

Unit 1 Characteristics and Classification of Living Organisms

Characteristics of Living Organisms

- Living organisms are classified into 5 groups: animals, plants, fungi, prokaryotes (bacteria) and protoctists
- There are 7 main characteristics carried out by all organisms

Nutrition

- Obtaining of food to provide energy and substances needed for growth and repair
- Plants: involves photosynthesis and taking up of mineral ions from soil (autotrophs)
- Animals: Eat plants to gain energy and nutrients (ingestion) which is used for growth and repair (heterotrophs)

Respiration

- Involves the chemical reactions that release energy in the cells
- Glucose + oxygen \longrightarrow carbon dioxide + water + energy
- Energy is used for growth and repair

Movement

- Organisms move a part or parts of themselves in order to change their position or place.
- Plants move slowly whilst growing, and leaves change position to absorb more light
- Animals move part of whole body to obtain food or flee predators

Excretion

- The removal of waste products formed during metabolism
- Plants store their waste in leaves, which subsequently fall off
- Animals breathe out Carbon dioxide and produce urine

Sensitivity

- Organisms sense stimuli and respond to them
- Plants move their leaves according to the position of the sun, or they open and close their flowers
- Animals have sensory glands and organs which detect light, sound pressure, etc.

Growth

- Permanent increase in size and dry mass
- Increase in cell number, cell size or both
- Plants grow throughout their life, animals stop at a certain size

Reproduction

- A process which results in the formation of new individuals
- Asexual reproduction is whereby one parent creates the offspring, there is no genetic variation, and the individual is genetically identical to the parent

- Sexual reproduction is whereby two parents gametes' fuse to create a new individual who carries a mixed set of genes

Classification

- Kingdom
- Phylum/Division
- Class
- Order
- Family
- Genus
- Species

Importance of classification

- Classification is the sorting out of living organisms into groups
- Scientists look at the differences and the similarities to then classify organisms when it comes to their morphology (outward appearance) and their anatomy (inward structure)

Binomial system of classification

- The binomial system consists of two names (genus and species/trivial)
- Worldwide system used by scientists
- Used to avoid confusion as many animals have more than one name

Genus

- The genus refers to a group of similar individuals that are closely related but do not interbreed with each other
- The genus is always written with a capital letter
- The name is always written in italics or underlined

Species/trivial

- A very similar group of individuals that can interbreed to produce fertile offspring
- Written in small letters
- Never used on its own

Modern Classification

- DNA sequencing and studying the sequencing of amino acids in proteins is more accurate than just observations
- If the sequences are very similar, they are placed in the same genus/species

Features of organisms

All living organisms have:

- Cell membranes
- Cytoplasm with ribosomes and enzymes
- DNA

There are two main types of cells:

- Prokaryotic: simple structure with no nucleus
- Eukaryotic: More complex cells structure with a nucleus

Animal Kingdom

- Multi cellular and eukaryotic
- Compact bodies
- Growth occurs throughout the body
- Need to obtain food
- No cell walls, large vacuoles or chloroplasts
- Have a nervous system- coordinate responses to stimuli

Plant Kingdom

- Eukaryotic and multicellular
- Have chloroplasts filled with chlorophyll, cellulose, cell walls and large permanent vacuoles
- Autotrophic
- Roots spread through soil to absorb water and minerals
- Grow at roots, tips and stems
- Can be divided into two groups: flowering and non-flowering

Prokaryotic (Bacteria) Kingdom

- Unicellular, microscopic
- Simple cell structure
- Spherical/rod shaped/short chains
- Have a cell wall (Sometimes encased in a slimy capsule)
- No nucleus
- Prokaryotic
- Cells contain plasmids (loops of DNA in cytoplasm)
- No chloroplasts or mitochondria
- Some have flagella which is used for movement through liquid

Protoctists Kingdom

- Amoeba, algae, plasmodium
- Unicellular/ multicellular (vary size)
- Nucleus present
- Prokaryotic
- Autotrophic or heterotrophic

Fungi Kingdom

- Eukaryotic (Complex cell structures)
- Cell walls and nuclei present
- Cell walls consist of chitin
- No chlorophyll
- Main body is called mycelium
- Multi/Unicellular
- Made up of branching network of hyphae-releases enzymes that digest food outside the fungi

- Saprophytic or parasitic
- Reproduce by forming spores

Viruses

- ARE NOT CELLS
- DNA/RNA surrounded by protein coat
- Genes code for: replication and protein coat
- Parasites: use host cell to multiply
- Not classified in any of the kingdoms as they are not alive
- Classified according to the type of genetic material and protein coat

Vertebrates

- Vertebral column/spinal chord
- Internal skeleton made from bone cartilage
- Belong to phylum Chordata
- Divided into 5 groups: Fish, Amphibians, Reptiles, Birds and Mammals

Fish

- Aquatic except mudskippers
- Streamlined, body covered with scales
- Fins for balance and to control movement
- Eyes present but no ears
- Lateral line detects pressure changes
- Gills for breathing in oxygen dissolved in water
- External fertilization and development

Amphibians

- Cold blooded
- Moist, scale-less skin
- Adults have 4 legs
- External fertilization and development
- Tadpoles breathe with gills, adults breathe with lungs on land and with skin in water
- Examples include: toads, frogs and salamanders

Reptiles

- Cold blooded
- Body covered with dry hard scales-cut water loss
- Live on land
- Breathe with lungs
- Internal fertilization, lay leathery waterproof eggs
- Development is external

Birds

- Homoeothermic
- Have feathers and wings
- Most can fly
- Internal fertilization: lay shelled eggs
- External development

Mammals

- Homoeothermic
- Hairs on skin except whales and dolphins
- Females have mammary glands for producing milk
- Lungs for breathing
- Internal fertilization; embryos develop inside mother's bodies

Invertebrates

- Do not have a spinal cord/vertebral column

Arthropods

- Largest group in the animal kingdom
- Have segmented bodies, exoskeletons and jointed legs
- Molt throughout their lives or only during early stages of development

Crustaceans

- Cephalothorax and abdomen
- Chalky exoskeleton
- Two pairs of antennae and compound eyes
- Between 5 and 20 pairs of legs
- Breathe using gills
- Mostly aquatic except woodlice and some land crabs
- Examples include: crabs, shrimps, crayfish and lobsters

Myriapods

Centipedes

- Bodies are not divided into separate regions
- Have one pair of legs on each segment
- Fast moving herbivores
- Powerful jaws to paralyze prey

Millipedes

- Two pairs of legs on each segment
- Slow-moving herbivores
- Feed on leaf litter

Insects

- Bodies divide into 3 parts: head, thorax and abdomen
- 3 pairs of legs on thorax
- Many have 2 pairs of wings
- One pair of antennae and compound eyes
- Breathe through spiracles
- Waterproof cuticle to prevent water loss
- Most can fly

Arachnids

- Bodies divided into 2 parts: cephalothorax and abdomen
- Four pairs of legs and no wings
- No antennae and several pairs of simple eyes
- Paralyze prey with poison fangs
- Weave silken webs with spinnerets

Ferns and flowering plants

- Multicellular
- Chloroplasts make them green
- Cellulose cell walls
- Transport systems:
 - Xylem vessels: carry water and mineral salts from roots to leaves
 - Phloem tubes: transport dissolved substances from leaves to the rest of plant

Ferns

- Strong stems, leaves and roots
- Waxy cuticle on leaves to reduce water loss
- Live in a variety of habitats
- Grow underground through rhizomes
- Produce spores which are distributed via wind

Flowering plants (Angiosperms)

- True leaves, stems and roots
- Reproduce via flowers that make seeds

Shoots and Roots

- Shoot: the part of the plant above the ground
- Stem functions:
 1. Support the structure of the shoot
 2. Spaces out leaves
 3. Stem hold flower in position for pollination
 4. Allows transport of water and sugars via xylem and phloem tissue

- Roots: found below the ground
- Root functions:
 1. Anchor the plant into the ground
 2. Absorbs water and mineral ions from the soil

Dicotyledons and Monocotyledons

Monocotyledons

- Grasses and cereals
- Parallel veins on leaves
- Leaves are narrow and long in grasses
- Leaf shape may vary
- Flower parts in multiples of 3
- One cotyledon inside each leaf

Dicotyledons

- Broad leaves
- Network of branching veins (net veins)
- Flower parts in multiples of 4 or 5
- Two cotyledons inside each leaf