CONCEPT: PROTEIN BINDING

Protein Binding

● All proteins bind to other _____

□ The *binding site* is the region where proteins bind

- It is highly **specific** and can usually only bind to one or a few particles

- The **ligand** is any substance bound to a protein

- **Affinity** measures the strength of protein binding

□ Noncovalent bonds between amino acids in the binding site allow for the ligand to bind to the protein

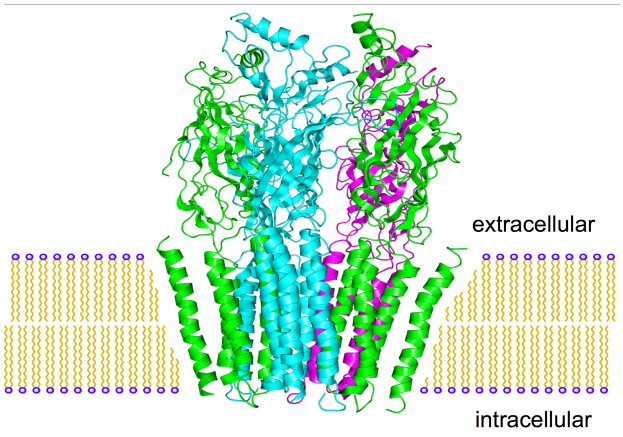
- Also called *molecular complementarity* when binding site and ligand properties are complementary

□ Surface conformation of the protein binding site provides it a certain _____

- Can restrict the ligand's access to water and prevent the formation of hydrogen bonds

- Allow for reactions between ligands and polar amino acid side chains

EXAMPLE: Extracellular ligand binding to a protein in the membrane bilayer



● There are _____ forms of protein binding

□ *Surface-String*: One large protein surface interacts with polypeptide chain of another protein (string)

□ *Helix-Helix*: Two polypeptide helices interact

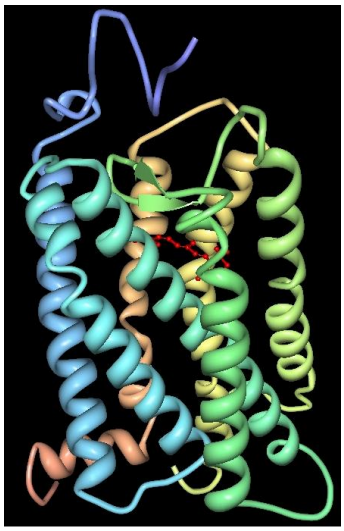
□ *Surface-Surface*: Two protein surfaces interact – most common form of protein interaction

□ *Molecular channels*: One protein forms a channel containing an active site on the inside

- Allows for processing of an unstable intermediate protein quickly without it diffusing into cytosol

□ *Small Molecule*: Nonprotein binding of a small molecule that gives the protein a specific function

EXAMPLE: The small molecule retinol (grey) bound to the human rhodopsin protein



Antibodies

● **Antibodies** are proteins (also called immunoglobulin proteins) produced by the immune system

□ Antibodies help the body _____ and respond to foreign molecules

- Recognize an **antigen**, which is any foreign molecule – VERY specific

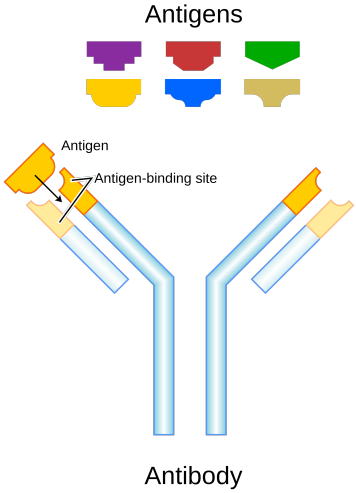
- Antibodies recognize an antigen's **epitope** or small specific region that the antibody binds

□ Antibodies are shaped like a "Y" with a heavy and light chain segment

- There are variable regions that recognize specific antigens, and constant regions specific to antibodies

□ Antibodies are extremely _____. They can tell the difference between a single amino acid

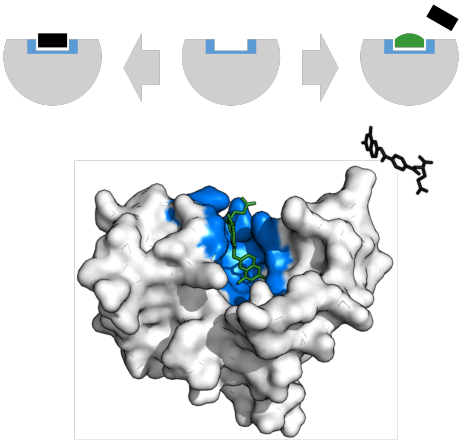
EXAMPLE: An antibody structure is specific for one antigen



Enzymes

- **Enzymes** are proteins that help to _____ (speed up) reactions
  - □ Enzymes bind to **substrates**, which are ligands that bind to enzymes
    - Binds to the active site portion of the enzyme
  - □ Once bound the enzyme stabilizes the *transition state* to lower activation energy
    - Chemical reaction or modification proceeds
  - □ Many pharmaceutical drugs inhibit enzymes

EXAMPLE: Enzymes bind to substrates to catalyze chemical reactions



PRACTICE

1. Which of the following is not a form of protein binding?
    a. Helix-helix
    b. Surface-string
    c. Surface-surface
    d. Surface-helix

2. The region of a molecule that an antibody binds is called what?
    a. Antigen
    b. Epitope
    c. Ligand
    d. Substrate

3. True or False: The binding site of a protein is highly specific for one or a few ligands
    a. True
    b. False