The Root

The primary root, the plant's first root, develops from the root meristem of the embryo. In gymnosperms and many dicotyledons, the primary root develops as a taproot, which gives rise to lateral, or branch, roots. The taproot and its smaller branched lateral roots form a taproot system. In monocotyledons and some dicotyledons, the primary root is commonly short-lived, so the root system of the adult plant is composed of many branching adventitious roots (roots which originate from stem tissue). In these plants, the roots form a fibrous root system.

A. Root Systems
While examining the tap and fibrous roots provided, attempt to relate the root system structure to its functions of anchorage, absorption, storage, and conduction. Examine too, the stem cuttings available. The roots arising from stem cuttings are also adventitious. Cuttings are one means that plants have of vegetative propagation.

B. Root Structure
1. The Root Tip
Examine a living radish seedling. Identify the root cap and the many root hairs. What is the function of root hairs? What function does the root cap have?

2. Dicot Root Structure
Obtain a prepared slide of a cross section of Ranunculus root. Note the wide cortex and narrow vascular cylinder - or stele.

Using your high power objective identify each of the following, beginning at the outermost cell layer and working toward the center of the root.
- The single layer of epidermis
- The wide cortex region of starch-storing parenchyma cells (note the many intercellular spaces)
- The thick-walled endodermis, the internal border of the cortex.
- The layer of thin-walled pericycle cells, which forms the outer layer of the vascular cylinder (stele)
- Xylem, consisting of three or four radiating ridges of thick-walled cells
- Strands of phloem alternating with the ridges of the xylem

3. Monocot Root Structure
Obtain a prepared slide containing cross sections of mature Zea (corn) or of Smilax root. Examine the slide with low power and note the relative size of the cortex and the vascular cylinder. Unlike dicot roots, roots of monocots contain a central pith region interior to the vascular cylinder.

Using the high power objective, identify the following tissues from the outside to the center of the root:
- Epidermis
- Cortex with a conspicuous, thick-walled endodermis
- Xylem, which alternates irregularly with small phloem patches.
- Internal pith
4. **Lateral Root Origin**
   Observe the slide of lateral root origin. From which region in the root do lateral roots originate?