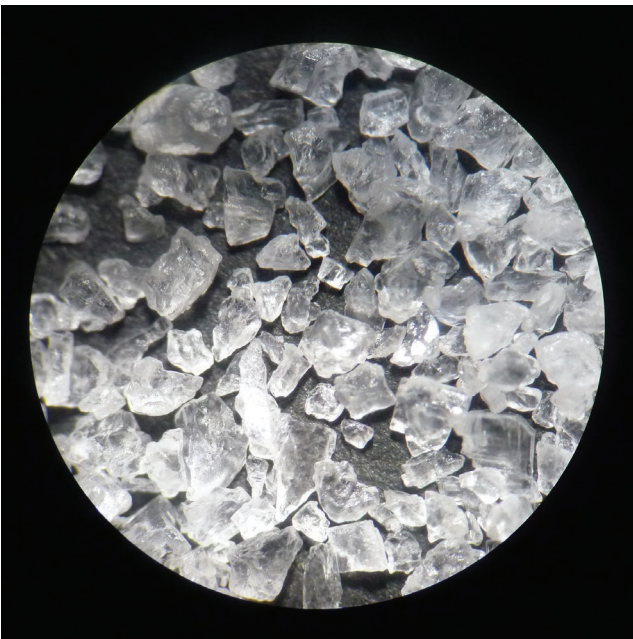


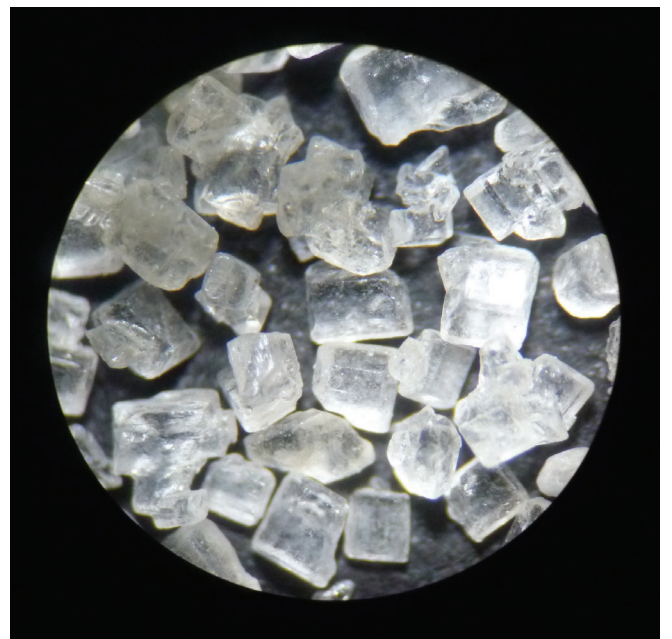
table salt 40x



Epsom salt 20x



Himalayan salt 20x

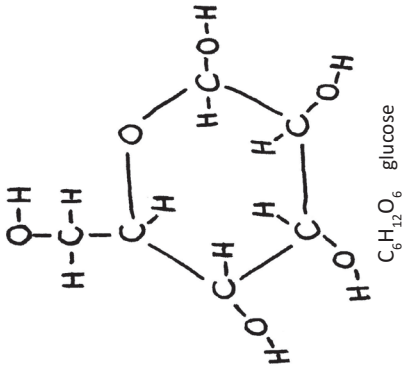
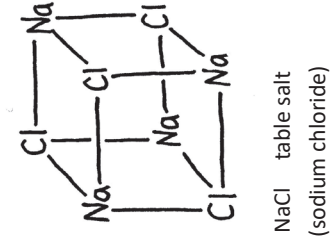
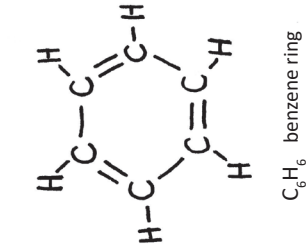
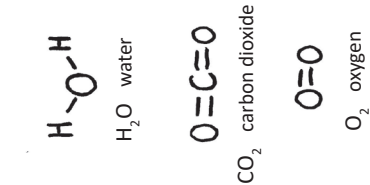


raw cane sugar 40x

sand 40x

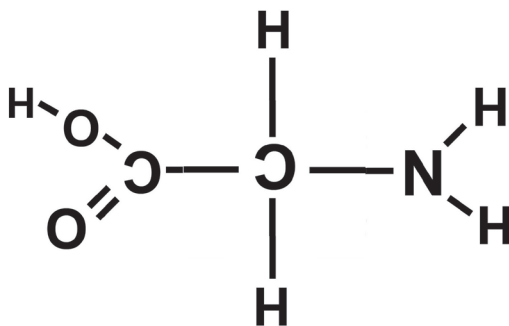


H - hydrogen		
O - oxygen		
C - carbon		
Na - sodium		Cl - chlorine

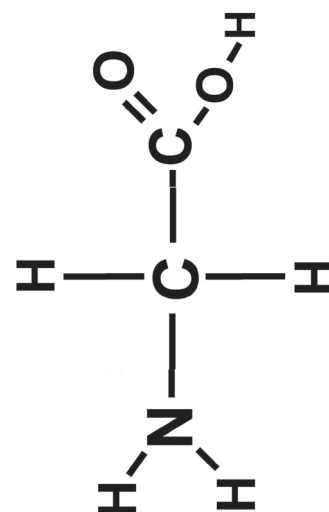
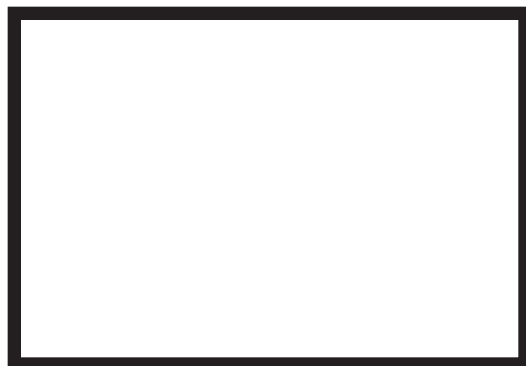
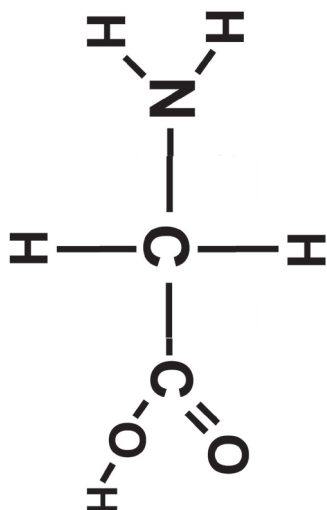
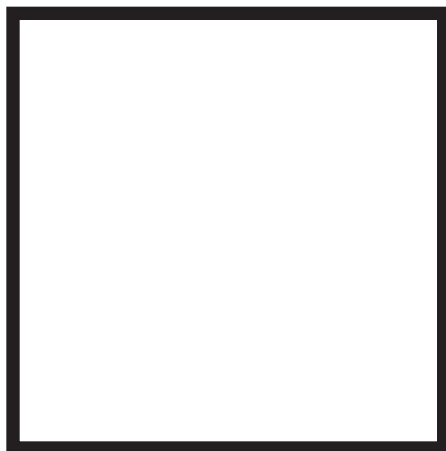


$\text{I}-\text{C}-\text{I}$	$\text{I}-\text{C}-\text{I}$	$\text{I}-\text{C}-\text{I}$	$\text{C}(=\text{O})\text{OH}$
$\text{H}_2\text{N}-\text{H}_2\text{O}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$
$\text{H}_2\text{N}-\text{C}(=\text{O})\text{OH}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$
$\text{H}_2\text{N}-\text{C}(=\text{O})\text{OH}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$
$\text{H}_2\text{N}-\text{C}(=\text{O})\text{OH}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$
$\text{H}_2\text{N}-\text{C}(=\text{O})\text{OH}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$	$\text{H}_2\text{O}$

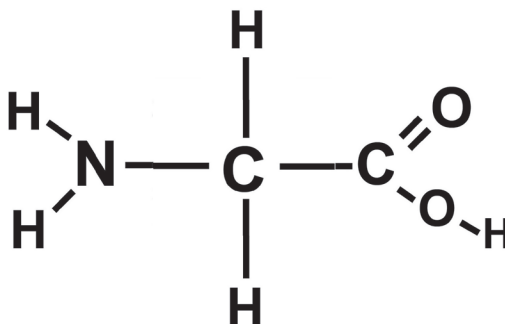
THE  
GLYCINE  
GAME



THE  
GLYCINE  
GAME



THE  
GLYCINE  
GAME



THE  
GLYCINE  
GAME

PRINT ONTO CARD STOCK / ONE COPY (FOR UP TO 4 PLAYERS)  
TRIM OFF THIS BOTTOM SECTION



<p>Take a card if you have consumed any food or drink today that contains casein. Remember, casein is the protein found in milk. Casein foods include milk, cheese, yogurt, and ice cream. Butter and cream have had most of their casein removed, so they are not really casein foods.</p>	<p>Food allergies are usually not a good thing, but today they will earn you a card. Name your food allergy or allergies and then take a card.</p>	<p>Can you guess which of these plant parts has the highest amount of protein?</p> <p>a) roots      b) leaves *c) seeds      d) flowers</p>
<p>Everyone (except the card reader) loses a card. Choose one of your cards and return it to the bottom of the draw pile.</p>	<p>If we could gather all the sodium and chlorine atoms in your body, and turn them into salt, can you guess how many shakers they would fill?</p> <p>a) half a shaker      b) one shaker *c) three shakers      d) ten shakers</p>	<p>Nuts are full of amino acids! Take a card if you have eaten any type of tree nut today or yesterday. Tree nuts include walnuts, almonds, pecans, pistachios, brazil nuts, pine nuts, macadamias, hazelnuts, and cashews.</p> <p>NOTE: Peanuts are NOT tree nuts.</p>
<p>Salt can be extracted from sea water. Can you name the country that has the saltiest sea in the world?</p> <p>a) Turkey      b) Lebanon c) Egypt      *d) Israel</p>	<p>Time to trade! Each player must choose one of their cards and hand it to the player on their left.</p>	<p>The ancient Romans were famous for the stinky, salty sauce that they used as a condiment (like ketchup). The sauce was left to ferment (rot) for months. Can you guess the main ingredient of their stinky sauce?</p> <p>*a) fish      b) beans c) cabbage      d) garlic</p>
<p>The healthiest (mineral-rich) drinking water in the world is generally considered to be water that comes from what source?</p> <p>a) lakes      *b) glaciers c) the ocean      d) underground wells</p>	<p>Beans are a great source of protein. If you have eaten any beans today or yesterday, take a card.</p> <p>Ex: green beans, kidney beans, black beans, cannellini bean, Fava beans, Lima beans, refried beans</p>	<p>Can you guess who drinks more milk than anyone else in the world? The citizens of:</p> <p>*a) Norway      b) Netherlands c) Germany      d) France</p>
<p>Dairy cows produce over 80% of the world's milk. The runner up, with 14% is:</p> <p>a) sheep      b) goats *c) buffalo      d) camels</p>	<p>Can you guess where the world's largest dairy farm is located? They milk over 90,000 cows every day!</p> <p>*a) Arabia      b) Korea c) Russia      d) South Africa</p>	<p>Can you guess the most popular dairy cow in the United States?</p> <p>a) the brown and white Guernsey *b) the black and white Holstein c) the tan and white Jersey</p>
<p>Which type of milk will look slightly blue if you shine a light through it?</p> <p>a) raw milk      b) whole milk c) 2% fat milk      *d) fat-free skim milk</p>	<p>Which of these plant sources is NOT used to make a milk substitute?</p> <p>a) almonds      b) oats *c) peanuts      c) coconuts</p>	<p>This question is about something you read in the chapter. Which one of these substances do you think has the <u>lowest</u> pH number?</p> <p>a) water      b) apple juice c) milk      *d) lemon juice</p>

## ACTIVITY IDEA 2J "MOLECULE MAT" for chapter 2

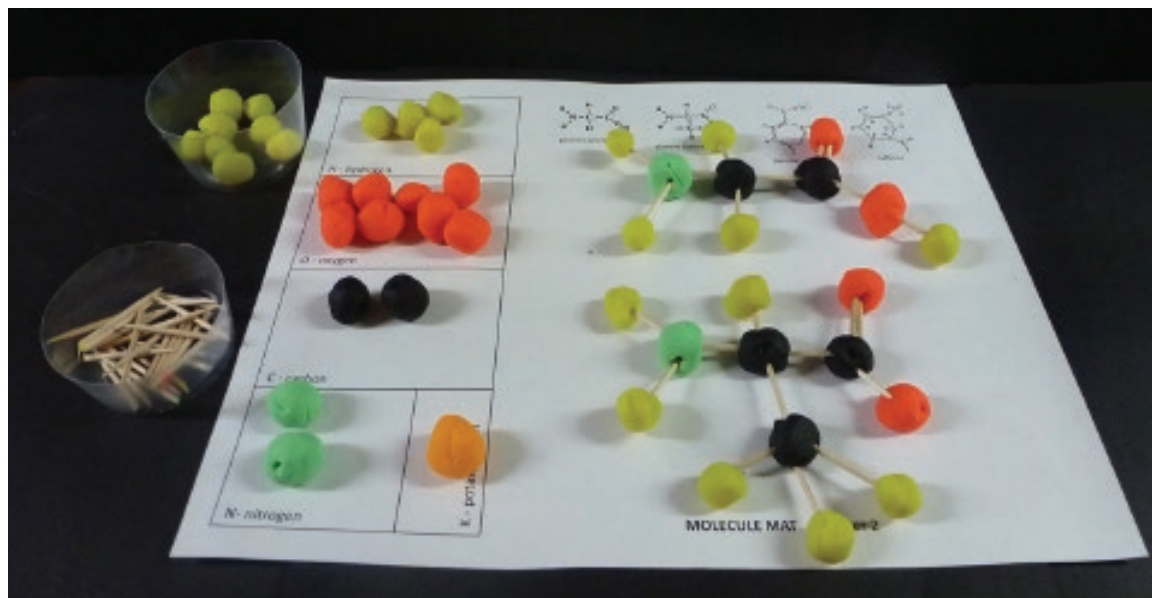
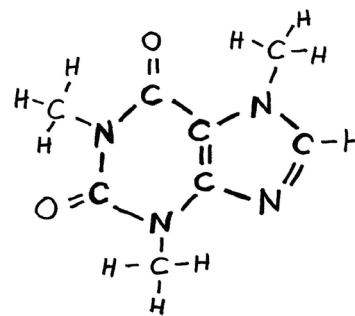
### You will need:

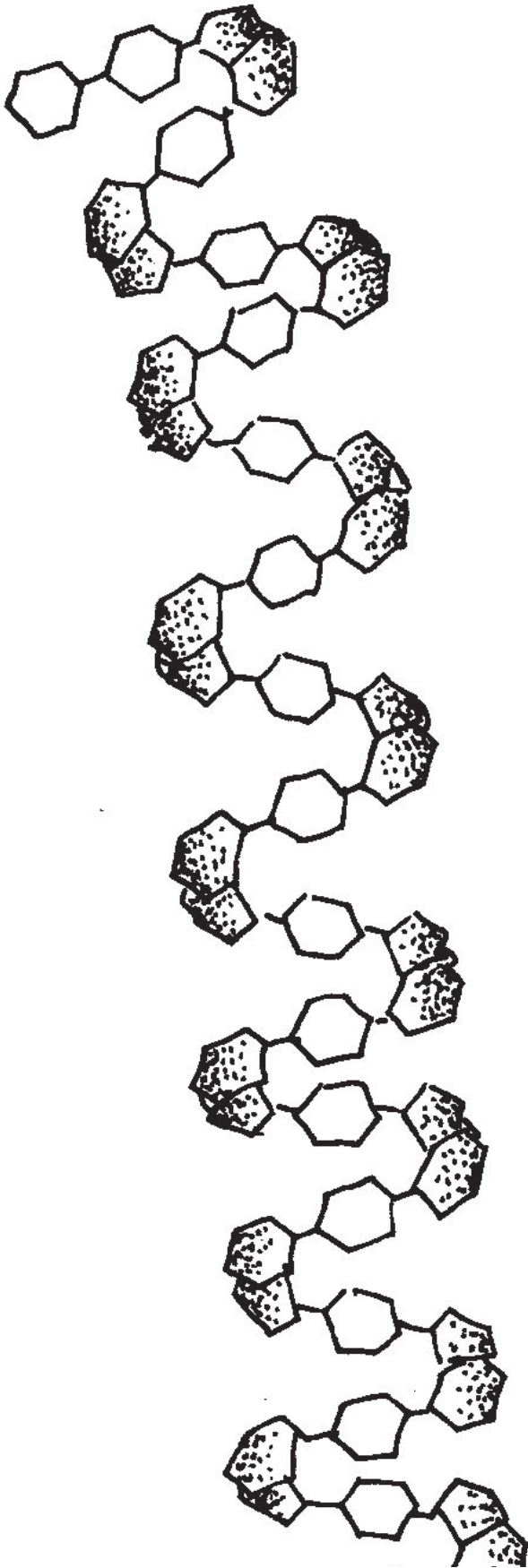
- a copy of the following pattern page for each student
- toothpicks
- the materials you used for the Molecule Mat in chapter 1 (or try something different if you want to)

### What to do:

- 1) Put your chosen materials inside the boxes on the left side of the page (or in small dishes if they won't fit inside the boxes). Toothpicks can be set in a dish, or simply in a pile, within the student's reach.
- 2) Let the students work on their own as much as possible.
- 3) The molecules are likely to be large enough that all four will not fit onto the page. You can tell your student to build two then recycle the items, or give them an extra blank sheet and have them build several molecule on it.
- 4) For students who are keeping a portfolio of their work, take a photo of their paper with all the finished molecules on it.

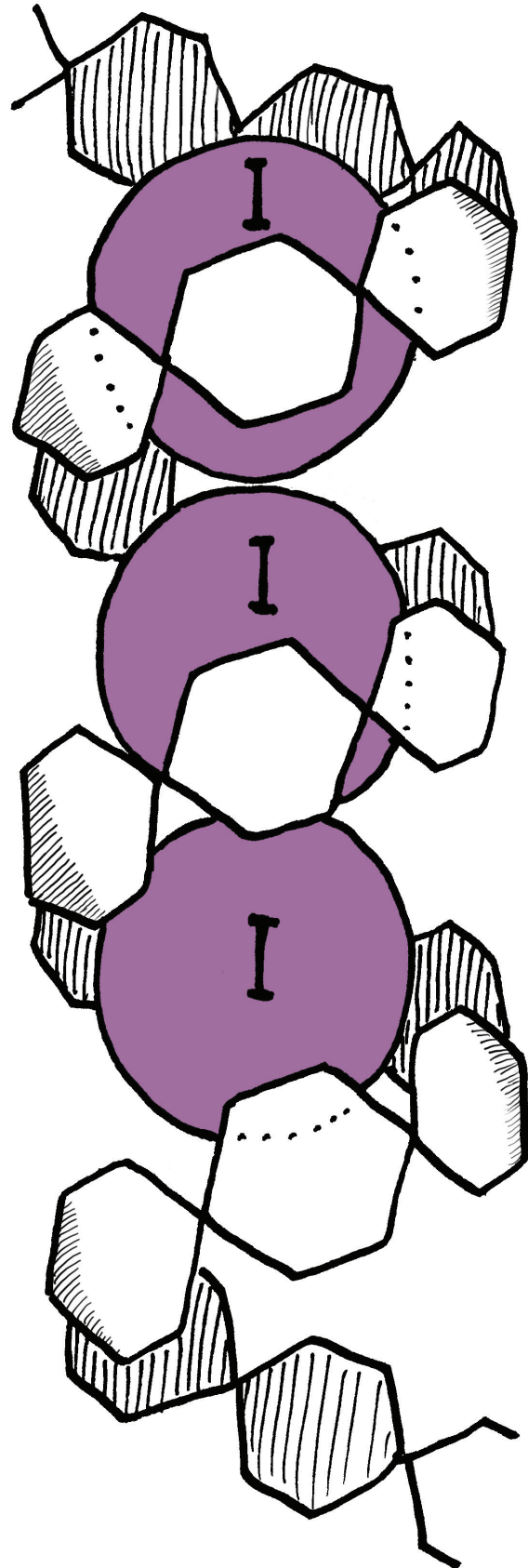
TIP: For students who finish early (if you are working with a group) have them bond their glycine to their alanine. (Remove the OH from the COOH, and one of the H's from the  $\text{NH}_2$ . The OH and H will form a water molecule.) If they need another challenge, have them build caffeine, shown here on the right.  
(We will build this after the last chapter, but doing it twice is fine.)





AMYLOSE

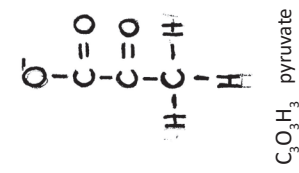
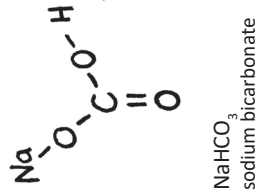
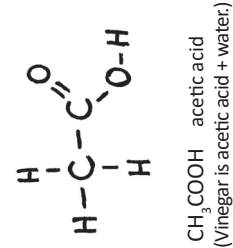
The hexagons are glucose molecules.



I = iodine atom

The iodine atoms form 3-atom linear molecule that fit right into the coil.

H - hydrogen	
O - oxygen	
C - carbon	
N - nitrogen	S - sulfur
	Na - sodium

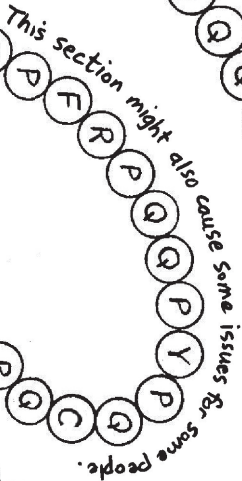


Make some Maillard molecules:

- 1) Use 4, 5 or 6 carbons.
- 2) Use 1, 2, or 3 oxygens.
- 3) Optional: add a sulfur or 1 or 2 nitrogens.
- 4) Fill any empty bonds with hydrogens. This means checking to see that all carbon atoms are bonded to four other atoms, all oxygens are bonded to two atoms, sulfur to two, and nitrogens to three. For example, if you find a carbon with only two atoms stuck to it, add 2 H's. If you find an oxygen with only one atom stuck to it, add one H.

(GLIE-uh-din)

Gladiatin isn't a "bad" protein. It's just a series of amino acids that happens to have a few areas that are similar enough to body proteins that some people's immune systems get confused.



This last section is the part in which causes autoimmune problems (celiac):

## FOUR AMINOS TO KNOW:

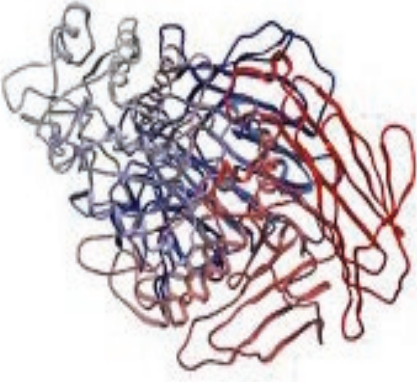
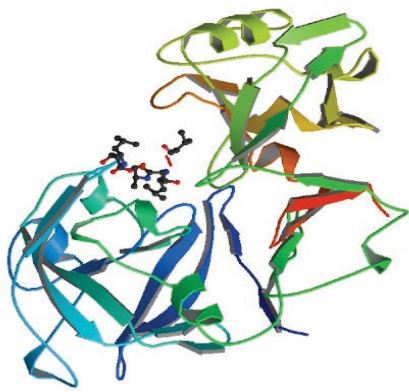
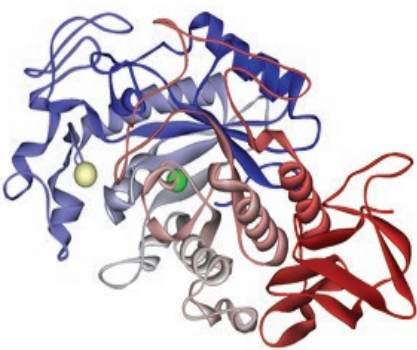
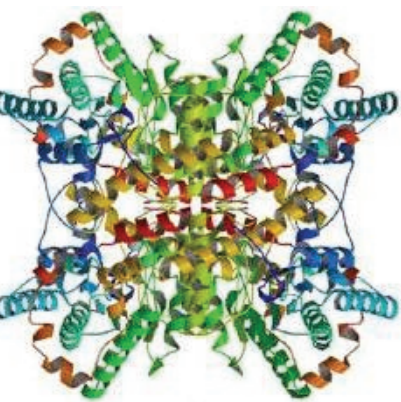
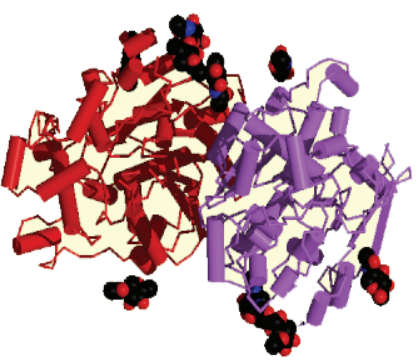
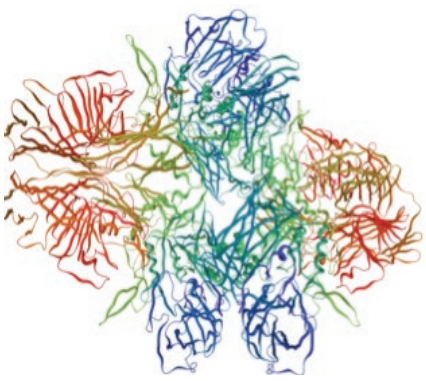

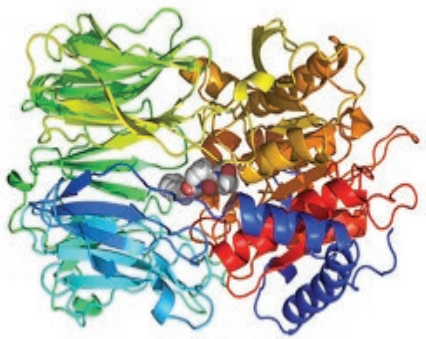
**= Methionine (Met) or M**  
Means "start"

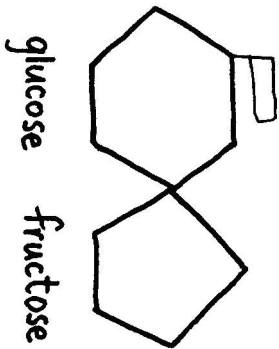
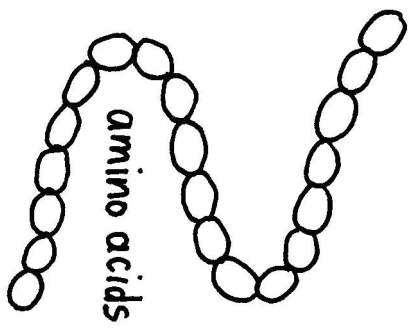
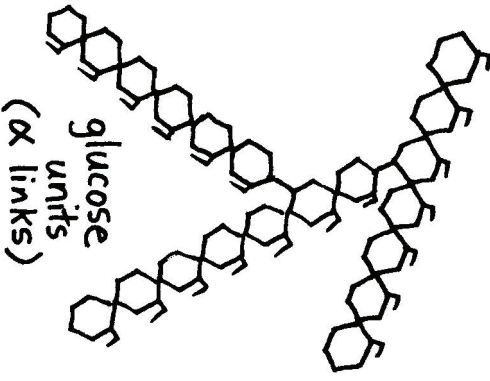
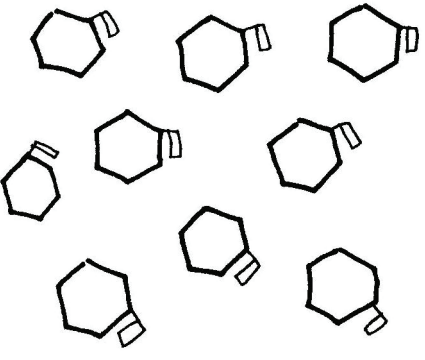
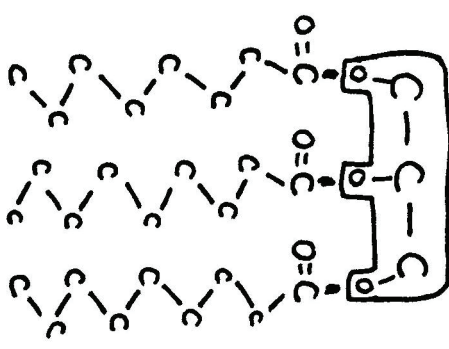
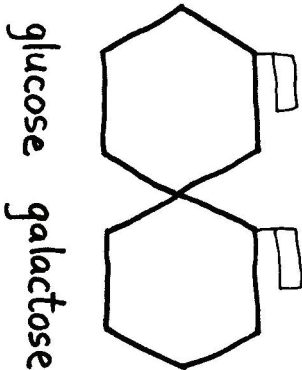
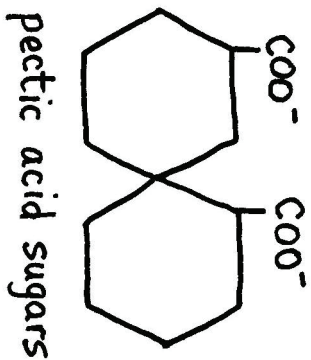
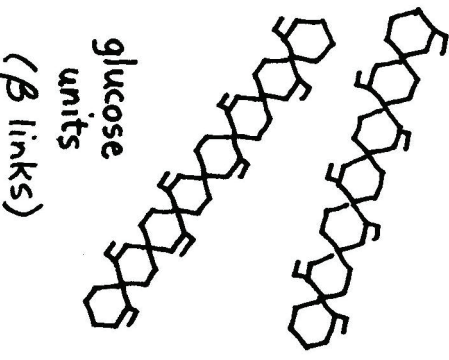
**= Proline (Pro) or P**  
used to build connective  
tissue in your body but  
common in many proteins.

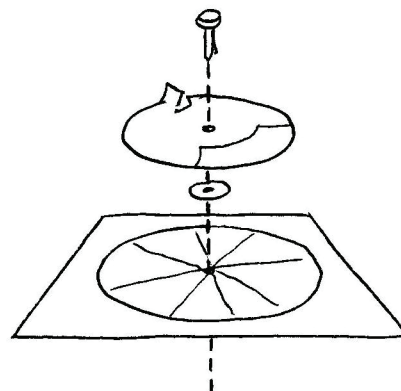
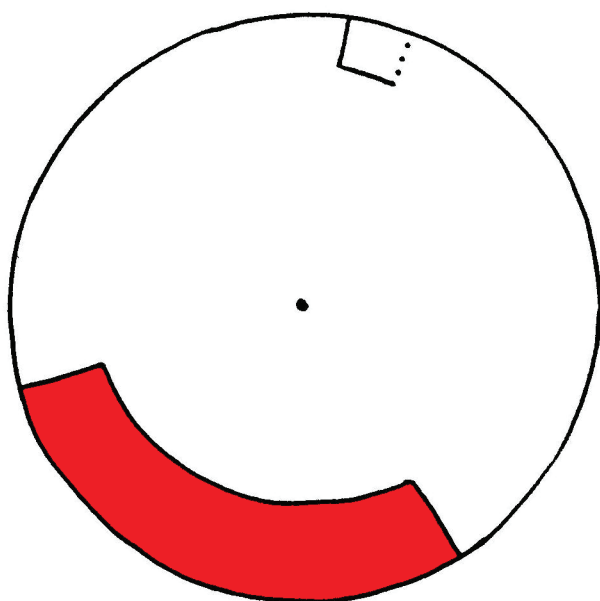
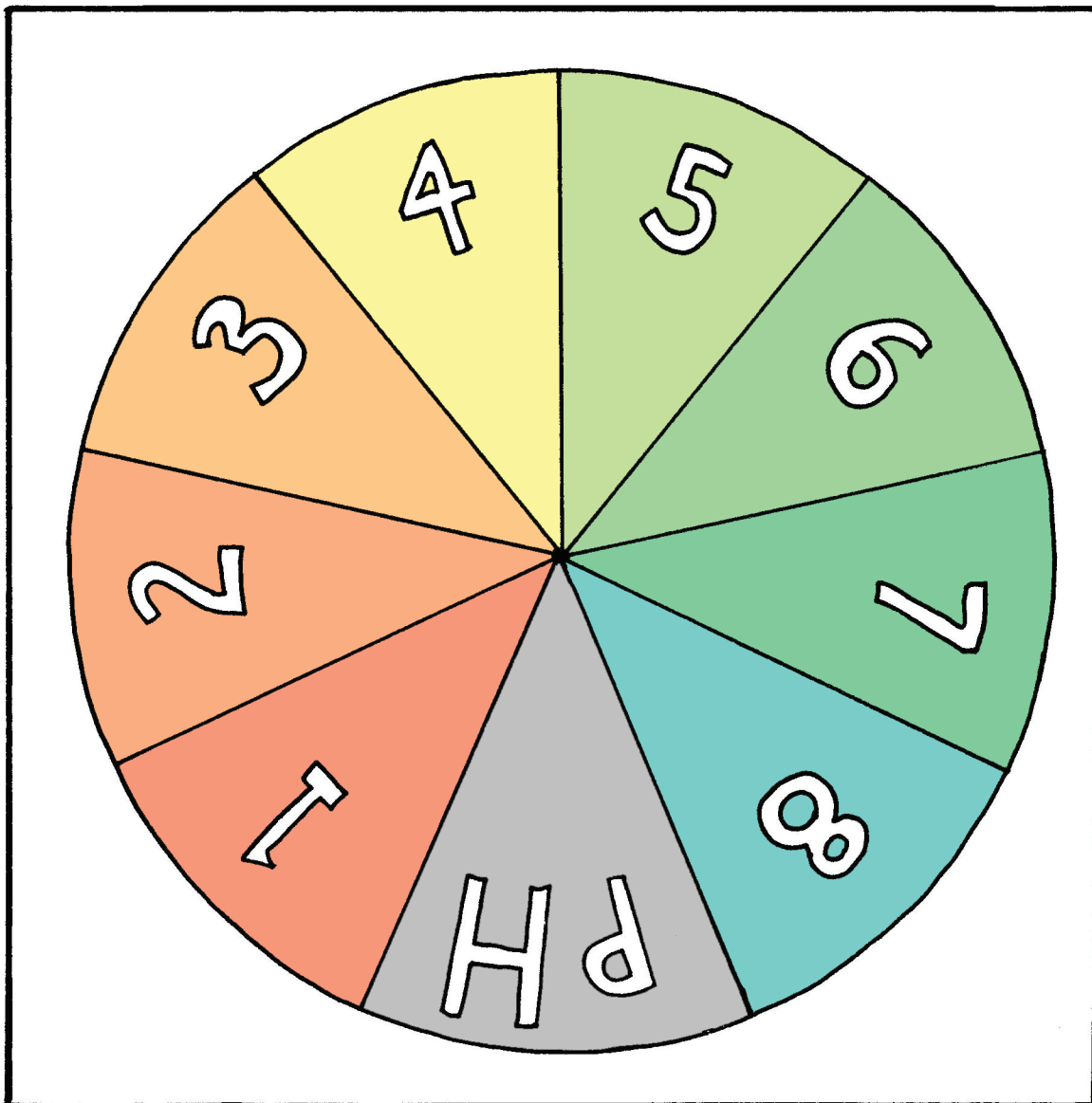
**= Glutamine (Gln) or Q**  
has a second  $\text{NH}_2$  group  
It is one of the most abundant amino acids found in the body.

**= Cysteine (Cys) or C**  
has a sulfur atom that is attracted to other sulfur atoms, forming cross-links. Cysteines make gluten stretchy and tough.



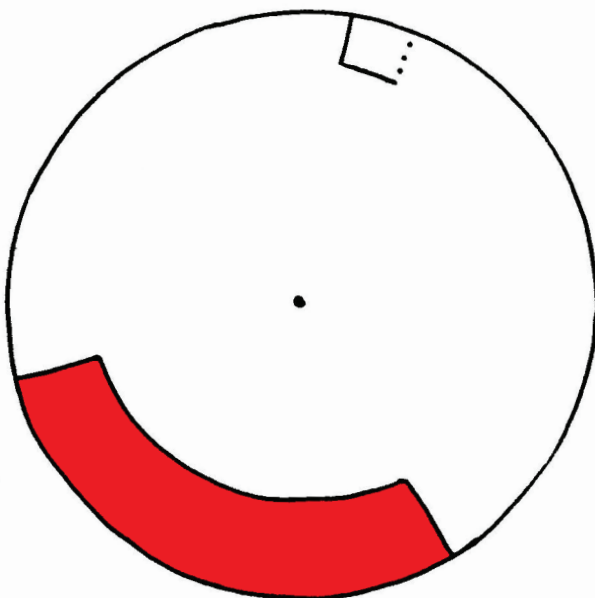
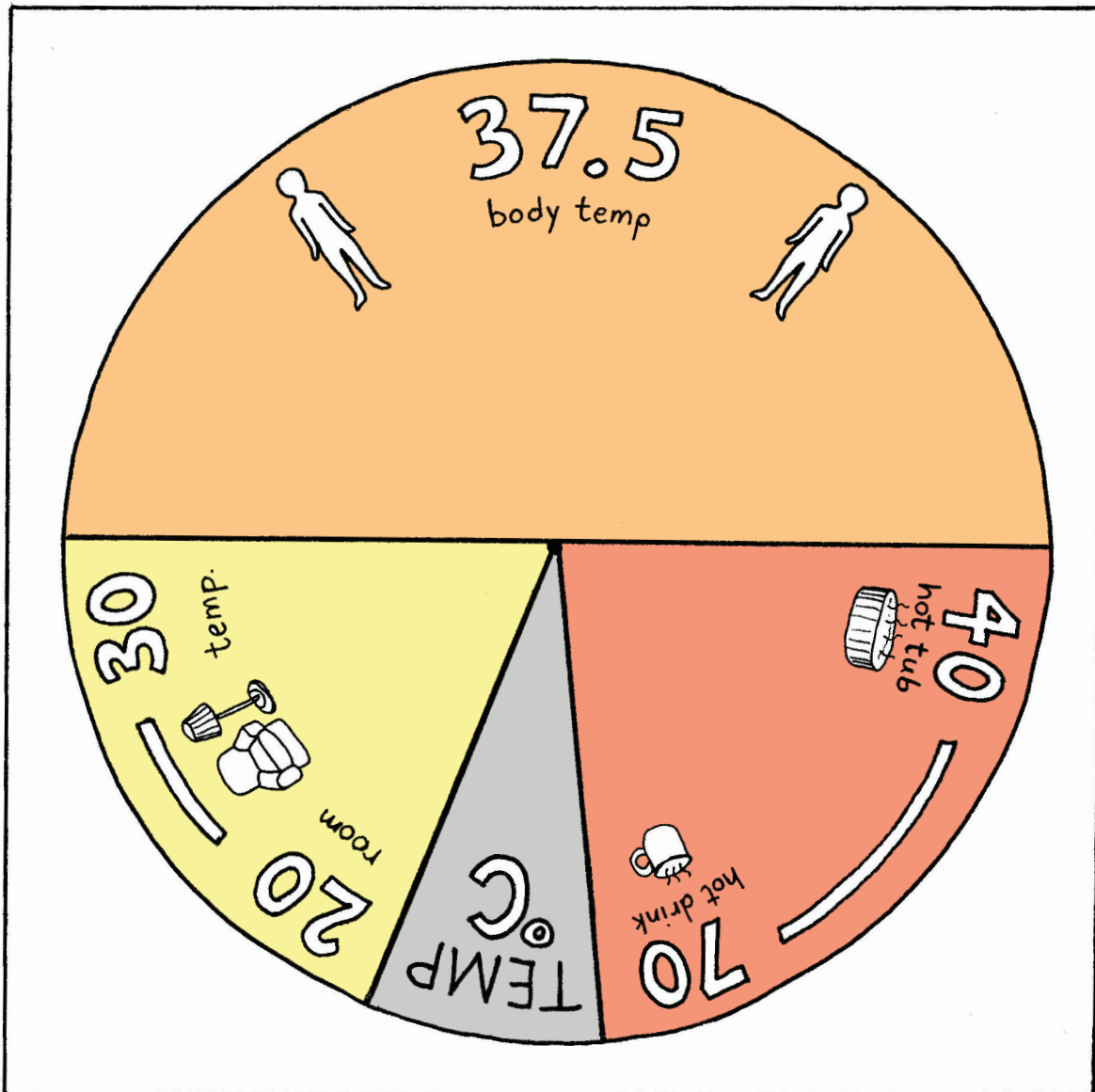
<p><b>SUCRASE</b></p>  <p>Breaks apart: <b>sucrose</b>  Works best at <b>pH 6</b>  Most efficient temp: <b>37.5° C</b></p>	<p><b>PEPSIN</b></p>  <p>Breaks apart: <b>proteins</b>  Works best at <b>pH 1-3</b>  Most efficient temp: <b>37.5° C</b></p>	<p><b>AMYLASE</b></p>  <p>Breaks apart: <b>starch</b>  Works best at <b>pH 6-7</b>  Most efficient temp: <b>37.5° C</b></p>	<p><b>GLUCOSE ISOMERASE</b></p>  <p>Changes glucose to fructose  Works best at <b>pH 7-8</b>  Most efficient temp: <b>60-70° C</b></p>
<p><b>LIPASE</b> (Pancreatic lipase)</p>  <p>Breaks apart: <b>triglycerides</b>  Works best at <b>pH 8</b>  Most efficient temp: <b>37.5° C</b></p>	<p><b>LACTASE</b></p>  <p>Breaks apart: <b>lactose</b>  Works best at <b>pH 8</b>  Most efficient temp: <b>37.5° C</b></p>	<p><b>PECTINASE</b></p>  <p>Breaks apart: <b>pectin</b>  Works best at <b>pH 4-5</b>  Most efficient temp: <b>30-40° C</b></p>	<p><b>CELLULOSE</b></p>  <p>Breaks apart: <b>cellulose</b>  Works best at <b>pH 5</b>  Most efficient temp: <b>40-50° C</b></p>

<p><b>SUCROSE</b></p>  <p>glucose      fructose</p>	<p><b>PROTEINS</b></p>  <p>amino acids</p>	<p><b>STARCH</b></p>  <p>glucose units (<math>\alpha</math> links)</p>	<p><b>GLUCOSE</b></p> 
<p><b>LIPIDS</b> (TRIGLYCERIDES)</p> 	<p><b>LACTOSE</b></p>  <p>glucose      galactose</p>	<p><b>PECTIN</b></p>  <p>pectic acid sugars</p>	<p><b>CELLULOSE</b></p>  <p>glucose units (<math>\beta</math> links)</p>

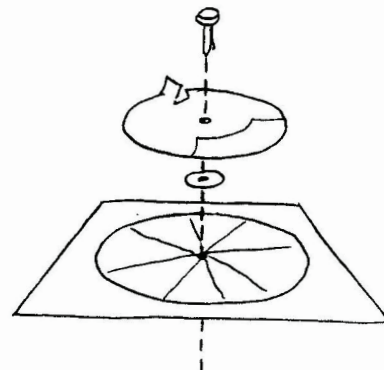


NOTE: Cut the notch on the wheel and fold it up to make a tab that can be used to flick the spinner.

The red bar replaces a pointer. Any wedge (even a small portion of it) that touches the red bar is okay.

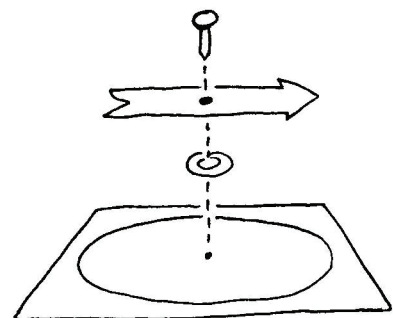
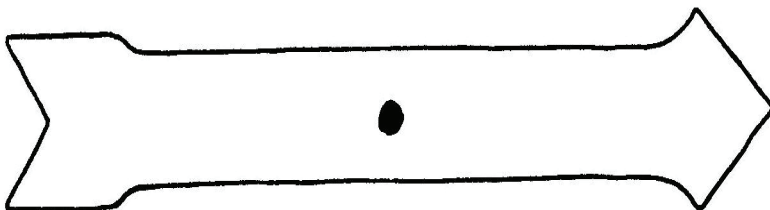
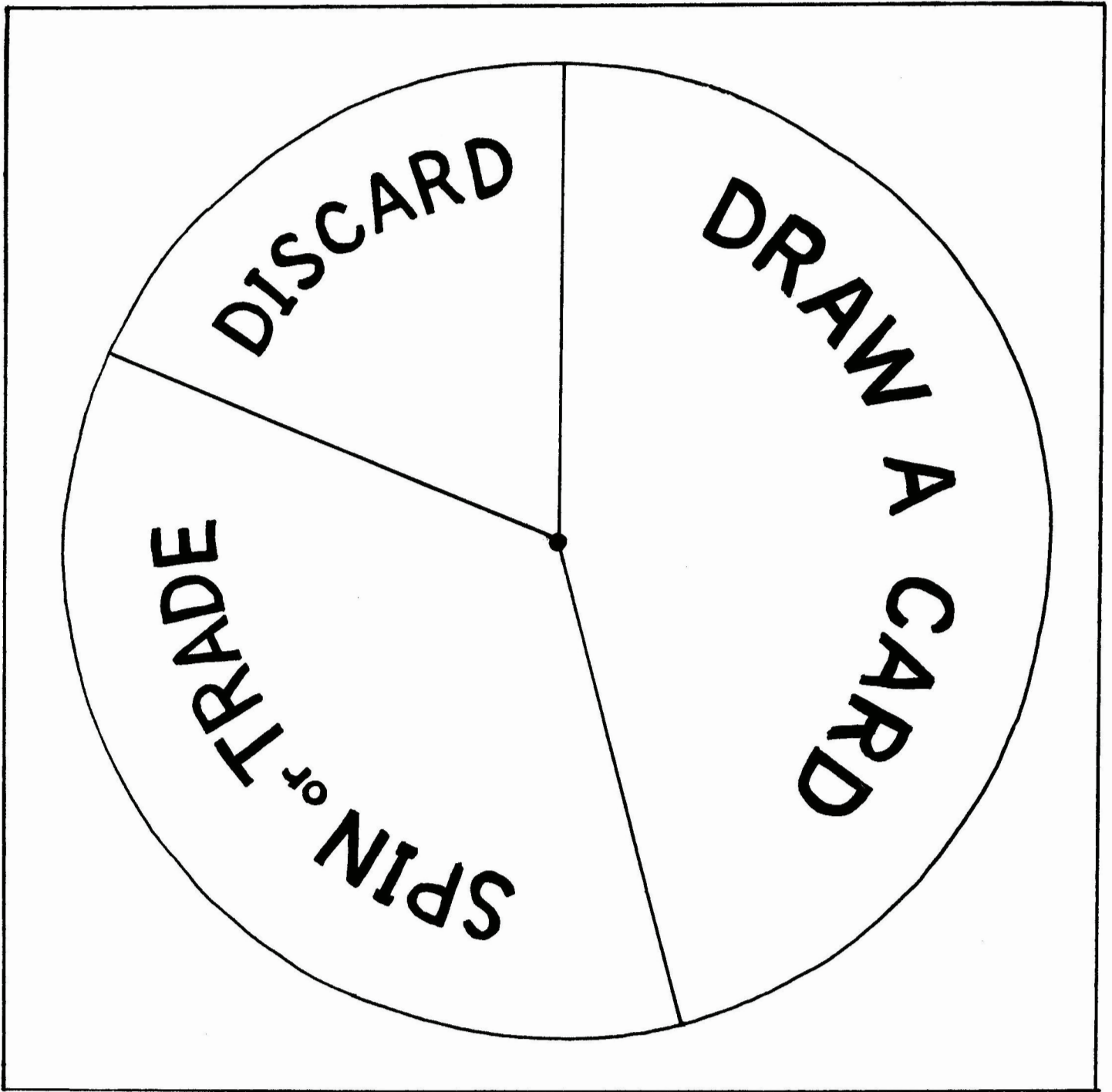


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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

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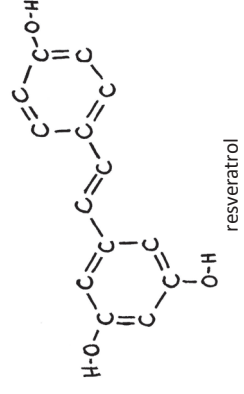
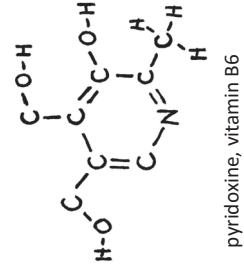
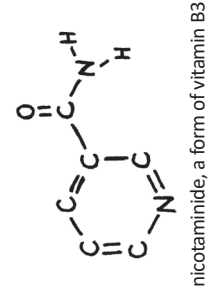
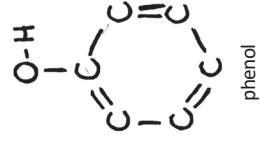
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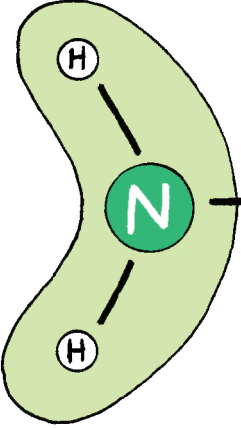
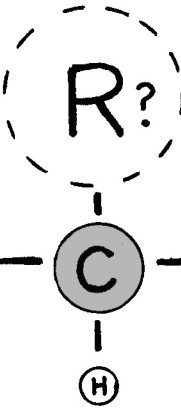
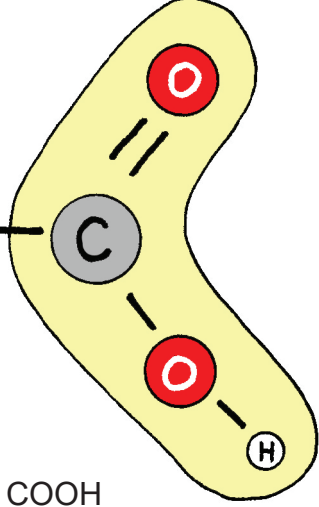
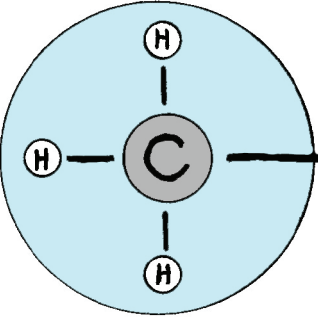
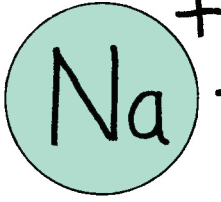
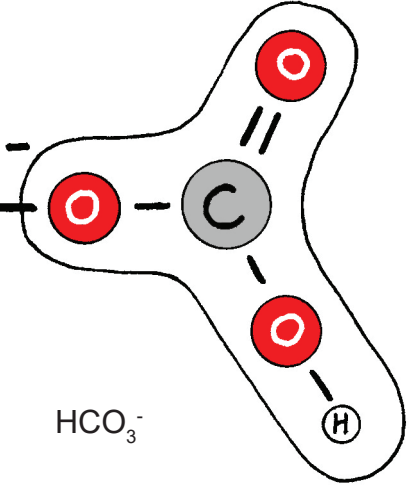
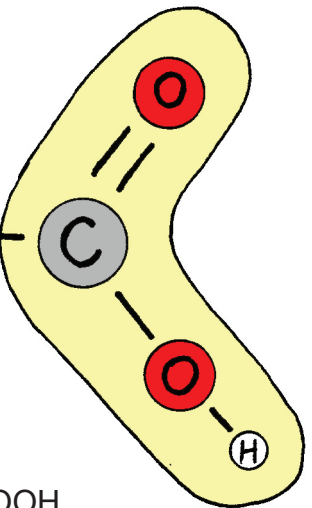
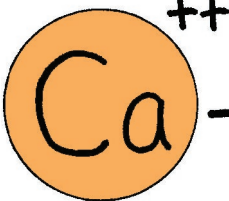
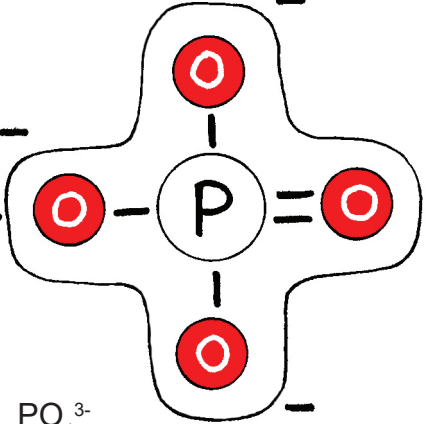
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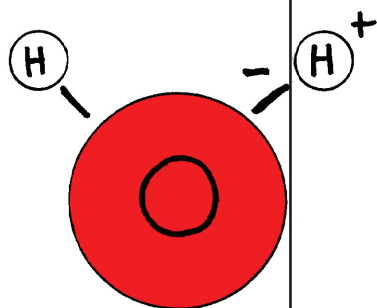
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

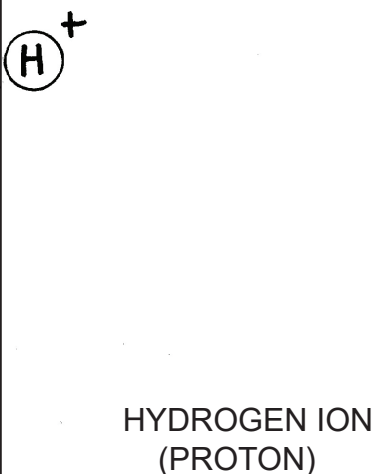
H - hydrogen	
O - oxygen	
C - carbon	
N - nitrogen	



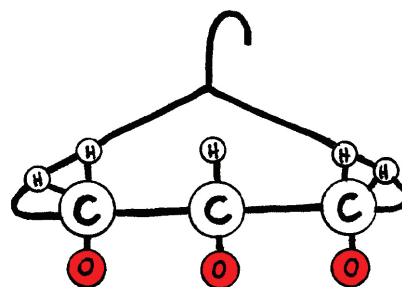
<p>AMINE GROUP</p>  <p>NH<sub>2</sub></p>	 <p>ALPHA CARBON and "R" GROUP (20 possible R's)</p>	<p>CARBOXYL GROUP</p>  <p>COOH</p>
<p>METHYL GROUP</p>  <p>CH<sub>3</sub></p>	 <p>SODIUM ION</p>	 <p>HCO<sub>3</sub><sup>-</sup></p> <p>BICARBONATE</p>
<p>CARBOXYL GROUP</p>  <p>COOH</p>	<p>CALCIUM ION</p> 	<p>PHOSPHATE</p>  <p>PO<sub>4</sub><sup>3-</sup></p>



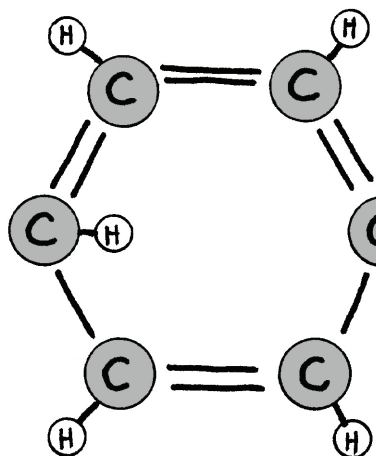
HYDROXIDE ION



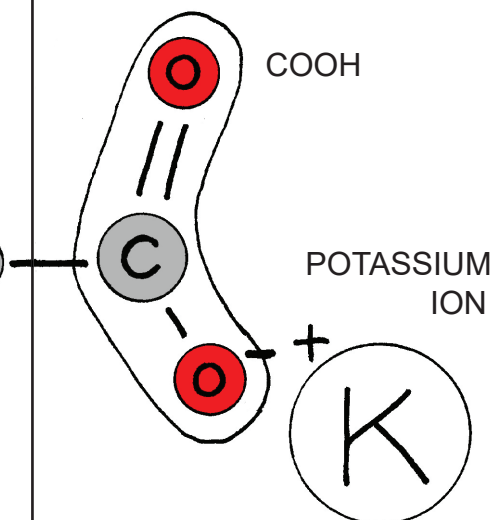
HYDROGEN ION  
(PROTON)



GLYCERIN

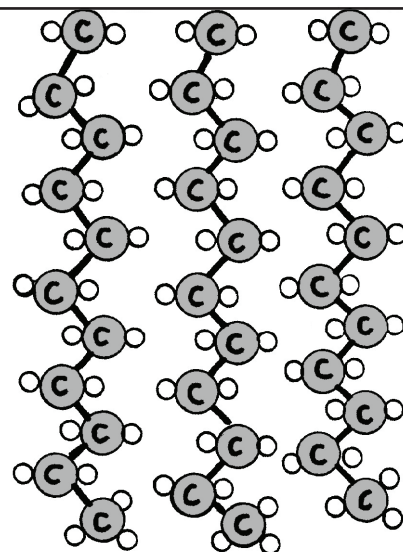


BENZENE RING

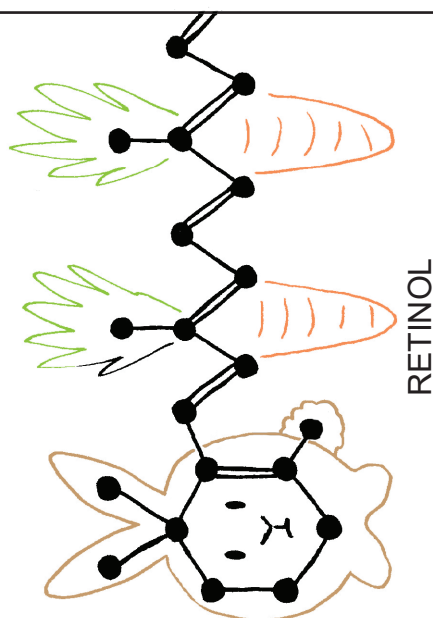


COOH

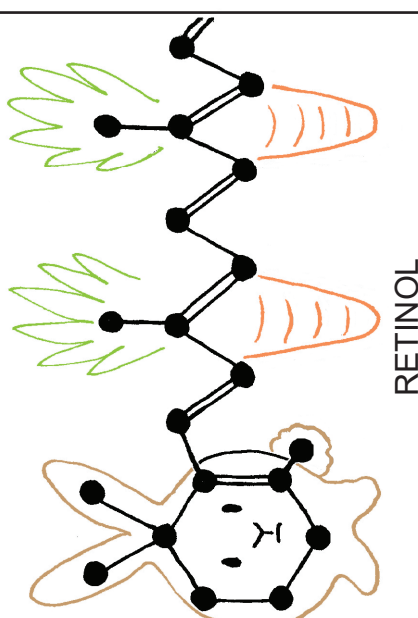
POTASSIUM  
ION



FATTY ACIDS

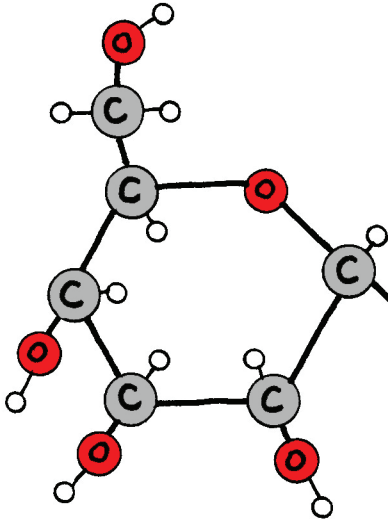
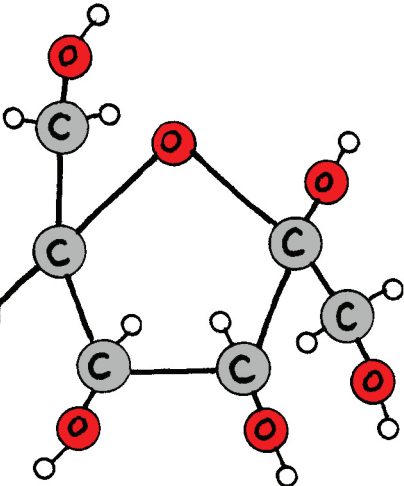
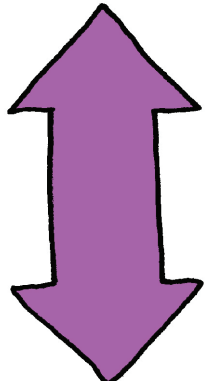
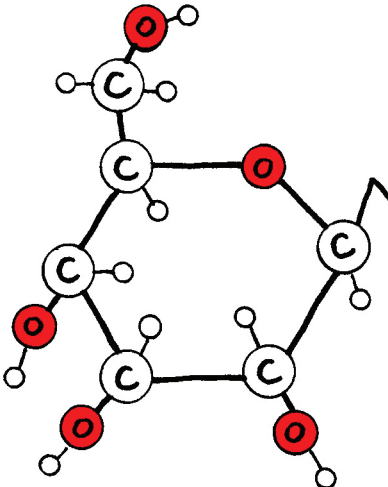
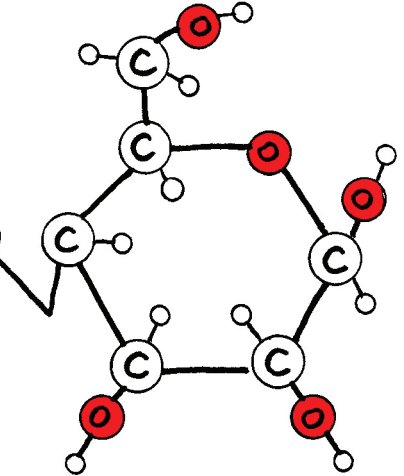
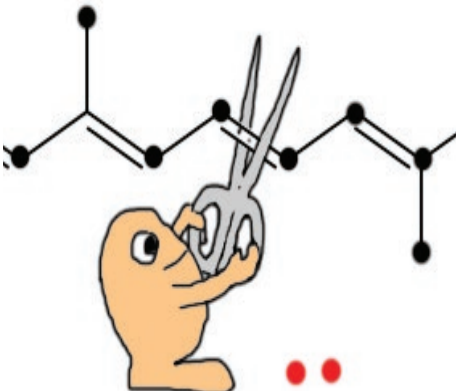

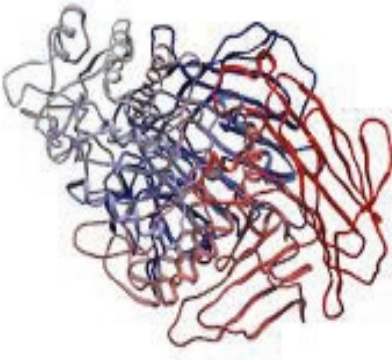


RETINOL



RETINOL

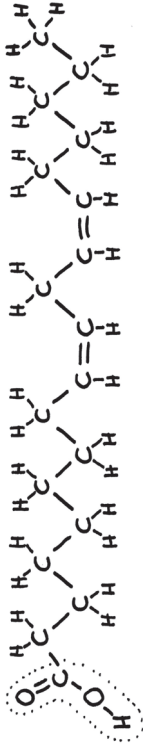
TRADE  
↑  
TRADE

<p>GLUCOSE</p> 	<p>FRUCTOSE</p> 	<p>TRADE</p>  <p>TRADE</p>
 <p>GLUCOSE</p>	 <p>GALACTOSE</p>	 <p>ENZYME: beta-carotene 15,15' monooxygenase</p>
 <p>LACTASE</p>	 <p>SUCRASE</p>	<p>pH</p> <p>This card will split water into OH<sup>-</sup> and H<sup>+</sup>.</p>



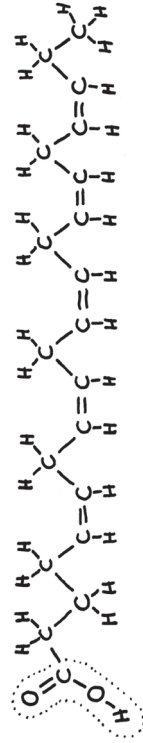
# MOLECULE MAT Chapter 5

Omega-6 fatty acid  
LINOLEIC ACID (*lin-oh-LAY-ick*)



COOH is marked just to help you see it as a unit. That H might come off, which is why it's called an acid.

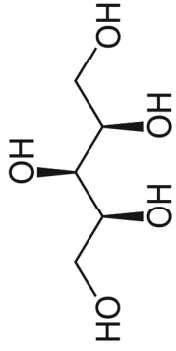
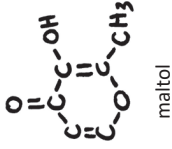
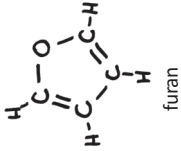
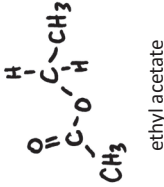
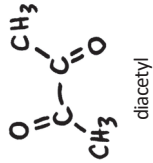
EPA Omega-3 fatty acid  
(Eicosapentanoic acid)



We saw in the chapter that this molecule is actually curved. However, it will be easier for you if we don't worry about the curve and let you just concentrate on where the H's are.

H - hydrogen	O - oxygen	C - carbon
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-----Caramelization molecules-----



(There are 5 carbons, and 7 hydrogens not shown.  
Remember, carbon always makes 4 bonds!)

H - hydrogen

O - oxygen

C - carbon