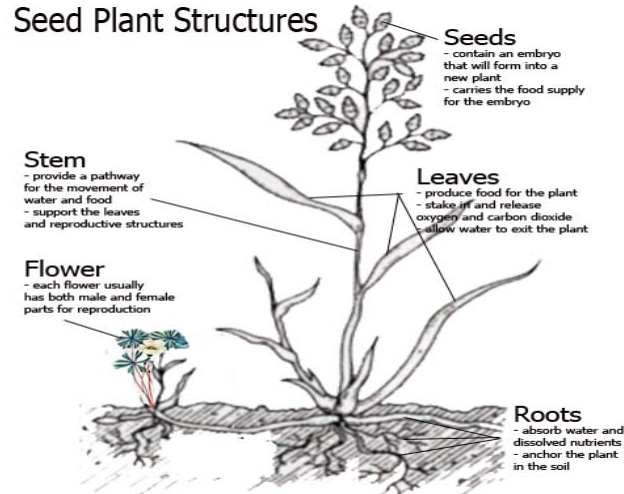## 1.0 Understanding structures and life processes of plants helps us to interpret their needs.

1.1 The Body of Seed Plants

Seed plants are the largest group of plants in the world.
Each seed plant structure has specific functions.

Seed Plant Structures

Seeds
- contain an embryo that will form into a new plant
- carries the food supply for the embryo

Stem
- provide a pathway for the movement of water and food
- support the leaves and reproductive structures

Leaves
- produce food for the plant
- stake in and release oxygen and carbon dioxide
- allow water to exit the plant

Flower
- each flower usually has both male and female parts for reproduction

Roots
- absorb water and dissolved nutrients
- anchor the plant in the soil

1.2 Plant Processes

- ### *A Process For Moving Water Up From The Roots*

A combination of different processes moves the water from the roots to other parts of the plant, and also allows substances in and out of the cells.
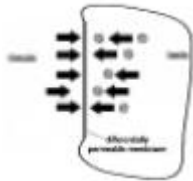
Osmosis is a particular type of diffusion in which only some of the particles are allowed to pass through a barrier. This barrier is called a differentially permeable membrane. Osmosis is the diffusion of water through a **differentially permeable membrane**.

Capillary action – where the water particles are attracted to each other and to the sides of the tubes, and the pushing and pulling action of diffusion and osmosis (moving water through the xylem tissue in the stem) moves water from the roots up to the very top of the plant. The loss of water through evaporation is called transpiration.
Active Transport is another process that enables a plant to get nutrients regardless of the difference in concentration. It does however require energy to move these substances in and out of the plant.

- ### *A Process to Make Food*
A pigment called chlorophyll makes the leaves green. The energy of the sun is trapped in the leaves and changed into a kind of chemical energy. Carbon dioxide and water are used by the leaves in the process called photosynthesis, to make sugar and give off oxygen. Plants also need oxygen - at night when photosynthesis does not happen, respiration does.

- ### *A Process to Use Food*
Cellular Respiration is a gas exchange process by which plants release carbon dioxide and let oxygen into their cells. Water enters and leaves the cells in the leaves through the guard cells. When they absorb water they swell, opening the stoma (which lets in carbon dioxide and lets out water vapor).

The word equation for cellular respiration is:
Sugar + Oxygen → Carbon Dioxide + Water + Energy

1.3 Reproduction of Seed Plants

A **life cycle** is the stages that a living thing goes through from one generation to the next.
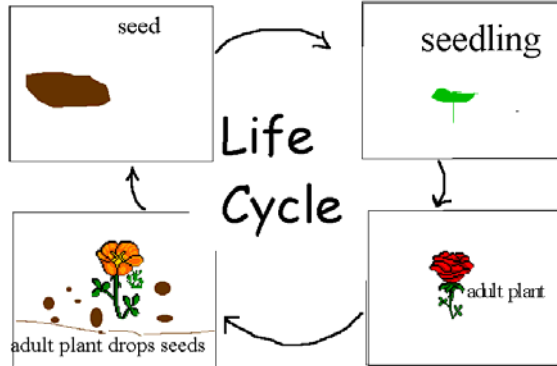Plants reproduce in their lifecycle in two very different ways.
Sexual reproduction involves the production of seeds and fruits from specialized cells of two plants.

The Life Cycle of Seed Plants

The Seed Stage

Seed Parts include the living plant (embryo) , the food supply (cotyledon), and the seed coat.

The length of time a seed is able to stay alive varies according to the conditions it experiences. The longest-lasting seed was frozen for over 10,000 years before it sprouted and even flowered.

When a seed is able to come in contact and get covered by the soil, it remains inactive until the right conditions are present for it to germinate.
Germination is the development of a seed into a new plant.

The Seedling Stage

Very fast growth, producing their own food by photosynthesis

The Adult Stage

A plant is an adult when it produces reproductive structures, either cones or seeds

Reproduction of Seed Plants
Flowers use color, scent, nectar to attract animals, so that the pollination process can begin.
Flowering Plant Reproduction   **Flower Structure - A Web Quest**

Identify the Flower Parts	Flower part	Function
	petal	brightly colored parts of the flower to attract insects and birds
	sepal	green, protect the flower before it opens (underneath after it opens)
	stamen (male reproductive organ)	
	anther	where pollen is produced and stored
	pollen grains	cases containing male reproductive cells
	filament	stalk that supports the anther
	pistil (female reproductive organ)	
	stigma	sticky 'lip' of the pistil that captures pollen grains
	style	stalk that supports the stigma
	ovary	swollen base of the pistil containing ovules
	ovules	sacs containing female reproductive cells

Pollination

Pollination can occur by self-pollination or cross-pollination.
Pollination occurs after a pollen grain lands on the stigma of the flower, above the ovary. The pollen grain produces a pollen tube that grows down from the stigma to the ovule. Through this tube, cells transfer from the pollen grain to the ovule. The ovule then grows into a seed.

[**Pollination**](http://www.botany.uwc.ac.za/ecotree/flowers/pollination.htm) (good visual description at: http://www.botany.uwc.ac.za/ecotree/flowers/pollination.htm)

Pollinators

Dispersal is the transportation of seeds away from the parent plant.
It can happen in various ways, including: wind, waterways (rivers, streams, etc.), bird droppings , animal fur, and fire. Farmers use machines to disperse seeds. Once they have grown into the crop, they are harvested in two steps. A **swather** cuts the plants and lays them in rows (the stubble - what is left of the plant after being cut - prevents the plant from touching the soil, so the seeds can ripen). A **combine** then separates the grain from the rest of the plant. (The grain seeds are collected and the straw is baled, or spread evenly over the field).

The bee   spreads pollen over more crops than any other insect. Artificial pollination can also be used to breed different varieties of plants for specific purposes (usually to produce a better yield, or one that is more resistant to environmental conditions - such as cold winters) It is not just exposure to cold temperatures that kills seeds, but prolonged exposure to cold temperatures.

Cones

The cone is the part of the tree that has a series of woody scales, and come in various shapes and sizes. Both male and female cones are produced by cone-bearing trees. Female cones contain ovules (eggs) - the small bumps at the end of a scale in a cone. Pollen grains (containing sperm) develop on the smaller male cone. Wind carries the pollen grains to the female cones. Although most of the pollen grains never reach the female cones, those that do get caught in the sticky fluid near the ovule. A pollen tube grows to the ovule and sperm is able to fertilize the egg. The process of **pollination** is complete. Female cones of pine trees mature, open, and release their seeds during the fall or winter months. (This whole process takes at least two years) The seeds can then be dispersed by various methods and when they get covered they can eventually sprout and become new pine trees.

Reproduction Without Seeds

Asexual, or **vegetative reproduction**, occurs when a 'parent' plant grows new plants from its roots, stems, or leaves. Plants that reproduce by vegetative reproduction are genetically identical to the parent that produces it. Some plants reproduce from stems:

| Strawberry **Runners layering** (runners) | Gladioli **Corm fragmentation** (buds and root systems) | Cattails Horizontal **Rhizomes** | Cacti **Flattened Stems** |

Plants can also reproduce from their roots and are called **suckers**.

Technology to Reproduce Plants

Asexual reproductive technologies include:
cuttings – small pieces of a plant that usually have part of the stem and a few leaves.
grafting – one stem cutting that is attached to the stem of another plant, eventually growing together.

Plant Structures Are Adapted to Their Environment

Plants have particular habitats, each with its own set of environmental characteristics, including light, temperature water and soil conditions. The structure of a plant helps it to adapt to these conditions. There is much more to a plant than what you are able to see above the surface of the soil. In fact, up to one third of the plant can be beneath the soil. **Types of Roots**

Roots perform several functions:

- they absorb water and minerals from the soil
- they support and anchor the plant so it cannot be relocated easily
- they store food to help the plant survive during times of scarcity

The most prominent part of the root in many plants is the taproot, with many smaller roots coming out from it, like branches on a tree. These smaller roots are covered in root hairs. The smaller roots and root hairs absorb water and nutrients from the soil.

Other plants have fibrous roots, which is a shallow system of similar-sized roots that can quickly soak up moisture.

Roots are often especially adapted to a plant's habitat.

Moss campion is an example of how a plant grows its taproot system throughout the early years of the plant's life, so that it can have a well established taproot system before the upper part of the plant matures (it can take up to 25 years for the plant to bloom).

The duckweed on the other hand has tiny roots on the underside of the leaf and are surrounded entirely by water.

The Stem One function of the stem is to transport water and nutrients between the leaves and the roots. Another function of the stem is to support the leaves and to ensure that the leaves receive adequate light. To achieve this most stems grow above the ground   Still another function is to store food for the plant. The food produced in the leaves is stored in the stem - like potatoes, which have swollen underground stems called **tubers** (the starch they store is used by the plant to grow). Some plants store food as sugar as well - the sugar cane is a good example.

1.4 Plant Needs and Growing Conditions

All plants need the right amount of light, water, nutrients and space in order to grow and survive.

- ***Plants Need Different Amounts of Light*** (fern – marigold)
- ***Plants Need Different Amounts of Water*** (cactus – rice)
- ***Plants Need Different Nutrients*** (beans – wheat)
- ***Plants Need Different Amounts of Space*** (buttercups – redwoods)

ROOT CROPS

Generally grow in a short period of time, usually survive when there is little moisture and can be stored for long periods of time

The yield from crops that are grown outdoors is highly dependent on the environmental conditions, climate and soil types. In a greenhouse all of the growing conditions can be controlled. There are obvious advantages, but there are also disadvantages. A wide range of warm-season crops, including seedless cucumbers, tomatoes, lettuce, peppers, house plants, and cut flowers are grown in greenhouses. Growing healthy plants requires knowing the best conditions for the plant you are growing, at each stage in its life cycle.