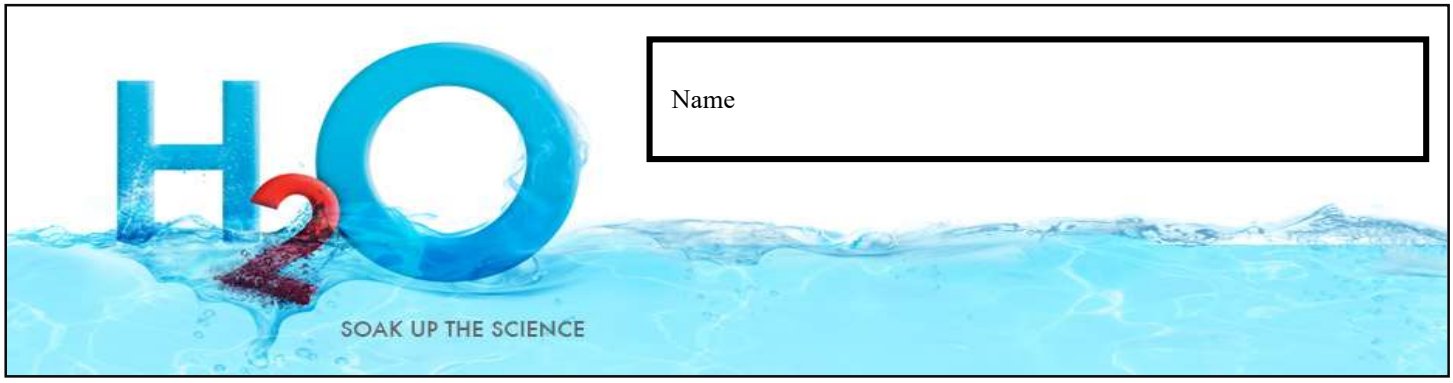


Name

1. Obtain about 125 mL of deionized water into a clean beaker and set on black table. Get a thermometer but never put it down on the table! -- Accurately measure the temperature of the water to the 10th of a °C.

What is the temperature of your water? _____°C

Convert to Kelvin with a formula...

2. Pour exactly 10.0 mL of this water into a beaker, set it up on a ring stand with mesh to heat it with a Bunsen Burner. Time how long it takes to vaporize it all, STOP the fire when the water disappears. Heating an empty beaker is not good for the beakers. Let it cool ON the ring stand.

How many seconds did it take to vaporize it all into $H_2O_{(G)}$? _____

3. Get on reusable hand warmers. They are filled with a supersaturated aqueous solution of sodium acetate.

Write the formula for aqueous sodium acetate. _____(AQ)
While you and your partner are both watching, "click" the little metal tab inside, that releases energy into this solution, disrupting it. Watch what happens! Feel it.

Write the formula for solid sodium acetate. _____(S)

5. Write THE FAMOUS one liner about bonds.

6. Write THE FAMOUS one liner about bonds again so you don't forget it ever.

7. Get a NEW penny and an eye dropper. Count how many drops of deionized water the penny can hold. Do this 3 times Dry off the penny for each trial.

_____ drops _____ drops _____ drops

When done, add the smallest drop of hand soap onto the penny, count that as one drop, and see how many more drops of water fit on the penny this time.

_____ drops

8. Take the rest of your deionized water and put a scoop of SULFUR powder onto the surface of the water with a wooden splint. Observe what you see and draw it below. Write what you see on the right.

While looking through the side of the beaker (bend your knees), poke at the sulfur with your finger, try to push the sulfur into the water. Can you? Put some pump soap onto the surface of the water. Notice what happens to the sulfur when soap is added.

Draw your beaker with the sulfur powder. Label diagram.	Observations <u>before</u> soap is added to water and sulfur… 1 2
	Observations <u>after</u> soap is added to water and sulfur… 1 2

<u>WASH HANDS WITH SOAP NOW. Do not eat the sulfur</u>.

Wash out the beakers with plenty of water down the drain. Put away all your equipment.

9. Get six magnetic water molecules and arrange them into a hexagon. Ice forms into hexagons, into a ringed structure that repeats itself in three dimensions, making the ice cube get bigger and bigger.

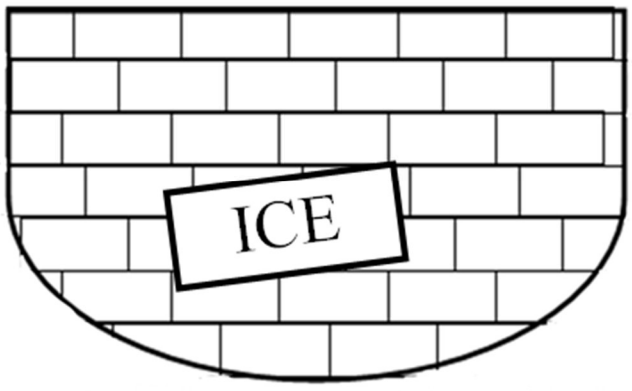
Look hard at the hexagonal model. Draw 6 STRUCTRUAL DIAGRAMS of these molecules of water in one color; using a colored pencil draw the hydrogen bonding between the molecules.

Don't draw the magnets!
Use the magnets to help you align the molecules and notice the hydrogen bonding that creates the ice ring.

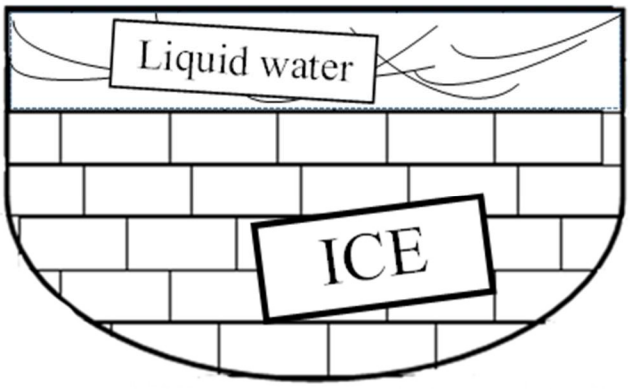
Stick your finger in the hole.
That space is the reason that ice can float on liquid water, that is one big reason that life exists on the planet. Otherwise, all the ice would sink into the oceans and lakes over a few hundred years. All the water would exist as solid ice, except in the summer when a small top lay of it would melt. Algae and fish could exist, neither would anything else on Earth survive.

Winter—ALL WATER IS FROZEN If water were NONPOLAR, it would freeze and become denser than liquid water, and over time, all water would become frozen. All life in the ocean would die (freeze). No algae and no fish leads to less oxygen & less food for the land creatures (us)	Summer— ALMOST ALL WATER IS FROZEN But a small top layer would melt. Since winter comes every year, all the water that melted would freeze up again. No time for algae or fish to come back.

Winter



Summer



The 31 Water Questions start here… (always show formulas)

1. Name the bonds that are inside one water molecule.
2. Name the bonds that are between different water molecules.
3. Draw 3 particle diagrams of water in the solid, liquid and gas phase. Eight molecules per box. A simple circle will represent a single molecule of water.

4. Draw the structural diagram of one water molecule, with dipole arrows in proper place.
5. Tell why $\Delta T°C = \Delta TK$ even though the numbers in C or K are different.
6. If you have 369 mL of water, how many joules would it take to raise the temperature of that water *BY* 47.5°C? (not to 47.5°C, by that number of degrees)

7. How much total energy did it take to heat up & boil away your 10.0 mL of deionized water?
8. Convert the number of joules from q #7 into kilojoules.
9. Convert the number of joules from q #7 into calories (the little c kind, not kilocalories)

10. When we boiled the water on the ring stand, what bonds were being broken by the heat?

11. If steam condenses on your hand, what bonds reform as the steam gas condenses back into $H_2O_{(L)}$?
12. If 16.4 grams of steam condense on your hand, how much heat is released in joules (ouch!)

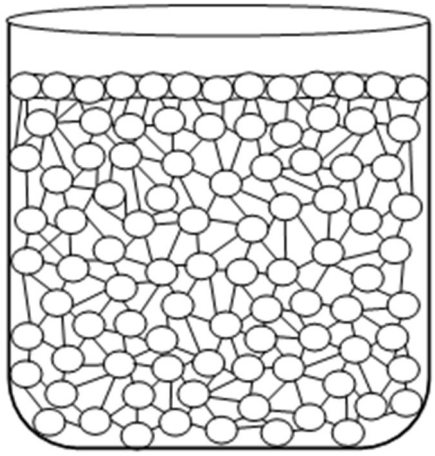
13. Skip this one, of course

14. When steam condenses, is it exothermic, or endothermic? Would you write $\Delta H +$ or $\Delta H -$ to indicate this.

15. The reusable hand warmers contain sodium acetate solution. It starts out as a supersaturated solution, and ends up as solid sodium acetate. Write the chemical symbols that show this physical change. Put the energy on the proper side of the arrow.

16. When water is still, it develops a surface tension. Why is there surface tension on the surface but there is nothing like surface tension "inside" the water below the surface? Why is the surface so different than the "inside" of most of the water in the beaker?

17. What is an example of a surfactant? What is a surfactant? How do they work?



The diagram shows molecules of water hydrogen bonded to each other. At the surface, these hydrogen bonds are stronger left to right, across the face of the surface of the water. Inside the bulk of the water, these hydrogen bonds attracted in every direction, so no surface or edge forms.

Bugs can "stand" on the water, the surface tension helps hold them up. Once under the surface, the bugs can no longer get an edge to stand against, there are no edges inside the water, under the surface.

Keep going….

18. Using table G, how much ammonia dissolves into 100 g water at 90°C?
19. How much ammonia dissolves into 100 mL of water at 10°C?

20. How much ammonia dissolves into just 40. mL water at 10°C?
21. How much NaCl dissolves into 420 mL water at 90°C?

22. Which of the ten compounds on table G dissolves the least well at 10°C? Best at 20°C?
23. Write the names of the 3 compounds which appear to dissolve better into colder water than warmer?

24. Which compound seems to dissolve about the same at any temperature of water?
25. If you have 100 mL saturated $NaNO_{3(AQ)}$ at 70°C and you chill it to 50°C very quickly how much solute precipitates out of solution.

26. If you dissolve 60.0 g $KClO_3$ into 100. mL water at 100°C, then cool this solution to about 23°C, 50.0 grams precipitates out of solution as a solid. LOOK AT table G before you answer. Once this solute precipitates out of the solvent, does this chemical system "stop" or does something else happen? Use words who's initials are DE in your answer.

27. Ice floats on water. How is it possible for solid water to float in the liquid water?
28. What is the mass of one mole of water molecules? (hint: do the molar mass neatly)

29. Calculate how many moles 125 grams of water has.
30. How many molecules are in 125 grams of water?

31. What is the mass of one molecule of water? (hint, no math required)
32. What is the mass of 125 molecules of water?

33. How much SO_2 can dissolves into a 5760 mL aqueous solution at 70°C?
34. How many grams of ammonium chloride dissolve into a 14.5 mL aqueous solution at 50°C?

35. Draw a diagram which shows how 6 water molecules orient themselves to $KCl_{(S)}$ that dissolves into the water. A circle with K^{+1} in it, and a circle with a Cl^{-1} would indicate the ions. Draw SIX water molecules and one cation and one anion is enough.

This lab report needs		points
Cover page	Title and ONE SENTENCE describing the point of doing these lab experiments.	2
Lab handout	Fill in the blanks, drawings, etc.	4
Lab questions	The 34 Questions	34
This lab is due on:		40 points total