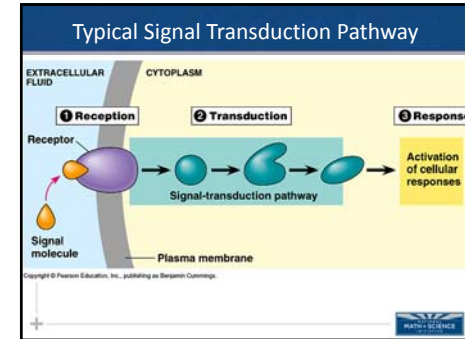
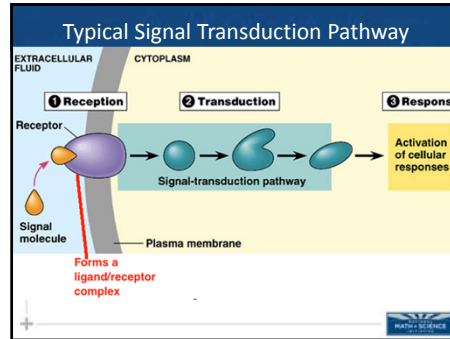








**Endocrine & Cell Communication Part III:
Hormonal Communication**

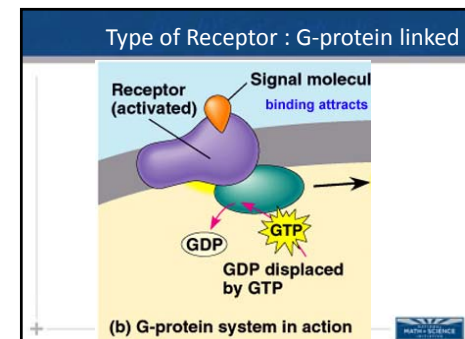
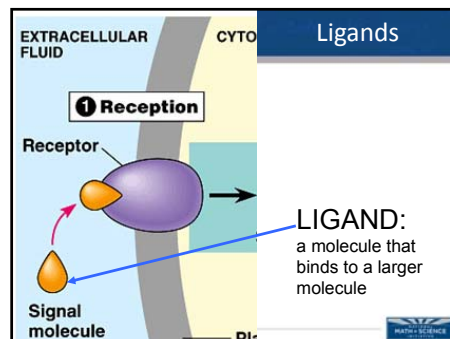



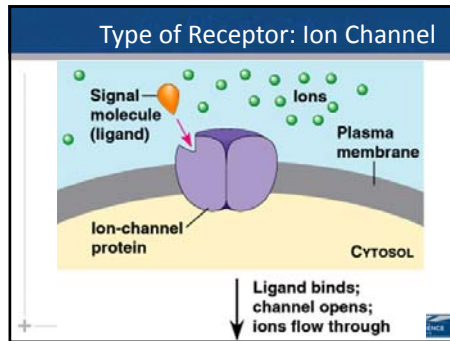
- Enduring Understanding 3.D Cells communicate by generating, transmitting and receiving chemical signals.
 - EK 3D2: Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling
 - c. Signals released by one cell type can travel long distances to target cells of another cell types.
 - 1. Endocrine signals are produced by endocrine cells that release signaling molecules, which are specific and can travel long distances through the blood to reach all parts of the body.
- 

- Ligand = Chemical Messenger**
- Three major classes of molecules function as hormones in vertebrates (ligands)
 - Polypeptides (proteins and peptides)
 - Amines derived from amino acids
 - Steroid hormones
- 

- Phase 1: Reception**
The target cell detects the ligand
- Membrane proteins
 - G-protein linked receptors
 - Ion channel receptors
 - Tyrosine Kinase
 - Intracellular receptor
 - Steroid hormone receptors
- 

- The Process of Communication:
Signal-Transduction Pathway**
- Three stages of the Signal-Transduction Pathway**
1. reception
 2. transduction
 3. response
- 



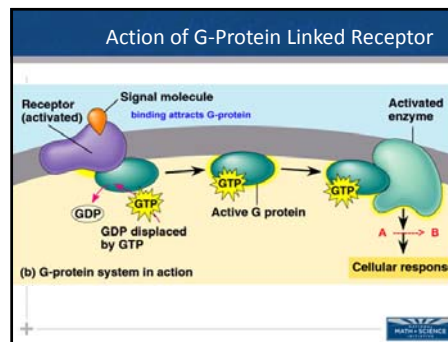
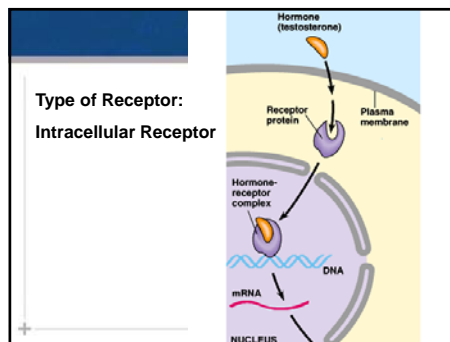
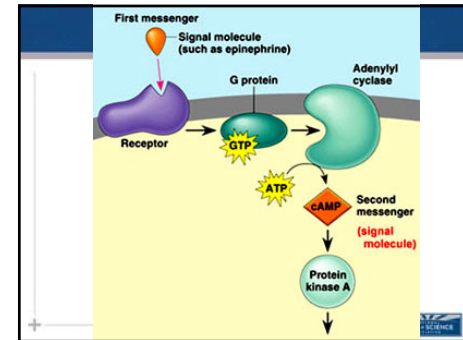
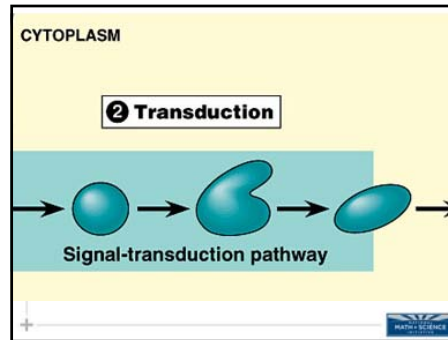
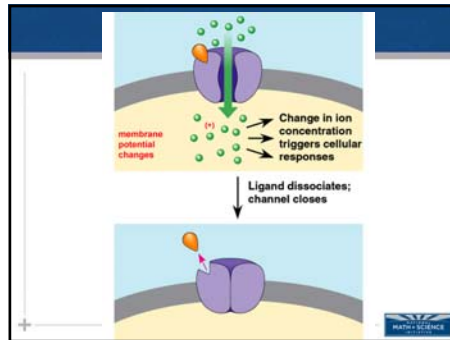


Name three types of receptors in the signal transduction pathway

- G-protein-linked receptors
- Ion channel receptors
- Intracellular receptors

Transduction

- Binding changes the receptor protein.
- Can set off a cascade reaction



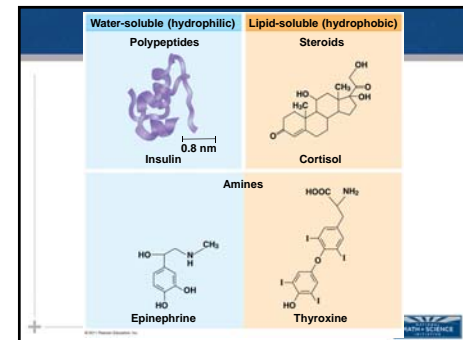
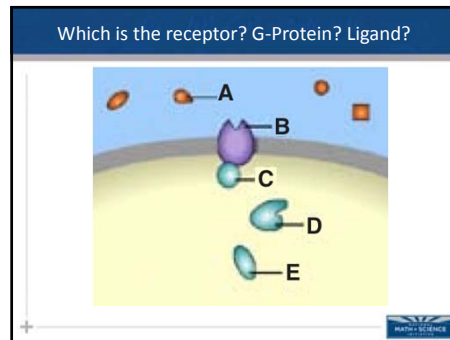
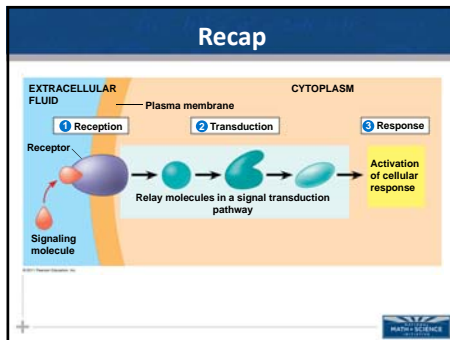
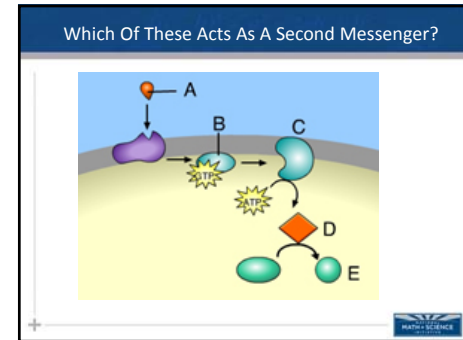
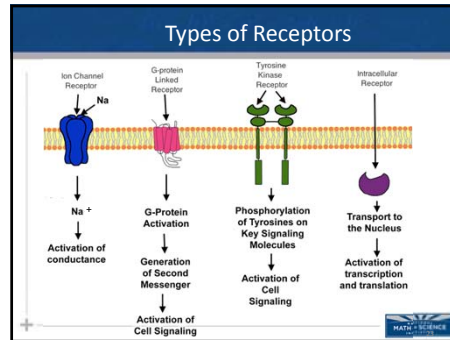
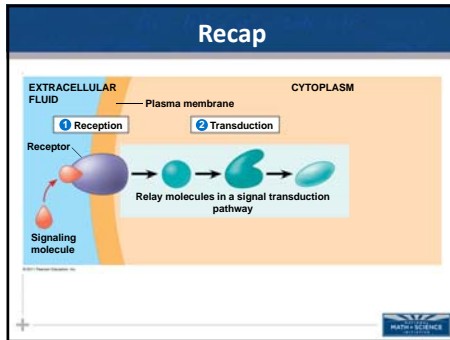
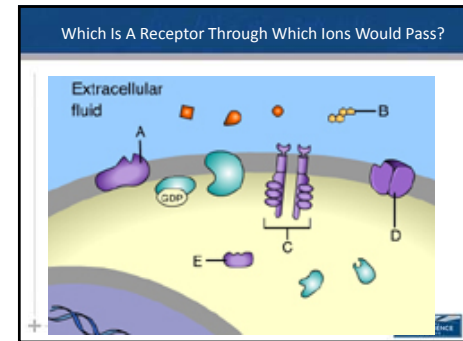
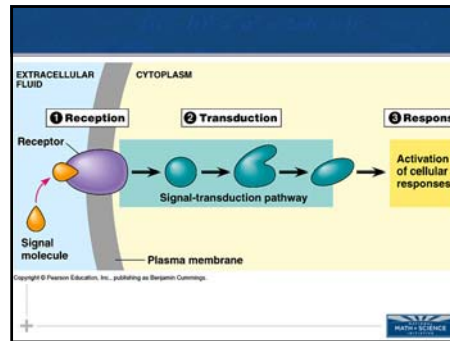
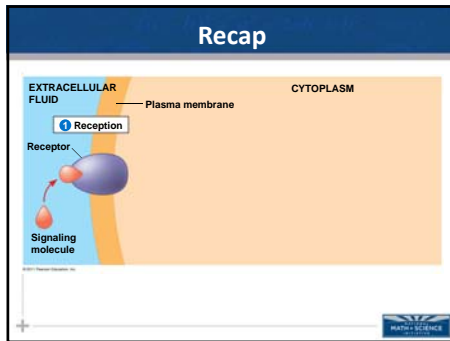
Response

Set any of a variety of cell activities in motion.

- Activation of an enzyme
- Rearrangement of cytoskeleton features
- Activation of a specific gene

3 Response

Activation of cellular responses



Cellular Response Pathways

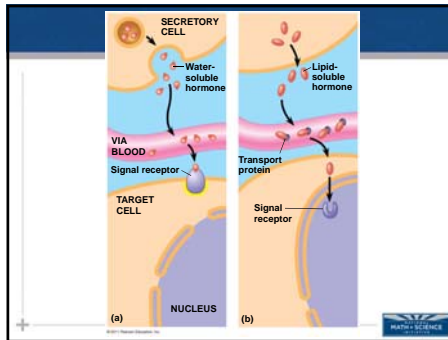
- Water- and lipid-soluble hormones differ in their paths through a body
- Water-soluble hormones are secreted by exocytosis, travel freely in the bloodstream, and bind to cell-surface receptors
- Lipid-soluble hormones diffuse across cell membranes, travel in the bloodstream bound to transport proteins, and diffuse through the membrane of target cells

Pathway for Water-Soluble Hormones

- Binding of a hormone to its receptor initiates a **signal transduction** pathway leading to responses in the cytoplasm, enzyme activation, or a change in gene expression

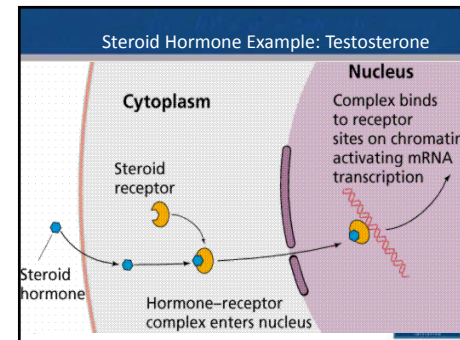
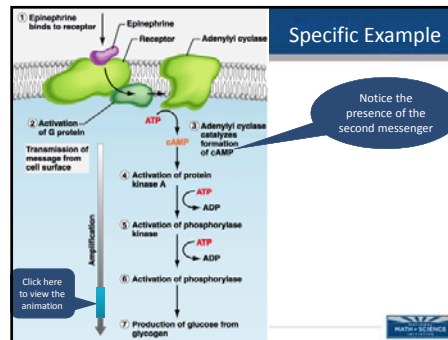
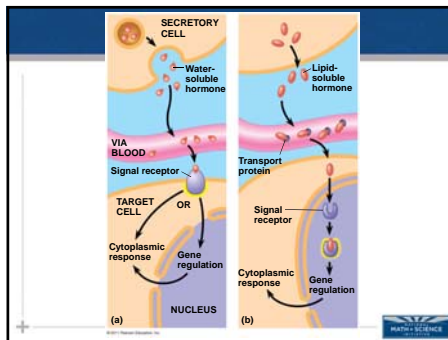
Pathway for Lipid-Soluble Hormones

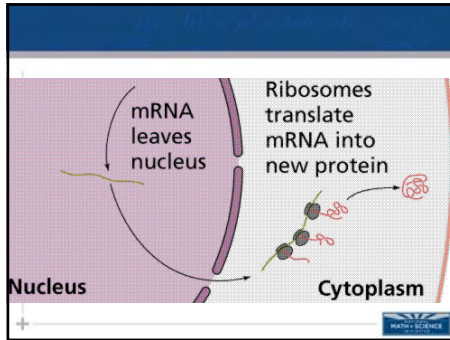
- The response to a lipid-soluble hormone is usually a change in gene expression
- Steroids, thyroid hormones, and the hormonal form of vitamin D enter target cells and bind to protein receptors in the cytoplasm or nucleus
- Protein-receptor complexes then act as transcription factors in the nucleus, regulating transcription of specific genes



Pathway for Water-Soluble Hormones

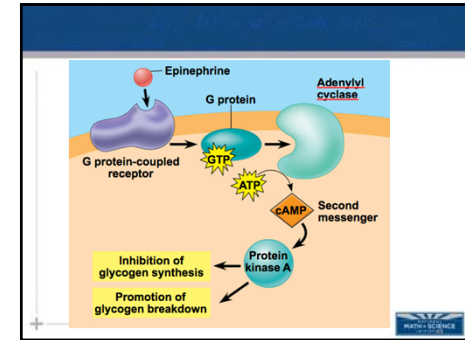
Pathway for Lipid-Soluble Hormones





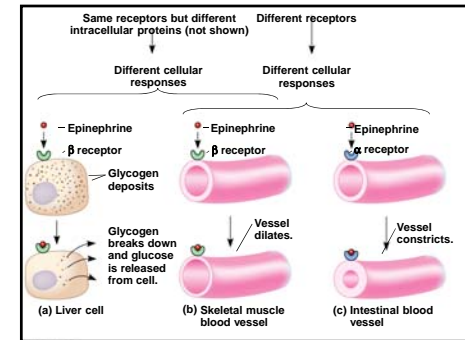
Compare protein and steroid hormones by completing this T chart

Characteristic	Protein Hormone	Steroid Hormone
Speed of response	Rapid response, cascade	Response is slower, gene expression
Primary biomolecule composition	Amino acid	cholesterol
Method of leaving secretory cell	Exocytosis	diffusion
Location of receptor	Membrane bound	Intracellular
Example	Epinephrine	Testosterone



Model Steroid Hormone Action using the Testosterone Manipulative

- Multiple Effects of Hormones
- The same hormone may have different effects on target cells that have
 - Different receptors for the hormone
 - Different signal transduction pathways



Compare protein and steroid hormones by completing this T chart

Characteristic	Protein Hormone	Steroid Hormone
Speed of response		
Primary biomolecule composition		
Method of leaving secretory cell		
Location of receptor		
Example		

- Multiple Effects of Hormones
- The hormone **epinephrine** has multiple effects in mediating the body's response to short-term stress
 - Epinephrine binds to receptors on the plasma membrane of liver cells
 - This triggers the release of messenger molecules that activate enzymes and result in the release of glucose into the bloodstream

- Did you know...
- One reason that kittens sleep so much is because a growth hormone is released only during sleep.
 - The levels of two stress hormones, cortisol and epinephrine which suppress the body's immune system, will actually drop after a dose of laughter.
 - Chocolate is associated with the release of serotonin, the hormone that makes you feel relaxed, calm, and happy. So are hugs.

**NATIONAL
MATH + SCIENCE
INITIATIVE**

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