A * Types of cells + ECM
B * Types of tissues
C * Histological optical instruments.

Cell. biology
1st lecture

■ Cell: Structural & functional Unit of living body.

① Pro-karyotic cell → Its genetic material is located in "~~Genophore~~ Nucleoid"
↳ Reprodctive mechanism: "Binary" = "asexual" = fission"

② Eu-karyotic cell ← It can be Uni-cellular like "Amoeba"

Features	Eu-karyote	Pro-karyote
Genetic mater.	✓ (genophore)	✓
Ribosomes	✓	✓
Cell membrane	✓	✓
Cytoplasm	✓	✓
membrane bounded cell organells	✗	✓

(4) only

* There are 200 types.

Basic tissues (Types):

Epithelium
- Covers exterior surfaces
- Line internal cavities.
- Form certain glands.

Connective tissue
- Binds cells and organs together
  - Carti-lage
  - Bone
  - Blood

Muscular
- Contracts to provide movement.
- Exitable

Nervous
- generates electrochemical signals as (nerve impulses).
- To communicate between different regions
- Exitable

(E.C.M): is the substance that fills spaces between cells + Secreted by them. [Composed from. protiens & other ...]

E.C.M
- ⓐ Basement membrane = (B.M.)
- ⓑ Intersfitial fluid

ⓑ: Thin layer of fluid surrounds the cell.

Wh Hepa?
- H_2O
- Proteins
- acids
- waste material
- Hormones
- elyctro-lytes

ⓐ: Sheet-like depositions of ECM, at the base of epithelial cells (only).

* Is visible with L.M.

B.M.
- B.L
  - Lamina Densa
- R.L
  - Lamina Lucida

= (B.L) Basal lamina
- lucida
- densa

Reticular lamina = (R.L)

(E.T) Basement membrane

(C.T)

The basal lamina:

1- visible with (E.M.)
[20-100 nm]

2- Its major component is: Collagen (IV)

* In D.M. basement membrane of:
Retina + Kidney → Renal Failure
become thick.

* Epithelial tissue is:
avascular [but] Innervated
- gets its nourishment from C.T. (Connective tissue)

The reticular lamina:

1- Formed by (reticular fibers)
Secreted by C.T. (fibroblasts)

2- Thicker than basal lamina.

Functions of basement membrane

1. Achoring
2. Pathway of cell migration
3. Wound healing
4. Barrier between E.T & C.T.
5. Blood filtration in kidney
6. Carcinoma in situ (cancer early stage)

E.C.M
↓↓ in epithelium (E.T.)
↑↑ in Connective tissue (C.T.)
- Jelly like → C.T. proper → Loose / dense + adipose
- Hard → Bone
- Rubbery → Cartilage
- Fluid → Blood

Methods of studying cell bio.

1* Cell culture: Isolating cells & make them grow under controlled conditions.

2* Cell fractionation: seperate cellur components by Centrifugration.

3* Chromatography: chemical analysis to seperate a mixture to its components. (2) phases: Mobile - Stationary

4* Electrophoresis: seprating charged molecules using electrical field depends on (size & charge)

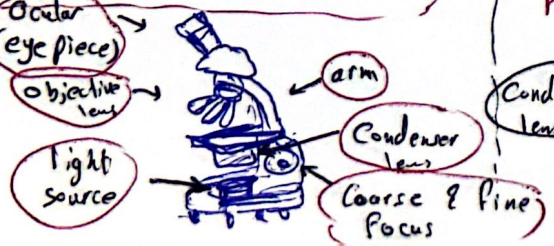
5* Genetic tech.: Study structure + function of genes:
- Isolating gene / cloning (copy) gene / determine unknown DNA sequences.

Microscopy: is the standard optical instrument for magnifying images.

① Light microscope (L.M.)

* Illuminating system: Light source + Condenser lens
* Imaging/Magnifying system:
  - a- Ocular lens: 10x
  - b- Objective lens: 4, 5, 40x
- Microscope's capacity factors:
  - ① Resolution power: Is the smallest distance between 2 particles that can still be seen as 2 seperated.
  - ② Magnification power: The power to enlarge objects.

Healthy eye = 0.2 mm
L.M. = 0.2 μm
E.M. = 0.2 nm



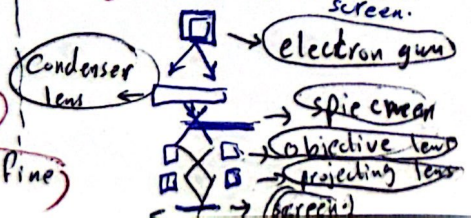
② Electron microscope (E.M.)

(أوضح للأجزاء)

- up to 200.000 x
- * Section thickness: (0.01) μm
- Illuminating system:
  - Electron gun (electron beam)
  - Condenser lens.
- Imaging system:
  - Electromagnetic lenses 2-3
  - Screen (Fluorescee)
- * Lenser are: electro-magnetic
- * Beam passes through Vacuum tube.
- Lenses ↳ Objective (a) projecting (b)

(a): refocuses electrons → form image

(b): enlarges image + Projects it in Fluorescse screen.



③ Phase Contrast

- Produces images for unstained (Transparent objects)
- Depends on different refractive indices
- Useful for:
  1- living cells: Blood cells sperms
  2- Tissue cultres.

④ DIC (3D)

* DIC → Differential interphase contrast microscope.
* 3D images
* Utilize 2 seperate beams of light

⑤ Fluorescence

(الأشعة الفلورية)

* Idea: Some substances absorb ultraviolet → reflect it as visible long-wave length (Fluorescence)
- Illuminating sys: special lamp emits Ultraviolet rays
- Usfel for:
  - DNA/RNA
  - Proteins
  - antigen antibody complex
* Antibodies are labeled with Fluorescence.

⑥ Confocal Laser

- Illuminating sys:
  - Laser source
* Specimen should: labeled with Fluorescence.
* LASER passes through small hole? A. to avoid photo bleaching (fine details)
- Uses: ↑ optical resolution & contrast.
* A computer system reconstruct full image.

E.M

- TEM * (0.2 nm)
- SEM (10 nm) (3D)

Heavy Salts used in E.M.

- Lead Nitrate
- Uranyl Acetate