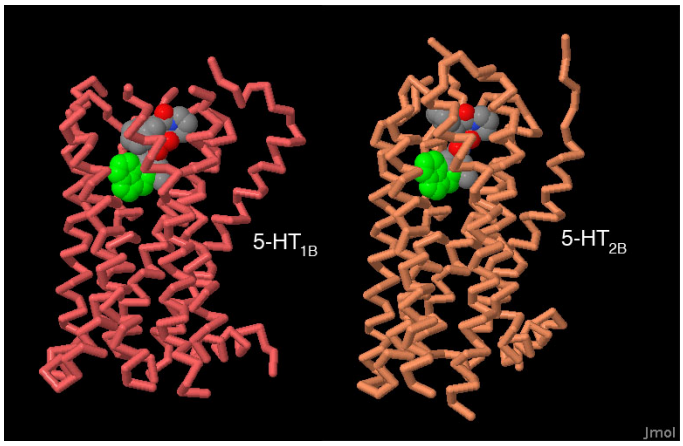
What Does Medicine Do?



The Chemistry of Life Unit focuses on the shape/charge of molecules and how specific molecular structures influence function (since we all know *structure* determines *function*). Use Chapter 2 and 4 in your textbook, Unit 1 in your Holtzclaw book, and the internet to help you with the following technical concepts. You will be presenting this information to the class the 2nd week of school. I would use Google Slides/PowerPoint for the presentation part to accompany your 3D models.

For this project, you will do the following:

- Choose a **medication, drug, or hormone** that is interesting to you. Explain WHY you are choosing this particular medication, drug, or hormone. I want it to be meaningful to you!
- You will **create** a **3D model** of this **molecule** using beads, string, toothpicks, Playdough, etc. Plan to bring this model in the 2nd week of school (the exact date will be sent out on Remind).
- Identify every covalent bond of the molecule as being either polar or nonpolar. (To do this, you must remember the difference between polar and nonpolar bonds. You may need to use an electronegativity table to help you identify the different bonds. If a covalent bond is polar, be sure to indicate the partial charges that each element has.)
- Identify the names of each functional group in the molecule (Chapter 4 will help here).
- Choose 3 elements and do the following with them: list the element's number of protons, neutrons, and electrons; sketch a model of the element and the location of its protons, neutrons, and electrons (put the electrons in energy shells).
- **Create** a **3D model** of the **protein receptor** this medication/drug/hormone binds to. Try your best here with the structure of the protein.
- Specify where this protein receptor can be located and how the molecule is actually able to bind to the receptor. Be as specific as possible with the shape/charge of the protein receptor and how it matches up to the shape/charge of your medication/drug/hormone.
- Explain the cellular mechanism that occurs once this medication/drug/hormone attaches to the proper protein receptor. Also, explain the physiological response (response of the body) that results from this interaction between the medication and protein receptor. Be specific. This will require deep research and critical thinking!
- Explain what would happen to the cellular/physiological response if the shape/charge of the medication/drug/hormone OR the protein receptor got changed.
- Answer the following question to conclude: How does the structure of your molecule determine its function?!

MST AP Biology: Chemistry of Life

Choose a medication, drug, or hormone that is interesting to you and a reason why. Create a 3D image of this molecule	1 point Reason why is not explained or the 3D model is not shown/ accurate	2 points Reason why is explained; the 3D molecule is shown and accurate	Points Earned/Comments:
Identify every covalent bond of the molecule as being either polar or nonpolar.	0 points 2 or more bonds within the molecule are NOT identified at all OR are NOT identified correctly	1 point Each bond of the molecule is identified correctly as polar/nonpolar (if only 1 bond is not identified or not identified correctly, full point can still be earned)	
Identify the names of each functional group in the molecule.	0 points Functional groups are not identified or not identified correctly	1 point Point is awarded if all functional groups are correctly identified	
Choose 3 elements and do the following with them: list the element's number of protons, neutrons, and electrons; sketch a model of the element and the location of its protons, neutrons, and electrons (put the electrons in energy shells).	0 points 1 or more elements have incorrect information about the amount of protons, neutrons, and electrons OR 1 or more sketches are incorrect	1 point All 3 elements have the correct number of protons, neutrons, and electrons listed and the sketch for each element is accurate	
Create a 3D protein receptor. Identify the specific type of protein receptor this medication/drug/hormone binds to and where this protein receptor can be located (ex. the type of cell). Be as specific as possible with the shape/charge of the protein receptor and how it matches up to the shape/charge of your medication/drug/hormone.***	1 point 3D is not accurate or the type of protein receptor and its proper location are NOT identified correctly OR the shape/charge of the protein receptor and the molecule is NOT explained in detail	2 points 3D model is accurate; the type of protein receptor and its proper location are identified correctly AND the shape/charge of the protein receptor and molecule is explained in detail	
Explain the cellular mechanism that occurs once this medication/drug/hormone attaches to the proper protein receptor and the physiological response.	1 point An overview cellular mechanism of what happens after the molecule binds to the receptor is given, but NOT many details behind this process or the physiological response are given	2 points A detailed cellular mechanism of what happens after the molecule binds to the receptor is explained; the physiological response is explained in detail	

MST AP Biology: Chemistry of Life

Explain what would happen to the physiological response if the shape/charge of the medication/drug/hormone OR the protein receptor got changed.	0 points A statement is made for what would happen to the mechanism or physiological response if the shape/charge of the molecule or protein receptor changed, but not many details are provided	1 point It is clear that critical thinking and detail went into this part to describe what would happen to the mechanism or physiological response if the shape/charge of the molecule or protein receptor changed	
Answer the following question to conclude your presentation: How does the structure of your molecule determine its function?!	0 points Summary statement is not given	1 point Point is awarded if question is answered in light of previous information covered in the project about the structure/function of the molecule and protein receptor	
Professionalism	0 points	1 point It is clear that effort went into this. Presentation is professional.	
Total Points			/12

****For the protein receptor part of the project, try to specify WHERE the protein receptor is located (ex. the kind of cell it is on…like a muscle cell or brain cell called a neuron etc.). Try to be as specific as you can with the type of receptor it is (the most common protein receptors are ligand-gated ion channels, G-protein receptors, and tyrosine kinases…but the protein could also be classified as a transmembrane protein, peripheral protein, carrier protein etc.) and then be as specific as you can with the shape/charge of the protein receptor. The whole point here is to show that a molecule with a specific shape binds to a receptor based on its shape (think of a key going into a lock) or a molecule with a given charge binds to a receptor based on the opposite charge (let's say a molecule with lots of partial positive charges binds to a receptor with a lot of partial negative charges hanging off of it). I realize the shape/charge can be hard to find…focus on the WHERE part more than anything and try your best based on research you find for the rest (type of receptor and shape/charge of receptor)!*