

Date:

15 / 10 / 2023



لجان الدفوعات



تفريغ فسيولوجي



Cellular level of
organization

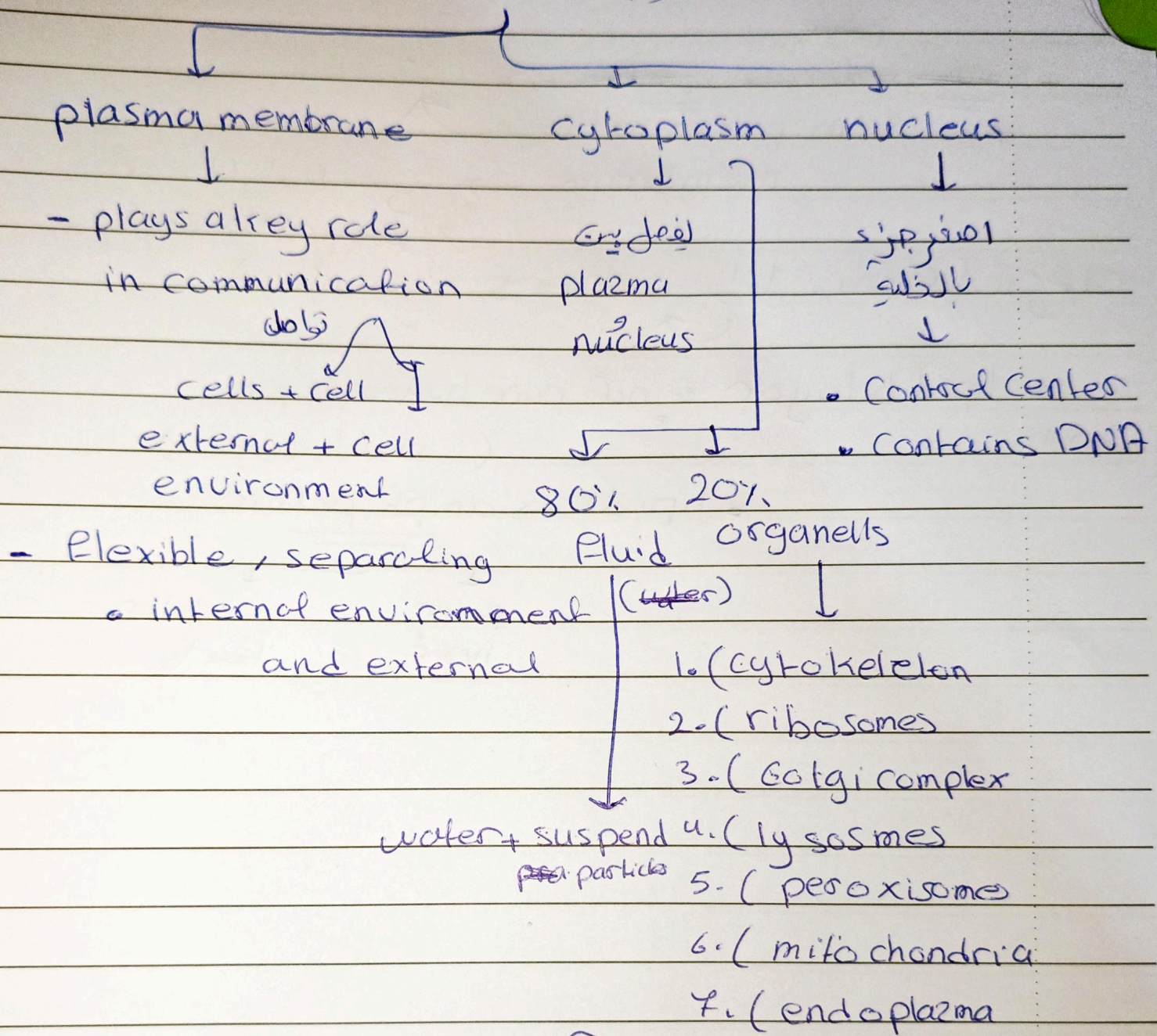
موضوع المحاضرة:

٣

رقم المحاضرة :

إعداد الصيدلانية : بيان عدنان

The cell divides into (3) main parts:-



قسم الخلية إلى ثلاثة أجزاء رئيسية

تحتوي على بروتينات و دهون و سكريات و ايونات

شبه سائلة

Semipermeable

membrane

شبه سائلة

THE PLASMA MEMBRANE

شبه سائلة / سائلة

شبه سائلة / سائلة

The basic structural framework of the plasma membrane is the lipid bilayer (lipid molecules—phospholipids (75%), cholesterol (20%), and glycolipids (5%)).

glucose
polar
lipids

phospholipids
lipids

hydrophobic
hydrophilic
COOH polar
carboxylic acid
nonpolar
tails

not pure hydrophobic

The lipids are amphipathic molecules (polar heads and nonpolar tails).

Glycolipids appear only in the membrane layer that faces the extracellular fluid, which is one reason the two sides of the bilayer are asymmetric.

hydrophobic
hydrophilic

lipids

شبه سائلة

ليس كل اعمار لا تتغير

Plasma membrane

شبه سائلة

ليس في

tails

water

Plasma membrane

شبه سائلة

gapes

THE PLASMA MEMBRANE

Membrane proteins are classified as integral or peripheral according to whether they are firmly embedded in the membrane.

1. Most integral proteins are transmembrane proteins (span the entire lipid bilayer and protrude into both the cytosol and extracellular fluid). main function: ion channels

2. Peripheral proteins are attached to the polar heads of membrane lipids or to integral proteins at the inner or outer surface of the membrane.

large molecules (hydrophilic) ⇒
membrane proteins

Integral proteins (their functions are important!):

1. Forming ion channels.

2. Acting as carriers or transporters.

3. Are called receptors.
Speed chemical reaction
تسرع التفاعل الكيميائي

4. Are enzymes.

اعماله التحفيزية
الموقع النشط
active site

5. Serving as linkers.

6. Serving as cell identity markers.

علامات هوية الخلية

agonist
antagonist

محفز (مع)
مضاد

(مضاد)

agonist
antagonist
active site

محفز
مضاد
الموقع النشط

σ idisaw 2, 16
ion channel
(span)
plasma membrane

Peripheral proteins (their functions are important!):

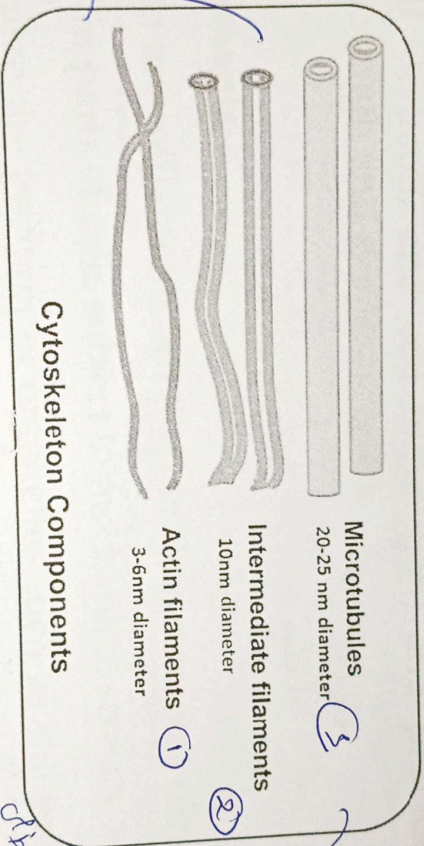
1. Serve as enzymes and linkers.
2. Support the plasma membrane. and Integral proteins
3. Anchor integral proteins.
4. Participate in mechanical activities:

دائم کل عصبی
cytoskeleton
رکون! الی عصبی

THE CYTOPLASM

- The cytoskeleton is a network of protein filaments that extends throughout the cytosol (microfilaments, intermediate filaments, and microtubules).

طیوٹ جو ڈیٹ



main function support and maintain the shape
رکھنا اور شکل
بھرنے کے لیے
میں سے مدد
دینا

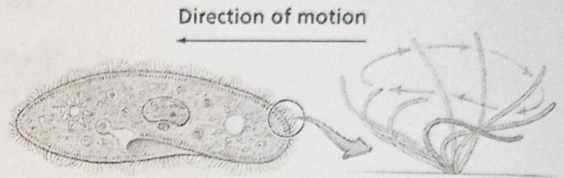
کل واحد نظام
Protein size
طالعہ
ایک سو عین
Function
طالعہ

فیکٹا
تھریڈ
رکھنا
کریو بالکٹ

Cilia

- Microtubules are the dominant components of cilia and flagella. Both are motile projections. However, cilia is present throughout the surface of a cell, but flagella is present at both the ends or all over the surface.

- Hair-like structure.
- The main function of motile cilia is to keep the airways clear of mucus and dust.



(b) Cilia

شعيرات

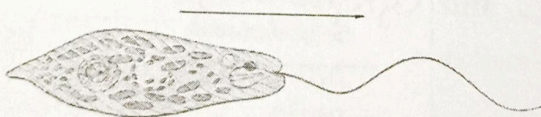
تتحرك كل واحد بنفسه

اتجاه واحد بشكل

التردد

rotational

Flagella



(a) Flagella

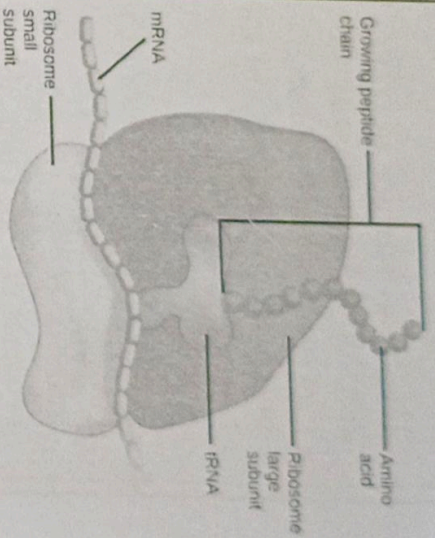
- Flagella are similar in structure to cilia but are typically much longer.
- Flagella usually move an entire cell (i.e. sperm).
- The motion of cilia is rotational, very fast moving. The motion of flagella is rotary movement in prokaryotes whereas it is bending movement in eukaryotes. Cilia beat in coordination or one after the other. Flagella beat independent of each other.

Flagella ← عند الانسان فقط في الذكر
Cilia ← عند الحيوان اعنوي
prokaryotic eukaryotic

Flagella - rotational movement
Cilia - bending movement

Ribosomes

- Are the sites of protein synthesis.
- The name of these tiny structures reflects their high content of one type of ribonucleic acid (ribosomal RNA, or rRNA).
- "Scattered throughout cytoplasm": Some ribosomes are attached to the outer surface of the nuclear membrane and to an endoplasmic reticulum. Ribosomes are also located within mitochondria. Other ribosomes are "free" or unattached to other cytoplasmic structures.



nucleus $\rightarrow$ Ribosomes $\rightarrow$ free

free ribosomes (endoplasmic reticulum) $\rightarrow$ free ribosomes

free ribosomes (endoplasmic reticulum) $\rightarrow$ free ribosomes

Endoplasmic Reticulum

- The endoplasmic reticulum (ER) is a network of membranes in the form of flattened sacs or tubules.
- The ER extends from the nuclear envelope (membrane around the nucleus), to which it is connected and projects throughout the cytoplasm.
- Cells contain two distinct forms of ER: rough ER and smooth ER, which differ in structure and function.



Function: $\rightarrow$ protein synthesis, lipid synthesis, storage of calcium, phospholipids and lipids and carbohydrates

Golgi Complex

Cis Face

secretory vesicle

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1000

- Most of the proteins synthesized by ribosomes attached to rough ER are ultimately transported to other regions of the cell (i.e. Golgi complex).

Sacs 250 ✓

Protein

515 515

Cis Case

اذا خطب

cis face or hant face

2.10.2

+ fans Pace

والله اعلم

Golgi Complex

Functions of Golgi Complex:

توزيع و تخزين المواد
Structure

1. Modifies, sorts, packages, and transports proteins received from the rough ER (through face or cis entry). Enzymes in the middle site of the Golgi complex modify the proteins to form glycoproteins, glycolipids, and lipoproteins.
2. Forms secretory vesicles that discharge processed proteins via exocytosis (through exist or trans face) into extracellular fluid and forms transport vesicles that carry molecules to other organelles, such as lysosomes.

endocytosis

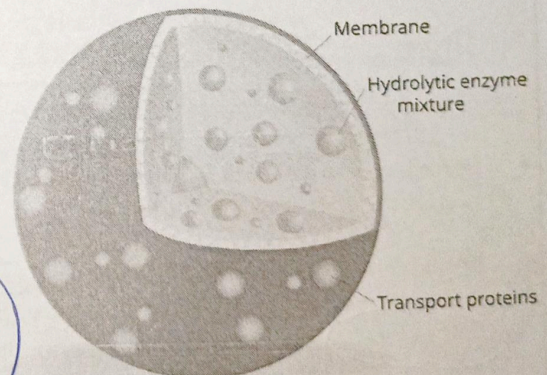
المواد
التي
تدخل
Golgi هي
proteins

المواد التي
تخرج
من Golgi هي
proteins

Lysosomes

- Lysosomes are membrane-enclosed vesicles that form from the Golgi complex.
- They can contain as many as 60 kinds of powerful digestive and hydrolytic enzymes that can break down a wide variety of molecules.

LYSOSOME



المواد التي
تدخل
lysosomes هي
proteins

Lysosomes

Functions of lysosomes:

1. Digest substances (within the cell) that enter a cell via endocytosis and transport final products of digestion into cytosol.
2. Carry out autophagy, the digestion of worn-out organelles.
3. Implement autolysis, the digestion of an entire cell.
4. Accomplish extracellular digestion.

للقيام بتفكيك غير مكتمل

تلك العملية
تسمى
تفكيك

microbe

Peroxisomes

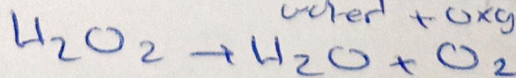
- Peroxisomes contain several oxidases, enzymes that can oxidize (remove hydrogen atoms from) various organic substances.
- They protect the cells from oxidative damage.
- They protect other parts of the cell from the toxic effects of potentially toxic compounds.
- Peroxisomes are very abundant in the liver, where detoxification of alcohol and other damaging substances occurs.
- Peroxisomes also contain the enzyme catalase which decomposes by-product of the oxidation reactions which is hydrogen peroxide (H_2O_2); thus, it decomposes hydrogen peroxide to water and oxygen.

main function

H_2 → atom toxic

do!

water + oxygen



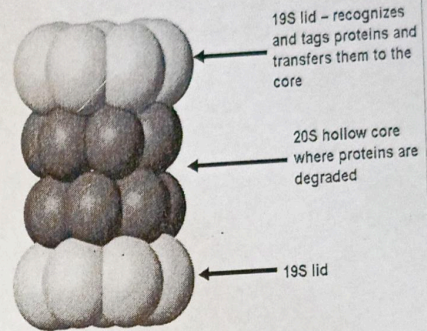
Chemical reaction
تفاعل كيميائي

protein phase as protein
unfunctional 20S

Proteasomes

- Cytosolic proteins require disposal at certain times in the life of a cell. Continuous destruction of unneeded, damaged, or faulty proteins is the function of tiny barrel-shaped structures consisting of four stacked rings of proteins around a central core called proteasomes.
- Proteasomes were so named because they contain proteases, enzymes that cut proteins into small peptides. Once the enzymes of a proteasome have chopped up a protein into smaller chunks, other enzymes then break down the peptides into amino acids, which can be recycled into new proteins.

26S proteasome

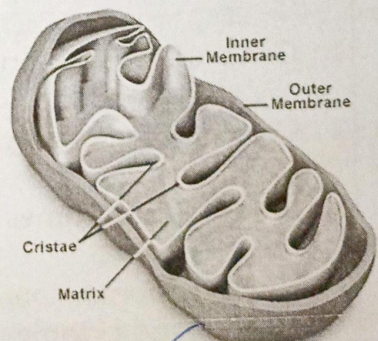


protein تفسر
amino acid - تر جوشده
منه

Mitochondria

- Mitochondria generate most of the ATP through aerobic (oxygen requiring) respiration, "powerhouses" of the cell. The enzymes that catalyze the chemical reactions which are part of the aerobic phase of cellular respiration are located in the mitochondria.
 - Active cells that use ATP at a high rate—such as those found in the muscles, liver, and kidneys—have a large number of mitochondria.
- A mitochondrion consists of an outer mitochondrial membrane and an inner mitochondrial membrane with a small fluid-filled space between them (mitochondrial matrix.).

Mitochondria Structural Features



ATP تصنع

Active transport
 نقل نشط
 ATP 255

passive transport
 النقل السلبي
 لا يحتاج ATP

Gradients across the Plasma Membrane:

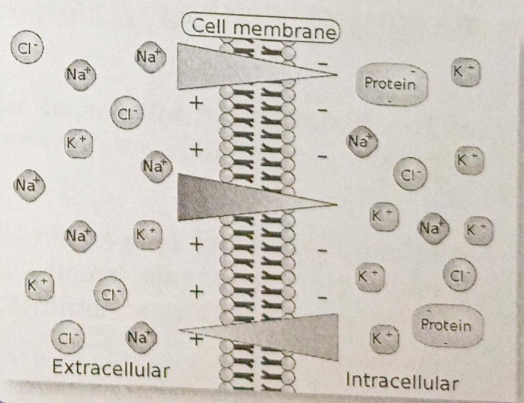
- A concentration gradient is a difference in the concentration of a chemical from one place to another, such as from the inside to the outside of the plasma membrane. A substance will move "downhill," from where it is more concentrated to where it is less concentrated, to reach equilibrium.
- The plasma membrane also creates a difference in the distribution of positively and negatively charged ions between the two sides of the plasma membrane.

يمكن أن تكون مواد
 nonpolar and polar

↓
 تحتاج إلى نقل نشط
 Electrical gradient

Gradients across the Plasma Membrane:

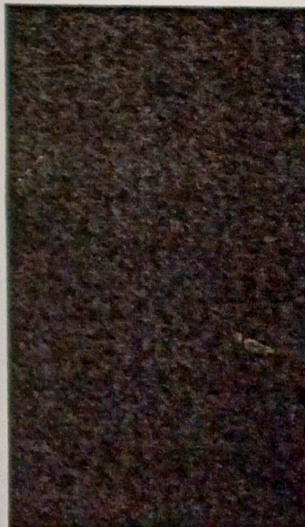
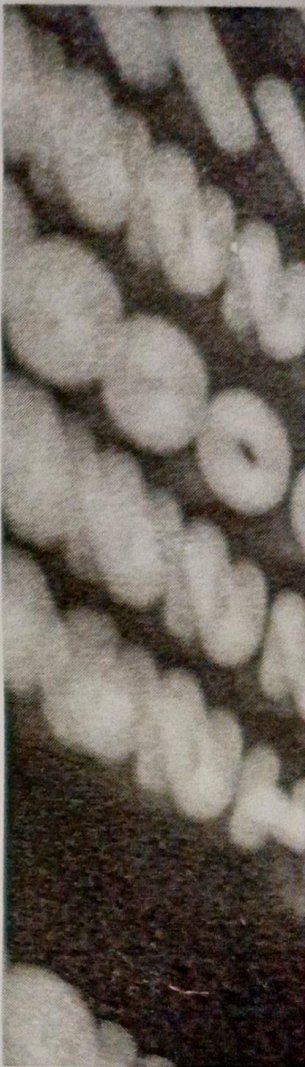
- The difference in electrical charges between two regions constitutes an electrical gradient. This termed the membrane potential. A positively charged substance will tend to move toward a negatively charged area, and a negatively charged substance will tend to move toward a positively charged area.
- The combined influence of the concentration gradient and the electrical gradient on movement of a particular ion is referred to as its electrochemical gradient.



Cell membrane
 جدار الخلية

علاقة بين تركيز الأيونات
 وكمية الشحنات

electrochemical
 كهربائي كيميائي



Transport processes

Passive

Active

ATP صرفاً 2

من ذی کینزائی: ال فیل

Diffusion

من ذی کینزائی: ال فیل

من ذی کینزائی: ال فیل

Osmosis

- water

معادل

isotonic → معادل

hypotonic → کم تر

hypertonic → زیاد تر

Facilitated

polar and higher change

گلیسرول

carrier

- ~~glucose~~

- glucose

- some vitamins

- Fructose

- galactose

channel

قنوات

یون

- ion

Simple

- Oxygen

- nitrogen gas

- Carbon dioxide

- Fatty acid

- water

- urea

- small alcohol

- Fat - Soluble vitamin

Transport processes

~~Passive~~ + Passive

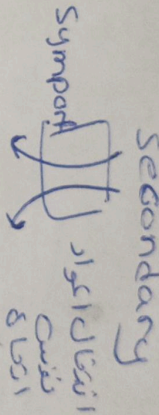
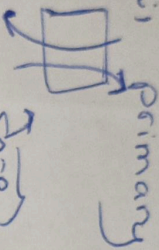
Active

انتقال المواد عن طريق

Antipart

Cell ATP في الخلية

أي طاقة يتم



Passive

Exocytosis

إفراز خلوي في
خلوية فقط

Transcytosis

إفراز خلوي
داخل خلوية

ATP في خلية
ATP كيميائي
في خلية
شريطة

مثلا على انتقال
glucose
ATP

- Transcytosis

(Endocytosis + exocytosis)

- antibodies

- blood vessels

endothelial cells

exocytosis

الخلايا التي تنقل
المواد إلى الخلية

موجبات في خلية

- hormones
- digestive enzymes
- mucus

phagocytosis

cell

macro-phages

neutro-phils

vesicle

white blood cell

Receptor-mediated

LDLs

plasma

membrane

- vitamin

- antibody

الموقع الوترية

الذي يتواجد

كجزيئات

receptor

على سطح الخلية

بعض المواد يمكن أن

exocytosis

الدخول في خلية

الدخول في خلية

plasma

وقتها في سطح الخلية