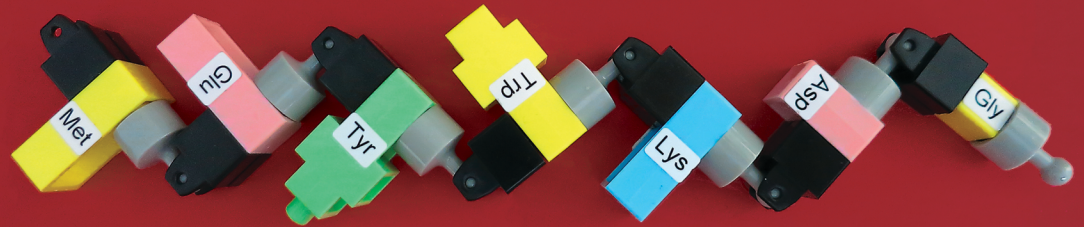


Protein

Booklet 2:

Advanced Structure and Protein Examples



Models and lessons created
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Graphics by Amanda Mayer.
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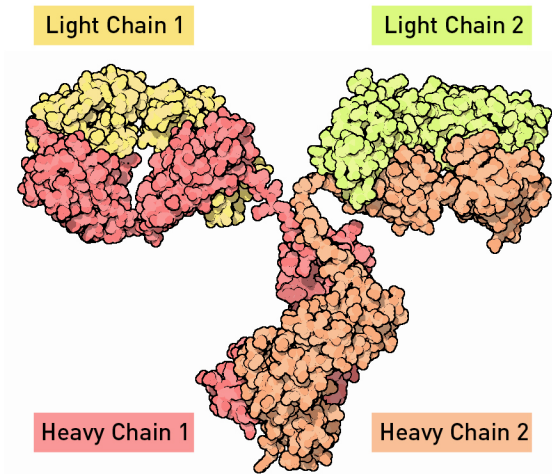
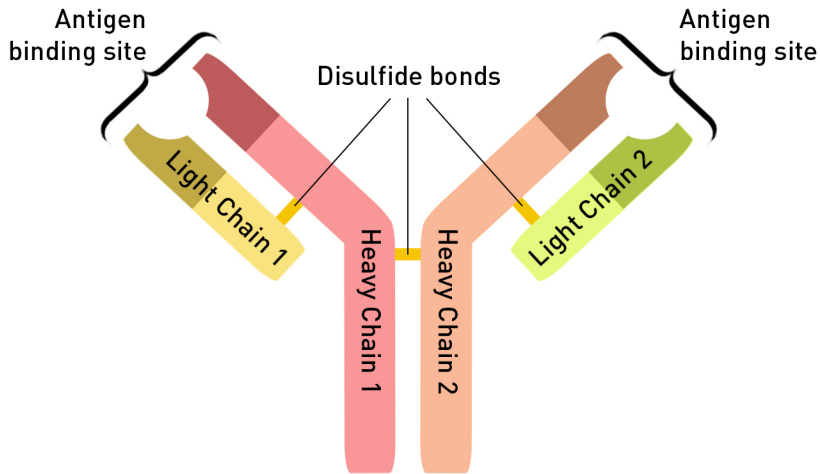
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This booklet assumes you have completed Protein Booklet 1: Introduction to Structure and Function.

Defense Protein: Antibody

Antibodies are large Y-shaped proteins found in blood. These molecules are used by the immune system to identify and neutralize foreign objects like bacteria and viruses. These foreign objects are called antigens. Each arm of the "Y" of an antibody recognizes part of an antigen. Each antibody has four protein chains: two heavy chains and two light chains. All four chains are connected to each other by disulfide bonds.

1. Compare the antibody diagrams below. Find the antigen binding sites. Find the three disulfide bonds and note their location.

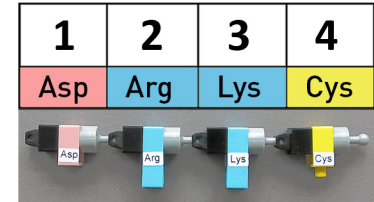
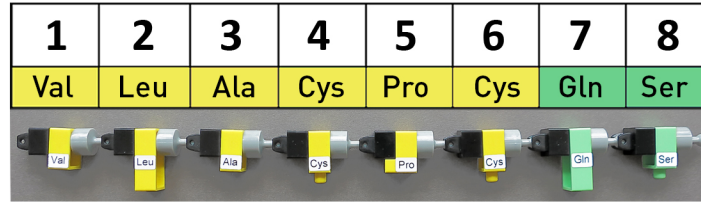


Q: How many protein chains are in one antibody?

Image from the Protein Data Bank: <http://www.rcsb.org/>

Antibodies are large proteins, so you will only build half of the antibody, one heavy chain and one light chain.

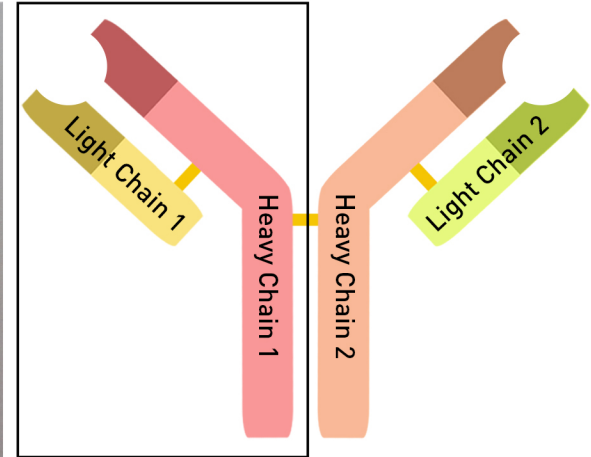
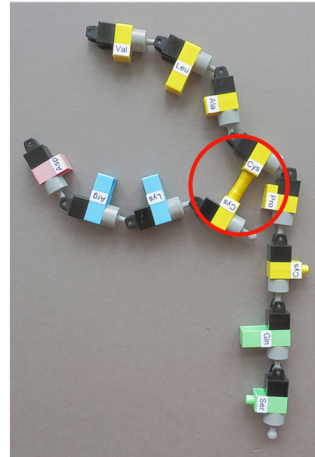
2. Build the 2 chains as shown. Check that the amino ends are free on the first amino acids. Turn the amino groups so the eyes are showing.



3. Position the heavy and light chains next to each other as shown in the photo. Adjust the side chains.

Notice the Cys amino acids in both chains. The Cys side chains create a disulfide bond that holds the 2 chains together.

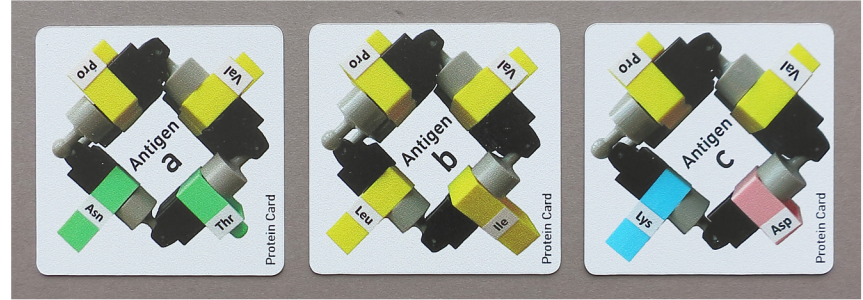
4. Add a disulfide bond between the first Cys on the heavy chain and the Cys on the light chain as shown in the red circle.



Now we need antigens for our antibody.

5. Find the 3 antigen cards in your Protein Card Pack.

Let's discover which antigen will bind the best.



6. Try each antigen card in the antigen binding site as shown in the photo. Rotate each antigen card to maximize the interactions between the side chains of the antibody and antigen.

7. Which antigen do you think will bind most strongly to the antibody? Make a choice (Antigen a, Antigen b, or Antigen c) before continuing to the next page.

