

Structure and Development of embryo (Monocot and Dicot)

The zygote gives rise to an embryo by a predetermined series of cell divisions and cell differentiations . This process is called **embryogenesis**. The embryo then germinates and grows into an adult plant. In seed plants, embryogenesis occurs within the embryo sac of the ovule.

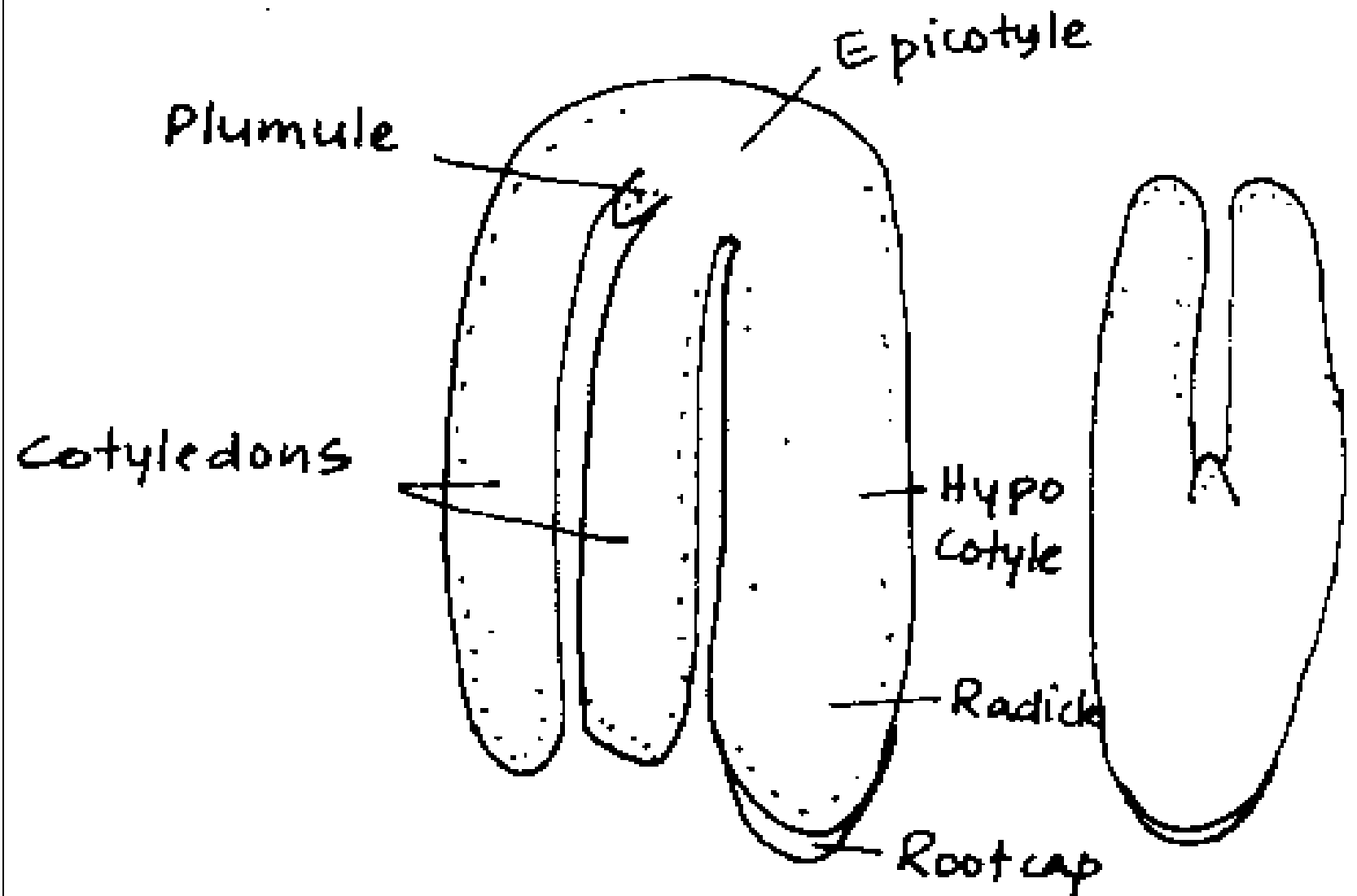
Structure and development of Dicot embryo:

Structure: A typical dicot embryo has:

Two embryonic leaves called **cotyledons** attached to an **embryonal axis** .

The embryonic shoot apex called **plumule**. This develops into the future shoot. The embryonic root apex called **radicle**. This develops into the future root.

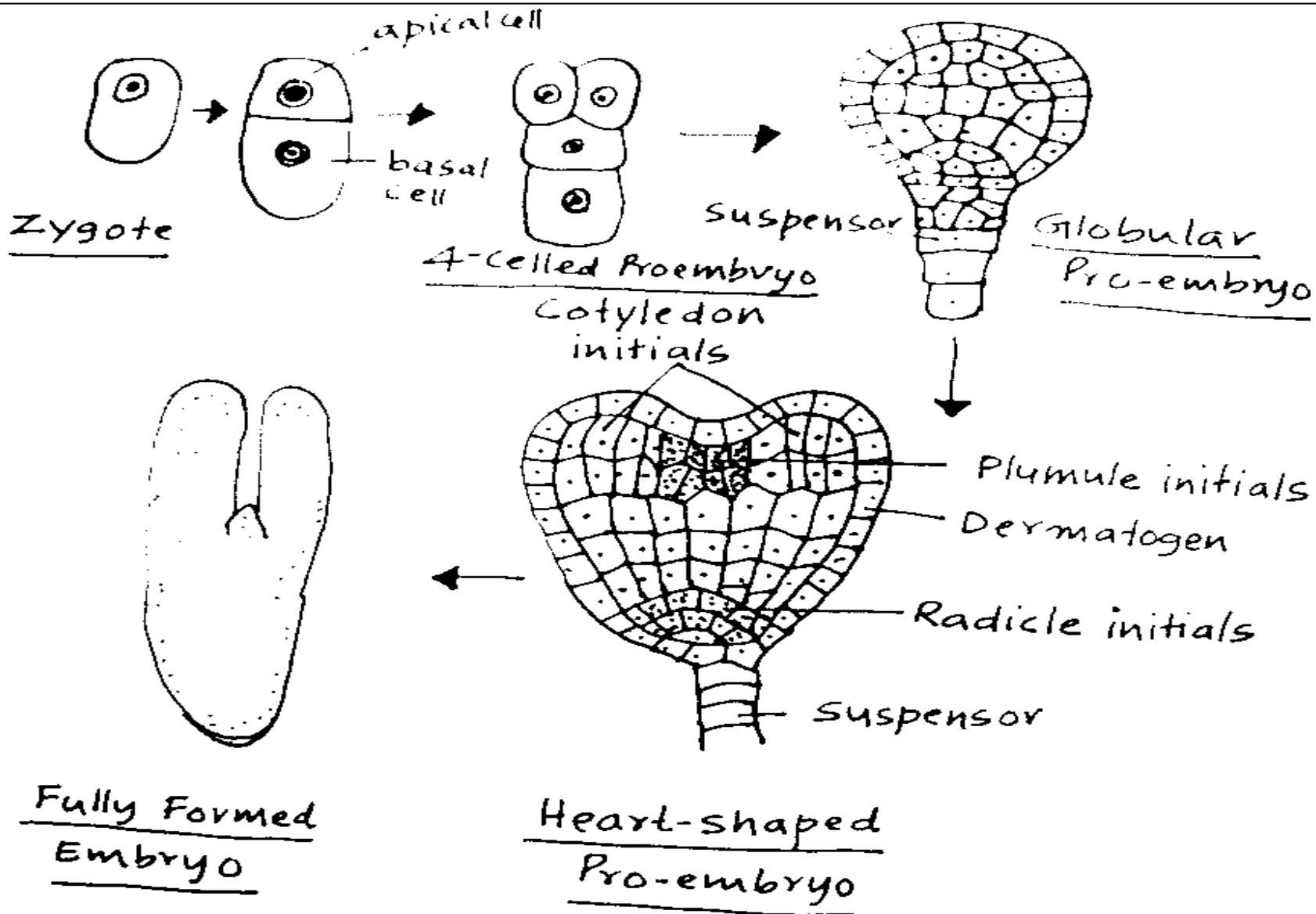
The part of axis above radical is called **hypocotyle** and below the plumule is called **epicotyle**.



DICOT EMBRYO

Development (Crucifer type):

- The first division of the zygote is almost always **asymmetrical** (uneven) and **transverse** to its long axis, producing a small **apical** cell and a large **basal (bottom) cell**.
- The apical cell divides vertically and the basal cell divides transversely to form a **4-celled** structure called **proembryo** (T shaped).
- The upper three cells of the proembryo divide further both by anticlinal and periclinal divisions to form a 32-celled **globular proembryo**. Development of various organs of embryo or **Organogenesis**



STAGES OF DICOT EMBRYOGENESIS

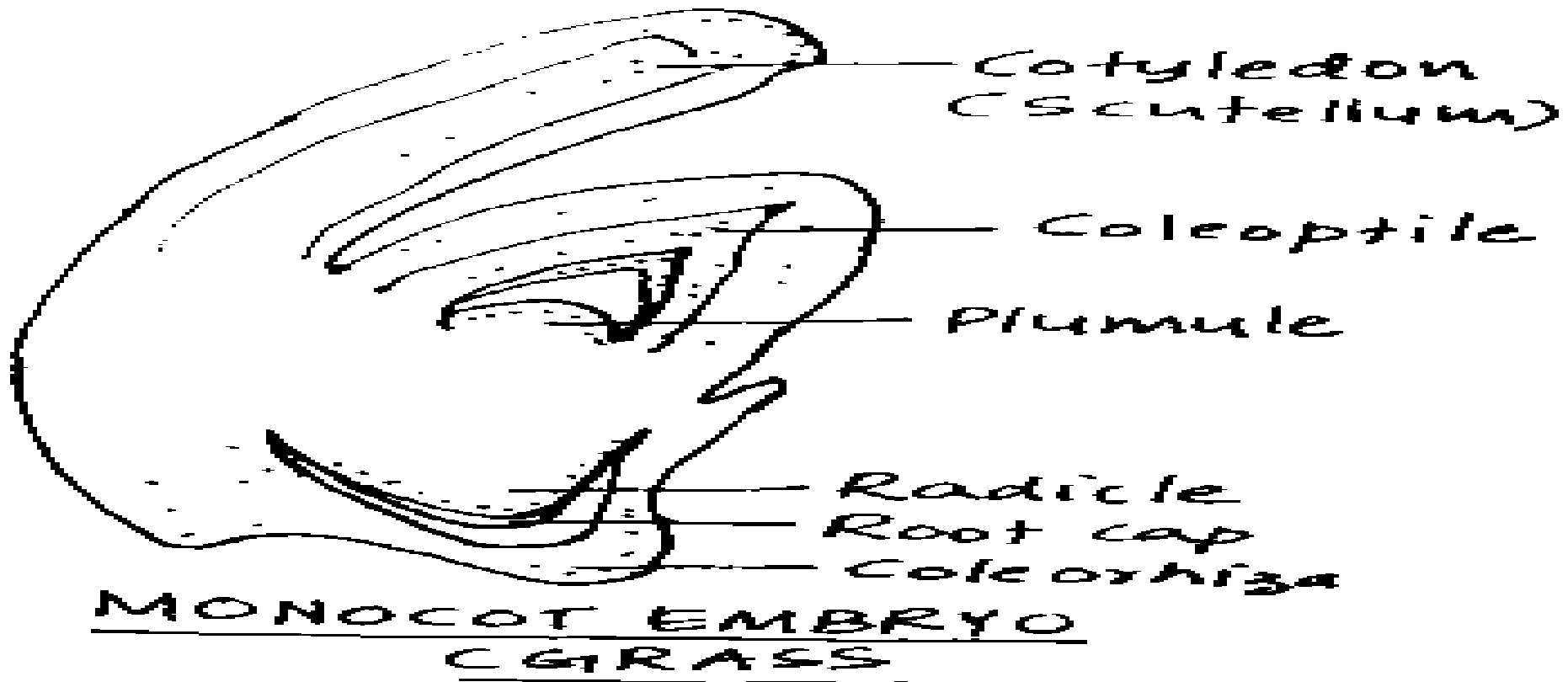
Development of various organs of embryo or Organogenesis

occurs in the 32 celled proembryo.

- The outer most layer of cells of the globular proembryo develop into a distinct layer called **dermatogen** which forms the future **epidermis**.
- The inner cells of the upper region develop into the **cotyledons** and **plumule** while the lower cells develop into the **radicle**.
- The cotyledonary cells divide rapidly than the plumule cells. Therefore the embryo becomes **heart shaped**.
- When the cotyledons are completely formed, they enclose the plumule at the base.
- The lower most cell formed by the basal cell does not contribute to embryo structure. It may divide by a few transverse divisions to form a **filamentous** structure known as the **suspensor**, which anchors the embryo to the embryo sac wall and helps in nutrient absorption from the surrounding tissues.

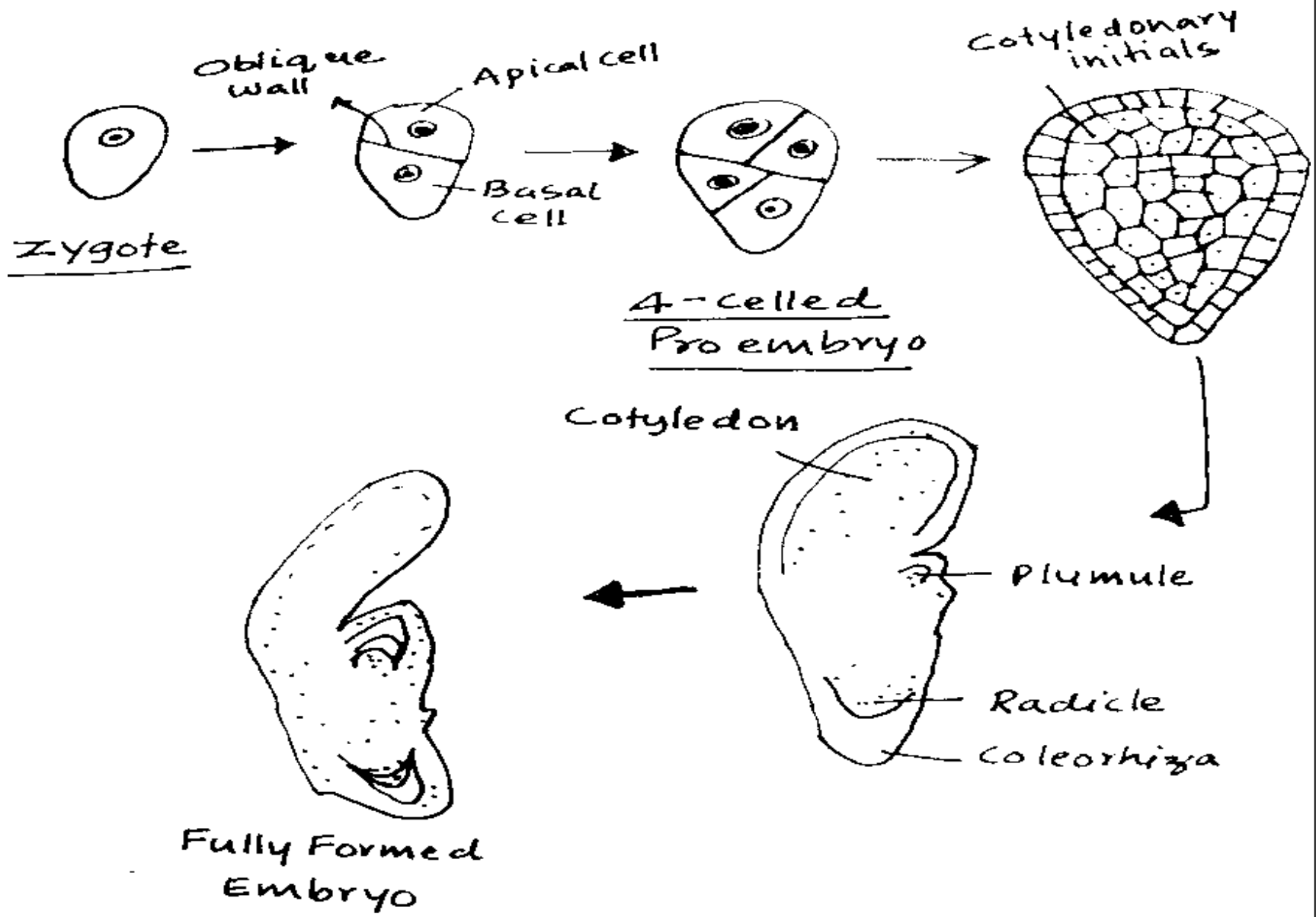
Structure and development of Monocot embryo:

- The monocot embryo has a single large cotyledon called **scutellum**.
- The **plumule** and **radicle** are lateral in position
- The plumule is protected by a covering of leaf-like structures called **coleoptile**. The radicle is protected by a **root cap** and **coleorhiza**.



Development (Grass type):

- The first division of the zygote is oblique, **asymmetrical** (uneven) and **transverse**, producing a small **apical** cell and a large **basal (bottom) cell**.
- Both cells divide again at right angles to the first division, forming the **4-celled proembryo**.
- Further divisions at different planes result in the formation of a **16 celled** and **32 celled pro-embryos**.
- Development of various organs of embryo or **Organogenesis** occurs in the 32 celled proembryo.
- The cells of **lateral-apical region** develop into the single cotyledon or scutellum.
- Below the scutellum, plumule and radical are developed. The outer layer of cells develop into coleoptile, root cap and coleorhiza.



STAGES OF MONOCOT EMBRYOGENESIS