

## Ms. Pall's Solution Chemistry Mega Problem II

2.75g  $\text{Al}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$  is dissolved in 150.0 mL of  $\text{H}_2\text{O}$  to make a solution

- Explain, using calculations, how to make this solution. [ $n=0.008570$ ]
  - Give full experimental details.
  - Determine the concentration of the solution. [ $c=0.0571$ ]
  - Write a dissociation equation for the solution of aluminium nitrate.
  - Determine the concentration of the ions in the solution.  
[ $\text{Al}^{3+}=0.0571\text{M}$ ;  $3\text{NO}_3^- = 0.171\text{M}$ ]
  - What is the concentration of the ions if 30.00 mL of the solution was withdrawn? [Same]
  - Determine the number of ions in 2.75 g of  $\text{Al}(\text{NO}_3)_3$ . [ $2.064 \times 10^{22}$ ]
- 

18.75M solution of  $\text{NH}_3(\text{aq})$  is provided. Task: To prepare a 25.00 mL, 2.00 M ammonia solution.

- Explain, using calculations, how to make the diluted solution. [*volume of the stock solution required = 2.67mL*]
  - Give experimental details.
- 

30.00 mL of the **original** prepared solution was reacted with the 25.00 mL, 2.00 M ammonium hydroxide solution

- Write a balanced chemical equation, including the states.
- Write a TIE.
- Name the reacting ions and spectator ions.
- Write a NIE.
- Calculate the theoretical mass of the possible precipitate that may be isolated. [ $0.134 \text{ g}$ ]
- In an experiment, 0.072 g of precipitate is isolated, calculate the % yield. [ $54\%$ ]
- Ammonia is a weak base whereas sodium hydroxide is a strong base. Explain what is meant by the term a strong base and a weak base. Describe an experiment you could perform to demonstrate the strength of each base.
- State the definition of a base in terms of the Bronsted-Lowry definition, and write an equation for the reaction of ammonia with water. State the conjugate acid-base pairs.
- Ammonia may be also defined in terms of the Lewis definition of acid-base. Define the term Lewis base and explain using the structure of ammonia to explain why ammonia can act as the Lewis base.
- Write an equation to illustrate the reaction of ammonia with (i) hydrogen ions,  $\text{H}^+(\text{aq})$   
(ii) boron trifluoride,  $\text{BF}_3$

(Note: sections (p) – (s) require the knowledge of acid- base chemistry)