

## CHAPTER 8: SUPPORT AND MOVEMENT

1. There are three type of skeletal systems;
  - i. endoskeleton
  - ii. exoskeleton
  - iii. hydrostatic skeleton

### Endoskeleton or Internal Skeleton

1. All vertebrates have an internal skeleton inside the body.
2. The internal skeleton is the endoskeleton.
3. Most vertebrates (mammals, birds, reptiles, amphibians and fish) have an endoskeleton.
4. However, some fish such as sharks and rays, have an endoskeleton made of cartilage (cartilage is a strong flexible material that is also in our nose and ears).

### Support system of vertebrates

1. The support system of human and vertebrates consists of the internal skeleton.
2. The properties and characteristics of the endoskeletons of vertebrates vary according to the habitat in which the vertebrates live.

Draw figure 8.1 m/s 68 textbook volume 2

### Support system in humans

<http://en.wikipedia.org/wiki/endoskeleton>

1. Human are supported by an endoskeleton especially the *backbone*.
2. The endoskeleton of human consists of 206 bones.
3. The spinal column consists of 33 small bones (vertebrae)
4. The weight of a human is supported mainly by the pelvic girdle. The biggest and strongest bone in the body.
5. Skeleton mainly consists of bones and cartilage.

6. Skeletal system is made up of:
  - a. bones
  - b. cartilage
  - c. tendons
  - d. ligaments
7. The functions of the skeleton include:
  - a. to support the weight of the body
  - b. to give the body its structure, strength and shape
  - c. to produce blood cells
  - d. to protect soft organs of the body such as the heart and the kidneys
  - e. to act as a base for attachment of muscles; for examples, the biceps are attached to the humerus through the tendon.

### Support system of land vertebrates

Go to [www.britanica.com](http://www.britanica.com). Type the word *animal skeleton*. You can get more information about the *skeleton system in animals*.

1. Land vertebrates are supported by endoskeletons (internal skeletons).
2. The endoskeleton of land vertebrates is divided into two group:
  - i. axial skeleton (skull, rib cage and back bone)
  - ii. appendicular skeleton (pectoral girdles, upper limbs and pelvic girdles, lower limbs)
3. The skeletal systems of land vertebrates:
  - a. give them structure, strength and shape
  - b. support their weight
  - c. protect their soft tissues and organs
4. The weight of land vertebrates is supported mainly by the pectoral (shoulder) and pelvic (hip) girdles.
5. Birds have endoskeletons **adapted for flight**. Their endoskeletons are made up of **lighter hollow bones** and their forelimbs are modified to form wings.

## Support system in aquatic vertebrates

1. **The body weight of aquatic vertebrates is supported by the buoyancy of water** (surrounding water).
2. Aquatic vertebrates can be divided into two groups:
  - a. aquatic mammals (dolphin and whale)
  - b. fish
  - c. fish with cartilage skeleton examples shark and rays
  - d. fish with bone skeleton, majority of fish.
3. Their pectoral and pelvic girdles are very small compared to those of land vertebrates.
4. The endoskeleton of aquatic mammals vertebrates is divided into two groups:
  - a. axial skeleton
  - b. appendicular skeleton
5. The fish skeleton consists of:
  - a. axial skeleton
  - b. appendicular skeleton
  - c. visceral skeleton
6. Aquatic vertebrates, unlike land vertebrates, have light and flexible endoskeletons.
7. The skeletons of aquatic mammals are made up of bone.
8. Endoskeletons of aquatic vertebrates have streamlined shapes. The shapes help them to speed up movement in water.

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## Exoskeleton or External Skeleton

<http://en.wikipedia.org/wiki/exoskeleton>

1. Most invertebrates, such as insects, crabs, lobsters and snail, have a hard covering on the outside of their body.
2. The hard covering is the external skeleton or exoskeleton.
3. The exoskeleton supports the body of an invertebrates and protects its internal organs.
- 4.

## Hydrostatic Skeleton or Fluid-filled Skeleton

[http://en.wikipedia.org/wiki/hydrostatic\\_skeleton](http://en.wikipedia.org/wiki/hydrostatic_skeleton)

1. Invertebrates without an exoskeleton, such as earthworm, leeches, slugs and jellyfish have a hydrostatic or fluid-filled skeleton.
2. A hydrostatic skeleton consists of liquids under pressure contained in certain compartment of the body as shown in figure 8.3 below.

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3. The high pressure in the liquid acts on the inner walls of the animals body to support its body and to maintain its shape.

## Land Invertebrates

1. Land invertebrates with jointed leg, such as insects, scorpions, centipedes and snail, have a hard but light exoskeleton their body.
2. Land invertebrates without jointed legs, such as earthworms, caterpillars, leeches and slugs, have a hydrostatic skeleton to support their body.

## Aquatic Invertebrates

1. Aquatic invertebrates, such as crabs, cockles, mussels, corals and lobsters have hard and strong exoskeletons.
2. Most of their body weight is supported by the surrounding water.
3. Its also protects their internal organs from being crushed by the surrounding high water pressure.
4. Aquatic invertebrates, such as a jellyfish have hydrostatic skeletons to maintain their shapes and support part of their body weight.

Rotifer, sea anemone, hydra, nematode ????????

## THE SUPPORT SYSTEM IN PLANTS

1. Every plant uses its strong cell walls to support itself.

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2. Plant cell walls are made of a tough and strong material called cellulose.
3. The stem of a plant provides support for the plants.
4. Plants have two main growing parts that is roots and shoot.
5. Primary growth is growth in the length of the roots and stem.
6. Secondary growth is sidewise enlargement in the diameter of the stem.
7. The vascular cambium produces cells each year and forms two tissues, the phloem and the xylem.
8. The **phloem** is a tissue that **transports food** in the plant.
9. The **xylem** is a tissue that **transports water and minerals**.
10. The phloem cell form the bark (outside) of the plant and the xylem cells form the hardwood (inside).
11. Stem are either herbaceous or woody.
12. Herbaceous stems are soft. The fluid in the plant cells support the stem of these plants.
13. Woody stems are hard and rigid. Woody stem have an outer layer of material called bark which provide support.

Rujuk CD Rom ada extra note

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## Aquatic plants

Go to [www.microscopy-uk.org.uk/mag/artoct99/plantupright.html](http://www.microscopy-uk.org.uk/mag/artoct99/plantupright.html) to view the tissues in a non-woody plant and the microscopic images of cells in turgid and wilting plants..  
For easy access, go to [www.icd.com.my](http://www.icd.com.my)

1. Aquatic plants, unlike land plants need little supportive tissue. They often have numerous air sacs in their stems, leaves and roots.
2. These air sacs provide buoyancy to help them to stay afloat or upright in water.

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<http://www.microscopy-uk.org.uk/mag/artoct99/plantupright.html>

### Land Plants

1. Some of land plants, such as herbaceous plants have weak stems that are unable to support their branches, leaves, flowers and fruits.
2. However, they have adapted plants parts that support them. How each of the following adapted plant parts shown in figure below.
3. Root also provides support by anchoring the plants.
4. Tall tree have buttress roots to support their trunk.
5. Some woody plants have additional features to helps them:
  - a. Buttress roots
    - i. Casuarina trees have buttress roots to provide additional support to the stems.
  - b. Prop roots
    - i. Banyan trees and maize plant have prop roots to give extra support
  - c. Clasping roots
    - i. Money plants and pepper plants climb by clasping.
  - d. Stilt roots
    - i. Mangrove trees have stilt roots which provide extra support to the stem and help them to obtain sunlight.
6. The tree that have weak stems produce prop roots, stilt root or strangling roots to support the stem.
7. Some non-woody plants weak stems which are unable to support the plants. The have others to help them.

- a. Tendrils
  - i. The cucumber plants and pumpkin plant climb and grow upwards by using tendrils.
- b. Thorns
  - i. Bougainvillea plants and rattan plants climb by using thorns.
- c. Twinning stems
  - i. Morning glory plants twine around other plants to help them climb and obtain sunlight.
- d. Prickles
  - i. Rose plants have curved prickles for climb.

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### Aquatic Plants

1. Aquatic plants, like land plants also have adapted parts that support them in water.
2. How each of the following adapted plant parts shown in figure below.

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### APPRECIATING THE SUPPORT SYSTEM IN LIVING THINGS.

1. Posture in the way in which we position our body when we stand, walk and run.
2. A correct body posture prevents damage to our support system.

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.....The end.....

### DICTIONARY

Endoskeleton	-	rangka dalam
Skeletal system	-	system rangka
Support system	-	system sokongan

Exoskeleton	-	rangka luar
Limb	-	anggota
Streamlined	-	bentuk bergaris arus
Bark	-	kulit kayu
Cellulose	-	selulosa
Rigid	-	tegar/kaku
Stem /trunk	-	batang
Crippled	-	tempang
Crutches	-	tangkat ketiak
Inability	-	ketidakupayaan
Flap	-	berkibar
Stir up	-	bergerak ke atas
Rib cage	-	sangkar rusuk
Bone marrow	-	sumsum tulang
Hollow	-	rongga
Anchoring	-	mengukuhkan
Buttress	-	banir
Proper	-	suitable
Stiff	-	difficult