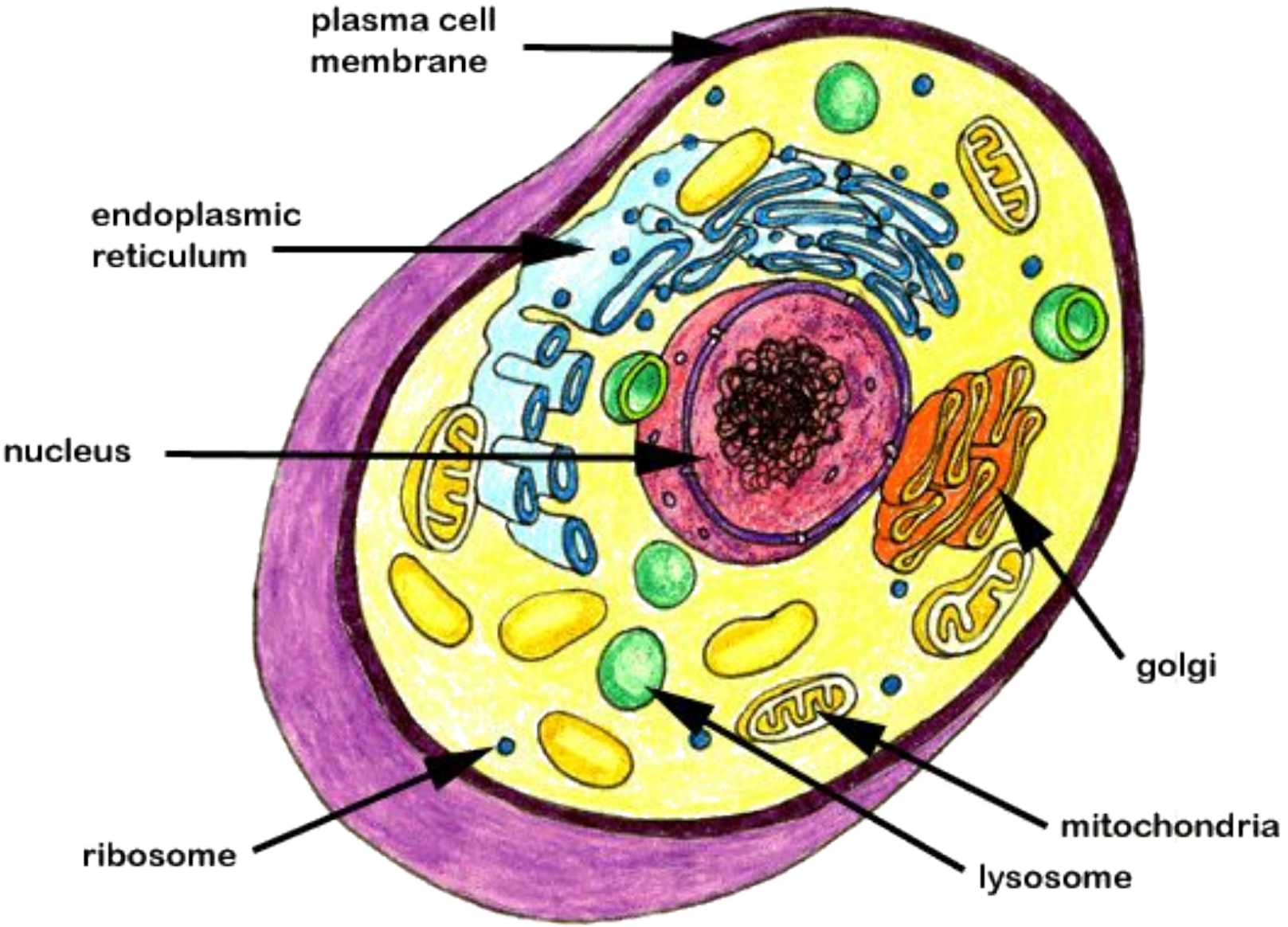
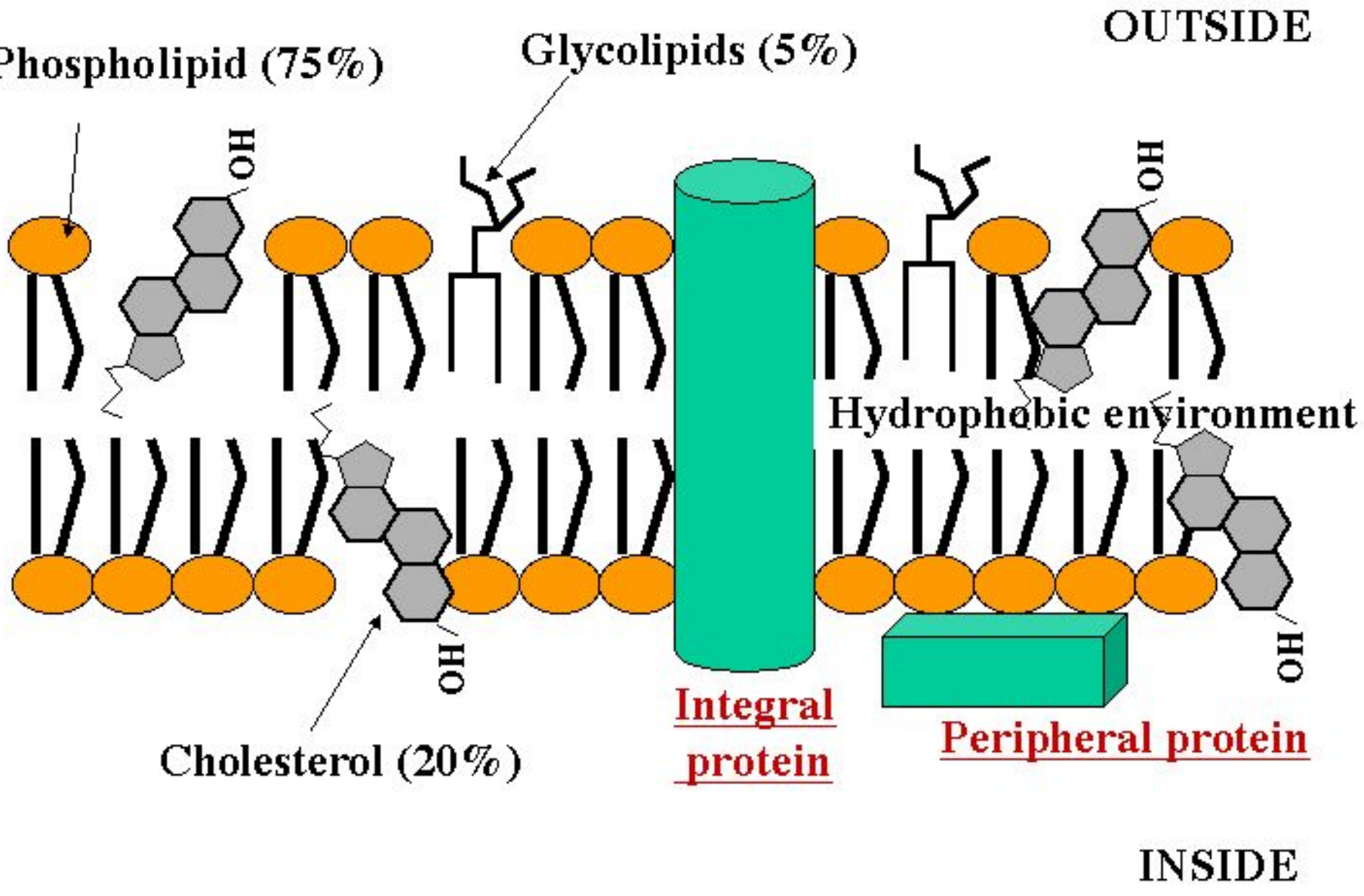
Structure and Functions of Biomembranes

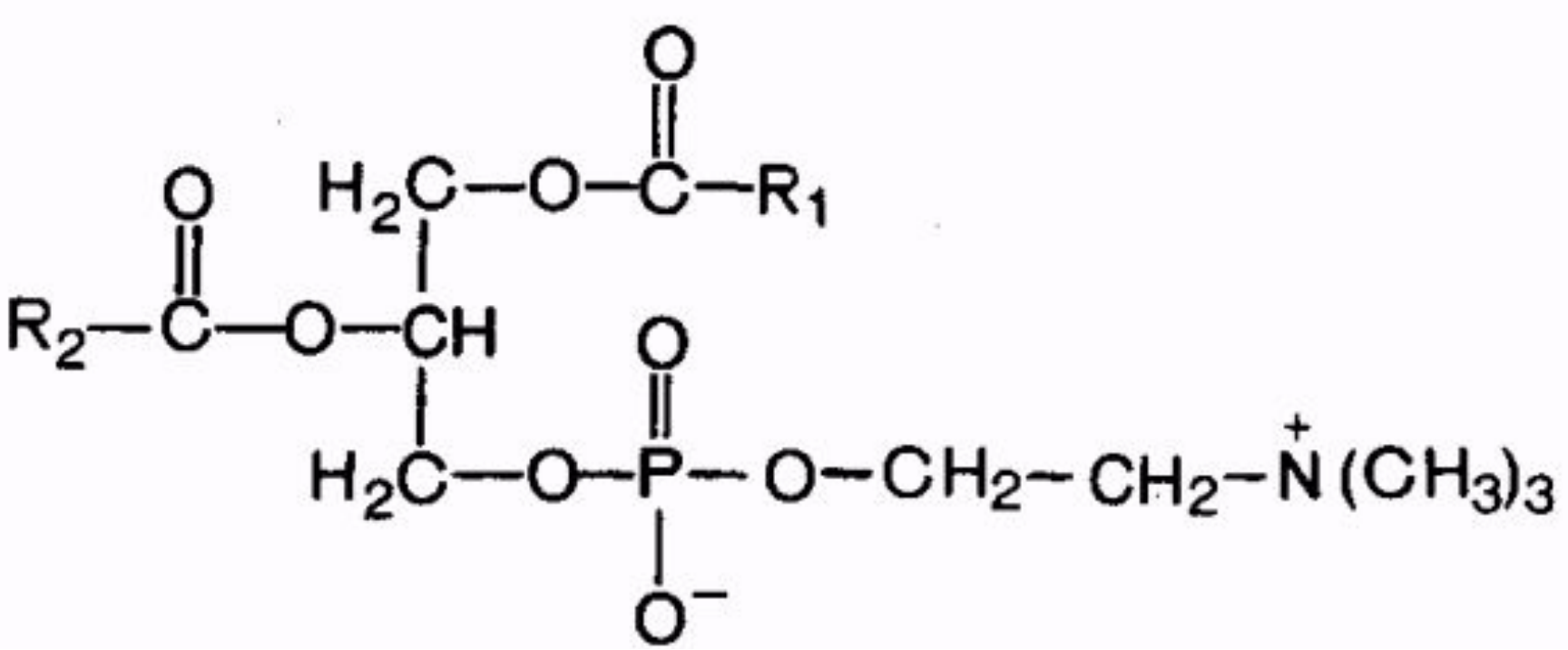
Cell structure



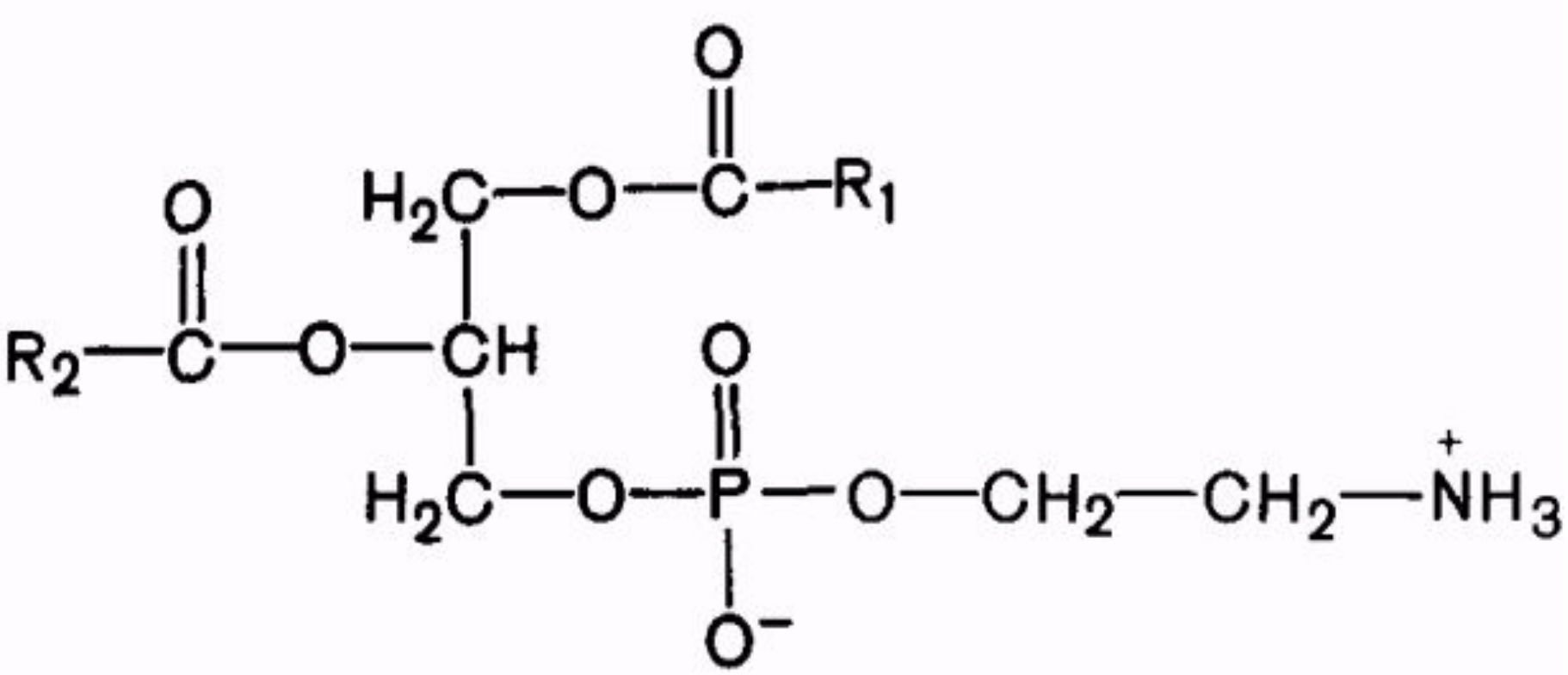
Plasma membrane



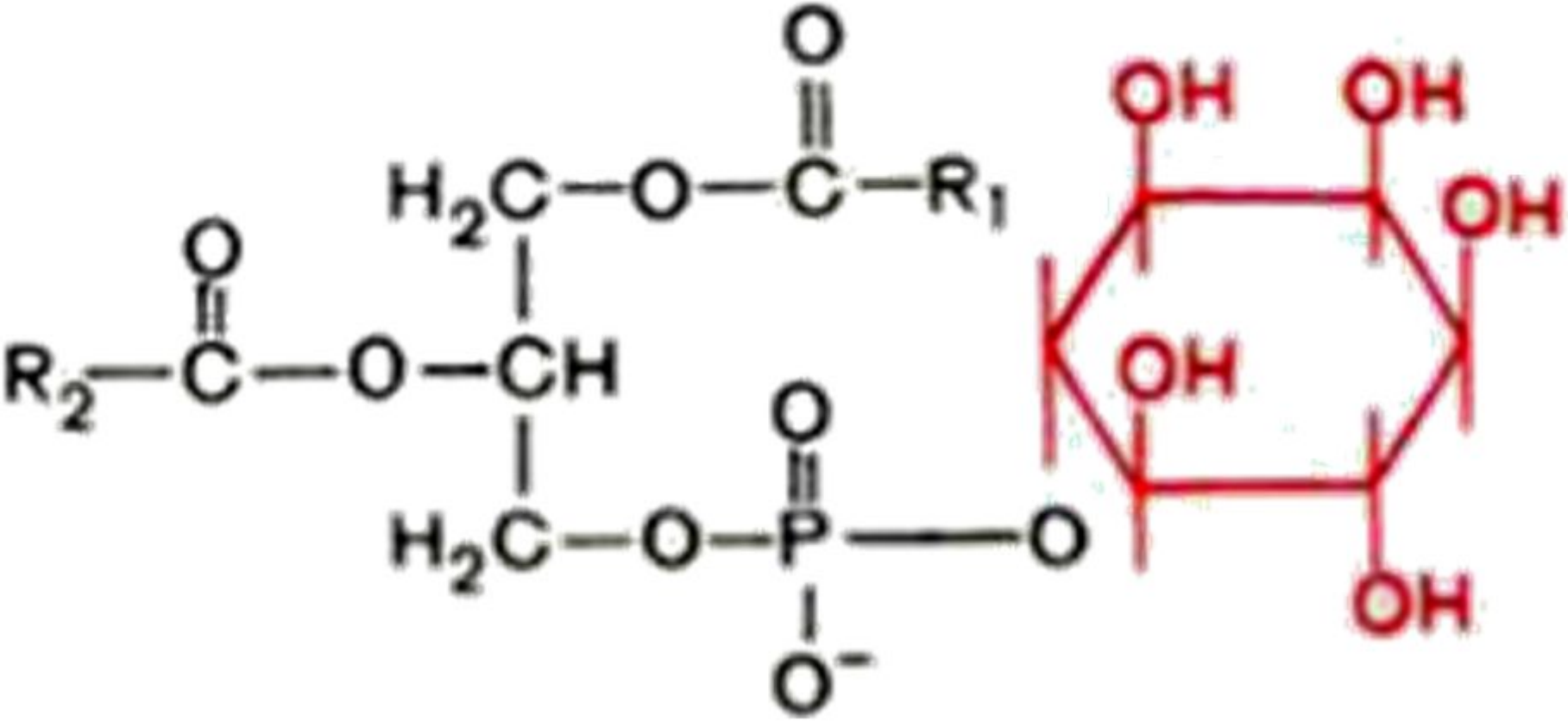
Phospholipid phosphatidylcholine



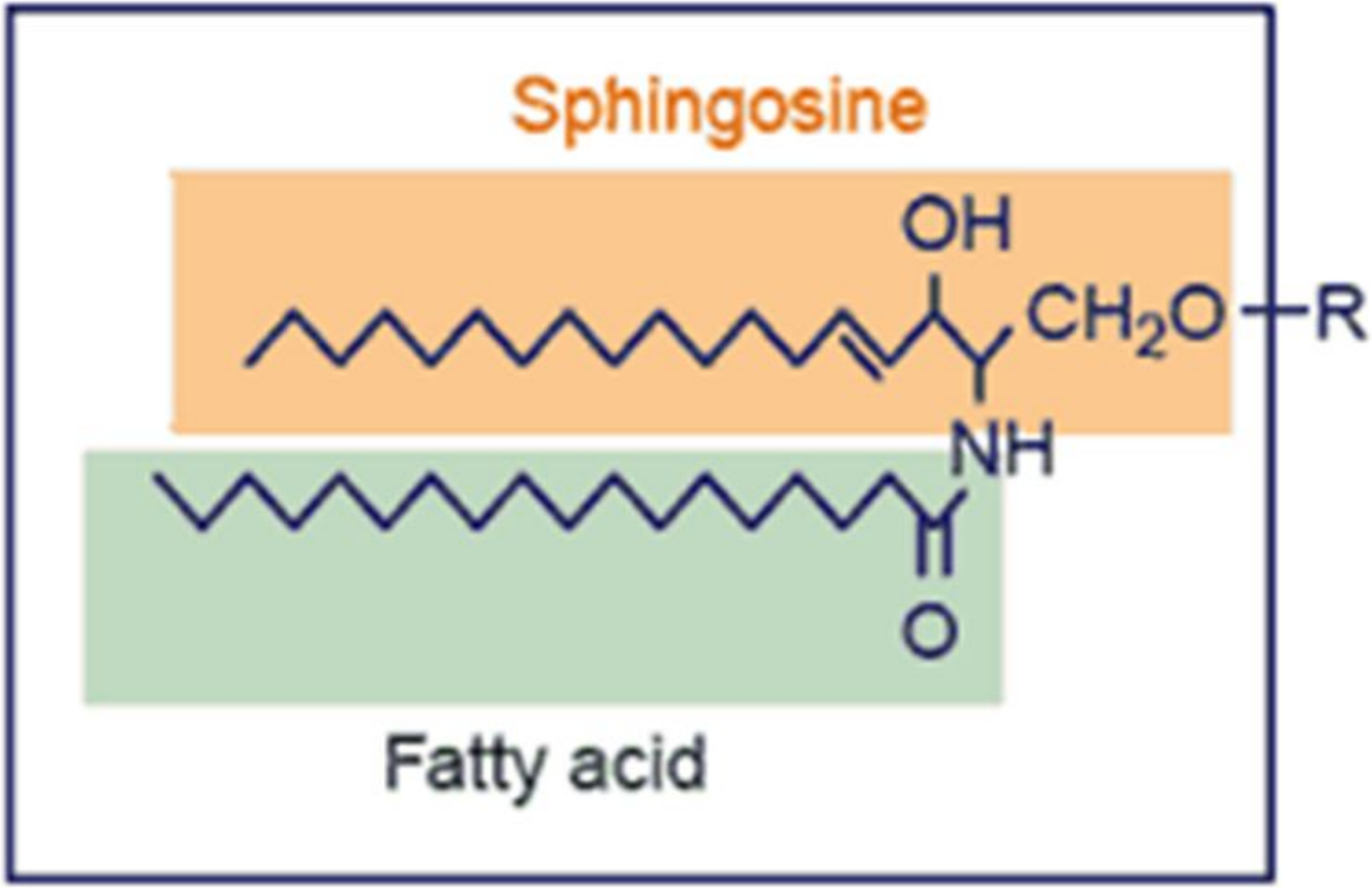
Phospholipid phosphatidylethanolamine



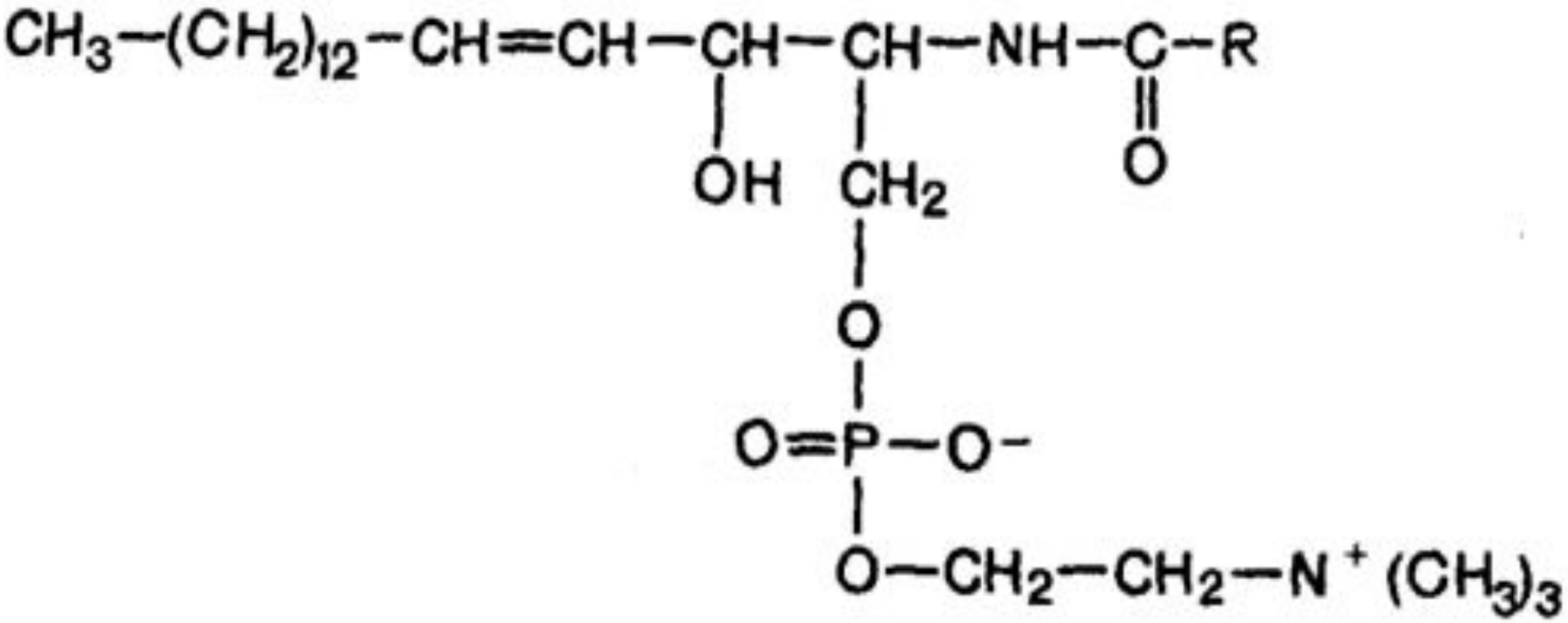
Phospholipid phosphatidylinositol



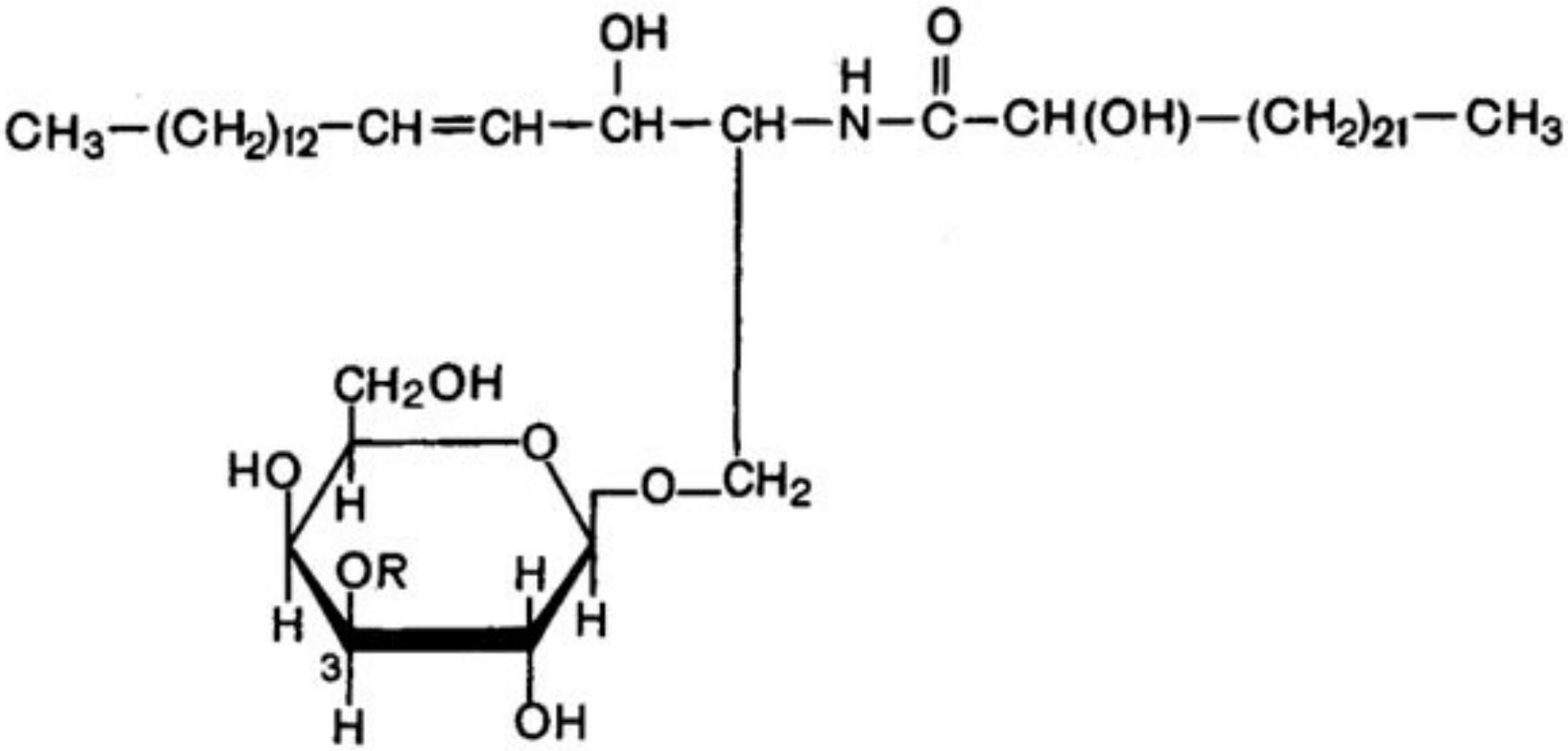
Sphingolipid ceramide



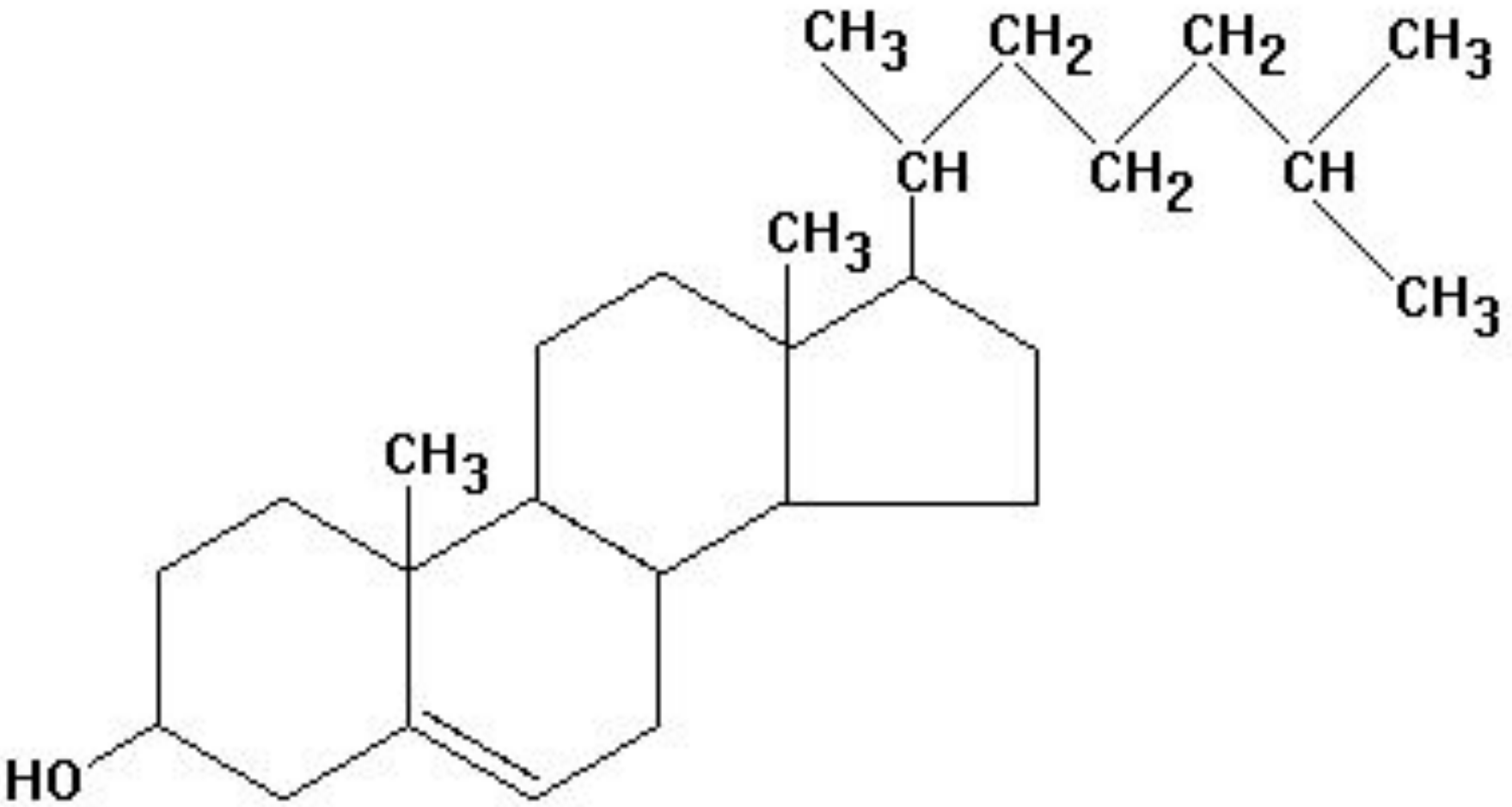
Sphingophospholipid sphingomyelin



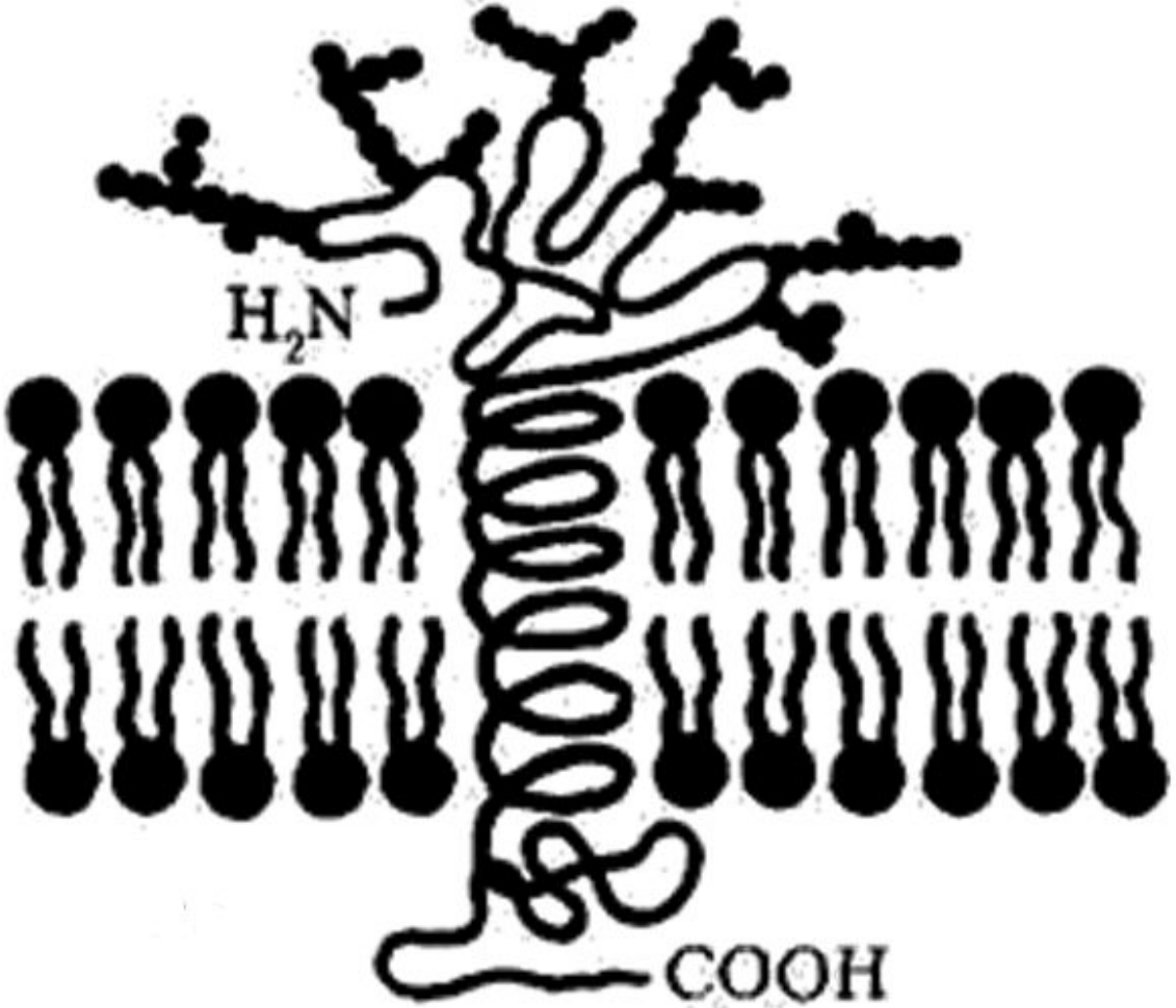
Glycolipid galactosyl ceramide



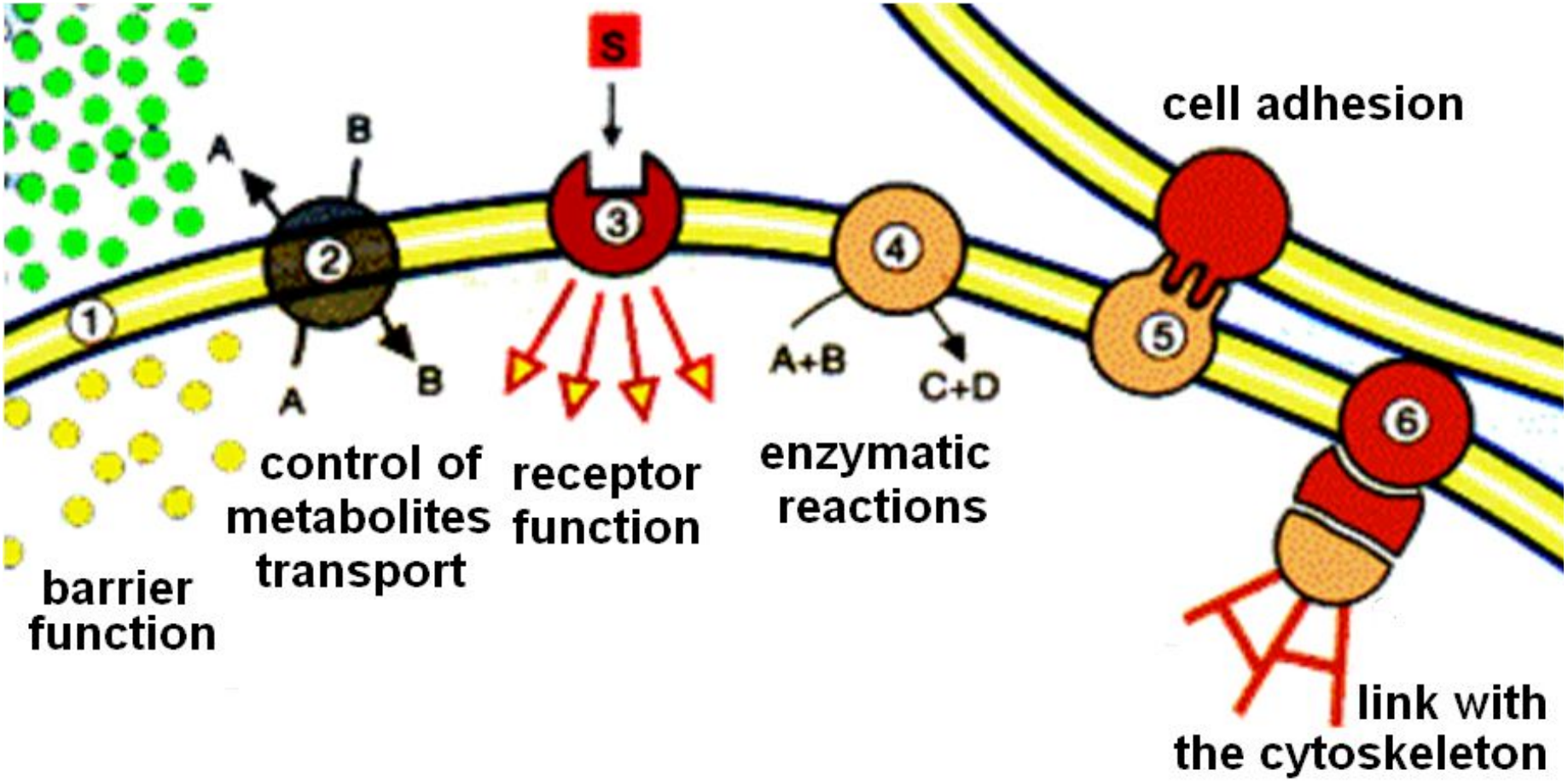
Cholesterol



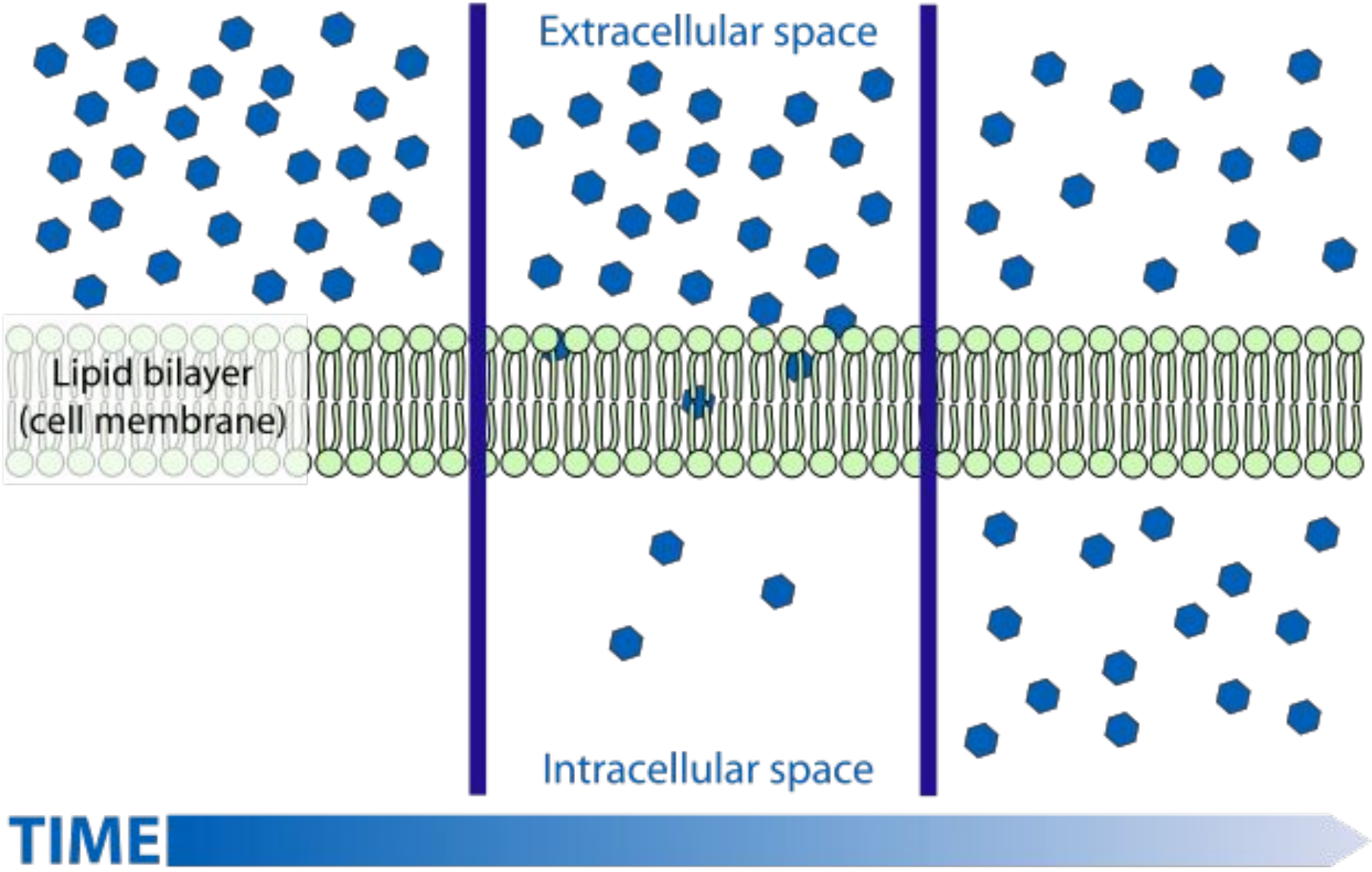
Integral protein-receptor (glycoprotein)



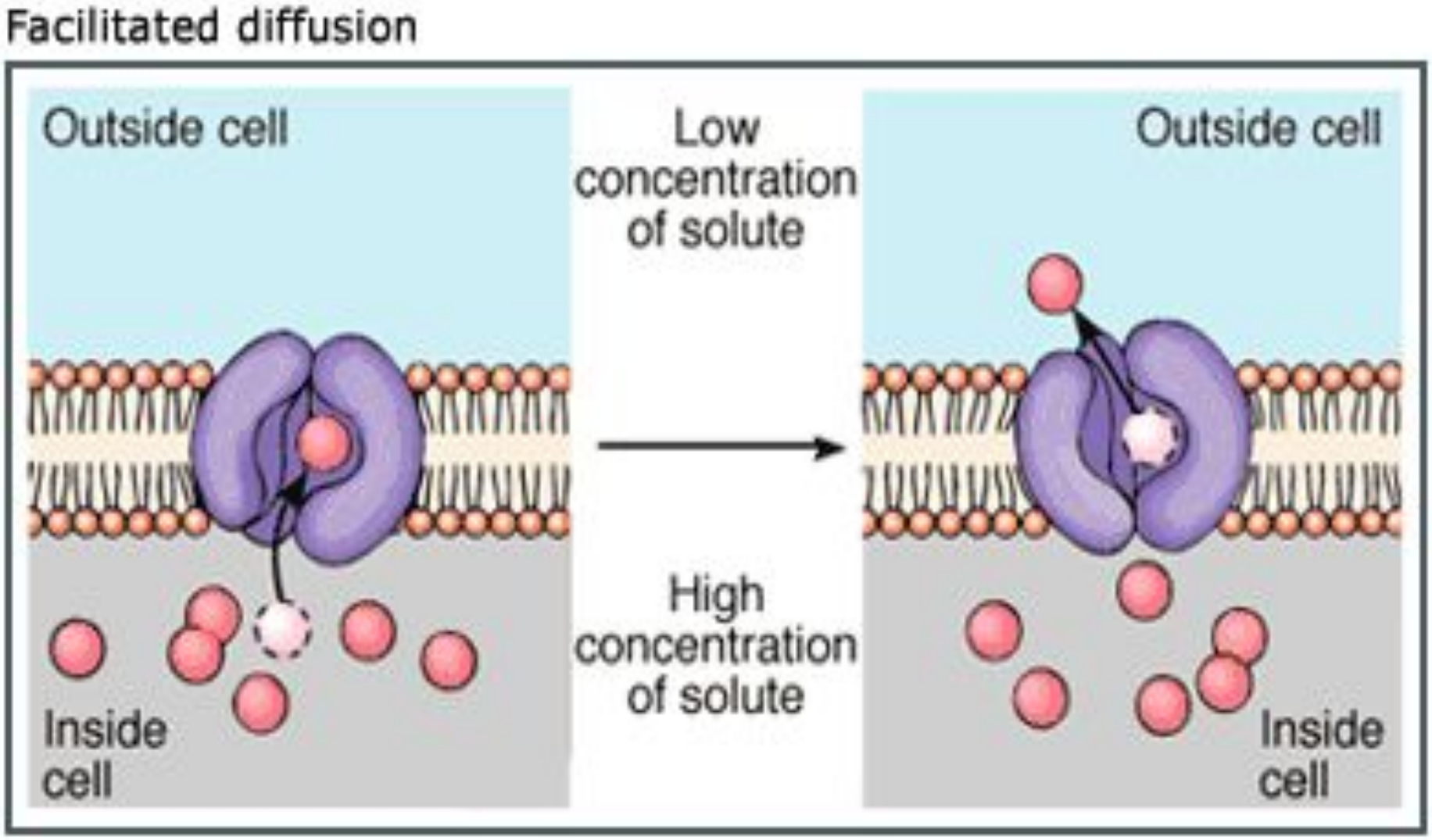
Functions of biological membranes



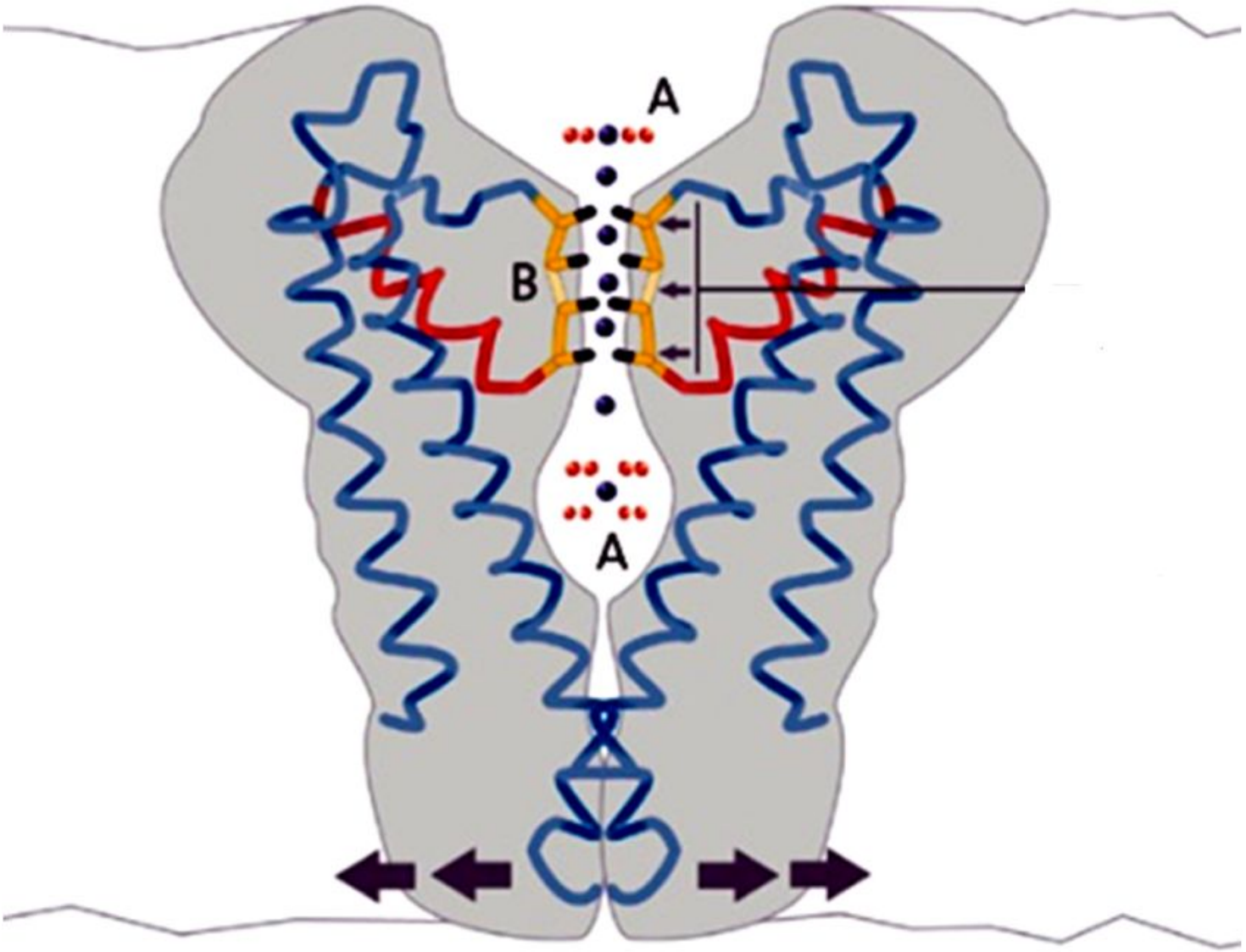
Simple diffusion



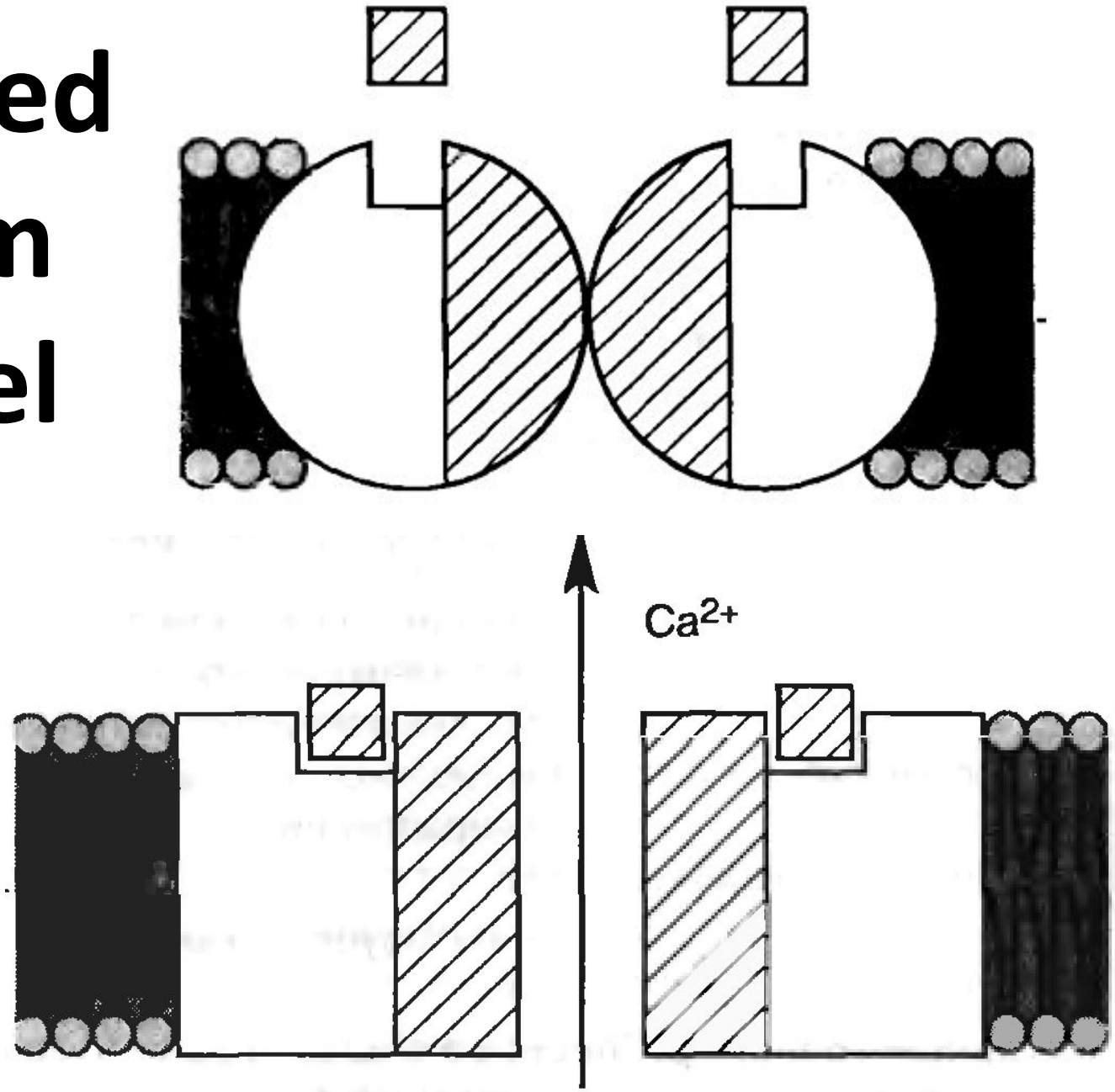
Facilitated diffusion



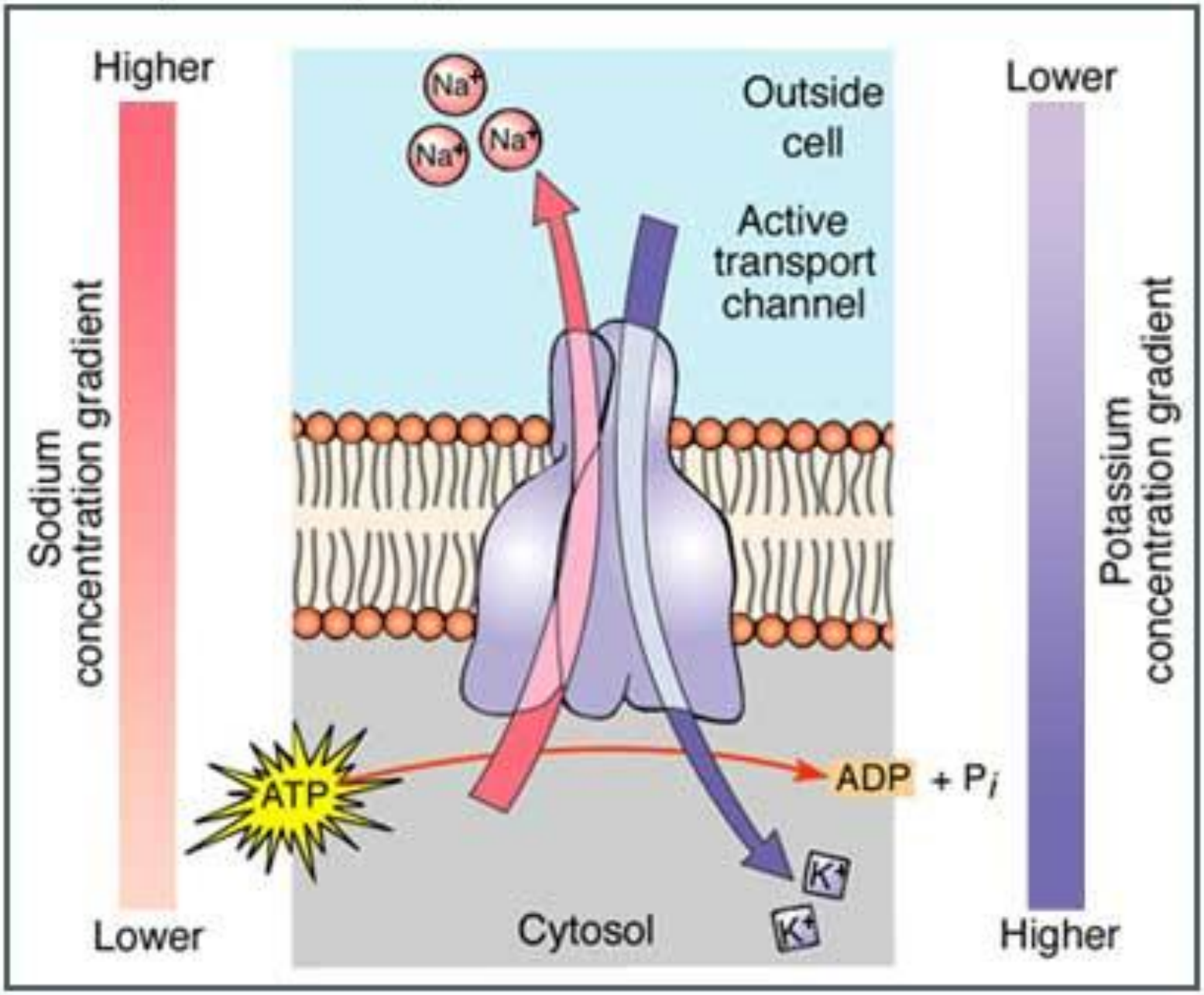
Ion channels

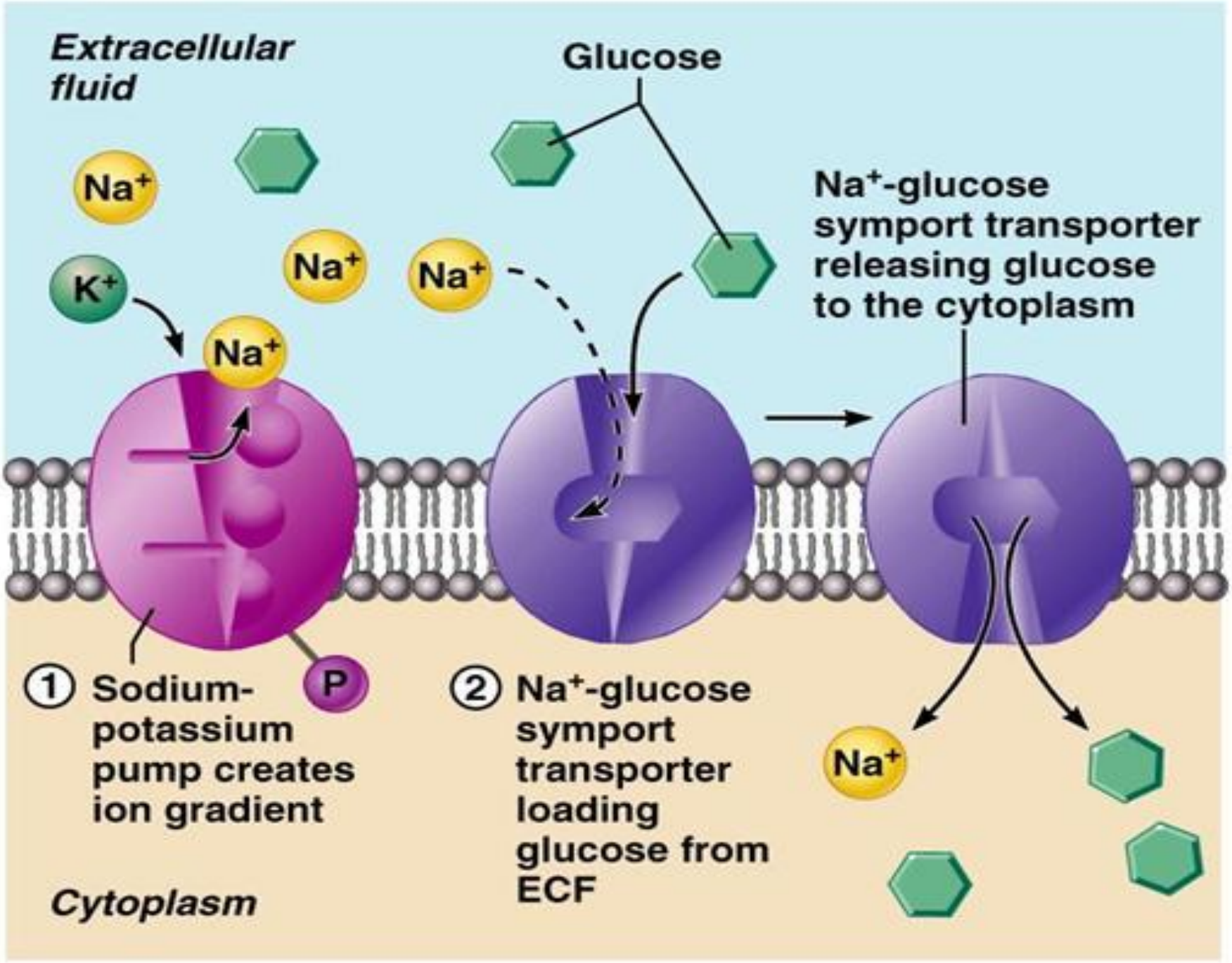


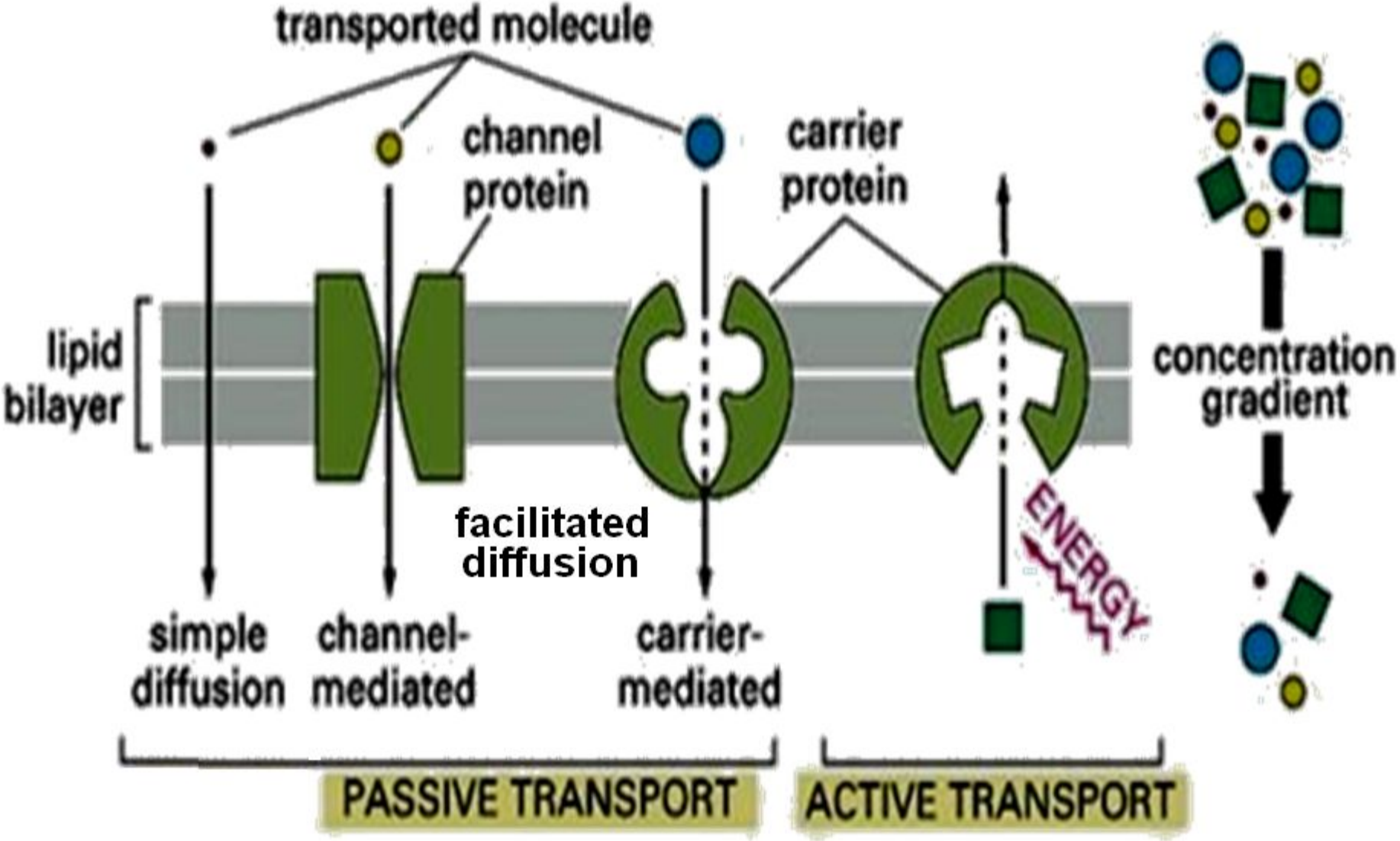
Regulated calcium channel



Sodium-potassium pump

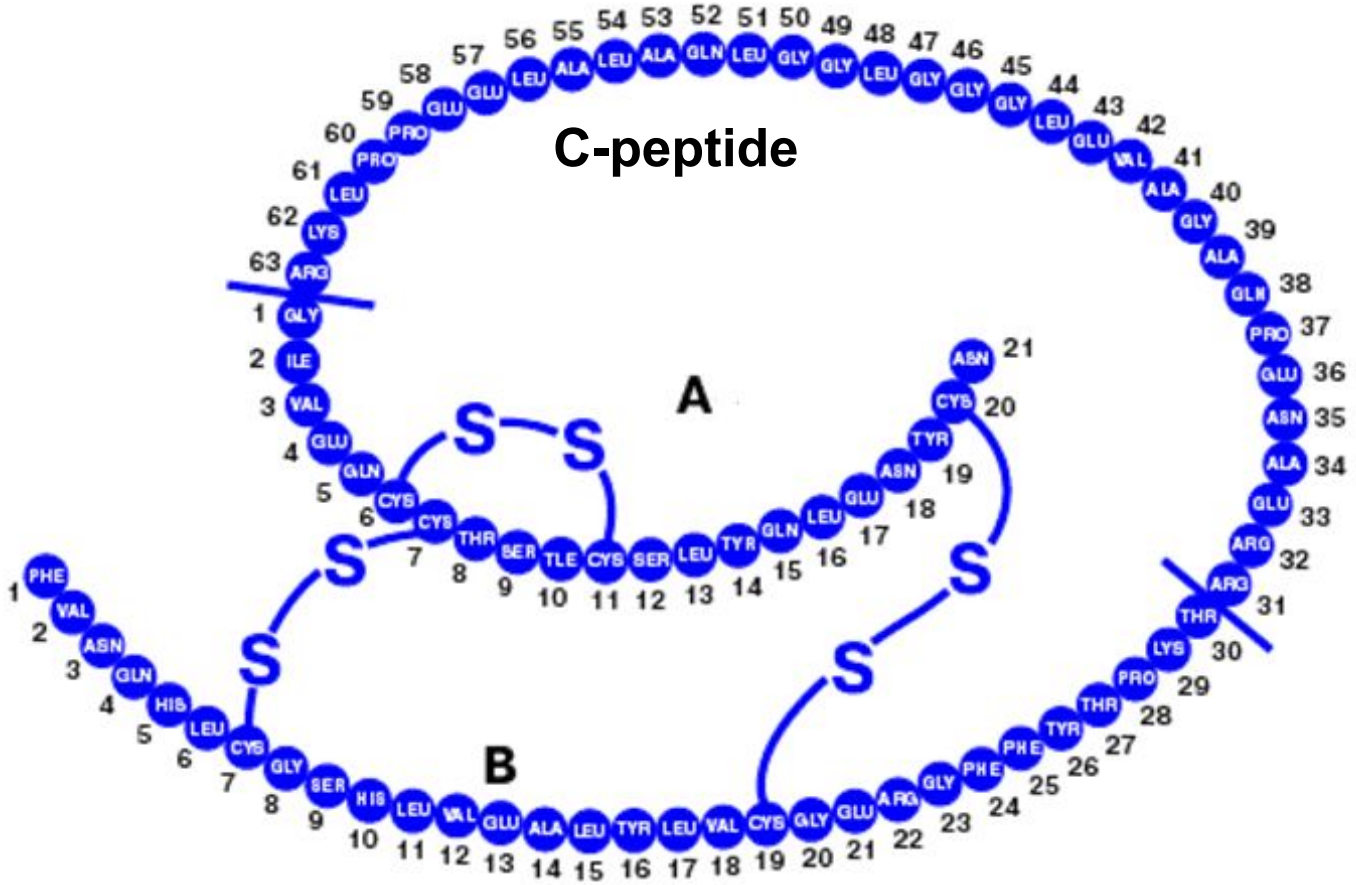



Extracellular fluid
Glucose
Na+
K+
Na+
Na+
Na+
Na+-glucose symport transporter releasing glucose to the cytoplasm
P
① Sodium-potassium pump creates ion gradient
② Na+-glucose symport transporter loading glucose from ECF
Na+
Cytoplasm


transported molecule
channel protein
carrier protein
lipid bilayer
concentration gradient
facilitated diffusion
ENERGY
simple diffusion
channel-mediated
carrier-mediated
PASSIVE TRANSPORT
ACTIVE TRANSPORT

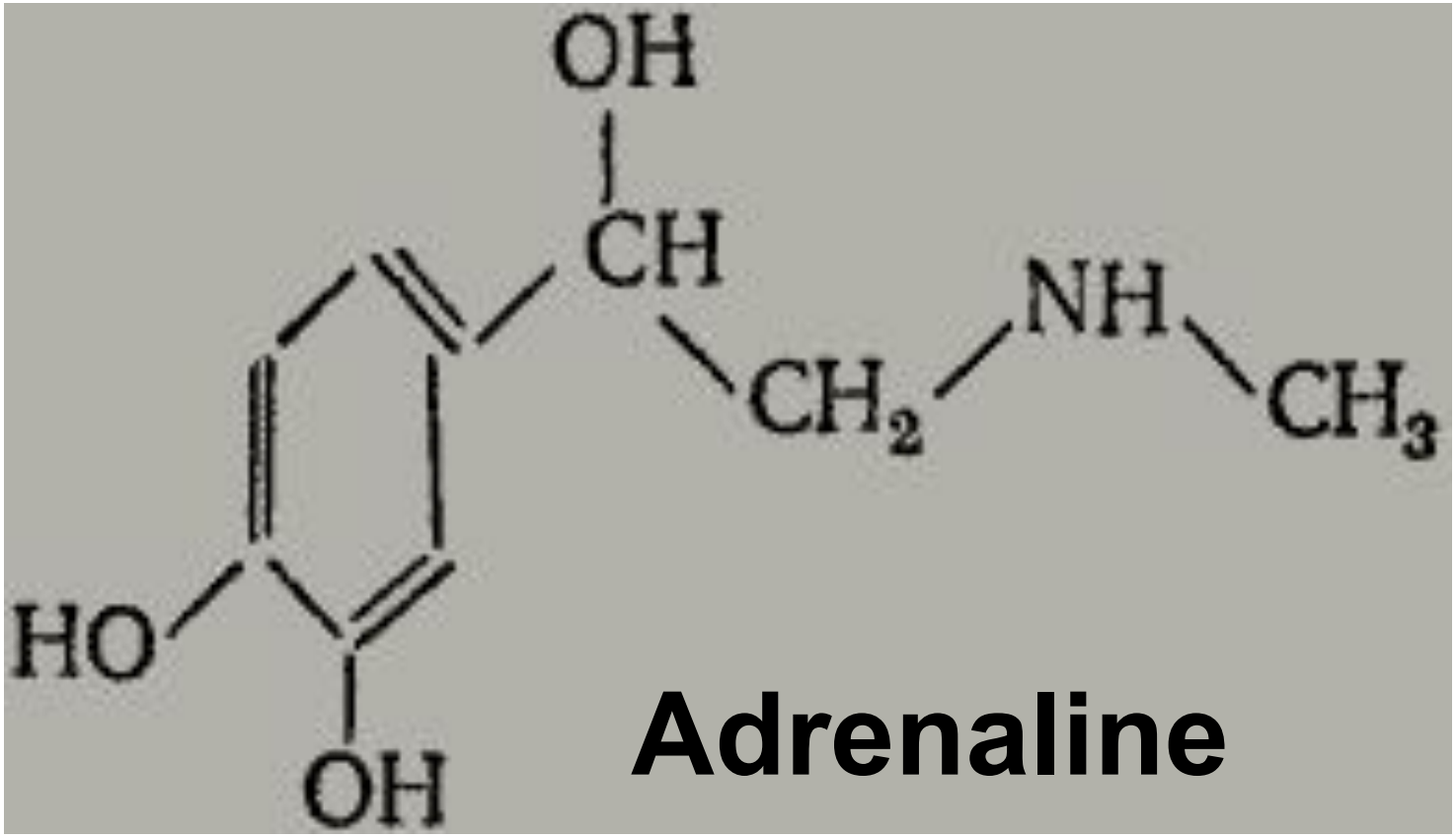
The Mechanism of Hormonal Signal Transmission

Peptide and protein hormones

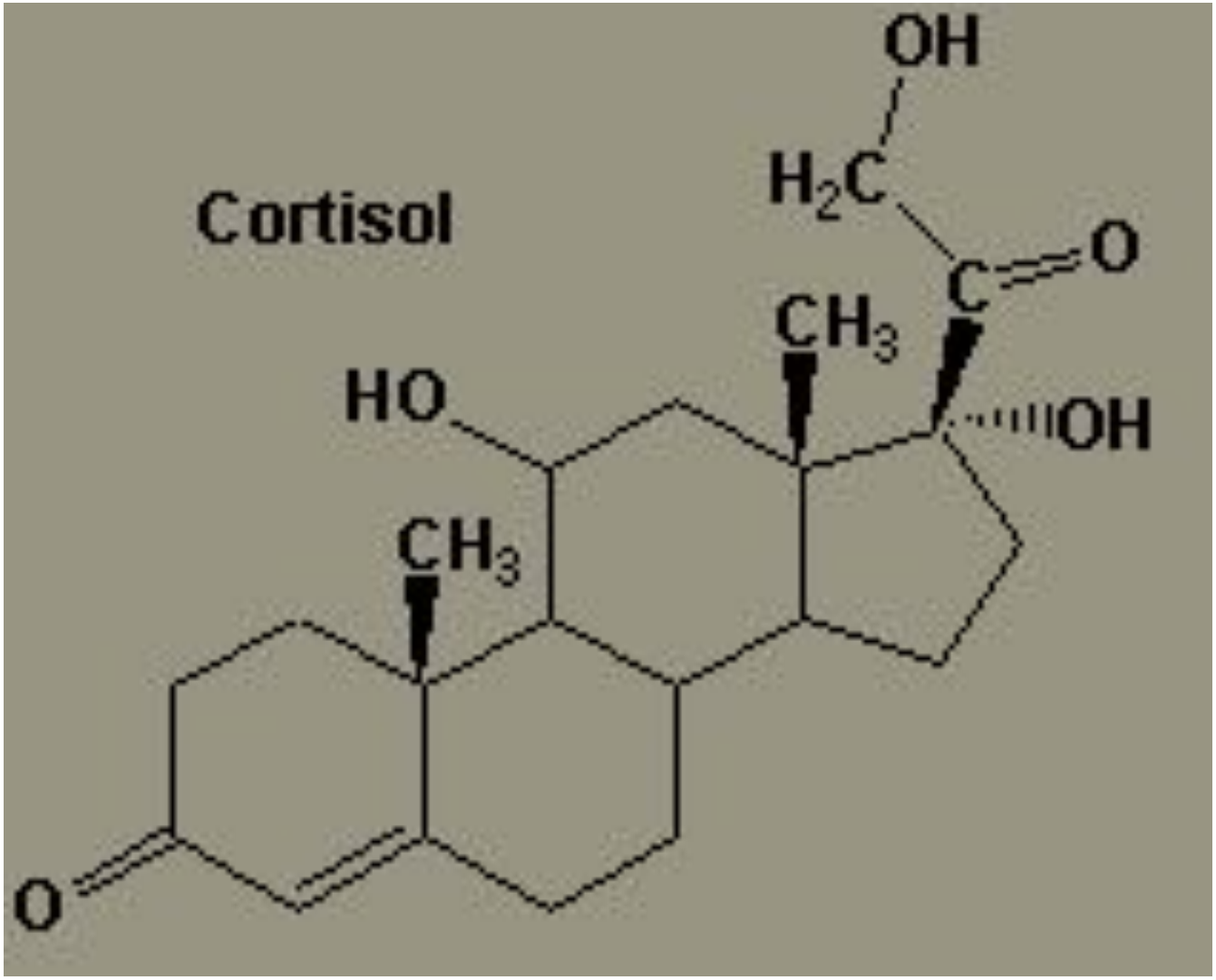


Insulin

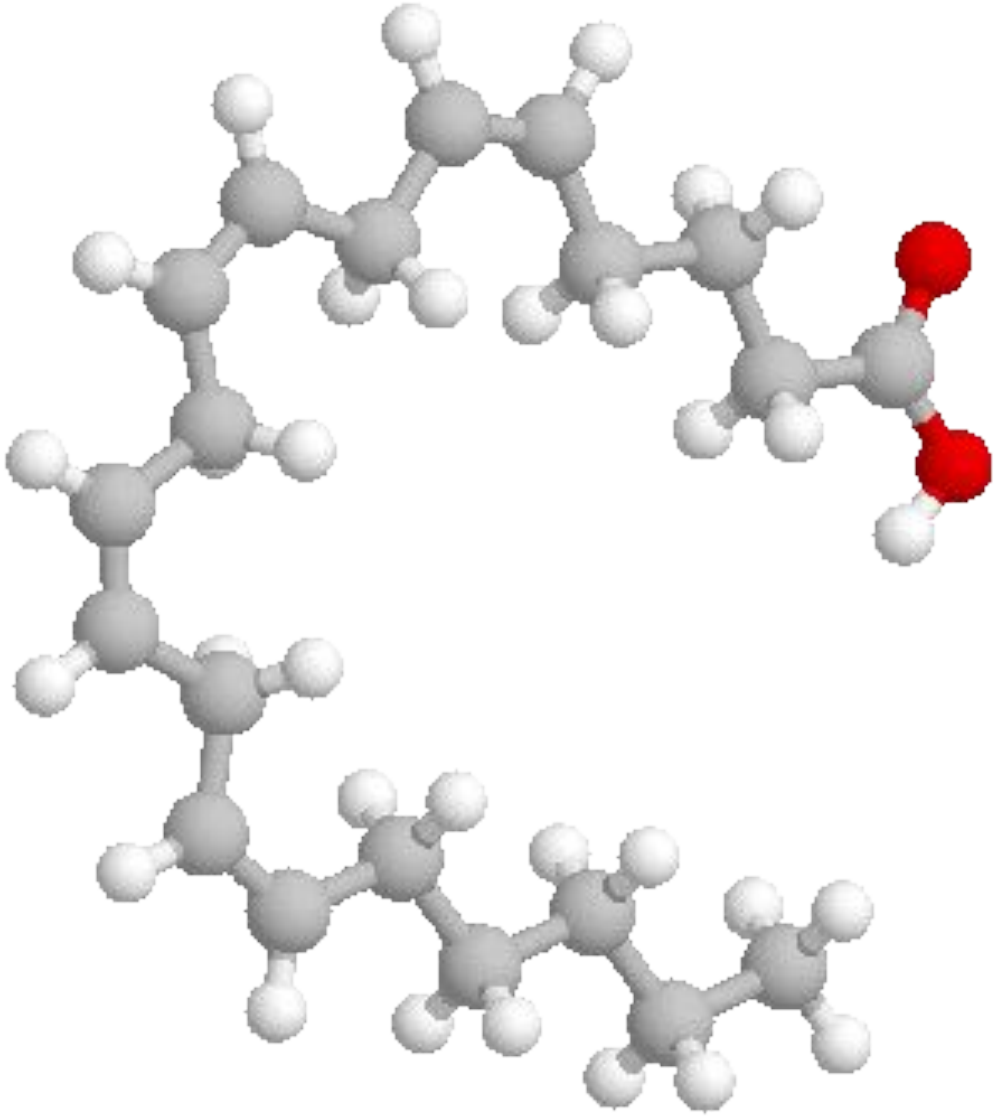
Hormones - amino acid derivatives



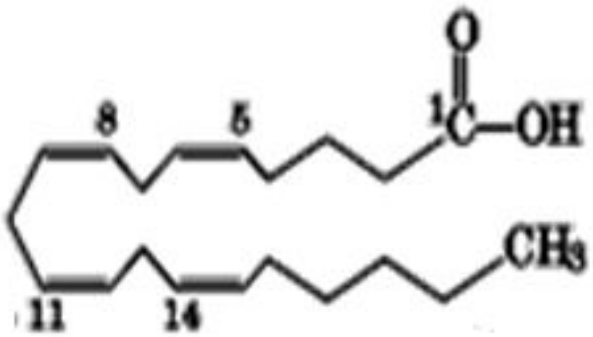
Steroid hormones



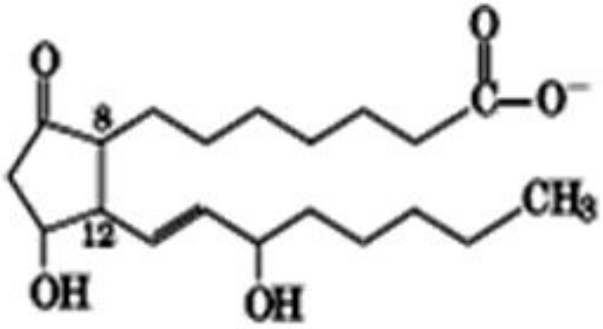
Arachidonic acid



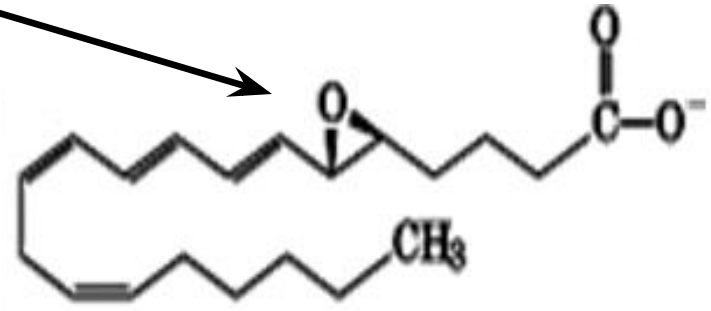
Eicosanoids



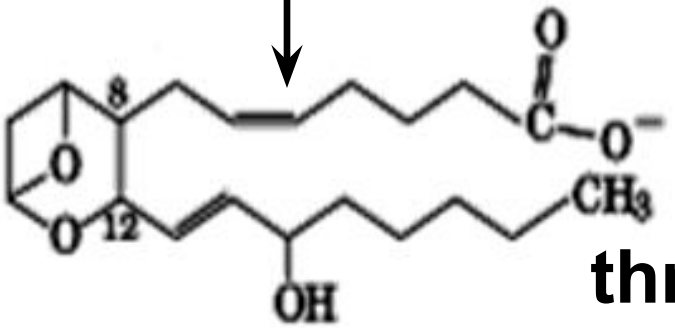
arachidonic acid



prostaglandins

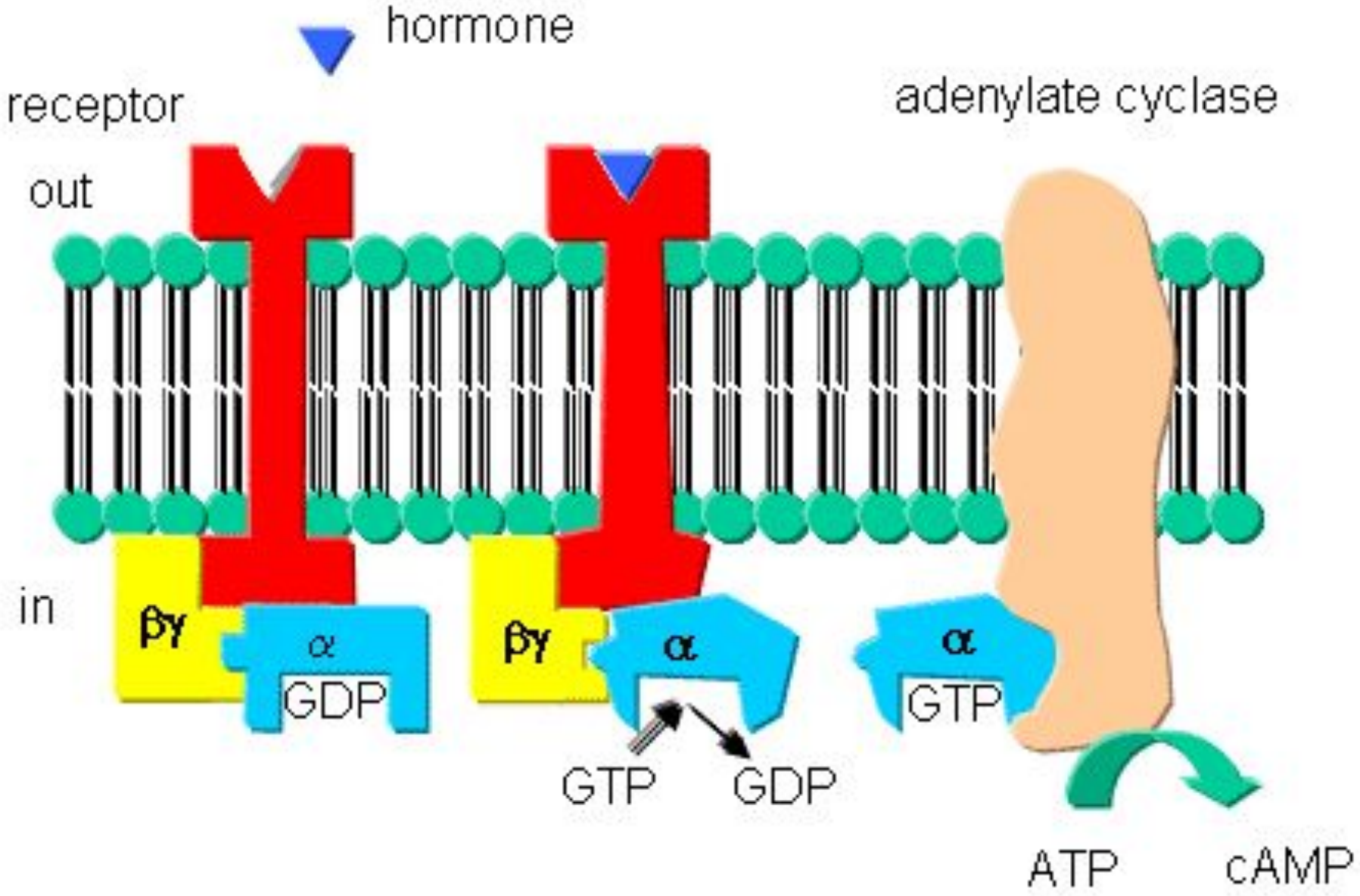


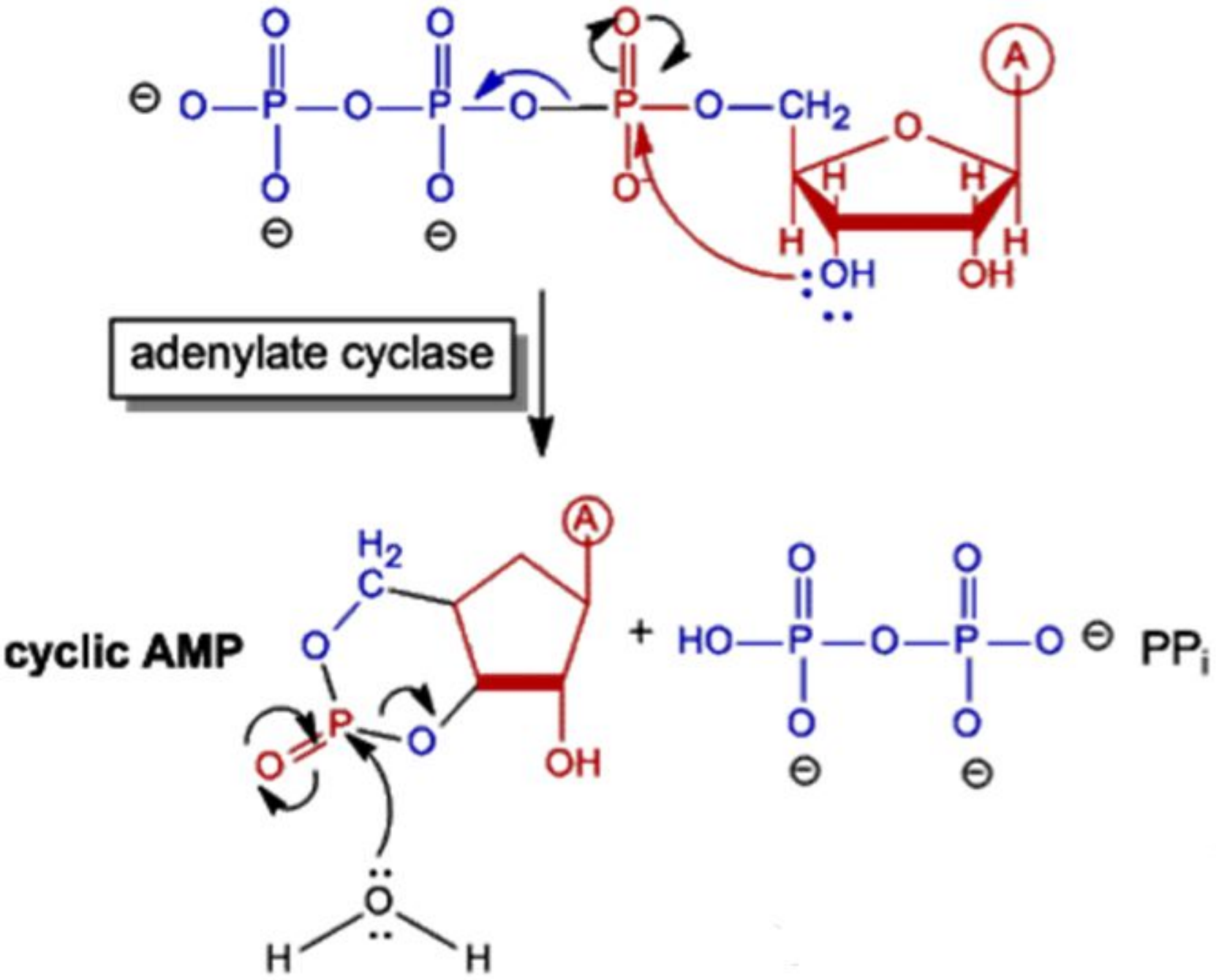
leukotrienes

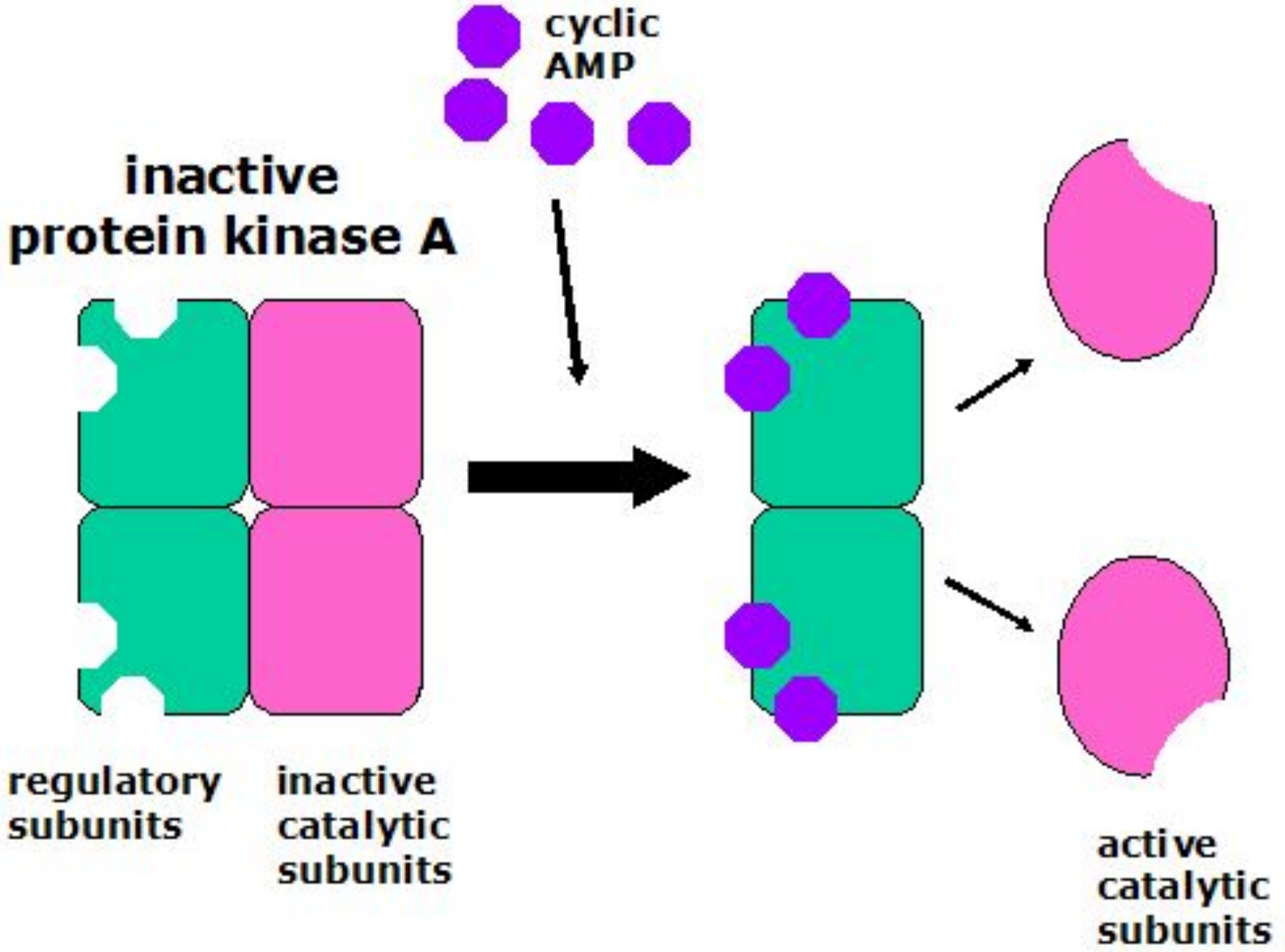


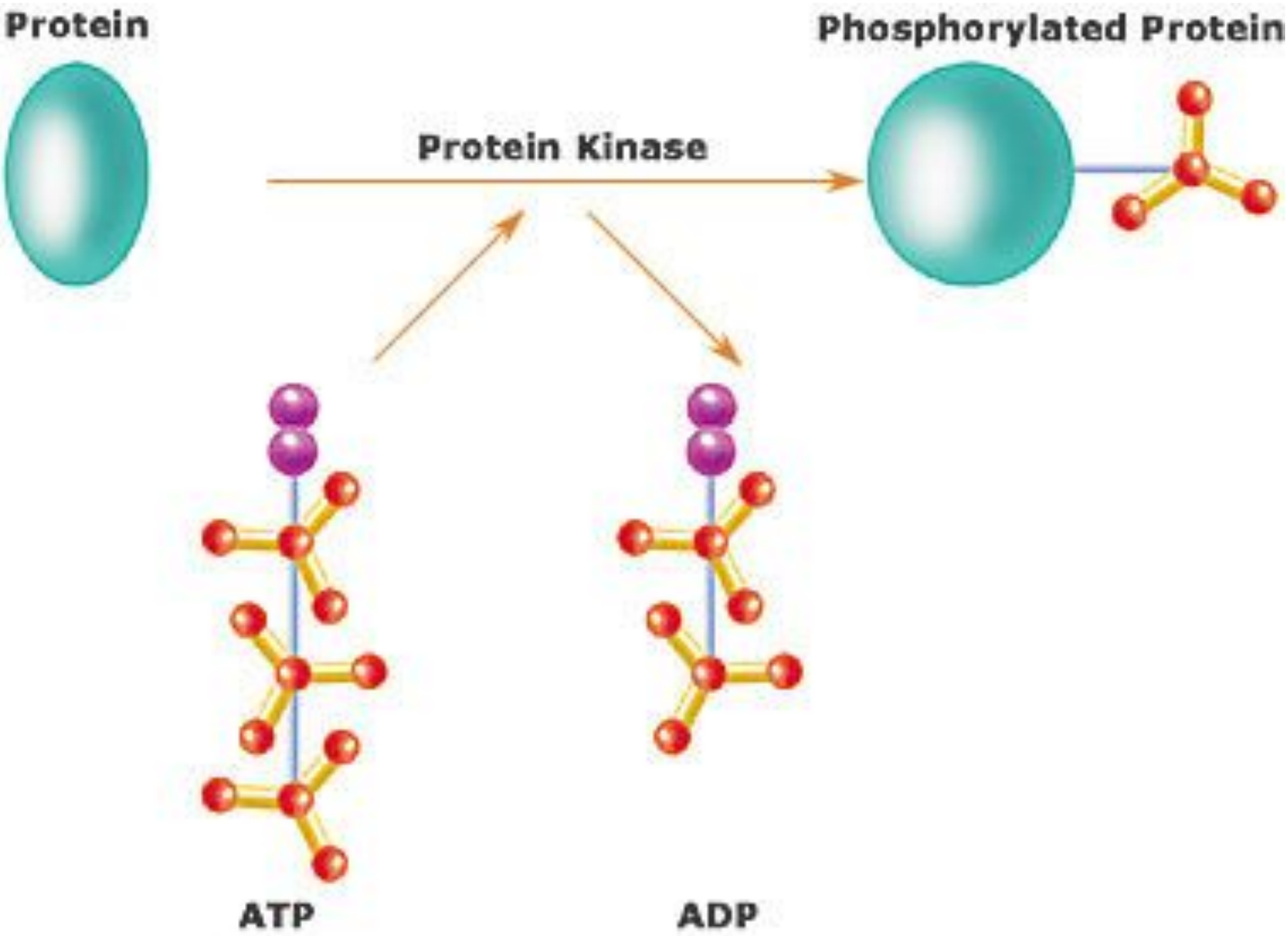
thromboxanes

Adenylate cyclase messenger system

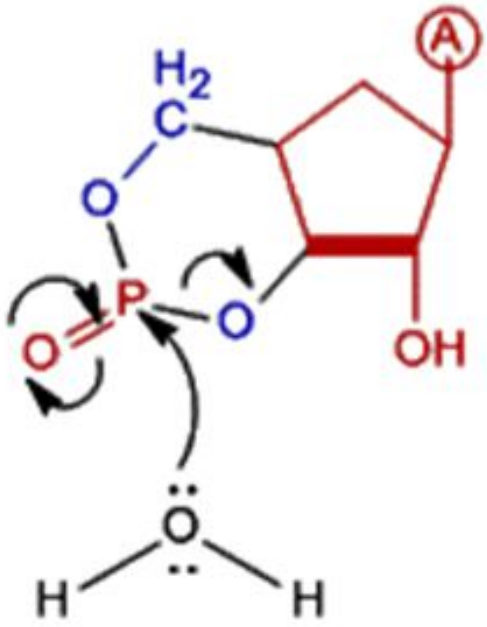



adenylate cyclase
cyclic AMP
+
PPi


cyclic
AMP
inactive
protein kinase A
regulatory
subunits
inactive
catalytic
subunits
active
catalytic
subunits


Protein
Phosphorylated Protein
Protein Kinase
ATP
ADP

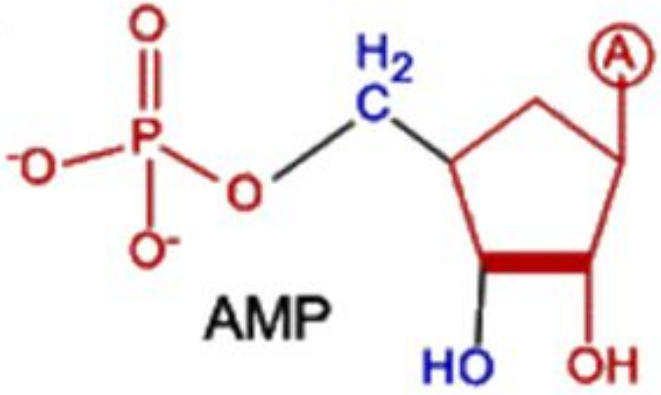
Termination of signal



cyclic AMP

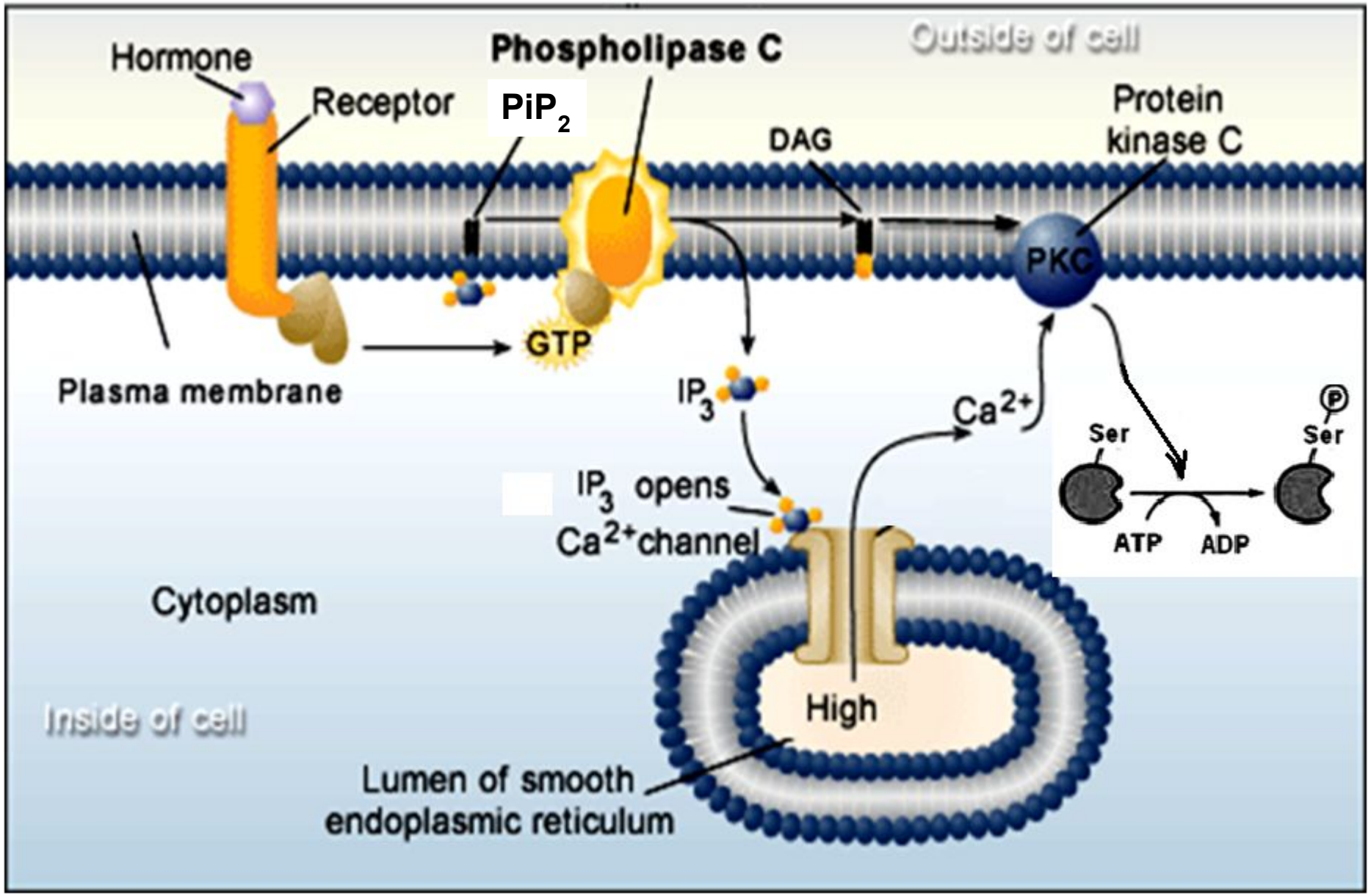
phosphodiesterase

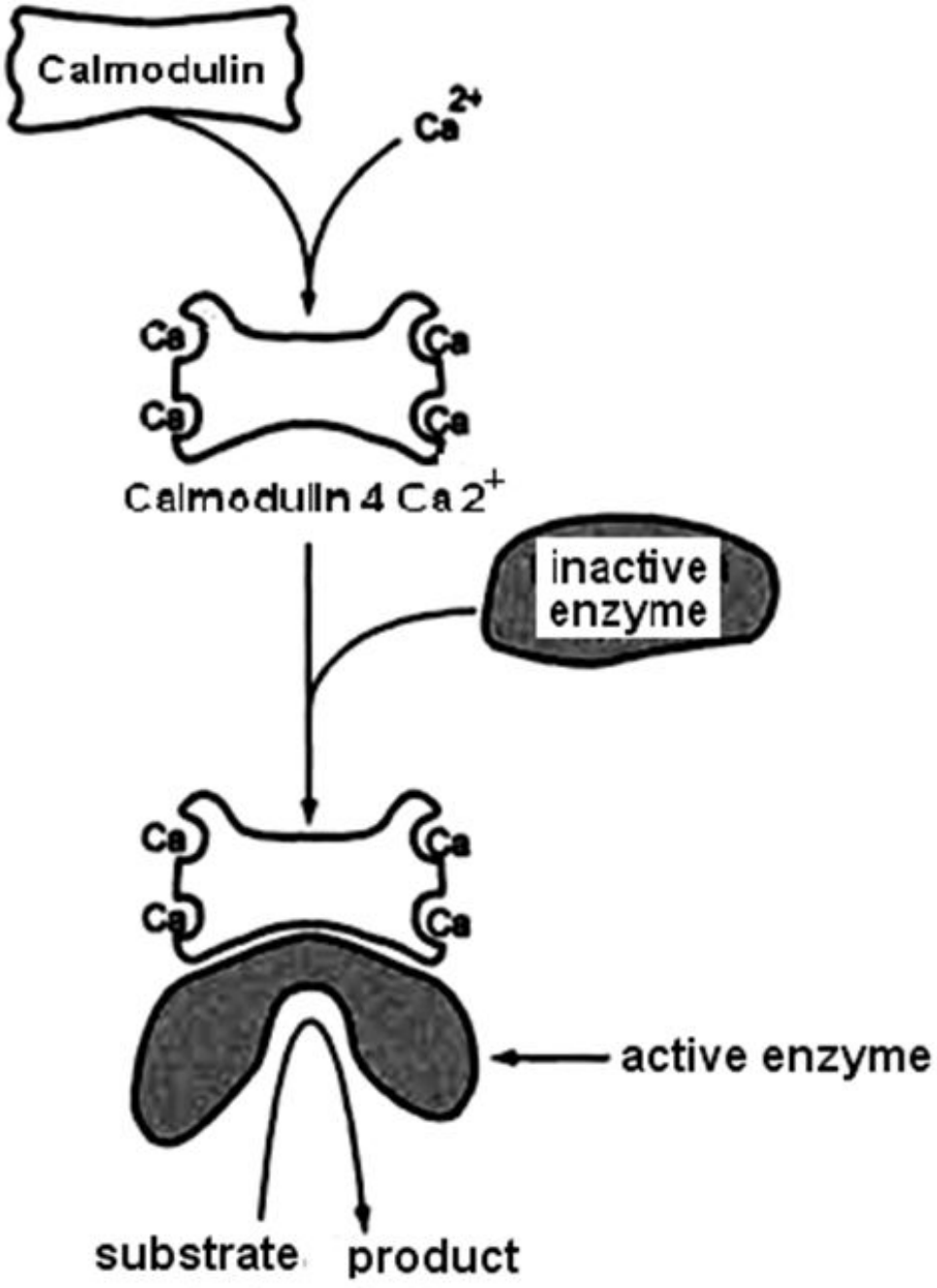
inhibited by caffeine



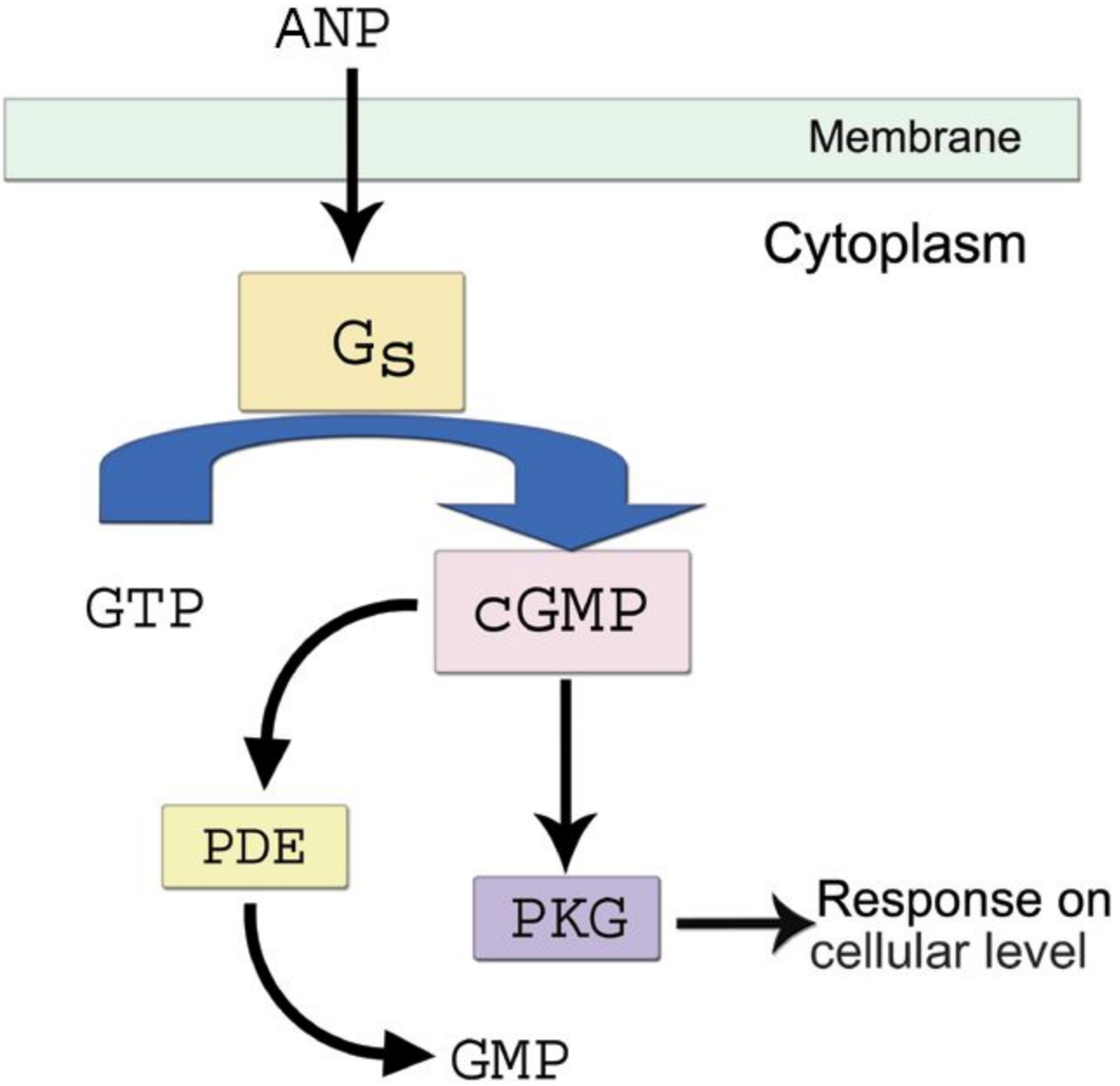
AMP

Phosphatidyl inositol calcium system

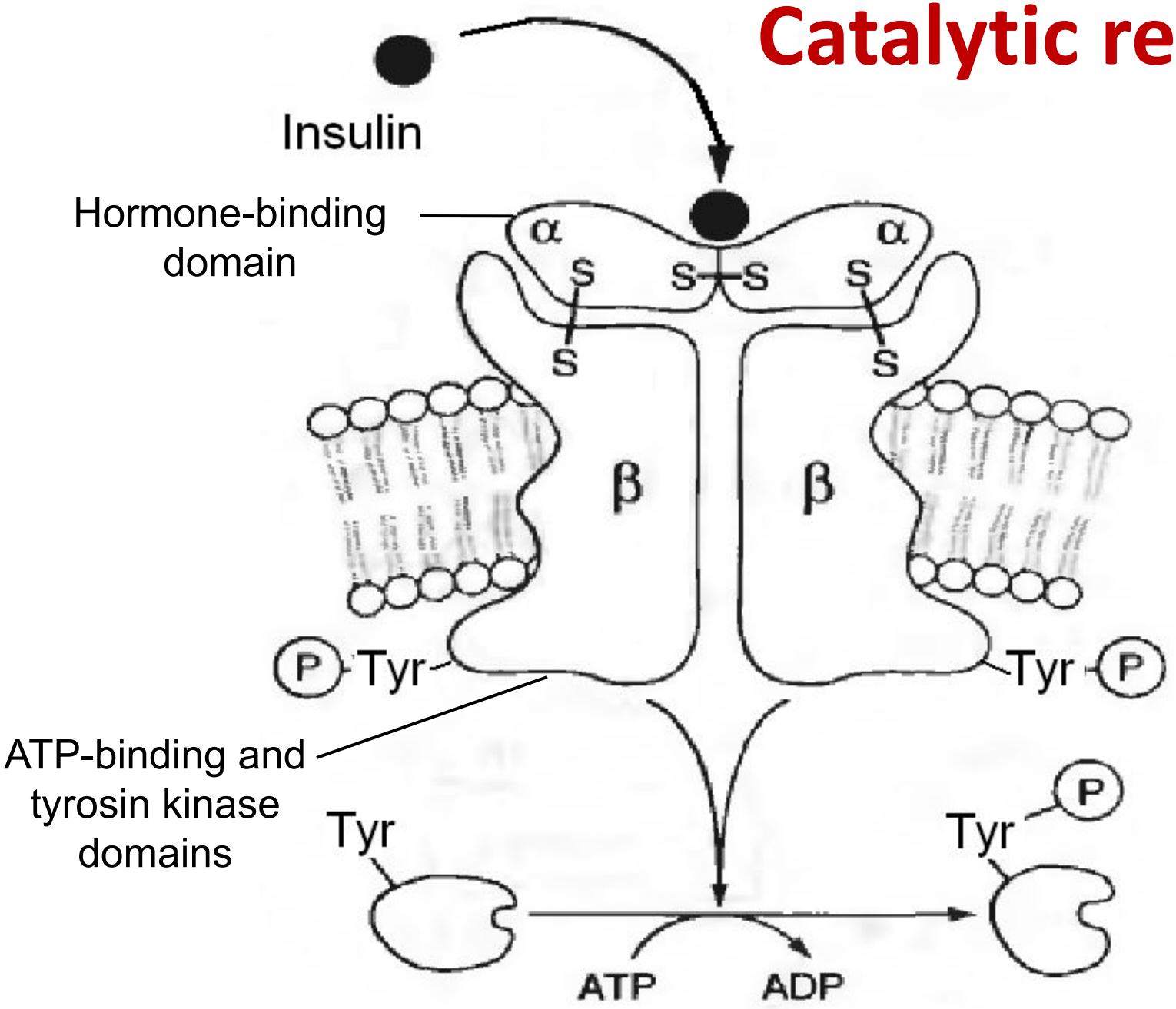



Calmodulin
Ca2+
Ca
Ca
Ca
Ca
Calmodulin 4 Ca 2+
inactive enzyme
Ca
Ca
Ca
Ca
active enzyme
substrate
product

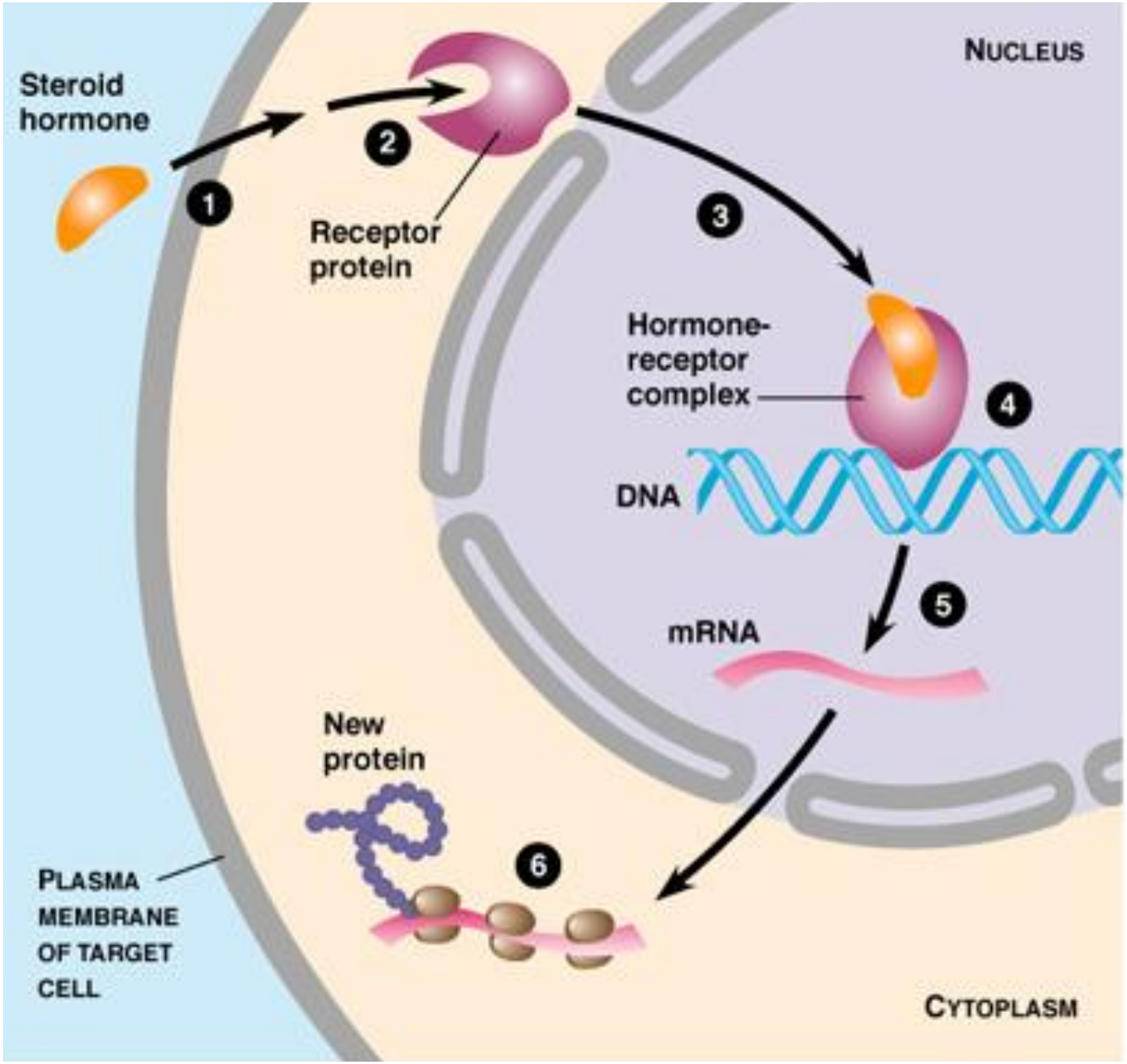
Guanylate cyclase messenger system



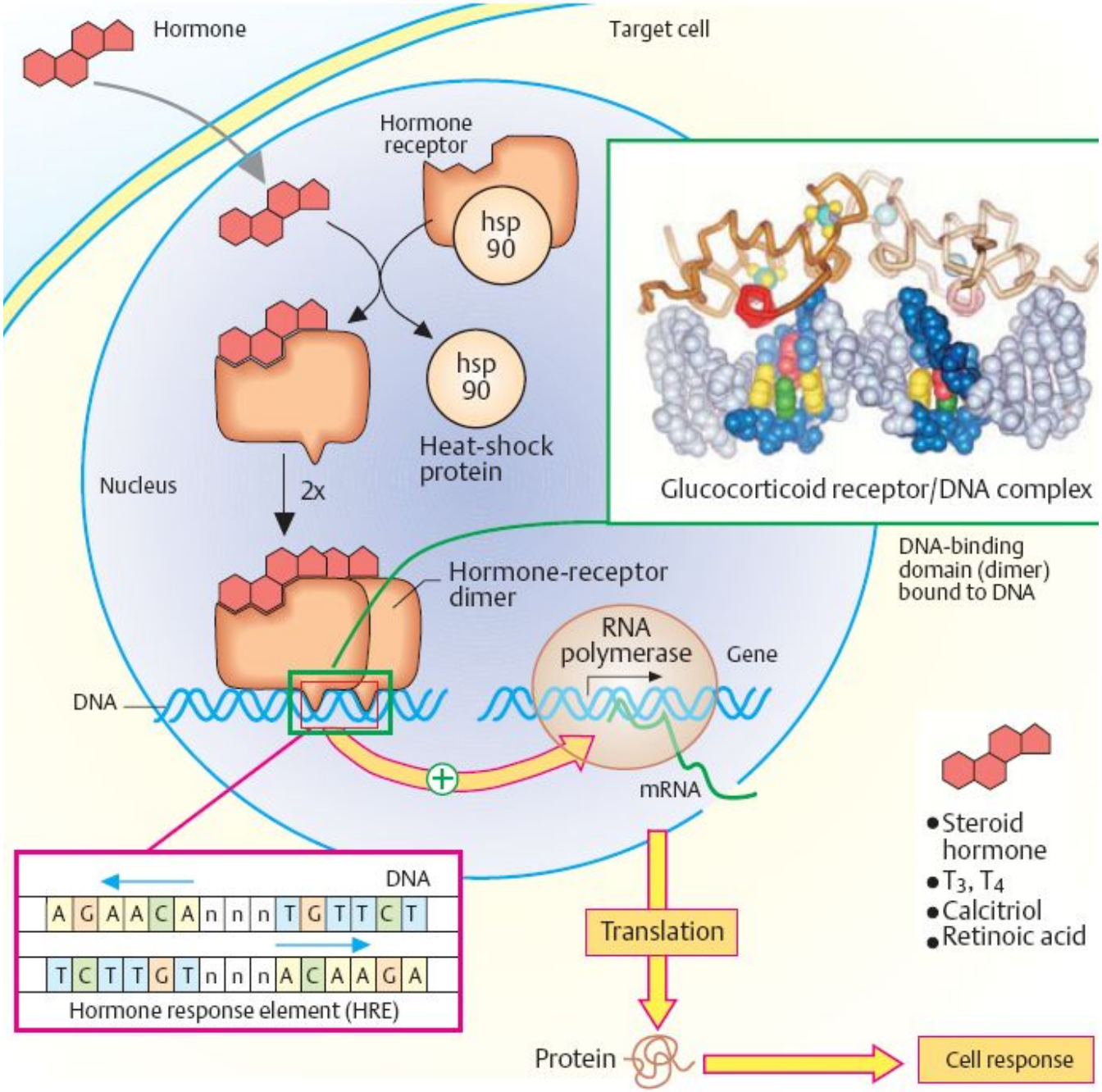
Catalytic receptor



Mechanism of lipophilic hormones action



Mechanism of lipophilic hormones action



Hormonal regulation system