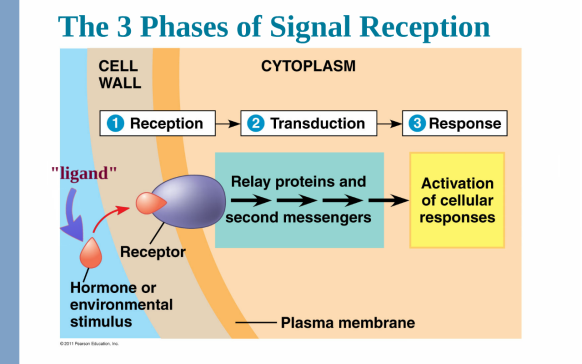
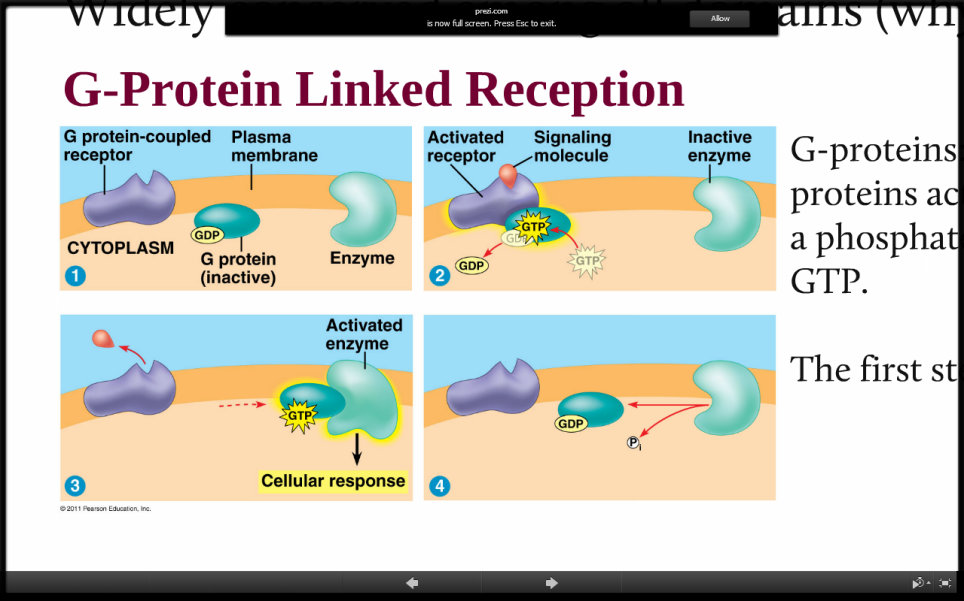
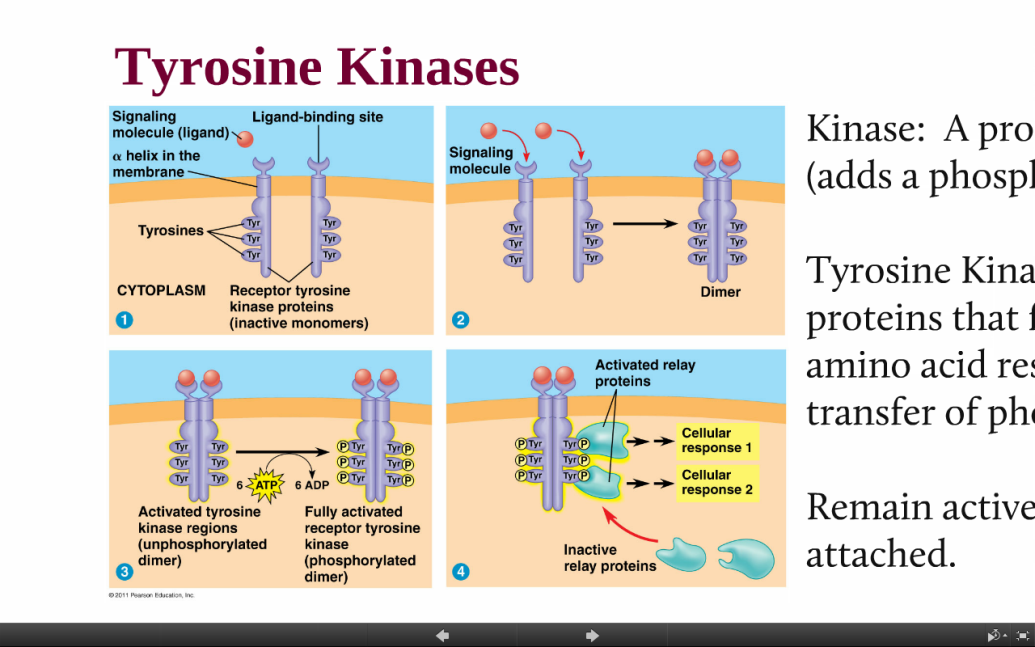
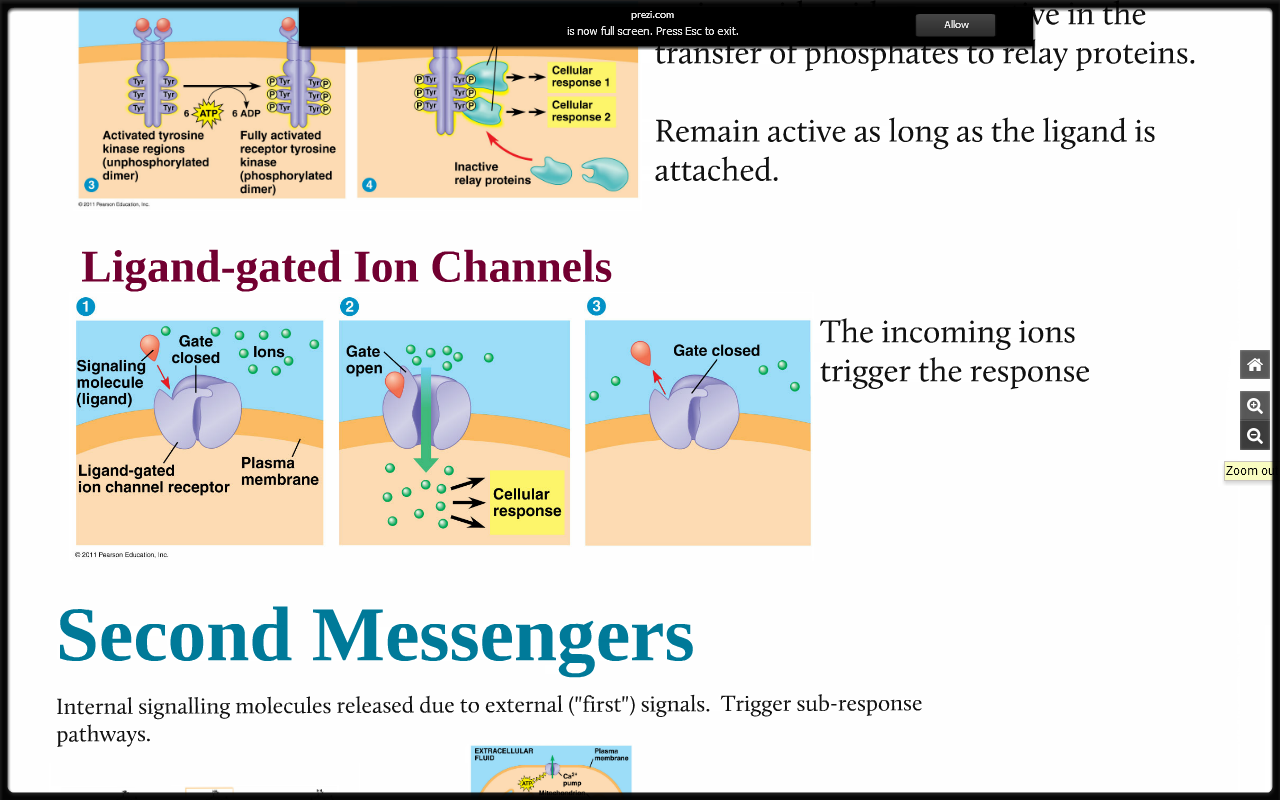
**CELL COMMUNICATION**

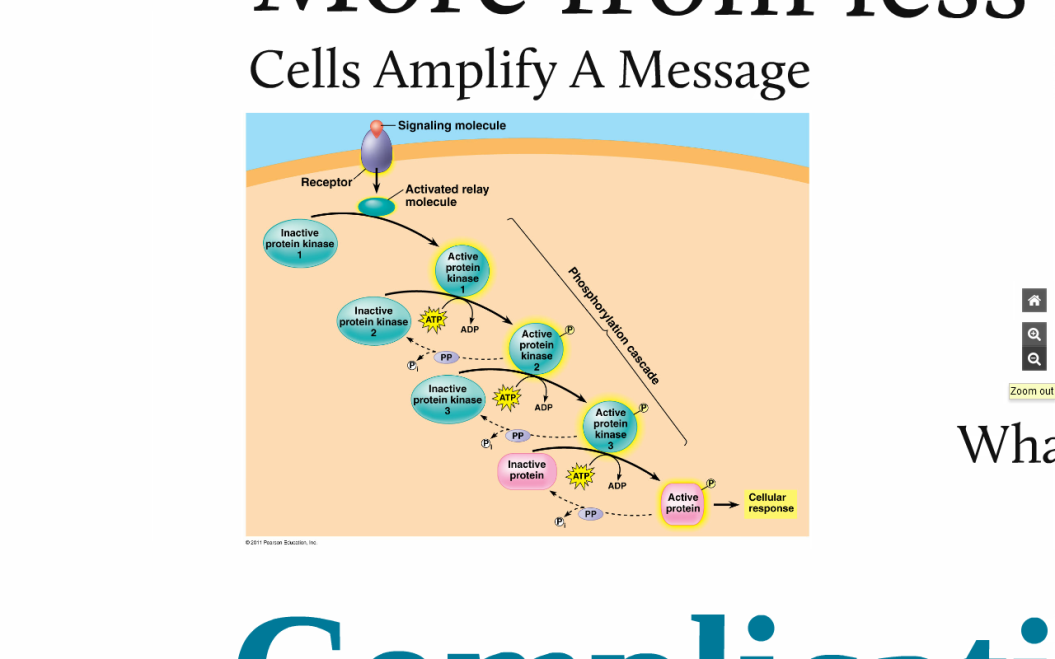
**RECEPTION**- **LIGAND** (signal molecule) binds to specific **RECEPTOR** on outside of cell.   
  
**TRANSDUCTION**- Signal is converted to another form inside cell that produces a specific cellular response  
  
**RESPONSE-** specific cell response is produced inside cell

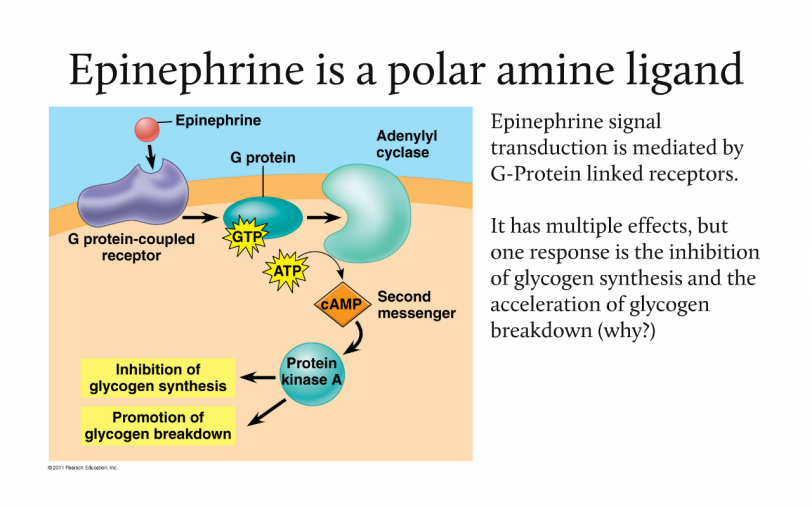
**LIGANDS CAN BE:** • **HYDROPHOBIC or SMALL-** EX: TESTOSTERONE and CORTISOL  
Enter cell and bind to **INTRACELLULAR** receptors in cytoplasmor nucleus• **HYDROPHILIC**- water-soluble ligands EX: INSULIN and EPINEPHRINE (ADRENALIN)Stay outside cell; Bind to receptors in **PLASMA MEMBRANE**  
 **CONFORMATIONAL CHANGE in receptor = initial transduction of signal  
Binding of ligand to EXTERNAL receptors releases INTERNAL signaling molecules   
CELL SIGNALING leads to REGULATION OF TRANSCRIPTION** or **CYTOPLASMIC ACTIVITIES**

**G-PROTEIN RECEPTOR-** • Ligand binds receptor attached to G protein  
 • Conformation change causes inactive G=protein to   
 attach  
 • GTP displaces GDP and activates G-protein  
 • Active G-protein activates another enzyme  
 **TYROSINE KINASE RECEPTOR-**  **KINASE**- Protein that “phosphorylates”   
 (adds a phosphate to) another molecule **TYROSINE KINASES:** • Attachment of ligand to receptor forms dimers  
 • Active dimers transfer phosphates to other   
 proteins which produce a response  
 • Remain ACTIVE as long as LIGAND is attached

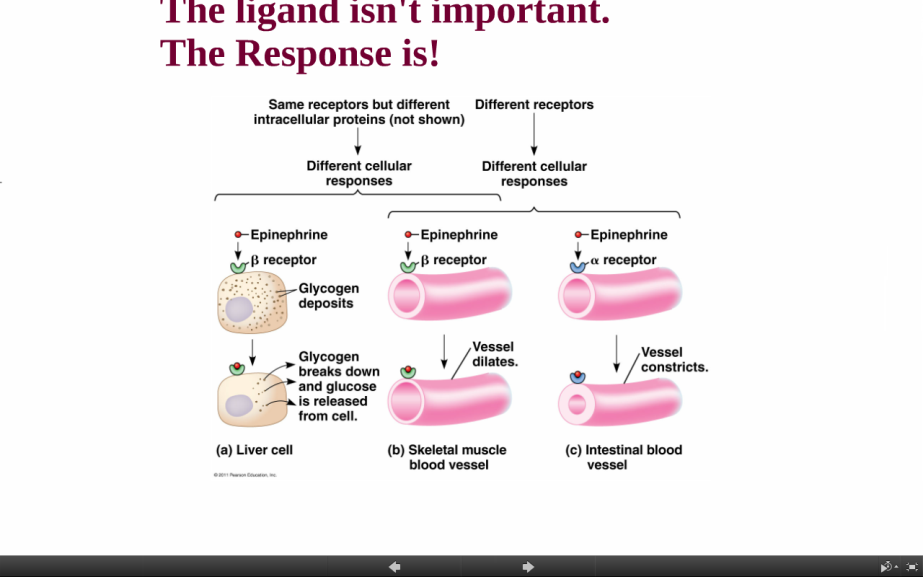


**LIGAND-GATED ION CHANNELS-**   
• LIGANDS open passageways for specific ions  
• Influx of ions causes cellular response

**SIGNAL TRANSDUCTION PATHWAYS**• often involve a **PHOSPHORYLATION CASCADE**• Each step **PROTEIN KINASES** activate other proteins  
• Allows for **AMPLIFICATION** of signal  
 ( produces large response)

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**SECOND MESSENGERS  
-**Small, non-protein water soluble molecules or ions   
 EX: **Ca++ ions** and **cyclic AMP**• once activated, 2nd messengers can initiate a phosphorylation cascade



**SAME LIGAND CAN PRODUCE DIFFERENT RESULTS IN DIFFERENT TISSUES VIA DIFFERENT INTRACELLULAR PROTEINS**

**EXAMPLES OF CELL COMMUNICATION** (There are many, many more) **QUORUM SENSING in bacteria:** communication among microbes that triggers group response when population reaches certain density

**APOPTOSIS (programmed cell death)** integrates multiple cell signaling pathways  
 • Signals activate cascade of “suicide” proteins in cell  
 • Important part of embryonic development in vertebrates, essential for nervous system formation,   
 operation of immune system, morphogenesis of hands/feet & loss of tails in humans