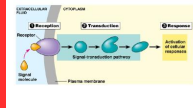
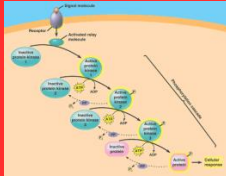
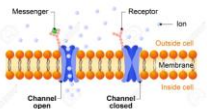


Three Stages of Signal Transduction



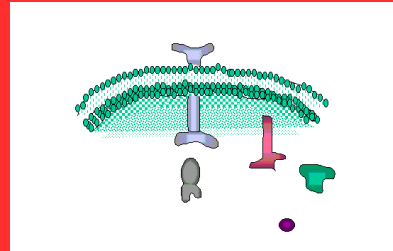
## 4.2 Introduction to Signal Transduction

Ligand-gated ion channel



## ENDURING UNDERSTANDING

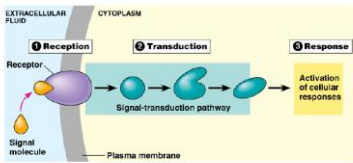
IST-3 Cells communicate by generating, transmitting, receiving, and responding to chemical signals.



### IST-3.C Describe the components of a signal transduction pathway.

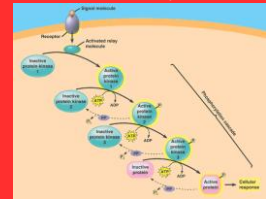
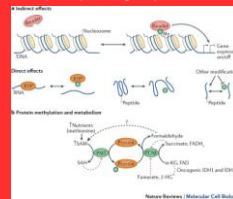
- Signal transduction pathways link signal reception with cellular responses.

Three Stages of Signal Transduction



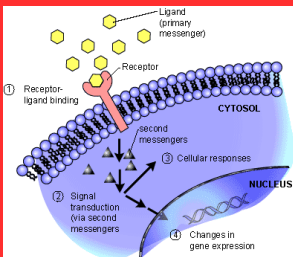
### IST-3.C Describe the components of a signal transduction pathway.

- Many signal transduction pathways include:
  - Protein modifications
    - Methylation changes the signaling process
    - Methylated histones can act epigenetically
  - Phosphorylation cascades in which a series of protein kinases add a phosphate group to the next protein in the cascade sequence



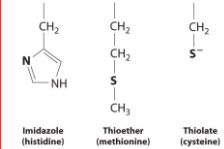
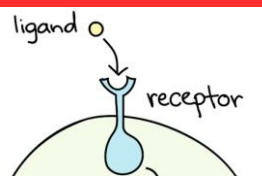
### IST-3.D Describe the role of components of a signal transduction pathway in producing a cellular response.

- Signaling begins with the recognition of a chemical messenger (a ligand) by a receptor protein.



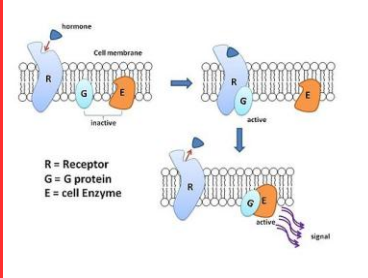
### IST-3.D Describe the role of components of a signal transduction pathway in producing a cellular response.

- The ligand-binding domain of a receptor recognizes a specific chemical messenger, which can be a peptide, a small chemical, or protein, in a specific one-to-one relationship.



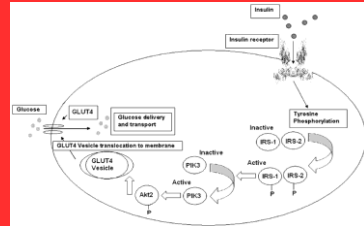
**IST-3.D Describe the role of components of a signal transduction pathway in producing a cellular response.**

- **G protein-coupled receptors** are an example of a receptor protein in eukaryotes.



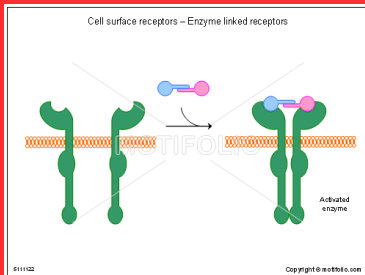
**IST-3.D Describe the role of components of a signal transduction pathway in producing a cellular response.**

- Signaling cascades relay signals from receptors to cell targets, often amplifying the incoming signals, resulting in the **appropriate responses** by the cell, which could include cell growth, secretion of molecules, or gene expression



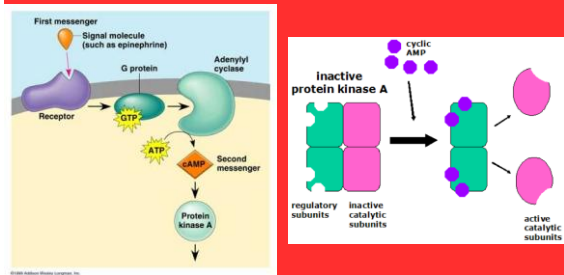
**IST-3.D Describe the role of components of a signal transduction pathway in producing a cellular response.**

- After the ligand binds, the intracellular domain of a receptor protein changes shape initiating transduction of the signal.



**IST-3.D Describe the role of components of a signal transduction pathway in producing a cellular response.**

- Second messengers (such as cyclic AMP) are molecules that relay and amplify the intracellular signal.



**IST-3.D Describe the role of components of a signal transduction pathway in producing a cellular response.**

- Binding of a ligand to a ligand-gated channels can cause the channel to open or close.

