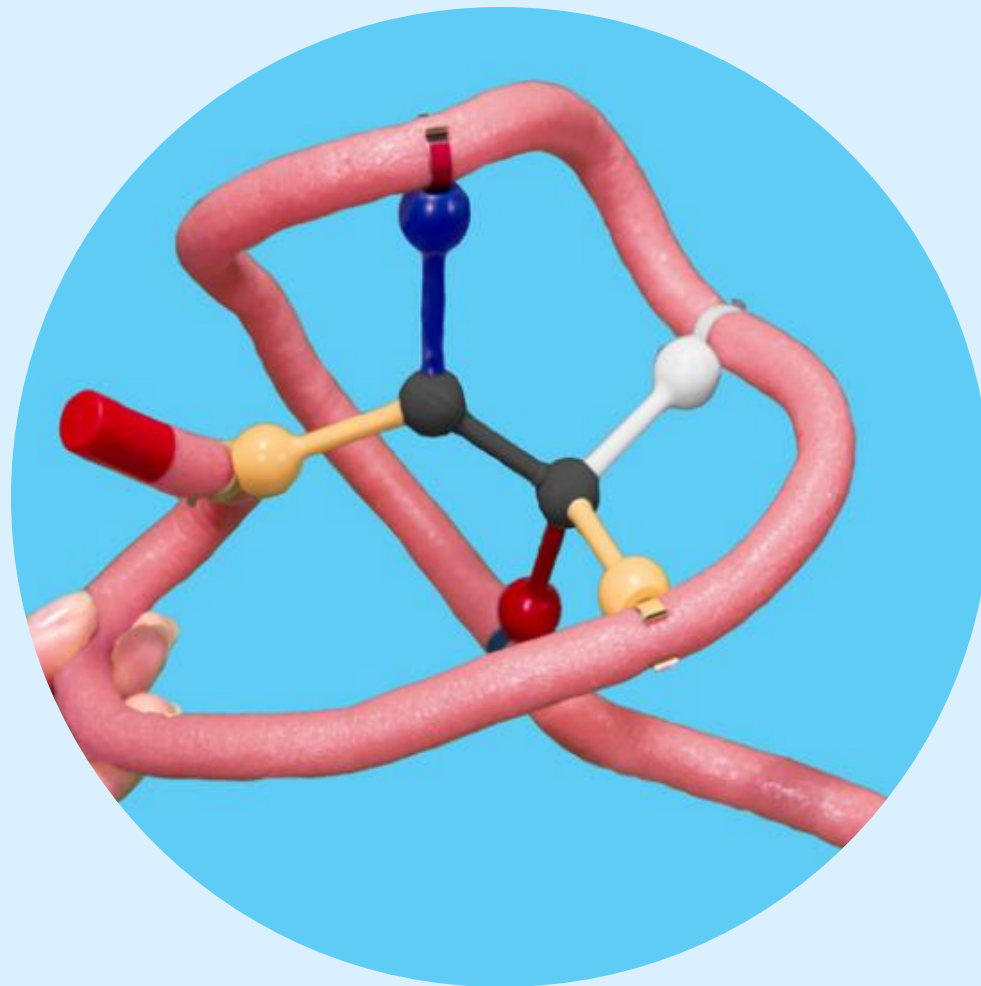
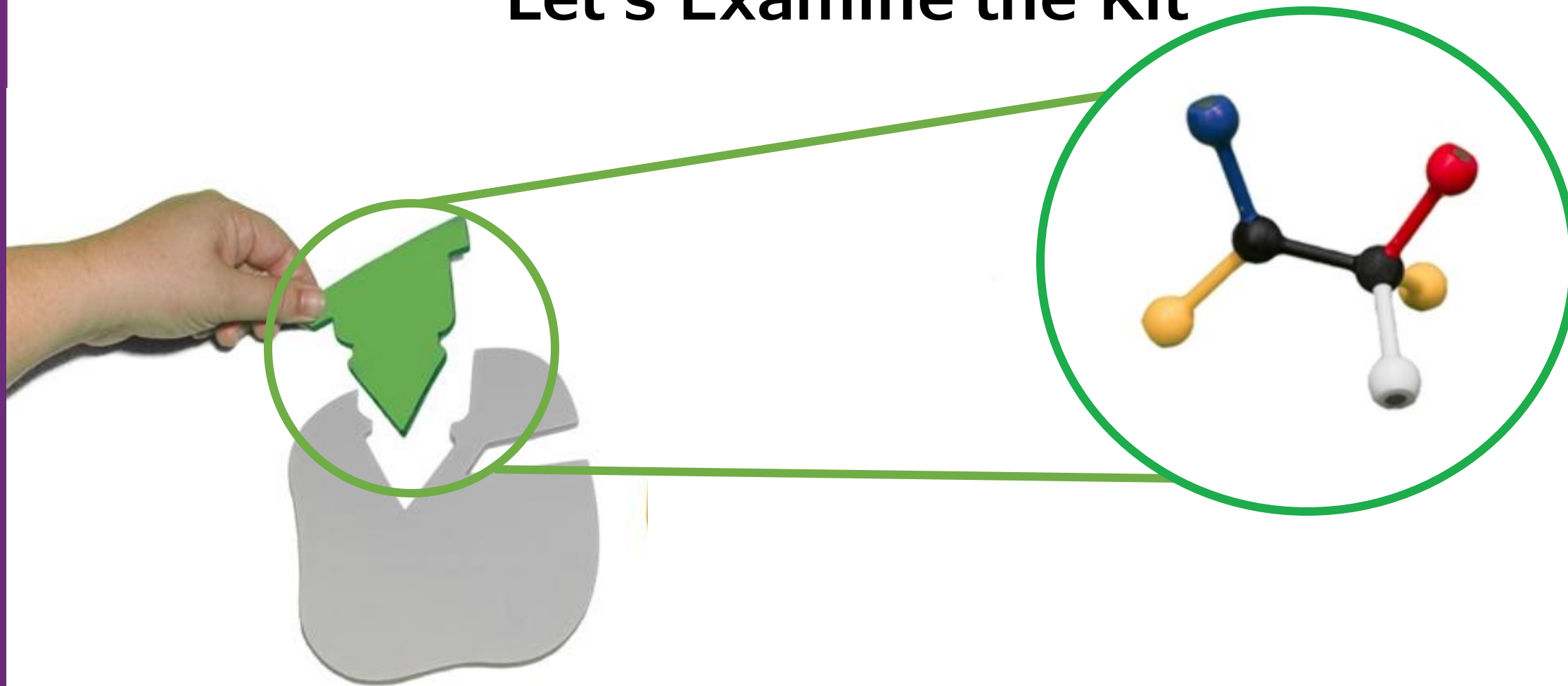


# Designing an active site

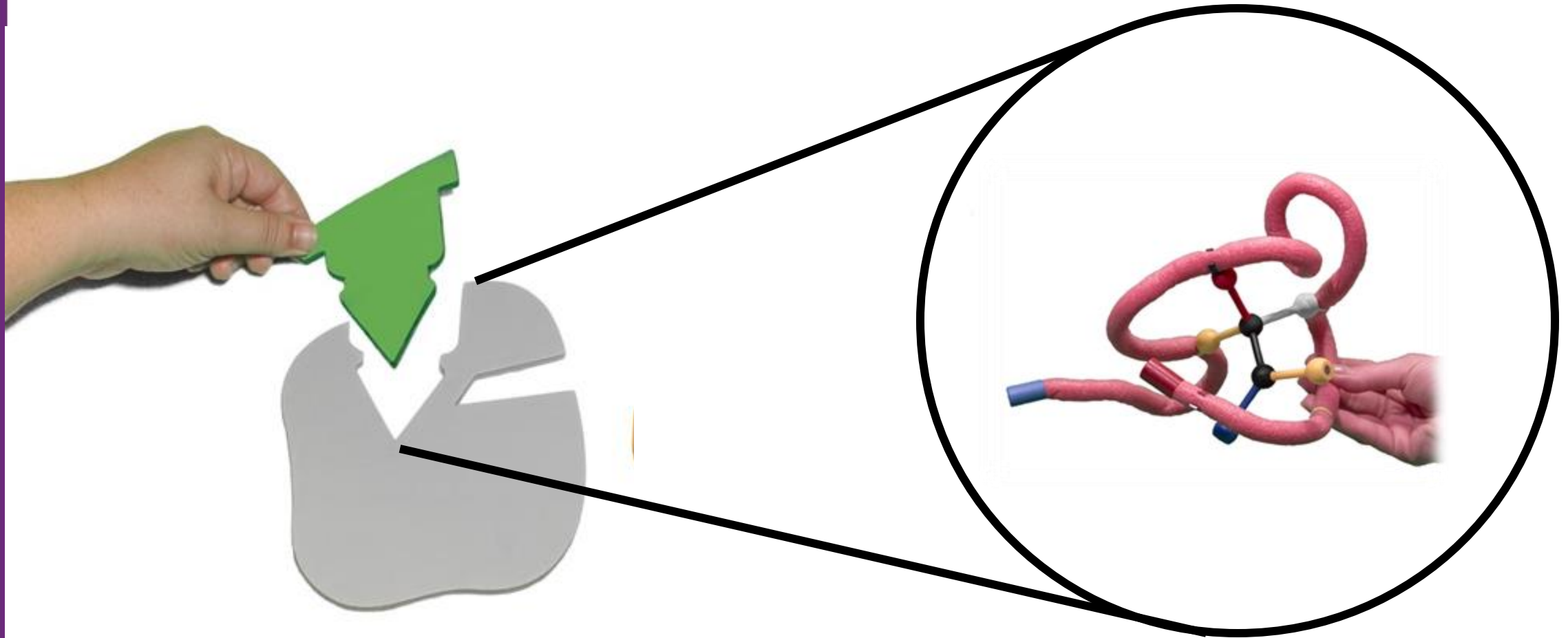
Ruth Hutson



# Let's Examine the Kit

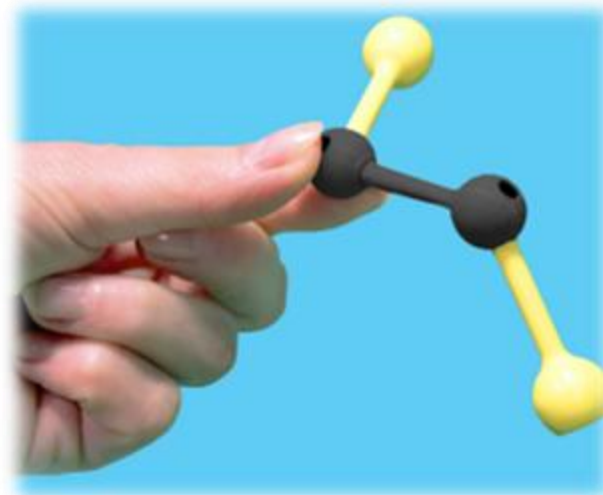


# Let's Examine the Kit



# Assembling the Substrate

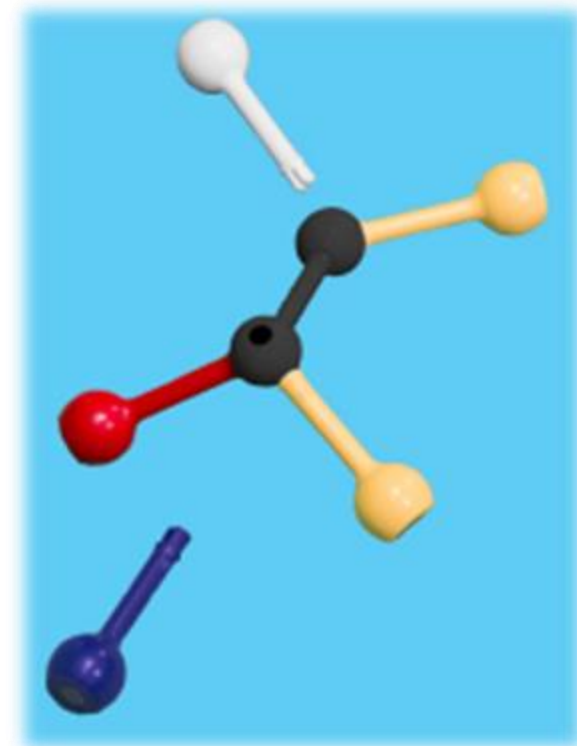
- Select the piece with the black 4-hole sphere and 2-hole sphere.
- Connect one yellow functional group to the four-hole sphere.
- Connect the other yellow functional group to the two-hole sphere.
- Connect the remaining functional groups randomly.





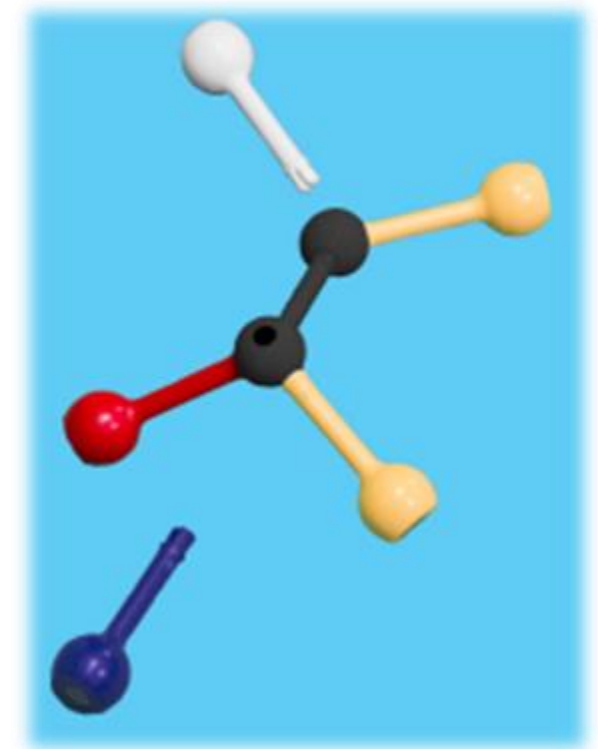
# Examining the Substrate Model

| Functional group<br>color | Chemical property | Type of<br>bond/interaction |
|---------------------------|-------------------|-----------------------------|
| Red                       |                   |                             |
| Blue                      |                   |                             |
| White                     |                   |                             |
| Yellow                    |                   |                             |
| Green                     |                   |                             |



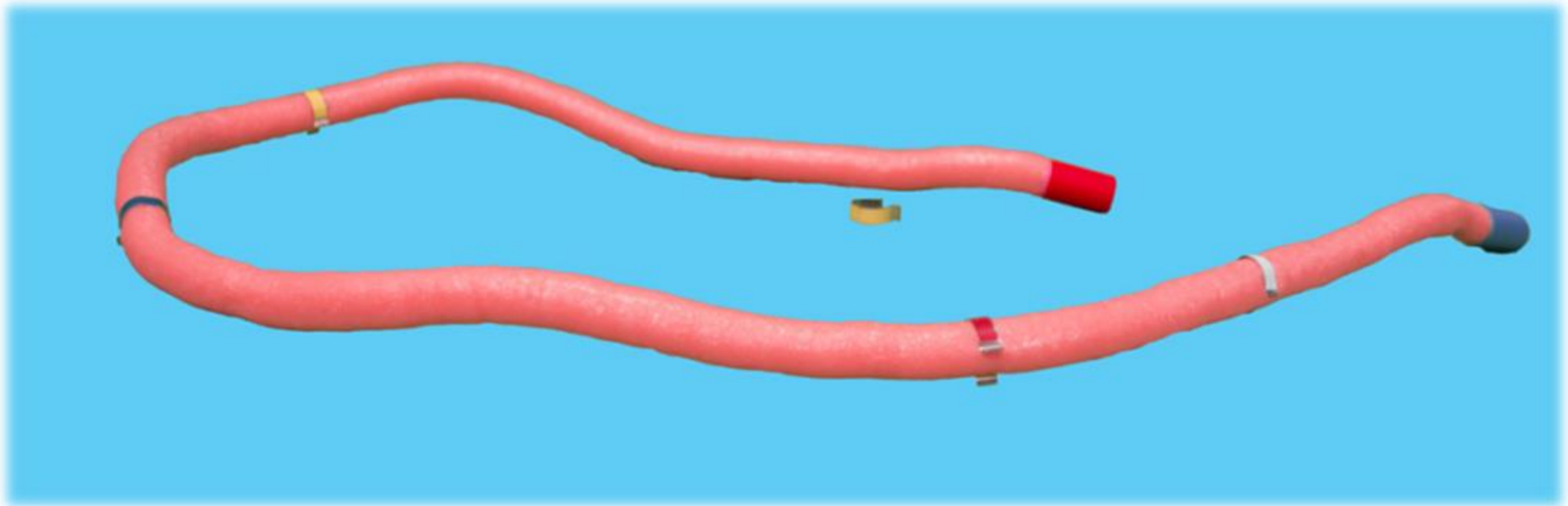
# Examining the Substrate Model

| Amino acid R-group color | Chemical property         | Type of bond/interaction |
|--------------------------|---------------------------|--------------------------|
| Red                      | Acidic<br>Negative Charge | Salt Bridge              |
| Blue                     | Basic<br>Positive Charge  | Salt Bridge              |
| White                    | Hydrophilic               | Polar                    |
| Yellow                   | Hydrophobic               | Nonpolar                 |
| Green                    | Cysteine                  | Disulfide Bonds          |



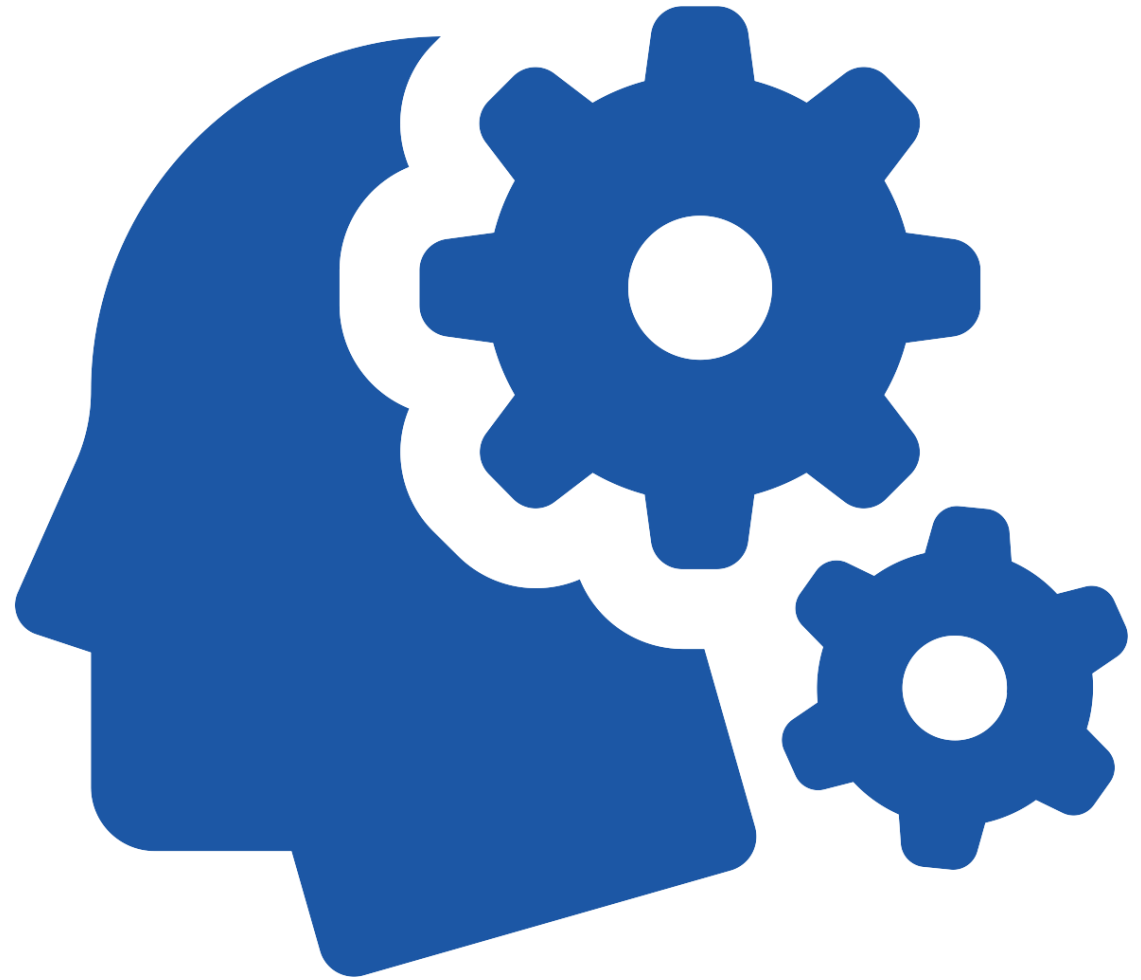
# Assembling the enzyme

- Place the metal clips along the entire length and in random order on the 3-foot mini toober.



# Constructing the Enzyme-Substrate Complex

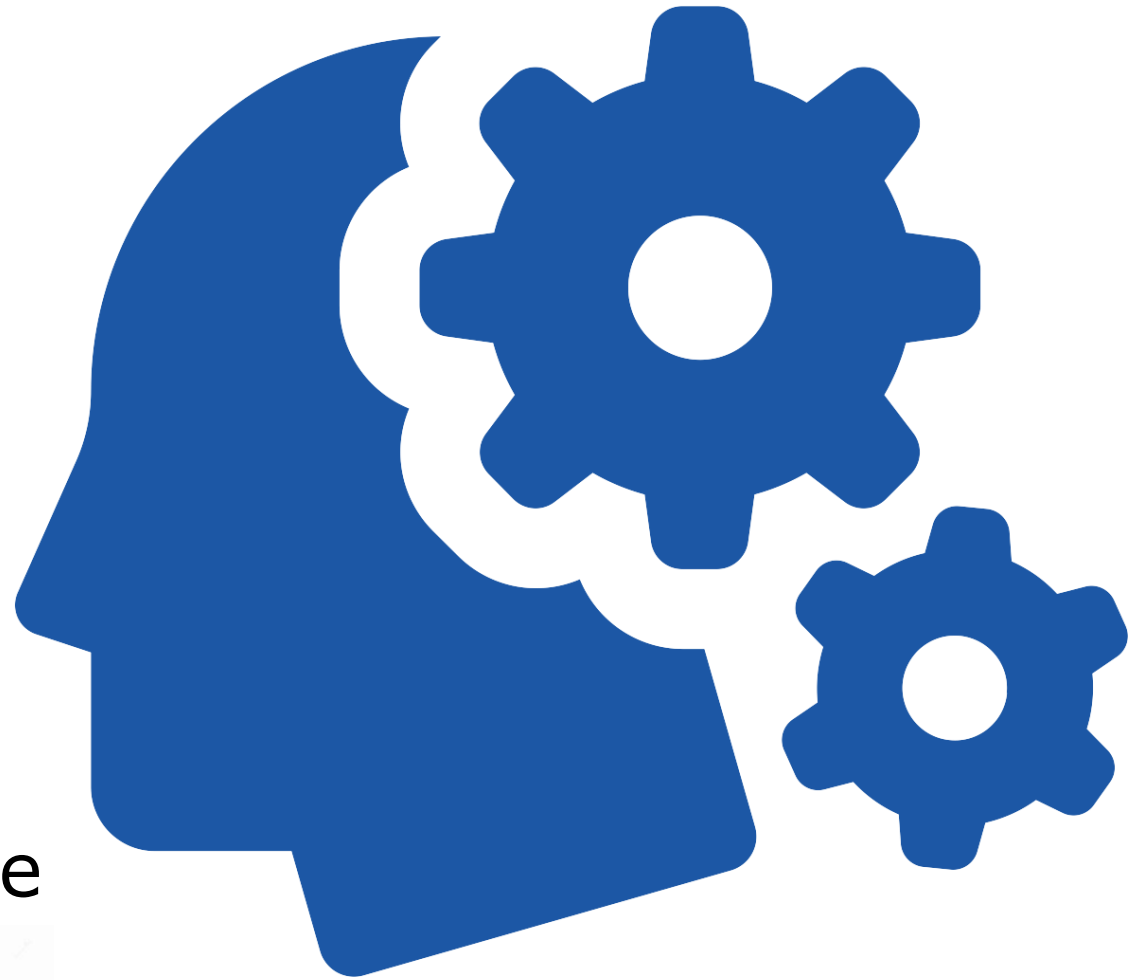
- Fold the mini-toober around the substrate
- Follow the basic principles of chemistry as design the complex
- Remember that your complex should be three-dimensional



# Constructing the Enzyme-Substrate Complex

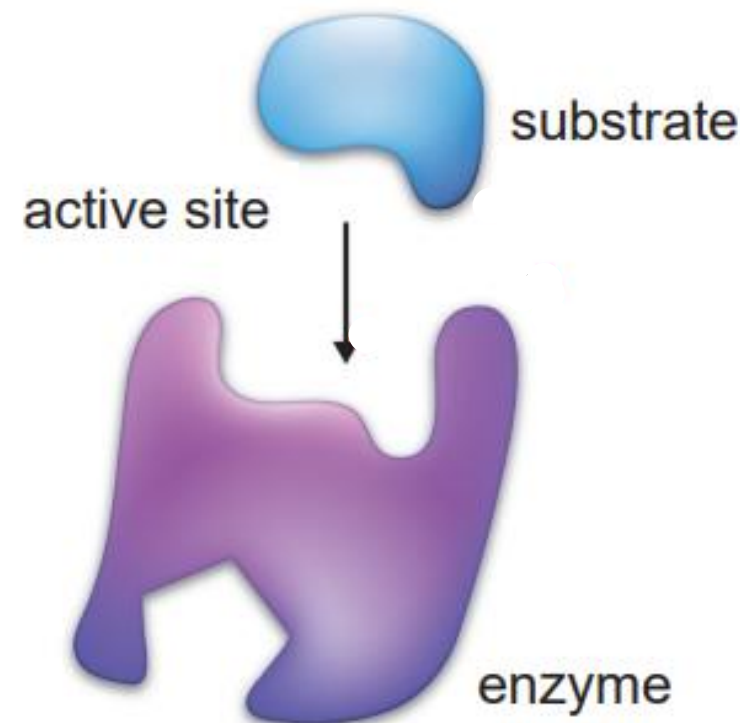


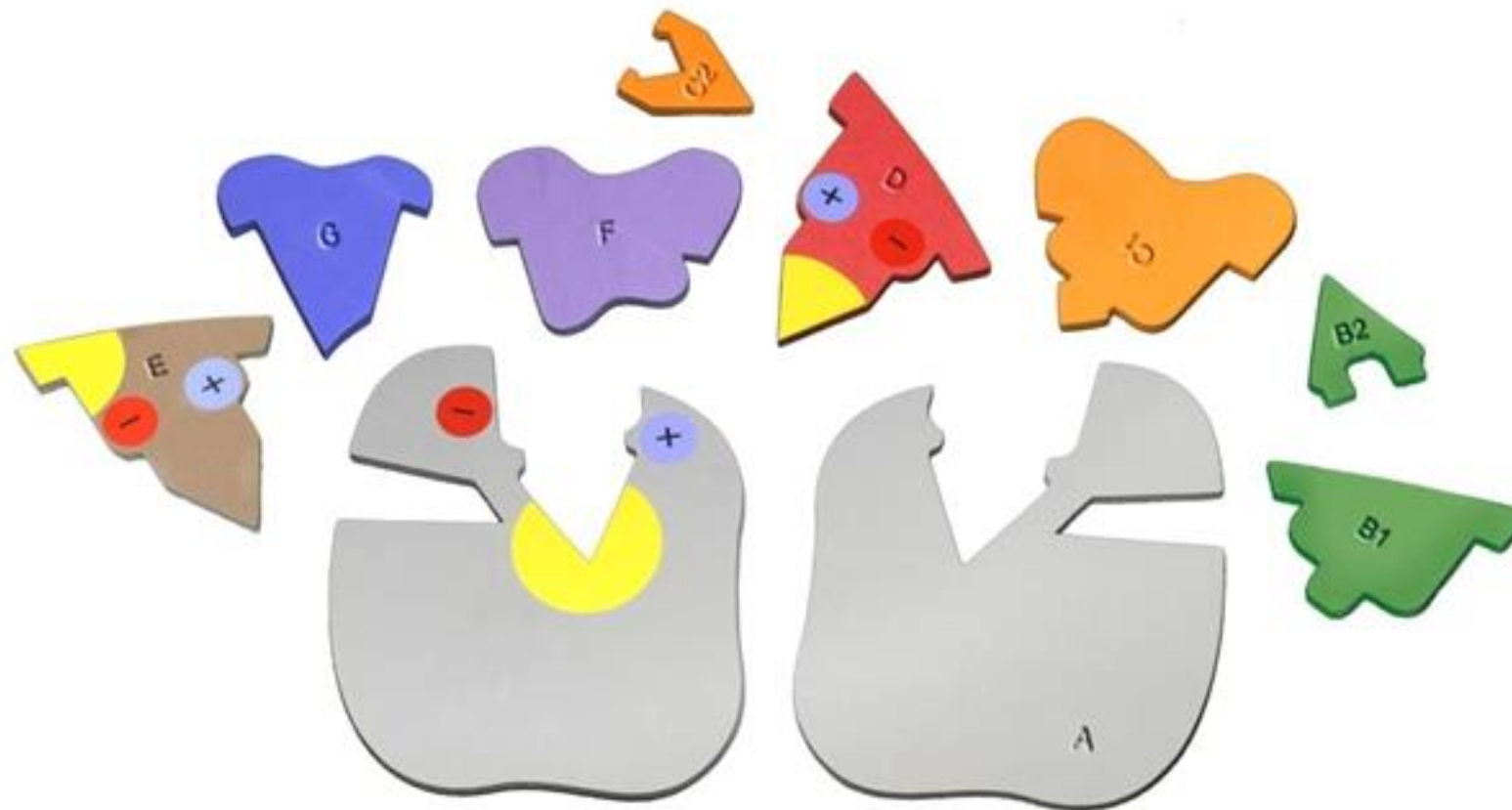
- Which parts of the substrate should match
  - the yellow clips?
  - the white clips?
  - the red clips?
  - the blue clips?
- Share your complex with those at your table.
- Compare the complexes.



## Design Challenge: Creating Variant Forms of Enzymes

- Design a new substrate structure
- Sketch the new substrate binding to an enzyme's active site.
- Explain the results to your elbow partner.
- Use the mini-toober to construct an active site, if you prefer.





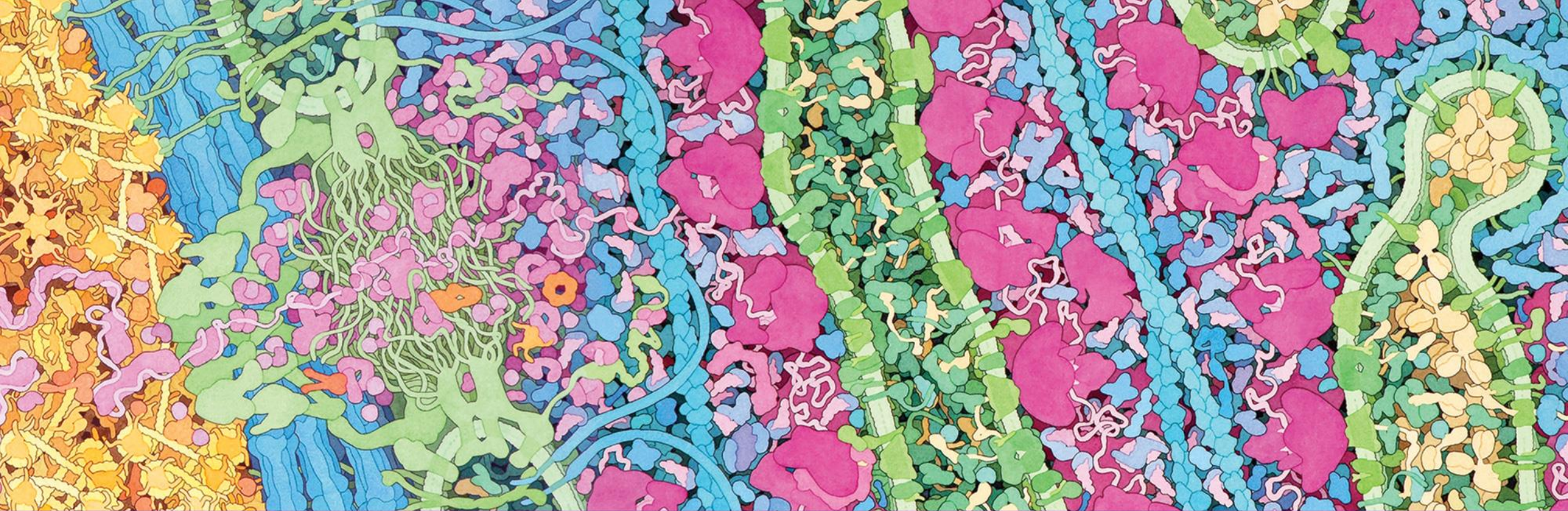
# Reflection time

Take 5 minutes to think about what you've learned today....



- What are three ways that you can adapt the activity for your students?
- What are two possible consequences when there is slight change in the shape of substrate or enzyme?
- What is one misconception your students might have that this kit could alleviate?





3d molecular  
designs

Transforming Science Learning