Chapters 15 and 16 Review ANSWER KEY

1. Draw a water molecule, and list properties about water (type of bonds, three bond forces, polar, slight positive/negative, etc). covalent bonds, forces: dispersion, dipole (polar) and hydrogen bonds. Oxygen = slightly negative, hydrogen = slightly positive.
2. Why does water have high surface tension? Why is water considered the universal solvent? Surface tension = hydrogen bonds. Universal solvent = polar bonds
3. Give two examples of substances that do not dissolve in water. Explain molecularly why this occurs. Oil, gasoline. They are both nonpolar. Since water is polar, it prefers to dissolve other polar things.
4. Why is 4oC an important number for water? What happens above or below this temperature? Why does this happen? Water is most dense at 4oC. As the temp. cools, the density decreases due to hydrogen bonds.
5. Using NaCl as an example, explain HOW water dissolves things. NaCl is arranged in a crystalline structure, oxygen, which is slightly negative, is attracted to sodium (positively charged), thus compromising the crystal structure
6. Why are some ionic compounds actually immiscible (unable to be dissolved in water?). The ionic bonds are too strong, so water can’t break them.
7. What is an electrolyte, and how are they able to form? Something that conducts electricity IN WATER.
8. What separates a strong electrolyte from a weak electrolyte. Strong = dissolves into ions completely. Weak = does not dissolve completely.
9. Colloids and suspensions a similar in terms of the Tyndall Effect and different in terms of Brownian Motion. Explain these two terms in the context of colloids and suspensions, giving one specific example of each. Both colloids (fog) and suspensions (salad dressing) exhibit Tyndall Effect (scatter light), but only colloids exhibit Brownian motion (not separated by gravity).
10. What is the difference between an unsaturated and a saturated solution? What about a saturated and a supersaturated solution? Unsaturated = a lot of solute, not a lot of solvent. Saturated = a lot of solute and a lot of solvent. Unsaturated = a lot of solute, not a lot of solvent.
11. What are the three major factors that influence solubility, or the ability for a substance to dissolve? Heat, agitation, crushing into smaller pieces, pressure
12. How are pressure and solubility related, giving one example? Why this relationship only apply to gasses? As pressure increases, solubility increases (soda bottle). Only gasses are compressible.
13. Name the following hydrates and find their % water composition: CuSO4 ● 5H2O, CoCl2 ● 6H2O Copper (II) Sulfate pentahydrate (36.08%). Cobalt (II) chloride hexahydrate (45.44%)
14. If you have 45.0 grams each of the hydrates above, find the amount that remains when all of the water has been evaporated. 28.8 g CuSO4; 24.6 g CoCl2
15. What is the formula for molarity? What does this formula represent? Molarity (M) = mol solute/L solution
16. You are dissolving 23.0 grams of HNO3 into a 200.mL solution. Calculate the molarity of your solution. 1.82 M
17. You have a 450 mL Potassium Chloride solution with a concentration of 0.125M. With this information, calculate how much Potassium Chloride, in grams, is needed to make a solution of this concentration. 4.19 g KCl
18. What is the formula for dilution? What type of relationship exists between volume and concentration? M1V1 = M2V2. As volume of solution increases, concentration decreases (inverse relationship)
19. How will the volume be affected if you want to double the concentration of a solution? The volume will be cut in half.
20. If you add 25mL of water to a 200 mL, 0.432 M solution, how will this affect the concentration? .384M
21. What is the formula for percent by mass and volume? % = mass solute/mass solution x 100%
22. 1 quart juice from concentrate is labeled as being 25% juice, by volume. How much is this in mL? (1 qt = 946mL). 237 mL juice in a quart.
23. What mass of water do I need to add to 50 grams of NiCl2 to make a 4.5%, by mass, solution? 1061 g H2O
24. What is the formula for molality? If you were given a volume of your solvent, how would you be able to convert this into a mass, in kilograms? m = mol solute / kg solvent. If given volume of solvent, use density formula.
25. Find the amount of water you need to add to 45.0 grams of magnesium chloride to make a 4.56 m solution. .104 kg (104 g H2O)
26. You are dissolving 60.0 grams of CH4 into 100. mL of ethanol. If the density of ethanol is 0.789 g/mL, find the molality of this solution. 47.4m
27. How are the boiling point and freezing point of a solvent affected when you add solute to it? Show this in the two formulas. Boiling point increases. Freezing point decreases. ΔT = I x K x m
28. What does the i in the formula represent? Find the value of i for the following: CaSO4, BeCl2, CH4. I = ionic particles. CaSO4 🡪 I = 2. BeCl2 🡪 I = 3. CH4 🡪 I = 1
29. What is the change in freezing point of a solution containing 132 g C12H22O11 and 250 g of H2O? (Kf = 1.86 oC/m). 2.86oC
30. What is the boiling point of a solution containing 52.0 g MgSO4 and 334 g H2O? (Kb = 0.512 oC/m) 101oC