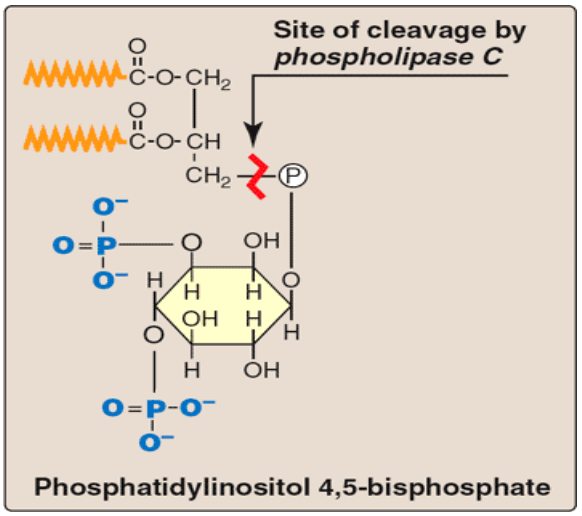
# Phosphatidyl-Inositol
# Secondary Messenger System

- PI is an unusual phospholipid in that it often contains stearic acid on carbon 1 and arachidonic acid on carbon 2 of the glycerol.
- It serves as a reservoir of arachidonic acid in membranes and, thus, provides the substrate for prostaglandin synthesis when required.

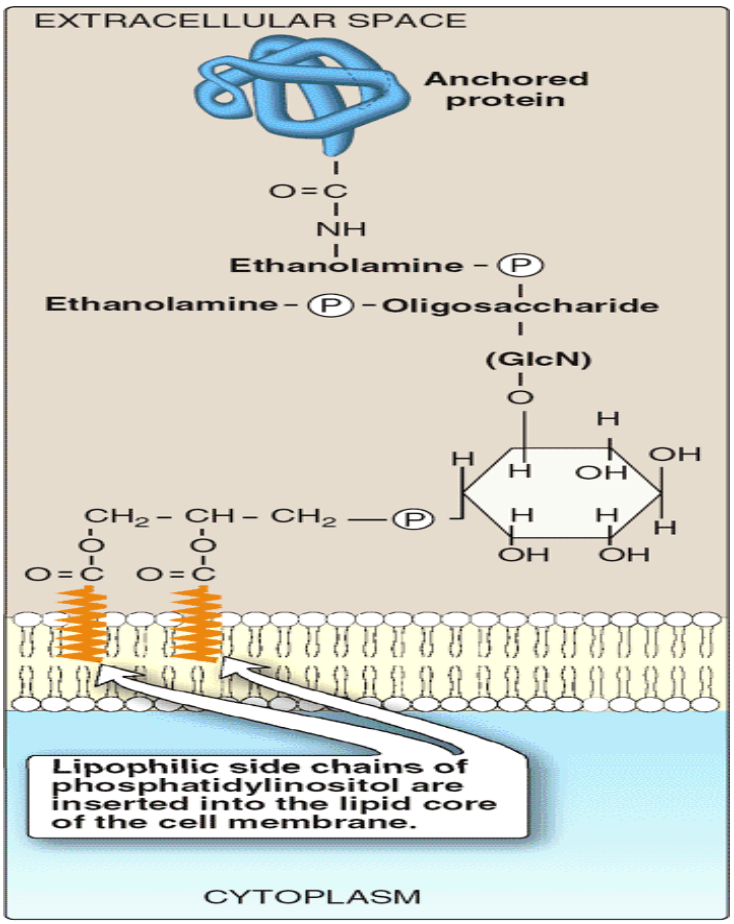



## Role of PI in Signal Transmission Across Membranes:

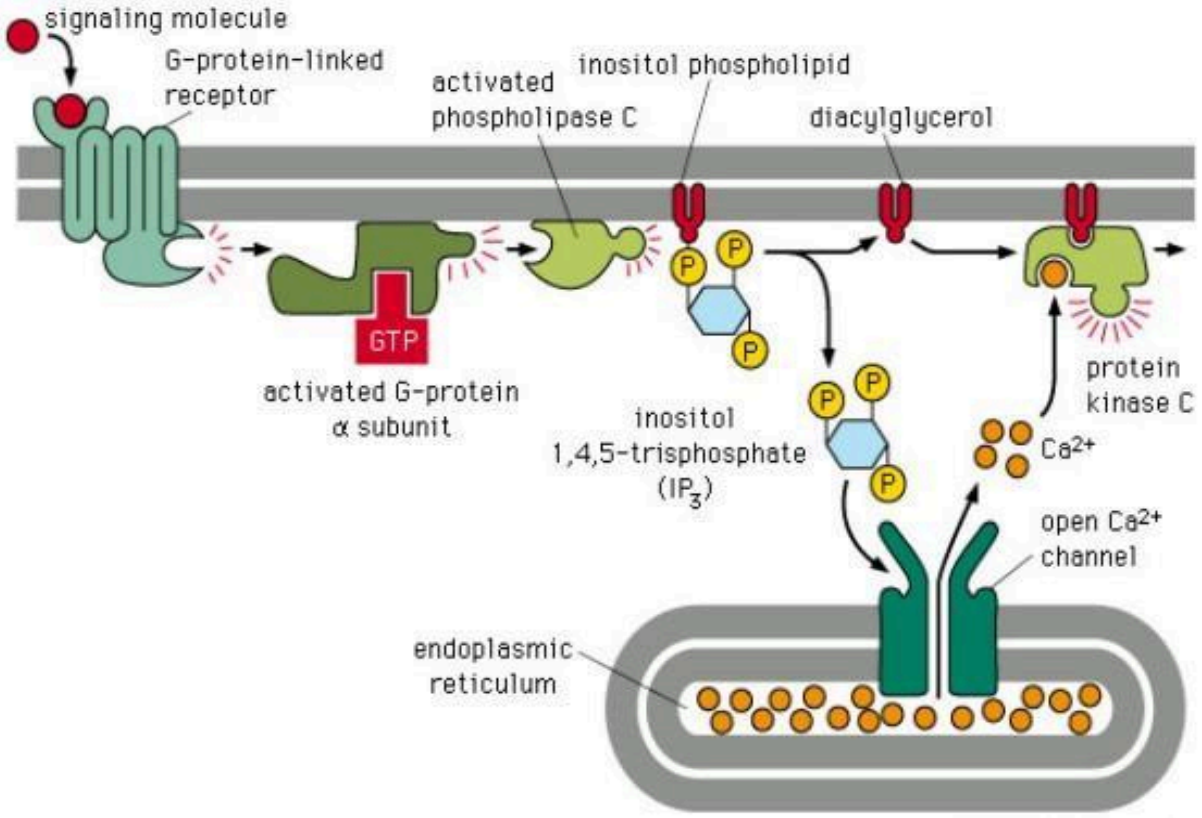
- The phosphorylation of membrane-bound phosphatidylinositol produces polyphosphoinositides e.g. phosphatidylinositol 4,5-bisphosphate.
- Neurotransmitter binding at receptor degrades PIP2 by phospholipase C.
- The products, inositol 1,4,5-trisphosphate (IP3) and diacylglycerol (DAG), mediate the mobilization of intracellular calcium and the activation of protein kinase C.

## Role of PI in Membrane Protein Anchoring:

- Specific proteins can be covalently attached via a carbohydrate bridge to membrane-bound PI .e.g.
- Alkaline phosphatase (a digestive enzyme found on the surface of the small intestine that attacks organic phosphates)
- Acetylcholine esterase (an enzyme of the postsynaptic membrane that degrades the neurotransmitter acetylcholine)
- Cell surface proteins bound to glycosyl phosphatidylinositol (GPI) are also found in a variety of parasitic protozoans (for example, trypanosomes and leishmania).
- Being attached to a membrane lipid (rather than being an integral part of the membrane) allows GPI-anchored proteins rapid lateral mobility on the surface of the plasma membrane.
- The protein can be cleaved from its anchor by the action of phospholipase C.




## Role of Inositol Triphosphate in Intracellular Signaling:


signaling molecule
G-protein-linked receptor
activated phospholipase C
inositol phospholipid
diacylglycerol
GTP
activated G-protein α subunit
inositol 1,4,5-trisphosphate ($IP_3$)
$Ca^{2+}$
protein kinase C
open $Ca^{2+}$ channel
endoplasmic reticulum
P