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**Theme: Diversity Living Things**

**S1 New Curriculum Biology-Chapter 3 - Classification**

### **Principle of classification**

This is an arrangement of organisms into manageable groups based on similarities of their structures or appearance. The branch of biology that deals with classification is called Taxonomy.

The smallest unit of classification is the species that include organisms that can interbreed. Similar species make a Genus and the next levels are families, order, classes, phyla and finally Kingdoms.

### **Nomenclature of organisms.**

The system of naming organisms is known as binomial system of nomenclature. Here an organism's name consists of two names. The first name is a genus name which starts with a capital letter and the second name is a species name which starts with a small letter for example, man is **Homo sapiens**.

### **Levels of classification**

In biological classification, organisms are systematically categorized into hierarchical levels based on shared characteristics. Here are the main levels of classification from broadest to most specific:

1. **Domain** – The highest level, categorizing life into three groups: Archaea, Bacteria, and Eukarya.
2. **Kingdom** – Divides life into five major categories like Animalia, Plantae, Fungi, Protocista, and Monera.
3. **Phylum** – Groups organisms based on body plans and structures (e.g., Chordata for vertebrates).
4. **Class** – Further divides phyla (e.g., Mammalia for mammals within Chordata).
5. **Order** – Groups organisms within a class based on more refined similarities (e.g., Carnivora includes meat-eaters).
6. **Family** – Narrows down organisms within an order (e.g., Felidae includes cats).
7. **Genus** – Groups closely related species (e.g., Panthera includes lions and tigers).
8. **Species** – The most specific level, identifying individual organisms that can breed and produce fertile offspring (e.g., Panthera leo for lions).

## Kingdoms

There are five kingdoms i.e. Monera, Protocista, Fungi , Plantae and Animalia,.

The characteristics of these five kingdoms are presented in the table below

Structure	Monera	Protocista	Fungi	Plantae	Animalia
Cell organization	Unicellular (single celled)	Unicellular and multicellular	Unicellular and multicellular	Multicellular	Multicellular
Nucleus	Absent	Present	Present	Present	Present
Cell wall	Present without cellulose	Absent in some but present in others with cellulose or other substances	Present made of chitin	Presence with cellulose	Absent
Cell vacuole	Absent	Present or absent	Present or absent	Present	Small and numerous
Chloroplasts	Absent	Present or absent	Absent	Present	Absent
Flagella/Cilia	Solid, rotating	Present in most members	Absent	Only present in gametes of some plants	Present in gametes
Mode of feeding	Autotrophic or heterotrophic by absorption (saprophytic)	Autotrophic or heterotrophic by absorption (saprophytic) or phagocytosis	Heterotrophic by absorption (saprophytic)	Autotrophic	Heterotrophic by ingestion

## Viruses

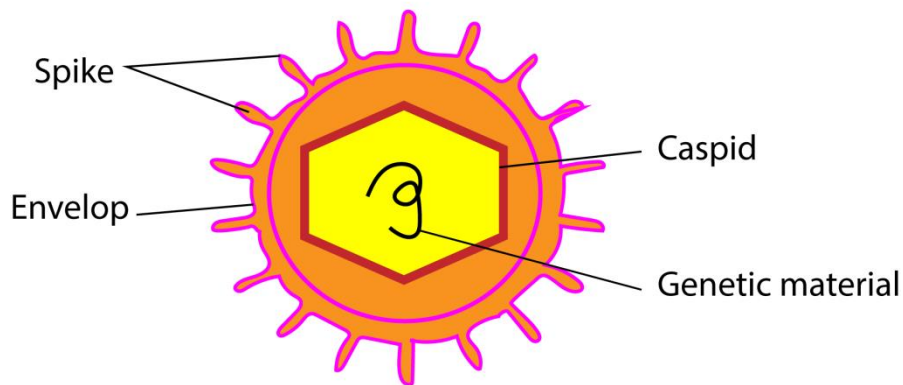
Viruses are not placed in any kingdom because they have characteristics for both living and non-living things. They are non-living because they can be crystallized and they are living because they contain nucleic acid (DNA or RNA) and can replicate .

### Definition

A virus is a tiny infectious agent that can only replicate inside the living cells of organisms.

It consists of genetic material (either DNA or RNA) wrapped in a protective protein coat. Viruses invade host cells, hijack their machinery, and use it to reproduce, often causing disease in the process.

### Simplified diagram of a virus



Viruses cannot be classified into any Kingdom because, they are on the borderline between living and non-living things.

Viruses are smaller than bacteria and cannot be seen with a light microscope. Viruses are living thing because they contain nucleic acid in form of DNA or RNA.

Viruses have a variety of shapes; i.e. spherical such as poliomyelitis, straight rods such as tobacco mosaic (TMV), or flexible rods such as potato viruses.

#### Economic importance

1. Viruses cause diseases to plants such as tobacco bright and tomato mosaic by (TMV), curly top, psorosis and spotted wilt.
2. Viruses cause diseases to animals as rabies, flue, polio, HIV/AIDS, Ebola and cancers.
3. May lead to antibiotic resistance by bacteria.
4. Used in genetic engineering.

#### Control of the spread of viral disease

1. Burning infected plants
2. Abstinance or use of a condom to prevent HIV
3. Quarantine for highly infectious virus such small pox.
4. Vaccination

NB. Viral diseases are difficult to treat because viruses are continuously mutating.

## Human Immunodeficiency Virus (HIV)/AIDS



AIDS patient at critical stage

Human Immunodeficiency Virus (HIV) is a virus that attacks the body's immune system, specifically targeting white blood cells. Over time, if untreated, HIV can weaken the immune system to the point where the body struggles to fight infections and diseases. The most advanced stage of HIV infection is Acquired Immunodeficiency Syndrome (AIDS).

### Symptoms of AIDS

AIDS (Acquired Immunodeficiency Syndrome) is the most advanced stage of HIV infection, where the immune system is severely weakened. Symptoms can vary, but common signs include:

- **Persistent fever**
- **Extreme fatigue**
- **Significant weight loss**
- **Chronic diarrhea**
- **Swollen lymph nodes**
- **Night sweats**
- **Skin rashes or bumps**
- **Frequent infections**
- **White spots or unusual lesions in the mouth**
- **Neurological complications** such as memory loss or confusion

These symptoms occur because the immune system is no longer able to fight off infections and diseases effectively. Opportunistic infections, such as tuberculosis or pneumonia, often develop in individuals with AIDS

## Testing for HIV

Presence of symptoms alone is not enough to confirm that someone has HIV because many other diseases such as tuberculosis

There are several types of tests available:

- **Nucleic Acid Test (NAT)** – Detects HIV infection **10 to 33 days** after exposure.
- **Antigen/Antibody Test** – Can identify HIV **18 to 45 days** after exposure.
- **Antibody Test** – Detects HIV **23 to 90 days** after exposure.

Testing is recommended for everyone at least once, and more frequently for those at higher risk. Many testing options are available, including laboratory tests, rapid tests, and even home testing kits.

## Transmission of HIV

HIV is primarily transmitted through bodily fluids such as blood, semen, vaginal fluids, and breast milk. It can spread through unprotected sexual contact, sharing needles, and from mother to child during childbirth or breastfeeding. However, it is **not** spread through casual contact like hugging, kissing, or sharing food.

## Control of the spread of HIV

Controlling the spread of HIV involves a combination of prevention strategies, education, and medical interventions. Here are some key approaches:

- **Safe Practices:** Using condoms correctly every time during sex significantly reduces the risk of HIV transmission.
- **Pre-Exposure Prophylaxis (PrEP):** A medication taken by HIV-negative individuals at high risk to prevent infection.
- **Post-Exposure Prophylaxis (PEP):** A treatment taken within 72 hours of potential exposure to HIV to prevent infection.
- **Regular Testing:** Getting tested for HIV and other sexually transmitted infections (STIs) helps in early detection and prevention.
- **Antiretroviral Therapy (ART):** People living with HIV should take ART as prescribed, which can suppress the virus to undetectable levels, preventing transmission.
- **Needle Safety:** Avoiding the sharing of needles and syringes helps prevent HIV transmission among drug users.
- **Education and Awareness:** Spreading accurate information about HIV transmission and prevention reduces stigma and encourages safer behaviors.
- **Mother-to-Child Prevention:** Pregnant women with HIV should take ART to prevent transmission to their babies.

## Treatment of HIV/AIDS

There is currently no cure for HIV, but antiretroviral therapy (ART) can effectively manage the virus, allowing people with HIV to live long and healthy lives. Early diagnosis and treatment are crucial in preventing the progression to AIDS.

## Ebola

This is rare but deadly virus.

It spreads through contact with body fluids of infected person.

It causes Ebola Hemorrhagic Fever (EHF)

### Symptoms of EHF

- High fever
- Vomiting
- Sore throat
- Bloody stool
- Headach
- Bleeding from body opening
- Bloody urine

How to control Ebola Hemorrhagic fever

Controlling the spread of **Ebola Hemorrhagic Fever** involves a combination of **prevention, rapid response, and medical interventions**. Here are some key strategies:

- **Early Detection & Surveillance:** Monitoring outbreaks and identifying cases quickly to prevent further spread.
- **Isolation & Quarantine:** Infected individuals must be isolated, and those exposed should be monitored for symptoms.
- **Safe Burial Practices:** Ebola can spread through contact with infected bodies, so safe burial procedures are essential.
- **Personal Protective Equipment (PPE):** Healthcare workers must wear protective gear to prevent exposure.
- **Community Awareness & Education:** Informing people about symptoms, transmission, and prevention methods.
- **Vaccination & Treatment:** There are vaccines available for Ebola virus disease, and treatments are under development.
- **Avoiding Contact with Infected Animals:** Ebola can spread from animals like bats and primates to humans.

## Hepatitis

It is the swelling of the liver. There are three common types of Hepatitis, that is, Hepatitis B virus which causes a serious liver infection but is easily preventable by vaccination. Hepatitis

C, major cause of liver cancer. And Hepatitis cause by heavy alcohol drinking, drug use, other infections and toxin.

### Symptoms of Hepatitis B

Symptoms can range from mild to severe, and some people may not experience any symptoms at all. Here are common signs of Hepatitis B:

- **Abdominal pain**
- **Dark urine**
- **Fever**
- **Joint pain**
- **Loss of appetite**
- **Nausea and vomiting**
- **Extreme fatigue and weakness**
- **Jaundice** (yellowing of the skin and eyes)

If left untreated, Hepatitis B can lead to serious complications such as liver failure

### How to control Hepatitis B

Controlling **Hepatitis B** involves a combination of **prevention, early detection, and medical management**. Here are key strategies:

- **Vaccination:** The **Hepatitis B vaccine** is the most effective way to prevent infection. It is recommended for infants, healthcare workers, and those at higher risk.
- **Safe Practices:** Avoid sharing needles, razors, toothbrushes, or other personal items that may come into contact with blood.
- **Protected Sex:** Using condoms reduces the risk of transmission through sexual contact.
- **Screening & Testing:** Regular testing helps detect Hepatitis B early, especially for pregnant women and those at risk.
- **Antiviral Treatment:** For chronic Hepatitis B, antiviral medications can help manage the virus and reduce liver damage.
- **Healthy Lifestyle:** Avoid excessive alcohol consumption and maintain a balanced diet to support liver health.

### Cassava mosaic virus



Cassava mosaic virus causes cassava mosaic disease shown in the image above. This disease leads to reduced yields and poor crop quality.

Control of cassava mosaic disease

Controlling Cassava Mosaic Disease CMD involves several strategies:

- **Using Disease-Free Planting Material:** Starting with healthy, virus-free cassava cuttings helps prevent the spread of CMD.
- **Roguing and Sanitation:** Regularly inspecting fields and removing infected plants can reduce the spread of the disease.
- **Chemical Control of Whiteflies:** Since whiteflies transmit the virus, controlling their population with insecticides can help manage CMD.
- **Planting Resistant Varieties:** Some cassava varieties are bred to resist CMD, reducing the impact of the disease.

### Kingdom Prokaryotae/ Monera

The main features of Kingdom monera are:

- They are unicellular (single-celled), but some bacteria such as blue-green bacteria may form single rows of cells.
- Have varied methods of nutrition including autotrophic and heterotrophic modes
- Reproduce asexually by binary fusion and sexually by conjugation
- All bacteria are prokaryotes, i.e. they have no membrane-bound organelles such as a nucleus

The kingdom contains cyanobacteria (blue-green bacteria) and bacteria that are unicellular.

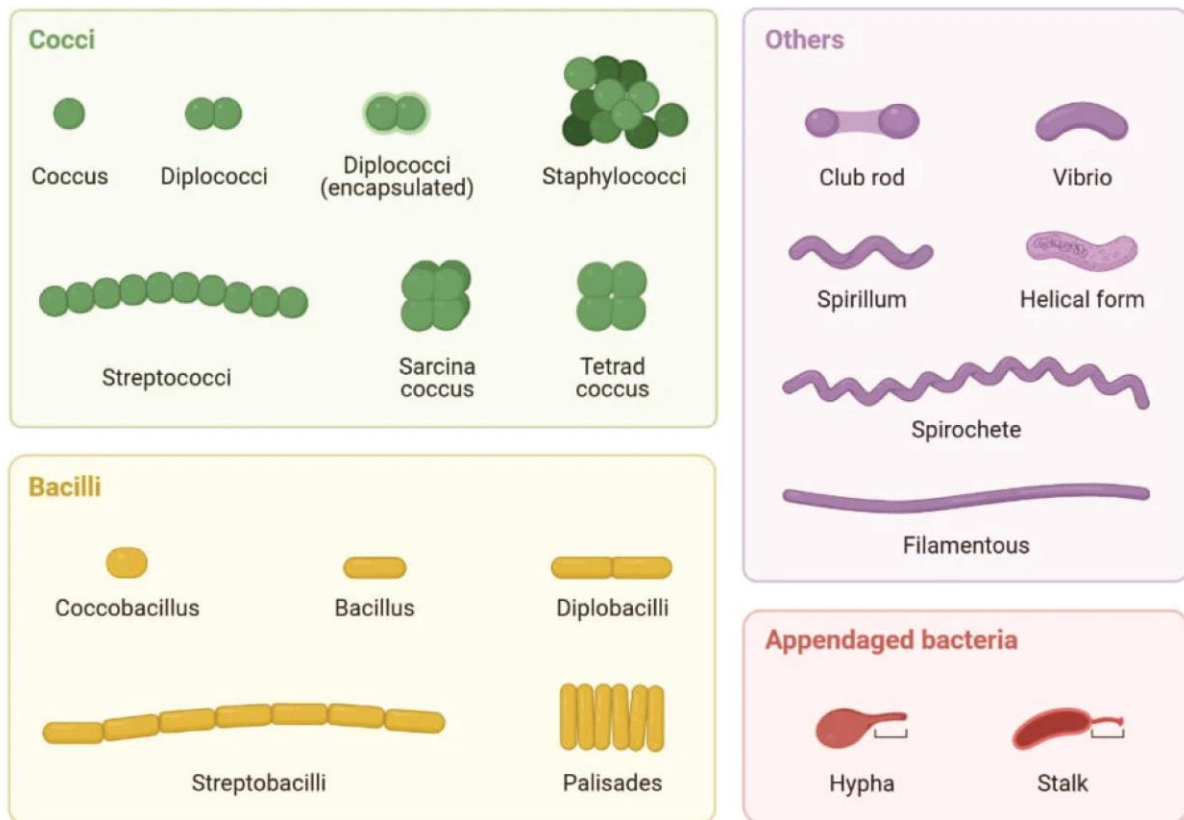
Blue-green algae photosynthesize and are capable of fixing nitrogen.

Bacteria are classified into gram positive bacteria when their cell wall is stained by gentian violet or gram negative when their cell walls are not stained by gentian violet. Gram negative bacteria are more susceptible to antibiotics than gram negative bacteria.

Bacteria are generally distinguished by their shapes, i.e.,

- Cocci are spherical. Cocci may stick together in chains or streptococci or in clusters or staphylococci,
- Bacilli are rod shaped
- Spirilla are spiral shaped (illustrations)

## Shapes and Arrangement of Bacteria



Common plant bacterial diseases include:

- aster yellows
- bacterial wilt
- blight
  - a. fire blight
  - b. rice bacterial blight
- canker
- crown gall
- rot

Common animal bacterial diseases include

- Cholera.
- Leprosy.
- Tuberculosis.
- Plague.
- Syphilis.

**Prevention of bacterial diseases**

- Keeping proper hygiene
- Eating well cooked food
- Proper sanitation
- Antibiotics

## Importance of bacteria

- Cause decay and recycling of matter
- Symbiotic bacteria in intestine synthesize vitamin B12 while those in herbivores produce enzyme cellulase to digest cellulose.
- Food production: cheese, yoghurt and vinegar, etc.
- Manufacturing process. E.g. making soap powder, tanning leather.
- Used in genetic engineering to make useful material.

## Kingdom Fungi

### Characteristics

1. Have no chlorophyll; do not photosynthesize.
2. Heterotrophic
3. Cell wall contain chitin rather than cellulose
4. Body usually a mycelium
5. Carbohydrates stored as glycogen
6. Reproduction by means of spores without flagella

### Examples of Fungi

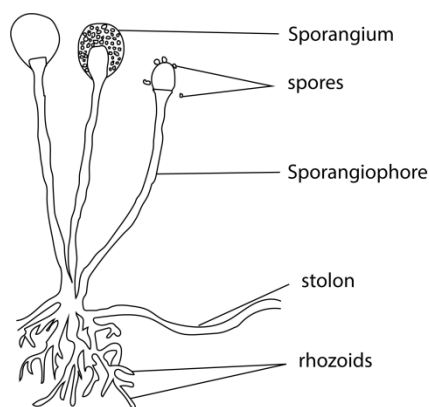


Mushroom



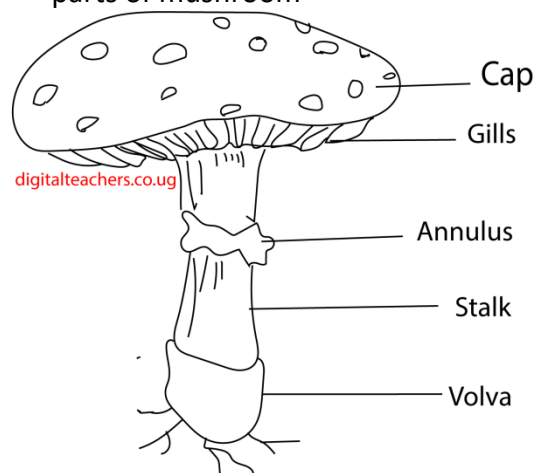
Mould

### Parts of Rhizopus



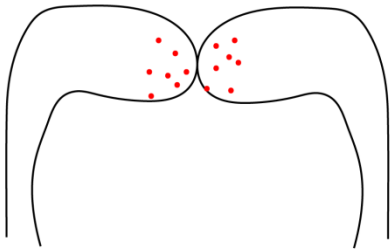
### Economic importance of fungi

### parts of mushroom

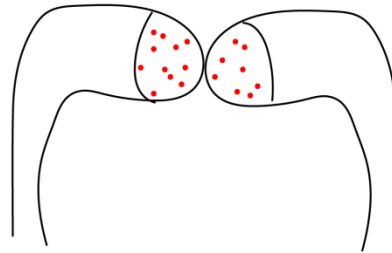


Mushroom

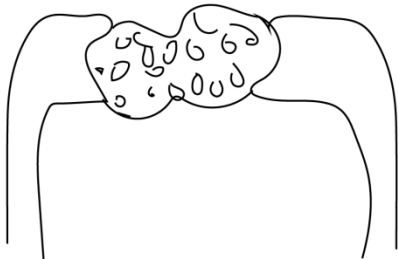
## Sexual reproduction in rhizopus



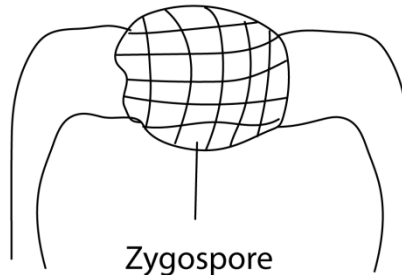
1. Swollen tips of hhyphae come together



2, Cross wals apperar and enclose sevelral nuclei



3. end wall disappear and nuclei fuse and outer covering begin to develop



[digitalteachers.co.ug](http://digitalteachers.co.ug)



under favorable conditions  
zygospore germinate

### Benefits of fungi

- Decompose and recycle organic matter
- Production of antibiotics e.g. penicillin
- Production of alcohols
- Baking e.g. yeast

### Disadvantages of fungi

- Cause diseases e.g. ringworm,



- Food decay

### Example fungal disease in plants



Anthracnose



Rots



Mildews



Rusts

### Example of fungal diseases to animals



Athletic foot



Oral thrush

- meningitis

## Kingdom Protocista

The kingdom Protocista consists of eukaryotic organisms which are assemblages of similar cells. It includes algae, all protozoa and slime moulds.

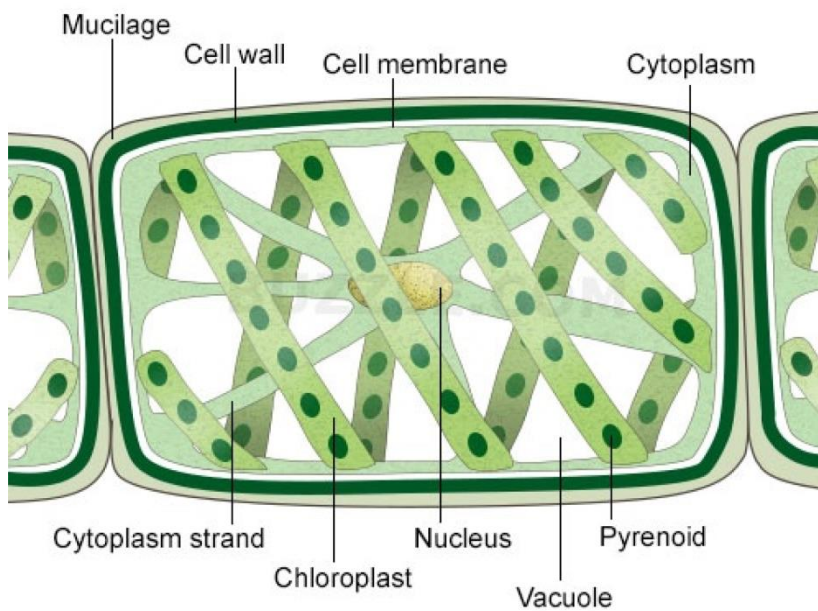
### Characteristics

1. Have no stems, roots or leaves
2. No sclerenchyma
3. No vascular tissue
4. No archegonia
5. Have other photosynthetic pigments in addition to chlorophyll a.

## Algae



### Structure of Spirogyra

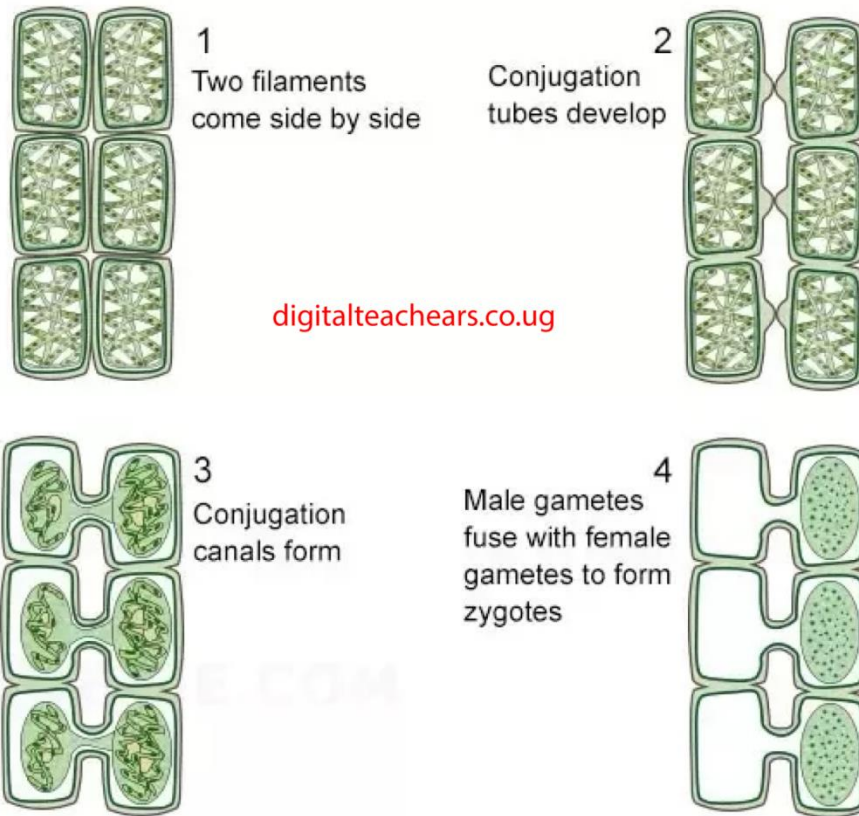


### Reproduction

Asexual reproduction by fragmentation

Sexual reproduction by conjugation

Stages of conjugation in spiroyra



### Economic advantage of algae

1. Primary producer
2. Food
3. Provide oxygen in water through photosynthesis.
4. Alginic acid derivatives are used as thickener in food, cosmetic and drug industry.
5. Algal bloom cause water to smell and may lead to depletion of oxygen and death of fish.

## Kingdom plantae

### Characteristics

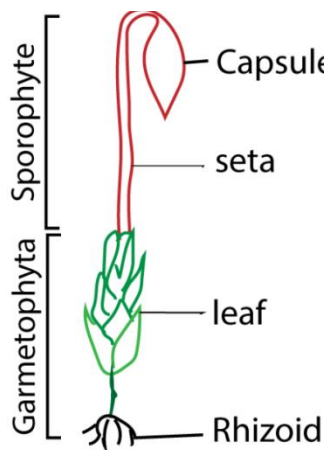
- Are made of more than one eukaryotic cell.
- Have cell wall containing cellulose
- Have chlorophyll as their main photosynthetic pigment.

### Phylum Bryophyta(moss)



- a. It is made of small plants generally found in moist terrestrial habitats
- b. They have no root and no vascular tissue
- c. Show alternation of generation in which the sporophyte and gametophytes are almost equally conspicuous, although the sporophyte is attached to and depends on, gametophyte throughout life.

Drawing of moss

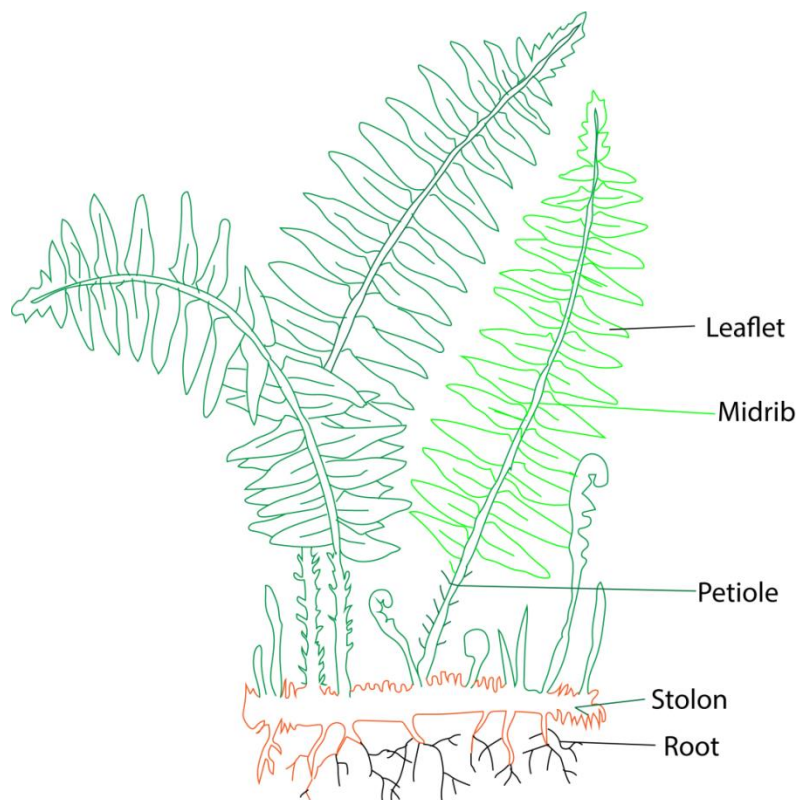


### Phylum Filicinophyta (ferns)



Ferns have large leaves with chlorophyll called fronds which are coiled in bud.

Have roots and well developed vascular systems.



### Phylum Angiospermophyta: Flowering plants

They are made of two classes, monocotyledoneae (monocotyledonous plants) and dicotyledoneae (dicotyledonous plants).

#### Comparison of monocotyledonous plants and dicotyledonous plants.

Monocotyledoneae	Dicotyledoneae
Embryo has one cotyledon	Embryo has two cotyledons
Narrow leaves with parallel venation	Broad leaves with net work veins
Scattered vascular bundles in stem	Ring vascular bundles
Rare cambium present and normally no secondary growth	Vascular cambium present which can lead to secondary growth
Many xylem groups in root	Few xylem groups in root
Flower parts in threes	Flower parts in fours or fives
Calyx and corolla not usually distinguishable	Calyx and corolla are distinct.
Often wind pollinated	Often insect pollinated
e.g. maize and rice	e.g. bean



Maize



Bean

### Coniferous plant



### Economic importance of plants

1. For decoration
2. For food, timber, medicine, raw materials for industries (fruits juices), fibre producing plants (sisal, hemp, cotton)

## Kingdom Animalia

The organism included in this kingdom are non-photosynthetic multicellular organism with nervous coordination.

### Phylum protozoa

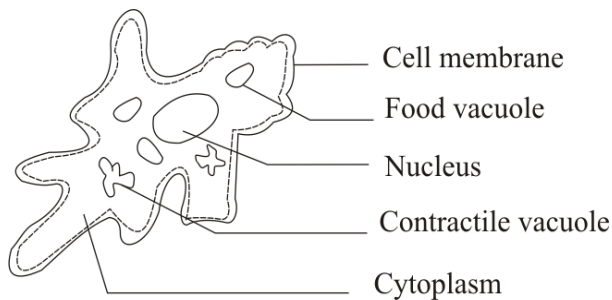
Examples; amoeba, Euglena, paramecium and trypanosome

#### Characteristics

1. they are single celled.
2. they are microscopic
3. they reproduce by means of binary fission.
4. they move by pseudopodia (amoeba), cilia (paramecium) or flagella (euglena)
5. reproduce by binary cell division or by cell fission

### Common protozoa

#### Amoeba



#### Feeding of amoeba

Amoeba feeds by use of cell membrane to engulf the food particle. The food particle is taken in the cytoplasm and enclosed in food vacuole where it is digested.

#### Locomotion

By pseudopodia

#### Excretion

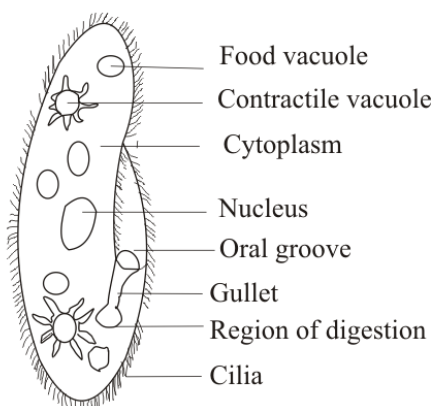
- Ammonia diffused through the cell membrane
- Excess water by contractile vacuole

Reproduction: Binary cell division

#### Economic importance

- Entamoeba histolytica cause amoebic dysentery
- They feed and control other disease-causing organisms e.g. bacteria

#### Paramecium



**Feeding:** Cilia push food into the gullet and ingestion takes place only at the end of the gullet. The food vacuole move in a very definite path through the body of the paramecium and egestion takes place at only one part near the region of ingestion.

**Movement:** cilia

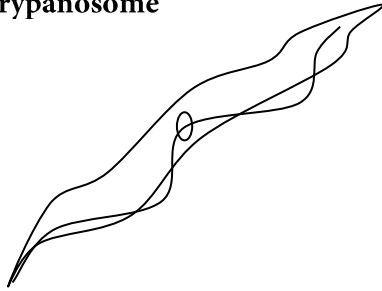
#### Excretion

- Ammonia diffused through the cell membrane
- Excess water by contractile vacuole

Reproduction: by binary cell division

Economic importance: source of food to other aquatic organisms

### Trypanosome



Economic impotence trypanosome

- Is a parasite
- Causes nagana in cattle and sleeping sickness in man

Transmission: By tsetse fly

Prevention: by spraying tsetse flies

### Plasmodium

Causes malaria and transmitted by female anopheles mosquito

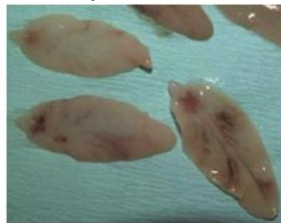
Prevention of malaria

- Sleeping in mosquito net.
- Using mosquito replant
- Draining stagnant water
- Using insecticide
- Treatment of malaria

### Phylum Platyhelminthes (Flatworms)



Planarian



Liver fluke



Tapeworm

Characteristics

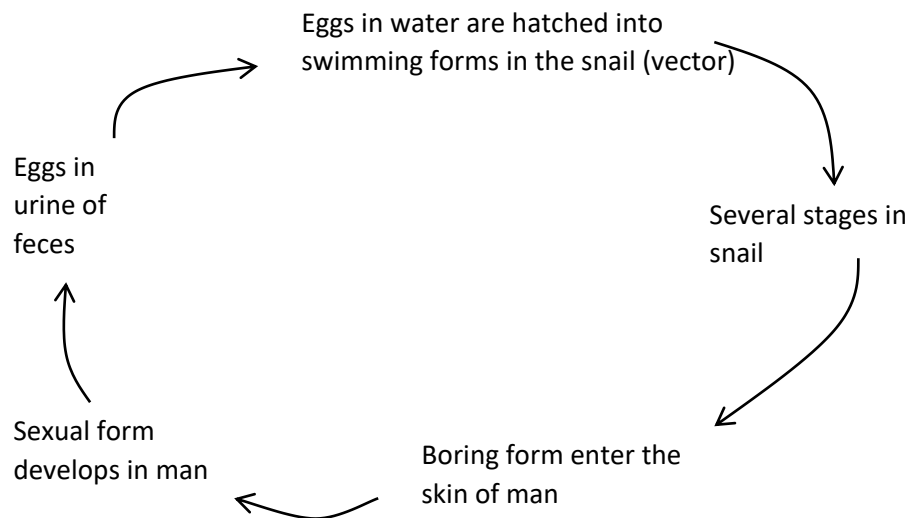
1. their bodies are flat with distinct head.
2. they are parasitic
3. are hermaphrodite (have both sexes)
4. They are **triploblastic** with a body wall composed of an outer epidermis and inner gastrodermis separated by a relatively undifferentiated region of mesoderm called **mesenchyme**.

They are subdivided into three classes

1. Turbellaria: these are carnivorous flat worms found in fresh water, streams and ponds. It remain under water during day and comes out to feed at night e.g. planarian

2. Trematoda; are generally endo or ecto-parasites e.g.
- fasciola hepatica or liver fluke is a parasite found in the liver.
  - Blood fluke cause bilharzias.

Life cycle of the blood fluke



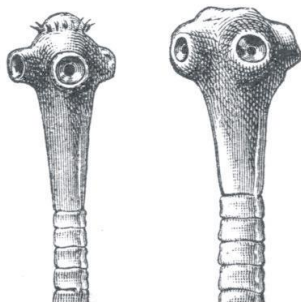
### Economic importance

Liver fluke cause liver diseases, large number block bile ducts.  
Blood fluke cause bilharzias.

3. Cestoda (tape worms)
- they are endo parasites found in the alimentary canal of vertebrates.
  - They are ribbon-like with distinct head or scolex and a series of segments or proglottis
  - The proglottis contain both male and female reproductive system.
  - Lack a digestive system
  - Lack any means of locomotion

They are two types

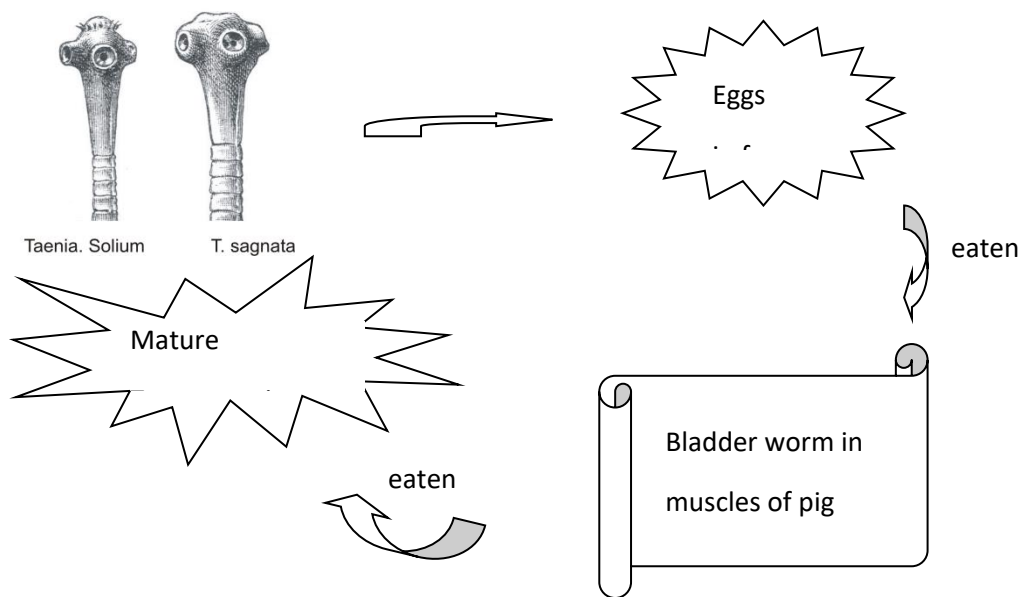
- Taenia saginata uses a cow as a secondary host.
- Taenia solium uses a pig as a secondary host



Taenia. Solium

T. sagnata

## Life Cycle of a tape worm



## Harmful effects of tapeworms

- They are parasites
- They may block the intestine and cause constipation and other problems
- Lead to anemia

## Control of spread of tapeworms

- proper disposal of feces
- eat well cooked food
- proper sanitation
- regular deworming with drugs

## Dangers of parasitic mode of life

- failure to find a host
- Failure to penetrate a host
- Failure to protect self from host defense mechanisms.

## Adaptations of the tapeworm parasitic mode of life

1. possesses suckers and hooks for attachment
2. produces a lot of mucus that protects it from the host digestive enzyme
3. produces a large number of eggs to increase chance of finding a host
4. has intermediate secondary host e.g. pig or cow.
5. lack unnecessary organs to reduce on energy demands.
6. its hermaphrodite to increase the rate of egg production.
7. it survives in low oxygen area by using anaerobic respiration
8. has resistant stage in the soil.
9. its flat and long to increase absorptive surface.
10. can regenerate

## Phylum Nematoda

### Characteristics

- they are unsegmented
- they are laterally symmetrical
- have cylindrical bodies
- have separate sexes
- gaseous exchange occurs by diffusion over the body surface

### Examples

#### 1. Round worms e.g. ascaris or hook worm



Ascaris

Round worms are parasites in duodenum are transmitted in feces.

Transmission is controlled by proper hygiene, eating fruits after washing them

#### 2. Filarial worms

These are parasites that cause elephantiasis/filariasis in man.



Filarial worms are transmitted by mosquitoes

Its spread is controlled by sleeping in mosquito net.

## Phylum Annelida: segmented worms

E.g. earthworm, leech, lungworm



Characteristics of segmented worms

- Has segmented body
- It is hermaphrodite
- Has complete digestive system
- Its excretory organ is called nephridia
- Gaseous exchange occurs over the body
- Uses chaeta for locomotion

Economic importance of earthworms

- Tunnels improve aeration and drainage of soil

- causes decay and formation of humus
- source of food to other animals e.g. chicken
- die and rot to form manure.
- Mixes soil layer

### Phylum mollusca



Snail



slug

#### Characteristics of mollusca

- have soft bodies
- protected by shell
- have well developed digestive system
- have well developed gaseous exchange system

#### Importance of mollusca

- food source

### Phylum: Coelenterate/cnidaria

#### Characteristics:

- diploblastic with a body composed of two cell layers, an inner gastrodermis and outer epidermis.
- single body cavity with one opening surrounded by tentacles
- radial symmetry
- polymorphism

#### Examples



Jelly fish



Star fish



Sea anemone

## Phylum: Arthropods

General characteristics

1. have segments bodies
2. have exoskeleton
3. have jointed legs
4. they have a dorsal heart with open vascular system

They are divided into five classes

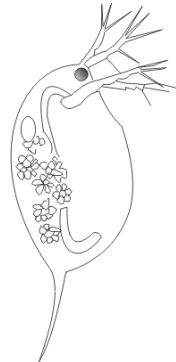
- a. crustacea
- b. chilopoda
- c. diplopoda
- d. arachnida
- e. insecta

Class crustacean

Characteristic

- have two compound eyes
- mostly aquatic
- have five or more pairs of legs.

Examples



Water flea



crab

Economic importance

Source of food to man and other animals

Few are parasitic

### Class Chilopoda

Characteristics

Have cylindrical bodies with numerous segments each with one pair of leg.

Carnivorous

Example



Centipede

## Class Diplopoda

### Characteristics

- their bodies are cylindrical with numerous segments that are similar except around the head region.
- Each segment has two pair of walking legs

Example: millipede



### Adaptations of millipedes to the environment

- Exoskeleton prevents excess water loss.
- Has a dark color for camouflage from predators.
- Have eyes to see food and predators.
- Have legs for locomotion to look for food and run away from predator.
- Has strong mandible for chewing.

### Adaptations of the head of a millipede to survival of organism

- Eyes to see food
- Strong mandibles for feeding
- Antennae for feeling

### Economic importance

- a. Millipedes are herbivores and pest to farm crops.
- b. They burrow and aerate the soil and improve drainage.

## Class: Arachnida

### Characteristics

- a. the body is divided into two main body parts, cephalothorax and abdomen
- b. have no antennae
- c. have four walking legs on cephalothorax

### Examples



Spider



Tick

### Economic importance

- Tick and mites are parasites to domestic animals
- Tick spreads diseases to man e.g. coastal fever
- Spiders feed on vectors.
- Scorpions and spiders inflict fatal stings

### Adaptations of the tick to the mode of life

- Hard cuticle to prevent water loss and protects in parts
- Has dark color for camouflage
- Has strong teeth to cling on the host
- Has eyes to look for host.

## Phylum: Chordata

### Characteristics

1. Gill slits presents in pharynx/ Pharyngeal pouches/ gill clefts
2. Post-anal tail at some stage in the development
3. Notochord
4. Dorsal tubular/tubular nerve chord

They are subdivided into four classes

Pisces- fish

Amphibia- amphibian (frog and toads)

Reptilia- reptiles (lizard, snake, crocodiles)

Aves – the bird

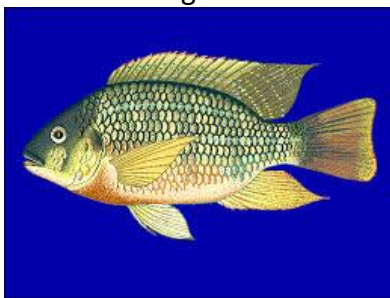
Mammalia - the mammals e.g. man, dogs

Fish, amphibian and reptiles do not maintain constant body temperature and are referred to as poikilothermic or cold blooded. Bird and mammal maintain their constant body temperature and referred to as hoiothermic or warm blooded.

Fish

Is classified into two types:

1. Bony fish e.g. tilapia have their skeleton made of bones.
2. cartilaginous fish have a skeleton made of cartilages e.g. shark



Tilapia



Shark

## Characteristics

They live permanently in water.

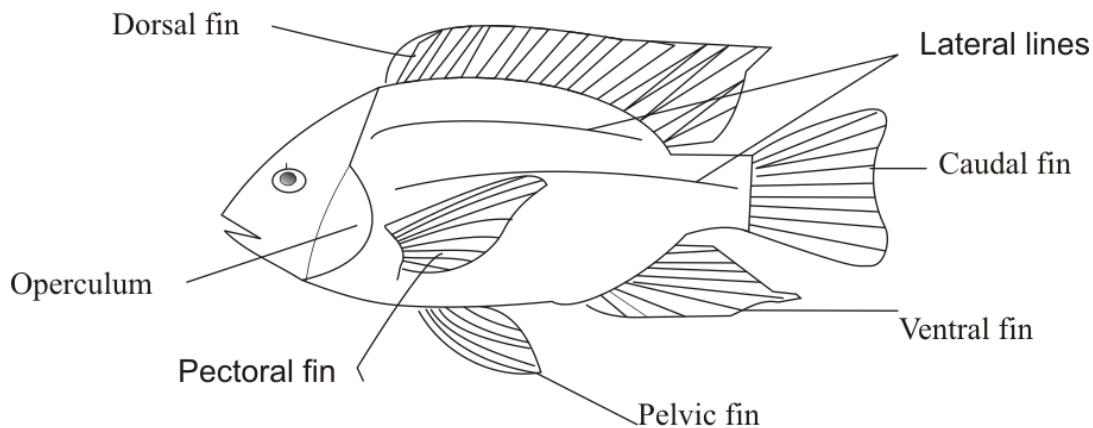
Their bodies are protected with scales or hard skin

They extract oxygen from water using gills.

## Adaptations of the gills for gaseous exchange

- Well supplied with blood to supply deoxygenated
- Numerous to increase the surface area for gaseous exchange..
- Have thin epithelium to facilitate diffusion.
- Equipped with a ventilation mechanism that draw continuous fresh water streams over the gills

## A drawing of a tilapia



## Functions of parts of fish

1. Operculum protects gills
2. Dorsal fin prevents fish from rolling.
3. lateral lines detect sound waves
4. caudal fin used for propulsion
5. pectoral, pelvic and ventral fins for balancing.

## Class Amphibia

These are amphibians which include Toads, newts, and frogs.

### Characteristics

1. they live both on land and in water.
2. The require water for breeding
3. They have soft moistened skin with no scales

4. They lay eggs in water and are fertilized externally.
5. they are poikilothermic. That is, their body temperature varies with environmental temperature.

Adaptations of a toad to way of life



Toad

1. has eyes to see food
2. has legs for locomotion
3. dark to camouflage to the environment
4. has muscular legs for locomotion.
5. has elastic tongue to catch distant prey

## **Class Reptilia**

Reptiles include: snakes, crocodiles, lizards, turtles, tortoise and chamelions.

General characteristics

1. they have a dry skin with horny scales
2. they have two pairs of pentadactyl limbs (limbs with five digits)
3. they use lungs for gaseous exchange
4. they are poikilothermic.
5. they lay eggs with a leathery shell
6. no gills
7. homodont (all teeth of the same type)

## Examples



Lizard



Crocodile

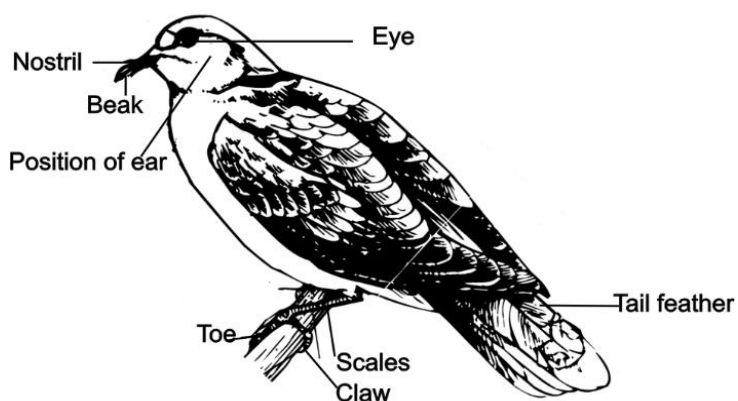
## Class Aves

These are birds e.g cock, hens, ducks, eagles, peacock.

Characteristics of birds

1. Their skin is covered with feathers except legs that are covered with scales.
2. they have skeletons made of hollow bone.
3. they have two pairs of pentadactyl limbs of which the fore limb is modified into wings.
4. have beaks for feeding.
5. they are homoiothermic. That is, they regulate their body temperatures.
6. they lay eggs with shells
7. they undergo internal fertilization

Parts of a bird



## Feathers

Functions of feathers

1. protect inner part of the body.

2. Keep the body warm and dry
3. Some feathers e.g. quill feather is used for flight.

### Types of feathers.

Types of feathers



Quill/Flight



Contour



Down



Filoplume

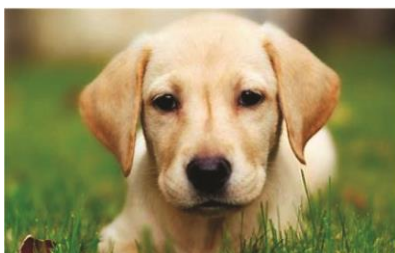
- (a) Quill feather: used for flight, protection and warmth.
- (b) Contour Feathers, Down feathers and filoplume are used for protection, and warmth.

### Class: Mammalia

Characteristics

1. endothermic
2. Hair
3. Sweat glands and sebaceous glands
4. Mammary glands
5. Pinna (external ear)
6. Heterodont (specialized teeth)
7. Diaphragm

Examples



Dog



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Donkey



Cow

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