

HYDROLYSIS – THE REACTIONS OF IONS WITH WATER

Introduction

Salts are substances formed by the reaction of an acid with a base. Some salt solutions, such as calcium chloride used to deice roads, are acidic. Others, such as sodium fluoride present in toothpaste, form basic solutions. Still others, such as potassium chloride, form neutral salt solutions.

The pH of a salt solution depends upon the cations or anions of the dissociated salt accepting hydrogen ions from or donating hydrogen ions to water molecules. Depending on the direction of the hydrogen ion transfer, the resulting hydronium ion or hydroxide ion concentration may yield an acidic, a basic, or a neutral salt solution.

In this experiment, you will test various salt solutions to determine the relationships among the parent acid, the parent base, and the pH of the resulting salt solution.

Your Task

You will be provided the following compounds:

NaCl,	NH ₄ Cl,	CH ₃ COONa,	AlCl ₃ ,	K ₃ PO ₄ ,	KNO ₃ ,
Na ₂ CO ₃ ,	Al ₂ (CO ₃) ₃ ,	Fe ₂ (SO ₄) ₃ ,	CH ₃ COONH ₄ ,	NH ₄ (CO ₃) ₂ ,	KBr

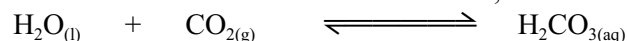
1. From the Introduction, formulate a problem statement.
2. Predict the pH of the solution when each of the above solids is dissolved in water, justifying your prediction in each case.
3. Design and carry out your procedure to test your hypothesis.
4. Construct a suitable observation table to record all your data.
5. Analyse and evaluate your results.

Conclusion

1. Which type of acids and bases react to produce acidic salts?
2. Which type of acids and bases react to produce basic salts?
3. Which type of acids and bases react to produce neutral salts?
4. Provide a suitable concluding statement.

Extension

1. When carbon dioxide dissolves in distilled water, the following reaction takes place:



- a. How might this reaction affect the data you obtained?
 - b. How might the effect of this reaction be reduced?
2. Aluminium sulphate is added to paper to reduce ink seepage. Is this substance an acidic, a basic, or a neutral salt? Explain your answer.
 - (a) The presence of aluminium sulphate is causing books throughout the world to disintegrate. Suggest a method to reduce the effect of this salt.
 - (b) Why are the world's oldest books not affected by this problem.
 3. (a) The presence of aluminium sulphate is causing books throughout the world to disintegrate. Suggest a method to reduce the effect of this salt.
 - (b) Why are the world's oldest books not affected by this problem.
 4. Would you expect an aqueous solution of iron (II) sulphate to be more acidic or less acidic than a corresponding solution of iron (III) sulphate?
 5. When an aqueous solution of iron (III) chloride is added to boiling water, iron (III) hydroxide is precipitated. How do you explain this fact?