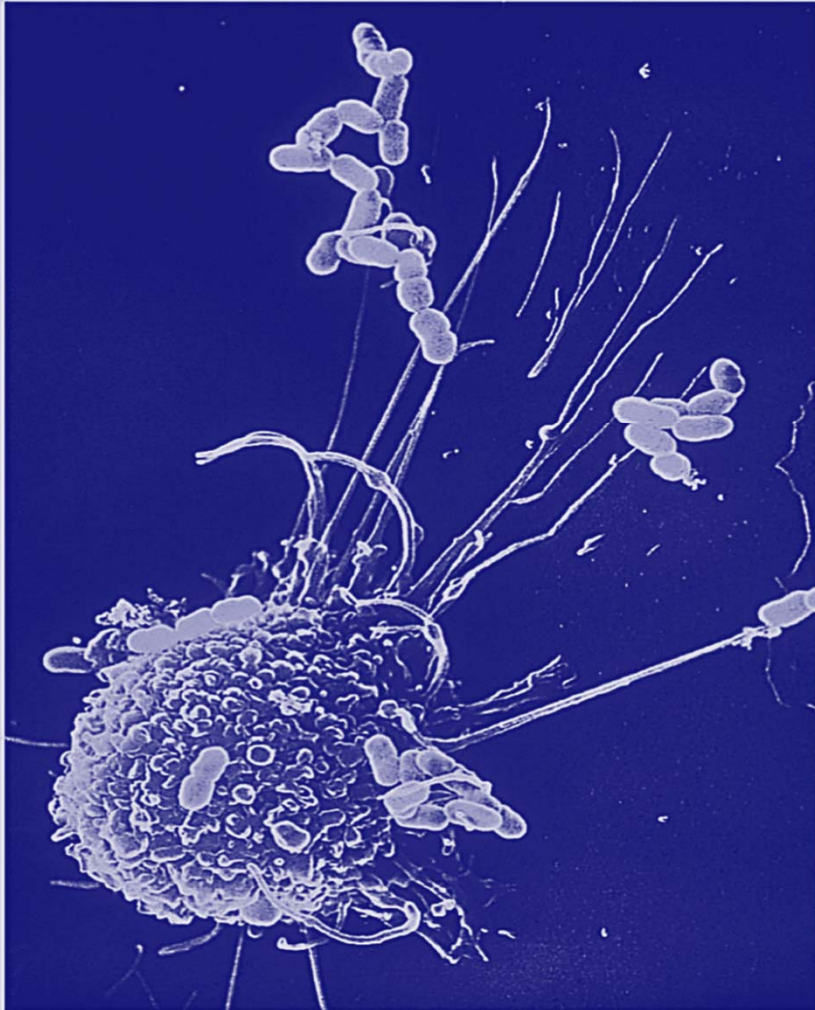


**CELL BIOLOGY &
PHYSIOLOGY**

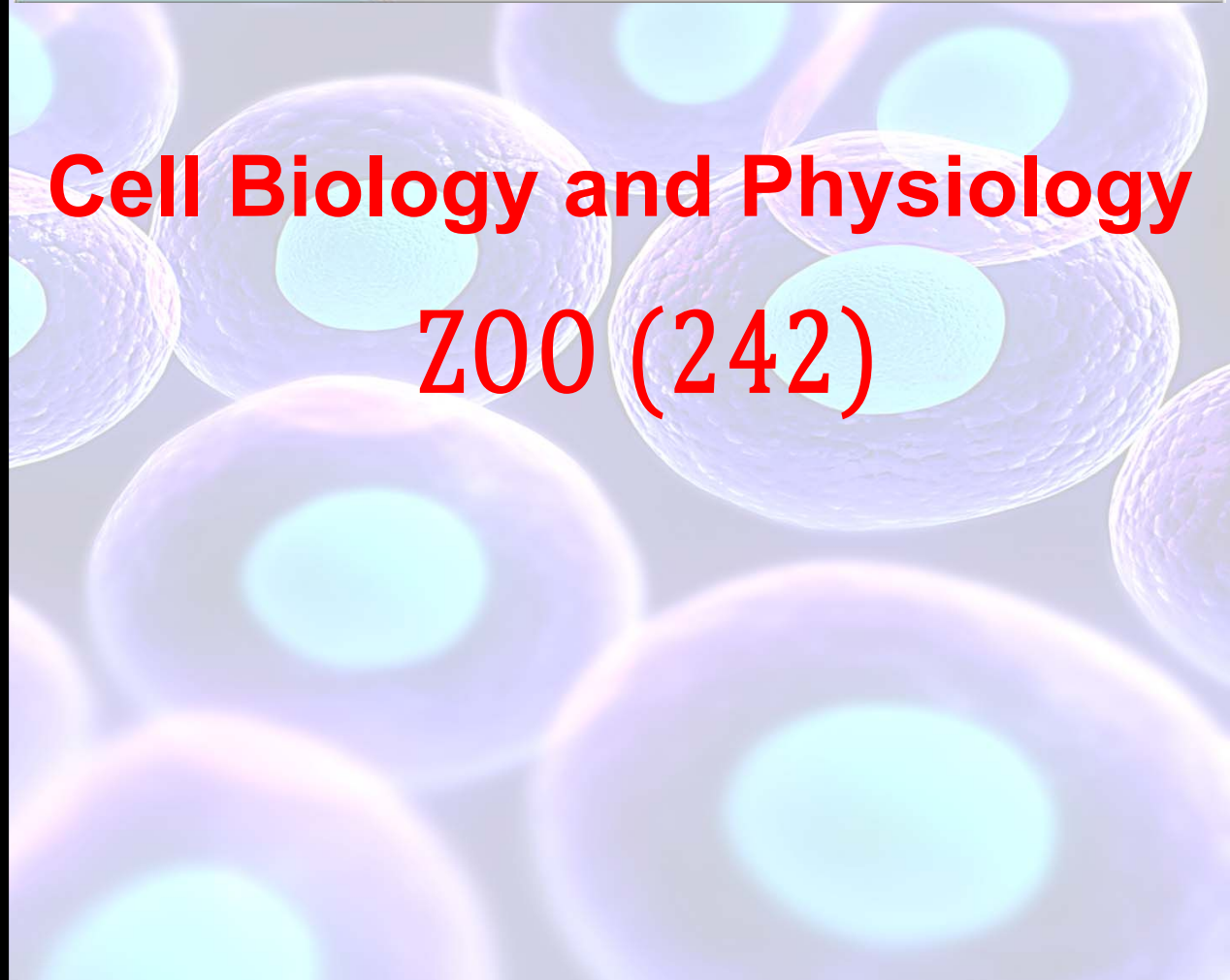
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King Saud University



college of sciences
Zoology Department

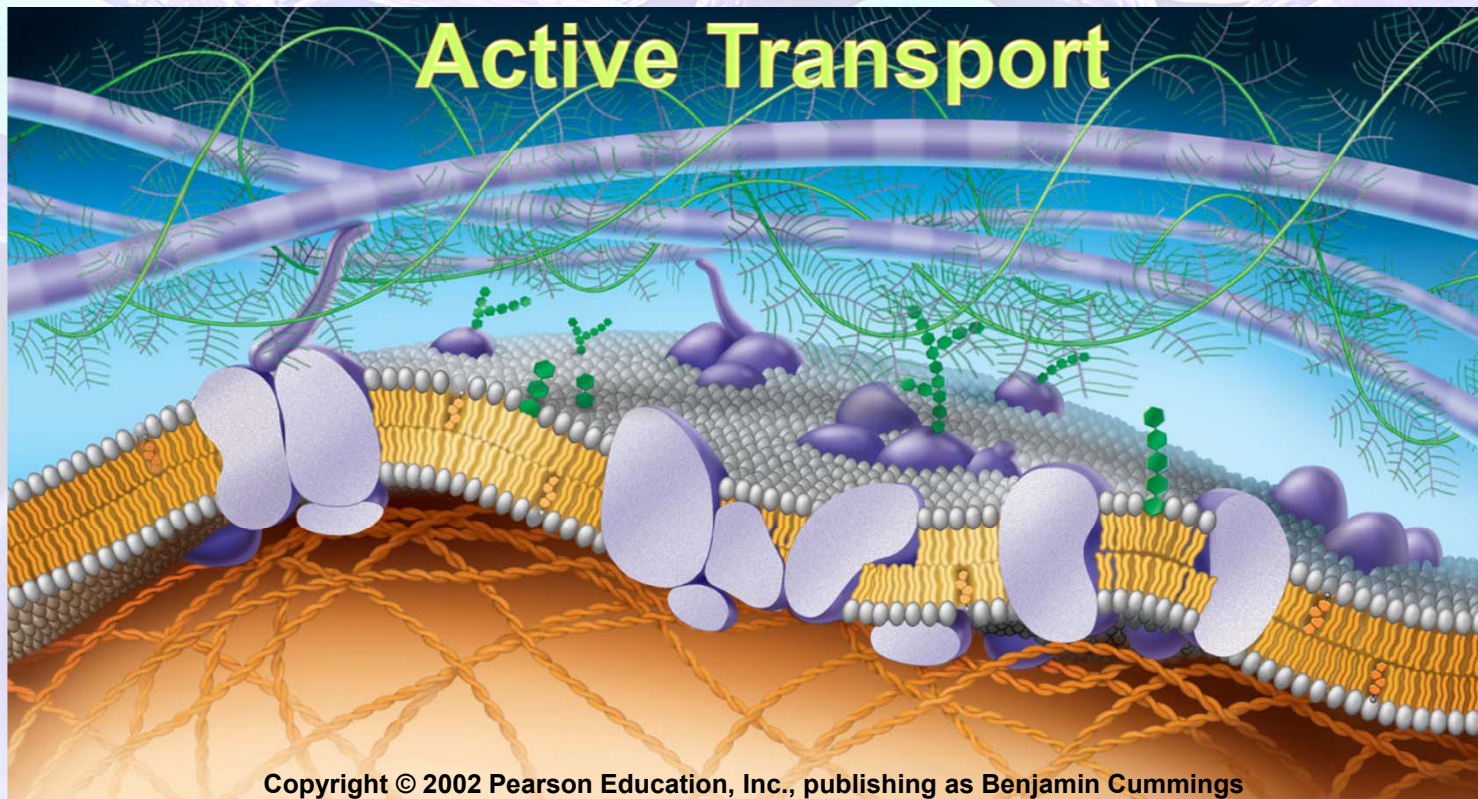


**Cell Biology and Physiology
ZOO (242)**



بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

How things get into and out of the cell?



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Objectives

B)- Active transport

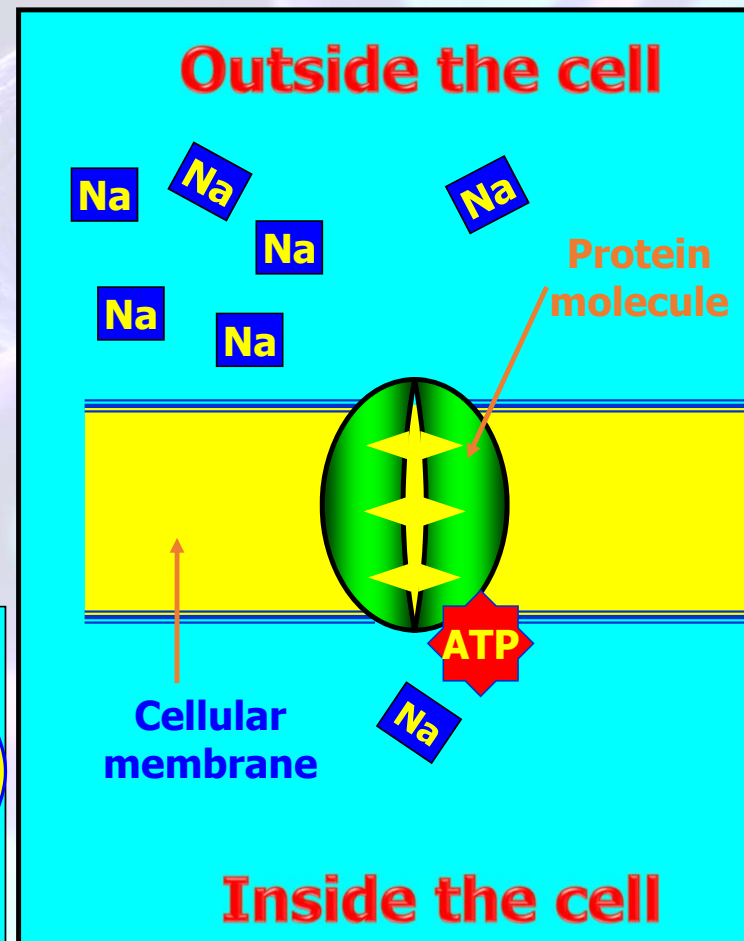
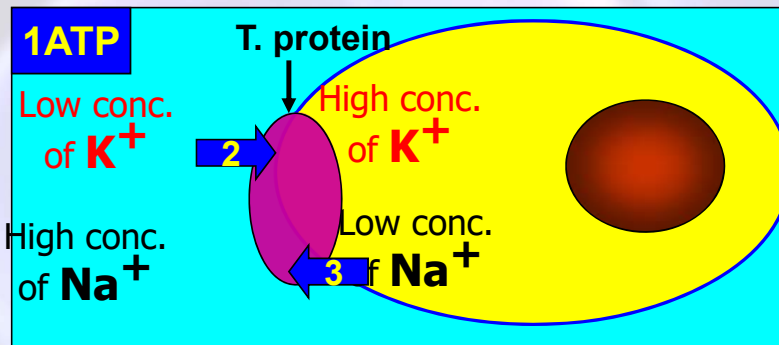
- **Transport of small molecules**
- **Transport of large molecules (macromolecules).**
 - **Exocytosis**
 - **Endocytosis**
 - **Phagocytosis**
 - **Pinocytosis**
 - **Receptor-mediated endocytosis**

Active transport: pumping ضخ of solutes against their
concentration gradient الإنحدار التركيبي

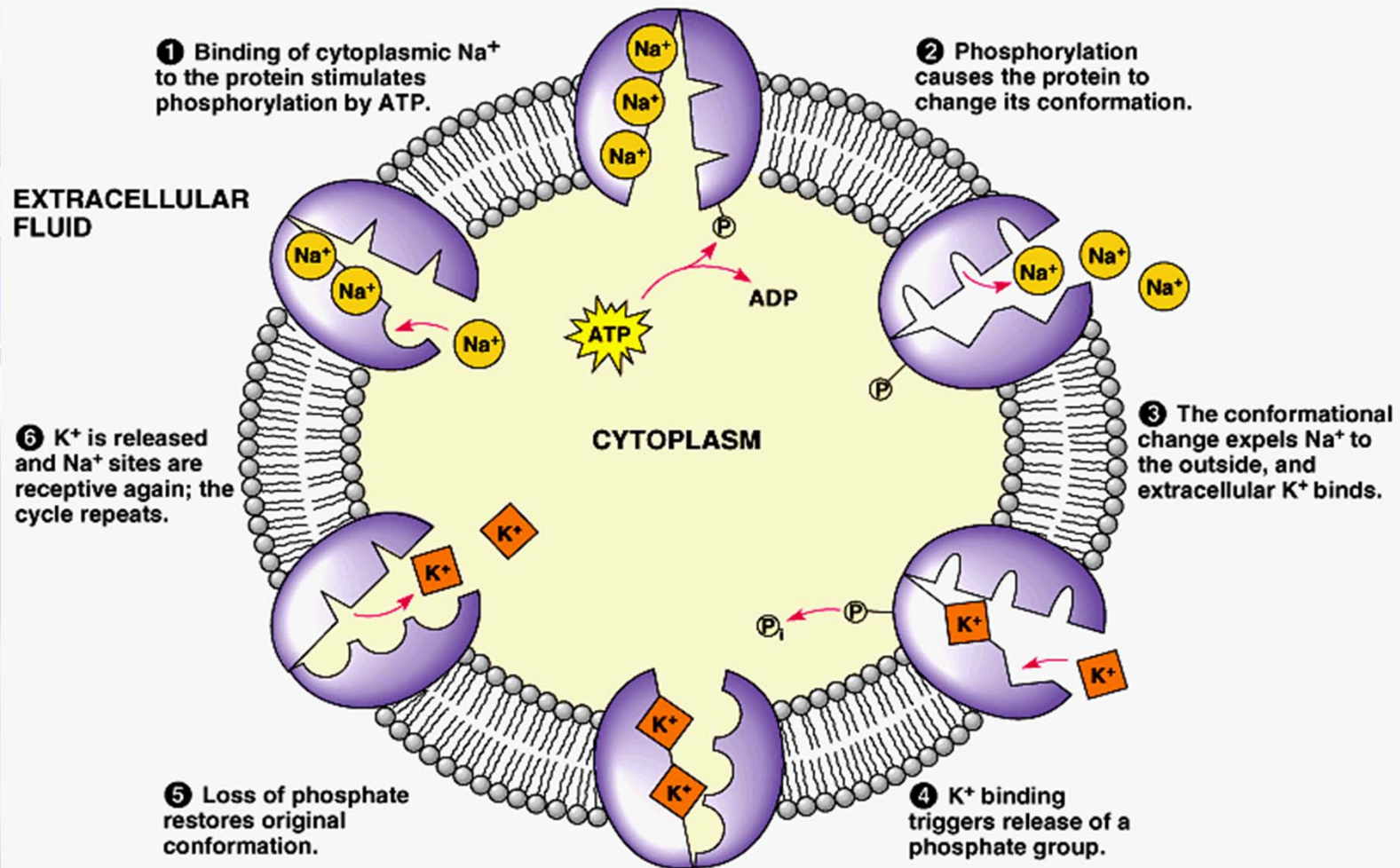
- Some facilitated transport proteins can move solutes **against their concentration gradient**, from the side where they are **less concentrated** to the side where they are **more concentrated**.
- This active transport requires metabolic **energy via ATP**.
- Active transport is critical **بالغ الأهمية** for a cell to maintain its internal concentrations of small molecules.
- Active transport is performed by specific proteins embedded in the membranes called **transport protein (T. protein)**.

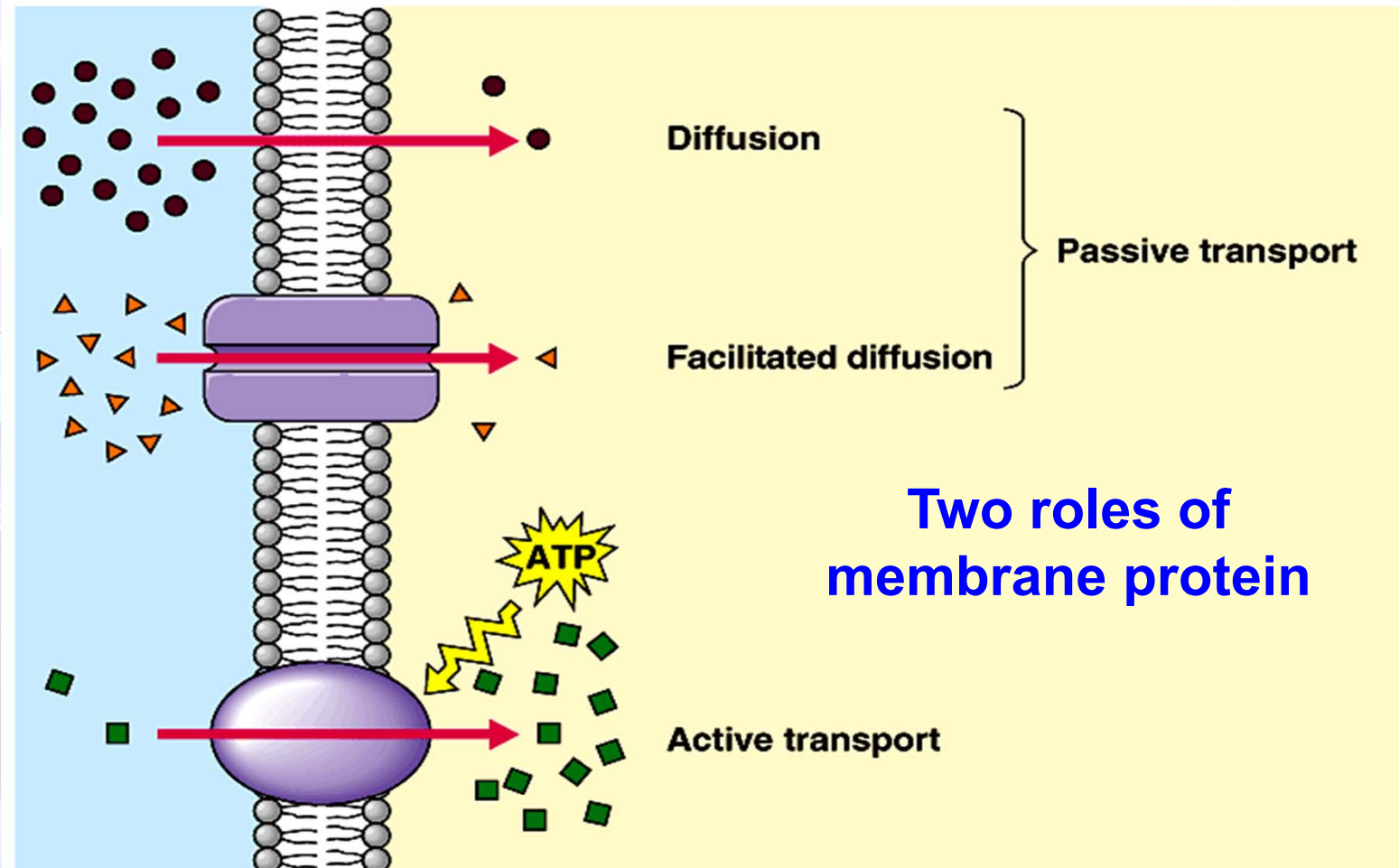
1)- Transport of small molecules (Ions)

- The sodium-potassium pump actively maintains the gradient of sodium (Na^+) and potassium ions (K^+) across the membrane.
 - The animal cell has higher concentrations of K^+ and lower concentrations of Na^+ inside the cell.
 - The sodium-potassium pump (T. protein) uses the energy of one ATP to pump 3 Na^+ ions out and 2 K^+ ions in.



Sodium-potassium pump





Both diffusion and facilitated diffusion are forms of passive transport of molecules **down their concentration gradient**, while active transport requires an investment of energy to move molecules **against their concentration gradient**.

2)- Transport of large molecules (macromolecules)

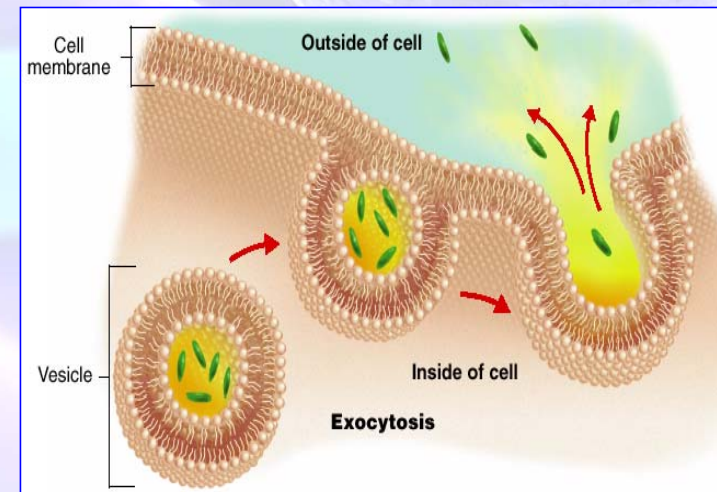
Large molecules are transported by Exocytosis and endocytosis

- ❖ Small molecules and water enter or leave the cell through the lipid bilayer or by transport proteins.
- ❖ Large molecules, such as **polysaccharides**, **proteins** and **lipoprotein particles** cross the membrane by vesicles أوعية.

1. Exocytosis الإخراج الخلوي:

A transport vesicle budded from **من ينشأ** the Golgi apparatus is moved by the cytoskeleton to the plasma membrane.

When the two membranes come in contact **يتلامس**, the bilayers fuse **يندمج** and spill **يُفرع** the contents to the outside.



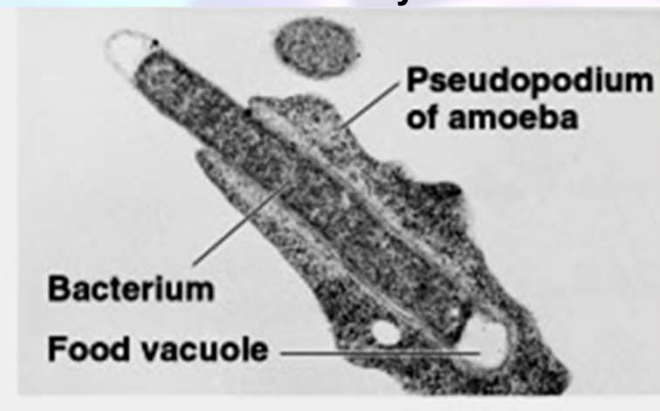
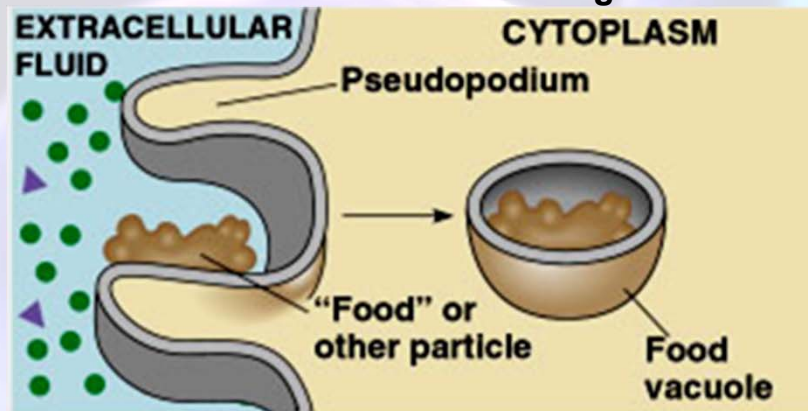
Transport of large molecules (macromolecules)

2- Endocytosis الإيدخال الخلوي:

A cell brings in macromolecules and particulate matter by forming new vesicles from the plasma membrane and include the following:

A)- Phagocytosis الإبتلاع الخلوي:

- Called “cellular eating”. The cell engulfs **تبتلع** a particle by extending pseudopodia **أقدام كاذبة** around it and packaging it **تغلفها** in a large vacuole.
- The contents of the vacuole are digested when the vacuole fuses with a lysosome.

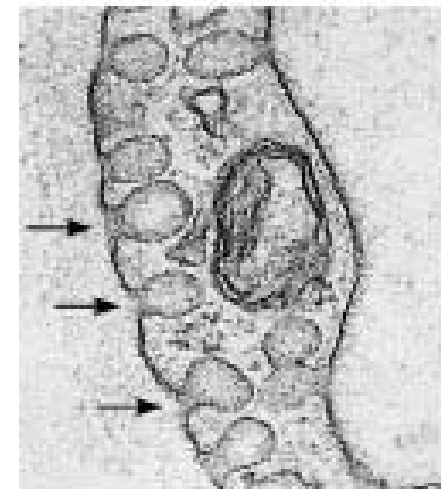
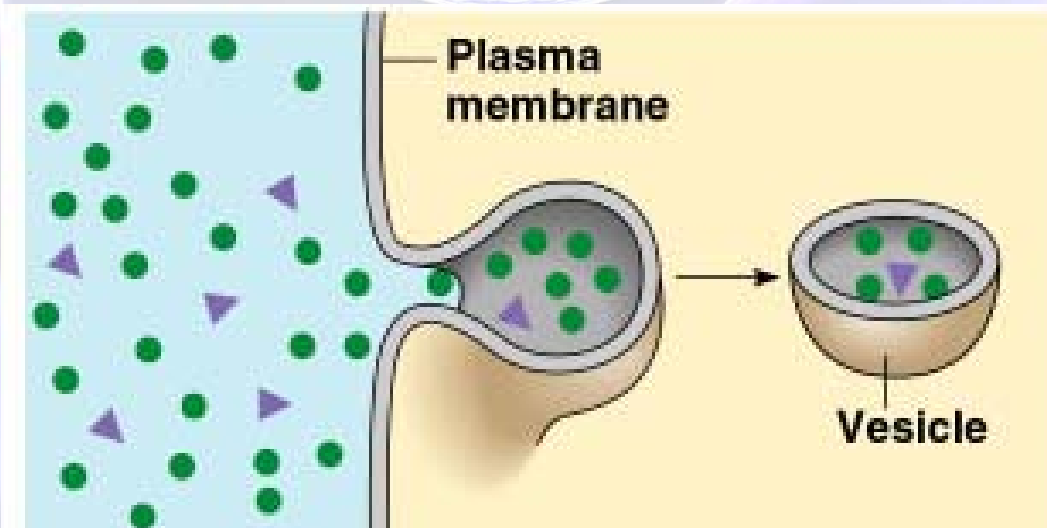


Transport of large molecules (macromolecules)

B)- Pinocytosis, الشرب الخلوي “cellular drinking”.

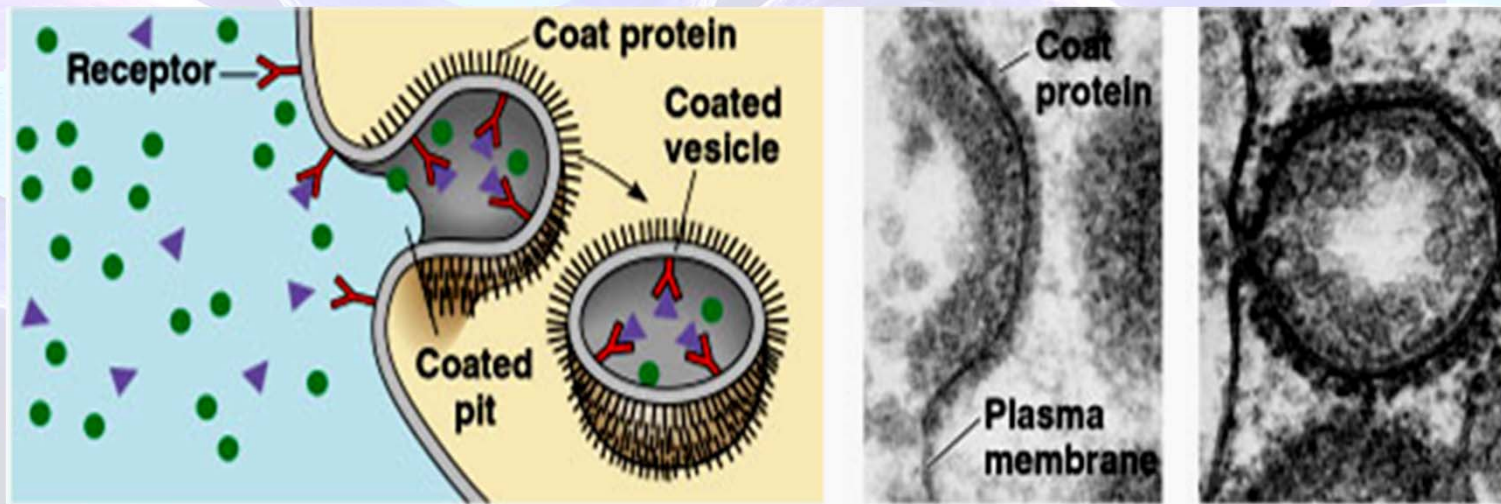
A cell creates a vesicle around droplets نقاط of extracellular fluid
السائل الموجود خارج الخلية.

- This is a non-specific process عملية غير متخصصة.



Transport of large molecules (macromolecules)

C)- Receptor-mediated endocytosis: الإدخال الخلوي عن طريق المستقبلات المتخصصة

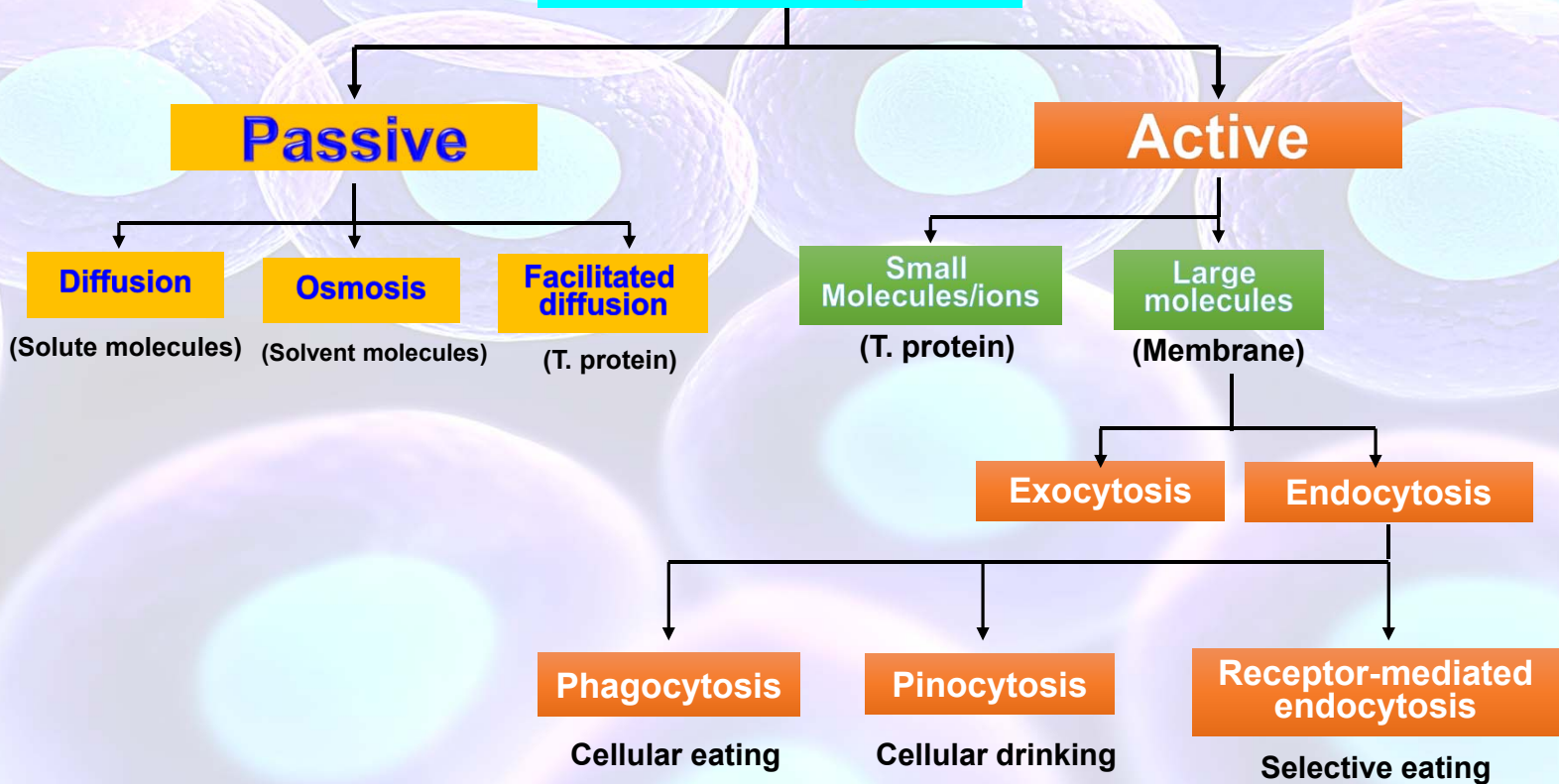


It is called (**Selective eating**) which is very specific in what substances are being transported.

- It is triggered **تستحث** when extracellular substances bind to special receptors **مُستقبلات خاصة**, on the membrane surface. This triggers the formation of a vesicle
- It enables a cell to take large quantities of specific materials that may be in low concentrations in the environment.

Summary

Cell Transport



References

- “**membrane structure and function**” chapter 07 **Biology** by Jane B Reece; Neil A Campbell; et al Boston : Benjamin Cummings / Pearson, ©2011. English : 9th ed.