Quiz 10A

Question 1. Answer the following questions about NaC2H3O2 · 10 H2O (8 points).

1. Name the compound. \_\_sodium acetate decahydrate\_\_\_\_\_
2. Calculate the percent water.

Na: (22.990 g/mol)1 = 22.990 g/mol

C: (12.011 g/mol)2 = 24.022 g/mol

H: (1.008 g/mol)3 = 3.024 g/mol

O: (15.999 g/mol)2 = 31.998 g/mol

H2O: (18.015 g/mol)10 = 180.18 g/mol

 = 262.214 g/mol ≈ 262.21 g/mol

$$\%H\_{2}O=\frac{m\_{water}}{m\_{hydrate}}×100=\frac{180.18 g/mol}{262.21 g/mol}×100=68.71486648\%≈68.715\%$$

Question 2. What is the mass percent of sodium hydroxide in a solution that is made by dissolving 5.15 g NaOH in 49.0 g H2O (5 points)?

$$\%NaOH=\frac{m\_{solute}}{m\_{solution}}=$$

$$\%NaOH=\frac{5.15 g}{(5.15 g+49.0 g)}×100=$$

$$\%NaOH=\frac{5.15 g}{54.15 g}×100=$$

$$\%NaOH=9.510618652\% NaOH≈9.51\% NaOH$$

Question 3. Calculate the grams of nitric acid in 548 mL of 12 M HNO3 solution (5 points).

$548 mL solution×\frac{1 L}{1000 mL}×\frac{12 mol HNO\_{3}}{1 L solution}×\frac{63.012 g HNO\_{3} }{1 mol HNO\_{3}}=410 g HNO\_{3}$

Question 4. A solution is made by dissolving 77.6 g of ethylene glycol (C2H6O2) in 226 g of water (10 points).

1. What is the molality of the solution?

$molality=m=\frac{n\_{solute}}{kg\_{solvent}}=\frac{77.6 g C\_{2}H\_{6}O\_{2}}{226 g water}×\frac{1000 g}{1 kg}×\frac{1 mol C\_{2}H\_{6}O\_{2} }{62.068 g C\_{2}H\_{6}O\_{2}}=\frac{5.53 mol C\_{2}H\_{6}O\_{2}}{kg water}$

1. What is the freezing point of this solution?

$$T\_{freezing point}=T\_{pure solvent}-mk\_{f}$$

$T\_{freezing point}=0℃-\left(1.86\frac{℃ kg}{mol C\_{2}H\_{6}O\_{2}}\right)\left(\frac{5.53 mol C\_{2}H\_{6}O\_{2}}{1 kg}\right)=0℃-10.3℃=-10.3℃$