



تَوِير

BIOLOGY

Lec no : 10

File Title : Chapter 8

Done By : AlMiqdad Nwihi

وَقُلْ رَبِّ زِدْنِي عِلْمًا



Concept 7.4: Active transport uses energy to move solutes against their gradients

- Facilitated diffusion is still passive because the solute moves down its concentration gradient, and the transport requires no energy
- Some transport proteins, however, can move solutes against their concentration gradients

The Need for Energy in Active Transport

- **Active transport** moves substances against their concentration gradients ¹
- Active transport requires energy, usually in the form of ATP ²
- Active transport is performed by specific proteins embedded in the membranes ³

الشروط

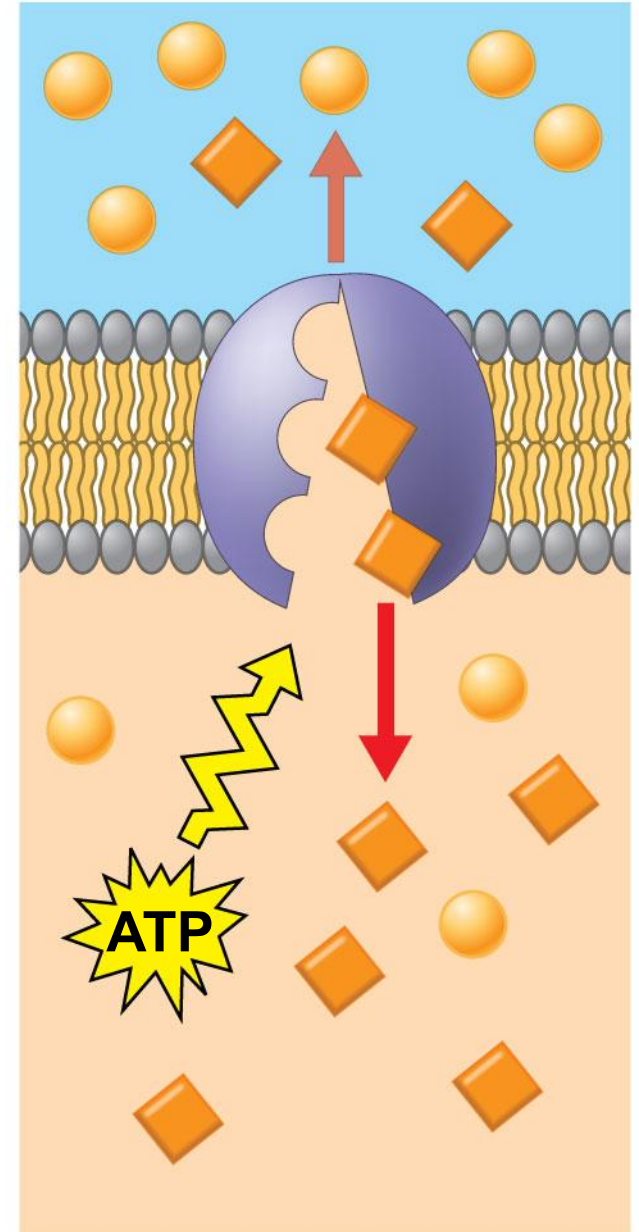
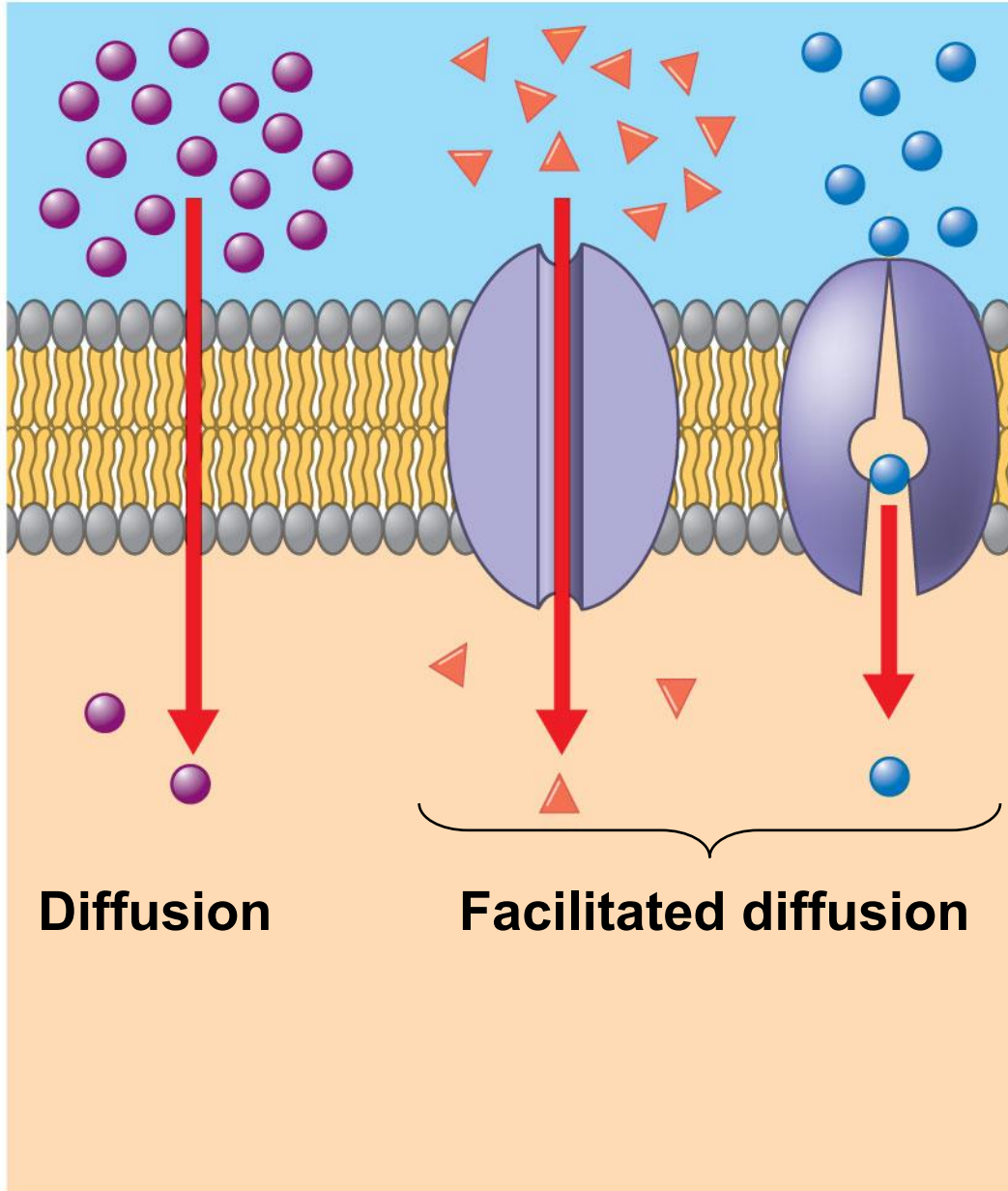


Animation: Active Transport

Figure 7.19

Passive transport

Active transport



مضخة مولدة للجهد الكهربائي

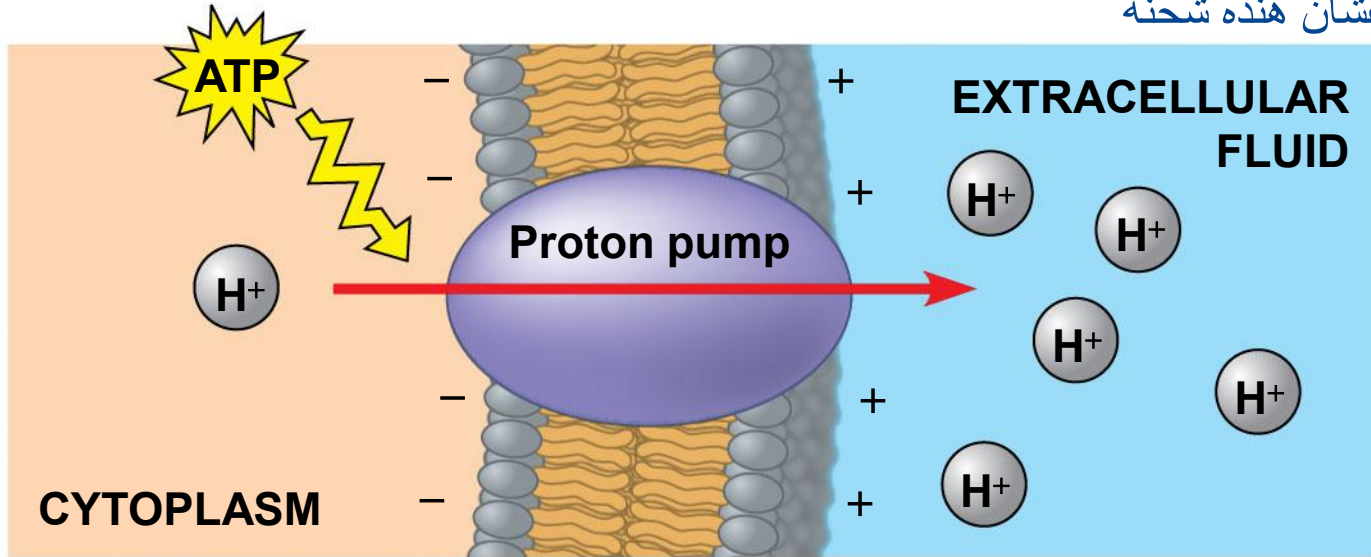
- An **electrogenic pump** is a transport protein that generates voltage across a membrane
- The sodium-potassium pump is the major electrogenic pump of animal cells
- The main electrogenic pump of plants, fungi, and bacteria is a **proton pump** $\rightarrow H^+$
- Electrogenic pumps help store energy that can be used for cellular work

also found in animal cells

Figure 7.20

It pumps the protons from inside to the outside of the cell (against concentration gradient) using ATP so the protons are concentrated in the extracellular side of the cell which will cause an electronic repulsion (تنافر كهربائي)

بسبب فرق تركيز البروتون بين داخل و خارج الخلية (التركيز برا اعلى) و التنافر بين جزيئاته يحاول يرجع يدخل على الخلية بس ما يرجع من نفس المضخة ولا الطبقة المزدوجة من الليبيدات المفسفرة (phospholipid bilayer) بتسمحه يمر عشان هنده شحنة



Cotransport: Coupled Transport by a Membrane Protein

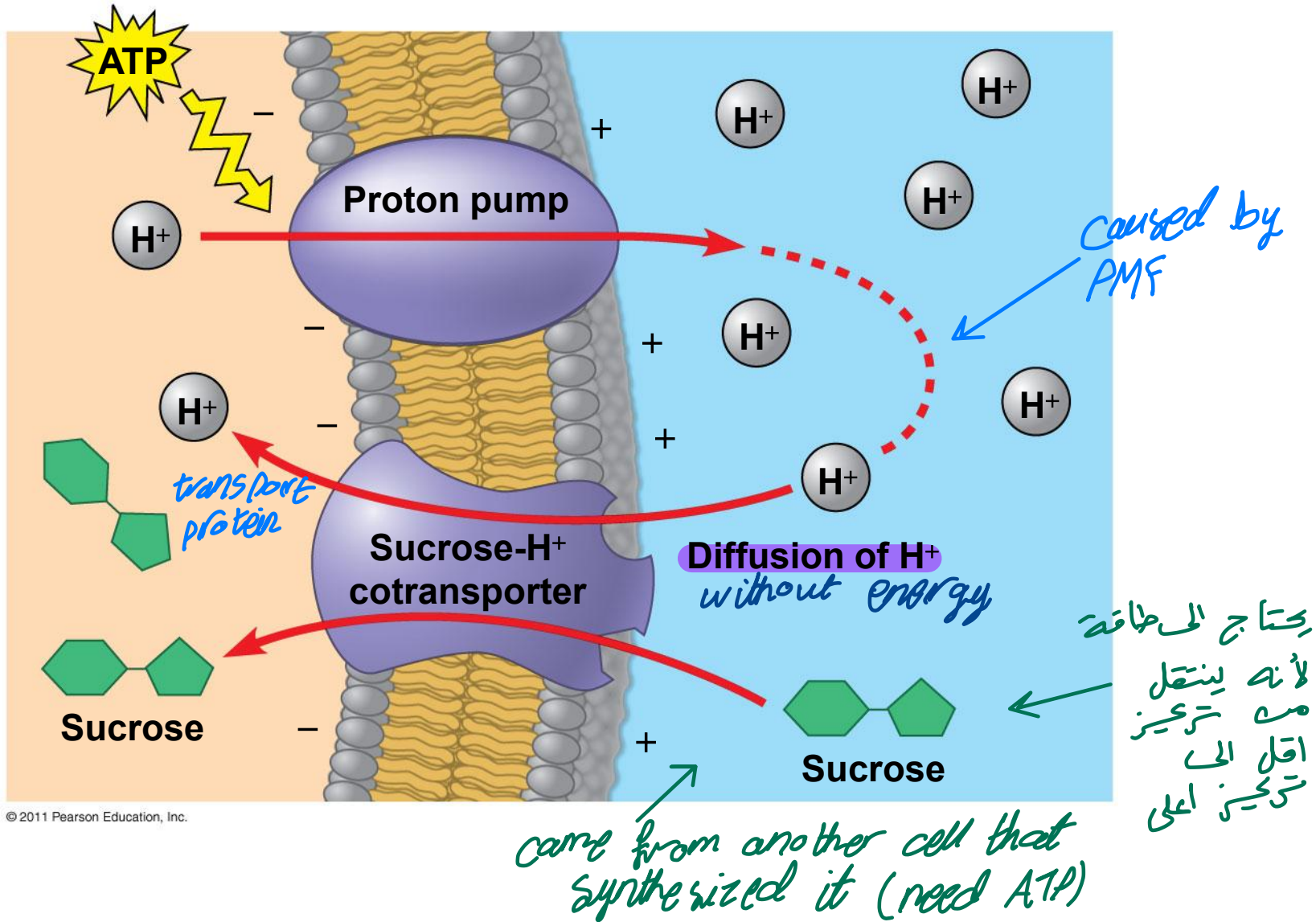
نقل مشترك / مزدوج

- **Cotransport** occurs when active transport of a solute indirectly drives transport of other solutes
يعني ينقل مادة نقل نشط و الثانية بدون طاقة
- Plants commonly use the gradient of hydrogen ions generated by proton pumps to drive active transport of nutrients into the cell

like sucrose

Figure 7.21

Protons get out of the cell actively through the proton pump and get back in passively through the sucrose-H⁺ cotransporter

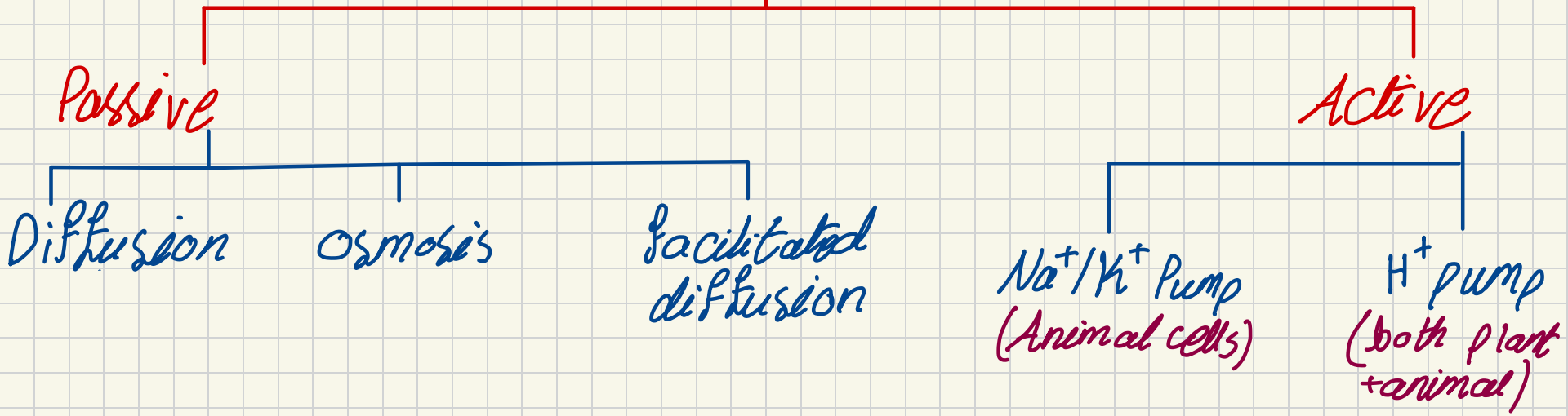


Proton motive force (PMF): The force that promote the movement of protons down it's electrochemical gradient (down hill)

Sucrose that is produced from the green parts in the plant cell go to the other parts in the plant that don't synthesis it

Sucrose - H^+ cotransporter: Transports protons (H^+) passively
Transports sucrose actively

Transportation in the cell



Concept 7.5: Bulk transport across the plasma membrane occurs by exocytosis and endocytosis *only in animal cells*

- Small molecules and water enter or leave the cell through the lipid bilayer or via transport proteins
- Large molecules such as polysaccharides and proteins, cross the membrane in bulk via vesicles
- Bulk transport requires energy

Exocytosis → Need ATP because the vesicle's movement

من داخل الخلية الى خارجها

on the microtubules

- In **exocytosis**, transport vesicles migrate to the membrane, fuse with it, and release their contents
- Many secretory cells use exocytosis to export their products

خلايا افرازية

like Pancreas



Animation: Exocytosis

Endocytosis

من خارج الخلية الى داخلها

- In **endocytosis**, the **cell takes in macromolecules** by **forming vesicles from the plasma membrane**
- Endocytosis is a **reversal of exocytosis**, involving different proteins
- There are three types of endocytosis
 - **Phagocytosis** (“**cellular eating**”)
 - **Pinocytosis** (“**cellular drinking**”)
 - **Receptor-mediated endocytosis** → *specific*

non-specific

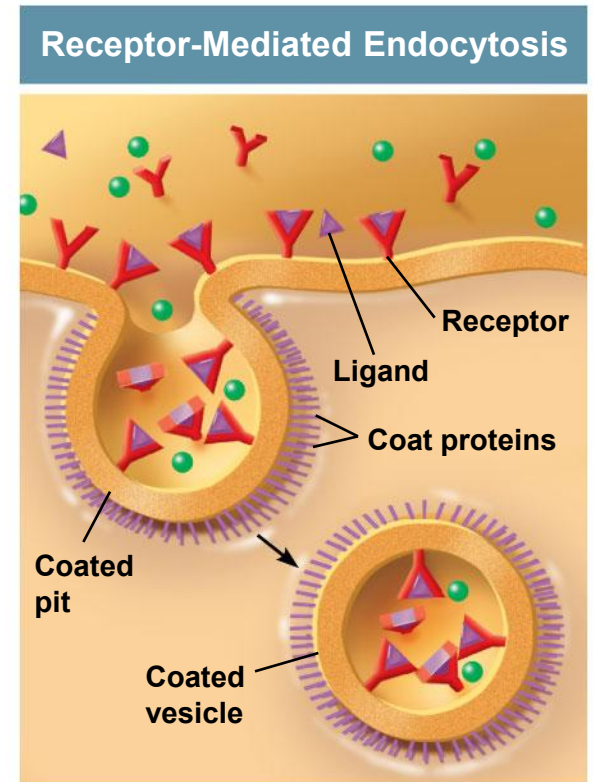
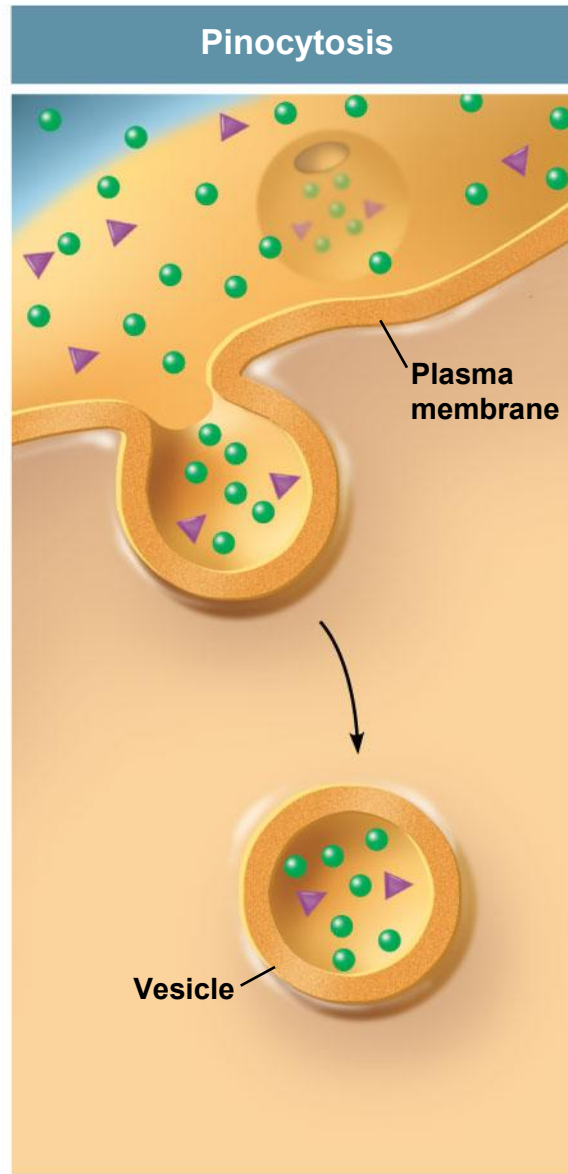
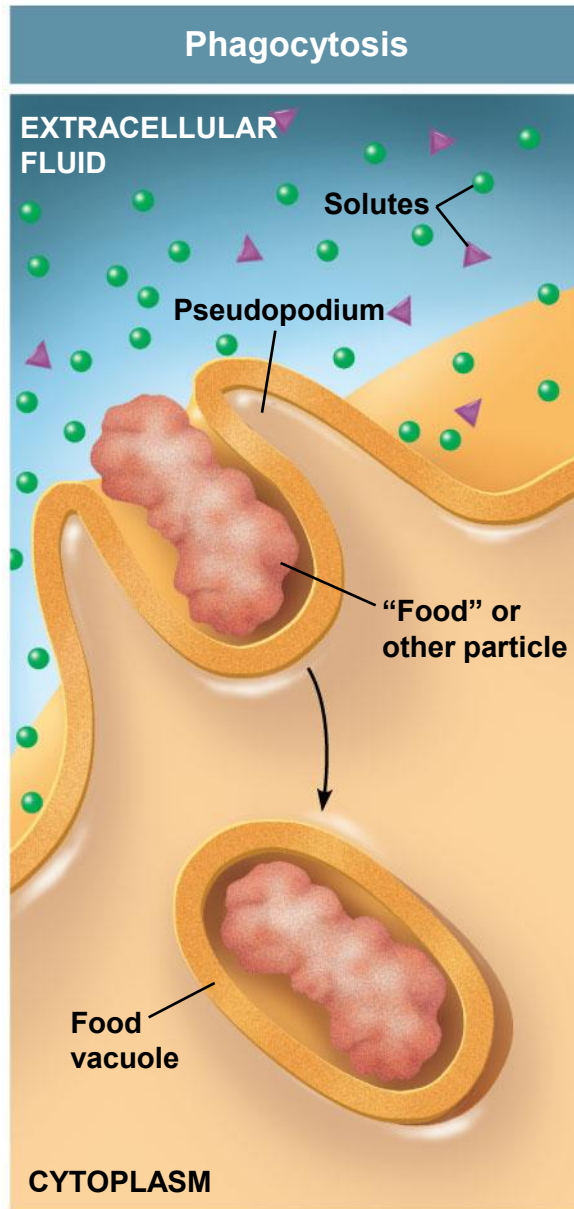
تحدث فقط
لجوار مستقبلات
لها مستقبلات

حالة خاصة من ال Pinocytosis



Animation: Exocytosis and Endocytosis Introduction

Figure 7.22



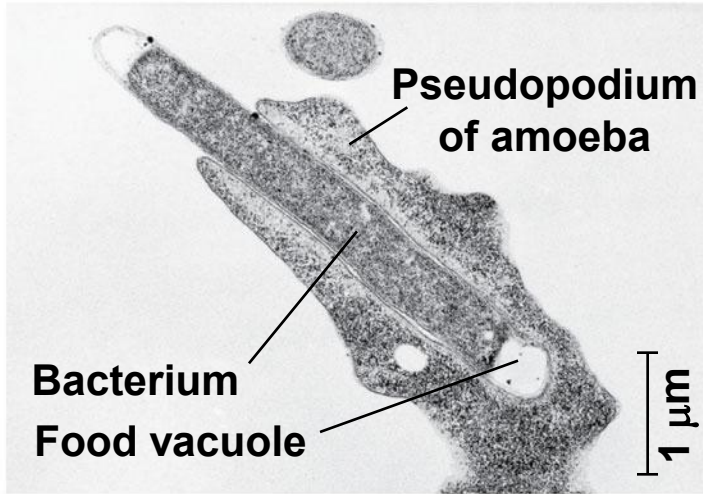
- In **phagocytosis** a cell engulfs a particle in a vacuole
- The vacuole fuses with a lysosome to digest the particle

like WBC

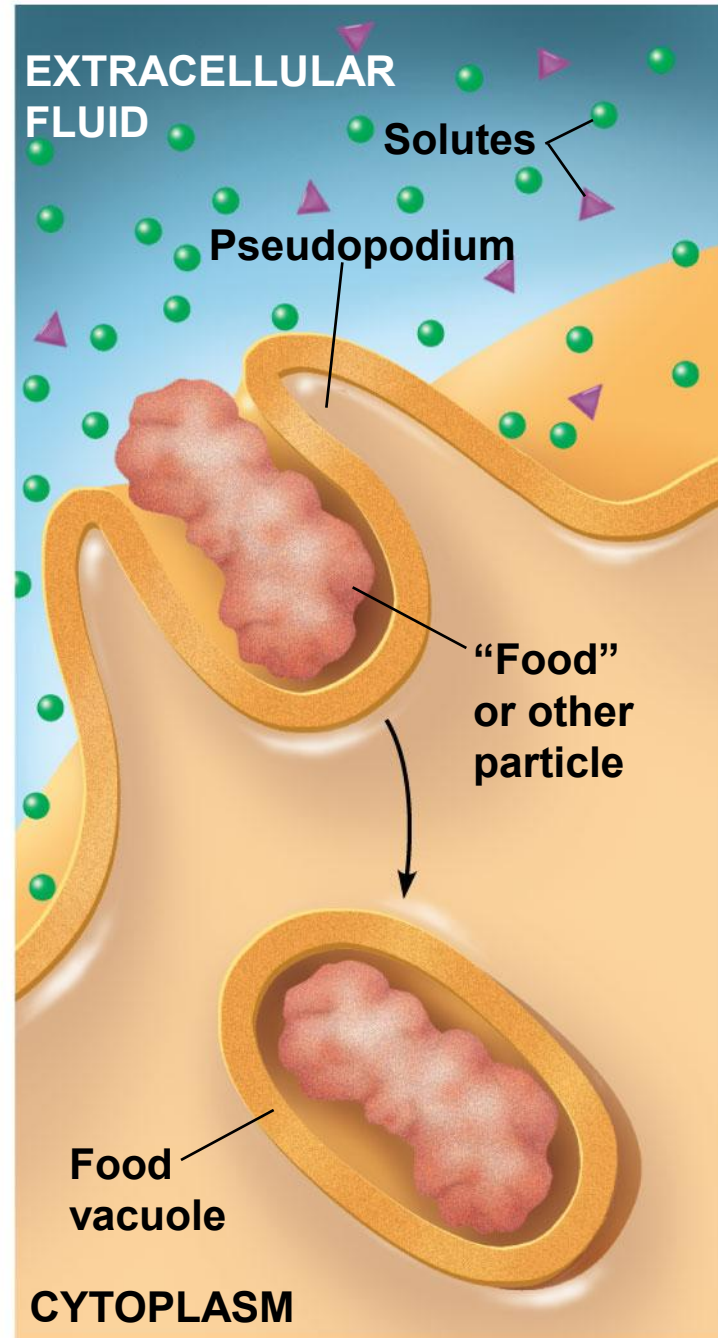


Animation: Phagocytosis

Phagocytosis



An amoeba engulfing a bacterium via phagocytosis (TEM).



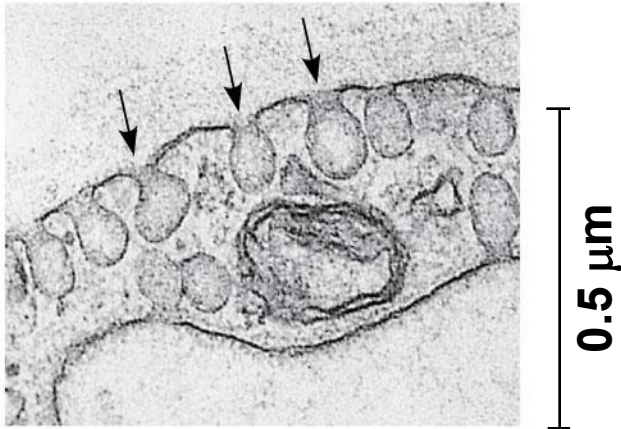
لما تكون المواد ذائبة

- In **pinocytosis**, molecules are taken up when extracellular fluid is “gulped” into tiny vesicles



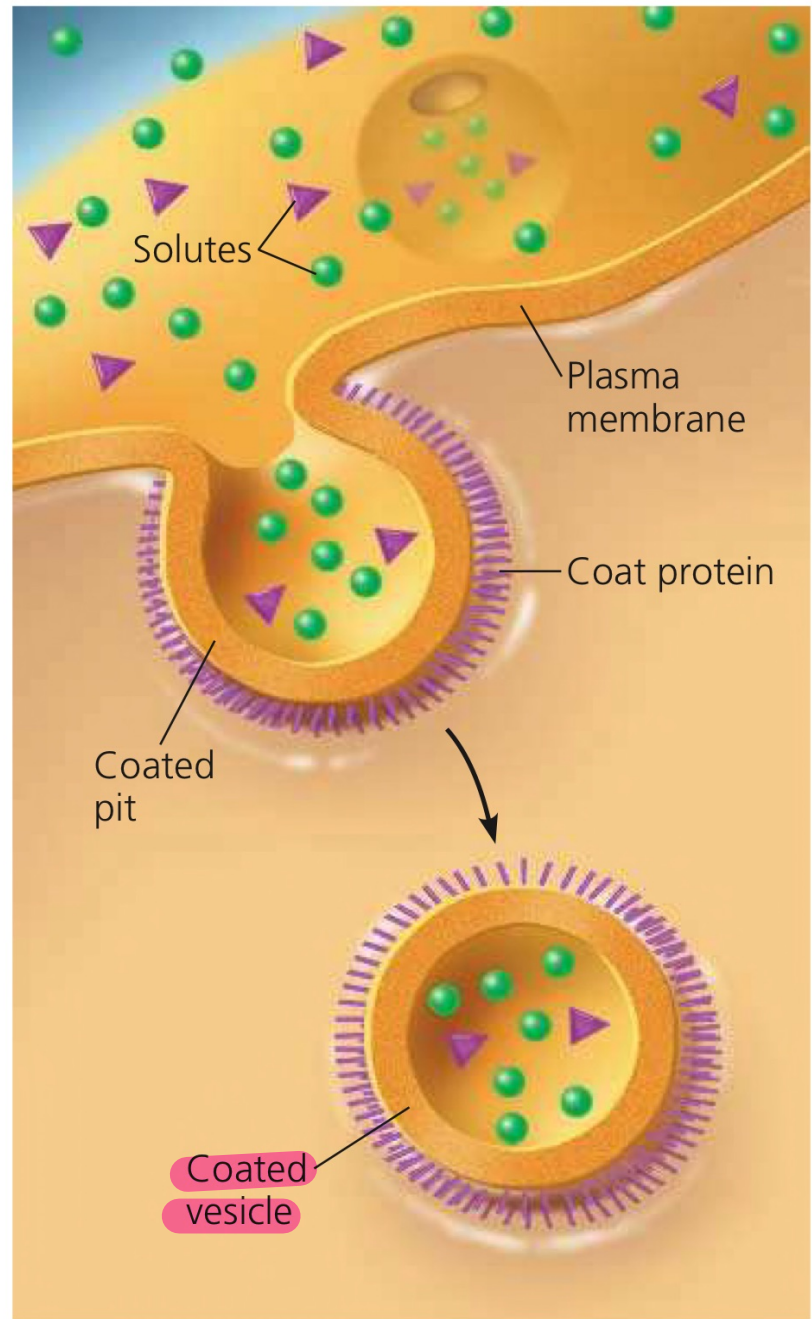
Animation: Pinocytosis

Pinocytosis



Pinocytosis vesicles forming in a cell lining a small blood vessel (TEM).

The solute in this process is smaller than the solute in Phagocytosis



- In **receptor-mediated endocytosis**, binding of ligands to receptors triggers vesicle formation
- A **ligand** is any molecule that binds specifically to a receptor site of another molecule

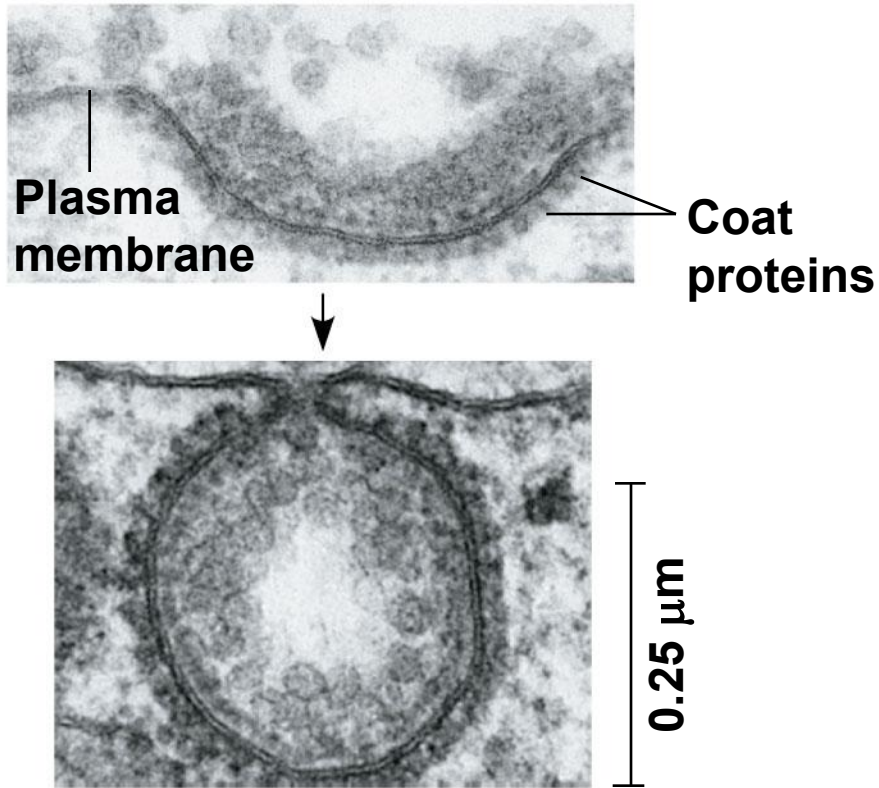
like cholesterol movement

- 1) can't move through the blood because it is hydrophobic so there is a specific protein called "low density lipoprotein" LDL which carry the cholesterol to move it in blood (Ligand)
- 2) Doesn't get in all cell only enter the cells that have a receptor for it with the ligand
Cholesterol and LDL

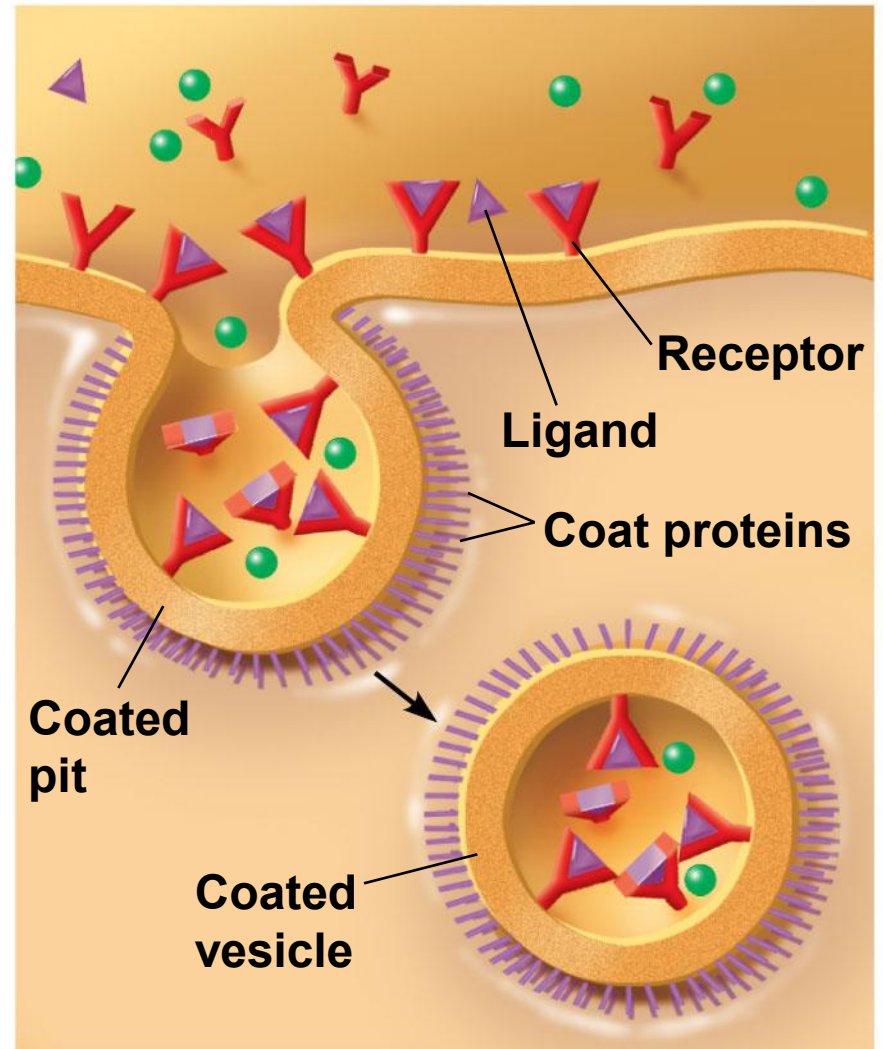


Animation: Receptor-Mediated Endocytosis

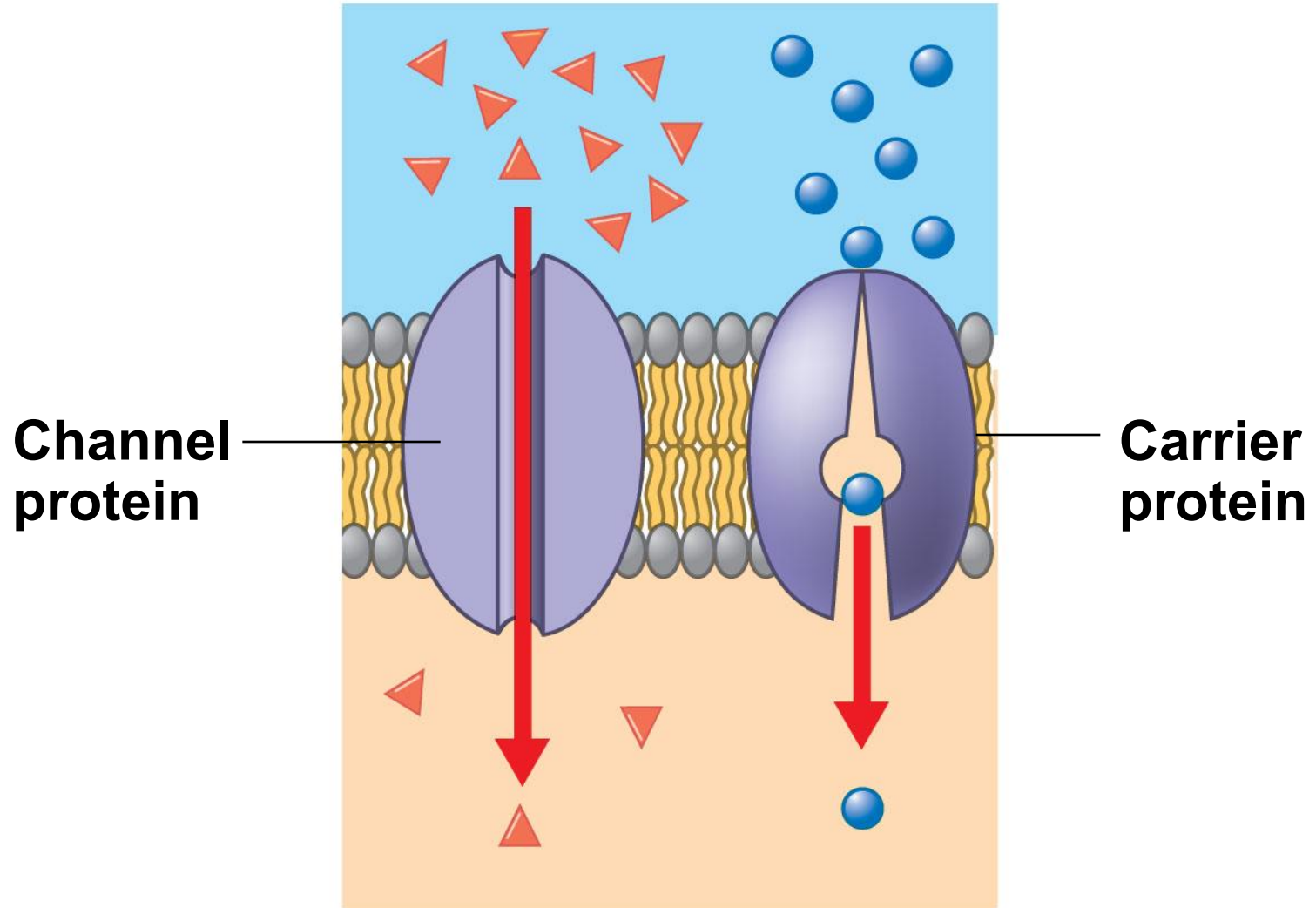
Receptor-Mediated Endocytosis



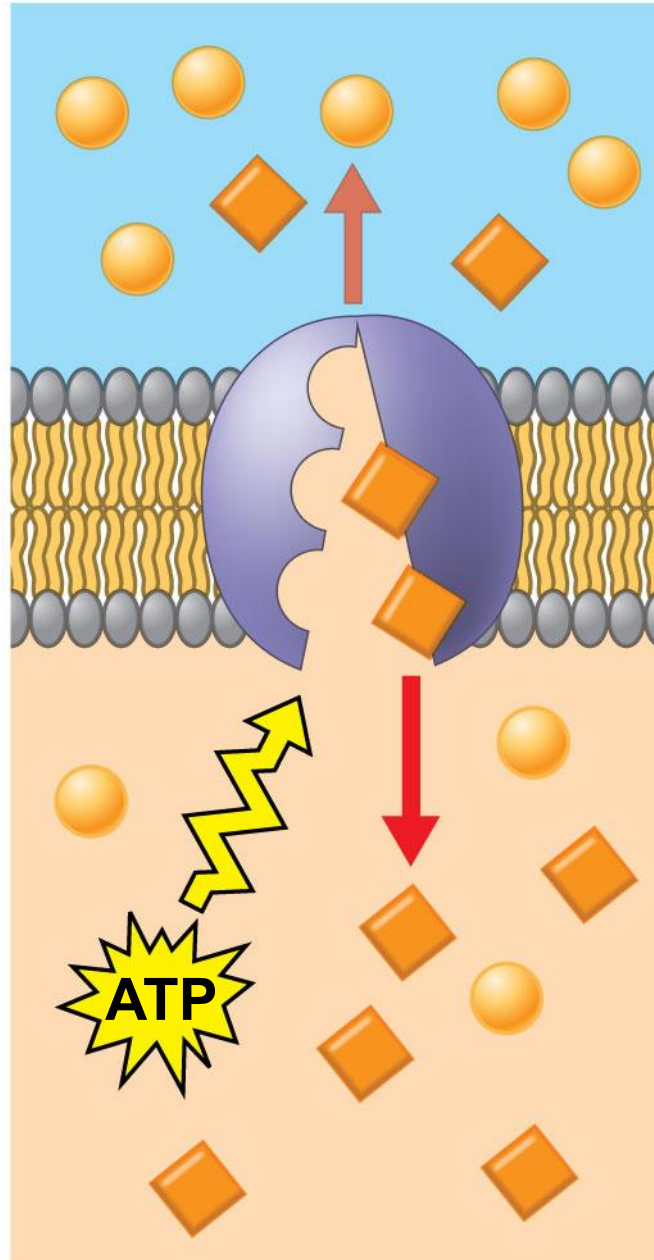
Top: A coated pit. **Bottom:** A coated vesicle forming during receptor-mediated endocytosis (TEMs).

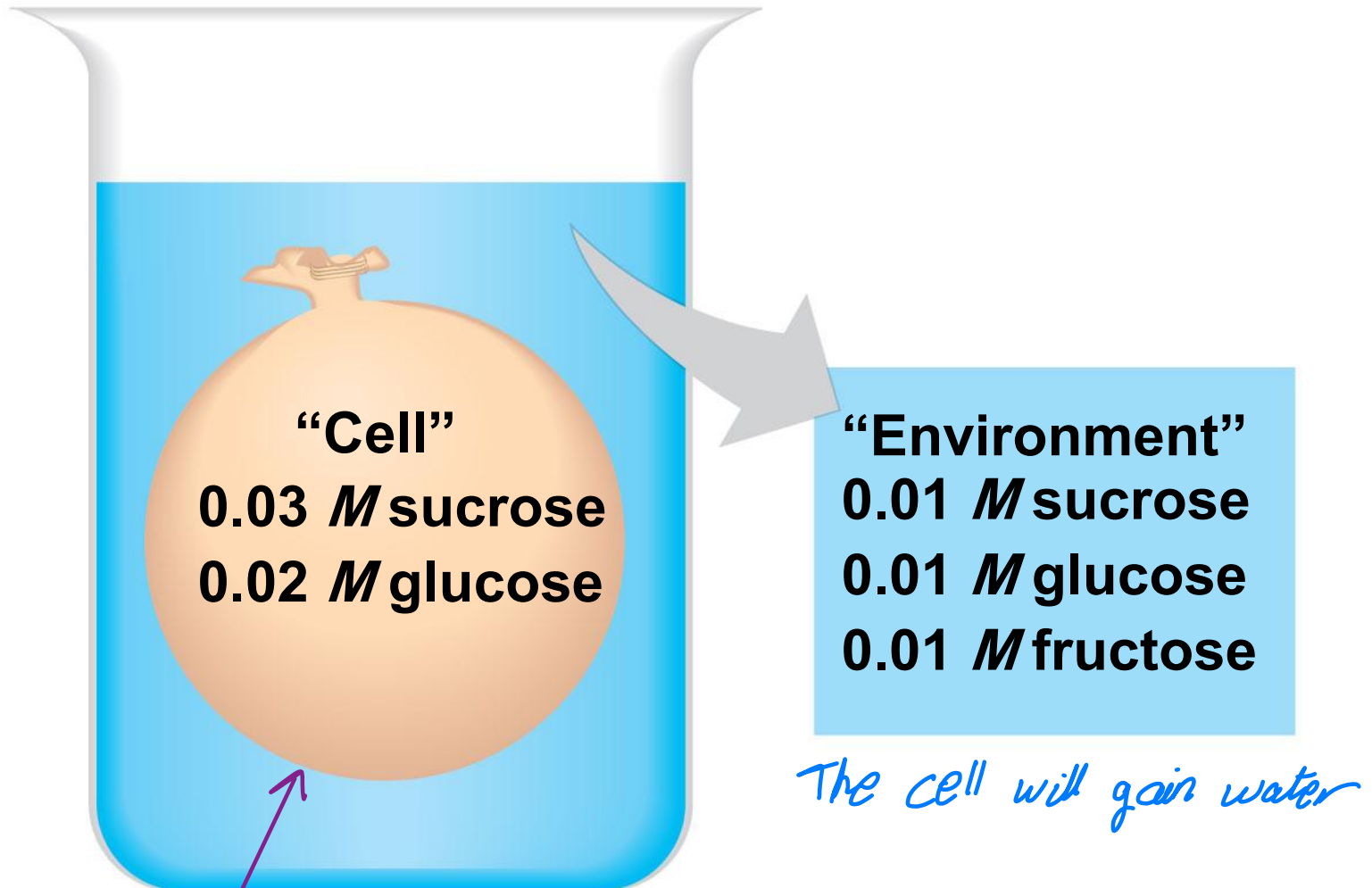


Passive transport: Facilitated diffusion



Active transport

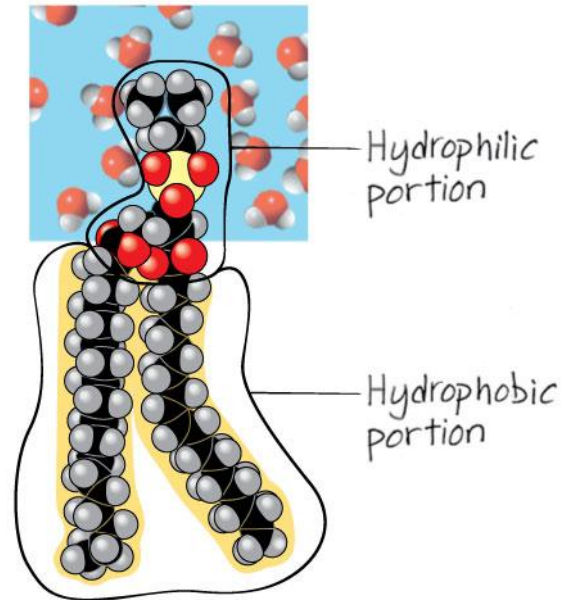




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this is a selective permeable membrane (doesn't allow solutes to pass)

Figure 7.UN04



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