Lec. 1

Anatomy → علم التشريح

→ interner structure for plant.

→ cell: وحدة بناء جسم الكائن الحي

	Animal cell	Plant cell
1) cell wall جدار خلوي	Absent	Present
2) chloroplast كلوروفيل	//	//
3) Vacuole فجوة	If present : small and many	single - large
4) centriol	Present	* ABsent in almost Plants * Present in lower Plants

← الخليتين حقيقية النواة = [eucaryote]

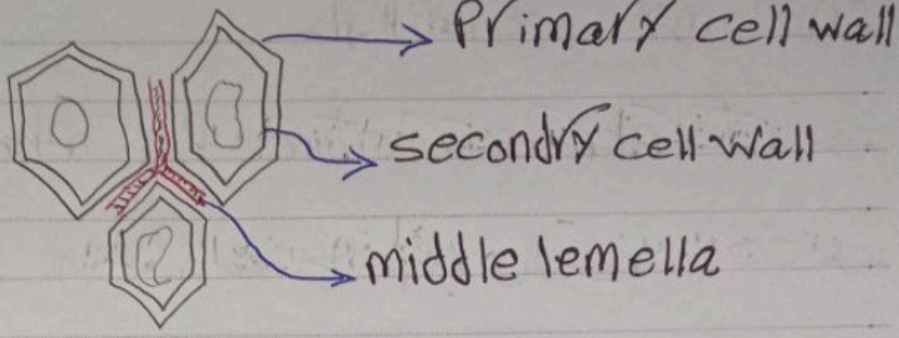
III. The cell wall الجدار الخلوي

→ It consist of multiple layer

← تتكون من عدة طبقات

* كل خلية تتكون من طبقتين و الطبقة الثالثة تختلف من نبات لآخر

الأعلى



A) Primary cell wall: composed of cellulose (سليلوز), hemicellulose, Pectin (بكتين)

* in all Plant * it Provides The strength (شدة) and flexibility (مرونة)

B) Middle lemaella: الصفيحة الوسطى

* it composed Pectins * in all Plants

c) Secondry cell wall: الجدار الثانوي

* in some Plant * inside Primary cell wall

* it contains lignin (الجنين) * it Provides strength

---

* Funcation: cell wall

* Protection الحماية
* Mechanical support تدعيم ميكانيكي
* Regulate growth تنظيم النمو
* Regulate diffusion تنظيم انتشار المواد
* with stand Turgor Pressure يقاوم ضغط الإمتلاء

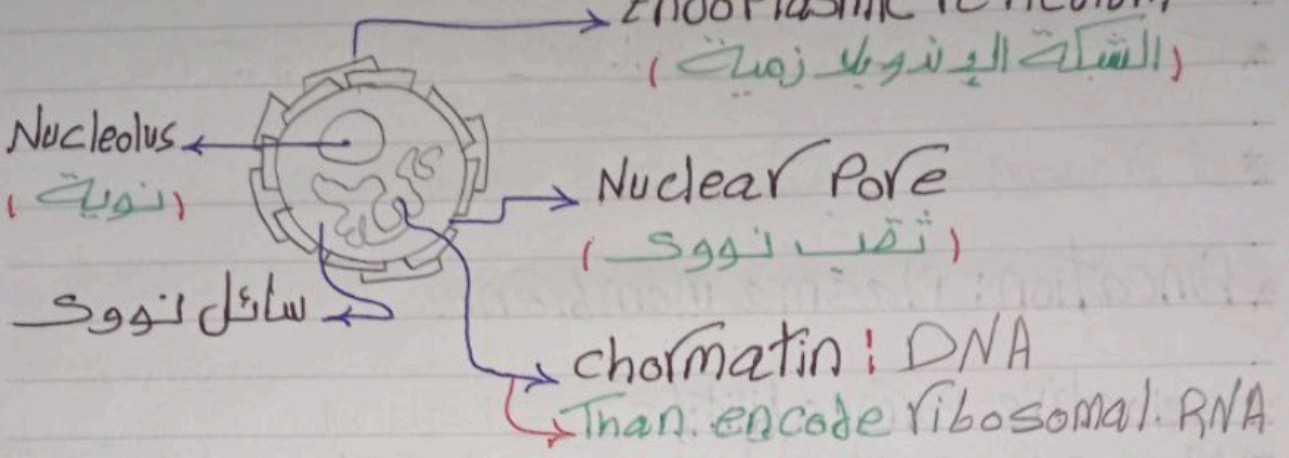
2| Plasma membrene: الغشاء البلازمي

* it consist of a lipid bilayer and proteins.
* it presents within cell wall.
* funcation: Plasma membrene
* selective permeability النفاذية الإختيارية
* Allow some materials to pass through and prevents others * السماح بمرور بعض المواد وتمنع الأخرى.
* Regulate
  - diffusion تنظيم عملية انتشار المواد
  - facilitated diffsion // عملية إنتشار
  - active transport // // النقل النشط

3| cytoplasm: السيتوبلازم

* it contains various organic and inorganic
  - بها مواد عضوية وغير عضوية.
  - الماء هو أكثر عنصر به: (70:80%)

4| Nucleus: النواة



* funcation: Nucleus

* it controls all Activites.
* Transferred hriditory characters.
تنقل الصفات الوراثية أثناء البناء.

5| EndoPlasmic reticulum: الشبكة الإندوبلازمية

"E R"

* The ER may be
  1- Smooth → S.ER (ناعمة)
  2- Rough → R.ER (خشنة)

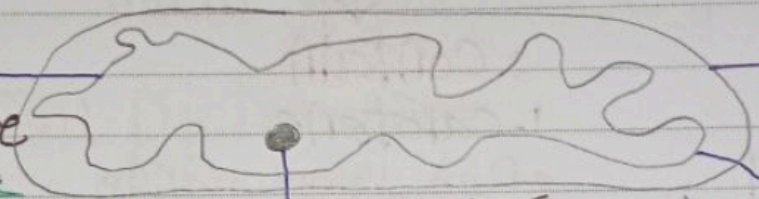
* funcation: E R"

* it increase surface area within cytoPlasm
* it helps inTranslocation metabolite نواتج الأيض
* Rough: Protein synthesis. تصنيع البروتين
* Smooh: lipid and Fat synthesis. تصنيع ليبيد ودهون.

الأعضاء

* it plays an important role in cell wall formation and cell division
← يساعد في تكوين جدار الخلية وإنقسامها.

6! mitochondria: ميتوكندريا



* funcation: mitochondria
* Aerobic respiration "تنفس هوائي"
* ATP → Bower house of the cell.

7! Ribosomes: الريبوسوم

* composed of ribonucleic acid "rRNA" and "Protins"
* composed of Two subnits (تحت وحدة)
* The plant ribosomes are {80s}

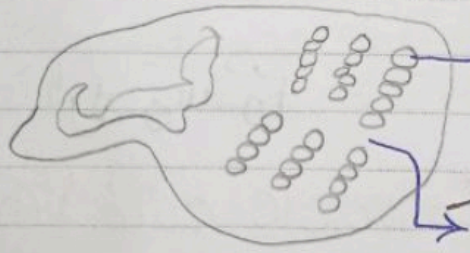
الأعضى

8) Plastid: البلاستيدة

- "chloro plasts" → Green Plastid → ∴ contain: 1- carotene, 2- chlorophyll
- "chrome plasts" → colored Plastid → ∴ contain: 1- carotene, *Red_Yellow-orange
- "leuco plasts" → just store
  - Aleuro Plasts: * store Proteins
  - Amylo Plasts: * store carboxydrate
  - elaio Plasts: * store oils and fats

* funcation: Plastid

* Photosynthesis "البناء الضوئي"



9| Golgi apparatus = Dictysomes : جسم جولجي

← تشبه الأقراص ومرتبة في أكوام وضبطة (flat)
وحوافظ (sacs)

← يوجد بها حويصلات "micro vesicles"

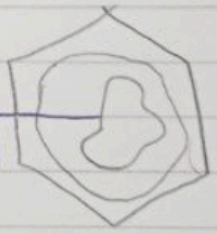
* funcation: Dictysomes.

* formation of glycoproteins and glycolipids.
تكوين الجليكوبروتينات والجليكوليبيدات.

* secretion of cell wall materials
عملية الإفراز

10| Vacuole : الفجوة

Tono Plast" غشاء محيط بالفجوة
"single membrane



* funcation: Vacuole

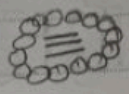
* osmo regulation "الماء, محتوى ملح"
تنظيم أسموزي

* digestive enzymes
بها انزيمات هاضمة يمكنها تحليل
* المكونات الخلوية "cytoplasmic components"
* والنواتج الأيضية "metabolites"

Lec: 2

→ crystals _ البلورات

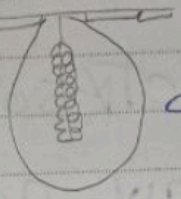
* بلورات ابرية

: Rephides 

1) Ca_oxalate: ↗

2) $CaCO_3$; cystolith

* حويصلة مجهرية عنقودية العنب



* Tissues _ الأنسجة

→ Group of cells have orgin and form and function

→ Can be similar or dissimilar

* Meristematic differentiation Mature «خلايا ناضجة»

خلايا انشائية (جنين) * تمايز

	meristematic cell	mature cell
Living _ nonliving	* Living	* Liveing or nonliving
cell wall	* Thin _ of cellulose	* thin or thick * of cellulose, liginin
shape	* isodimetric _ round _ oval _ Polygonal	* with specific shape
vacuoles	* absent or veres mall	* Have large

الأقصى

	meristematic cell	mature cell
intercellular spaces	* may or may not be	* Present or abcent
cytoplasm	* ~~dilute~~ dense لزج	* dilute مخفف
cell division	* continue to devide throw out her live 4	* Stop devide Always or temporarily
store food	* doesn't store food	* may store food or not
Ergastic مواد غير حية	* Abcent	* present

→ classification of meristematic tissues.

A] Based of Position.

1) Apical meristem
→ Growing tips of (roots, leaves, branches, stems)

→ increases Plant length زيادة النبات في الطول

→ Terminal in stem - جذع

→ sub terminal in root - جذر

2_intercalary meristem

→ increase plant length

→ Between mature meristem

3_lateral meristem

→ along side of stem and roots

→ increase plant width - عرض

E.X : cambium and cork cambium = Phellogen

← كامبيوم وعائي ← خشب ولحاء

B) Based of funcation

1_Proto derm - بشرة أولية → epidermis بشرة

2_Proto cambium - كامبيوم أولي → Xylem خشب Phloem لحاء

3_ground meristem - مرستيم أساسي → Parenchyma, Colenchyma, Sclrancyma

C3 Based on origin

1- Pro-meristem — البريستيم الأولي

→ Embryonic meristem : النسيج الجنيني

→ gives primary meristem → protoderm, procambium, ground meristem

2- Primary meristem

→ derived from Pro-merstem

→ include apical meristem and intercalary meristem

→ it: protoderm, procambium, ground meristem

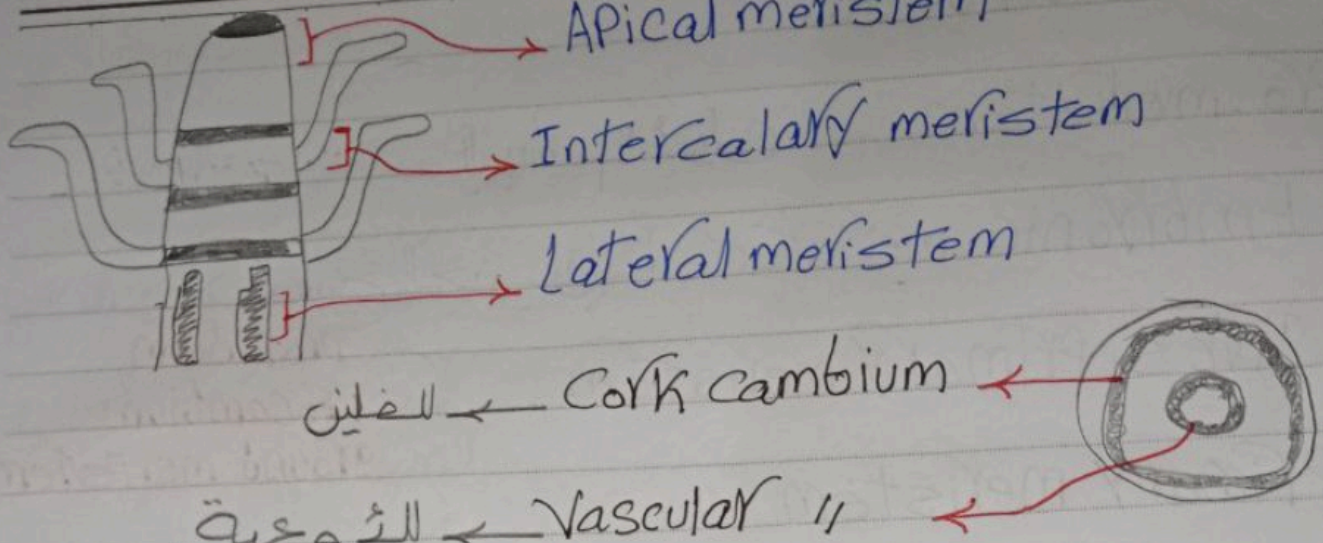
→ it responsible for primary growth in length

3- Secondary meristem

→ derived from Permanent like Parenchima

→ it is cork cambium, vscular cambium → «وعاء»
«فلين»

→ it responsible for secondary growth in width and thickness



→ mature tissues الأنسجة الناضجة

A] simple
- Parenchyma.
- Collenchyma.
- Sclerenchyma.

→ one type of cells

B] Complex
- Xylem. خشب
- Phloem. اللحاء

→ more than of cells

* Parenchyma

→ living, cell wall thin of cellulose > 90%

→ Shape: Polyhedral متعدد, oval, spherical, rectangular, cylindrical, stellate

→ Types of Parenchyma: specialized

1) chlorenchyma: has chloroplasts : Photosynthesis

2) Aerenchyma: has intercellular spaces "Air space"

→ in aquatic plant and some land plant

→ help plant to float and exchange gases

3) storage Parenchyma: store food.

→ tuberous stem and root store starch grains

← السيقان والجذور المتدرنة تخزن حبوب النشا في خلاياها البارانشيمية.

∴ funcation:

1) storage , photosynthesis , gas exchange , protection

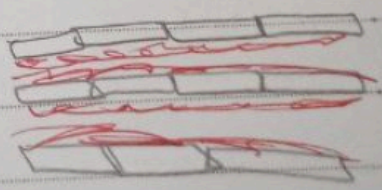
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* Collenchyma

→ living , cell wall thick of cellulose

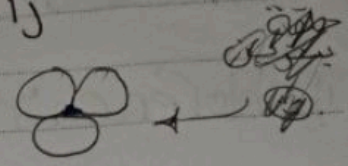
→ Types of Collenchyma

1) Lamellar collenchyma — صفائحي



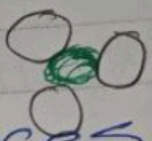
2- Angular collenchyma – زاوي

→ Angles at the corners of cells



3- ~~Annulze~~ –
Lacunar – فجوي

→ the wall facing intercellular spaces



النوع الوحيد الذي به مسافات بينية

4- Annular collenchyma – حلقي



حلقة بنزين

→ the cell wall are uniformally thick

خلايا الجدران سميكة بشكل متجانس

---

* Sclerenchyma →

→ non living, secondary cell wall, lignified

→ protection, mechanical support

Types of sclerenchyma

1) Sclereids 2) fibers

Lec: 3

1

→ funcation of Parenchyma:

* Protection (Epidermis) — # الحماية
* storage — # التخزين
* Regeneration and wound hell — # التجديد و التئام الجروح
* Radial transport of water and solute — # النقل الشعاعي للماء و المواد
* Photosynthesis (chlorenchyma) — # البناء الضوئي
* Gas exchange (aerenchyma) — # تبادل الغازات
* Secretion — # الإفرازات

→ funcation of collenchyma:

* it Provides strength, elasticity, support — # شدة ومرونة وحماية
* Photosynthesis (collenchyma has chloroplasts) — # بناء ضوئي
* it supports Young stem and leaves.

→ funcation of sclerenchyma:

* Protection and mechanical support — # حماية وتدعيم ميكانيكي

* Types of sclerenchyma: Based on origin, structure, funcation

→ sclerenchyma is divides into 2 Types

1- sclereids

2- fibers

* Sclerenchyma: secondary meristem.

	★ sclereide	★ fibers
→ origin	★ from mature Parenchyma	★ from meristematic cells.
→ cell ending	★ Have blunts ends غيرحادة	★ with long Tapered ends مدببة
→ shape	★ shorter cell of Various shape	★ Elongated cells.
→ Pits	★ numerous عديدة	★ fewer
→ Aggregation	★ single or in loose groups	★ bundles groups
	★ Not association with xylum or Phloem	★ found association with xylum or Phloem

→ Types of sclereide : based on shape and size.

1] Brachy sclereids (Stone cells) # خلايا حجرية
* with simple, Branched Pits [ramiform Pits].
* found is Some Fruits Pear, guave, apple are gritty.



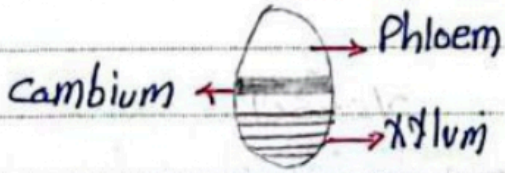
2] macro sclereids (Rod cells)
← عصوية
* Elongated
* found in epidermals of some legum seeds.
توجد في البشرة لبعض بذور البقوليات

3] osteo sclereids (Bone cells)
← عظمية
* with dilated ends # بنهايات متسعة
* found in sub-epidermal layer of some legume seeds.
توجد في الطبقة تحت البشرة لبعض بذور البقوليات

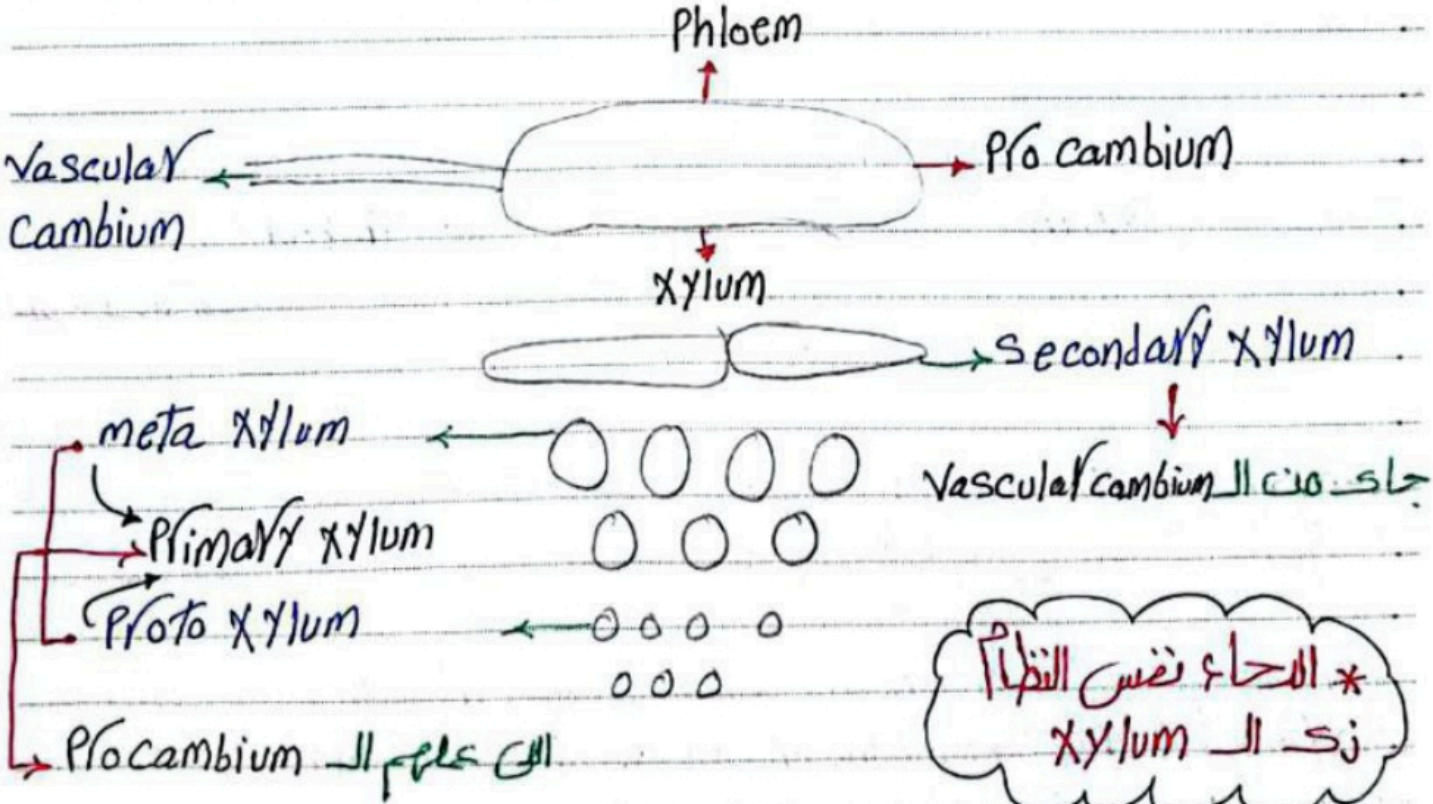
→ macro sclereids and osteo sclereids form a thick waterproof layer of the seed coat of the certain legume that prevent desiccation and prevent herbivory
تشكل طبقة سميكة مقاومة للماء من أغلفة بذور البقوليات تمنع الجفاف.

4] Astro Sclereids (star-shaped cells)
* in aquatic plants → in Leaves
* often coverd with calcium oxalate crystals
* branched irregularly

→ Types of fibers: besed on Position



1] Xylem fibers with xylum
2] Phloem " with Phloem
3] cortical " in the cortex
4] Pericycle fibers = Peri Vascular = Bundle sheath in the Pericycle



→ Xylum is made up of 4 kinds of cells.

~~Vessels~~

1) Tracheary elements — عناصر ناقلة

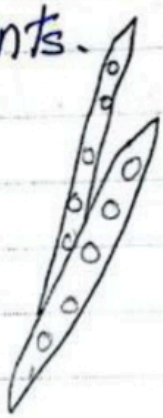
Vessels أوعية
* conduction of water and mineral in flowering plants (Angiosperms)
→ Vessels tube elements.



* Vessels tube elements have thich and lignified secondary cell wall
→ Lumen is wider than that of tracheids and fibers
* أكثر سمكا وأوسع تجويفا

→ ends is flat
end to end الخلايا مرتبة

Tracheids قصيبات
* conduct of water and mineral in gymnosperm and seedless vascular plants.



* Lumen is wider than fiber but less wider than vessels
→ cell with Pointed cells.
* خلايا ذات نهايات مدببة

overlap each other الخلايا

2) Xylum fibers : * Elongation cell, with Pointed ends.
* thick lignified secondary wall.
* mechanical support.

3) Xylum Parenchyma
* Living, with thin or thick primary wall made up of cellulose
* with simple pits نُقر
* funcation → storage of food

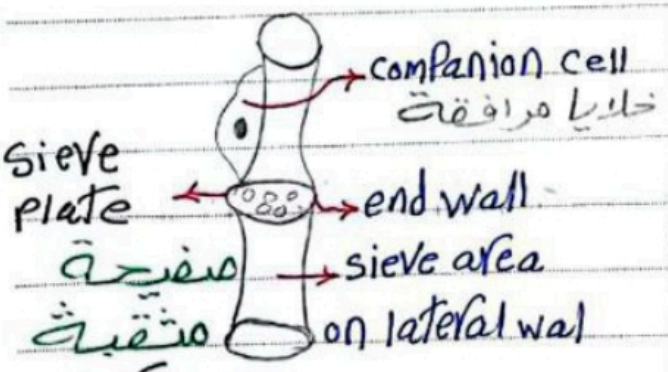
∴ Xylum is made up of 4 kinds of cells

* Tracheary elements → Vessels (1) / Tracheids (2)
* Xylum fibers (3)
* Xylum Paren chima (4)

→ Phloem is composed of 4 kinds of cells.

1) Sieve Elements — عناصر الغربال

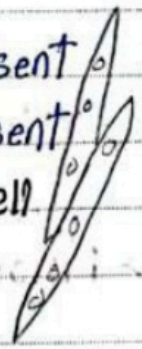
Sieve Tube أنبوب الغربال



* shorter.
* it contains a lining layer of cytoplasm ∴ Living.
* they have thick primary wall.
→ ends are flat.
→ توصيل مواد الغذائية في Angiosperms

Sieve cells خلايا الغربال

* Sieve plat is absent
* Sieve area is present
* with Albuminous cell



→ توصيل المواد الغذائية في Gymnosperm and seedless vascular plants.

→ ends is are Pointed
* Longer.

الأفقي

2] Companion Cells _ الخلايا المرافقة
* thin-walled, Elongation, Parenchyma cells.
* Associated with the sieve elements.
* have cytoplasm and nucleus.
* connected to the sive tubes through pits in lateral walls..
* help the sieve tube in the conduction of food materials.

3] Phloem Parenchyma
* living, with thin or thick primary wall
* with simple Pits نقر
* storage of food

4] Phloem fibers
* elongation cells, with Pointed ~~Pits~~ Pits
* thick lignified secondary wall
* mechanical support

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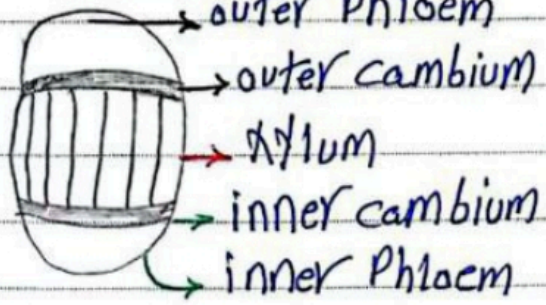
* xylum
+
* Phloem
→ Vascural Bundle [V.B]

1) collateral = conjoint V.B
* xylum and Phloem are arrengment at the same radius نصف قطر

A] closed : Combium Absent between Phloem and xylum: stem / leaves
↳ monocot

B] open : Combium is present : stem / leaf
↳ dicot

2) Bicollateral (V.S)



In Luffa

3) Radial (V.S) قطرية

* Xylum and Phloem are arrenged in an alternate mamner with each other



In Root

4) Concenteric (V.S) مركزية

A) Amphivasal : Xylum completely surronds Phloem. محيطة بالخشب

B) Amphicribral : Phloem " " Xylum. " باللحاء

Lec : 4

→ Pits - الحفر

* Pits are thin regions of the cell walls.
هي مناطق رقيقة من جدران الخلايا.

* Help the cell in comunication. # يسمح للخلية في التواصل.

* Each pit has acavity which separated by pit membrane.
كل حفرة بها تجويف يسمى تجويف الحفرة الذي يُفصل بغشاء رقيق يسمى غشاء الحفرة.

* Pit membrane → (middle lamella + Primary cell wall)

→ Tours : Thick, Primary wall

→ Three Types of Pits.

- [] Bordered Pits : الحفر المحددة

* The secondary cell wall may overarch the pit cavity forming a border."
قد يغطي جدار الخلية الثانوي تجويف الحفرة مكونا حدودا

* The remaining part of the pit membrane surrounding the Tours is called margo.
الجزء الأخير المتبقي من غشاء الحفرة المحيط بالطوق يسمى الهامش.

* margo is thinner and very Porous.
الهامش أرق ومسامي للغاية

→ Tours: Regulates the movement of the water and ions.

→ margo: Allow the movement of the water and ions between cells.

* Borderd Pits formed in vessels and some Tracheids.
تتكون في الأوعية وبعض القصيبات الهوائية.

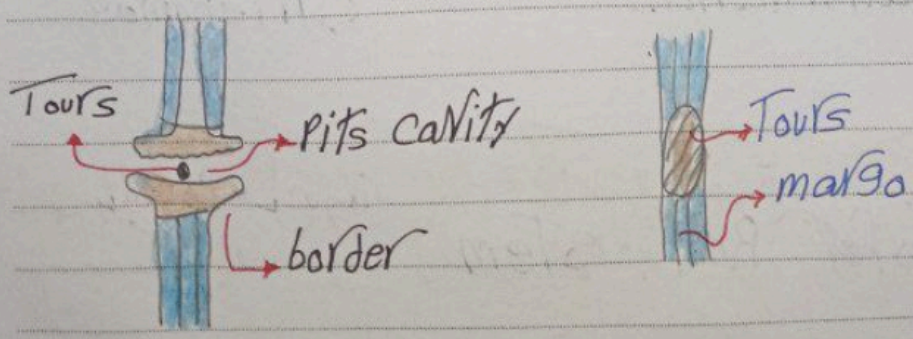
2] Simple Pits: الحفر البسيطة

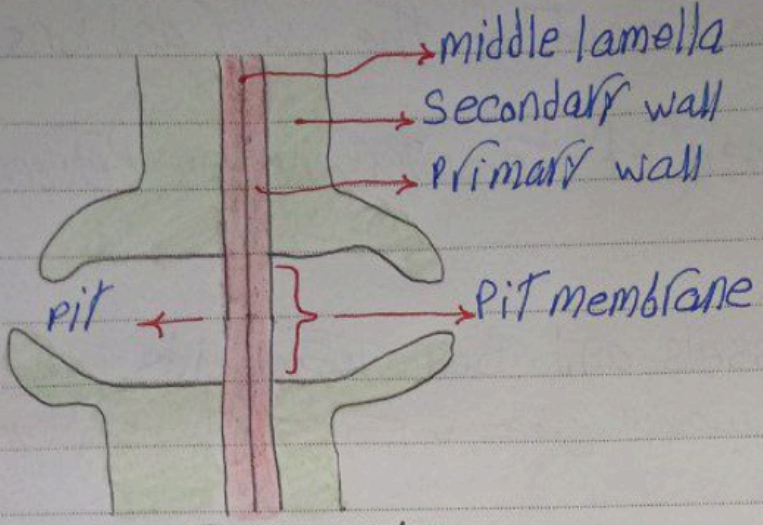
* Lack the bordes, formed in Parenchyma fibers and Sclerads cells.
لا حدود لها، تتكون في الخلايا البارنشيمية والألياف والخلايا الصلبة.

3] Half-bordered Pits: الحفر ذات الحدود النصفية

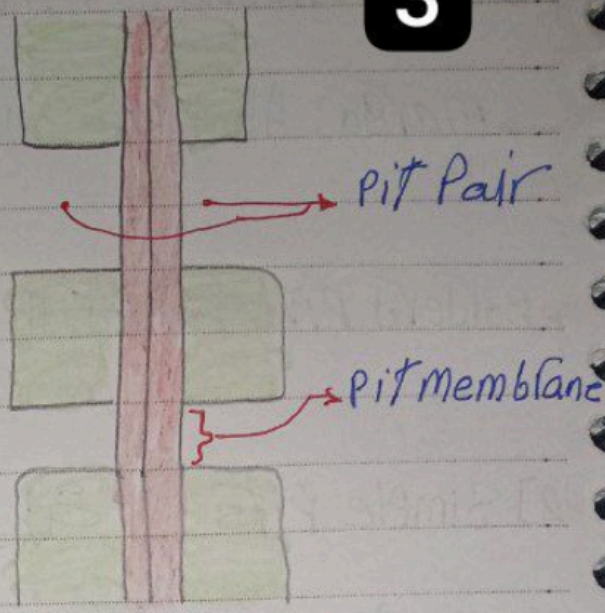
* when a bordered pit is opposite by a simple pit.
عندما يقابل الحفرة ذات الحدود حفرة بسيطة.

* it is found when aparenchyma cell opposes a Tracheid or a Vessels.
توجد عندما تقابل خلية من الخلايا البارنشيمية القصيبة الهوائية أو الوعاء.



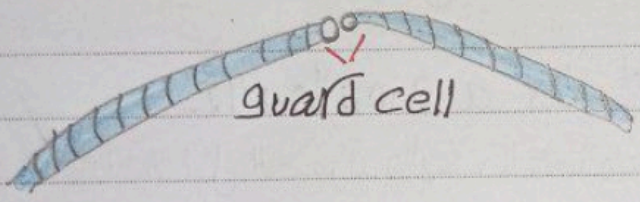


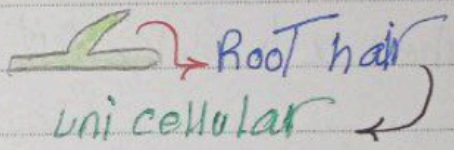
"Bordered Pits"

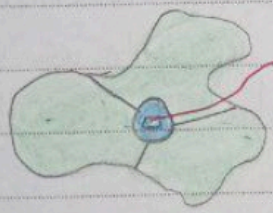


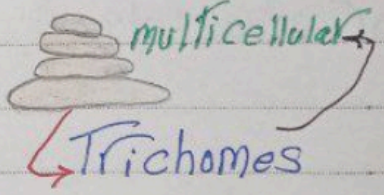
"Simple Pits"

→ Epidermal Tissue System.









← باقي المحاضرة

Dicot and monocot of Root, stem and Leaf

وجول بالتفصيل في السكشن

	Root	Stem
Epiderms	★ Absorptive ★ stomata absent ★ cuticle absent ★ Hairs present, unicellular	★ Protective ★ stomata may be present ★ cuticle present ★ Hairs absent or present multi cellular
V.B	★ V.B Radial ★ Proto xylum exarch	★ V.B → collateral, Di collateral, concentric ★ Proto xylum endoarch



Exarch

Proto xylum over meta xylum



Endoarch

Proto xylum under meta xylum



mesarch

inside Proto xylum

Lec 5

→ Ecological Anatomy - التشريح البيئي للنبات

1] Hydrophytes - الهيدروفايتات

1

« النباتات المائية »

* cuticle : Absent. # البشرة غائبة

* Stomata : usually absent. # الثغور غائبة

* Vascular tissues : Xylem is much reduced but Phloem is distinct. # يتم تقليل الخشب بشكل كبير ولكن اللحاء مميز.

* mechanical tissues : as sclerenchyma. are reduced or Absent

* Aerenchyma and air chambers : well developed.

2] mesophytes - الميزوفايتات « النباتات المعتدلة »

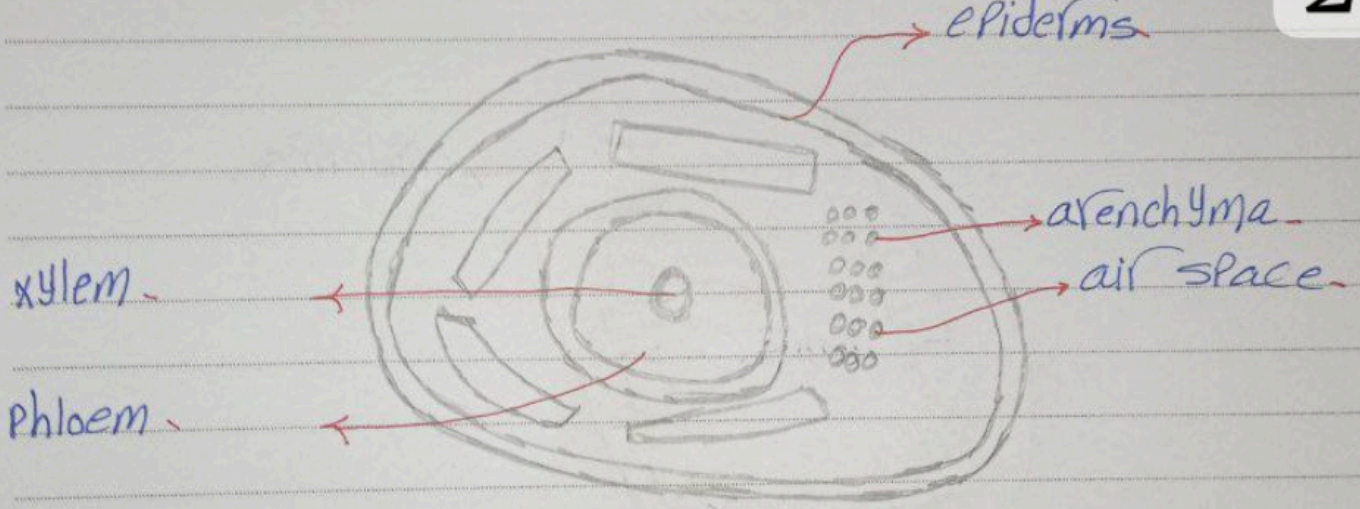
* cuticle : thin
* stomata : are exposed on leaf surface. # تظهر الثغور على سطح الأوراق
* Vascular Tissues : Xylum and Phloem are well developed.
* mechanical Tissues : have Normal amount. # مع كمية طبيعية
* Aerenchyma and air chambers : may present.

3] Xerophytes _ الكسروفيتات « #النباتات الصحراوية

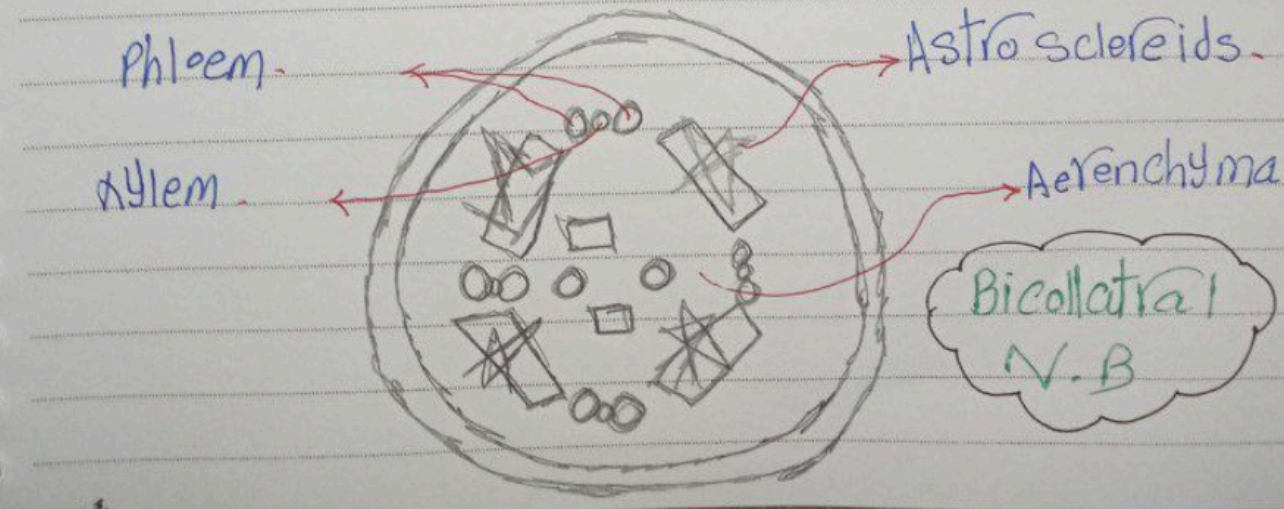
* Cuticle: thick → To avoid loss of water.
* Stomata: are very few and sunken and protected with hairs.
#الثغور قليلة جدا وغائرة ومحمية بالشعر.
* Vascular Tissues: Xylem and Phloem are well developed.
* mechanical Tissues: have a large amount of mechanical tissue.
* Aerenchyma and air chambers: absent.

2

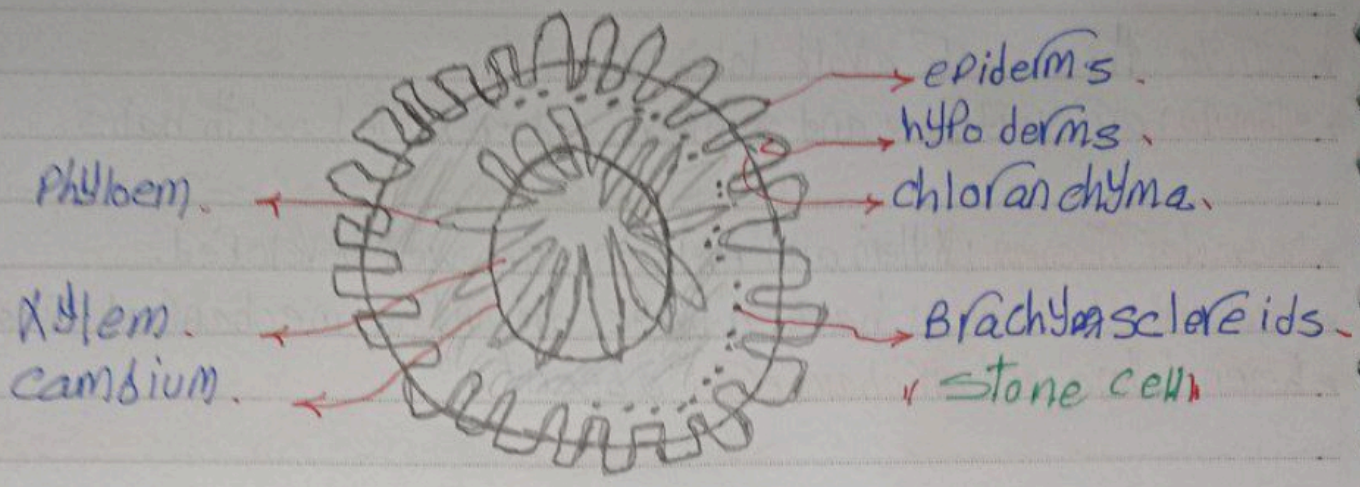
→ Elodea stem « Hydrophyte Plant »



→ Nymaphaea Petiole / stem « Hydrophyte Plant »



→ Retama stem (Xerophyte Plant)



→ Ammophila leaf (Xerophyte Plant)

