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Mature

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Living or Dead

Approximation of Thickness of walls of permanent tissues

Thick walled or thin walled

Types of permanent tissues

- Simple
- Complex

Number of Types of permanent tissues

2

Simple permanent tissues

Number of division of simple permanent tissues

3

Divisions of simple permanent tissues

- Parenchyma
- Collenchyma
- Sclerenchyma

Complex permanent tissues

Number of division of complex permanent tissues

2

Divisions of complex permanent tissues

- Xylem
- Phloem

Parenchyma

Parent of words “parenchyma”

- Para
- En-chien

Country of parent word of parenchyma

Greece

Meaning of “para” in parenchyma

Beside

Meaning of “en- chien” in parenchyma

To pour

Spatial arrangement in parenchyma

Intercellular space present

Approximation of Thickness of wall of parenchyma

Thin walled

Presence of life in parenchyma

Living

Compositing materials of cell wall of parenchyma

- Cellulose
- Calcium pectate

Structure attaching parenchymatous cells

- Plasmodesmata

Function of plasmodesmata in parenchymatous cells

Attach parenchymatous cells

General representation of shape of parenchymatous cells

Polyhedral

List of shapes exhibited by parenchymatous cells

- Spherical
- Oval
- Cylindrical
- Rectangular
- Stellate
- Spindle

Types of parenchymatous tissues

Number of divisions of parenchymatous tissues

5

Divisions of parenchymatous tissues

- Prosenchyma
- Aerenchyma
- Stellate parenchyma
- Chlorenchyma
- Storage parenchyma

Prosenchyma

Approximation of Thickness of wall of prosenchyma

Thick

Cause of thick wall of prosenchyma

- Deposition of Cellulose

Approximation of length of prosenchyma

Elongated

Shape of ends of prosenchyma

Pointed

Functions of prosenchyma

- Mechanical support
- Protection
- Conduction

Examples of prosenchyma

Pericycle

Aerenchyma

Spatial arrangement in aerenchyma

Presence of intercellular spaces

Contents present at the intercellular spaces of aerenchymatous cells

Air

Function of aerenchyma

- Circulation of air
- Provide buoyancy

Examples of aerenchyma

Cortex of

- Hydrilla
- Nymphea
- Eichhornia

Stellate parenchyma

Shape of spatial arrangement in stellate parenchyma

Star

Component in intercellular space in stellate parenchyma

- Short arms
- Long arms
- Air space

Examples of stellate parenchyma

- Petiole of Banana
- Petiole of Canna

Chlorenchyma

Distinct cellular organell present in chlorenchyma

Chloroplast

Function of chlorenchyma

- Photosynthesis

Examples of chlorenchyma

- Pallisade parenchyma
- Spongy parenchyma

Storage parenchyma

Function of storage parenchyma

- Store reserve food material

Substances stored by storage parenchyma

- Sugar
- Amide
- Protein granules
- Oil drops

Examples of storage parenchyma

- Endosperm of Seeds
- Pulp of fruits

Function of parenchymatous tissues

Function of idoblastic cells present in parenchymatous tissues

- Secretion

Substances secreted by idioblastic cells present in parenchymatous tissues

- Resin
- Latex
- Tanin
- Oils

Modification of parenchymatous tissues

List of modification of parenchymatous tissues

- Cuticle

- Xylem parenchyma

Components of cuticle in parenchymatous tissues

Cutin

Location of deposition of cutin in cuticle of parenchymatous tissues

Tangential Wall

Function of cuticle in parenchymatous tissues

- Protect inner tissue
- Reduce Rate of Transpiration

Collenchyma

Parent words of collenchyma

- Colla
- enchyma

Country of origin of parent word of collenchyma

Greece

Meaning of “colla” in parent word of collenchyma

Glue

Meaning of “enchyma” in parent word of collenchyma

An infusion

Presence of life in collenchyma

Living

Approximation of thickness of cell walls in collenchyma

Thickened

Cause of thickness of cell walls in collenchyma

- Presence of
  - Pectin
  - Cellulose
  - Hemi cellulose

Function of thickening components in cell walls of collenchyma

- Hold Water

Elasticity of collenchyma

Plastic

Spatial arrangement in collenchyma

Compact

Shape of end of cells of collenchyma

Oblique

Approximation of length of cells of collenchyma

Elongated

General location of collenchyma

- Hypodermis of dicotyledonous stem
- Leaves

Part of the plant body exhibiting absence of collenchyma

Roots

Types of plant on the basis of primary division exhibiting absence of collenchyma

Monocots

Types of collenchyma

Number of division of types of collenchyma

3

Division of types of collenchyma

- Plate
- Angular
- Lacunate

Plate collenchyma

Term for plate collenchyma

Lamellae collenchyma

Location of deposition of thicknening material at the cell wall of plate collenchyma

Tangential Wall

Examples of plate collenchyma

Hypodermis of sunflower stem

Angular collenchyma

Location of deposition of thickening material at the wall of angular collenchyma

Angle of Cells

Examples of angular collechyma

- Stems of
  - Tagetus
  - Tomato
  - Datura
  - Potato

Lacunate collenchyma

Location of deposition of thickening material at the wall of lacunate collenchyma

- Wall bordering the intercellular space

Examples of lacunate collenchyma

- Hypodermis of cucurbita stem

Functions of collenchymatous tissues

- Tensility
- Support

Sclerenchyma

Parent words of sclerenchyma

- Sclerous

Country of origin of parent words of sclerenchyma

Greece

Meaning of “sclerous” in parent word of sclerenchyma

Hard

Meaning of “enchyma” in parent word of sclerenchyma

An infusion

Approximation of thickness of cell walls of cells present in sclerenchyma

Extremely thick

Cause of extreme thickening in cell walls of cells present in sclerenchyma

Uniform deposition of lignin

Presence of life in cells of sclerenchyma

Dead

Cause of death of cells of sclerenchyma

Deposition of impermeable secondary walls

Sclerotic parenchyma

- Transitory form of sclerenchyma
- Have Protoplasm
- But Lignified Walls

Presence of life in sclerotic parenchyma

Living

Thickening material present at the walls of sclerotic parenchyma

Lignin

Thickening material present at the walls of unlignified cells of sclerenchyma

Suberin

Types of sclerenchyma

Number of types division of sclerenchyma

2

Division of types of sclerenchyma

- Fibres
- Sclerids

Fibres

Approximation of length of fibres

Long

Shape of ends of fibres

- Pointed
- Rounded

Approximation of thickness of fibres

Thick walled

Cause of thickness of fibres

- Deposition of
  - Liginin
  - Cellulose
  - Gelatinous material

Shape of fibres

Polygonal

Cause of narrowness of lumen of fibres

Heavy deposition of secondary wall

Types of pits present at the walls of fibres

- Simple
- Oblique

List of plants yielding longest fibres

- Linum usitatissimum
- Corchorus
- Cannabis

General location of fibres in parts of plants

- Hypodermis
- Pericycle
- Secondary xylem
- Secondary phloem

Sources of origin of cells of fibres

- Procambium
- Cambium
- Ground Meristem

Types of fibres

Number of division of types of fibres

3

Division of types of fibres

- Surface
- Wood
- Bast

Surface fibres

Location of surface fibres

- Surface of plant organs

Examples of surface fibres

- Cotton fibres found in testa of seeds
- Mesocarp
- Fibres of coconut

Wood fibres

Location of wood fibres

- Secondary xylem

Source of origin of wood fibres

- Vascular cambium

Types of wood fibres

Number of division of types of wood fibres

2

Division of types of wood fibres

- Libiform fibres
- Fibre tracheids

Libiform fibres

Approximation of length of libiform fibres

Long

Approximation of thickness of libiform fibres

Thick

Types of pits present at libiform fibres

Simple

Fibre tracheids

Approximation of length of fibre tracheids

Short

Approximation of thickness of fibre tracheids

Thin

Types of pits present at fibre tracheids

Bordered

Bast fibres

Location of bast fibres

- Pericycle
- Phloem

Term for bast fibres

Extraxylary fibres

Examples of bast fibres

- Cannabis sativa
- Linum usitatissiumum
- Corchorus capsularis
- Hibiscus cannabinus

Function of fibres

- Mechanical strength

Sclereids

Approximation of thickness of wall of sclerids

Thick

Cause of thickness of walls of sclerids

Cells giving origin of sclerids

Parenchymatous cells

Process of origin of sclerids in parenchymatous cells

General shapes of sclerids

Approximation of length of sclerids compared to fibres

Shorter than fibres

General location of sclerids in plants

- Hard endocarp of almond
- Hard endocarp of coconut
- Hard Seed coats
- Regions of cortex , pith as in Nymphea
- Pulp of fruits

Types of sclerids

- Branchy sclerids
- Macrosclerids
- Osteosclerids
- Astrosclerids
- Trichosclerids

Branchy sclerids

Term for branchy sclerids

Stone cells

Approximation of size of branchy sclerids

Small

Shape of branchy sclerids

Isodiametric

Location of branchy sclerids

- Cortex
- Pith
- Phloem
- Pulp of fruits

Macrosclerids

Term for macrosclerids

Rod cells

Shape of macrosclerids

Rod

Approximation of length of macrosclerids

Elongated

Location of macrosclerids

- Leaves
- Cortex of stem
- Outer seed coat

Osteosclerids

Term for osteosclerids

Bone cells

Shape of osteosclerids

- Bone
- Barrel

Location of osteosclerids

Hakea

Term for Astrosclerids

Stellate cells

Shape of astrosclerids

- Stellate
- Star

Location of astrosclerids

Leaf of Nymphea

Term for Trichosclerids

Internal Hairs

Shape of trichosclerids

Hair

General location of trichoslcerids

- Intercellular space of leaves of some hydrophytes
- Intercellular space of stem of some hydrophytes

Function of sclerids

- Mechanical support

Complex Permanent Tissues

Number of cells present in complex permanent tissues

- More than one

Types of complex permanent tissues

Xylem

Parent word of xylem

Xylos

Country of origin of parent word of xylem

Greece

Meaning of “xylos”

Wood

Components of xylem

Number of divisions of components of xylem

4

Division of components of xylem

- Trachieds
- Vessels
- Xylem fibres
- Xylem parenchyma

Absence of components of xylem

Types of plants exhibiting absence of vessels

- Pteridophytes
- Gymnosperms

List of pteridophytes having the presence of vessels

- Selaginella
- Equisetum
- Pteridium

List of gymnosperms having the presence of vessels

- Gnetalls
- Ephedra
- Gnetum

Types of plants exhibiting the absence of trachieds

- Hydrophytic angiosperms

Function of xylem

- Conduct water
- Provide mechanical support

Trachieds

Anatomy of trachieds of xylem

Tube

Approximation of length of xylem

Elongated

Presence of life in trachieds

Dead

Shape of ends of trachieds

Tapering

Substance present at the cell wall of cells of trachieds

Lignin

Source of development of primary xylem

Procambium

Source of development of secondary xylem

Vascular cambium

Wall thickening at trachieds

Number of types of division of wall thickening characteristics of trachieds

5

Division of wall thickening characteristics of trachieds

- Annular
- Spiral
- Sclariform
- Reticulate
- Pitted

Shape of annular wall thickening characteristics of traachieds

Ring

Shape of spiral wall thickening characteristics of trachieds

Helix

Shape of sclariform wall thickening characteristics of trachieds

Ladder

Shape of reticulate wall thickening characteristics of trachieds

Network

Pits

Number of types of pitted wall thickening characteristics of trachieds

2

Types of pitted wall thickening characteristics of trachieds

- Simple
- Bordered

Approximation of thickening of pits

Unthickened

Location of pits in plant cells

Inner wall

Condition of presence of thickening at simple pits

Absent

Condition of presence of thickening at bordered pits

Present at borders

Vessels

Approximation of length of vessels at xylem

Elongated

Anatomy of vessels at xylem

Tube

Term for cells of vessels of xylem

Vessel members

Structure absent in vessels of xylem

Transverse septum

Cause of absence of transverse septum in xylem

Dissolution

Arrangement of cells in vessels of xylem

- Rows of cells placed one over other

Term for arrangement of cells in vessels of xylem

Syncytes

Substances present at the thickening of vessels of xylem

Lignin

Presence of life in vessels in xylem

Dead

Approximation of width of lumen of vessels in xylem

Wide

Cause of wide lumen of vessels in xylem

Absence of transverse septum

Structure present at the end walls of vessels of xylem

Perforation plate

Xylem fibre

Term for xylem fibres

Wood fibres

Presence of life at xylem fibres

Dead

Function of xylem fibres

- Mechanical strength

Substance present at the walls of xylem fibres

Lignin

Shape of ends of xylem fibres

Pointed

Source of permanent tissue for the formation of xylem fibres

Sclerenchyma

Types of xylem fibres

Number of types of division of xylem fibres

2

Division of types of xylem fibres

- Libiform fibre
- Fibre Trachieds

Terms for libiform fibres of xylem fibres

- True fibres
- Real fibres

Approximation of length of libiform fibres of xylem fibres

Elongated

Approximation of dimension of ends of libiform fibres of xylem fibres

Narrow

Function of narrow ends of libiform fibres of xylem fibres

Durability of wood

Type of pit present at the libiform fibres of xylem fibres

Simple

Type of pit present at fibre trachied of xylem fibres

Bordered

Function of fibre trachied of xylem fibres

Support

Xylem parenchyma

Substance present at the wall of xylem parenchyma

Cellulose

Presence of life at xylem parenchyma

Living

Function of xylem parenchyma

Food storage

Approximation of thickness of walls of xylem parenchyma in secondary xylem

Thick

Substance present at the wall of xylem parenchyma of secondary xylem

Lignin

Types of xylem parenchyma

Number of types of division of xylem parenchyma

2

Division of types of xylem parenchyma

- Axial parenchyma
- Radial parenchyma

Arrangement of of axial parenchyma of xylem parenchyma in plane

Vertical

Arrangement of radial parenchyma of xylem parenchyma in plane

Horizontal

Term for radial parenchyma of xylem parenchyma

Xylem ray

Phloem

Person coining the term phloem

Nagelli

Function of phloem in plant

- Transport

Substances transported by phloem in plant

- Sugars
- Amino acids
- Micronutrients
- Hormones

Directions of movement of food by phloem

Bidirectional

Presence of life at cells of phloem

Living

Components of phloem

Number of division of components of phloem

4

Division of components of phloem

- Sieve tubes
- Companion cells
- Phloem parenchyma
- Phloem fibres

Sieve tubes

Approximation of length of cells of sieve tube in phloem

Elongated

Approximation of thickness of cells of sieve tube of phloem

Thin wall

Anatomy of cells of sieve tubes of phloem

Tube

Pattern of arrangement of sieve tubes of phloem

Longitudinal

Cell organell absent at the sieve tubes of phloem

Nucleus

Perforation plate of sieve tubes of phloem

Sieve plate

Shape of transverse walls of sieve tubes of phloem

Oblique

Number of sieve areas present at simple sieve plate of phloem

Single

Number of sieve areas present at the compound sieve plate of phloem

Multiple

Controller of activities of sieve tubes of phloem

Nucleus of companion cells

Arrangement of cells present at the sieve tubes of phloem

Fusion

Time of formation of callose phloem

Winter

Solubility of callose in winters

Insoluble

Solubility of callose in spring of phloem

Solubule

Callose in sieve tubes of phloem

Carbohydrate pad

Function of callose in phloem

- Protect seive tube

Structure of sieve tubes absent in gymnosperms

Sieve plate

Companion cells

Term for companion cells in angiosperms of phloem

Companion cells

Presence of life at companion cells of phloem

Living

Approximation of thickness of walls of companion cells of phloem

Thin walled

Location of companion cells of phloem

Sides of sieve tube

Structure joining companion cells and sieve tubes

Plasmodesmata

Number of mother cells that originate companion cells and sieve tubes

1

Term for companion cells in gymnosperms of phloem

Albuminous cells

Type of permanent tissue at albuminous cells of phloem

Parenchymatous

Term for albuminous cells of phloem

Strasburger cells

Phloem fibres

Term for phloem fibres

Bast fibres

Approximation of thickness of walls of phloem fibres

Thick walled

Source of permanent tissue for the formation of phloem fibres

Sclerenchyma

Nature of function of phloem fibres

Mechanical

Phloem parenchyma

Term for phloem parenchyma

Bast parenchyma

Presence of life at the cells of phloem parenchyma

Living

Approximation of thickness of wall of cells of phloem parenchyma

Thin walled

List of materials present at phloem parenchyma

- Resin
- Latex
- Mucilage

Function of phloem parenchyma

- Conduction
- Store food material

Direction of travel of food in phloem parenchyma

Radial

List of types of plants exhibiting the absence of phloem parenchyma

- Monocots
- Herbaceous stem