular structures

- Capsule
- flagella
- pili
- Spore



Stages of Gram Stain

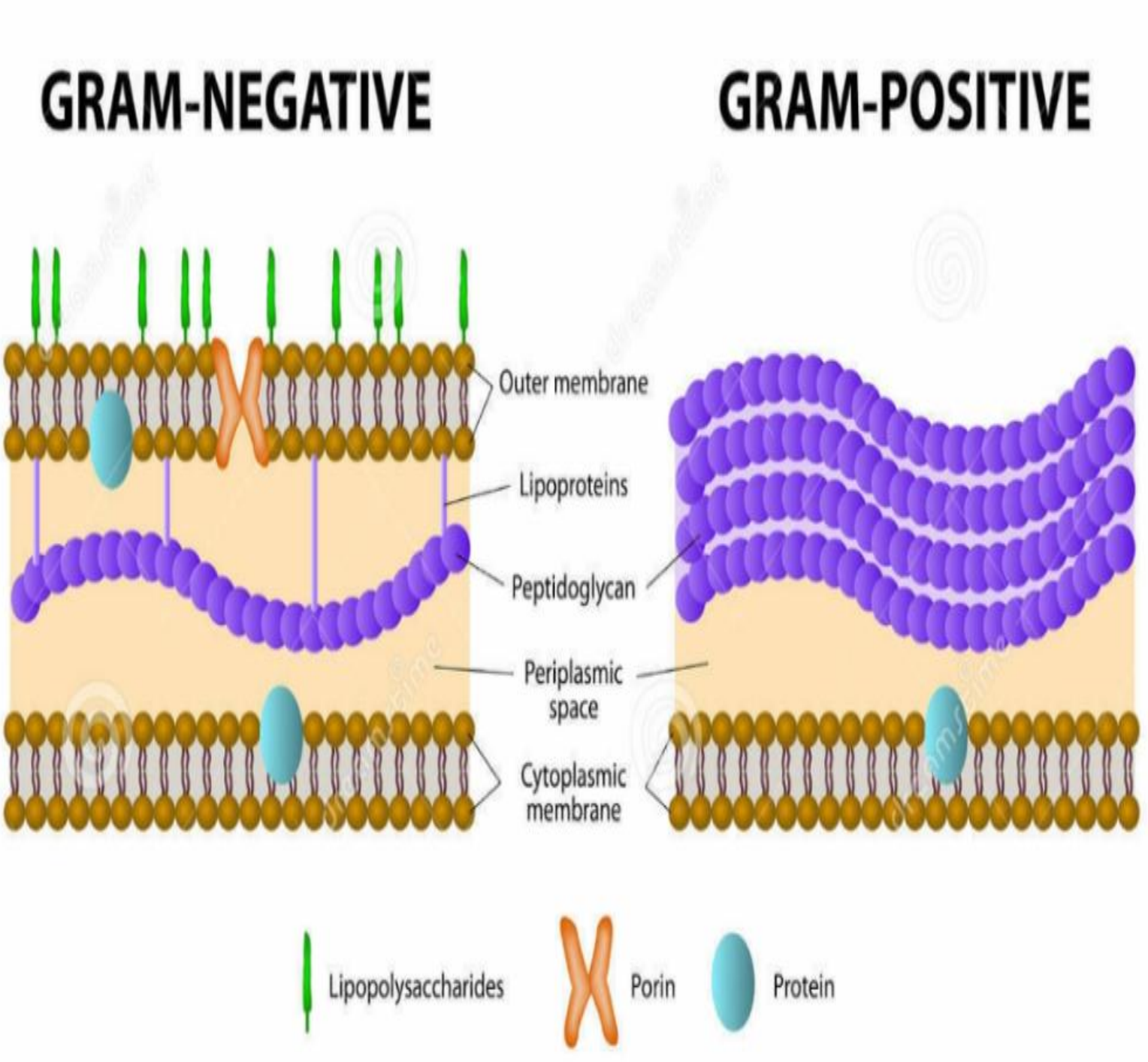
1. **Smear**
2. **Cristal violet**/purple color/; primary stain
3. Iodine solution; as a mordant /to form iodine-- violet complex/
4. Decolorized by **ethanol**
5. **Safranin** /red color/; counter stain or secondary stain

Gram positive

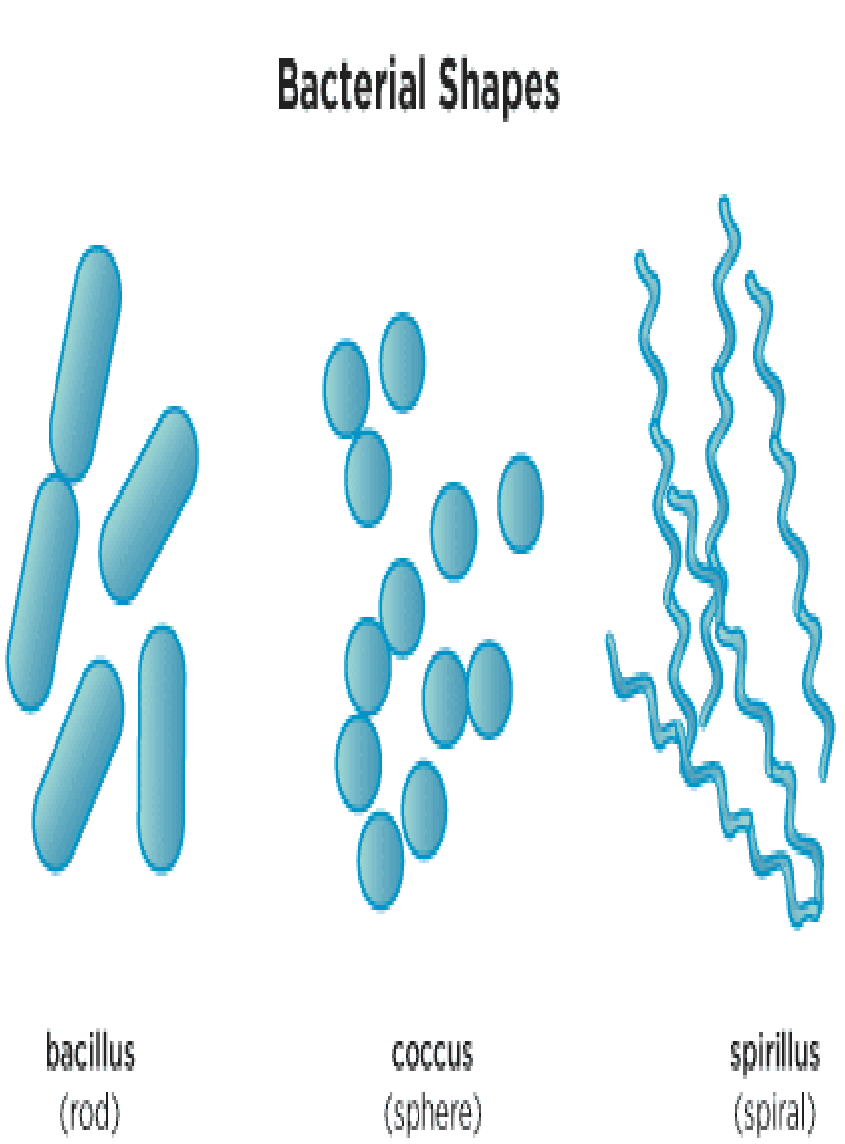
- Keep the color of primary stain /crystal violet/ not decolorized
- Stain **purple**

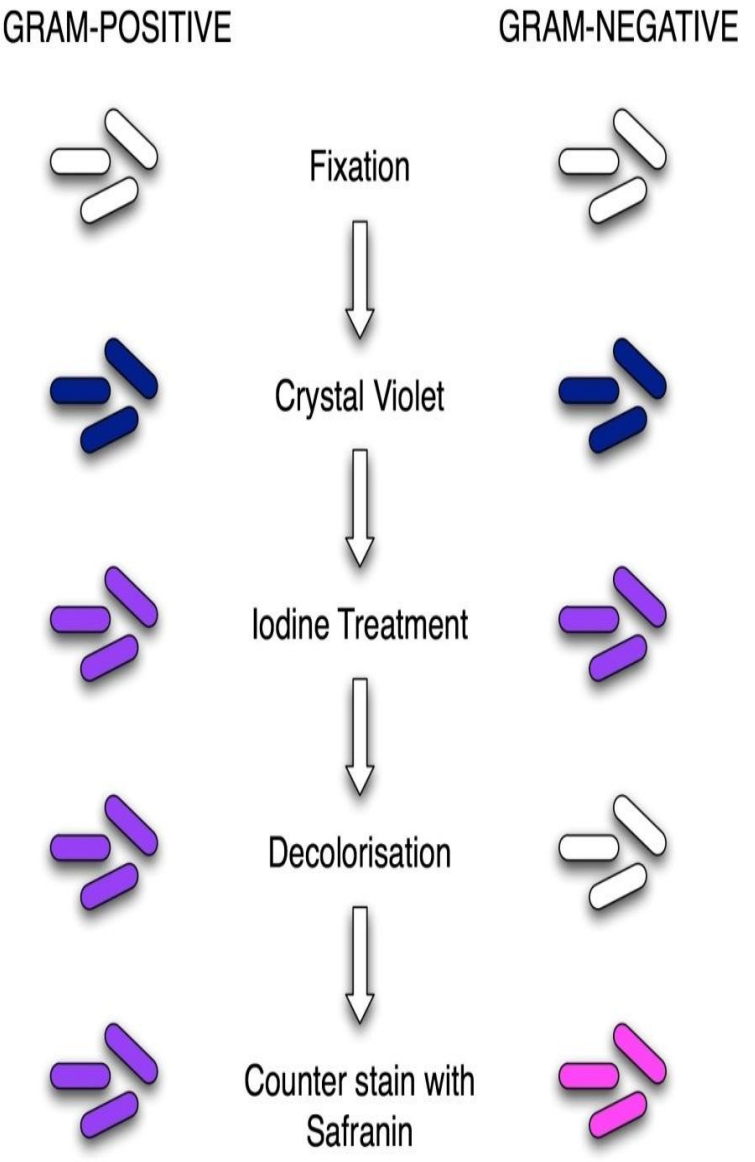
Gram negative

- Primary stain decolorized by ethanol
- Take the color of secondary stain safranin
- **Stain red/ pink/**


GRAM-NEGATIVE
GRAM-POSITIVE
Outer membrane
Lipoproteins
Peptidoglycan
Periplasmic space
Cytoplasmic membrane
Lipopolysaccharides
Porin
Protein

con't


Bacterial Shapes
bacillus
(rod)
coccus
(sphere)
spirillus
(spiral)


GRAM-POSITIVE
GRAM-NEGATIVE
Fixation
Crystal Violet
Iodine Treatment
Decolorisation
Counter stain with
Safranin

Viruses

- Smaller then bacteria
- **Neither** prokaryotic nor eukaryotic cell.
- Viruses are a particle, made up of
  - **Protein coat(capsoid)**
  - **Genetic material**: the genetic material is either **DNA or RNA**
- They are **obligate parasite**
- Viruses are considered to be living and non living things. **How?**
- **Do not carry out any of the function** of normal living organism **except reproduction**
- Viruses only **reproduce inside living cell**
- Viruses cause some common human disease such as AIDS, Influenza, rabbis

Fungi

Yeast;

- Is a single called fungi
- At anaerobic condition yeast carry out alcoholic fermentation
- Yeast have heterotrophic mode of nutrition
- Yeast reproduce **asexually by budding**

Moulds

- Made up of filament called hyphae
- A mass of hyphae together forms mycelium
- Reproduce **asexually** by **spore formation**

Germ theory of disease

- **Germ theory diseases** states that germ are the cause of disease
- **The theory of spontaneous generation** states that living things arise from non living things
- **Louis Pasteur** disproves the theory of spontaneous generation. **How?**
- **Louis Pasteur** indicates that, infectious disease caused by pathogenic micro-organism. He also introduces **pasteurization** technique.
- **Robert Koch** discovered the first disease causing micro-organism called **bacillus anthracites** which cause **anthrax**

Controlling micro-organism

- The major methods of controlling microorganisms include;
  - Sterilization
  - Disinfectants
  - Pasteurization

1. **Sterilization**;
   - The process of complete removal of micro-organism
   - Some of the methods that are used as sterilization;

A. autoclave sterilization

- Used to sterilize;
- Equipment which are not damage by heat
- **Bacterial spores** which do not die at low temperature
- Killing micro-organisms by boiling them in water at 120^0C under high pressure for **15-45 minutes**.

con't

B. Ultra high temperature (UHT)

- It is a way of **treating food** to kill all the micro-organism found in it.
- It is a techniques of heating the food at a temperature of **135^0c to150^0cfor 2-6** second
- Used in food processing industries to prevent contamination of food

C. Dry heat sterilization

- Used to sterilize scientific equipment
- Requires higher temperature high temperature and longer period of time
- Use the temperature of **170^0C** for one hour and**160^0C** for two hour

Contd.

2. Pasteurization

- Involves **boiling** or **heating** of milk, bear, other food staff
- It include heating followed by **rapid cooling**
- The temperature used
  - **62.9^0C for 30 seconds**
  - **71.6^0C for at least 15 seconds**

3. Disinfectants

- **Chemicals that** are used to kill micro-organisms on **inanimate object**
- Disinfectants have the following characteristics
  - **Fast acting**
  - **Effective against all type of micro-organism**
  - **Disinfect material without damaging or discoloring it**
- Dilute bleach and calcium hypochlorite used as disinfectant on drinking water
- **Antiseptics** Chemicals **(**Disinfectants) that can be applied to a **living tissue** such as skin
- Help to protect the entrance of germs if the skin is cut or damage

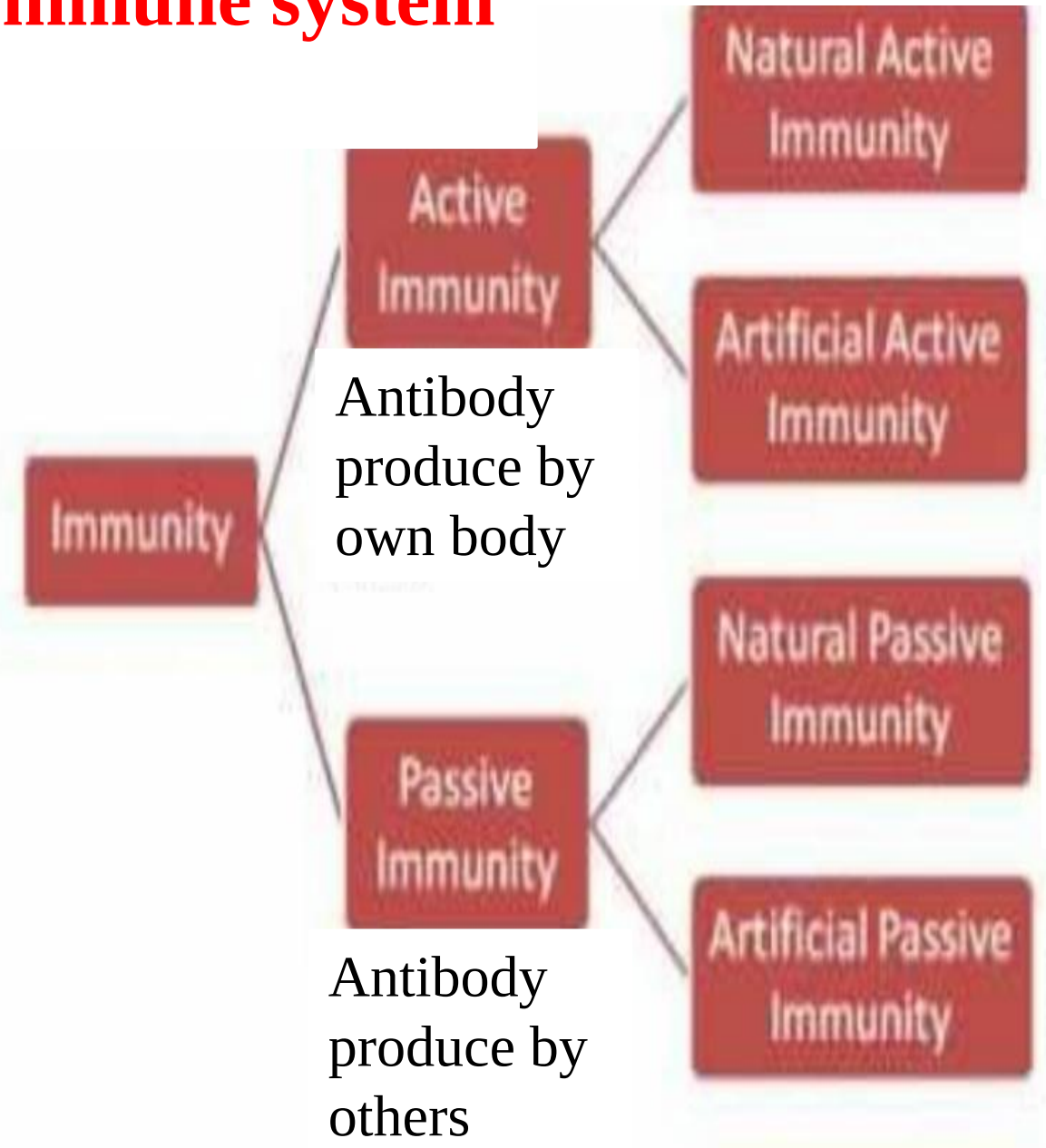
Culturing (Growing) Microbes

- **Importance of growing micro-organism**
  - To know how to kill them
  - To develop vaccine
  - To identify useful and harmful aspect
- **Precondition** for growing micro-organism;
  - **Isolating** the type of micro-organism to be studied
  - Developing suitable **nutrients medium**
  - Suitable **environmental condition**

Contd.

- **Nutrient medium**; nutrients required for the growth of micro-organisms
- It can be solid or liquid
  - **Agar**
    1. As **solid nutrient** medium which is extracted from red algae
    2. Micro-organism are cultured in a **petridish**
  - **Broth**
    1. A liquid nutrient medium
    2. Micro-organism are cultured in **test tube**
- **Culture media;** is a collection of nutrients and microbial cells grow on medium
- **Inoculation;** a technique of transferring microbes into a nutrient medium
- **Inoculating loop / needle**/; an instrument that is used to transfer micro-organism
- Culture microbes should transfer in a **zigzag streaks** because to avoid competition

Immune system



Antibody produced after recovery from sickness

Antibody produced as a result of vaccination

Antibody obtained from mothers to body through breast milk or placenta

Antibody obtained through injection of serum

Immune system

- **Immune system** the system in the body which protects against disease causing micro-organisms and foreign proteins (antigen)
- **Immunity** the ability of the body to resist disease
- **Type of immunity**
  - **Innate immunity**
    - Natural ability of the body to fight disease producing micro-organism
    - Immunity present at the time of birth against certain diseases
    - Non specific antibodies against disease germs
    - Inborn and is due to the presence of naturally occurring antibodies since birth
    - It obtain without the stimulation any foreign bodies
  - **Acquired immunity**
    - Immunity developing during the life time of individual after birth
    - Acquired immunity either active or passive

Active immunity

- **Natural active immunity**
  - Immunity resulting from having had a disease previously
  - The infection stimulates the body to form its own specific antibodies against germs
- **Artificial active immunity**
  - Immunity acquire artificially by receiving **vaccine**
  - **Vaccination /Immunization** /the use of dead or weakened pathogens to produce immunity to dangerous disease
  - **Vaccine** stimulated the body to form its own antibodies without having a disease
  - A child receive vaccines for **polio, tetanus, tuberculosis, hepatitis, measles, mumps, diphetria**

Passive immunity

- **Natural passive immunity**
  - Immunity passed **from mother to child**
  - Antibodies from the mother pass into fetus across placenta
  - Many antibodies are passed to the baby through breast milk
- **Artificial passive immunity**
  - Introducing **artificially antibodies** into the body give immediate immunity
  - **Antibodies** are drugs/ chemicals/which kill bacteria inside our body but do not harm human cell.
  - Antibiotics have no effect on disease caused by viruses
  - **Penicillin** is the first antibiotic produce by **Alexandor Flemming**

4.2 DISEASES

- Disease is a disorder state of an organ or organism
- Some of the most common human disease in Ethiopia

1. **Tape worm**
   - Tape **worm live in the intestine of host**
   - Have **head or scolex** which help to attach to the wall of intestine
   - Scolex have **suckers and hooks** used to attach the intestinal wall
   - They have segmented body called **proglottids**
   - The two most common tape worms that infect human are; **beef tape worm** (***Taenia saginata***)and **pork tape worm** (***Taenia solume***)
   - Beef tape worm **cattle** intermediate host and pork tape worm **pig** intermediate host

Tape worm

- **Transmissions**
  - Eating raw or undercooked meat
- **Symptoms**
  - Vitamin B12 deficiency
  - Weight loss
- **Control and prevention**
  - Use proper latrine
  - Meat inspection
  - Meat should be cooked well
- **Special adaptation of tape worm to service in human gut**
  - Scolex has hooks and suckers helps the parasite attached to small intestine
  - Flattened body absorbed digested nutrient over a large surface area
  - Thick cuticle to prevent from intestinal enzymes

2.Tuberculosis(TB)

- **Cause**
  - The bacteria called ***mycobacterium tuberculosis***
  - **TB** usually affect lung (pulmonary TB) affect kidneys, nodes, joints and lymph but it can also bones
- **Symptoms**
  - Loss of weight
  - Persistent cough
  - Night sweat
  - Loss of appetite
  - Fever and chest pain
  - Blood in sputum

Tuberculosis(TB

- **Transmission**
  - Through air droplet cough , sneeze
  - Infected milk
- **Prevention**
  - Pasteurize milk
  - Vaccination
  - Avoid droplet infection
  - antibiotics

3.Malaria

- Vector born disease (**vector** an organism that transmit disease causing microorganisms from one host to another)
- Affect the **liver** and **red blood cells. How?**
- **Cause;** parasite called **plasmodium**
- **Symptoms**
  - High fever, chills and sweats
- **Transmission**
  - by **the bite of female anopheles mosquito**
- **Preventions**
  - Avoid contact with mosquito using mosquito **repellents**, fixing **screen on windows**, using **net over beds**
  - Remove mosquito breeding place
  - **Biological control** (introducing an organism such as fish into the water that feeds on larva)
  - **Chemical control** sprayed on to the water in order to kill mosquito larva and egg

4. Gastroenteritis/acute watery diarrhea AWD/

- If someone suffering from AWD , the lining of the stomach, small intestine, become inflamed and painful
- Water cannot be reabsorbed by the inflamed lining the large intestine, resulting in liquid diarrhea
- **Caused**
  - **Viruses** rotaviruses
  - **Bacteria** salmonella and Escherichia coli
  - **Protozoa** giardia and amoeba
- **Transmission**
  - Eating contaminated food and watery

Contd.

- **Symptoms**
  - Violet abdominal cramps and pain
  - Feeling nauseous, vomiting often both
  - Watery diarrhea which does not usually have blood in it
  - Slight fever
  - General muscle ache and head ache
- **Control and prevention**
  - Wash hands after using toilet, and before preparing and eating food
  - Make sure that the water you drink and use to wash salad food and fruit is clean and safe
  - Avoid raw and undercooked meat, egg, fish etc
  - Avoid contact with someone has AWD

5.Cholera

- **Caused**
  - Bacterial infection called ***vibrio cholera***
- **Transmission**
  - Contaminated food and water with faces
- **Symptoms**
  - Mild to severe diarrhea
  - Vomiting and dehydration
  - A pale an water y diarrhea
  - Loss of salt and dehydration
  - Sever muscular cramp
- **Control and prevention**
  - Replace the fluids and salt to prevent dehydration
  - Antibiotics are used to treat disease
  - Everyone has supply of clean, uncontaminated water
  - The sewage is disposed effectively
  - Avoid consuming uncooked food and water

6.Typhoid

- **Cause**
  - bacterial infection ***salmonella typhi***
- **Transmission**
  - Contaminated food and water by faces
- **Symptoms**
  - A very high fever 39-40^{0}C
  - A painful abdomen
  - Sore throat and headache
  - Constipation or diarrhea
  - An enlarged spleen and liver
  - Untreated thyroid, becomes delirious, weak, exhausted and may die
- **Control and prevention**
  - Used antibiotics
  - Need plenty of fluids to replace the one lost
  - High calorie meals to help mineral and energy they have lost
  - Carful hand washing after toilet

7. Sexually transmitted disease (STD's)

- **STD'S** are transmitted through sexual contact
- They are also known as venereal disease
- The commonly known STD'S are gonorrhea, cancroids, syphilis, HIV/AIDS

7.1Gonorrhea

- **Caused**
  - Bacteria called ***Neisseria gonorrhea***
- **Transmission**
  - Spread through unprotected sex
  - Mother to child during birth
  - C; use condom
  - Visit clinics or hospitals

Contd.

- **Symptoms**
  - **In men the symptoms of gonorrhea are**
    - Burning sensation during urination
    - Yellowish or white discharge from penis
  - **In women mostly asymptomatic**, but sometimes it may show
    - Discharge from vagina
    - Burning sensation while urination
    - Untreated gonorrhea in pregnant women ,may result in blindness of her baby
- **Control and prevention**
  - Respect ABC rule
  - A; abstain B; be faithful C; use condom
  - Visit clinics or hospitals

7.2 Syphilis

- **Cause**
  - A bacterial infection called ***Treponema palladium***
- **Transmission**
  - unprotected sexual intercourse
  - congenital syphilis transmitted from mother to child
- **Symptoms** three major stage of symptoms
- **Primary stage** (the first six weak)
  - Painless sore at the site of infection
  - Swollen gland

Syphilis….

- **Secondary stage** (occur sex wreaks after primary infection)
  - Tiredness
  - Fever
  - Sore throat
  - Headaches
  - Hoarseness
  - Loss of appetite
  - Patch hair loss
  - Swollen gland
- **Third stage** (**late syphilis**)
  - It appears after years may cause severe irreversible problems
  - Involves illness of the skin , bones, central nerve systems
  - Transmitted from pregnant women to her baby and may cause death and deformity
- **Control and prevention**
  - Respect ABC rules
  - Visit clinic and hospitals
  - Blood test for pregnant women
  - If you are infected, avoid sexual contact

7.3 Chancroids

- **Cause**
  - A bacteria called ***Hemophilus ducrey***
- **Transmission**
  - Unprotected sexual intercourse
- **Symptoms**
  - **First stage**
    - ✓ Ulceration on genitals, particularly on penis
    - Bleeding of ulcer and bursting of pus
  - **Second stage**
    - ✓ Swollen glands which are filled with pus
    - ✓ Permanent loss of penis
- **Control and prevention**
  - ✓ Taking effective dose of antibiotics
  - ✓ Respect ABC rule
  - ✓ good genital hygiene , male circumcision

7.4 HIV/AIDS

- Acquired Immune Deficiency Syndrome (AIDS) is the medical term for a combination of illnesses that result when the immune system is weakened or destroyed
- **Caused** by Human Immunodeficiency Virus
- **Transmission**
  - Sexual intercourse with infected person.
  - From infected mother to her baby in the womb, during birth breastfeeds.
  - Through Infected blood transfusion
- **Fight against HIV/AIDS**
  - Education on HIV/AIDS (transmission and prevention)
  - Avoid stigma and discrimination
  - Encourage people to take voluntary HIV-test

The lymph system and Immune system

- Immune system is based in **lymph system** which spreads throughout the body.
- The lymph vessels carrying a fluid called **lymph**
- Lymph defend the body against disease by producing lymphocytes
- **Lymphocytes** produce antibodies against invading pathogens.
- The lymph glands filter out bacteria and other microbes from the lymph to be ingested by the phagocytes.
- Enlarged lymph glands are a sign that the body is fighting off an invading pathogen.
- the main sites of the enlarged lymph glands
  - **Axillary lymph nodes (in armpit)**
  - **Cervical lymph nodes (neck)**
  - **Mesenteric lymph nodes (gut)**
  - **Inguinal lymph nodes (in groin)**

How does HIV attack the immune system?

- There are two main types of white blood cells in the immune system.
- **T-lymphocytes (T-cells)** bind to foreign antigen and destroy it.
- **B-lymphocytes (B-cells)** make antibodies which bind to the antigen and destroy it.
  - Make memory cells which ‘remember’ how to make the right antibodies if the same foreign antigen turns up again
- HIV attacks the T-cells of the immune system.

Summery

No	Disease	Caused by	Root of transmission
1	Tape worm	Parasitic flat worm	Eating raw or under cooked meat
2	Tuberculosis	Bacteria, **Mycobacterium tuberculosis**	Air droplet /aerosol/
3	Malaria	Protozoa, plasmodium	Bite of anopheles mosquito
4	Cholera	Bacteria, Vibro cholera	Contaminated food and water
5	Typhoid	Bacteria, Salmonella typhi	Contaminated food and water
6	AWD	Bacteria, Virus, Protozoa	Contaminated food and water
7	Gonorrhea	Bacteria, Neissaria gonorrhea	Unprotected sexual intercourse
8	Syphilis	Bacteria, Treponema palladium	Unprotected sexual intercourse
9	Chancroid	Bacteria, Hemophilus ducrey	Unprotected sexual intercourse
10	AIDS	Virus, Human Immune Virus	Unprotected sexual intercourse

UNIT 5
CLASSIFICATION

5.1 PRINCIPLES OF CLASSIFICATION

- **The importance of classifying organism**
  - To simplify the study
  - Try to understand how life originated
  - To bring order out of chaos or confusion
- **The classification system**
  - **Species** a group of organism that can breed successfully with one another to produce fertile offspring
  - **Classification** is the system of groping organism based on similarity and difference
  - **Taxonomy** **a** branch of biology which is concerned with classification of organism
  - **Dichotomous key/ identification key/** the a type of key used to classify living organism based on making a choice between two alternatives
  - Groups of living things into categories is called **taxa**

Naming of living things

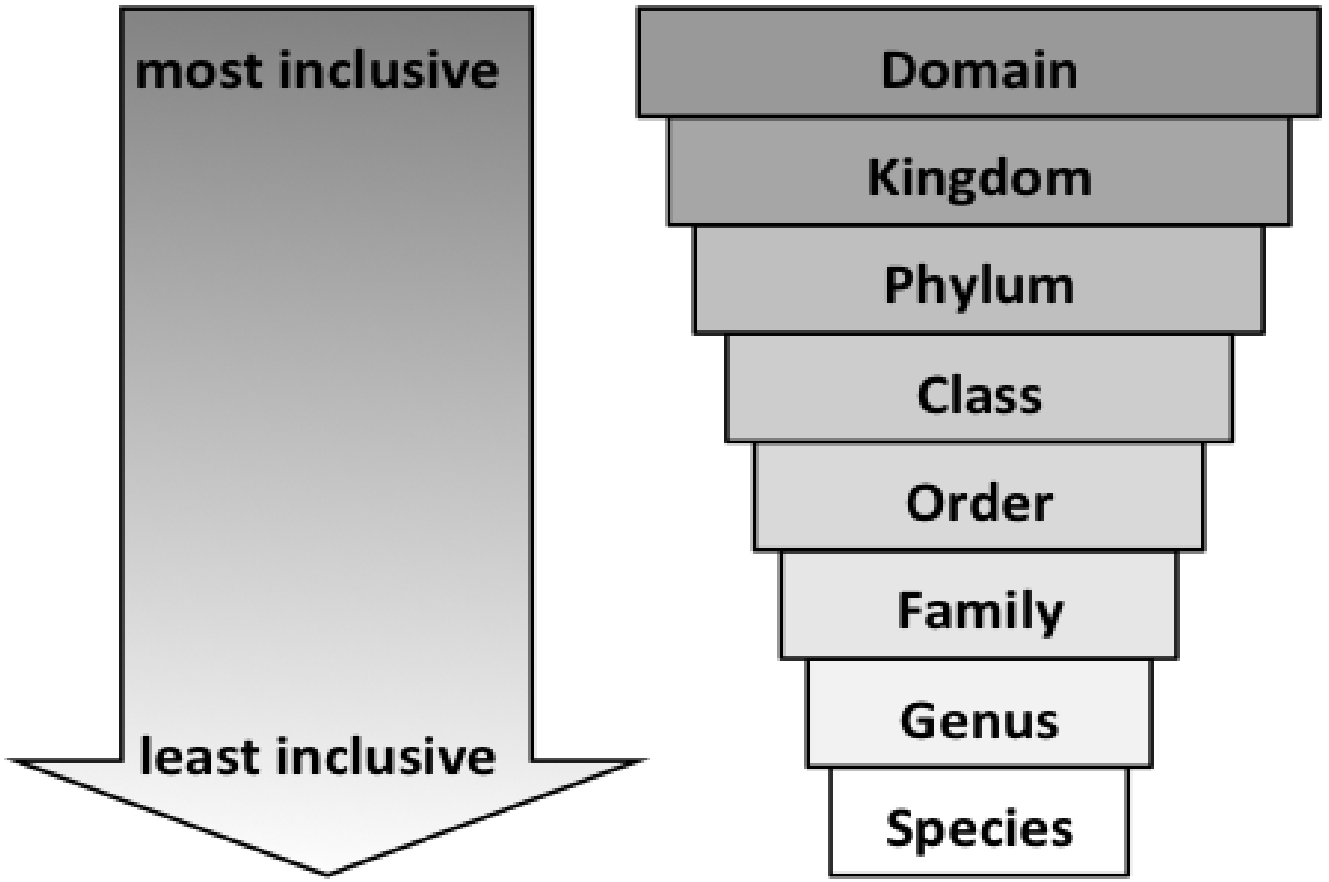
- **Linnaeus** was the first biologist who introduce **binomial system** of classification
- **Binomial system** of naming organism has two names
- The **first** name **genus** while the **second** name **species** both name derived from Latin
- The genus name starts in capital latter and the species name in small latter
- The scientific name should be underlined or printed in italics
- Examples
  - human beings ; ***Homo sapiens*** ***Homo,*** genus name ***sapiens,*** species name
  - Dog; ***Canis familiaris*** ***Canis,*** genus name and ***familiaris*** species name
  - House flies; ***Musca domestica***
  - Domestic cat; ***Felies domestica***

THE FIVE KINGDOM

- **In modern classification, there are five kingdoms namely;**

	Kingdoms	General characteristics
1	**Monera**	Unicellular prokaryotic organism E.g. Bacteria
2	**Protista**	Unicellular eukaryotic organism E.g., algae and protozoa
3	**Fungi**	Unicellular or multicellular organisms E.g. yeast and mucor
4	**Animalia**	Eukaryotic without chlorophyll E.g. man
5	**Plantae**	Eukaryotic chlorophyll containing organism. E.g. angiosperm

The 7main taxonomic category



Kingdom monera

- Are unicellular prokaryotic, that do not have membrane bonded nucleus
- Include all bacteria and blue green algae
- Bacteria act as pathogens
  - ***Mycobacterium tuberculosis*** which cause tuberculosis
  - ***Haemophilus ducrey*** that cause chancroid
- **Kingdom protista /protoctista/**
- Unicellular and eukaryotic ,that do have a nucleus
- They live as a parasite and free living
- Some Protista cause a serious disease
  - ***Plasmodium falciparum*** which cause malaria
  - ***Entamoeba histolyca*****,** which cause amoebic dysentery
  - **Trypanosoma,** a blood parasite that cause sleeping sickness
  - **Dianoflagelates** , which cause bioluminescence

Kingdom fungi

- Eukaryotic, unicellular and heterotrophic organism
- Have cell wall made up of chitin but lack chlorophyll
- Mood of nutrition
  - **Saprophytic fungi** feed on dead materials. They act as decomposer which have a role in recycling of nutrients .E.g. **Rhizophus, Mucor, penicillium**
  - **Mutualism fungi**; live in close association with other organism and both benefit. E.g **Lichens** an association of fungi and green algae
  - **Mycorrhizal** an association of a fungus a root of plant
  - **Parasitic fungi;** Feeding on living organism. ***Candida albicans*** cause trash, ***Tinea pedis*** cause athlete's foot

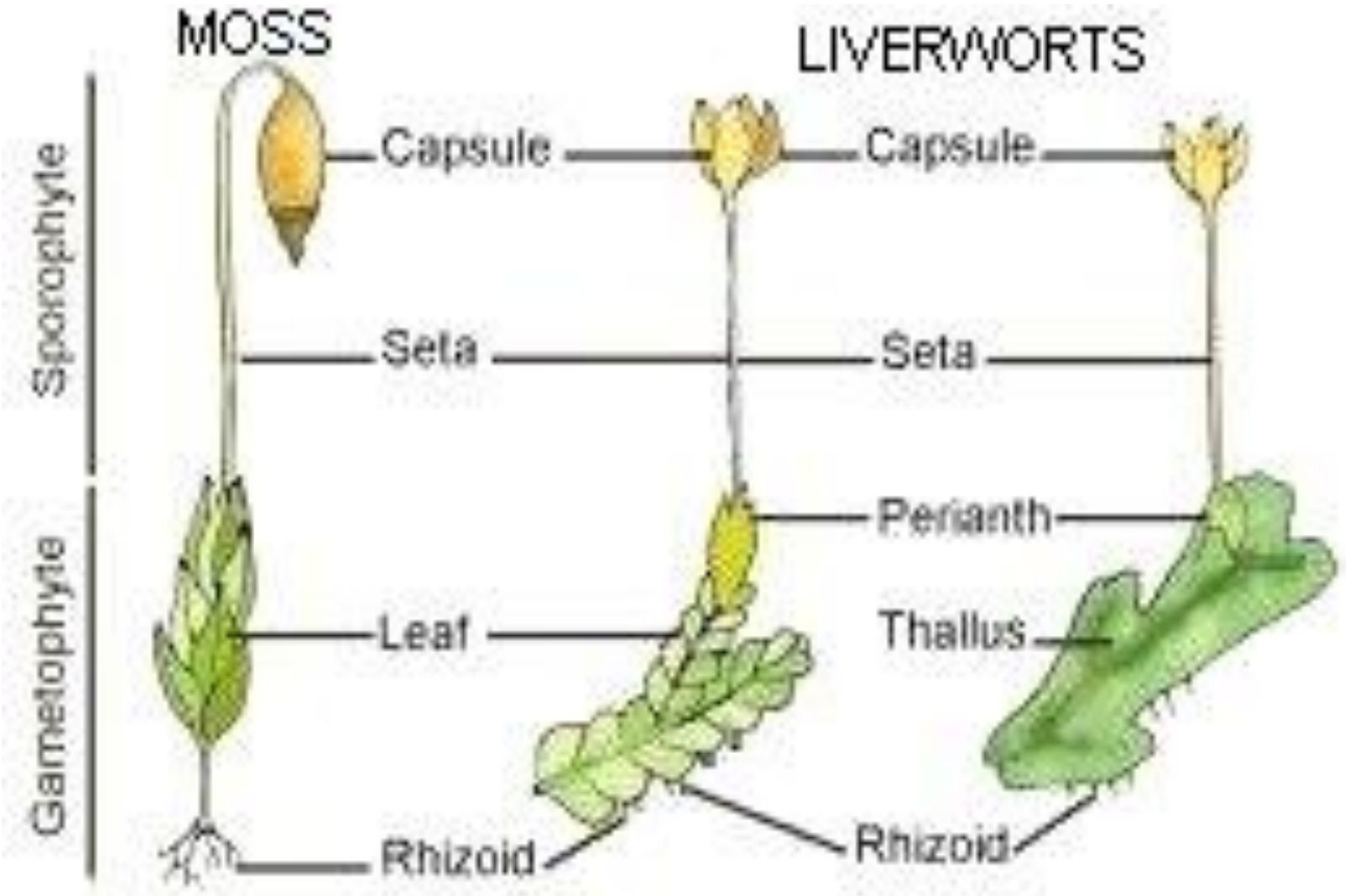
Kingdom plantae

- The main characteristics of plant
- Have eukaryotic cell
- Multicellular organism
- Contain chlorophyll and carry out photosynthesis
- Predominantly land dwelling
- Have cuticle to prevent water loss
- Four important **division** ;
  - **Bryophytes,**
  - **pteridophyta,**
  - **Gymnosperm,**
  - **Angiosperm**

Division bryophytes (mosses and liverworts)

- They are the simplest land plant
- They have no true root, stem and leaf, they **have thallus body**.
- They are non vascular (no xylem and phloem)
- Have a simple leaves
- Have a simple root like structure called **rhizoid** which is used for absorption of nutrient
- Commonly found in rainforest and high altitude

Bryophytes

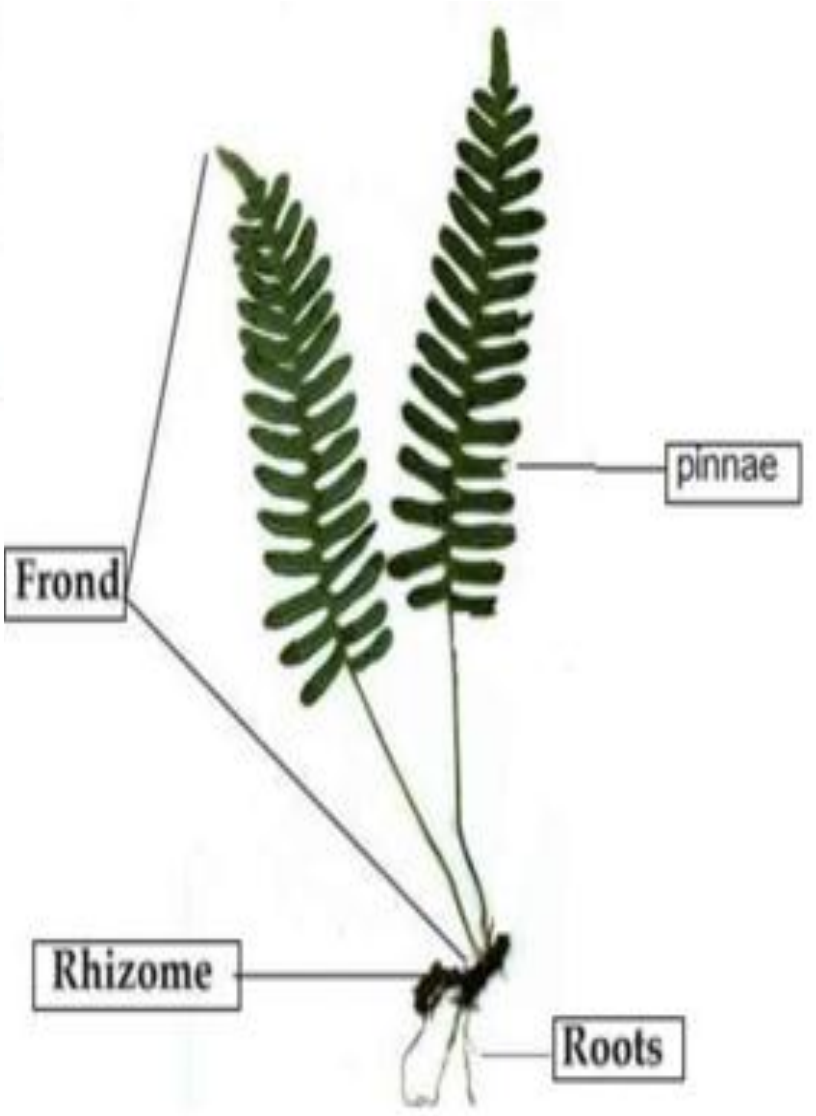

MOSS
LIVERWORTS
Capsule
Capsule
Seta
Seta
Perianth
Leaf
Thallus
Rhizoid
Rhizoid
Sporophyte
Gametophyte

Division pteridophyta (Ferns)

- Have well develop root, stem and leaf
- Have horizontally growing stem called **rhizomes**
- The fern leaf is called **fronds**
- Reproduce by **spores** found in **sori**, at the back of leaf
- **Have vascular tissue** (xylem and phloem)

Ferns





Spermatophyte (Seed bearing plant)

- Have well develop root stem and leaf
- Have well develop vascular tissues
- Male gametes contained in a pollen grains and the female gamete found in the embryo sac
- The product of fertilization in sexual reproduction is seed
- Spermatophyte divided into two division
  - **Division gymnosperm**
  - **Division angiosperm**

Division Gymnospermae (conifer, Non flowering plant)

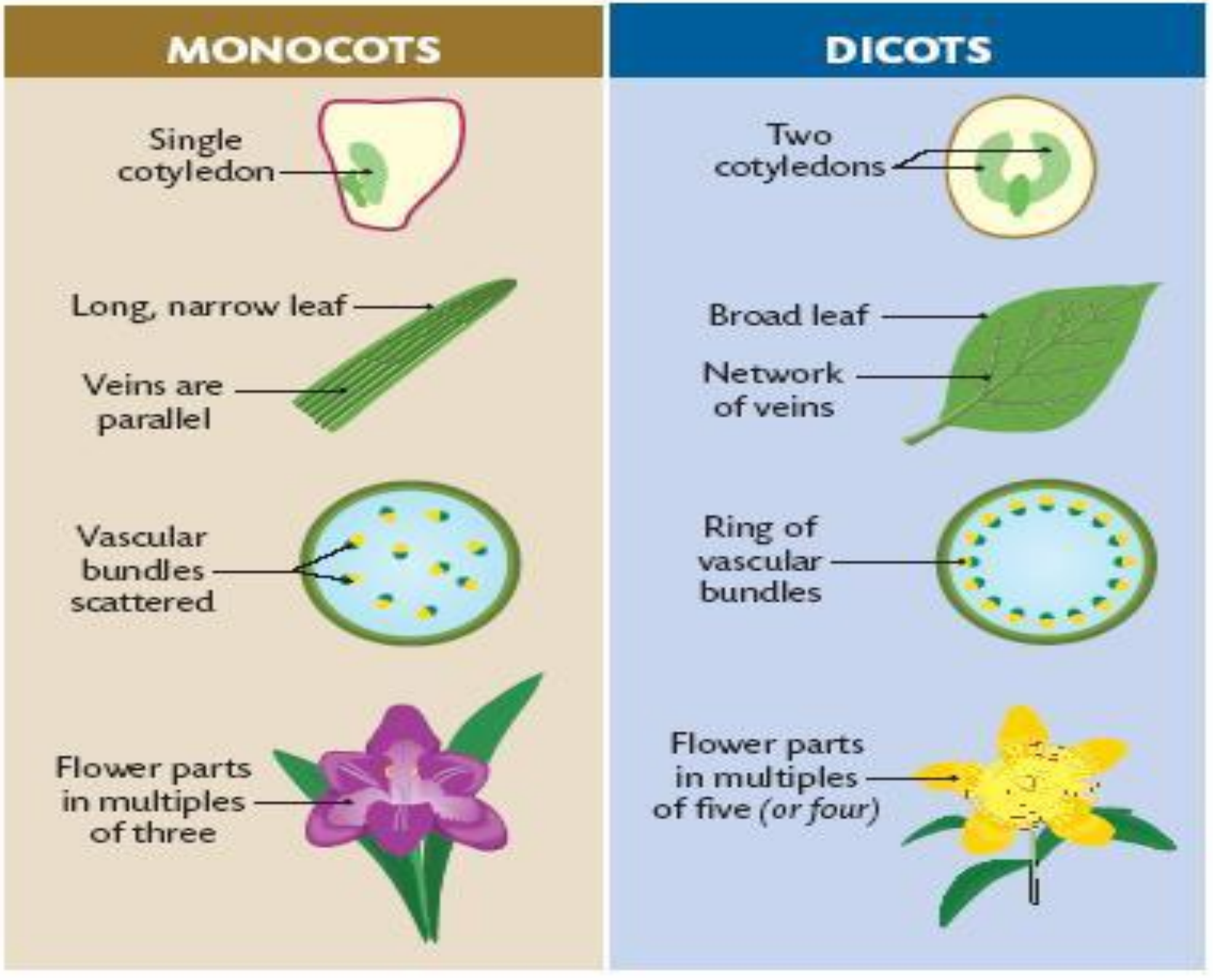
- Seed are not enclosed in a fruit
- Have small needle shaped leaves with a weak waxy cuticle in order to
- To reduce water loss, minimizes damage by excess heat or cold
- They are evergreen
- Reproductive organ male and female **cones**
- Do not have flower and fruits
- **E.g. pinus , yabesha tid,**

Division Angiosperm (flowering plant)

- Reproductive organ flower
- Seed enclosed in fruit
- Well develop xylem and phloem tissue
- Angiosperm divided into two sub class based on the number of cotyledon in their seed
  - **Monocotyledon (monocot)**
  - **Cotyledons (dicots)**

Monocots	Dicots
The embryo has single seed leaf	The embryo has two seed leaf
Parallel venation of leaves	**Net (reticulate) venation** of leaves
Leaves are generally long and **thin**	Leaves are often relatively **broad**
Scattered Vascular bundle	Ring of vascular bundle
Generally do not reach great size (absence of cambium)	Same dicot reach great size(have vascular cambium)
Often **wind pollinated**	Often **insect pollinated**
E.g. maize, grass, Orichids	E.g. pea rose, bean, mango, jacaranda

Monocot and dicot difference



Kingdom animalia

- Multicellular ,eukaryotic, ,heterotrophic organism
- Feed on other organism
- Exhibit locomotion, move their body from one place to another
- The cell do not have cell wall
- The major phylum in animal kingdom

Animal phylum	Representative examples
Porifera (sponges)	Sponges
Coelenterate (cnidaria)	Sea anemones, hydra, jellyfish, Coral
Platyhelminthes (flat worm)	Planaria ,tape worm, liver flukes,
Nematodes (round worm)	Ascaris,
Annelids (segmented worm)	Earthworm, leech
Mollusca (Soft bodied animal)	Octopus, squid, Slugs, Snail
Echinodermata (spiny skinned animal)	Starfish (Asteris),sea cucumber, sea urchin
Arthropod (joint footed animal)	Insects, arachnidan, crustacean, diplopods , Chilopods
Chordate	Pisces, amphibians, reptiles, aves, mammals

Phylum Porifera

(sponges)

- No tissue organization
- Single body cavity
- Numerous pores in body wall
- They are hallow filter fidder
- Adult are sessile; permanently attached to the surface of sea
- Co-ordination supported by **calcareous spicules**





Phylum Coelenterates (Cnidarians)

- Have two body layer
- Have only one opening mouth
- Radial symmetry
- Mouth supported by tentacle,
- for capturing prey
- Have stinging cell their tentacles for poisoning or immobilizing prey





Phylum Plathelments - flat worm

- Have no body cavity
- Have flat body shape
- Are bilateral shape
- Bilateral symmetry
- They are hermaphrodites
- Have mouth but no anus



planeria

- **Phylum Nematodes - Round worm**
  - Have narrow, thread like body
  - Bilateral symmetry
  - Body not segmented
  - No circulatory system
  - Complete digestive system with mouth and anus
- **Phylum Annelid- Segmented worm**
  - Have closed blood circulatory system
  - They are hermaphrodite
  - Bristle like structure called **chaetae,** help them to move
  - Most are free living

- **Phylum mollusca -Soft bodied animal**
  - Have soft body
  - Body not segmented
  - Most have shell
  - Body divided into head, foot and Visceral mass, Breath through gills
- **Phylum Echinodermata- spiny skinned animal**
  - Have exoskeleton
  - Have many tubular feet
  - Body covered with spin
  - Are radial symmetry

Echinodermata examples



Phylum arthropods – joint footed animal

- Have jointed appendage
- Have an exoskeleton made of chitin, which is used;
- Prevent water loss
- Limits their growth
- Have segmented body
- Have well develop nerve system
- Complete gut from mouth to anus
- The **most varied animal** on the earth
- Divided into a number of five class;
  - **Class insect**
  - **Class crustacean**
  - **Class chilopodes - centipedes**
  - **Class Diplopod- millipedes**
  - **Class Arachnidan**

Class Insectsa	Class Crustaceans	Class Chilopoda /Centipedes/	Class Diplopods /Millipedes.	Class /Arachnidan/
➢ Tree body parts ➢ Head, thorax, abdomen ➢ 3 pair of jointed Legs ➢ 1 or2 pair of wing ➢ have a pair of antenna ➢ one pair of Compound eye ➢ E.g flies, beetles	➢ body two parts ➢ Cephalothoraxes (fused head & thorax), Abdomen ➢ body covered by Carapace ➢ four pair jointed leg ➢ two pair of antenna and simple eye ➢ E.g. lobsters, wood lice, water flies	➢ flat body ➢ bright colored body ➢ few segment ➢ 1 pair of limb per segment ➢ Carnivores ➢ poisoning claws ➢ For paralyzing prey	➢ cylindrical body ➢ dull colored body ➢ have more segment ➢ 2 pair of limb per segment ➢ Herbivores ➢ have claws for biting and chewing prey	➢ two body parts Cephalothoraxes Abdomen ➢ with no antenna ➢ 4 pair of legs ➢ have simple eyes ➢ E.g. Spider, tikes, scorpions, mites

Phylum chordate

- Have notochords
- Have hallow nerve cord
- Have gill slits later replaced by lungs and gills

❖ **Vertebrates**

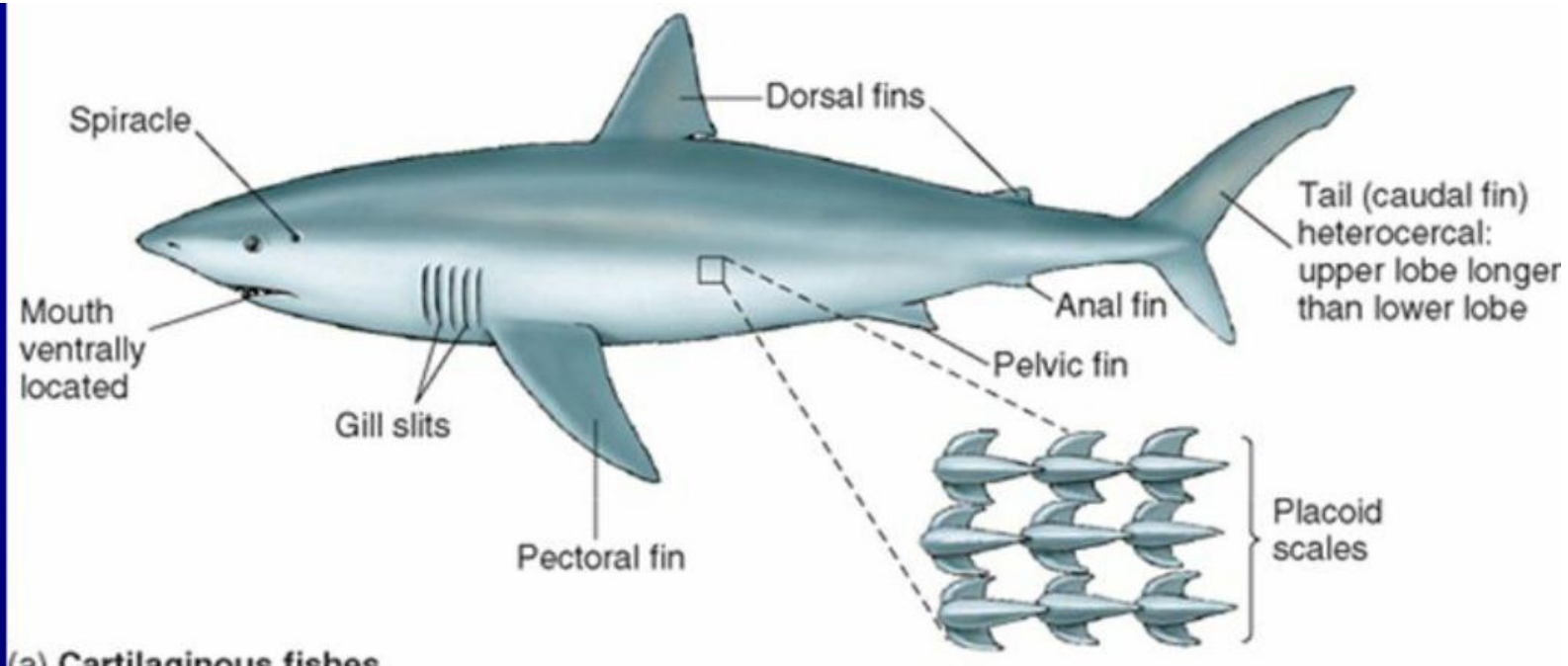
- **I**nvertebrates make up 99.9% of animals
- Have endoskeleton made of bone and cartilage
- Have closed blood circulatory system
- Have well developed nerve system
- Two pair of limb and kidney as execratory organ

Class Pisces-the fish

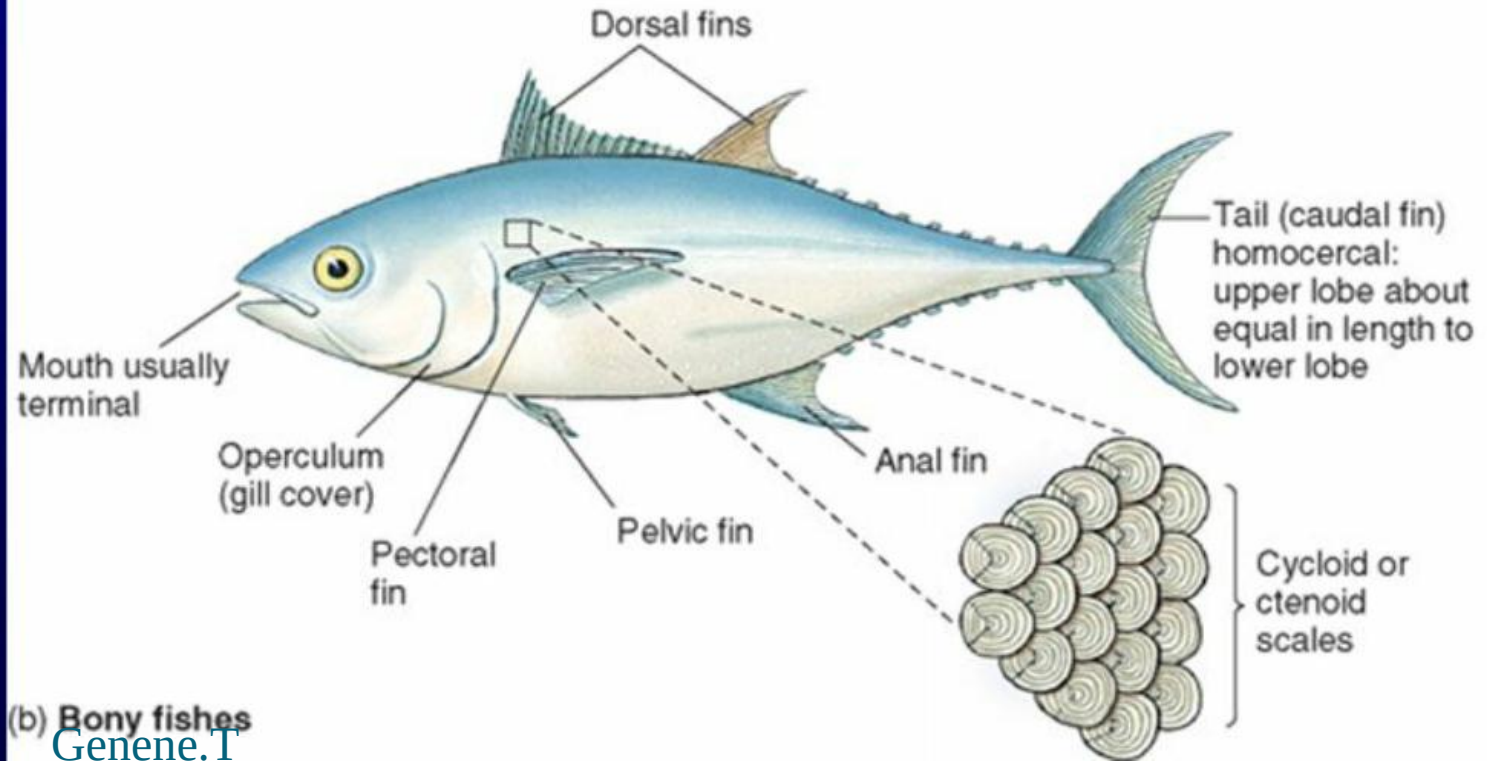
- Are aquatic
- **Ectothermic**
  - variable body temperature
  - need environment to regulate their body temperature
- Have gill
- Have fins
- Lay unfertilized egg
- Divided into two sub class
  - **Teleosts -** bony fish
  - **Elasmobranches-** cartilaginous fish

The fish

Bony fish	Cartilaginous fish
➢ Have bony skeleton	➢ Have cartilaginous skeleton
➢ Have round shaped scales	➢ Have scale but not round
➢ Opercula covering the gills	➢ No opercula but have gill slits
➢ Have homocerical ➢ Tail(even size fin)	➢ Have heterocerical ➢ Tail (different size)
➢ Usually smaller size	➢ Usually larger size
➢ E.g. Tilapia, Nile perch, catfish, cod,	➢ E.g. Sharks, skates, rays



(a) **Cartilaginous fishes**



(b) **Bony fishes**

Genene.T

Class amphibian

- Live on land and water
- Have moist skin (respiratory surface)
- Lay unfertilized egg in water
- Larva **(tadpole)** live in water
- The adult live both on land and water
- Are **Ectothermic**
- E.g. **frogs, toads, newts, salamander**

Frogs and toads

FROG	TOADS
➢ Has smooth skin	➢ Has rough skin
➢ Has a moist skin	➢ Has a dry skin
➢ Has more webbed feet	➢ Has less webbed feet
➢ Has bright colored body	➢ Has a dull colored body
➢ More streamlined body	➢ Less streamlined body
➢ Has extra-long hind legs	➢ Has hind legs that are not extra long

What's the difference between

FROGS & TOADS



Marsh Frog



Cane Toad

Class reptiles

- Have dry skin with scales
- Gas exchange take place in the lung
- Developed internal fertilization
- Lay egg in land in a leather shell
- Gill slits only seen in embryonic stage
- Have no external ears
- Are ectothermic **E.g. snake, Crocodiles, Lizard**

Class aves- birds

- **Have feathers**
- Fore limbs are adapted as wing
- Lay fertilized egg covered with shell
- Have beaks
- Have light skeleton , which make easier to fly
- **Are endothermic**-constant body temperature and
- Have hallow nerve cord

Class mammals

- Feed their young with milk
- Have diaphragm
- **Have 4 chamber heart**
- Body covered with hair
- Have sweat gland
- Have well developed brain
- Are endothermic
- E.g. **rats, monkeys, dogs, human**

Sub division of class mammals

Egg laying mammals	Marsupials	Placental mammals
➢ Lay egg ➢ E.g. duck billed mammals	➢ Produce immature young ➢ which are nourished milk in poach ➢ kangaroo, koalbeer , opssum	➢ Higher mammals ➢ **Produce fully developed young** ➢ Nourished milk from **mammary gland** ➢ Cats, caw, man

UNIT 6
ENVIRONMENT

- **Environment;** an organism's home and its surrounding
- **Ecology ;** deal with the study of environment
- It concerned with the interrelation ship of organism with each other and with its environment
- **It deal** biological organization (organism population community ecosystem biomes biosphere) **above organism**
- Ecology do not deal with individual organism

6.1 ECOSYSTEMS

- A life supporting environment
- All animals and plants that live in an area along with that thing that affect them
- Composed of **biotic (living) and abiotic (non-living)** components
- **Abiotic components**
  - Non living component of the environment
  - Includes
    - **Sun light,**
    - **Rainfall,**
    - **Temperature,**
    - type of **soil** and **rocks,**
    - **Level of oxygen, water. Wind**

Biotic component

- The living organisms within an ecosystem which affect the ability of an organism to survive there
- Includes
  - **Disease causing microorganisms** and
  - **Parasites**
  - **predator** numbers**,**
  - **Food availability,**
  - **Competition**
- **Competition;** animal compete for food, water, , territory, mate
- Plant compete with each other for light, water and nutrient

6.2 FOOD RELATIONSHIP

- Based on the mode of nutrition organism divided into two
  1. **Autotrophs**
  2. **Heterotrophs**
- **Autotrophs** organisms that can make their own food
- Autotrophs can be divided into;
  - **Photo autotrophs (light feeders);** a group of organisms that use sun light as primary source of energy to synthesis their own food **E.g. Green plants** because of making carbohydrate they are known as **producers**
  - **Chemo autotrophs;** a group of organisms that release energy from simple chemical reaction. E.g**. nitrifying bacteria, green sulfur bacteria**

Heterotrophs

- Organism that cannot synthesis their own food. they are called **consumer**
- Feed on other organism
- Can be divided as herbivores, carnivores, omnivores and decomposer
  - **Herbivores;** animal that feed on vegetation. E.g. caw, giraffe
  - **Carnivores;** animal that feed on animal flesh. E.g. Lion , cat
  - **Omnivores**; animal that feed on b plant and animal flesh. E.g. human ,rat
  - **Decomposers;** organism that break down dead bodies. E.g. bacteria, fungi

Food chains

- Is a simple and direct feeding relation ship
- Involves the transfer of energy and nutrient from one organism to another
- Energy flow from producer to consumer.
  Producers → **Consumers**
  - **Producers;** first trophic level. **Green plant**
  - **Consumers** can be
    1. **Primary consumer;** second trophic level. **Herbivores and omnivores**
    2. **Secondary consumer;** third trophic level. **Herbivores and omnivores**
    3. **Tertiary consumer;** forth trophic level. **Carnivores**
  - **Omnivores** can occupy primary and secondary consumer

Food chains…..

- Decomposers are found at the end of food chain
  - Grass ⟶ Caw ⟶ human
    - **Grass**; first trophic level and producer
    - **Caw**; second trophic level and primary consumer
    - **Human;** third trophic level and secondary

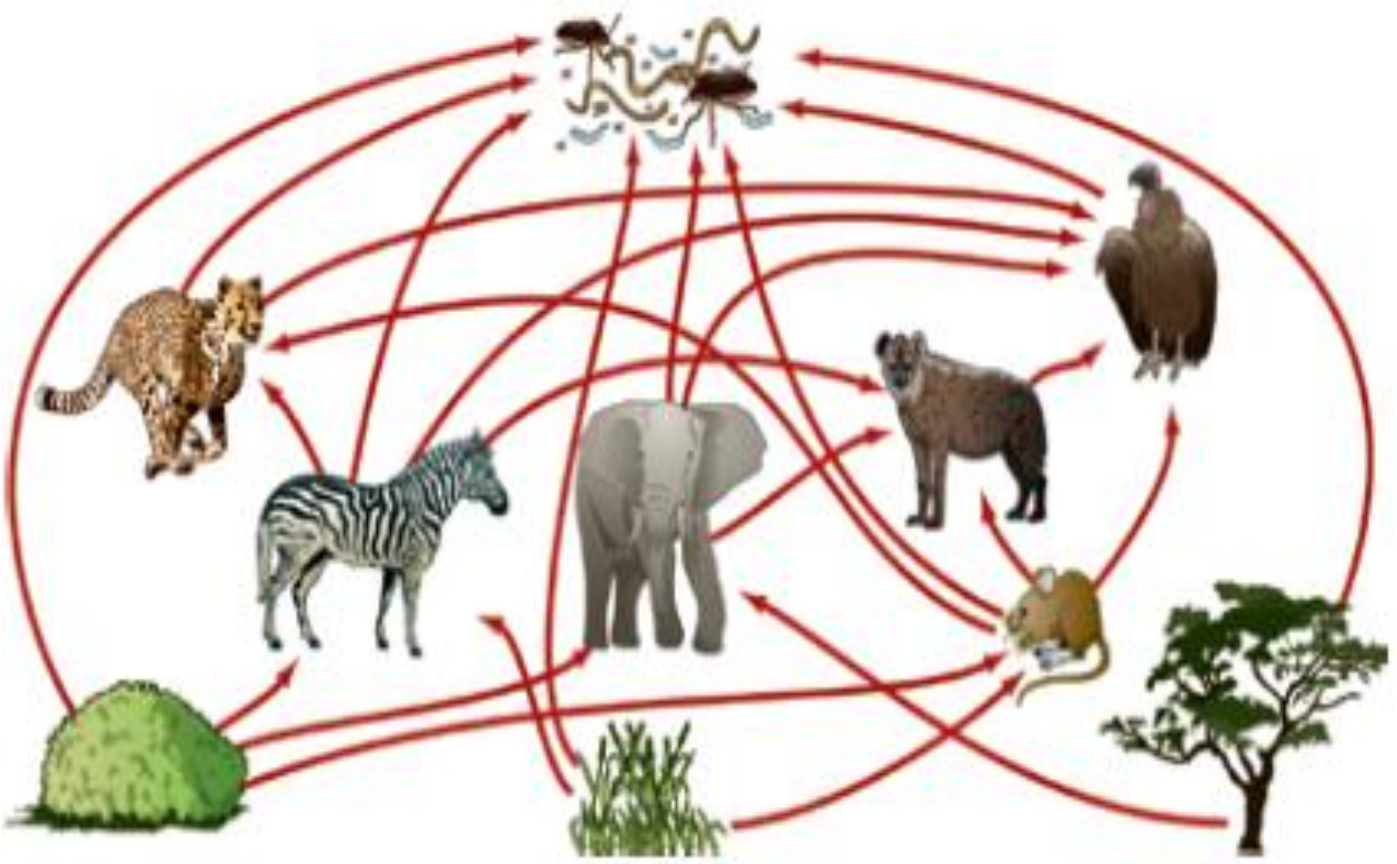
leaves → grasshopper → rodent → leopard

grass → zebra → lion

- **Aquatic food chain** start microscopic photosynthetic organism known as
  - **Phytoplankton ⟶ phytoplankton ⟶ zooplankton ⟶ Fish ⟶ Human**

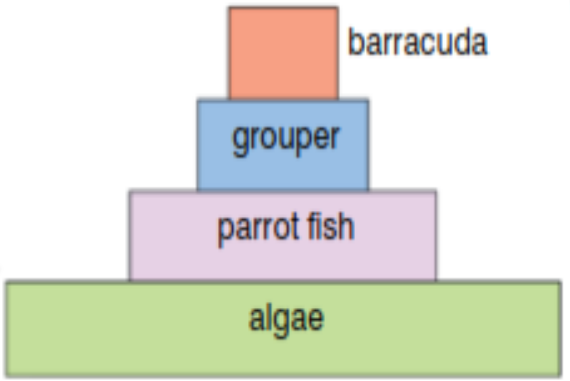
Food web

- Is a complex feeding interrelation between organism that consists many food chain
- The actual feeding relationships in a community



Ecological pyramid

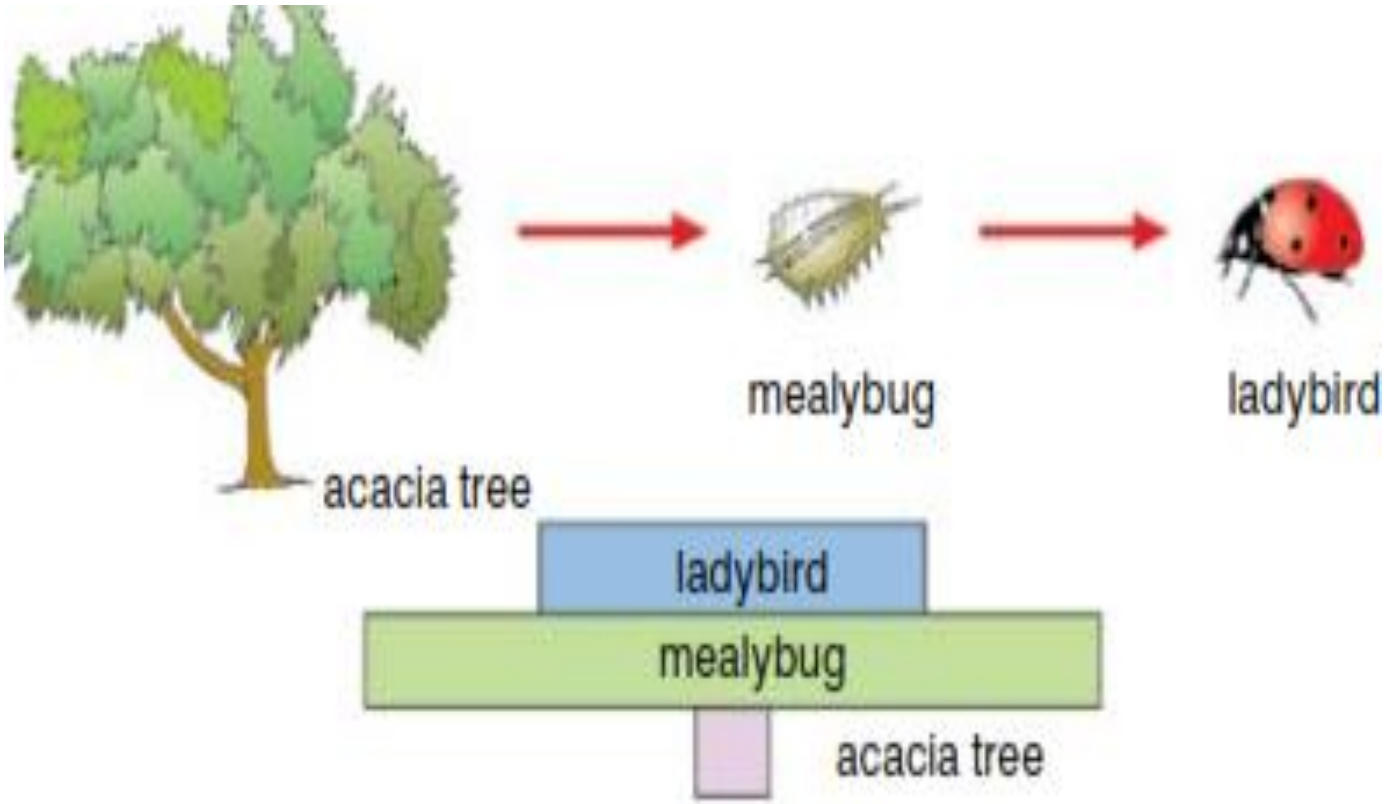
- Is a geographical representation designed to show the bio-productivity At each trophic level in a given ecosystem
- Three type of ecological pyramid
  1. Pyramid of number
  2. Pyramid of biomass
  3. Pyramid of energy



- **Pyramid of number**
  - Pyramid made based on the number of organism in each trophic level.
  - In most ecosystem the number organism decrease from producer to consumer

Pyramid of number …

- Sometimes pyramid of number does not accurately reflect ecological pyramid

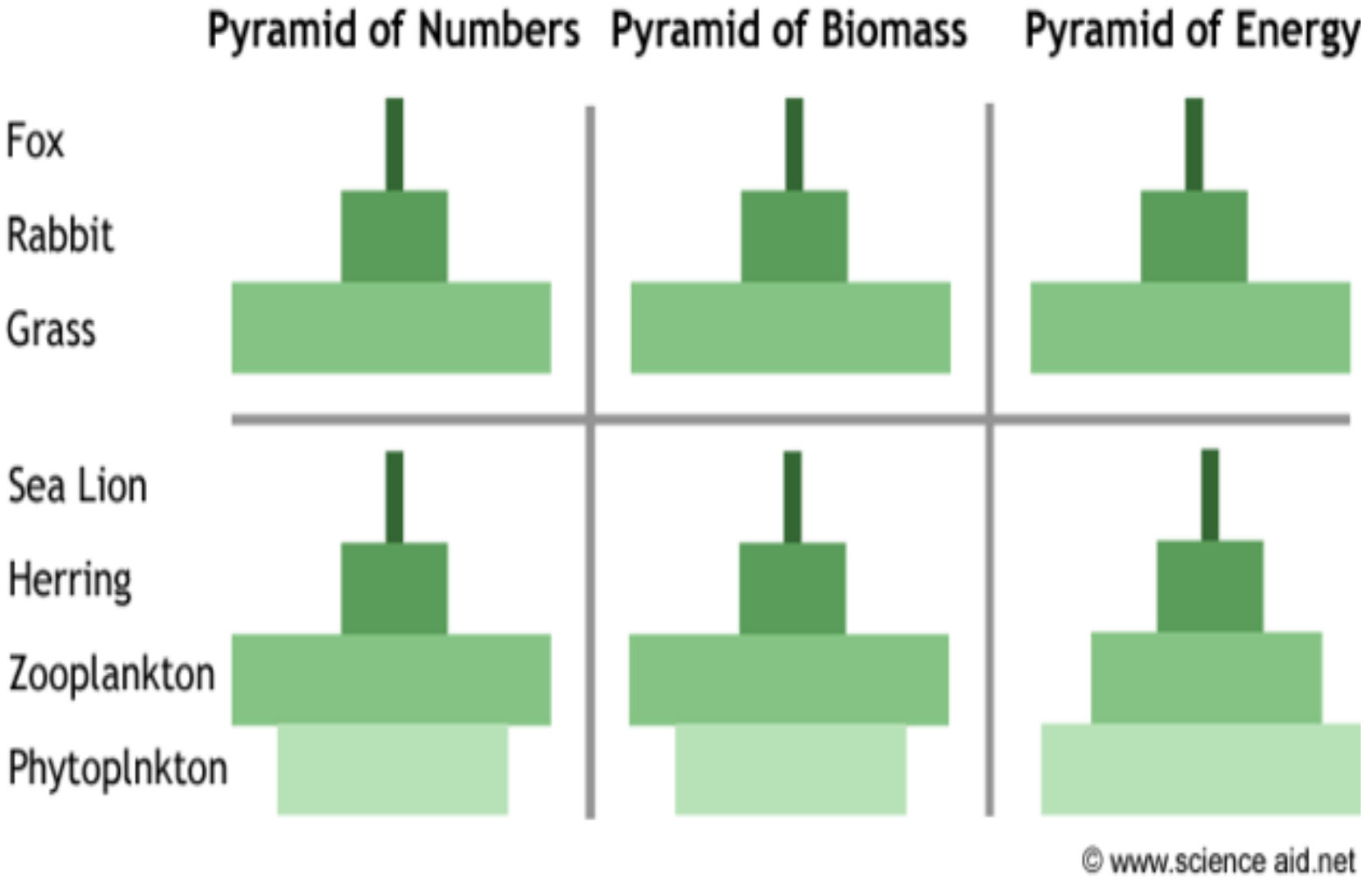


Pyramid of biomass

- **Biomass;** the total amount of organic matter
- Pyramid based on the dry mass of tissue of organism at each trophic level
- The total amount of biomass decrease as we go from producer to consumer
- At each trophic level biomass is lost by;
  - **Heat from respiration**
  - **Urine, faces and to provide energy**
- **Limitation**
  - Gives equal value to tissue which differ in
  - Chemical Composition and energy value

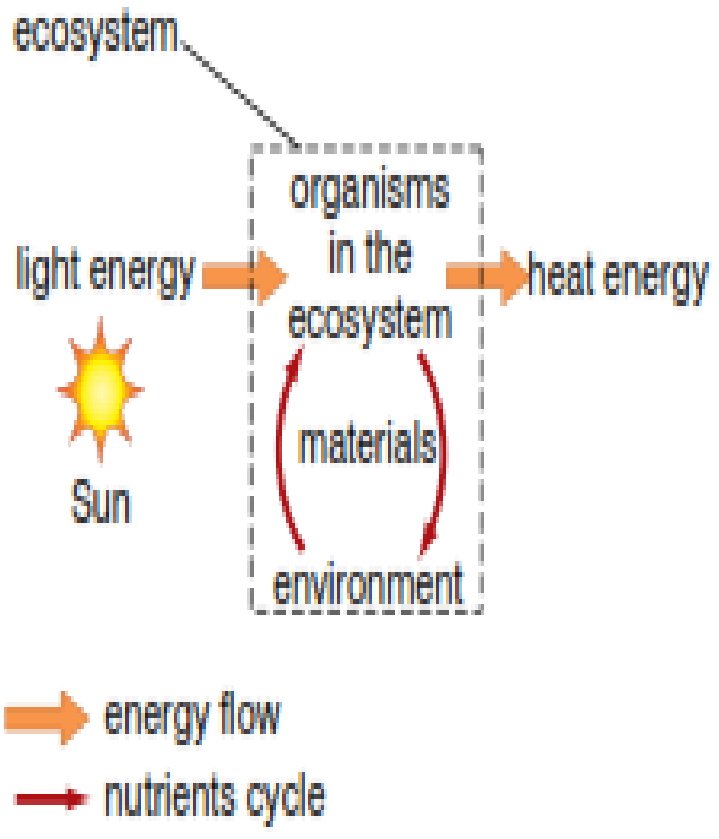
Pyramid of energy

- Pyramid drown based on the amount energy produce at each trophic level
- It gives the most **accurate representation**



6.3 RECYCLING IN NATURE

- **Nutrient** (carbon, nitrogen, sulfur, and water) recycled in an ecosystem between organism and environment
- **Decomposers (bacteria and fungi)** play a huge role in recycling
- **Energy** never recycling in an ecosystem

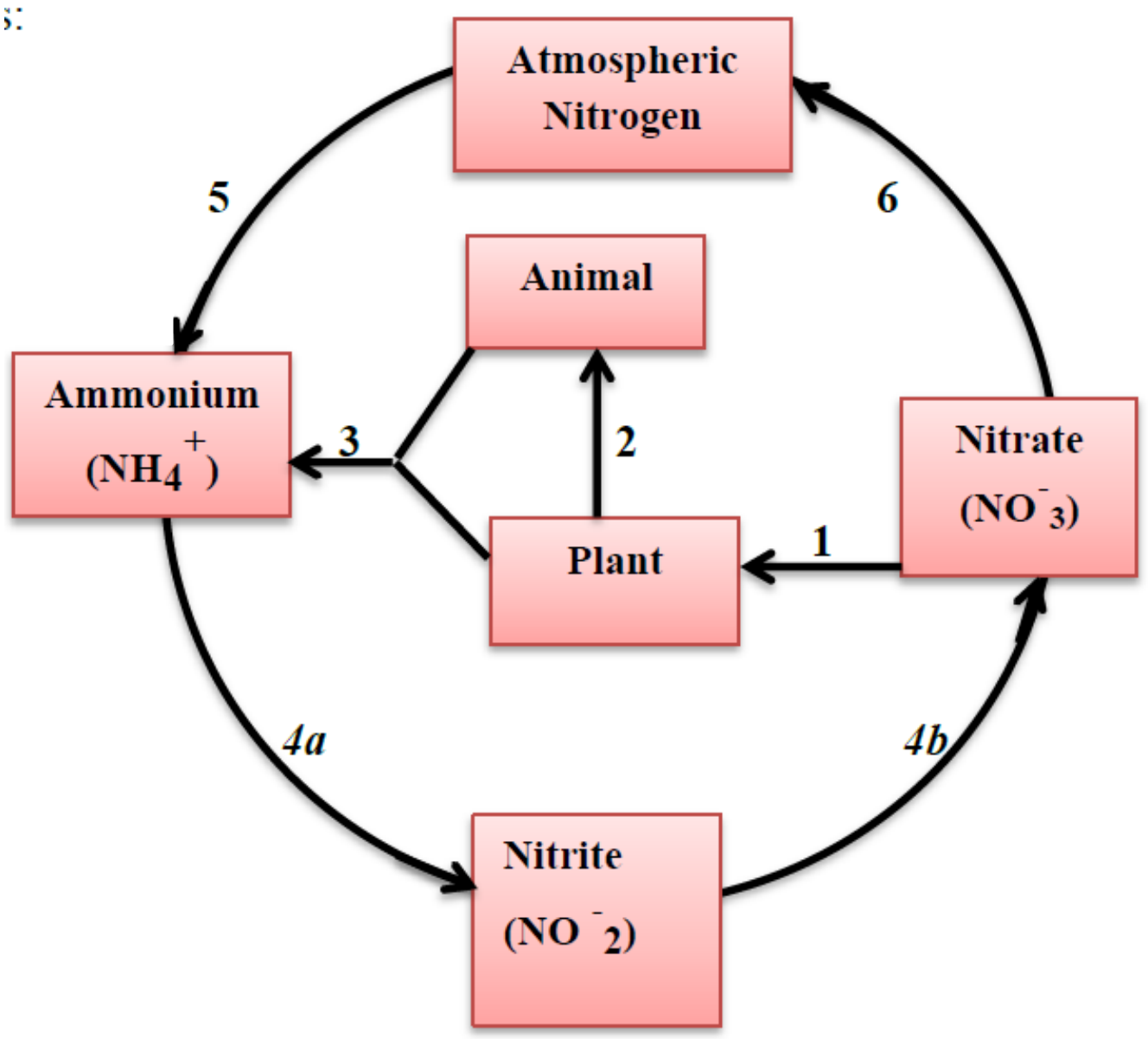


The nitrogen cycle

N2 Is the part of protein, amino acid, DNA ATP

1) **Plant** absorb nitrate from the soil and make amino acid and protein
2) **Animal** obtains nitrogen by feeding of plant
3) **Putrefying /amonifying/ bacteria;** convert protein in dead bodies and their execratory product into ammonia
4) **Nitrifying bacteria ;** ammonium ion is oxidize into nitrates in two process 4a. Nitrosomonas 4b. Nitrobacter
5) **Denitrifying bacteria;** convert nitrates in soil into elemental nitrogen, reduce the amount of nitrogen in the soil
6) **Nitrogen fixing bacteria;** convert elemental nitrogen into ammonium ion
   - **Legumes (Pea, bean);** in the root nodules of many legumes plant have symbiotically nitrogen fixing bacteria called rhizobium, which have the ability to fix nitrogen in the soil.

Nitrogen cycle



Carbon cycle

- **Important process in carbon cycle**
  - **photosynthesis;** remove the amount carbon dioxide from the cycle
  - **respiration;**
  - **combustions;** increase the amount of carbon dioxide in the atmosphere
  - **decomposition;**
- **Ozone;** layer of the atmospheres that protect the earth from harmful ultraviolet light from the sun
- **Global warming;** is the rising of temperature on earth's surface as a result of accumulation of **green house gas** like **carbon dioxide** and **methane**
  - **Carbon dioxide CO_2** , Increase as a result of human activity such as
    - **Combustion** Burning of fissile fuel,
    - **Deforestation**,
    - **Respiration**
  - **Methane; It is** increased in the atmosphere as a result of
    - Growth of rice in swampy condition
    - Digestive activity of cattle produce methane

ADAPTATIONS

- **Adaptations**; features of organism develop which make it possible for them to survive in a particular habitat
- **Animal in cold climate**
  - **Reduce surface area to volume** ratio, larger size like seal, whales and polar beer in order to prevent heat lost.
  - **Small extremities** like ear to reduce heat loss. E.g. polar beer
  - **Thick layer of fat** under skin (blubber) to store more internal heat
  - Have **thick fur coat** on the outside will insulate an animal

Animal in dry climate

- The biggest challenge of animal live in desert
  - Coping with the lack of water
  - The rise of core body temperature
- Large surface area to volume ratio (small size) to loss more heat
- Obtains water from the food they eat
- Lot of sweat produced in order to coal the body
- Active in early evening and late evening
- Big ear like fennec fox to loss heat faster
- Thin fur coat in order to loss heat

Plant adaptation in desert

- Deep growing root system to absorb water
- Thick and fleshy stem, root to store more water
- **Sunken and few stomata** to reduce the amount of water loss
- **Thick waxy cuticle** to reduce the amount of water loss
- **Leaves are reduce** to reduce transpiration
- **Have curled leaves**; these reduce the surface area of the leaf and trap moist air around the leaf.

- **Camouflage**; is the ability of an animal to blend its color into the surrounding environment to avoid detection.
- Important both to predator (the prey does not see them coming) and to prey (they cannot be seen)
- **Arctic fox** change the **grey and browns** of their summer coat into pure white in winter