Water Notes

name_____

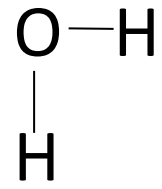
Objective: what are the important properties of water, and what is the fundamental reason that they exist?
Additionally we will learn some new water vocabulary words and review some you should know.

1. A water molecule is _____. It does NOT HAVE _____ _____

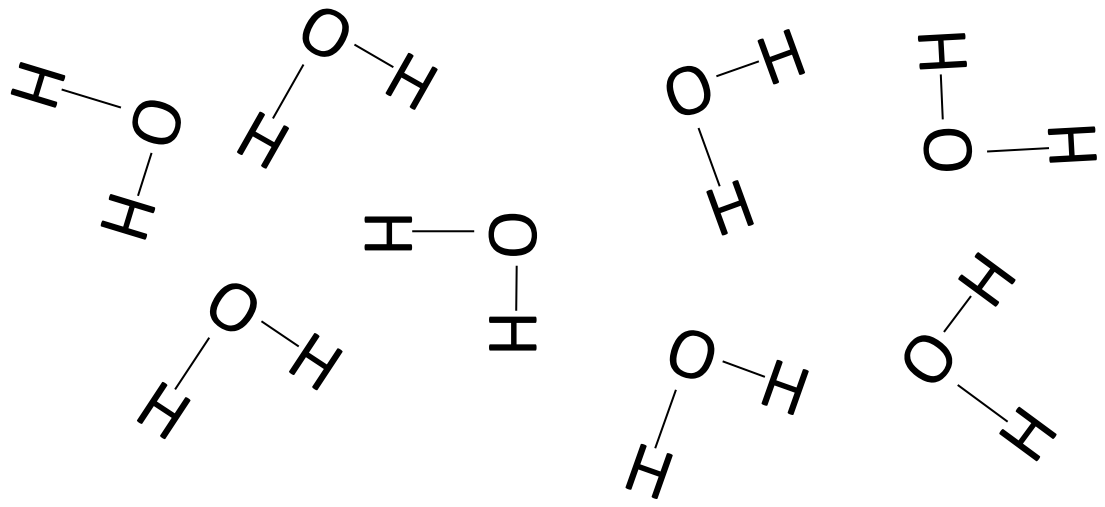
   Water molecules are _____. Water has _____ _____ due to a great difference in the _____ values between the oxygen and hydrogen atoms.

   The dipole arrows have a + end and an arrowhead that indicates "where" the electrons move towards (higher electronegative atoms.

   Draw 2 dipole arrows onto this molecule →



2. Connect the water molecules with proper hydrogen bonding. Use a COLORED PENCIL lines



3. Define Hydrogen Bonding:

4. Get 6 red/white water molecule magnets now, each as ____ Red and ___ white magnets. That means that

the red magnet is _____ and the white magnets are _____

5. Connect them into a 6 molecule ring. This shape is a _____

6. If you squish the 6 magnets (water molecules) in your hands and move them slowly they take up less space than when in the ring shape.
The density of pure water is _____

or you could say it this way as well _____.

7. The density of ICE must be: _____ since ice floats in liquid water.

8. The hole in the ring creates a slightly greater _____ for the 6 molecules of water frozen into a ring with a space in the middle, something that the liquid water just doesn't have.

9. Liquid water freezes at what temp? _____ or _____

10. To melt one gram of ice → one gram of water it would take adding the _____of _____

11. For water, that constant is _____

12. With an ice cube in your hand, the _____

_____.

13. Skip this one

14. How many water molecules does it take to form a normal crystal of ice? _____

15. How many points does a normal SNOWFLAKE have? _____

For real, do you see the connection between #14 and #15? That's important for your life and talking to little kids and parents. If you share this people will think you to be even brighter than you actually are. That's nice.

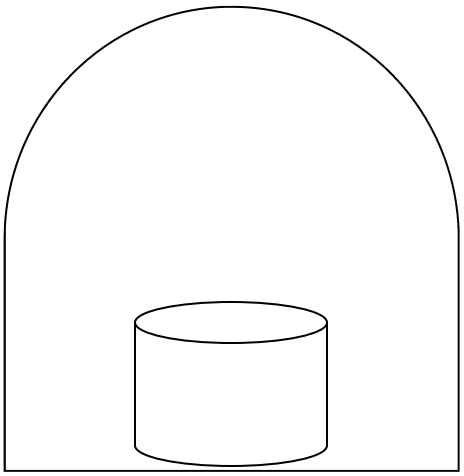
16. Water has a high BOILING POINT. This is due to _____ _____

Water is hard to boil, there are s A LOT of intermolecular _____ to overcome.

17. Water has a low VAPOR PRESSURE.

This is due to _____ _____

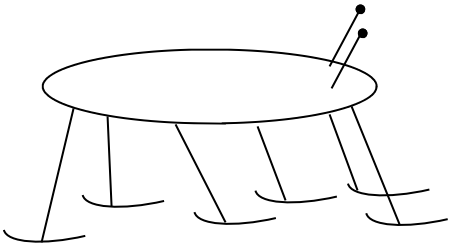
Vapor pressure is the extra pressure created by an evaporating liquid inside of a closed system, table ___.



18. Water has SURFACE TENSION.

This is due to _____ _____

19. Surface tension is…



20. Solid water (ice) can FLOAT on liquid water. This is due to _____ _____

How many water molecules does it take to form a normal crystal of ice? _____

21. Water has a very high SPECIFIC HEAT CAPACITY CONSTANT

This is due to _____ _____

22. The specific heat capacity constant for water is _____

23. Water has THE ABILITY TO CREATE SOLUTIONS. This is called _____

This is due to _____ _____

24. _____ _____ _____

25. This means that _____
or (most) ionic compounds.

Or…

26. Oils and other _____
(but not water which is polar)

27. Water has the ability to form HYDRATED IONIC COMPOUNDS.

This is due to _____ _____

28. Examples of hydrated ionic compounds include _____ & _____

29 Vocabulary	Correct choice		Definitions
Solvation			A. unable to dissolve, (precipitates)
Solute			B. the part of the solution that solute dissolves into (the water part)
Solvent			C. the process of dissolving into a liquid
Aqueous			D. able to dissolve
Soluble			E. holding as much solute in solution as possible (Charlie choc. milk)
Insoluble			F. dissolves into the solvent in a solution (the salt in salty water)
Saturated			G. holding less solute in solution than is possible (Janet choc. milk)
unsaturated			H. dissolved in water

OB: Mastering Table G – the Solubility Curves for 10 Compounds Take it out now.

30. For salty water, the solute is the _____, the solvent is the _____

31. For chocolate milk, the solute is the _____, the solvent is the _____

32. Table G is titled: _____at standard pressure

Standard pressure is _____ or _____

33. The Y axis (up/down) is solubility in units of _____

34. Which really means this _____

35. The X axis has these units _____

36. How many grams of KCl fits into 100 mL of water at 10°C? _____ grams

37. How many grams of $KClO_3$ fits into 100 mL of water at 40°C? _____ grams

38. How many grams of potassium nitrate fits into 100 mL of AQ solution at 50°C? _____ grams

39.

A. How many compounds are on this graph? ____

B. How many lines go "up" as the temperature rises? _____

C. How many lines go "down" as the temperature rises? _____

D. How many of these compounds are IONIC? _____

E. How many of these compounds are MOLECULAR? _____

40. How do we make sense of these statements???

Ionic compound solubility _____

Molecular compound solubility in water _____

41. How many lines can you look at on this graph at any time? _____

42. When an ionic compound like KI or NaCl goes into water, what particles end up in the water?

_____ _____ _____

43. When something like sugar $C_{12}H_{22}O_{11}$ go into water, what particles end up in the liquid water?

_____ _____ _____

44. How many g of NH_3 fit into 100 mL of water at 90°C? _____

45. When water (or any solvent) holds the maximum amount of solute at a given temperature,

this solution is said to be _____ like:

46. How many grams of ammonia fit into <u>50 mL</u> of water at 90°C?

47. How many grams of KCl fit into 100 mL of water at 10°C? _____ grams

48. How many grams of KCl fit into 350 mL of water at 10°C? _____ grams show work

49. How many grams of NH_3 fit into 100 mL of water at 10°C? _____ grams

50. How many grams of NH_3 fit into 12.0 mL of water at 10°C? _____ grams show work

This question is the same type, but asked a bit differently:

51. How many grams of $KClO_3$ solute fits into 844 mL of water at 373 Kelvin? (show work)

52. How many grams of sodium nitrate will it take to saturate 64.0 mL of water at 283 Kelvin?

Water Class #3

Draw arrows to point to the oil and water in the picture.

53 OIL

54. WATER

55. They do not mix because _____

56. In this case the OIL is _____

and the WATER is _____. THEY ARE _____

57. The reason that the oil is ON TOP and not on under the water is that the

oil _____

A box of biscuits. A box of mixed biscuits, and a biscuit mixer. ☺

58 Immiscible: _____

like water and oil. Water is polar, oil is nonpolar.

59 Miscible: _____

like vegetable oil and olive oil (both nonpolar) — *or water and ethyl alcohol (both polar)*

60. When a solution holds the most solute possible in the solvent it is said to be _____

61. If the solution holds LESS than that maximum amount of solute, it's called: _____

62. Charlie Chocolate milk would be _____

while Janet's is _____

63. A 100 mL $HCl_{(AQ)}$ at 80°C contains 37 g of HCl. Is this saturated or unsaturated? (circle one)

_____

64. Is a 100 mL $NaNO_{3(AQ)}$ at 25°C saturated if it contains 93 g $NaNO_3$? YES or NO (circle one)

_____

65. How many grams of NaCl will saturate a 100 mL solution at 90°C? _____ grams

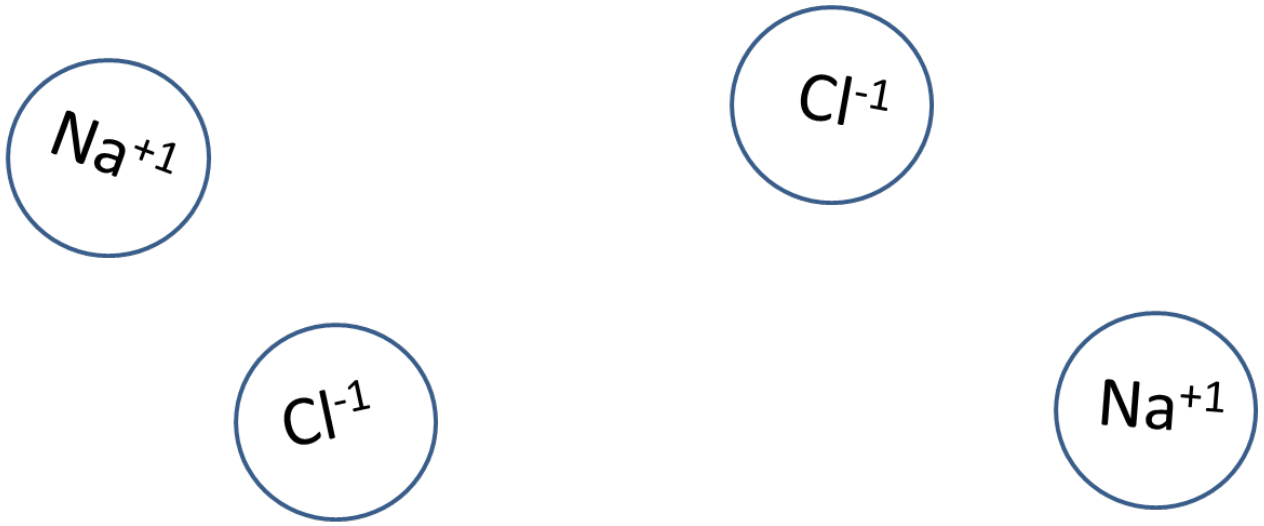
66. If you put 43 g NaCl into 100 mL, what would happen?

67. Will a 100 mL $NaCl_{(AQ)}$ at 90°C be saturated if it contains 43 g NaCl? _____,

$NaCl_{(S)}$

	Temp	Solute	If a solution contains this Mass in g	Is it Saturated or Unsaturated?	If unsaturated, how many more grams are needed to saturate this solution?
69	30°C	HCl	60 g		
70	60°C	KNO_3	100 g		
71	10°C	$NaNO_3$	80 g		
72	90°C	NH_4Cl	73 g		
73	20°C	KCl	20 g		
74	5°C	NaCl	31 g		

75 Arrange water molecules around these loose mobile ions of sodium chloride that have ionized into water.



76. Explain in one sentence why the water molecules are going to orient themselves to the ions in solution.

Surfactants

77. Soap is a surfactant. It can break the _____

78. Surfactant = _____

79. Soap is partially _____ + partially _____

80. The polar "head" gets dissolved; the

_____.

This allows water to escape "out of" the surface, or stuff to "fall through" the surface of the water.

81. _____ create gaps in the surface hydrogen bonding.

82. Oil molecules (vegetable oil, motor oil, mineral oil, etc.) are all nonpolar.
When oil is put into water, why can't the oil dissolve into the water like salts, or polar sugar molecules?

Because _____ the water is polar,
the oil is nonpolar. The water "can't catch" the oil droplets, they slip through the water's grasp.

The oil floats because oil has _____ than the water.

83. How many grams of $KClO_3$ fits into 100 mL of water at 90°C? _____ grams

84. How many grams of $KClO_3$ fits into 100 mL of water at 40°C? _____ grams

85. If you have a saturated $KClO_{3(AQ)}$ at 90°C and put it into a cooler and the temperature drops to just 40°C, what could possibly happen to all that $KClO_3$ that was in solution?

86. A 100 mL saturated solution of KNO_3 is at 60°C. It is cooled to 20°C. Describe what happens. Do math.

The rate of _____ = the rate of _____

This is dynamic equilibrium

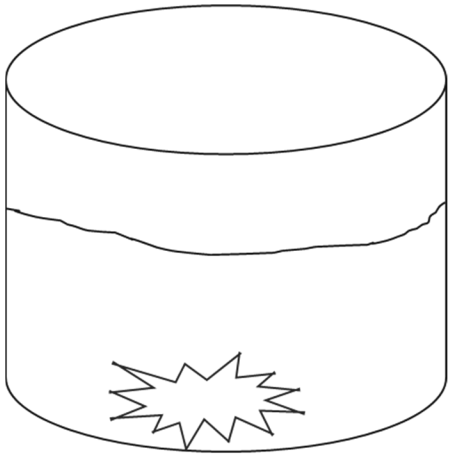
_____.

The last water class…

87. What happens when you put 140 g KI into 100 mL water at 10°C?

88. Does this "STOP"? _____

89. What does happen?



Label this picture.

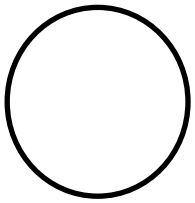
90. _____

91. _____

92. In a _____,

the rate of the _____ reaction is equal to the rate of the _____ reaction.

93. In this case we could say that the

rate of SOLVATION  rate of PRECIPITATION

94. When $NaCl_{(S)} \rightarrow Na^{+1}{}_{(AQ)} + Cl^{-1}{}_{(AQ)}$ this is called _____ or _____

95. Does sugar, $C_{12}H_{22}O_{11}$ do this? _____ How does sugar dissolve into water?

96. Electrolytes The hardest vocab word of the year

To be an electrolyte, First, you must be _____

Second, you must become _____ in water

Which provides _____ in solution

Loose mobile ions conduct _____

IONIC but NOT AQ is _____ (AgCl or CuS say)

AQ but not IONIC is _____ (sugar water)

	Substance	Is this an electrolyte?	Will this conduct electricity?
97	$NaCl_{(AQ)}$		
98	$NaCl_{(S)}$		
99	$NaOH_{(AQ)}$		
100	$NaOH_{(S)}$		
101	$AgCl_{(AQ)}$		
102	$AgCl_{(S)}$		
103	$C_{12}H_{22}O_{11(AQ)}$		

104. Is $Be(OH)_2$ an electrolyte? _____ Can it conduct electricity?

105. What about $Be(OH)_{2(L)}$ (melted beryllium hydroxide), will that be able to conduct electricity? _____

106. How is that possible?

107. If liquid $Be(OH)_2$ can conduct electricity, is it an electrolyte? _____, because

108. When sodium chloride goes into water, we would write the "equation" this way:

$NaCl_{(S)}$ $Na^{+1}_{(AQ)} + Cl^{-1}_{(AQ)}$

109. This is called _____ or _____

110. Does sugar do this? _____ What does sugar do?

Sugar _____.

Sugar is NOT IONIC, it dissolves because the molecules are _____,

but it dissolves into _____.

111. Show the dissociation or the ionization for sodium nitrate in water with phase symbols:

_____

112. Show the dissociation or the ionization for potassium phosphate in water with phase symbols

_____