SUMMER BIOLOGY PROJECT

Biomolecules

This is the summer project for biology. There will be 2 components to this project: **questions** and a **poster**. The questions will be answered on this packet. The poster must be created by using nutrition labels from foods at your house. Both this packet and the poster will be turned in to your biology teacher. There is a rubric at the end of this handout for each assignment. **We expect this to be good quality work!**

IT MUST BE SUBMITTED BY THE FIRST DAY OF SCHOOL OR ELSE IT WILL BE NOT ACCEPTED.

THIS PROJECT IS MANDATORY FOR ALL PRE-AP BIOLOGY STUDENTS. THOSE WHO DO NOT COMPLETE BOTH THE QUESTIONS AND THE POSTER WILL BE MOVED TO REGULAR BIOLOGY.

There is reading material in this packet to help you, but outside sources such as the internet are acceptable.

The goal behind this project is to prepare you for one of the most difficult topics in biology, biomolecules. By the end of this project you will know basic information about each biomolecule and how this pertains to your daily life through the food you eat.

If you have any questions about this project you can email Mrs. Stephanie Camacho at SCamacho@palestineschools.org Please allow 2-3 days for a response.

Why do we eat? Many foods taste good, but eating is important for the proper functioning of your body. When you eat a variety of foods from the basic food groups, you are supplying your body with the **nutrients** it needs. The four basic food groups are:

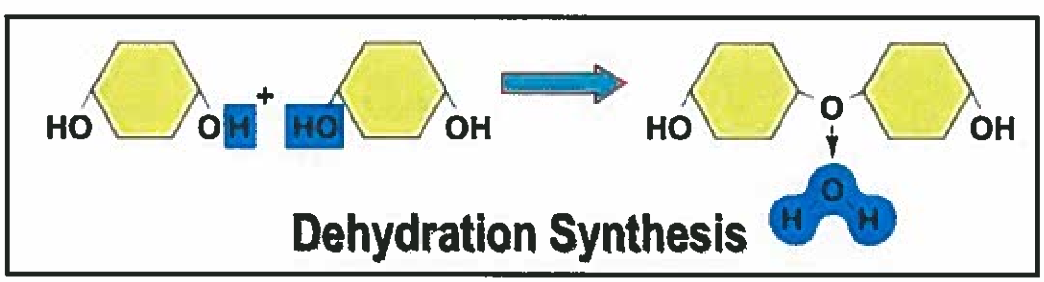
1) meat, poultry, eggs, fish, nuts, and beans
2) milk, yogurt, and cheese
3) fruits and vegetables
4) bread, rice, pasta, and cereals

These four groups provide your body with essential nutrients: water, carbohydrates, fats, proteins, and vitamins. Along with nucleic acids (DNA/RNA), carbohydrates, fats and proteins, are the four groups of **biomolecules (macromolecules)** your body uses.

MONOMER AND POLYMER

Most biological molecules are very large and are built by assembling small molecules, or monomers, into long chains. The resulting molecules are called **macromolecules**, or **polymers**.

A process of linking monomers, called **dehydration synthesis**, involves the removal of two hydrogen atoms and one oxygen atom to form water.

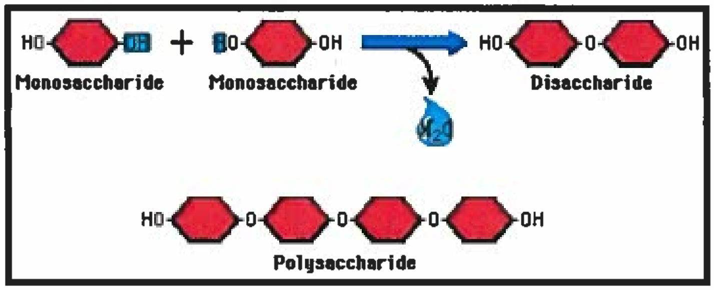


MONOMER	POLYMER
Monosaccharide	Carbohydrate
Fatty acid and glycerol	Lipid
Amino acid	Protein
Nucleotide	Nucleic Acid

CARBOHYDRATES

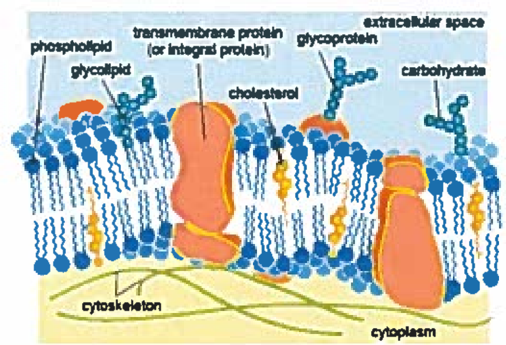
Carbohydrates and **fats (lipids)** are nutrients that supply your body with sources of energy. **Carbohydrates** may be **"simple sugars"** (like soda, candy, white bread, and table sugar) that provide a quick burst of energy. Or, carbohydrates may be **"complex sugars"** (like oatmeal, brown rice, and whole-grain breads) that provide energy over a longer period of time. Carbohydrates also provide structure to plants through the cell wall, which is made of cellulose. The elements making up carbohydrates are made up of **carbon, hydrogen and oxygen**.

Monosaccharide: one sugar molecule } simple sugars
Disaccharide: two sugar molecules } simple sugars
Polysaccharide: many sugar molecules } complex sugars



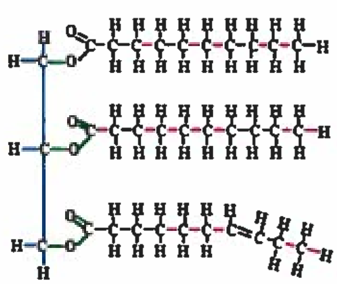
LIPIDS

In addition to storing energy for future use, **fats** make up the membranes of our cells (remember the lipid bilayer!), provide protection for vital organs, help your nervous system send electrical messages more quickly, assist in temperature regulation, and keep your skin from drying out. Fats are therefore important in your diet.



But, too much fat in a diet can create problems. We should try to eat "good fats" while avoiding "bad fats." What's the difference between a "good" fat and a "bad" fat? Good fats are also called **"unsaturated" fats**. Examples of good fats include vegetable oils, fish oils, nuts and peanut butter. Even these good fats must be eaten in moderation. Bad fats are also called **"saturated" or "trans" fats**. Examples of bad fats include butter, lard, red meat, fried foods, and packaged sweets and chips.

Lipids are made up of the following elements: **carbon, hydrogen and oxygen**.



The long branched chains of carbon and hydrogen provide a lot of energy. Each bond is storing energy, so when the bonds are broken during digestion, energy is released for our bodies to use.

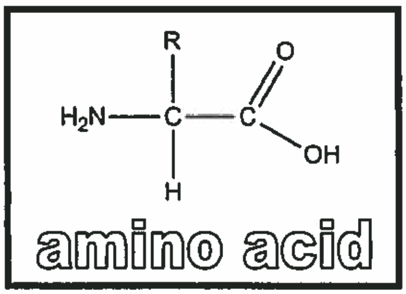
PROTEINS

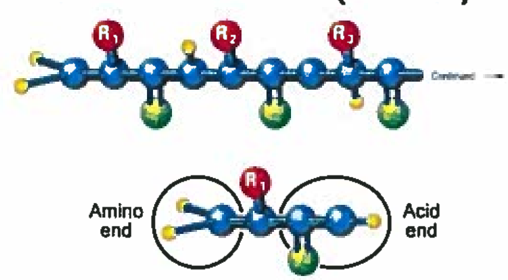
Proteins provide the body with **amino acids**, which your body uses to make more proteins. Remember that some proteins act as **enzymes** (speed up chemical reactions, break biomolecules down or build them) and provide structural support (like muscles and bone). Often times polymers are too large to fit inside a cell, so they must be broken down by enzymes into their monomers in order to be utilized by the cells. Foods that have a lot of protein include soy, meat, fish, poultry, beans, and dairy products.

Enzymes are named for what they break down or build and the name almost always ends in "ase". For example, lactase is the enzyme that breaks down lactose, a sugar in milk.

Proteins are made up of the following elements: **carbon, hydrogen, oxygen and nitrogen**.

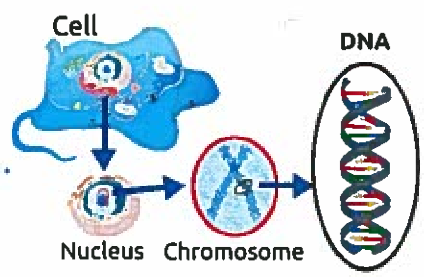
Polypeptides are chains of amino acids. Proteins are made up of one or more polypeptide molecules. The amino acids are linked by peptide bonds.

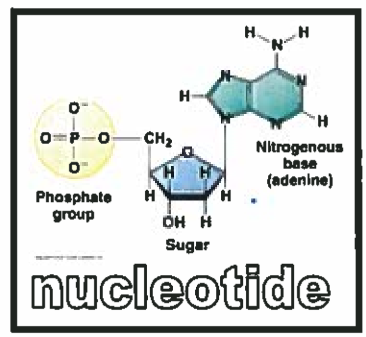




NUCLEIC ACIDS

Nucleic acids, like DNA and RNA, are the only biomolecules we do not get from our diets. DNA is inherited from our parents and RNA is transcribed in the nucleus with the help of proteins. The three components of a nucleotide are: sugar, phosphate group, and nitrogenous base. The elements that compose nucleic acids are, **carbon, hydrogen, oxygen, nitrogen and phosphorous**





??QUESTIONS??

CARBOHYDRATES:

1. What is the monomer of a carbohydrate called: ______________________________

2. What is the name of the process where one of these small units combines to form a more complex molecule?

________________________________ ________________________.

3. What is released in the process referred to in question #2? ___________

4. When several sugar monomers join together, what is formed? ___________________________.

5. Why do we eat carbohydrates: ____

6. What is another name for a complex sugar: ____

PROTEINS :

7. Proteins are made of smaller sub-units called: ____________________ ________________.

8. What kind of protein speeds up chemical reactions: _________________________
9. Give an example of proteins in your body: ____________________________

10. When amino acids are joined together by peptide bonds, what is the result: ___________________________ or

____

LIPIDS :

11. What are the 3 types of fats? Which ones are good and which are bad?

- ______________________ Good Bad
- ______________________ Good Bad
- ______________________ Good Bad

12. Explain at least 3 reasons why you need to have fat in your body.

1. ____
2. ____
3. ____

13. Label each food with a "U" for unsaturated fat, an "S" for saturated fat, or a "T" for trans fat.

tuna fish ____	Moz. sticks ____
French fries ____	milk ____
hamburger ____	olive oil ____
butter ____	steak ____
peanut oil ____	fried chicken ____

NUCLEIC ACIDS:

14. There are two types of nucleic acids, they are ___________ and ___________.

15. Nucleic acids are composed (made of) smaller subunits called ______________________.

16. The nucleotide is composed of what three parts: ______________________, ______________________,

and ________________________.

ALL BIOMOLECULES:

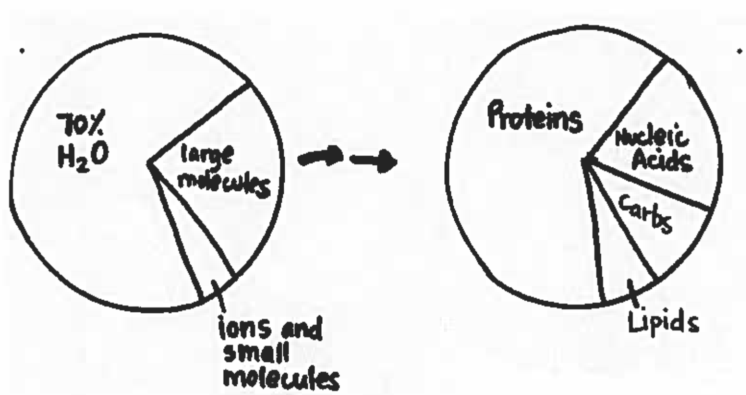
Label each item with a "C" for carbohydrate, a "P" for protein, or a "F" for fat. You can put more than one letter for each item. For instance, peanuts have proteins AND fats!

17. main source of energy in the body ____	24. makes up your muscles, skin, and bones ____
18. peanuts	25. what salivary amylase breaks down ____
19. made of amino acids ____	26. what salivary amylase is ____
20. sugars and starches ____	27. hemoglobin ____
21. hamburger ____	28. enzymes ____
22. butter ____	29. Saturated and unsaturated_ ____
23. antibodies ____	30. building blocks of hormones ____

Answer **TRUE** or **FALSE** to the following questions about **biomolecules.**

31. Biomolecules include carbs, lipids, proteins, and nucleic acids. ____________
32. Water is one of the types of biomolecules. ____________
33. Biomolecules are living things. ____________
34. Life would be impossible without biomolecules. ____________
35. Biomolecules are too large to fit inside cells. ____________

Substances Found in Living Things:



The majority of ALL living things are made of 36. ______________________________. This accounts for 70% of your body. A small percentage (37.________%) of ions and small molecules are found in all living things. About 25% of ALL living things are composed of large molecules called 38. _________________________. They come in four types: proteins, carbohydrates, 39. ___________________, and nucleic acids. The majority of these large molecules (more than half) are 40. ____________________________.

NUTRITION LABELS

A food label is a panel on a package of food which contains a variety of information about the nutritional value of the food item. There are many pieces of information which are standard on most food labels, including serving size, number of calories, grams of fat, included nutrients and a list of ingredients.

The amount of energy stored in food is measured in **Calories**. There are 4 Calories per gram of carbohydrate, 4 Calories per gram of protein, and 9 Calories per gram of fat. (A single paperclip has a mass of about one gram.) Most people need to eat about **2000 Calories per day**. Athletes generally need to eat more calories. This information is found on food labels A healthy, balanced diet is essential for good health. Try to eat lots of fresh fruits and vegetables, whole grains, nuts, fish, beans, poultry, and dairy products. Limit your consumption of red meats, fried foods, sweets, soda, white bread, and flaming hot Cheetos. Remember - the smart choices you make now mean better health later!

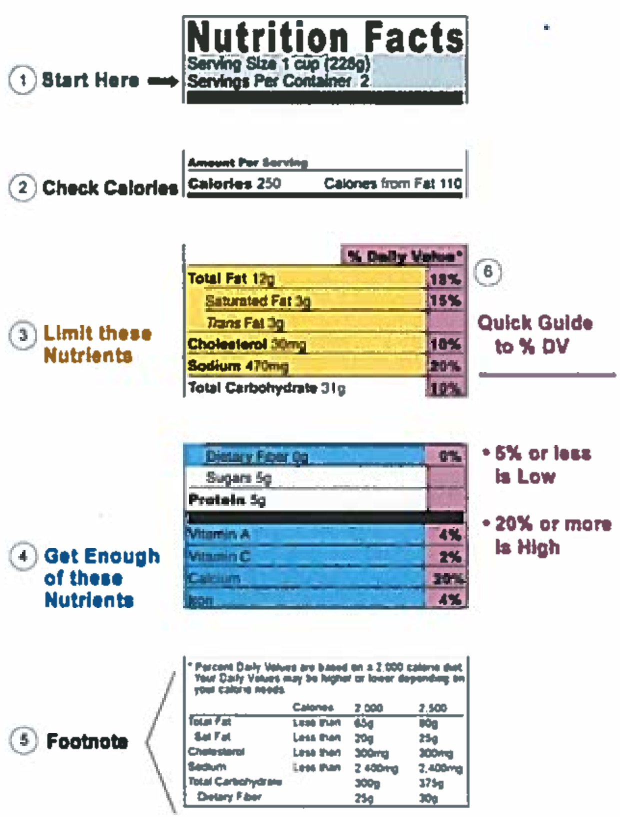
How to Read a Nutrition Label

The information in the main or top section (see #1-4 and #6 on the sample nutrition label below), can vary with each food product; it contains product-specific information (serving size, calories, and nutrient information).

The bottom part (see #5 on the sample label below) contains a footnote with Daily Values (DVs) for 2,000 and 2,500 calorie diets. This footnote provides recommended dietary information for important nutrients, including fats, sodium and fiber. The footnote is found only on larger packages and does not change from product to product.

In the following Nutrition Facts label we have colored certain sections to help you focus on those areas that will be explained in detail. You will not see these colors on the food labels on products you purchase.

Sample Label for Macaroni and Cheese



POSTER

You will put together a poster with 6 different nutrition labels. It can be from any food. You will cut out the label and the products name and glue it to the poster. You will then answer the following questions about each label. This information will need to be written neatly or typed under each nutrition label on your poster.

1. Serving Size: 2. Calories: 3. Total Fat: 4. Bad Fat (Saturated + Trans): 5. Total Carbs: 6. Sugars: 7. Protein: 8. How many calories are in one serving of this food? 9. How many total grams of fat are in a serving of this food?

After you have answered these questions for each label, you will then answer these 3 questions by comparing all 6 of your food labels:

1. **Which food item would be the best choice if you needed a quick energy source to run a marathon?**
2. **Which food item would be the best choice if you were trying to gain muscle mass before the upcoming football season?**
3. **Which food item would be the best choice if you trying to gain weight before going on an Alaskan expedition so you have plenty of insulation to protect you from their cold nights?**

This poster should be neat and presentable!

RUBRIC

QUESTIONS – DAILY GRADE		
Questions	**Correct (2.5)**	**Incorrect (0)**
1 – 40		
Total	/100	

POSTER – TEST GRADE		
Labels	**Present (5)**	**Not present (0)**
Label #1		
Label #2		
Label #3		
Label #4		
Label #5		
Label #6		
TOTAL		
Questions	**Correct (1)**	**Incorrect (0)**
Label #1 Questions (1-9)		
Label #2 Questions (1-9)		
Label #3 Questions (1-9)		
Label #4 Questions (1-9)		
Label #5 Questions (1-9)		
Label #6 Questions (1-9)		
TOTAL		
Overall Questions	**Correct (5)**	**Incorrect (0)**
#1		
#2		
#3		
TOTAL		
TOTAL	/99	