31. What is the molality of a solution containing 96.0g of methanol (CH_3OH), in 3500g of water?

$96.0g \times \frac{1mol}{32.05g} = 3.00mol$ $\quad \frac{3.00mol}{3.5kg} = \boxed{0.856m} \rightarrow .86m$ 2sf

32. How many grams of ammonia (NH_3) are dissolved in 1000ml of water to prepare a 0.42m solution? (hint: remember your formula and labels)

$0.42m = \frac{n}{1kg}$ $\quad n = 0.42mol$ $\quad 0.42mol \times \frac{17.03g}{1mol} = \boxed{7.15g} \rightarrow 7.2g$ 2sf

(1ml = 1g of water)

33. Record the equilibrium constant for the following equation. $aA + bB \rightarrow cC + dD$

$$K_{eq} = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

34. Using the equation from problem #33, determine the equilibrium constant for the following reaction and in which direction is the reaction most likely to progress.

$2\ AgNO_3 + CuCl_2 \rightarrow 2\ AgCl + Cu(NO_3)_2$ $\quad AgNO_3 = 0.64M$ $\quad CuCl_2 = 1.20M$ $\quad AgCl = 0.42M$ $\quad Cu(NO_3)_2 = .98M$

$K_{eq} = \frac{(0.42M)^2(0.98M)}{(0.64M)^2(1.20M)} = \boxed{0.35}$ $\quad K_{eq} < 1$ favors reverse reaction ←

35. What is the new boiling point of a aqueous solution containing 0.59*m* potassium fluoride? Note the Kb for water is 0.512°C/*m*. $\Delta T = i K_b m$ $\quad KF\ i = 2$ $\quad$ water (pure) boils @ 100°C

$\Delta T = 2 \cdot 0.512°C/m \cdot 0.59m = 0.604$ $\quad 100 + 0.604 = 100.604 \rightarrow \boxed{101°C}$

36. A solution contains 16.0 grams of methanol (CH_3OH), 23.0 grams of ethanol (C_2H_5OH) and 30.0 grams of propanol (C_3H_7OH). What is the mole fraction of ethanol?

$16.00g \times \frac{1mol}{32.05g} = 0.499mol\ CH_3OH$ $\quad 30.00g \times \frac{1mol}{60.11g} = 0.499mol\ C_3H_7OH$

$23.00g \times \frac{1mol}{46.06g} = 0.499mol\ C_2H_5OH$ $\quad$ Total moles = 1.50mol $\quad \frac{0.499}{1.50} = \boxed{0.332\ C_2H_5OH}$

37. If a 3.00M solution was required how much of a 12.0M solution would be required to make 1.5L?

$(3.00M)(1.5L) = (12.0M)(?)$ $\quad V_2 = 0.375 \rightarrow \boxed{0.38L}$

$M_1V_1 = M_2V_2$

38. What is the mass percent of a solution containing 45.0 g of potassium nitrate in 76.7 g of water?

$\frac{45.0g}{76.7g} \times 100 = \boxed{58.7\%}$