

FACTFILE: GCE BIOLOGY

CLASSIFICATION



Classification

Learning outcomes

Students should be able to:

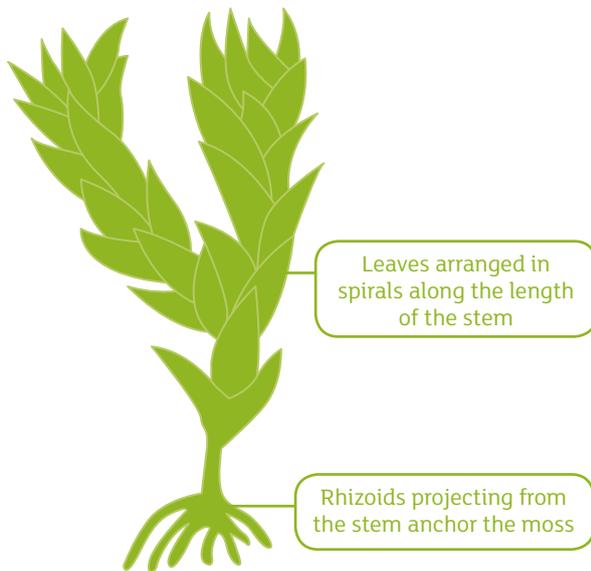
- demonstrate knowledge and understanding of the key features of moss with particular reference to their restriction to moist habitats;
- demonstrate knowledge and understanding of the key features of a fern in terms of adaptations to terrestrial life;
- demonstrate knowledge and understanding of key features of a flowering plant (angiosperm) in terms of adaptation to terrestrial life;
- demonstrate knowledge and understanding of the body form of the Phylum Cnidaria; (for example, hydra and jellyfish)
- demonstrate knowledge and understanding of the body form of the Phylum Platyhelminthes
- demonstrate knowledge and understanding of the body form of the Phylum Annelida; (for example, earthworm and lugworm)
- demonstrate knowledge and understanding of the body form of the Phylum Arthropoda; (for example, insect and spider)
- demonstrate knowledge and understanding of the body form of the Phylum Chordata; (for example, mammal and bird).



Kingdom Plantae – adaptation to terrestrial life

The following information on mosses, ferns and angiosperms (flowering plants) will look at their structure and how this influences the habitats they can survive in.

Please note there is no need to distinguish between the different gametophyte and sporophyte generations in these groups. The information provided will be for the dominant generation.



Mosses (Bryophyta)

Mosses are in the Phylum Bryophytes which are land plants.

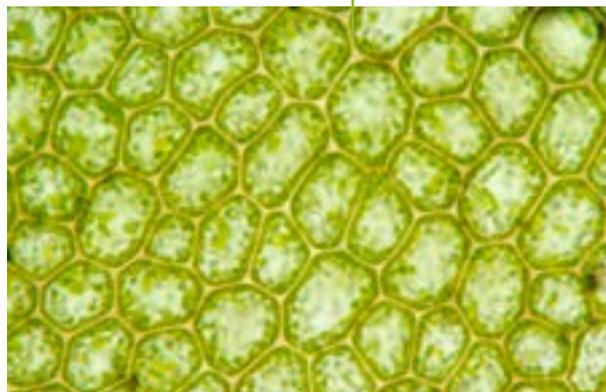
Structure of Mosses

- Multicellular but no differentiation into tissues.
- Body is a thallus differentiated into 'simple' leaves (arranged in a spiral) and stems.
- Strengthening and conducting tissues are either absent or poorly developed.
- Support by turgor only.
- The leaf cuticle is either absent or delicate and so loss and entry of water is difficult to control.
- No true vascular tissue (xylem or phloem) for transport.
- They have no true roots and instead are anchored by filaments called rhizoids growing from the stem.
- Water and minerals are absorbed by the whole surface of the plant (not just the rhizoids).
- Dispersal by spores which germinate in moist conditions but are not resistant to desiccation.

Cells of moss leaf show no differentiation into tissues

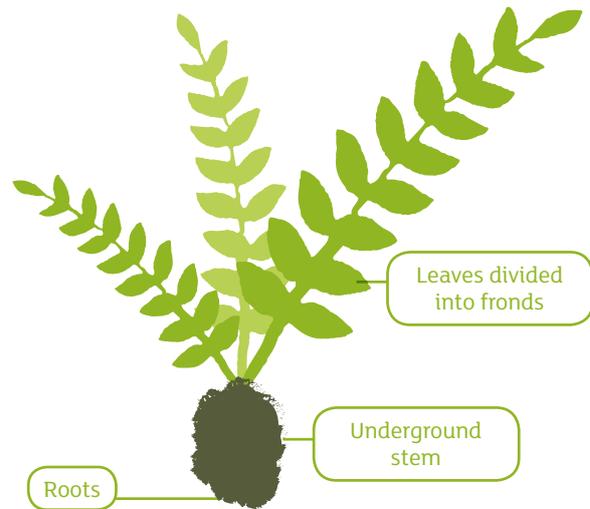


Mountain fern moss

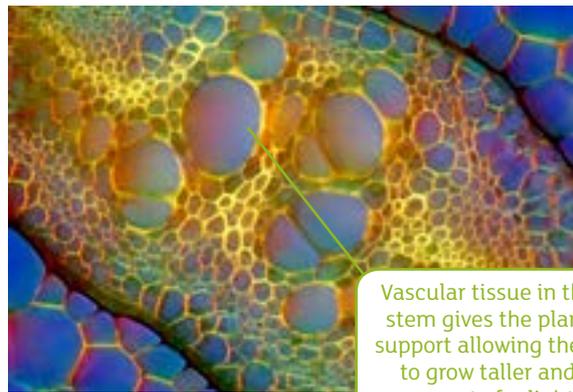


Ferns (Filinciophyta)

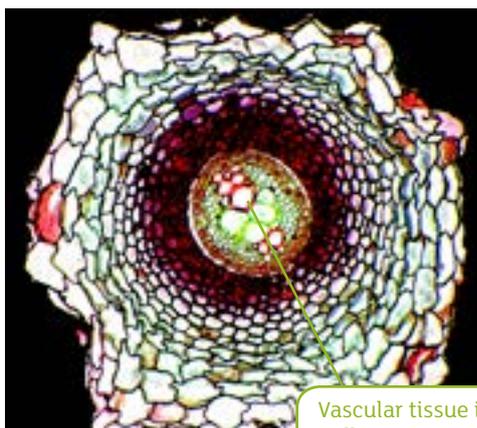
- Multicellular plants with differentiation into different tissues; roots, stems and leaves.
- Support by turgor in cells but also by lignified fibres in vascular tissue allowing the development of larger more complex bodies which can compete for light.
- Leaves possess a waxy cuticle and stomata through which gas exchange occurs.
- Leaves divided into fronds.
- True leaves, stems and roots are connected by vascular tissue (xylem and phloem) therefore transport throughout the plant is possible.
- Water and minerals absorbed through the roots and transported in xylem.
- Dispersal by spores which germinate in moist conditions but are not resistant to desiccation.



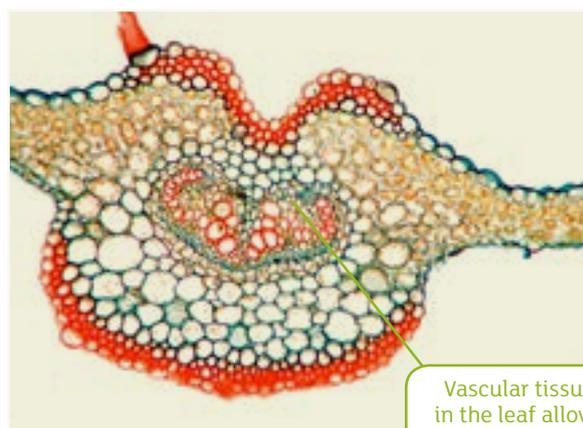
Fern



Fern stem



Fern root



Fern leaf

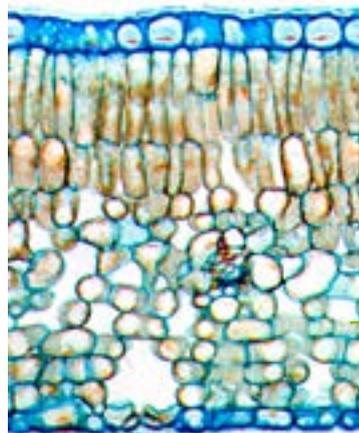
Flowering Plants (Angiosperms)

- Multicellular plants with differentiation into different tissues; roots, stems, leaves and flowers.
- Support by turgor in cells but also by lignified fibres in vascular tissue allowing the development of larger more complex bodies which can compete for light.
- Leaves possess a waxy cuticle and stomata through which gas exchange occurs.
- True leaves, stems and roots are connected by vascular tissue (xylem and phloem) therefore transport throughout the plant is possible.
- Water and minerals absorbed through the roots and transported in xylem.
- Dispersal by seeds which are able to withstand desiccation due to tough outer coat.
- Can adapt to a greater range of terrestrial environments as they have developed water retention characteristics such as curled leaves in marram grass.
- Xylem tissue has developed into wood in trees giving more support and enhancing water retention.
- Many have developed xerophytic adaptations such as leaves becoming spines in cacti.
- Others have re-established themselves in aquatic environments, for example water lily.



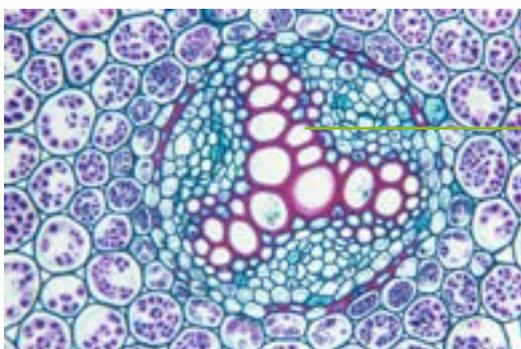
Peach (Prunus persica)

The flower is the most unique adaptation of the angiosperms as it allowed the enclosure of seeds in an ovary to prevent desiccation and provide them with a food source.



Tea leaf, light micrograph

Highly specialised tissues in the leaf allow for support and transport mechanisms



Section of Buttercup root mature stele

Xylem is heavily lignified to give extra support and allow water retention



Kingdom Animalia

The following information on each of these groups looks at the differences in body form and how these have limited or enhanced the environments in which organisms can survive.

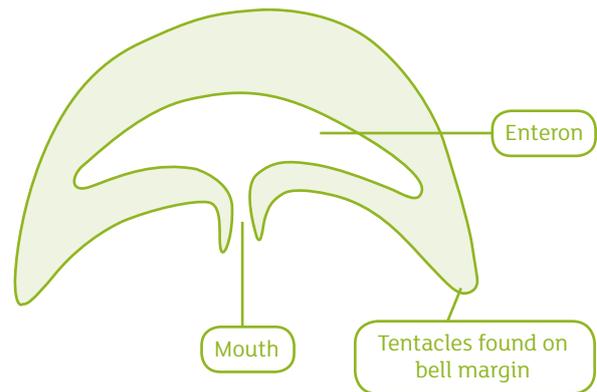
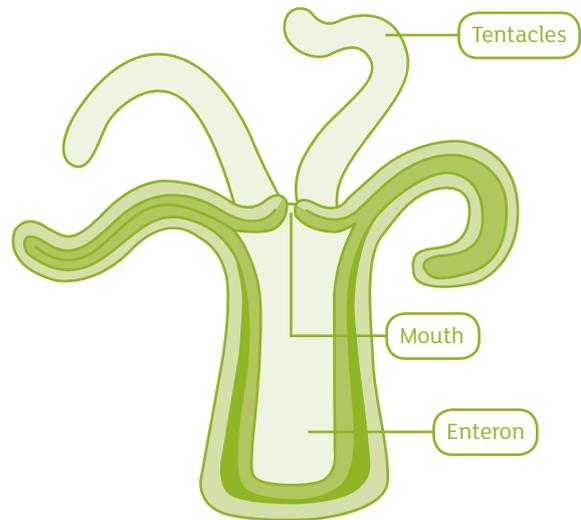
Phylum Cnidaria – including jelly fish, sea anemones and coral

These organisms are:

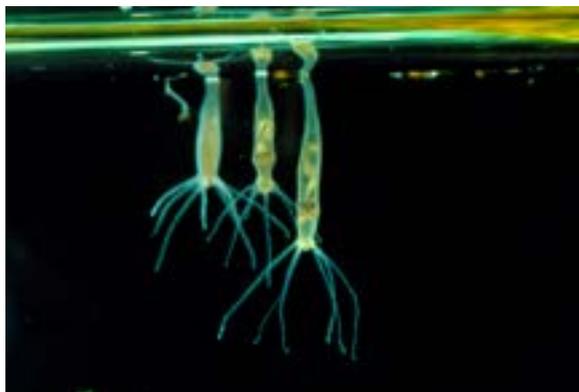
- Multicellular with some differentiation of tissues,
- Radially symmetrical,
- Have a single opening to the gut called the enteron, which carries out digestion,
- This opening, 'the mouth' is used for both ingestion and egestion,
- Mouth surrounded by tentacles containing stinging cells called nematocysts,
- Support is achieved by the aqueous medium in which they live and a hydro skeleton in the enteron.

All cnidarians have two basic body forms the **medusa** and the **polyp**. The polyp is cylindrical and sessile (attached to a surface and shows no locomotion) The medusa is umbrella shaped and free swimming.

Note: The two forms may be seen in one life cycle (polymorphic).



Lion's mane jellyfish

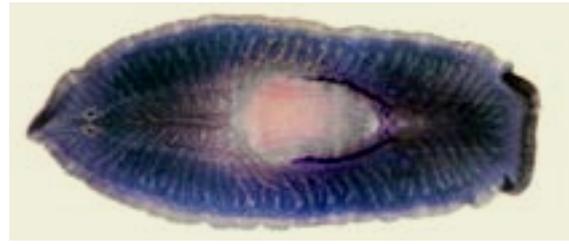


Hydra beneath water surface

Phylum Platyhelminthes

These organisms have:

- Multicellular structures with some differentiation of tissues,
- Bilaterally symmetrical,
- Unsegmented bodies,
- Gut has a mouth but no anus,
- Enteron completes digestion,
- Flattened body - compensates for lack of transport by providing a large surface area.



Planarian flatworm



LM of giant liver fluke, Fasciola hepatica

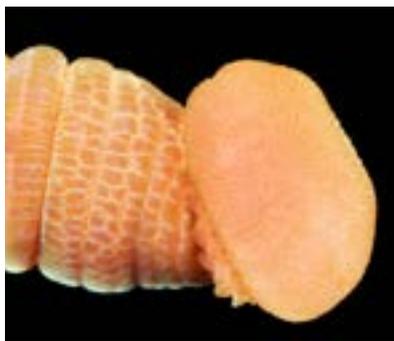


Lugworm in its burrow, illustration

Phylum Annelida

These organisms are:

- Multicellular, with some differentiation of tissues,
- Bilaterally symmetrical,
- Round in transverse section,
- Metameric – segmented body each with its own muscle, blood vessels and nerve supplies and some with reproductive organs,
- Non-chitinous cuticle,
- Gaseous exchange along the length of the whole body,
- Chaetae (bristles) present,
- Gut has both a mouth and an anus with regional specialisation along the length of the gut,
- Hydrostatic skeleton formed by segmented body cavities.



Lugworm



Earthworm



Earthworm head

Phylum Arthropoda

More than three quarters of all known species are arthropods with insects comprising half of those. Their basic body plan has allowed for a process called adaptive radiation allowing them to colonise many different ecological niches.

These organisms are:

- Multicellular with differentiated tissues,
- Bilaterally symmetrical,
- Fixed number of metameric segments, for example head, abdomen and thorax in insects; head and abdomen in arachnids,

- Metameric segments are more highly specialised than in annelids allowing evolution of specialised appendages for flight and burrowing,
- Jointed limbs,
- Gut has a mouth and an anus with regional specialisation,
- Support and protection are by a tough exoskeleton
- Exoskeleton made of chitin,
- Growth involves stages of moulting (ecdysis),
- Heart pumps blood in a haemocoel cavity to supply blood to all organs.



Scarab beetle



Orb Web Spider

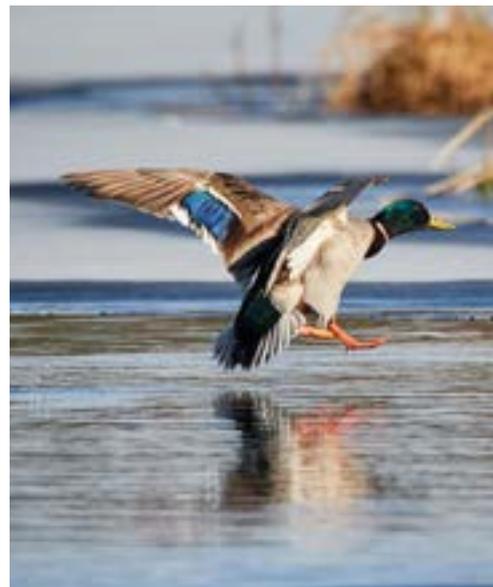
Phylum Chordata

These organisms are:

- Multicellular with highly differentiated tissues,
- Bilaterally symmetrical,
- Segmented,
- Gut has a mouth and an anus with highly specialised regions,
- Support by a spinal column with a jointed system of calcified bones.



Wood mouse feeding



Male mallard landing on water

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