

## Quiz 6 – October 16, 2019

Complete the following problems. Write your final answers in the blanks provided. You must show your work to receive full credit. Show your answers to the correct number of significant figures with the correct units.

1. What is the *molality* of para-dichlorobenzene ( $C_6H_4Cl_2$ ) in a solution prepared by dissolving 2.65 g  $C_6H_4Cl_2$  in 50.0 mL benzene? (molar mass of  $C_6H_4Cl_2$  = 147.0 g/mol, molar mass of benzene = 78.11 g/mol, density of benzene = 0.879 g/mL) (8 points)

$$2.65 \text{ g } C_6H_4Cl_2 \times \frac{1 \text{ mol } C_6H_4Cl_2}{147.0 \text{ g } C_6H_4Cl_2} = 0.01802 \text{ mol } C_6H_4Cl_2$$

$$50.0 \text{ mL benzene} \times \frac{0.879 \text{ g benzene}}{1 \text{ mL benzene}} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 0.04395 \text{ kg benzene}$$

$$\text{molality} = \frac{\text{mol } C_6H_4Cl_2}{\text{kg benzene}} \times \frac{0.01802 \text{ mol } C_6H_4Cl_2}{0.04395 \text{ kg benzene}} = 0.410 \text{ m}$$

Answer 0.410 m

2. A water sample is found to have 9.4 ppb of chloroform ( $CHCl_3$ , molar mass 119.38 g/mol). How many 250 mL glasses of water must you drink to consume 2.00 grams of chloroform? You may assume a solution density of 1.00 g/mL. (8 points)

$$2.00 \text{ g } CHCl_3 \times \frac{10^9 \text{ g water}}{1 \text{ g } CHCl_3} \times \frac{1 \text{ mL water}}{1 \text{ g water}} = \frac{2.00 \times 10^9 \text{ mL water}}{\text{g } CHCl_3}$$

$$\frac{2.00 \times 10^9 \text{ mL water}}{\text{g } CHCl_3} \times \frac{1 \text{ glass water}}{250 \text{ mL water}} = 8.5 \times 10^5 \text{ glasses water}$$

Answer 8.5 x 10<sup>5</sup> glasses water

3. A 10.00% by mass aqueous solution of sucrose (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>, molar mass 342.30 g/mol) has a density of 1.040 g/mL. What is the mole fraction of sucrose in this solution? Molar mass of water = 18.02 g/mol (8 points)

$$10.00 \text{ g-sucrose} \times \frac{1 \text{ mol sucrose}}{342.30 \text{ g-sucrose}} = 0.02921 \text{ mol sucrose}$$

$$90.00 \text{ g-water} \times \frac{1 \text{ mol water}}{18.02 \text{ g-water}} = 4.994 \text{ mol water}$$

$$X_{\text{sucrose}} = \frac{\text{mol sucrose}}{\text{mol sucrose} + \text{mol water}} = \frac{0.02921}{0.02921 + 4.994} = 0.005815$$

Answer 0.005815

+1 free point to make 25

**Periodic Table of the Elements**

1 <b>H</b> Hydrogen 1.008	2 <b>He</b> Helium 4.003																	
3 <b>Li</b> Lithium 6.941	4 <b>Be</b> Beryllium 9.012											5 <b>B</b> Boron 10.811	6 <b>C</b> Carbon 12.011	7 <b>N</b> Nitrogen 14.007	8 <b>O</b> Oxygen 15.999	9 <b>F</b> Fluorine 18.998	10 <b>Ne</b> Neon 20.180	
11 <b>Na</b> Sodium 22.990	12 <b>Mg</b> Magnesium 24.305	3 <b>Al</b> Aluminum 26.982	4 <b>Si</b> Silicon 28.086	5 <b>P</b> Phosphorus 30.974	6 <b>S</b> Sulfur 32.066	7 <b>Cl</b> Chlorine 35.453	8 <b>Ar</b> Argon 39.948											
19 <b>K</b> Potassium 39.098	20 <b>Ca</b> Calcium 40.078	21 <b>Sc</b> Scandium 44.956	22 <b>Ti</b> Titanium 47.867	23 <b>V</b> Vanadium 50.942	24 <b>Cr</b> Chromium 51.996	25 <b>Mn</b> Manganese 54.938	26 <b>Fe</b> Iron 55.845	27 <b>Co</b> Cobalt 58.933	28 <b>Ni</b> Nickel 58.693	29 <b>Cu</b> Copper 63.546	30 <b>Zn</b> Zinc 65.38	31 <b>Ga</b> Gallium 69.723	32 <b>Ge</b> Germanium 72.631	33 <b>As</b> Arsenic 74.922	34 <b>Se</b> Selenium 78.971	35 <b>Br</b> Bromine 79.904	36 <b>Kr</b> Krypton 83.798	
37 <b>Rb</b> Rubidium 85.468	38 <b>Sr</b> Strontium 87.62	39 <b>Y</b> Yttrium 88.906	40 <b>Zr</b> Zirconium 91.224	41 <b>Nb</b> Niobium 92.906	42 <b>Mo</b> Molybdenum 95.95	43 <b>Tc</b> Technetium 98.907	44 <b>Ru</b> Ruthenium 101.07	45 <b>Rh</b> Rhodium 102.906	46 <b>Pd</b> Palladium 106.42	47 <b>Ag</b> Silver 107.868	48 <b>Cd</b> Cadmium 112.414	49 <b>In</b> Indium 114.818	50 <b>Sn</b> Tin 118.711	51 <b>Sb</b> Antimony 121.760	52 <b>Te</b> Tellurium 127.6	53 <b>I</b> Iodine 126.904	54 <b>Xe</b> Xenon 131.294	
55 <b>Cs</b> Cesium 132.905	56 <b>Ba</b> Barium 137.328	57-71 <b>Lanthanide Series</b>	72 <b>Hf</b> Hafnium 178.49	73 <b>Ta</b> Tantalum 180.948	74 <b>W</b> Tungsten 183.84	75 <b>Re</b> Rhenium 186.207	76 <b>Os</b> Osmium 190.23	77 <b>Ir</b> Iridium 192.217	78 <b>Pt</b> Platinum 195.085	79 <b>Au</b> Gold 196.967	80 <b>Hg</b> Mercury 200.592	81 <b>Tl</b> Thallium 204.383	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 208.980	84 <b>Po</b> Polonium [208.982]	85 <b>At</b> Astatine 209.987	86 <b>Rn</b> Radon 222.018	
87 <b>Fr</b> Francium 223.020	88 <b>Ra</b> Radium 226.025	89-103 <b>Actinide Series</b>	104 <b>Rf</b> Rutherfordium [261]	105 <b>Db</b> Dubnium [262]	106 <b>Sg</b> Seaborgium [266]	107 <b>Bh</b> Bohrium [264]	108 <b>Hs</b> Hassium [269]	109 <b>Mt</b> Meitnerium [278]	110 <b>Ds</b> Darmstadtium [281]	111 <b>Rg</b> Roentgenium [280]	112 <b>Cn</b> Copernicium [285]	113 <b>Nh</b> Nihonium [286]	114 <b>Fl</b> Flerovium [289]	115 <b>Mc</b> Moscovium [289]	116 <b>Lv</b> Livermorium [293]	117 <b>Ts</b> Tennessine [294]	118 <b>Og</b> Oganesson [294]	
57 <b>La</b> Lanthanum 138.905	58 <b>Ce</b> Cerium 140.116	59 <b>Pr</b> Praseodymium 140.908	60 <b>Nd</b> Neodymium 144.243	61 <b>Pm</b> Promethium 144.913	62 <b>Sm</b> Samarium 150.36	63 <b>Eu</b> Europium 151.964	64 <b>Gd</b> Gadolinium 157.25	65 <b>Tb</b> Terbium 158.925	66 <b>Dy</b> Dysprosium 162.500	67 <b>Ho</b> Holmium 164.930	68 <b>Er</b> Erbium 167.259	69 <b>Tm</b> Thulium 168.934	70 <b>Yb</b> Ytterbium 173.055	71 <b>Lu</b> Lutetium 174.967				
89 <b>Ac</b> Actinium 227.028	90 <b>Th</b> Thorium 232.038	91 <b>Pa</b> Protactinium 231.036	92 <b>U</b> Uranium 238.029	93 <b>Np</b> Neptunium 237.048	94 <b>Pu</b> Plutonium 244.064	95 <b>Am</b> Americium 243.061	96 <b>Cm</b> Curium 247.070	97 <b>Bk</b> Berkelium 247.070	98 <b>Cf</b> Californium 251.080	99 <b>Es</b> Einsteinium [254]	100 <b>Fm</b> Fermium 257.095	101 <b>Md</b> Mendelevium 258.1	102 <b>No</b> Nobelium 259.101	103 <b>Lr</b> Lawrencium [262]				