

# Puspa Shrestha

Best Quality Resource Site for Class 11 And 12 Students  
(Based on Updated Curriculum 2077)

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## COMMENTS

Date - 20/10/12

Permanent tissues are the group of simple or complex permanent tissues.

I. Simple permanent tissue - contains only one type of cells and is of three types.

i. Parenchymatous tissue - a tissue composed of thin walled spherical, polygonal or isodiametric living cells enclosing intercellular spaces. It is generally found in epidermal, cortical, pith and mesophyll cells. It becomes:

- Chlorenchymatous tissue - if the cells bear green chloroplast pigments or

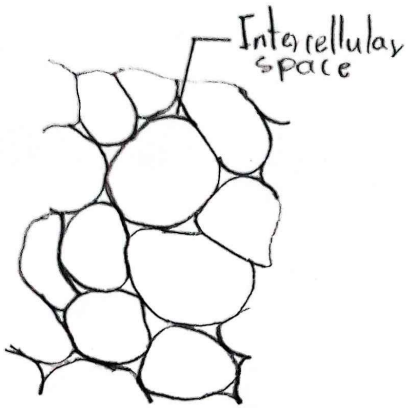
- Aerenchymatous tissue - if the loosely arranged cells enclose large air-cavities.

ii. Collenchymatous tissue - elongated living cells with slightly oblique or rounded ends. T.S. of this tissue shows circular or polygonal cells with thickened intercellular spaces formed by the deposition of cellulose and pectin. The cells may contain chloroplast. It is normally found below the epidermis.

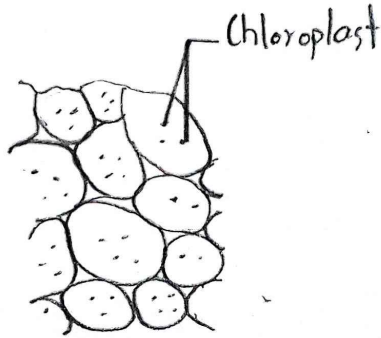
iii. Sclerenchymatous tissue - compactly arranged dead cells without intercellular space. Each cell called fibre, is long and spindle-shaped. The cell is empty with thick lignified walls. They

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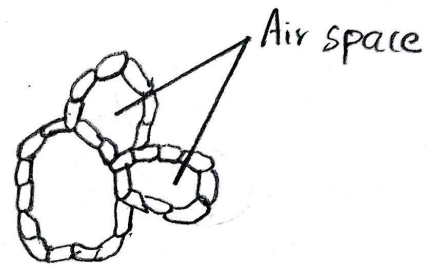
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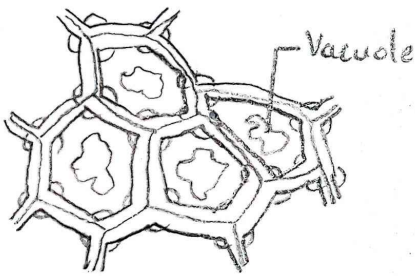
Parenchyma



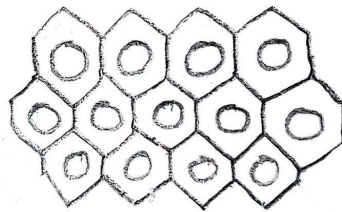
Chlorenchyma



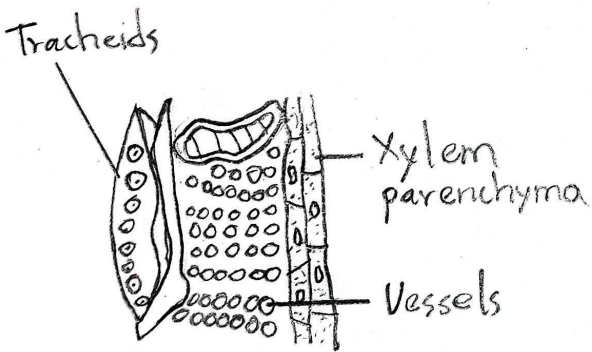
Aerenchyma



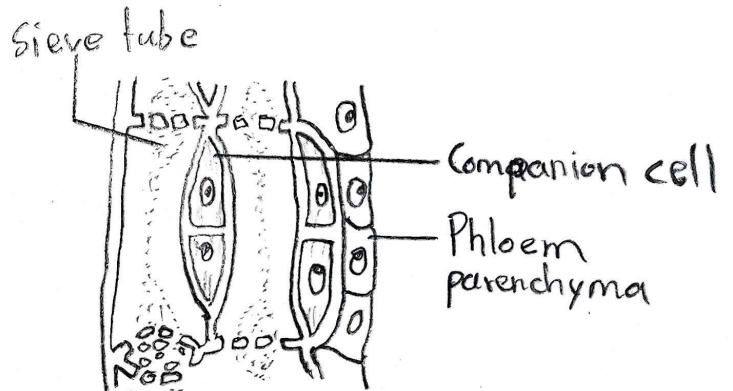
Collenchyma



Sclerenchyma



Xylem tissue



Phloem tissue

are found in patches or in layers in hypodermis, pericycle and xylem. There are special kind of sclerenchyma tissue called ~~Sect~~ Sclereids or the stone cells occurring in the hard parts of plant. They have reduced lumen due to the very thickened walls.

II. Complex permanent tissue - contains  $\geq$  more than two types of tissues. Its two types:-

i. Xylem - composed of four elements.

- Tracheids - elongated dead cells with tapering ends and the walls thickened in different patterns, such as annular, spiral, reticulate, scalariform and pitted.
- Vessels - elongated tube like dead cells with thickened walls. They are found in bigger size as metaxylem or smaller size as protoxylem.
- Wood parenchyma - parenchymatous cells associated with other xylem elements.
- Wood fibres - sclerenchymatous cells in woody plants.

ii. Phloem - composed of four elements.

- Sieve tubes - thin walled elongated tube-like cells with perforated end walls called sieve plates.

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- Companion cells - elongated thin-walled cells containing dense cytoplasm and a nucleus. They lie with sieve tube as company. In T.S., phloem show rectangular cells adjoining with sieve tubes.
  - Phloem parenchyma - parenchyma cells laying with sieve tube and companion cells.
  - Bast - phloem sclerenchymatous tissue laying with sieve tubes and companion cells in secondary phloem.