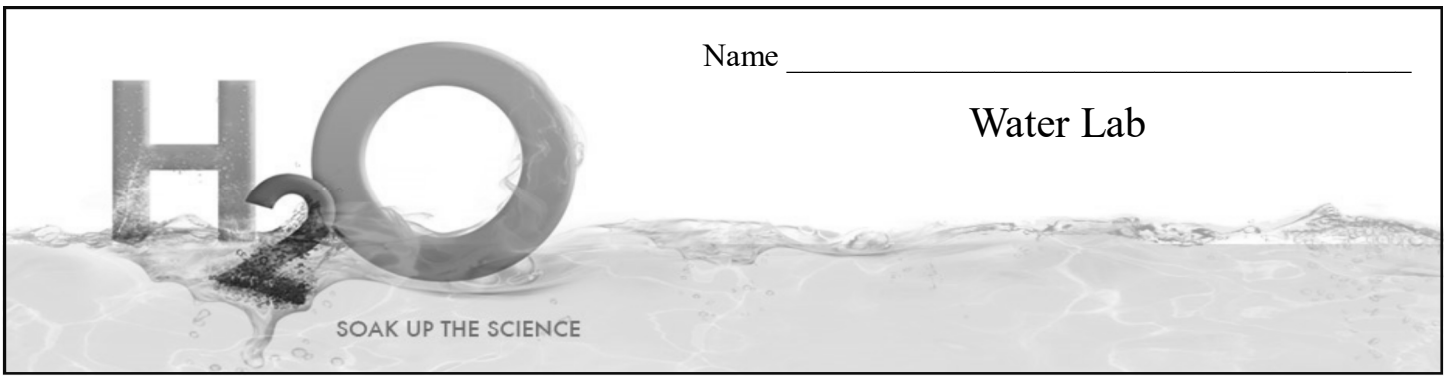


Name _____

Water Lab

We will examine water and the water molecule, as well as the important properties of water in this lab.
Full safety requires goggles at all time. Tie hair back when using Bunsen burners.

1. Obtain ~ 125 mL of deionized water into a clean beaker and set on black table. Get a thermometer (never put it down on the table!) Accurately measure the temperature of the water in centigrade (to the 10th of a degree).

   What is the temperature of your water? _____°C. And: _____ Kelvin

2. Pour 10.0 mL (measure carefully in to a tiny beaker) of this deionized water and 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 is just disappeared. Heating an empty beaker is not good for the beaker. Let it cool ON the ring stand.

How long, in seconds, did this take? _____ in seconds. (write this on the board)

How long was the LONGEST TIME? _____ The SHORTEST TIME? _____

How so such different times exist? Doesn't it take a certain amount of energy to heat up 10.0 grams of water? Doesn't it take an exact amount of energy to vaporize 10.0 grams of water? Discuss this with your lab partner.

3. Get on reusable hand warmers. They are filled with an aqueous solution of sodium acetate. They're supersaturated solutions.

   While you are both watching carefully, "click" the little metal tab inside, releasing some energy into this solution. Watch what happens! Make SURE your partners are watching, and touching it too.

Write THE FAMOUS one liner about bonds

4. Get 2 pennies, an eye dropper, and see how many drops of colored deionized water you can hold on your pennies. Count the drops. Dry off the pennies, and do this 3 times each.
Who got the most drops of water onto your penny at once?

   When done, fill a penny one more time, and then add the smallest drop of hand soap to the water with a wooden splint. What happened?

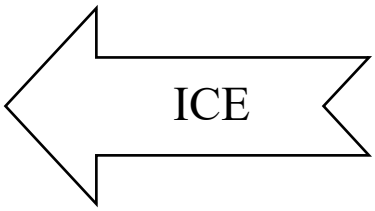
5. Take the rest of your deionized water and scoop some SULFUR powder onto the surface of the water with a wooden splint. Observe what you see and draw it in the box at left. List a few observations. While looking through the side of the beaker, poke at the sulfur with your finger. Push it into the water. Can you? Put some pump soap into your palm. Using the same splint, scoop some soap onto the sulfur, watch what happens

Draw your beaker with the sulfur powder. Label diagram.	Observations <u>before</u> soap is added to water and sulfur… 1 2
Redraw, re-label the diagram.	Observations <u>after</u> soap is added to water and sulfur… 3 4

<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 of your equipment.

5. Get a water molecule magnet kit, and take six water molecules. Arrange them into a hexagon, just like an ice crystal would form, although too small to see.

   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 have sunk in the ocean and over a few hundred years, all the water would exist as solid ice, except in the summer, when about ten feet of it would melt. No fish or algae could exist, neither would anything else survive. Look hard at this model. Draw six STRUCTRUAL DIAGRAMS in one color, then using a colored pencil, draw in the hydrogen bonds between the molecules now.



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

1. What sort of bonds are inside one water molecule?
2. What sort of bonds are between many water molecules?
3. Draw three particle diagrams, solid, liquid and gas water. Eight molecules in each 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 of the start and end temperatures are different.
6. You used 125 mL of water to start this lab. How many joules would it take to raise the temperature of that amount of 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, and boil away, the 10.0 mL of deionized water?
8. Convert that number of joules from question seven into kilo-joules.
9. Convert that number of joules from question seven into calories (the little c kind, not kilo-Calories)

10. When we boiled that water away, what bonds were being broken by the heat specifically?

11. If steam condenses on your hand, what bonds reform as the gas condenses back into a liquid?
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. They start out supersaturated and they end up solid sodium acetate. Write the chemical symbols that show this physical change. Put the energy on the proper side of the arrow, NOT on top of the arrow.

16. When water is still, it develops a surface tension. Why is there surface tension but not anything like surface tension "inside" the water in a beaker or in a pond? Why is the surface different?

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

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. List 3 compounds which appear to dissolve better into colder water than warm?

24. Which compound seems to dissolve about the same at any temperature of solvent?
25. If you have 100 mL saturated sodium nitrate solution at 70°C and you chilled this solution to 50°C very quickly calculate how much solute precipitates out of solution.

26. If you dissolve 60.0 g potassium chlorate into 100. mL water at 100°C and 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 #26. Once this solute precipitates out of the solvent, does this chemical system "stop" or does something else happen? Use the words who's initials are DE in your answer.

27. Ice floats on water. How is it possible for the 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 of water 125 grams of water contains.

30. How many molecules are present in 125 grams of water.

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

32. Draw a diagram which shows how six water molecules would orient themselves to a potassium cation and a chloride anion. A circle with K^{+1} in it would suffice for the cation, a circle with a Cl^{-1} would be enough to indicate the anion. Structural diagrams required for the six water molecules. I can count to six and so can you. .

This lab report needs		points
Cover page	Title and a ONE SENTENCE objective.	1
Lab handout	Fill in the blanks, drawings, etc.	3
Lab questions	The 31 Questions	31
Conclusion	Write a few paragraphs about water, water molecules, water properties, solubility of solutes in water, heat capacity constant, etc. Show off how much chemistry you know about water. (or not, but I would)	5
This lab is due on: _____		40 points total