

LAB ENRICHMENT ALL LEVELS

Lesson 1: CHEM/MATTER – WATER (Levels 1-4) complete challenges as you are able.

Lab Enrichment – Preparations

A. Read Lesson 1 (Levels will vary)
B. Utilize Poster Sets CHEM Water
C. Lesson 1-3 Vocabulary Essentials
D. Presentations (PPT) Levels 1-2 SC &
Levels 3-4 CP Lesson 1a & b www.readyanswer.org



ENRICHMENT - Explore Matter by learning about Water. Keep Lessons 1-3 vocabulary definition page handy. Practice, explore, or experiment by completing the following.

1. Build a Ball & Stick model of water (or tear down and rebuild) – plastic models

☑ A. Identify the atoms (H & O). Count the total number of **atoms** in 1 H_2O.
☑ B. Count the number of different **elements** in a water molecule
☑ C. Determine why a water molecule is also a **compound**
☑ D. Build/Draw a **molecule** that is NOT a compound (like O_2 or N_2)
☑ E. Measure the angle formed between the 2 hydrogen atoms and 1 oxygen atom
(Use the protractor to determine the angle.) What is it? _____

2. Build 6 complete water molecules using magnetic balls and rods. The silver balls represent oxygen (red) and the rods represent hydrogen (3 pieces).

☑ A. Make sure each ball has only 2 rods attached at ~100° angle
☑ B. Arrange all 6 on a piece of paper, not touching each other.
☑ C. Now, turn any rods (H) toward a ball (O) where possible
☑ D. Draw lines (max 4) from rods (H's) to O's wherever possible.
☑ E. Your lines may be similar to those in Illustration 2, but not identical. These lines symbolize the attraction between water molecules and other molecules due to waters polarity. Lesson 3 links these attractions to water's cohesion, adhesion, and surface tension properties. Note the lines are not part of the water molecule itself.

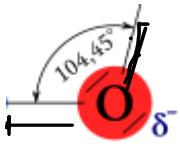
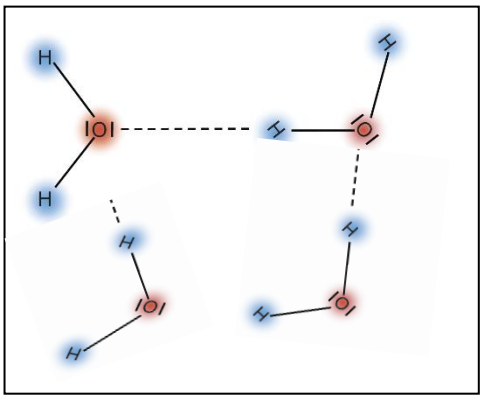


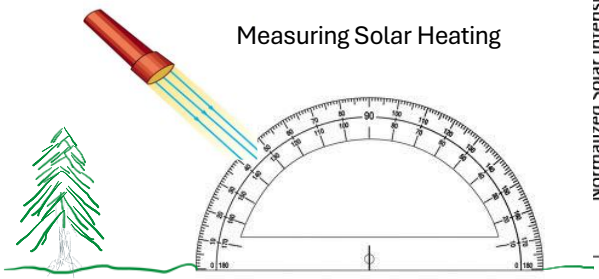
Illustration 1



Explore the magnets – what objects are attracted? List 3 that are attracted.

Just as magnets attract or repel, so do atoms, elements, molecules, and compounds when they have more or less electrons than protons. Remember water's polarity is similar a magnetic charge. Can your magnet move objects? **Y / N Why?**
← Illustration B

Illustration 3



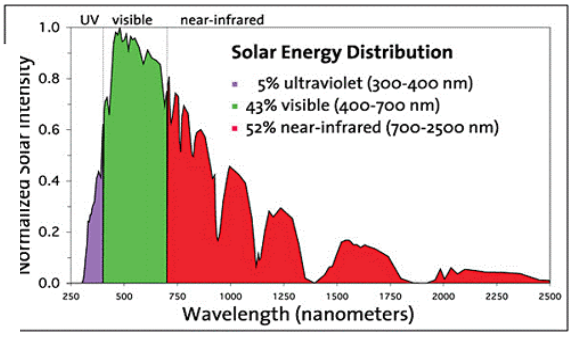


Illustration 4

3. Draw a long straight line near bottom of a blank page. This is a ground or horizon line. Next, put the protractor on the line and place a yellow pom-pom (sun) on the outer arch.

- ☑ A. What is the measure of the greatest angle (directly overhead)? _____
- ☑ B. Explore 4 equal angles of a rising/setting sun (~22.5° each with 90° the highest).
- ☑ C. What is the average altitude of the sun (given 0 to 90)/2 = _____ **or...**
  Use the rising - 0, 22.5, 45, 67.5, 90 & 90, 67.5, 45, 22.5, 0 for setting. _____
- ☑ D. Water evaporates best at 45 degrees solar angle. Would your average suggest that water efficiently evaporates on earth? **Y / N**
- ☑ E. Is the evaporation of water an interaction of matter and energy? **Y / N** How/Why?

4. Evaporation at Earth's temperatures would not be possible if not for the photoelectric effect of sunlight on water. The Water Cycle relies on evaporation to move water.

- ☑ A. Sunlight peaks around 500 nm wavelength (see Illustration 4). Circle the peak.
- ☑ B. At 500 nm, the color of light is green. Sunlight never looks green, because the combination of all colors of the rainbow is _____ light.
- ☑ C. Water evaporates due to the photoelectric effect without ever boiling. That means that sunlight alone creates a phase change in water. The best wavelength for this is ~500 nm. What color and wavelength does our sun peak?_____
- ☑ D. Does the water cycle seem "planned" by a Designer? **Y / N**
- ☑ E. Do matter and energy interact in the water cycle? **Y / N** How?

5. Understanding the water cycle.

- ☑ A. The power of the sun drives the water cycle, but the power of _____ causes the rain to fall, rivers to flow downhill, and oceans to collect the water.
- ☑ B. Create a mini cycle inside a zip lock bag with 2 ice cubes, tape, and a window. Tape the bag in a sunny window and watch for the states of matter to change.
- ☑ C. Shine a flashlight 2 inches above paper at 90°. Draw your circle of light.
- ☑ D. Shine a flashlight 2 inches above paper at 45°. Draw your oval of light.
  Compare the two circles. Which circle/oval is larger? **C or D**
- ☑ E. The angle of light is responsible for:
  a) evaporation b) heating earth c) seasons d) a, b, &

Which angle of light produces the most heat: **45°** **90°**
Which angle of light produces the most evaporation: **45°** **90°**