Ankara University, Faculty of Agriculture , Department of Fisheries and Aquaculture, Programme of Fisheries and Aquaculture

# AQS104: Biochemistry

Reference: Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2008). ***Lehninger Principles of Biochemistry (5th edition)***. Macmillan.

| AQS104 BIOCHEMISTRY: Weekly Programme | |
|---|---|
| **1. Week:**<br>• The foundations of biochemistry<br>• Water | **8. Week:**<br>Principles of metabolic regulation<br>The citric acid cycle |
| **2. Week:**<br>• Amino acids, peptides, and proteins<br>• The three-dimensional structure of proteins | **9. Week:**<br>Fatty acid catabolism<br>Aino acid oxidation and the production of urea |
| **3. Week:**<br>• Protein function<br>• Enzymes | **10. Week:**<br>Oxidative phosphorylation and photophosphorylation<br>Carbohydrate biosynthesis in plants and bacteria |
| **4. Week:**<br>• Carbohydrates and Glycobiology<br>• Nucleotides and Nucleic Acids | **11. Week:**<br>Lipid biosynthesis<br>Biosynthesis of amino acids, nucleotides, and related molecules |
| **5. Week:**<br>• DNA-based information technologies<br>• Lipids | **12. Week:**<br>Hormonal regulation and integration of mammalian metabolism<br>Genes and chromosomes |
| **6. Week:**<br>Biological membranes and transport<br>Biosignaling | **13. Week:**<br>DNA metabolism<br>RNA metabolism |
| **7. Week:**<br>Bioenergetics and biochemical reaction types<br>Glycolysis, gluconeogenesis, and the pentose phosphate pathway | **14. Week:**<br>Protein metabolism<br>Regulation of gene expression |

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## 6. Week:

## Biological Membranes and Transport

## Biosignaling

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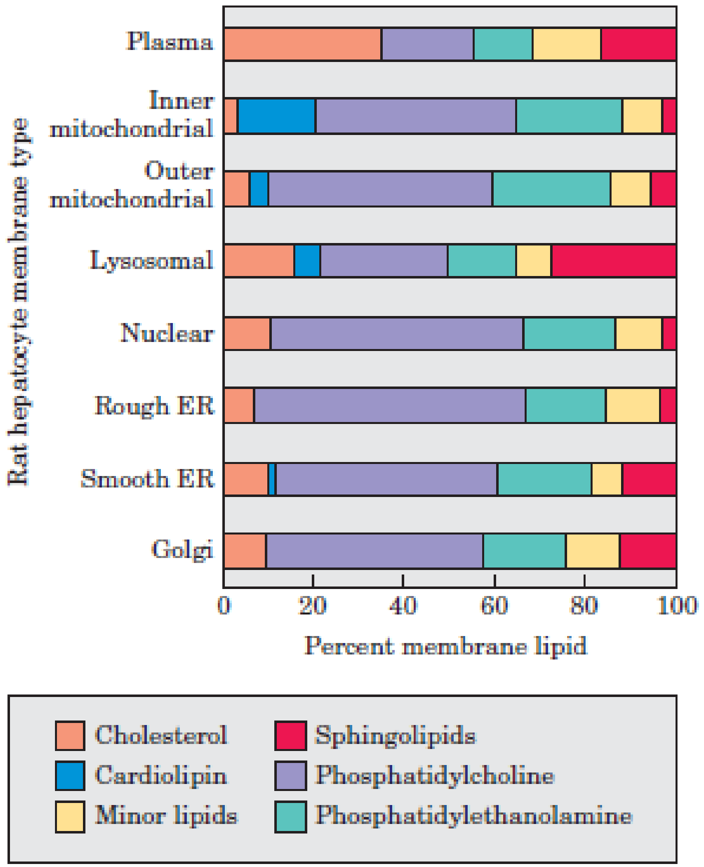


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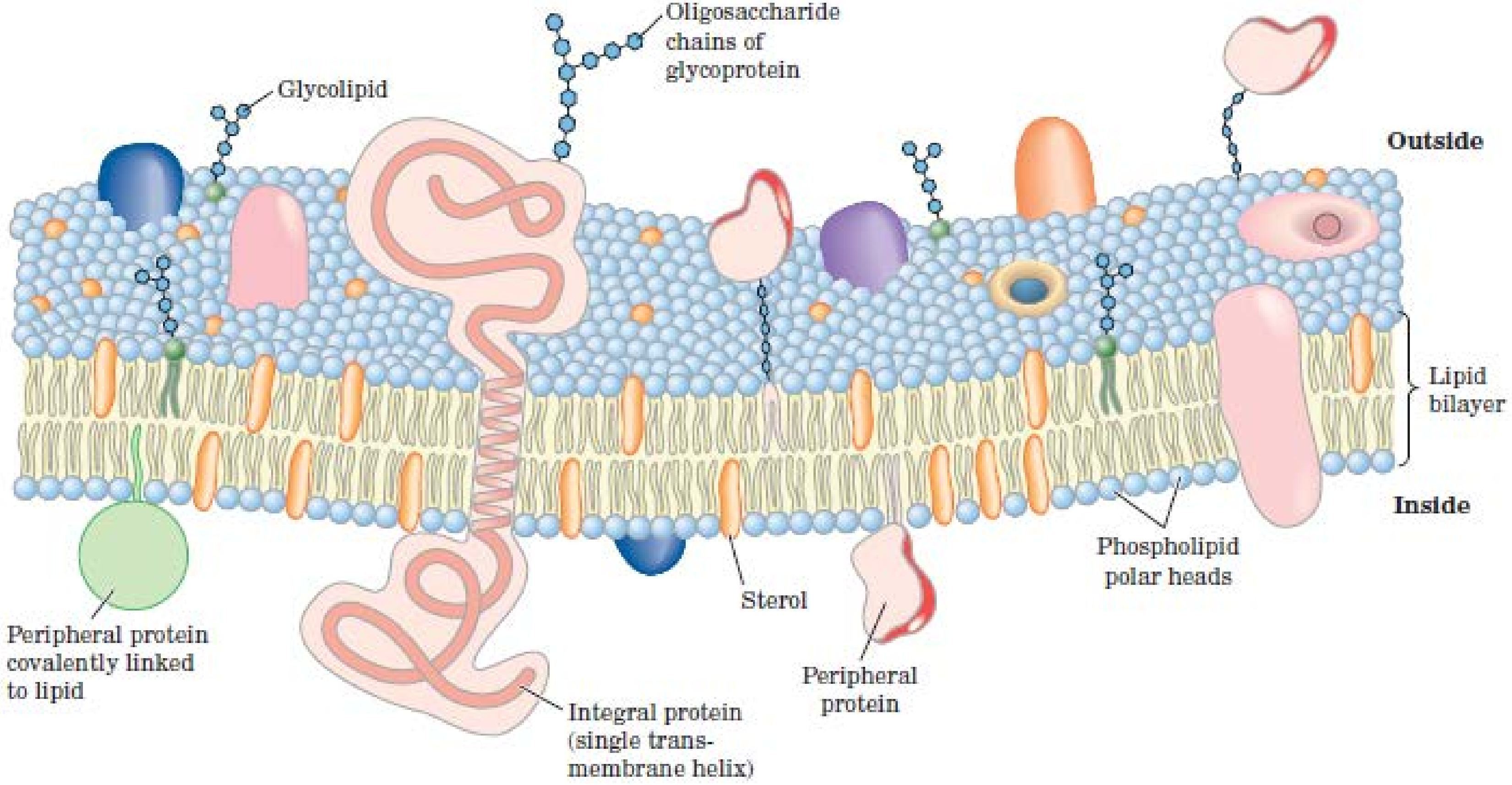


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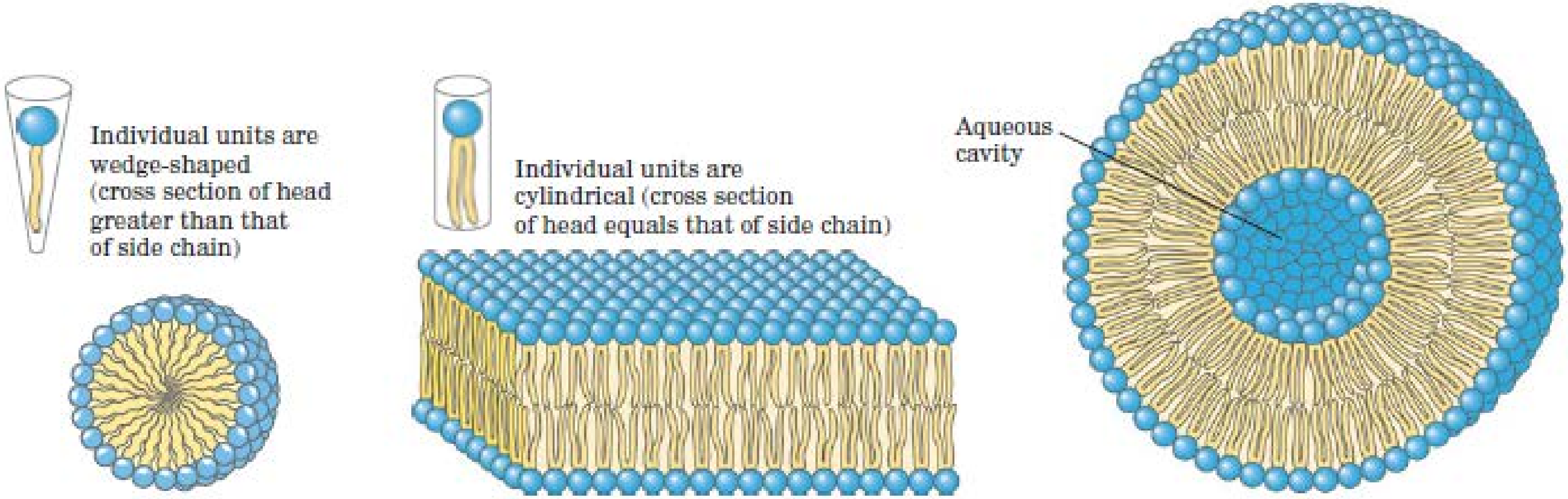


**(a) Micelle** **(b) Bilayer** **(c) Vesicle**

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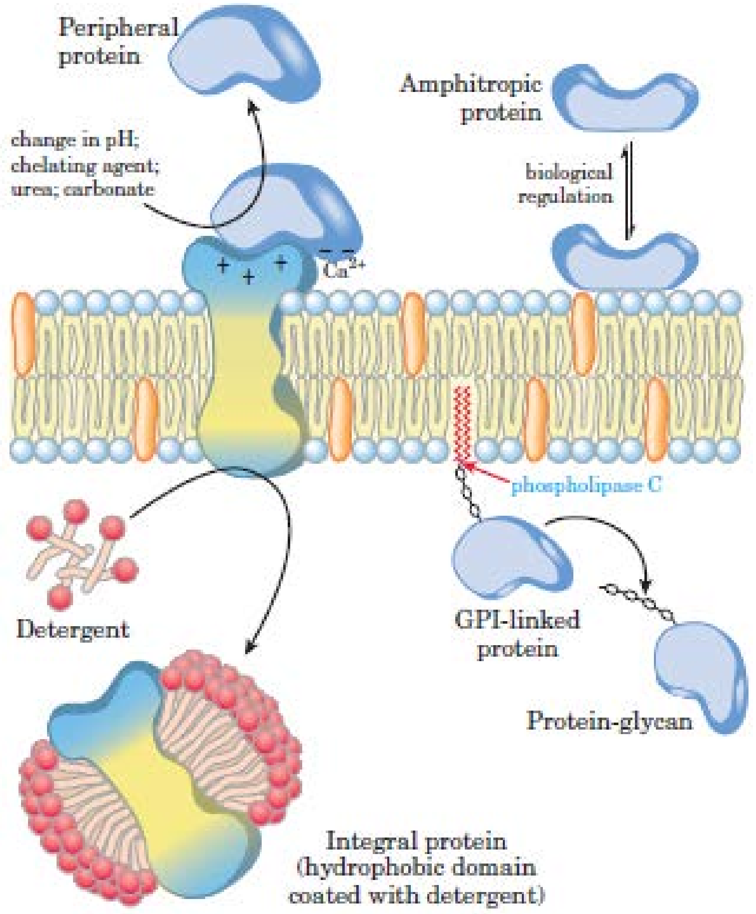

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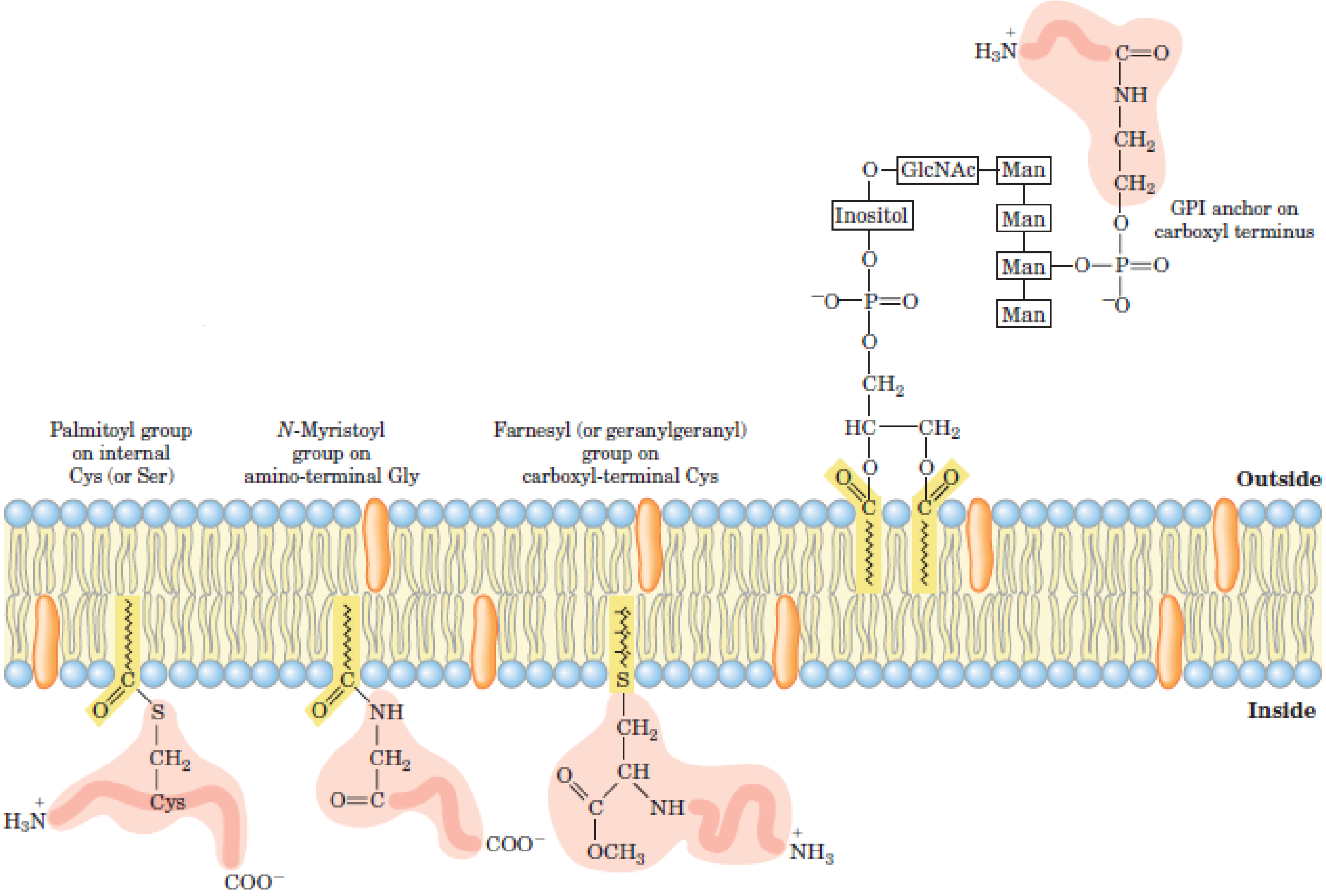

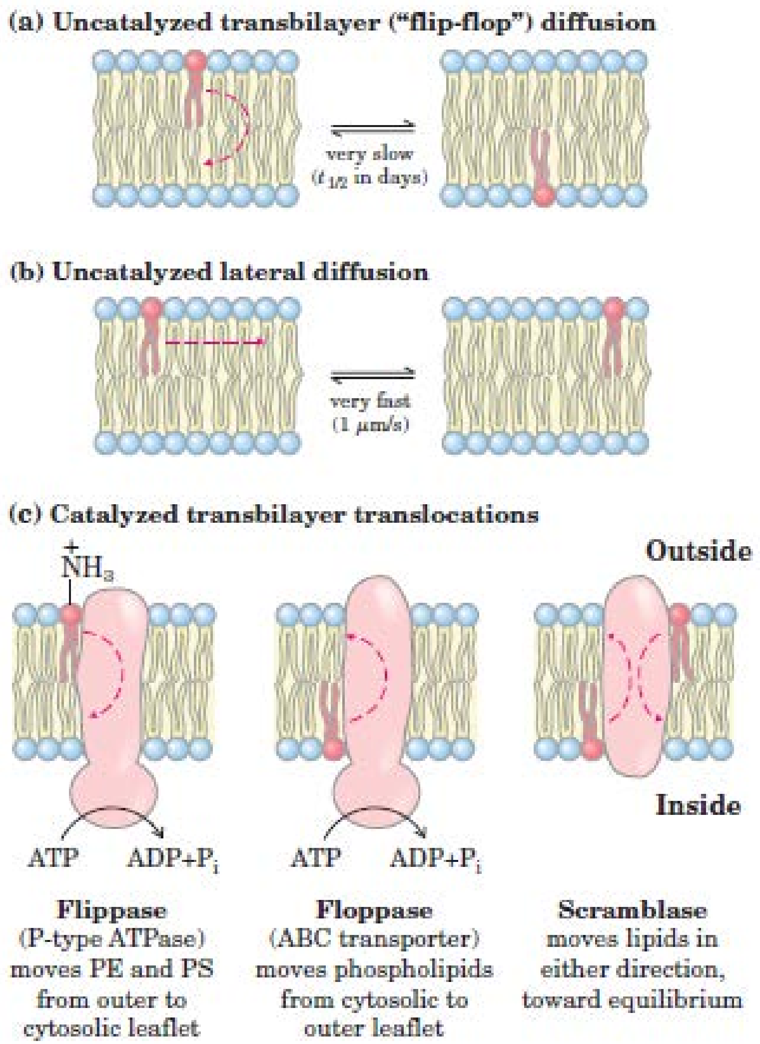


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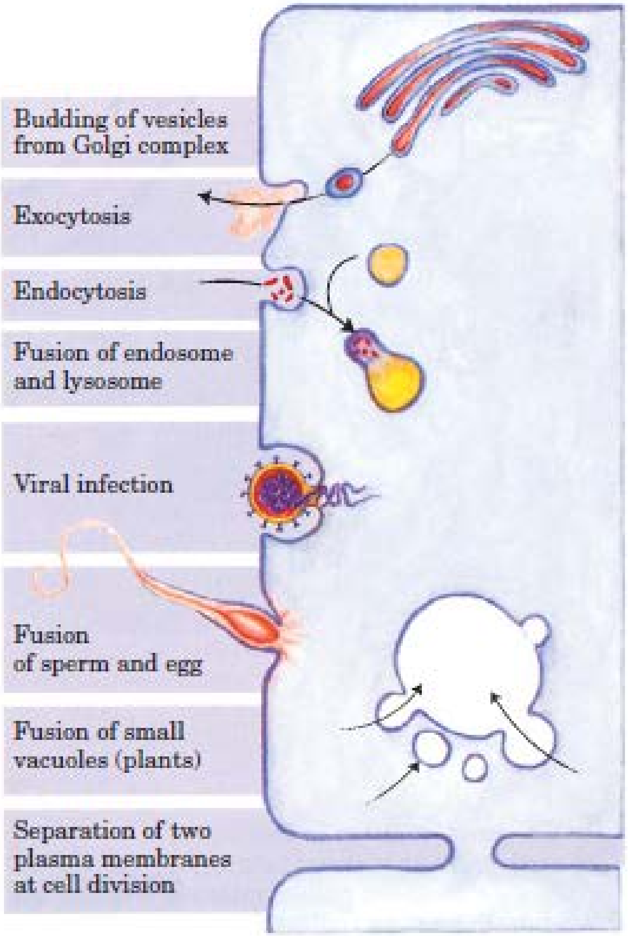


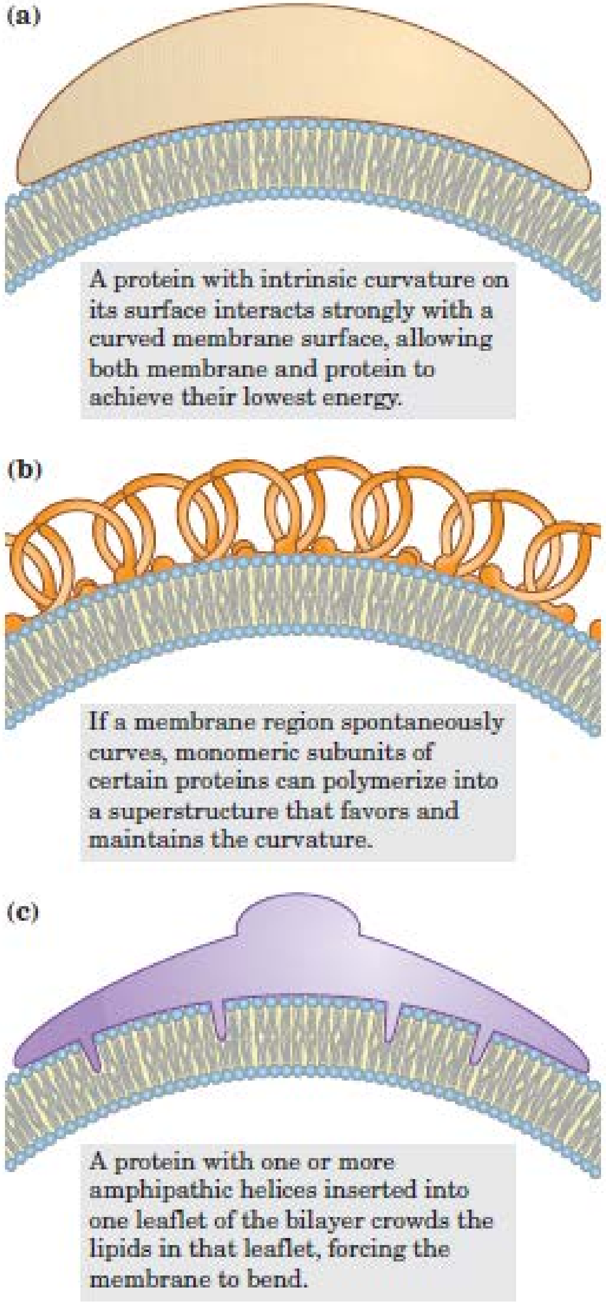

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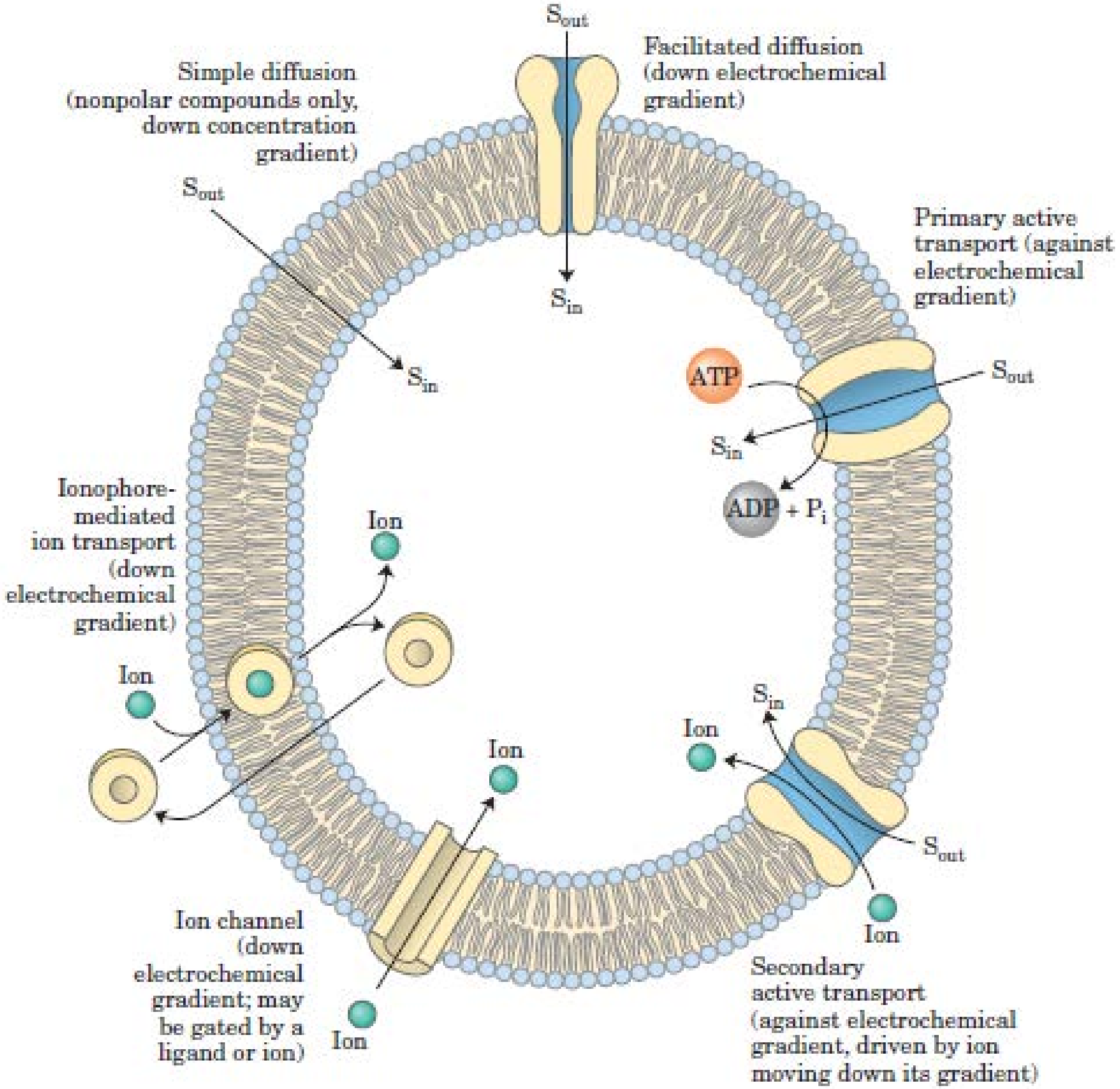

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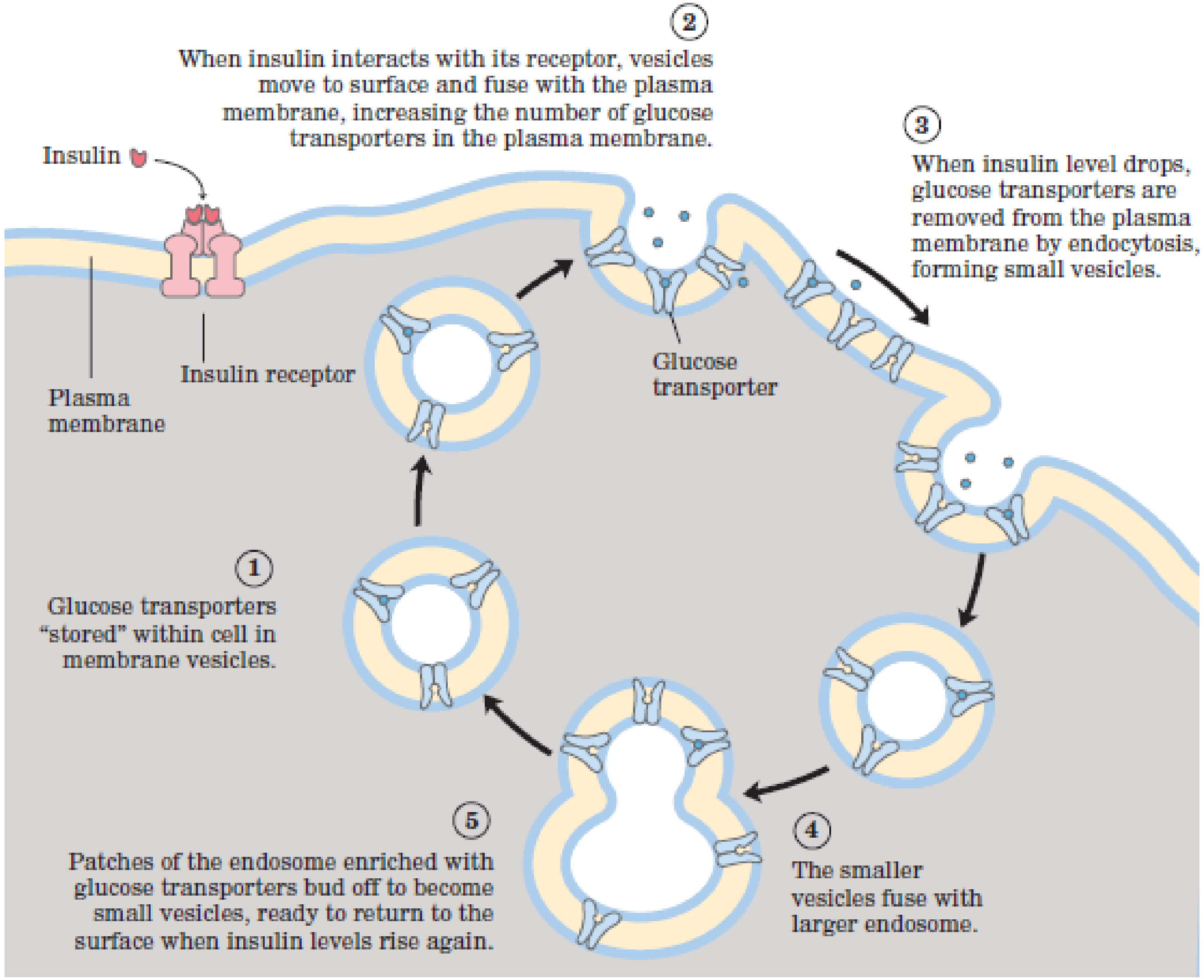

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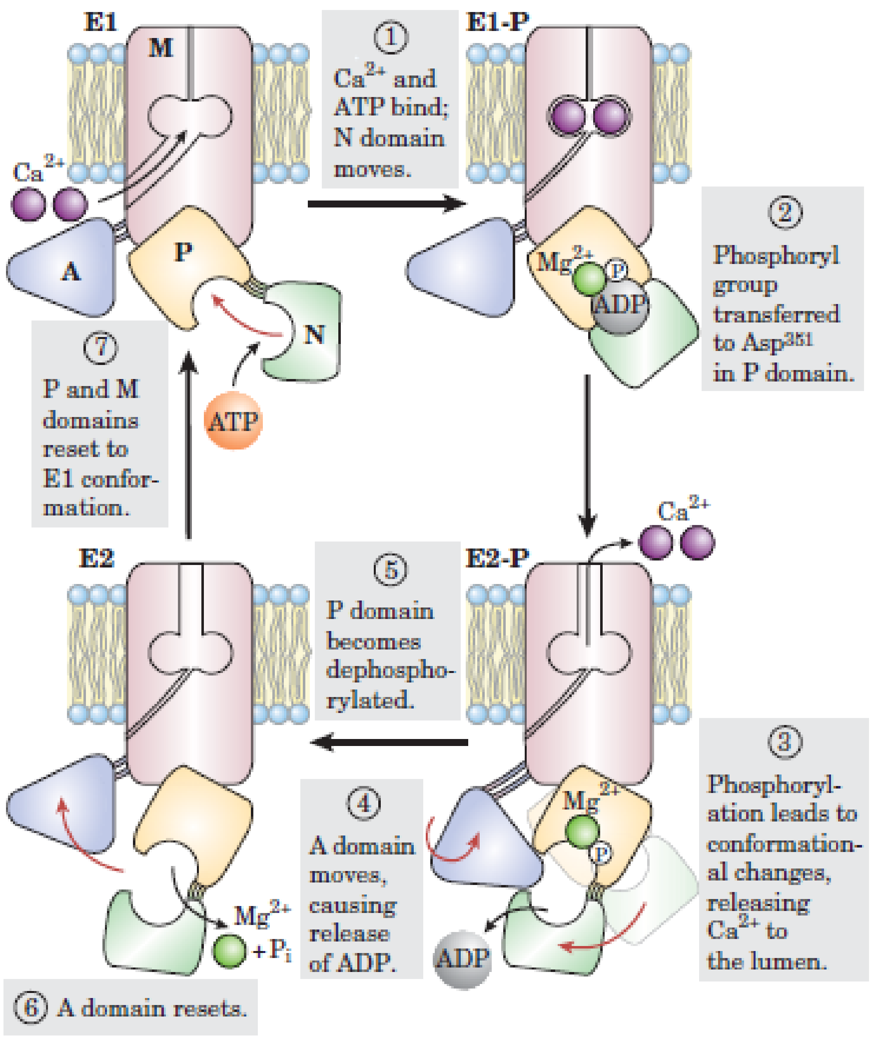

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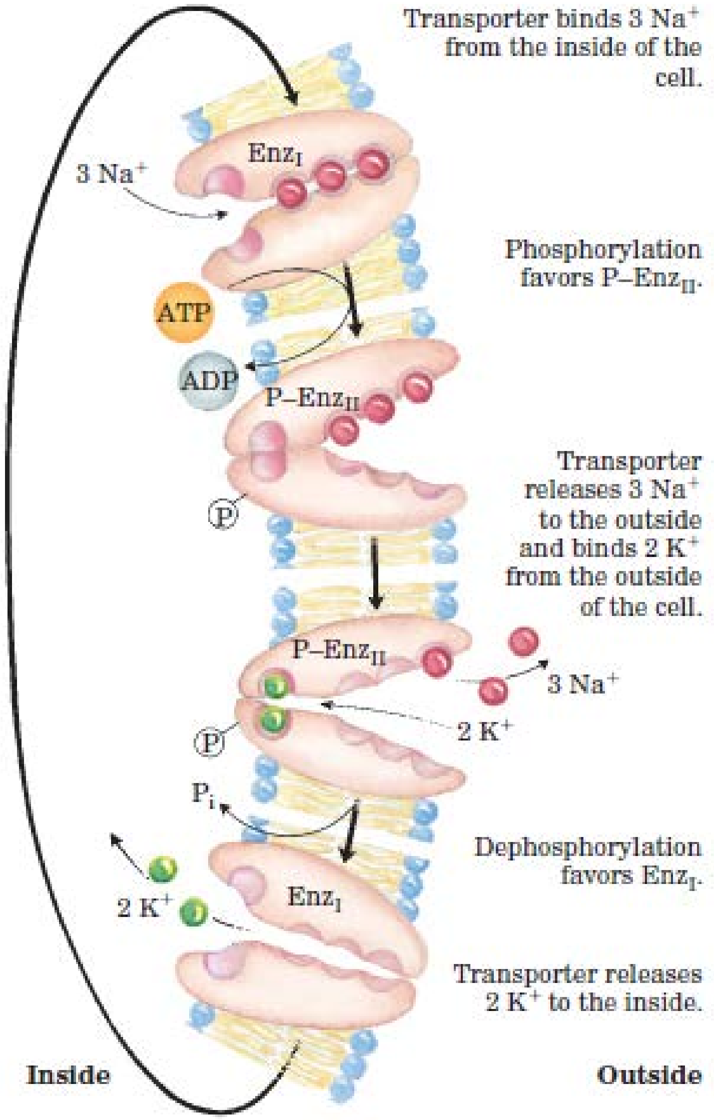

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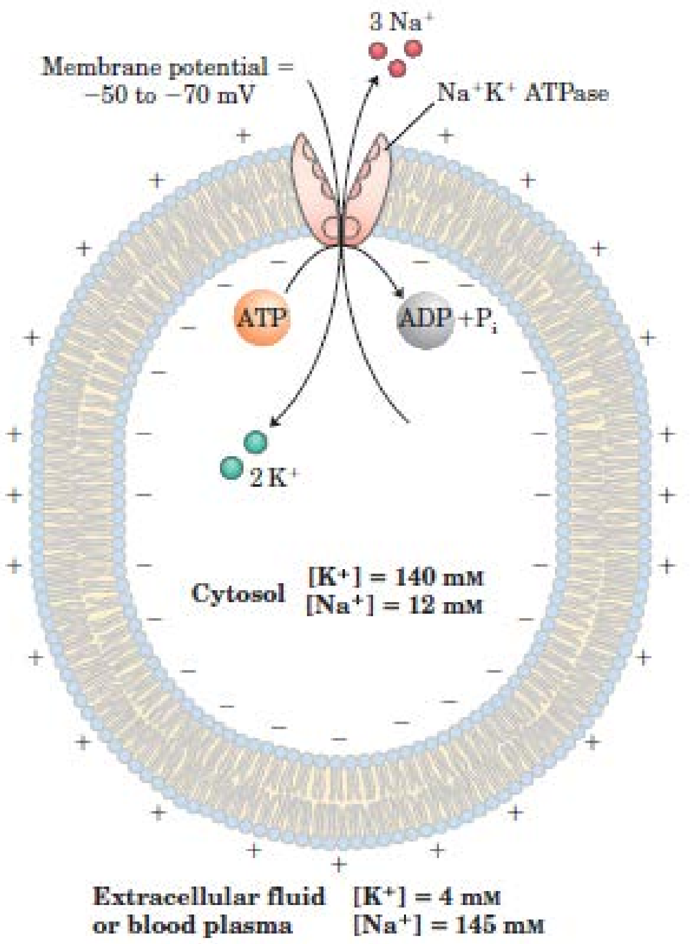

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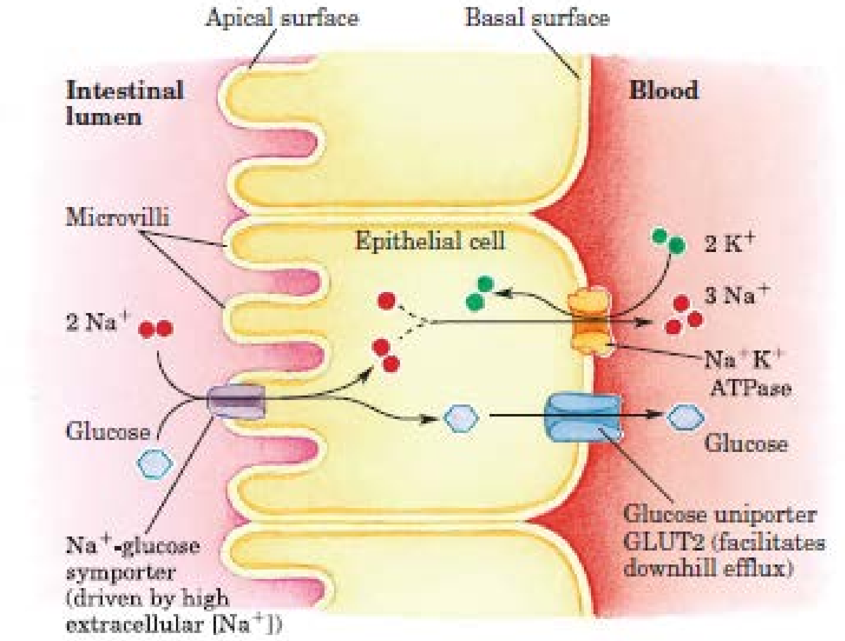
$$2Na^{+}_{out} + glucose_{out} \longrightarrow 2Na^{+}_{in} + glucose_{in}$$



| Aquaporin | Permeant (permeability) | Tissue distribution | Subcellular distribution* |
|---|---|---|---|
| AQP-0 | Water (low) | Lens | Plasma membrane |
| AQP-1 | Water (high) | Erythrocyte, kidney, lung, vascular endothelium, brain, eye | Plasma membrane |
| AQP-2 | Water (high) | Kidney, vas deferens | Apical plasma membrane, intracellular vesicles |
| AQP-3 | Water (high), glycerol (high), urea (moderate) | Kidney, skin, lung, eye, colon | Basolateral plasma membrane |
| AQP-4 | Water (high) | Brain, muscle, kidney, lung, stomach, small intestine | Basolateral plasma membrane |
| AQP-5 | Water (high) | Salivary gland, lacrimal gland, sweat gland, lung, cornea | Apical plasma membrane |
| AQP-6 | Water (low), anions ($NO_3^- > Cl^-$) | Kidney | Intracellular vesicles |
| AQP-7 | Water (high), glycerol (high), urea (high), arsenite | Adipose tissue, kidney, testis | Plasma membrane |
| AQP-8† | Water (high) | Testis, kidney, liver, pancreas, small intestine, colon | Plasma membrane, intracellular vesicles |
| AQP-9 | Water (low), glycerol (high), urea (high), arsenite | Liver, leukocyte, brain, testis | Plasma membrane |
| AQP-10 | Water (low), glycerol (high), urea (high) | Small intestine | Intracellular vesicles |

**Source:** Data from King, L.S., Kozono, D., & Agre, P. (2004) From structure to disease: the evolving tale of aquaporin biology. *Nat. Rev.* **5**, 688.

*Aquaporins that are present primarily in the apical or in the basolateral membrane are noted as localized in one of these membranes; those present in both membranes are described as localized in the plasma membrane.

†AQP-8 might also be permeated by urea.

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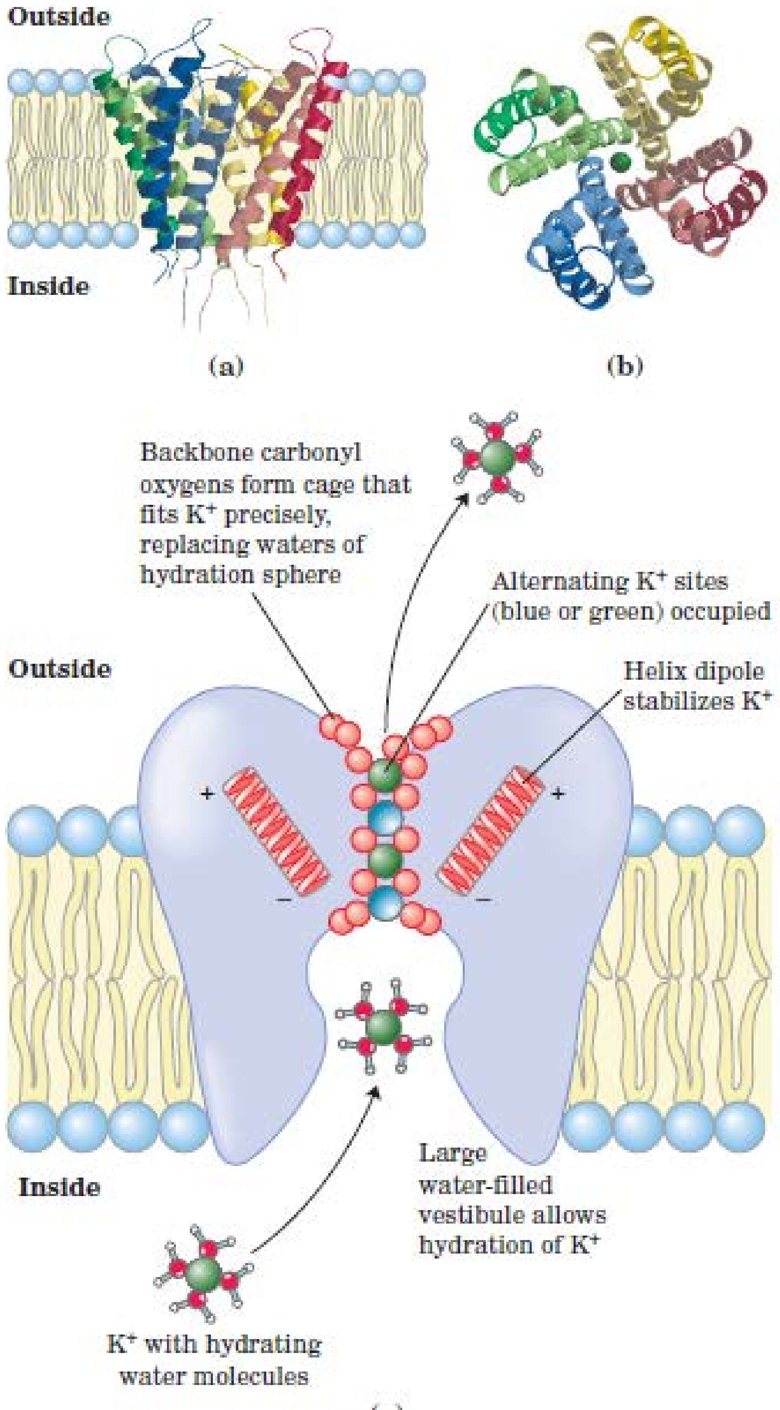

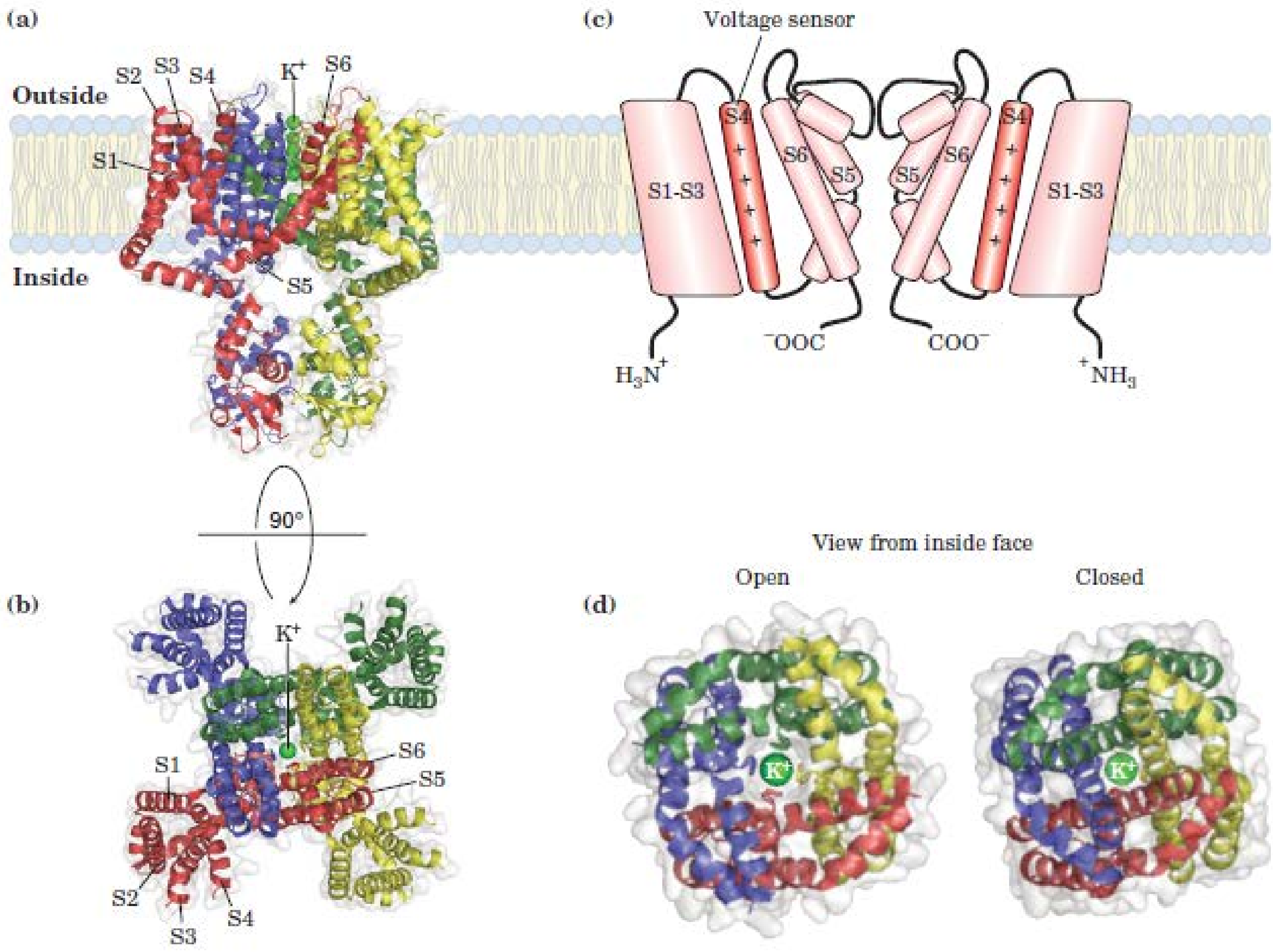


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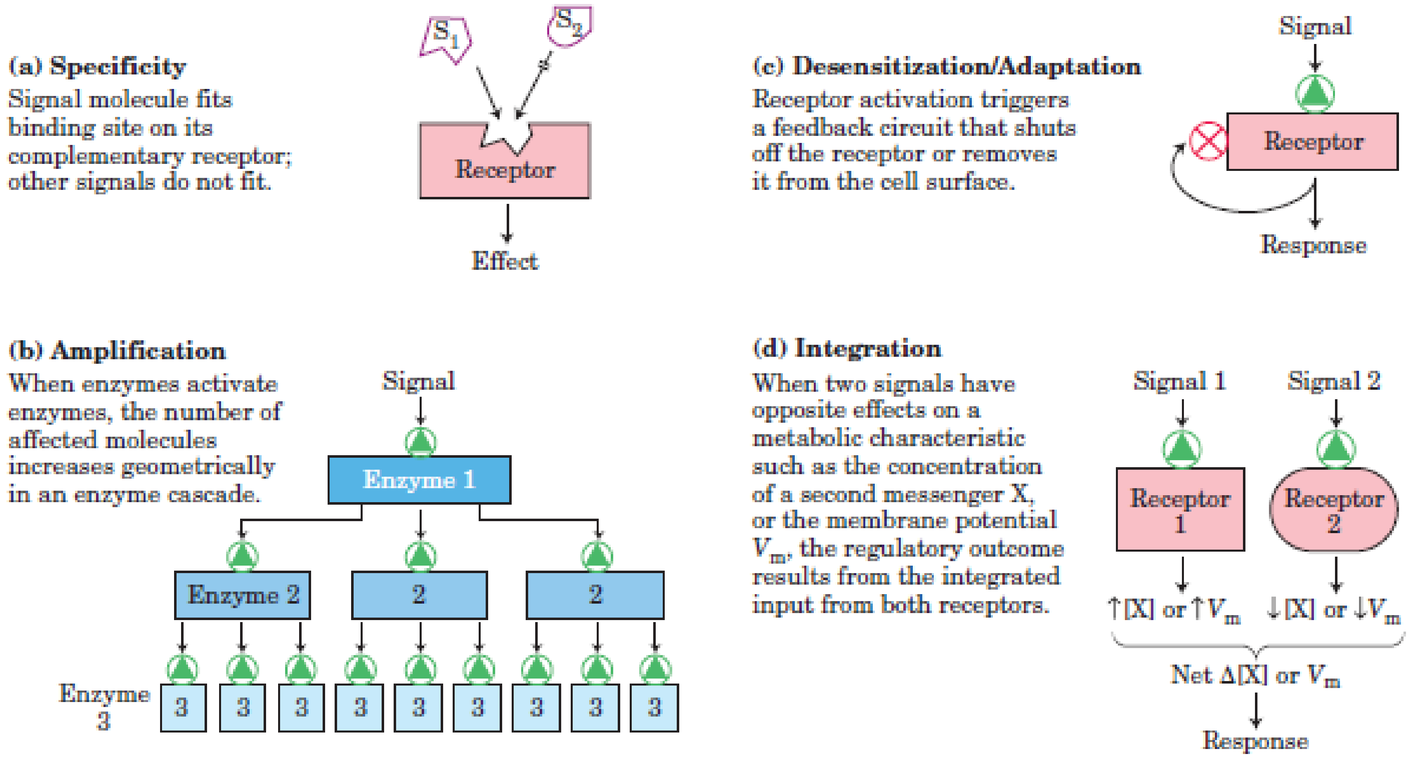


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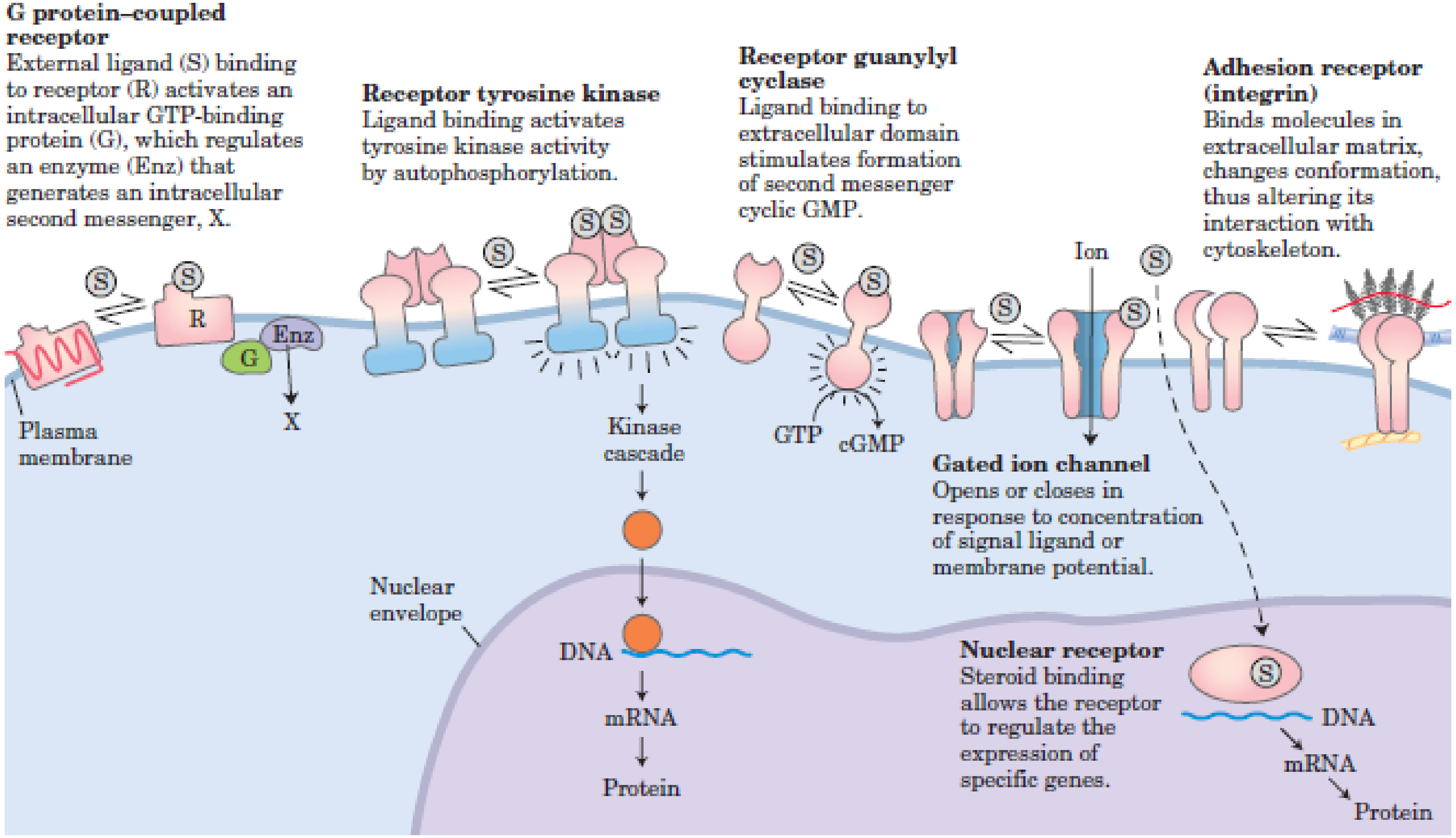


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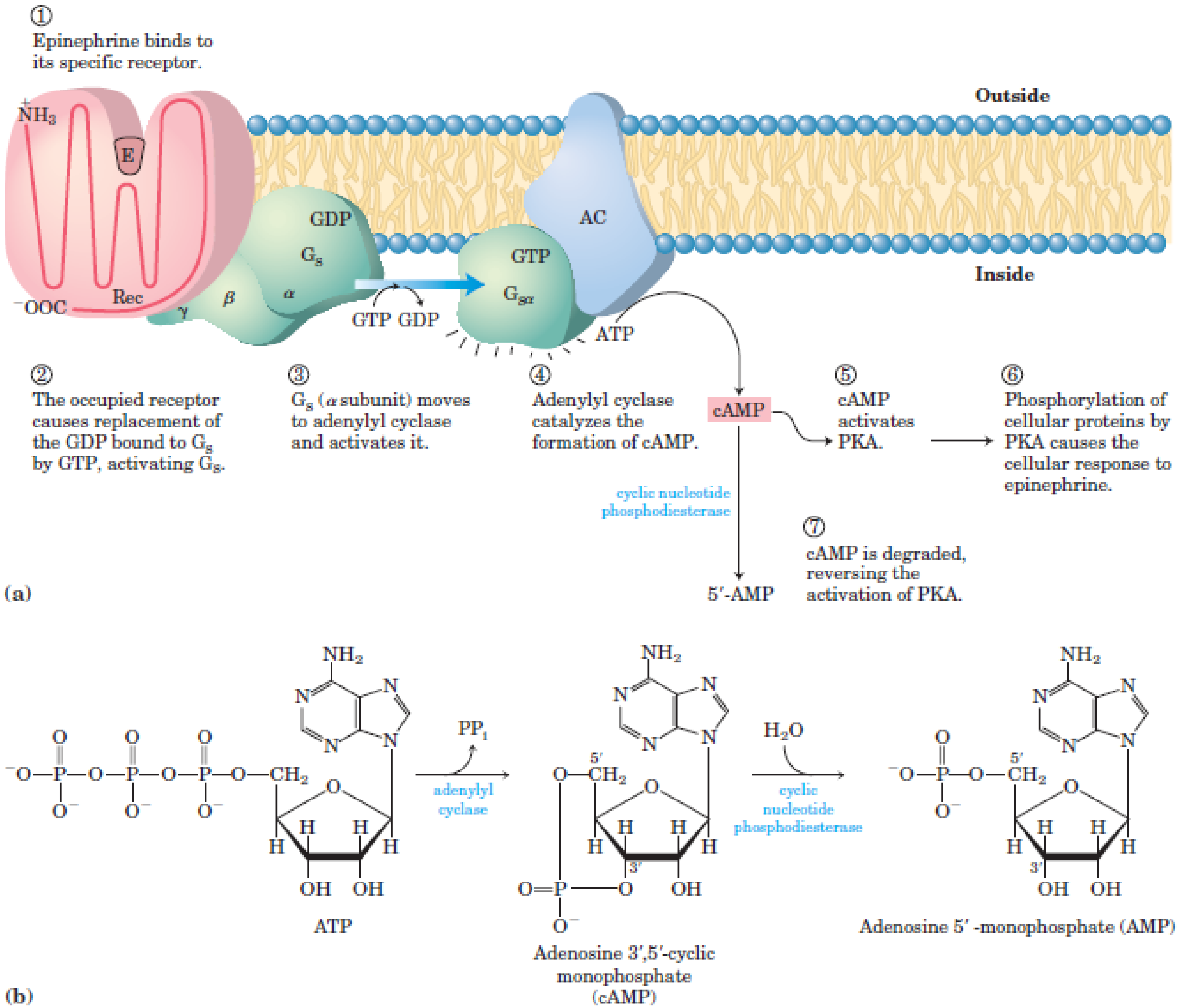


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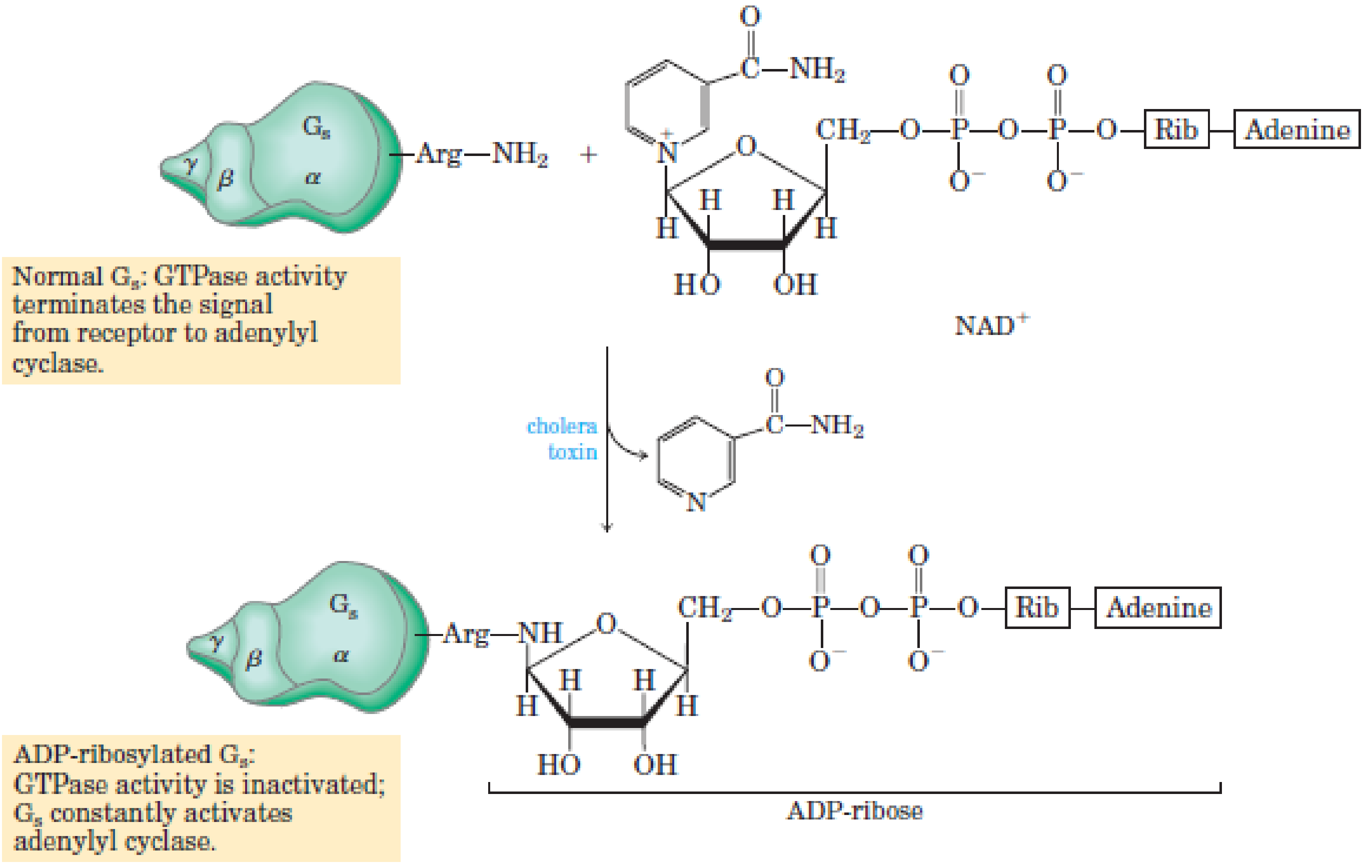

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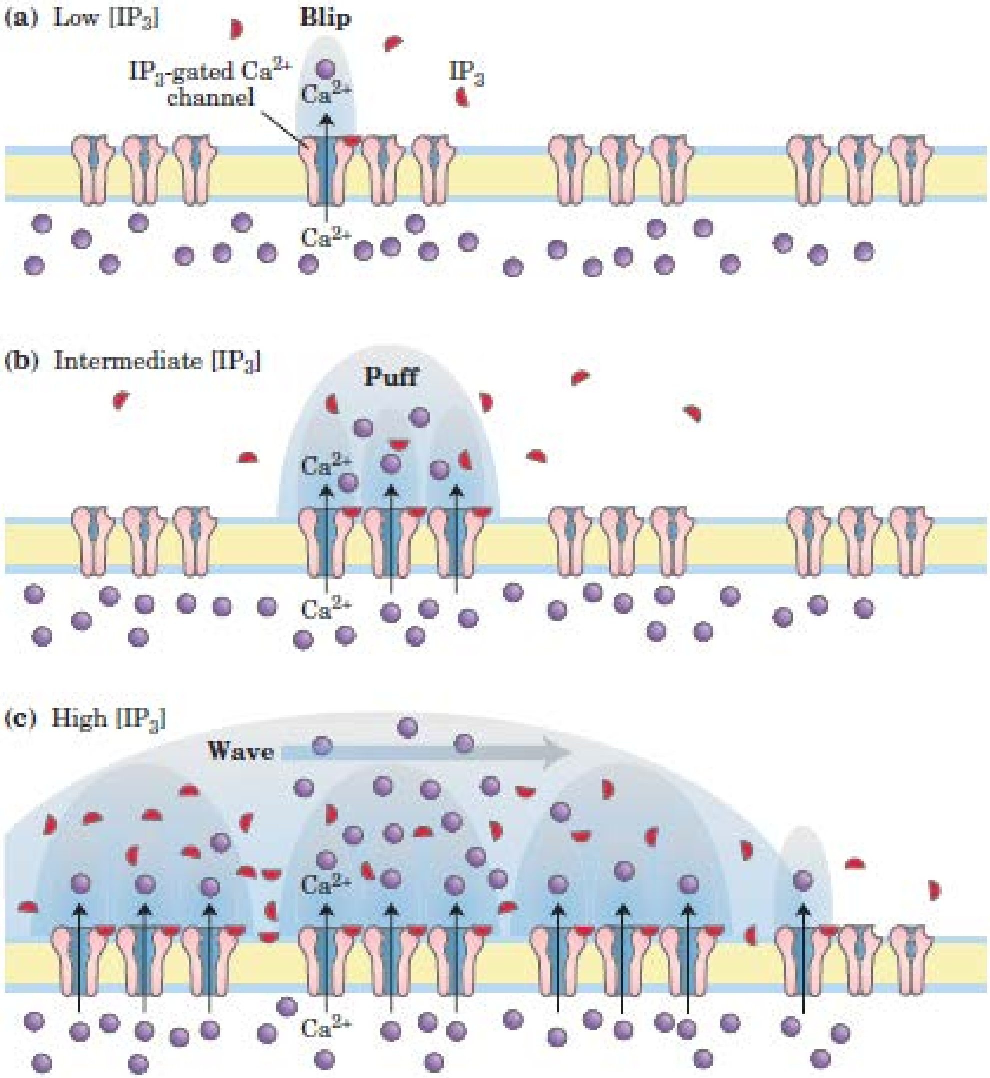

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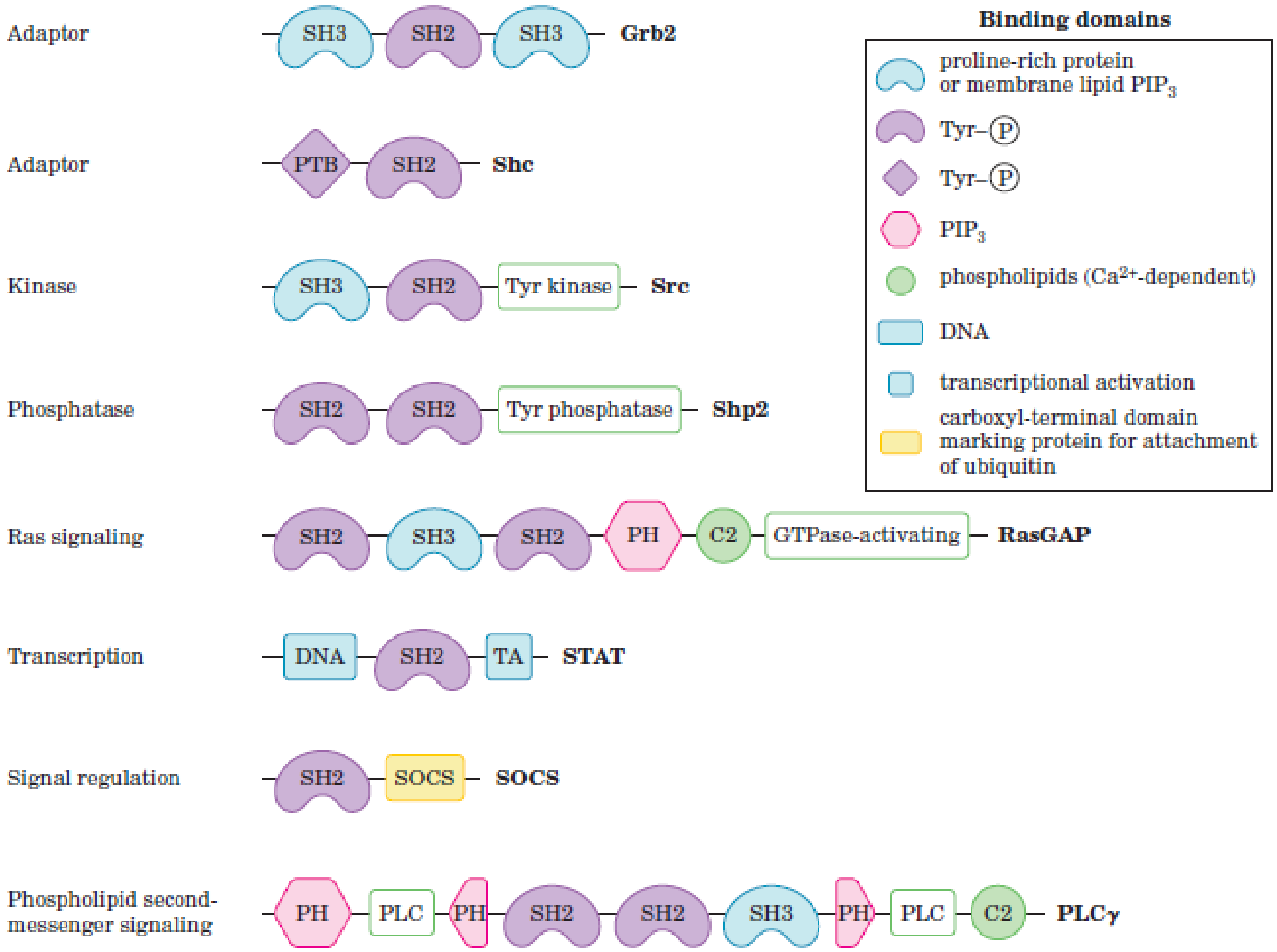

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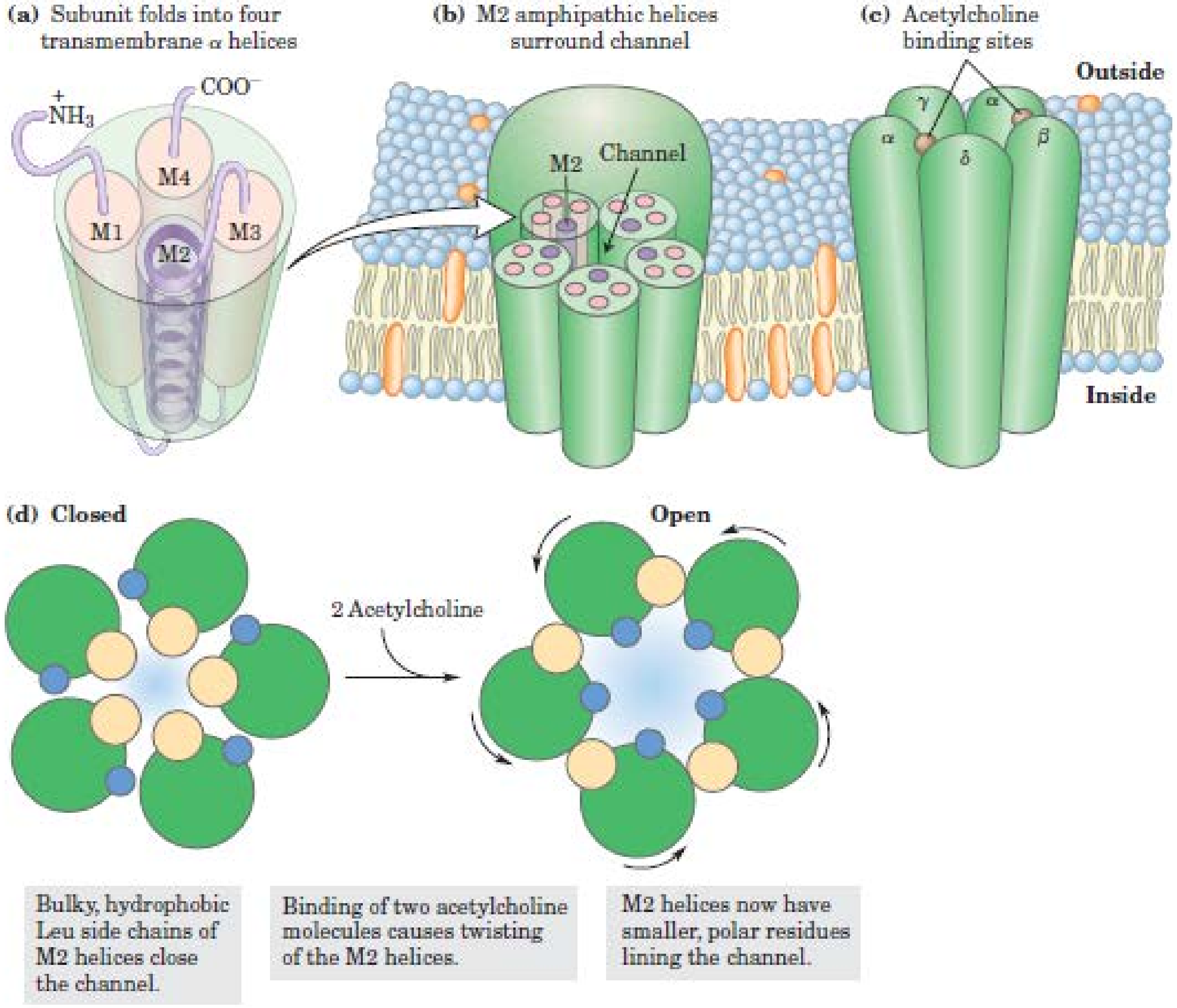

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