

31. What is the molality of a solution containing 96.0g of methanol (CH₃OH), in 3500g of water?

$$96.0g \times \frac{1 \text{ mol}}{32.05g} = 3.00 \text{ mol} \quad \frac{3.00 \text{ mol}}{3.5 \text{ kg}} = \boxed{0.857 \text{ m}} \rightarrow .86 \text{ m sf}$$

32. How many grams of ammonia (NH₃) are dissolved in 1000ml of water to prepare a 0.42m solution?
(hint: remember your formula and labels)

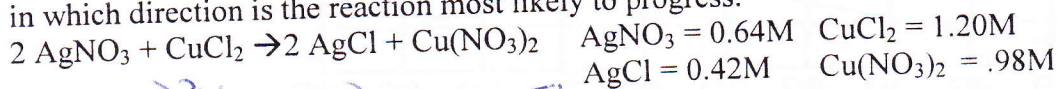
$$0.42 \text{ m} = \frac{n}{1 \text{ kg}} \quad n = 0.42 \text{ mol} \quad 0.42 \text{ mol} \times \frac{17.03g}{1 \text{ mol}} = \boxed{7.15g} \rightarrow 7g \text{ sf}$$

(1 ml = 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.



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

35. What is the new boiling point of a aqueous solution containing 0.59m potassium fluoride? Note the K_b for water is 0.512°C/m.

$$\Delta T = i K_b m \quad K_F \quad i = 2$$

$$\Delta T = 2 \cdot 0.512^\circ\text{C}/\text{m} \cdot 0.59 \text{ m} = 0.604$$

water (pure) boils @ 100°C

$$100 + 0.604 = 100.604 \rightarrow \boxed{101^\circ\text{C}}$$

36. A solution contains 16.0 grams of methanol (CH₃OH), 23.0 grams of ethanol (C₂H₅OH) and 30.0 grams of propanol (C₃H₇OH). What is the mole fraction of ethanol?

$$16.0g \times \frac{1 \text{ mol}}{32.05g} = 0.499 \text{ mol CH}_3\text{OH}$$

$$23.0g \times \frac{1 \text{ mol}}{46.07g} = 0.499 \text{ mol C}_2\text{H}_5\text{OH}$$

$$30.0g \times \frac{1 \text{ mol}}{60.11g} = 0.499 \text{ mol C}_3\text{H}_7\text{OH}$$

$$\text{Total moles} = 1.50 \text{ mol} \quad \frac{0.499}{1.50} = \boxed{0.332 \text{ C}_2\text{H}_5\text{OH}}$$

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

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

$$M_1 V_1 = M_2 V_2$$

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

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