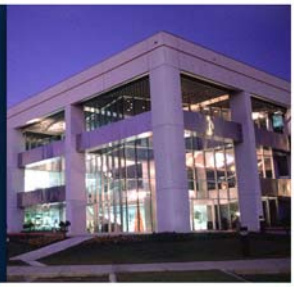
Classroom Visit Pre/Post Materials



NATIONAL HIGH MAGNETIC FIELD LABORATORY
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VIRES ARTES MORES
1851

NATIONAL SCIENCE FOUNDATION

The National High Magnetic Field Laboratory
Center for Integrating Research and Learning
1800 East Paul Dirac Drive
Tallahassee, Florida 32310
(850) 644-7191 * Fax: (850) 644-5818

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The National High Magnetic Field Laboratory

What is the NHMFL?

- The National High Magnetic Field Laboratory is a working science research laboratory utilizing state-of-the-art high magnetic field research systems. It is a world leader in magnet-related research and technology.

- The laboratory is one of nine in the world and the only one in North and South America. It was established in 1990 by the National Science Foundation and the State of Florida and is operated by the Florida State University, the University of Florida, and Los Alamos National Laboratory.
- The NHMFL brings together distinguished scientists and technicians from many disciplines including physics, chemistry, biology, geology, engineering, and materials science.
- Research at the NHMFL has implications and applications in medicine, energy, communications, electronics, the environment, transportation, and materials research and development.
- The laboratory is committed to enhancing science education with extensive educational programming at all levels.

How will your students benefit from the visit and the suggested activities?

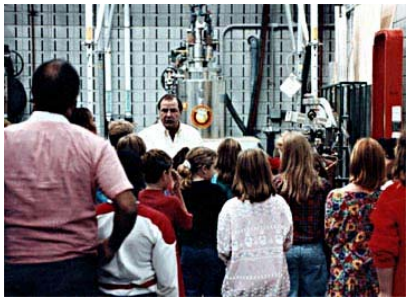
- Students will hear firsthand about what is done at a science research laboratory.
- Students will learn about diverse career opportunities in science and scientific research.

Pre-Visit Activities

The suggested pre-visit activities introduce students to basic ideas about the topic and the processes of science. Activities are correlated to the Sunshine State Standards and also include reading and writing extensions.

Post-Visit Activities

The suggested post-visit activities are designed to reinforce and expand upon what was learned by your students during the visit. The activities encourage students to analyze their ideas and spark further interest in science.



The NHMFL Education Website

You and your students are encouraged to visit the NHMFL education Website before and after your visit:

http://education.magnet.fsu.edu

Pre-Outreach Activity: What Do We Already Know?

Teacher Background:

A simple, yet effective learning strategy, a K-W-L chart, is used to help students clarify their ideas. The chart itself is divided into three columns:

K	**W**	**L**
What we **K**now	What we **W**ant to know	What we **L**earned

Materials:

- Chart Paper
- Markers

Activity Instructions:

1. Copy the K-W-L chart and pass out so that each student has their own sheet. Explain how the chart is to be filled out, then brainstorm with the class and have the students list everything that the they know about molecules. There are no right or wrong answers.

2. Next have the students list everything that they want to know about molecules. You may need to provide prompts such as:

If molecular scientists were here, what questions would you ask them?

If you were a scientist, what would you like to discover about molecules?

3. Keep the chart accessible so that you and the students can enter ideas, new information, and new questions, at any time. The class can return to the K-W-L chart after completing the activities. As students learn the answers to their questions, list the answers in the L column of the chart

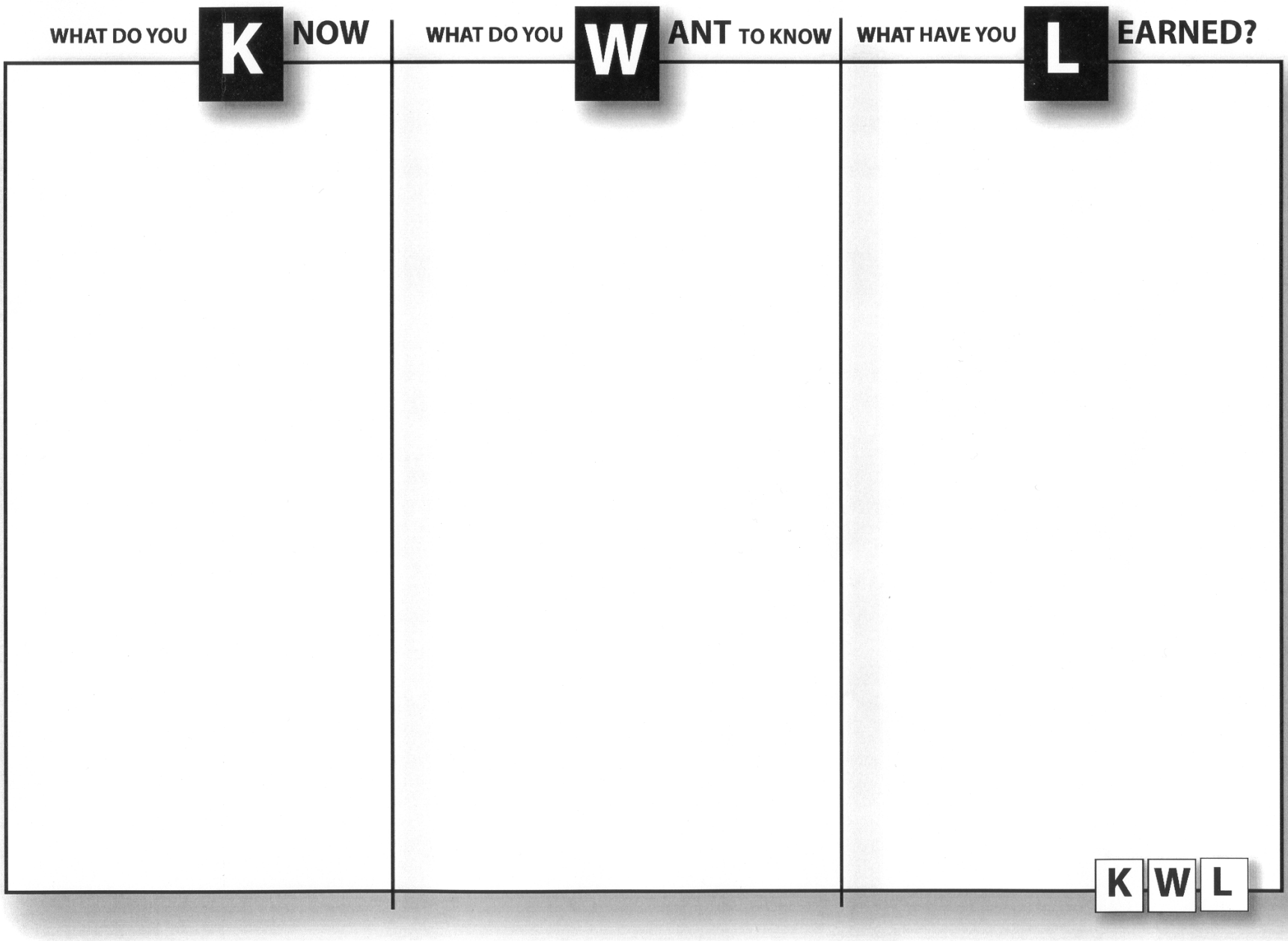
4. K-W-L charts are useful in identifying misconceptions that students have about molecules. Once the misconceptions are identified, have students design a way to test their ideas, reflect on what they observe, and refine the original conclusion.

5. Periodically, return to the K-W-L chart during the activities to check off items from the W column and to add to the L column. Students may want to add items to the W column to further their explorations.

Standards:

Grades 3-5: SC.C.2.2.1, SC.H.2.2.1
Grades 6-8: LA.C.1.3.1, SC.H.1.3.5, SC.H.2.3.1

NAME_____
TOPIC_____
TEACHER_____



Pre-Outreach Activity: Molecules in the air

Teacher Background:

Even though we cannot see air, it has weight and can be measured. A n understanding that air is made up of molecules will help students better grasp the molecule madness activity. Furthermore, this lesson can be tied into activites dealing with weather and air pressure.

Air is made up of molecules of nitrogen (78%), oxygen (21%), and other gases (1%). Billions of molecules of air bounce around causing air pressure. Air pressure is measured in pounds per square inch and the pressure changes depending on the number of molecules in a space and how fast they are moving. Air expanding into a larger space increases the pressure. When heated, air pressure increases and when cooled, it decreases if it is in the same amount of space. Pressure differences can be used to predict weather, create wind, and determine height of an airplane or hot air balloon. The most common kind of barometer, an aneroid barometer, can be made in the classroom.

By following the steps listed, you can create a homemade barometer, a device that measures air pressure. Barometers are used in meteorology to measure the current air pressure in an area. When storms approach an area, air pressure usually falls.

Materials:

- Glass jar
- Plastic straw
- Toothpick
- Tape
- Balloon
- Rubber band
- Construction paper (dark colors)
- Regular white paper
- Scissors

Activity Instructions:

1. Cut the neck off a balloon, and stretch the balloon over the mouth of the jar as tight as possible. Use the rubber band to secure the balloon.

2. Tape the toothpick to the end of the straw, and then tape the straw to the center of the balloon. This finishes construction of the barometer.

3. Use construction paper and white paper to "measure" high and low air pressure. Place the chart on the wall, a book, or window, and place the barometer so that the straw points at the chart. At the top of the chart, draw a symbol for good weather, and at the bottom, draw a symbol for bad weather.

4. Take the barometer outside and take a measurement of where the toothpick is pointing. Do this for the next few days, then graph the results and predict the coming weather. High pressure generally indicates clear weather; low pressure is an indicator of precipitation.

Standards:

Grades 6-8: LA.A.1.3.1, LA.C.1.3.1, MA.A.1.3.2, MA.A.1.3.4, MA.A.4.3.1, MA.B.1.3.2, MA.B.1.3.4, MA.B.3.3.1, MA.E.1.3.1, MA.E.1.3.2, SC.A.1.3.1, SC.A.1.3.2, SC.A.1.3.3, SC.A.1.3.4, SC.A.1.3.5, SC.A.1.3.6, SC.B.1.3.3, SC.C.2.3.3, SC.H.1.3.1, SC.H.1.3.2, SC.H.1.3.4, SC.H.1.3.5, SC.H.1.3.7, SC.H.2.3.1, SC.H.3.3.4, SC.H.3.3.6
Grades 9-12: LA.A.1.4.1, LA.A.2.4.1, MA.A.1.4.2, MA.A.2.4.2, MA.A.4.4.1, MA.B.1.4.3, MA.B.3.4.1, MA.B.4.4.2, MA.E.1.4.1, SC.A.1.4.2, SC.A.1.4.4, SC.A.2.4.2, SC.B.1.4.3, SC.D.1.4.3, SC.D.2.4.1, SC.H.1.4.1, SC.H.1.4.7, SC.H.3.4.1, SC.H.3.4.6

Post-Outreach Activity: Molecular Motion

Teacher Background:

Molecules in liquids and gases are in constant motion, and just because the sample is stable, does not mean there is no molecular motion. The speed at which molecules move depends on the amount of energy present. The more energy available, the faster the molecules move. Heat is an excellent source of energy, and a simple example of energy for students to understand.

For example in hot water, there is more heat than in cold water; therefore the molecules in hot water move faster than the molecules in cold water.

Introduce this activity by showing the students a cup of water, and then asking them what would happen if you added a drop of food coloring to the water. As you watch the diffusion of the food coloring, ask the students what they could do to speed up the spread of the food coloring. Use this discussion to lead into the activity.

Materials:

- Clear plastic cups
- Food coloring
- Hot and cold water
- Masking tape
- Marker
- Spoon

Activity Instructions:

1. Prepare two identical clear plastic cups filled with room temperature water. Add a drop of food coloring to both cups, and stir one cup with the spoon. Observe the results, and discuss.

2. Label two clear plastic cups with the masking tape and the marker. One cup will be used for cold water, and the other for hot water.

3. Fill both cups halfway with the appropriate water and then add one drop of food coloring to each cup. Do not move or stir the cups.

4. Have the students describe what is happening in each cup, and come up for an explanation for the events they witness. Where possible, test the explanations.

5. For an advanced activity, have students observe ice cold and nearly boiling water in addition to the hot, cold and room temperature water. Use thermometers to measure the temperature of the water, and a stopwatch to measure the time it takes for the food coloring to fully diffuse. These results can then be graphed.

Standards:

Grades 6-8: LA.A.1.3.1, LA.C.1.3.1, SC.A.1.3.1, SC.A.1.3.2, SC.A.1.3.3, SC.A.1.3.4, SC.A.1.3.5, SC.A.1.3.6, SC.B.1.3.3, SC.C.2.3.3, SC.H.1.3.1, SC.H.1.3.2, SC.H.1.3.4, SC.H.1.3.5, SC.H.1.3.7, SC.H.2.3.1, SC.H.3.3.4, SC.H.3.3.6
Grades 9-12: LA.A.1.4.1, LA.A.2.4.1, SC.A.1.4.2, SC.A.1.4.4, SC.A.2.4.2, SC.B.1.4.3, SC.D.1.4.3, SC.D.2.4.1, SC.H.1.4.1, SC.H.1.4.7, SC.H.3.4.1, SC.H.3.4.6

FCAT Sample
Practice Questions

1. Chang was playing in his swimming pool and began to wonder if the water in his swimming pool could be broken down any further. Which of the following is the smallest possible unit?

A Compound
B Electron
C Molecule
D Atom

2. Which of the following is the **best** definition for a molecule?

F Two or more atoms bonded together.
G When an atom is split.
H The type of radiation as an atom decays.
I An element that has undergone a phase change.

FCAT Sample
Practice Questions

You may need to refer to the periodic table in this booklet to answer questions 3 & 4.

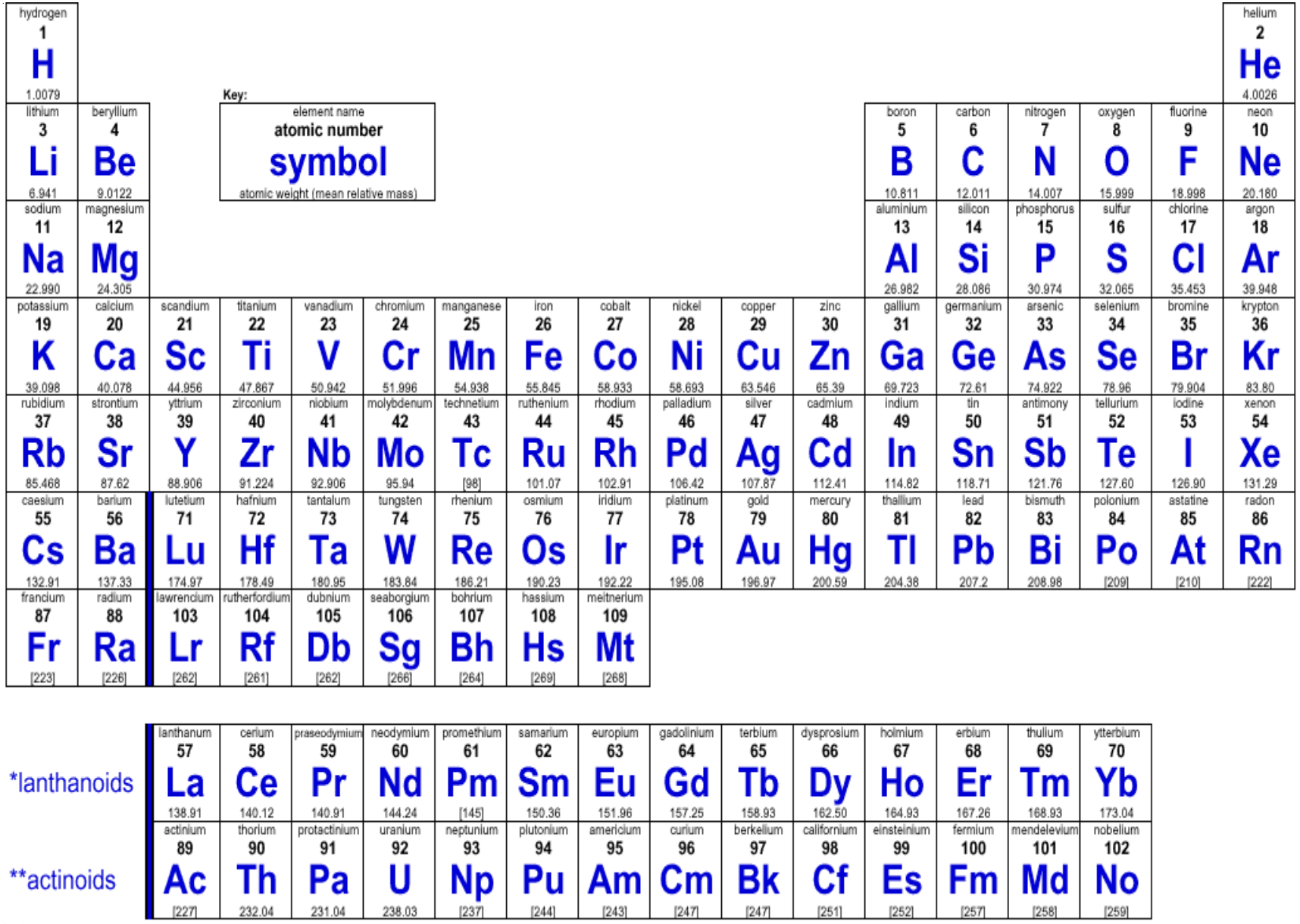
3. Glucose is a molecule consisting of carbon, hydrogen, and oxygen atoms. The molecular formula is $C_6H_{12}O_6$. What is the atomic weight of glucose?

A 3
B 24
C 96
D 180

4. Which of the following elements is **heaviest**?

F Molybdenum
G Magnesium
H Neon
I Lead

Periodic Table of the Elements



FCAT Sample
Practice Questions

Notes

Center for Integrating Research and Learning

National High Magnetic Field Laboratory
1800 East Paul Dirac Drive
Tallahassee, Florida 32301
850-644-4707
850-644-5818 Fax

http://education.magnet.fsu.edu
http://www.magnet.fsu.edu

Tours & Outreach:
Carlos R. Villa
villa@magnet.fsu.edu
850-644-7191