Describe and discuss how the external and internal structural components relate to and affect the major roles involved in the plant's production and development.

The plant body is composed of three main regions, the root system, the vegetative system, and the floral system. Each of these systems are made up of components, both internal and external structures, which relate to and affect the major functions in the plant's production and development.

The first system in plants is the roots. The roots form the underground parts of the plants. The roots have several functions, which include the absorption and transfer of water and dissolved minerals, food storage, and anchorage of the plant into the soil. The first root produced by a plant is known as the radicle, elongates during germination of the seed and forms the primary root. Roots that branch from the primary root are called secondary roots. In many plants the primary root is known as a taproot because it is much larger than secondary roots and penetrates deeper into the soil.
During and after enlargement, the cells produced by the meristem acquire the characteristics of the cells of the mature tissues of the root. Three types can be recognised. There is the epidermis, or the outermost cell layer, the vascular tissues or the xylem and phloem, which occupy the central core of the root, and the cortex, which lies in between the central vascular cylinder and the outer epidermis. (refer diagram a)
The xylem is responsible for transporting water and minerals to the above ground portions of the plant. The phloem transports food made in the leaves to the root. The cortex is comprised of several layers of parenchyma cells, which store food reserves in the form of starch grains. The innermost cell layer of the cortex forms the epidermis. The outermost cell layer of the vascular cylinder constitutes the pericycle. These cells retain the capacity for subsequent division pericycle cells divide to form the lateral root which in turn will grow out of the primary root axis to form the lateral root.
Absorption of water and minerals must take place across the epidermis. Which is not far behind the meristem a root hair zone is present. Root hairs are tube like extensions of epidermal cells and serve to increase the absorptive surface area of the root.

The vegetative system of a plant comprises of the stem and the leaves.
The stem is the main axis of a vascular plant and has many functions including; providing the plant with support, holding the buds, leaves and flowers in position, providing minimal photosynthesis, translocates water and dissolved nutrients around the plant, acts as storage organ and translocates food products of photosynthesis from the leaves to the root system. Most stems have an internal structure which consists of an epidermis, a cortex, vascular tissues and meristem tissue. (refer to diagram b) (Refer to root system mention above for the functions of these structures, as the functions of these structures just mentioned are the same in the stem and the root.)

Vascular plants have specialized tissues called vascular tissue. (refer to diagram c)
Vascular tissue carries water and nutrients throughout the plant, and help support the plant. There are two kinds of vascular tissue. Both kinds of vascular tissue contain specialized conducting tissue,

the xylem which transports water and minerals from the root to the above parts of the plant and phloem which transports food made in the leaves to the roots.

Leaves are essential plant organs because they play a fundamental part in the nutrition of plants. (refer to diagram d) They are usually flattened blades that consist, internally, mostly of parenchyma tissue called the mesophyll. Mesophyll is made up of loosely arranged cells with spaces between them. The spaces are filled with air, from which the cells absorb carbon dioxide and into which they expel oxygen. The mesophyll is bounded by the upper and lower surface of the leaf blade, which is covered by epidermal tissue. A vascular network of veins runs through the mesophyll, this network provides the cell walls with water and removes the food products of photosynthesis to other parts of the plants.
The leaves of a plant make more sugar than they need. The surplus is transported to other parts of the plant, e.g. the roots to supply their needs. This process is known as translocation.

Light is needed for photosynthesis to occur. The plants traps light energy from the sun and raw materials from the soil (via the roots) and converts them into food (sugar), and stores it for the life processes of the cells. In photosynthesis, carbon dioxide from the air joins with the water and minerals taken into the plant from the soil, to produce sugars and oxygen.
The cells of all living organisms, including plants must break down molecules of sugars; releasing the energy they contain to meet the energy needs of the plant. This is called respiration. Respiration is almost the complete opposite to photosynthesis. The process of respiration is that the living thing takes in oxygen from the surrounding environment plus the food they produce emit waste carbon dioxide, water and energy.
For a plant to grow, the rate of production of material by photosynthesis must exceed the rate at which this material is used by the plant in respiration. The material not used in respiration is used to produce new cells and therefore growth.

Transpiration is the process by which water is lost in the form of water vapour from the plant leaves via the stomata, (refer to diagram e). It is the cooling process of the plant. Cooling comes about because for liquid water to evaporate it must absorb heat from the surrounding leaf tissue; this in turn causes a drop in temperature. Some water vapour may pass through the cuticle but most is lost through the stomata. Leaves are the main transpiring organs. Inside the leaf the intracellular spaces expose a large surface area to the air, via the stomata. It is from these surfaces that water evaporates, allowing very rapid gas and water exchange between the leaf and the air. The air of the intracellular spaces is always saturated with water (100% humidity) because the cell walls are always moist.
Outside humidity is nearly always lower than this so water vapour moves from the leaf to the air in an attempt to even the balance of humidity. As the water leaves the air spaces more evaporates from the cell's surface, which causes water to be drawn from the cell. As the cell

The floral system contains the reproductive organs of the plant. The flowers produce seeds, enclosed in fruits, and therefore provide for the plant's survival, multiplication and dispersal. The main function of flowers is sexual reproduction, while on the other hand fruits are involved in dispersal and seeds may grow into new plants.
Flowers are the reproductive organs of a plant and normally consist of: a stem, sepals, petals, stalk and anthers, and an ovary, style and stigma, (refer to diagram f).
The stem elevates and supports the flower to facilitate pollination by wind or insect vectors. The sepals are at the base of the flower and enclose and protect the reproductive organs and can also have a distinctive colour, scent or shape to attract insects and birds for pollination.
The stalk and the anthers are the male reproductive organs and are collectively known as the stamen, which contain the pollen or the genetic material of the male. The style, stigma and ovary are the female reproductive organs and are collectively known as the pistil.

The flower is the sex organ of the flowering plants. Its job is to produce the males and female gametes (sex cells) and have them brought together so that fertilisations can take place. This results in the production of seed from which young plants will grow. The basic parts of a flower are the sepals, the petals, the stamens, and the carpels. The various parts of a flower have various roles in relation to sexual reproduction for the plant. Carpels are the female parts of flowers. Each carpel consists of an ovary, style and a stigma. Inside the ovary are the ovules which contain the female gametes waiting to be fertilised. Stamens are the male parts of a flower. Each stamen consists of a stalk or filament with an anther at the top. The male gametes, called pollen grains, are formed inside the anther. When the pollen is ready, the anther bursts open to release it.

Pollination is the process which is involved in the production of a seed, (refer to diagram g). During pollination the anthers swell and rupture, which causes the pollen to be released into the air. Wind and insects help to transport the pollen to the stigmas where it germinates and grows down the style to the ovary. In the ovary each pollen grain fertilises an ovule and produces a seed. After pollination occurs the flower degenerates, the ovary develops into the fruit and the ovule develops into seeds.

All the components of plants are essential to its survival. Roots obtain and provide nutrients, stems support and leaves and flowers supply food and produce the next generation of plants. One part of the system relies on another and therefore they can not survive without one another. All the components, both internal and external are related to and affect the production and development of the plant.