

Chemistry: Chapter 17 Strength of acids and alkalis

Combined Science (Chemistry Part): Chapter 17 Strength of acids and alkalis

Section 17.1

!!ELA041717001O!!

P is a 1 M solution of an acid; *Q* is a 1 M solution of another acid. *P* is a much better electrical conductor than *Q*. *P* reacts vigorously with magnesium while *Q* reacts slowly.

The following statements *may* apply to an acid solution:

- (1) It can be neutralized by an alkali.
- (2) It reacts with copper.
- (3) It reacts with sodium carbonate.
- (4) It is a solution of strong acid.
- (5) It contains $\text{H}^+(\text{aq})$ ions.
- (6) It is a solution of weak acid.

(a) Which three statements can be used to describe for both *P* and *Q*?

(b) Which statement can be used to describe

(i) for *P* but not for *Q*.

(i) for *Q* but not for *P*?

(c) Write the formula of an acid which may be used to prepare

(i) *P*

(ii) *Q*

[7M]

##

(a) (1), (3), (5) [3]

(b) (i) (4) [1]

(ii) (6) [1]

(c) (i) HCl (OR H_2SO_4 , OR HNO_3) [1]

(ii) CH_3COOH [1]

##

Section 17.2

!!ELA041717002O|!

Sodium hydroxide and ammonia are two common alkalis. Sodium hydroxide is a white crystalline solid. It dissolves in water and completely dissociates to form sodium ions and hydroxide ions. On the other hand, ammonia is a colourless gas. It is extremely soluble in water.

- (a) Write an equation to show how ammonia is partially ionized in water.
-
- (b) A solution of ammonia has a strong smell of ammonia gas. What does this tell you about the particles present in the solution?
-
- (c) Explain why many metal hydroxides can be precipitated from solutions of their ions by aqueous alkalis.
-
- (d) Give the name of a reddish brown metal hydroxide.
-
- (e) Write an ionic equation to show the formation of the hydroxide in (d) using ammonia solution and a certain salt solution.
-

[7M]

##

- (a) $\text{NH}_3(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq})$ [1]
(b) The solution contains a very large proportion of unionized ammonia molecules, $\text{NH}_3(\text{aq})$. [1] Some of these evaporate, accounting for the strong smell of ammonia gas. [1]
(c) Aqueous alkalis contain $\text{OH}^-(\text{aq})$ ions. Many metal hydroxides are insoluble or only slightly soluble in water. [2]
(d) Iron(III) hydroxide [1]
(e) $\text{Fe}^{3+}(\text{aq}) + 3\text{OH}^-(\text{aq}) \rightarrow \text{Fe}(\text{OH})_3(\text{s})$ [1]

##

Section 17.3

!!ELA041717003O|!

A student tested the pH of two aqueous solutions, hydrochloric acid and ethanoic acid. He found that both had a pH value of 4. He concluded that the two acids were equally concentrated and also equally strong. Was he correct? Explain.

[2M]

##

Incorrect for both cases. He should conclude that the two solutions had the same hydrogen ion concentration, and the ethanoic acid solution was more concentrated. Ethanoic acid is a weaker acid than hydrochloric acid at any concentration. [2]

##