

For full marks, please
luck! ☺

cant digits where appropriate. Good

1. How many grams of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ are required to prepare a 45.0 mL solution of 3.00 mol/L copper (II) sulfate solution? (2 marks TI, 1 mark C)

$$c = \frac{n}{V}$$

$$M_{\text{CuSO}_4 \cdot 5\text{H}_2\text{O}} = 249.72 \text{ g/mol}$$

$$c = 3.00 \text{ mol/L} = \frac{n}{0.045 \text{ L}}$$

$$n = 0.135 \text{ mol}$$

$$249.72 \text{ g/mol} \cdot 0.135 \text{ mol} = 33.7 \text{ g}$$

so 33.7 g of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is required

2. What mass of TSP is needed to make 200.0 mL of solution, if the recommended concentration is 1.7 % (m/v)? (2 marks TI, 1 mark C)

$$1.7\% = \frac{m}{0.2000 \text{ L}} \times 100$$

$$0.017 = \frac{m}{0.2000 \text{ L}}$$

$$3.4 \times 10^{-3} = m$$

$$m = 3.4 \times 10^{-3} \text{ g}$$

so $3.4 \times 10^{-3} \text{ g}$ of TSP is required

3. If I dilute 100.0 mL of 0.20 mol/L calcium acetate solution to a volume of 450 mL,

- a) What will the concentration of this solution be? (2 marks TI, 1 mark C) $C_1 V_1 = C_2 V_2$

$$0.20 \text{ mol/L} \cdot 0.1 \text{ L} = 0.450 \text{ L} \cdot C_2$$

$$0.02 \text{ mol} = 0.450 \text{ L} \cdot C_2$$

$$C_2 = 0.04 \text{ mol/L} = 4.0 \times 10^{-2} \text{ mol/L}$$

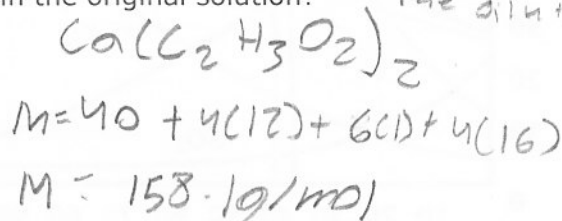
so $4.0 \times 10^{-2} \text{ mol/L}$ is the concentration of the diluted solution

- b) How many grams of calcium acetate were present in the original solution? (2 marks TI, 1 mark C)

$$c = \frac{n}{V}$$

$$0.20 \text{ mol/L} = \frac{n}{0.1 \text{ L}}$$

$$0.02 \text{ mol} = n$$



so There was 3.2 g of calcium acetate originally

$$0.02 \text{ mol} \cdot 158.1 \text{ g/mol} = 3.162 \text{ g of calcium acetate}$$

$$= 3.2 \text{ g}$$

4. If 15g of glucose has a solubility of 20×10^4 ppm in a solution, what is the mass of water required to make this solution? (3 marks TI, 1 mark C)

$$20 \times 10^4 \text{ ppm} = 0.2 \text{ g/g solution}$$

$$C = \frac{m}{V} = \frac{m}{V} \times 100$$

$$\text{ppm} = C \times 10^6$$

$$0.2 \frac{\text{g solute}}{\text{g solution}} \times 100\%$$

$$20\% = \frac{15\text{g}}{X}$$

$$X = 75\text{g solution}$$

$$75\text{g solution} - 15\text{g solute} = 60\text{g solvent}$$

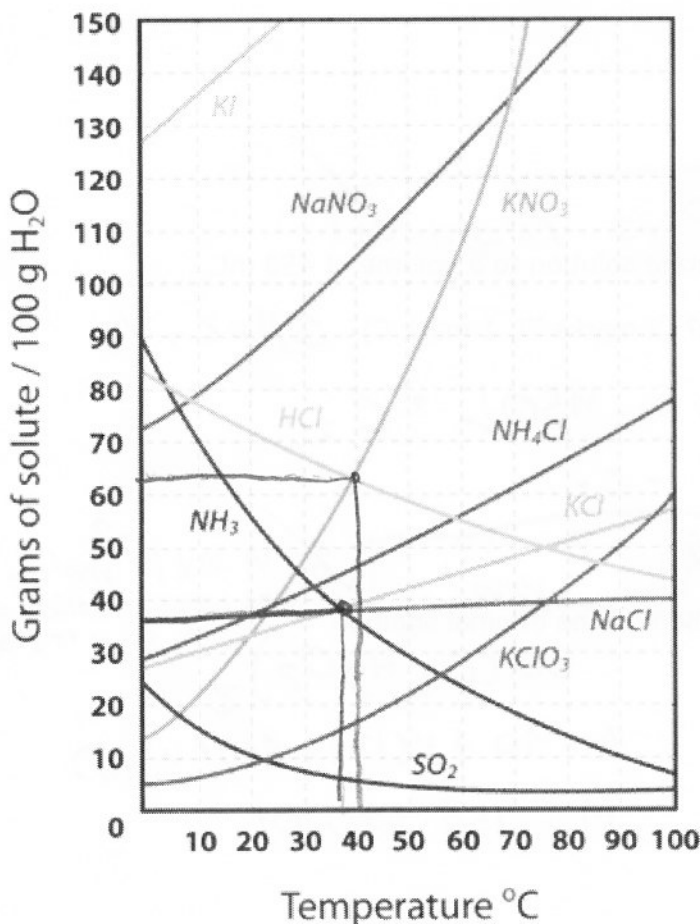
So 60g of water will result in 15g of glucose diluted to 20×10^4 ppm

3T+1C

~~Solute~~
~~Solution~~ ~~Solute~~
~~Solvent~~

5. Using the following solubility curves, answer question #5.

Solubility Curves



- 5a. At what temperature is the solubility of sodium chloride equal to ammonia? (1 mark TI)

$$38^\circ\text{C} \text{ or } 311\text{K}$$

1T

- b. How much water would you need to dissolve 120 g of KNO₃ at 40 °C? (2 marks TI, 1 mark C)

$$\frac{63\text{g KNO}_3}{100\text{g H}_2\text{O}} = \frac{63}{100}$$

$$\frac{63}{100} = \frac{120}{X}$$

$$X = 190.5\text{g H}_2\text{O}$$

sig fig

2T+1C