Name _____ Date _____ Period _____

Macromolecules

→ **PURPOSE:** To understand the structure of macromolecules by constructing paper models.

→ PRE LAB QUESTIONS (see Reverse Page)

INTRODUCTION: Macromolecules are also known as **polymers** because they are made of many smaller subunits. Each subunit on its own is known as a **monomer**. In order for the monomers to connect together a water molecule must be taken out, this reaction is known as a condensation reaction. When water is taken out, the shape of each subunit changes, which allows them to connect together. To break macromolecules apart, water is added and this reaction is known as hydrolysis.

MATERIALS:

1. 1 sheet of ~~construction paper~~ – Lab Notebooks
2. 2 sheets of **Monomer Cut-Outs**
3. Scissors
4. Glue stick
5. Colored Pencils – see colors needed in procedure
6. Notes on macromolecules

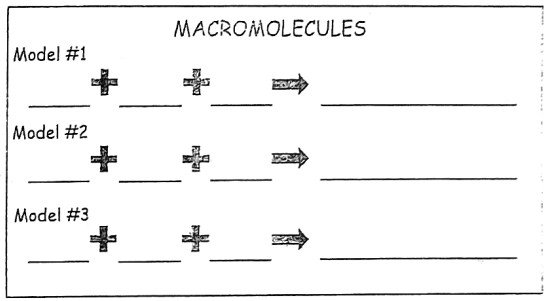
PROCEDURE:

1. Answer the PRE-LAB QUESTIONS on the **Macromolecules Answer Sheet**.
2. Gather materials.
3. On both sheets of **Monomer Cut-Outs**, color **shape A** green.
4. On both sheets of **Monomer Cut-Outs**, color **shape B** blue.
5. On both sheets of **Monomer Cut-Outs**, color **shape C** purple.
6. On both sheets of **Monomer Cut-Outs**, color **shape D** red.
7. On both sheets of **Monomer Cut-Outs**, color **shape E** yellow.
8. On both sheets of **Monomer Cut-Outs**, color **shapes F, G and H** different patterns of your choice. Be creative! **Shapes F, G and H** should <u>not</u> be the same color as any of the other shapes on the paper.

PROCEDURE, continued:

9. On the piece of construction paper you will paste the cut outs into the format of a chemical reaction. Turn your construction paper <u>horizontally</u> and use a pen (or marker) to set up your paper like **Diagram 1** below. Don't forget to leave plenty of space for your cut outs!

→ Diagram 1



10. Cut out all of the monomers on the <u>SOLID</u> lines.
11. Gather all cut outs of **shape A**. Try to join the pieces together.
    What do you have to cut in order for the pieces to join together correctly?
12. Glue your cut outs onto your construction paper for model #1.
13. Label the pieces for model #1. What monomer does **shape A** represent?
    Which macromolecule did you build?
14. Gather all cut outs of **shape B, C, D and E**. Try to join the pieces together.
    What do you have to cut in order for the pieces to join together correctly?
15. Glue your cut outs onto your construction paper for model #2.
16. Label the pieces for model #1. What monomers do **shapes B, C, D and E** represent?
    Which macromolecule did you build?
17. Gather all cut outs of **shape F, G and H**. Try to join the pieces together.
    What do you have to cut in order for the pieces to join together correctly?
18. Glue your cut outs onto your construction paper for model #3.
19. Label the pieces for model #1. What monomer do **shapes F, G and H** represent?
    Which macromolecule did you build?
20. Answer the conclusion questions.
21. When you are done, staple the **Macromolecules Answer Sheet** to your construction paper and turn it in.

Name _____ Date _____ Period _____

Macromolecules Answer Sheet

→ PRE-LAB QUESTIONS:

A. What does the prefix poly- mean?

B. What does the prefix mono- mean?

C. Why are macromolecules also known as polymers?

D. What are the 4 types of macromolecules?

_____

_____

_____

_____

E. If macromolecules are known as polymers, why is each subunit known as a monomer?

→ CONCLUSION QUESTIONS:

F. In order to construct the model of each macromolecule, what did you have to cut out from the monomers in order to make them fit together?

G. What type of chemical reaction were you modeling in this activity?

H. What molecule is needed to break macromolecules apart?

I. What is the reaction called that breaks the monomers apart called?

J. For each of the following polymers write their monomers.

- Carbohydrates – _____
- Proteins – _____
- Lipids – _____
- Nucleic Acids – _____

K. What monomer does shape A represent?
Which macromolecule did you build?

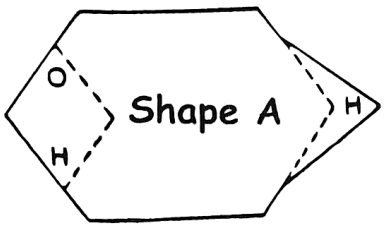
L. What monomers do shapes B, C, D and E represent?
Which macromolecule did you build?

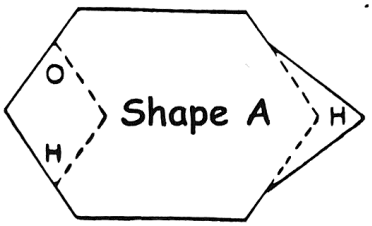
M. What monomer do shapes F, G and H represent?
Which macromolecule did you build?

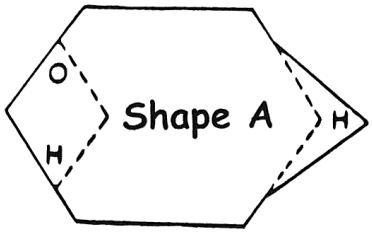
N. What macromolecule did you not build?
What are its monomers?

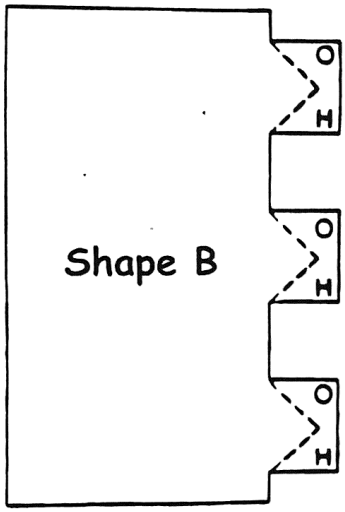
O. Using the words **monomer**, **polymer** and **macromolecule** explain what you built in the activity.

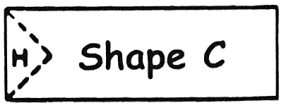
Monomer Cut Outs

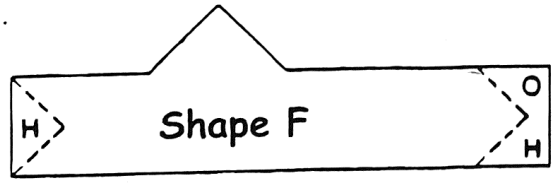


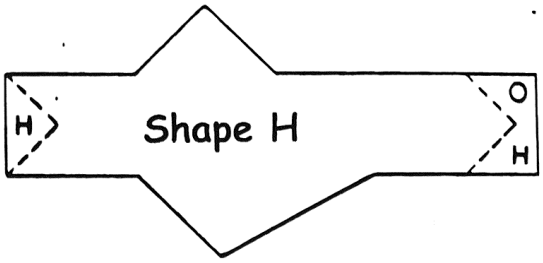


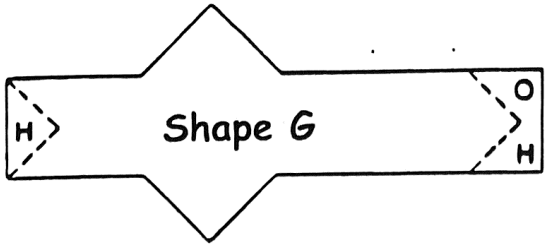


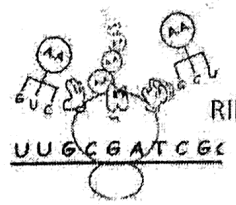
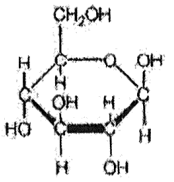
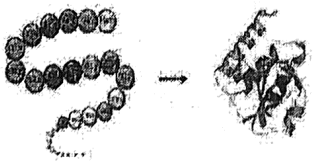
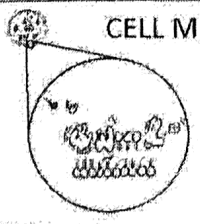
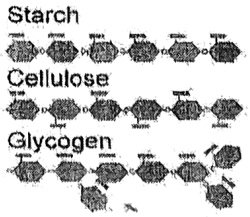
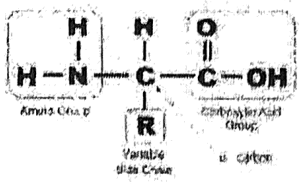
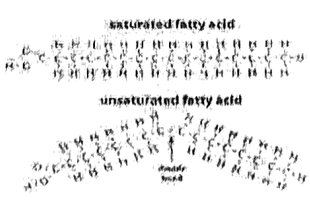
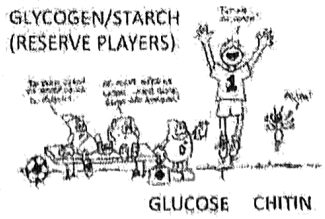
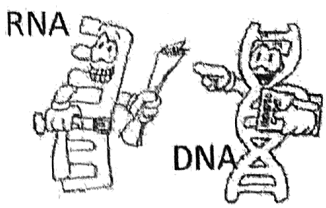










MONOMER: AMINO ACID	MONOMER: NONE	MONOMER: MONOSACCAHARIDE	MONOMER: NUCLEOTIDE
FUNCTIONS: 1. REGULATES CELL CYCLE 2. SPEEDS UP CHEMICAL REACTIONS	**FUNCTIONS:** 1. LONG TERM ENERGY STORAGE 2. INSULATION	**FUNCTIONS:** 1. SHORT TERM ENERGY STORAGE 2. SUPPORT FOR PLANT CELL WALLS	**FUNCTIONS:** 1. CONTAINS THE GENETIC CODE 2. LITERALLY BUILDS PROTENS
FOOD SOURCES: MEAT FISH BEANS	**FOOD SOURCES:** OLIVE OIL BUTTER ANIMAL FAT	**FOOD SOURCES:** POTATOES PASTA RICE	**FOOD SOURCES:** SHRIMP BROCCOLI BEER
CHEMICAL COMPOSITION: S,O,N,C,H	**CHEMICAL COMPOSITION:** C,H,O	**CHEMICAL COMPOSITION:** C,H,O	**CHEMICAL COMPOSITION:** P,O,N,C,H
EXAMPLES: 1. ENZYMES 2. HEMOGLOBIN 3. ANTIBODIES	**EXAMPLES:** 1. CELL MEMBRANES 2. EAR WAX 3. BEE'S WAX	**EXAMPLES:** 1. CELLUOSE 2. GLYCOGEN 3. STARCH	**EXAMPLES:** 1. DNA 2. RNA
			
			
			

★ Each macromolecule has 4 example squres, and squres for: Monomer, composition, function, food sources

★ Cut each of these & paste where its corresponding macromolecule is located.