

Chemistry: Chapter 17 Strength of acids and alkalis

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

Section 17.1

!!|EMA041717001O|!

Which of the following solutions has the lowest electrical conductivity? (All solutions are of the same concentration.)

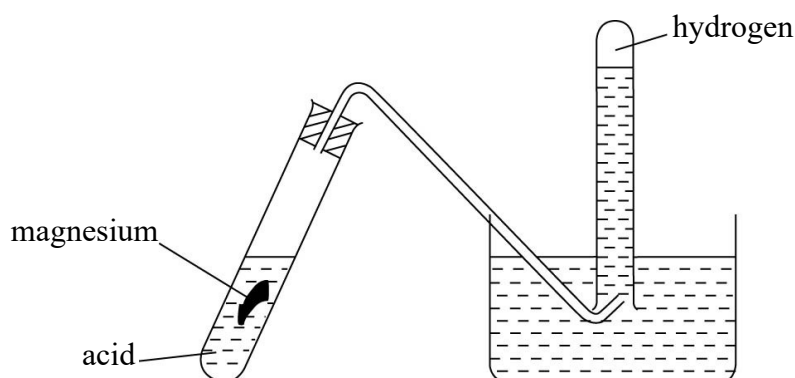
- A. Ethanoic acid
- B. Sulphuric acid
- C. Sodium hydroxide
- D. Sodium chloride



##A##

!!|EMA041717002O|!

The following set-up is used to collect hydrogen gas produced from the reaction between an acid and magnesium.



Which of the following acids (with the same concentration) can produce hydrogen at the highest rate?

- A. Citric acid
- B. Carbonic acid
- C. Ethanoic acid
- D. Hydrochloric acid



##D##

Section 17.2

!!|EMA041717003O|!

Which of the following statements about ammonia solution is INCORRECT?

- A. It contains ammonia molecules.
- B. It has a pH value greater than 7.
- C. It ionizes completely in water.
- D. It is very soluble in water.



##C##

!!|EMA041717004O|!

Sodium hydroxide is described as a strong alkali because it

- A. reacts with strong acid only.
- B. is corrosive.
- C. can dissolve oil stains.
- D. fully dissociates in aqueous solution.



##D##

!!|EMB041717005O|!

Which of the following statements about a dilute aqueous solution of strong acid is correct?

- A. It is a strong electrolyte.
- B. It has a pH value of 1.
- C. It is very sour.
- D. It reacts with all metals.



##A A strong acid is one which fully (or highly) ionizes in water. And by definition, an electrolyte which fully (or highly) dissociates or ionizes in an aqueous solution (or in molten state) is a strong electrolyte. A strong acid can be very dilute and pH can be any values higher than 1. The sense of ‘sour’ is only used to describe some dilute acids (e.g. ethanoic acid), but not for the strength of acids. Dilute acid cannot react with copper and other metals below copper in the metal reactivity series.##

!!|EMA041717006O|!

Which of the following is/are (a) strong acid(s)?

- (1) Carbonic acid
- (2) Hydrochloric acid
- (3) Ethanoic acid

- A. (1) only

- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only



##B Only hydrochloric acid highly ionizes in water.##

|!|EMA041717007O|!

Which of the following combinations is correct?

- | | <u>NaOH(aq)</u> | <u>NH₃(aq)</u> |
|----|-----------------------|---------------------------|
| A. | Complete dissociation | Complete ionization |
| B. | Complete dissociation | Slight ionization |
| C. | Slight dissociation | Complete ionization |
| D. | Slight dissociation | Slight ionization |



##B NaOH(aq) is a strong alkali. NH₃(aq) is a weak alkali.##

|!|EMA041717008O|!

Which of the following acids is a strong acid?

- A. 1 M CH₃COOH(aq)
- B. 12 M CH₃COOH(aq)
- C. 0.01 M HCl(aq)
- D. 0.5 M CH₃COOH(aq)



##C HCl ionizes fully in aqueous solution, while CH₃COOH ionizes slightly in aqueous solution.##

|!|EMA041717009O|!

Which of the following acids is a weak acid?

- A. Carbonic acid
- B. Sulphuric acid
- C. Hydrochloric acid
- D. Nitric acid



##A##

|!|EMA041717010O|!

Which of the following particles is NOT present in a dilute aqueous solution of

ammonia?

- A. NH_4^+
- B. NH_3
- C. OH^-
- D. NH_4OH



##D There is no such particle as NH_4OH .##

!|EMB041717011O|!

Which of the following particles is in the smallest amount in a dilute aqueous solution of ethanoic acid?

- A. CH_3COOH
- B. OH^-
- C. H^+
- D. CH_3COO^-



##B Ethanoic acid is a weak acid with only slight ionization, so the concentration of hydrogen ion is small. An acid solution must have the hydrogen ion concentration greater than the hydroxide ion concentration. So the concentration of hydroxide ion must be the smallest.##

Section 17.3

!|EMB041717012O|!

Which of the following statements about a concentrated acid is correct?

- A. It can react with copper metal.
- B. It cannot react with copper(II) oxide.
- C. It is an acid that fully ionizes in water.
- D. It must contain hydrogen ions when in aqueous form.

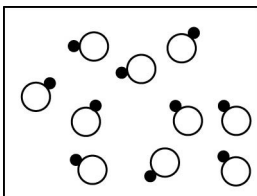


##D Only concentrated acids with strong oxidizing properties can react with copper (e.g. nitric and sulphuric acid). Concentrated hydrochloric acid is not an oxidizing agent, so it cannot react with copper. Reacting with a base like copper(II) oxide is a general property of acids, so concentrated acid will react with copper(II) oxide. Concentrated acids do not necessarily fully ionize in water. For example, concentrated ethanoic acid does not fully ionize. An acid should have a certain extent of ionization in water, so a concentrated acid must contain hydrogen ions when in aqueous form.##

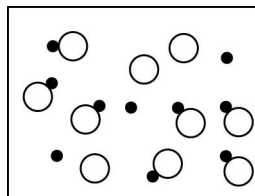
!|EMA041717013O|!

Which of the following diagrams represents the strongest acid?

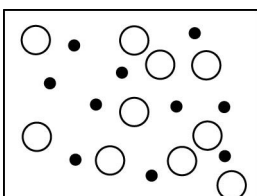
A.



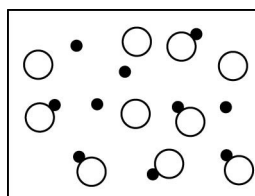
B.



C.



D.



(● represents H^+ , ○ represents the anion of the acid after ionization)

##C The acid molecules completely ionize, it indicates the acid is the strongest.##

||EMA041717014O||

Which of the following solutions has the lowest pH?

- A. 1 M HCl(aq)
- B. 1 M $CH_3COOH(aq)$
- C. 1 M $NH_3(aq)$
- D. 1 M NaOH(aq)



##A HCl(aq) is a strong acid and completely ionizes in water. It has the highest concentration of $H^+(aq)$.##

Each question below consists of two separate statements. Decide whether each of the two statements is true or false; if both are true, then decide whether or not the second statement is a *correct* explanation of the first statement. Then select one option from A to D according to the following table:

- | |
|---|
| <ul style="list-style-type: none"> A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement. B. Both statements are true and the 2nd statement is NOT a correct explanation of the 1st statement. C. The 1st statement is false but the 2nd statement is true. D. Both statements are false. |
|---|

Section 17.1

||EMA041717015O||

Sodium hydroxide is very soluble in water but ammonia is just slightly soluble in water.

1 M sodium hydroxide solution has a higher electrical conductivity than that of 1 M ammonia solution.



##C Ammonia is very soluble in water. Sodium hydroxide has a higher electrical conductivity because it is a strong alkali and completely dissociates in water to give a higher concentration of mobile ions i.e. Na^+ and OH^- ions.##

Section 17.2

|!|EMA041717016O|!

$\text{HCl}(\text{aq})$ is a stronger acid than $\text{CH}_3\text{COOH}(\text{aq})$.

HCl fully ionizes when it dissolves in water.



##A##

|!|EMA041717017O|!

Ammonia is a weak alkali.

Ammonia is a colourless gas.



##B##

|!|EMA041717018O|!

HCl dissolved in methylbenzene reacts with magnesium to give hydrogen.

$\text{HCl}(\text{aq})$ is a strong acid.



##C##

|!|EMA041717019O|!

Pure sulphuric acid changes blue litmus paper red.

Dilute sulphuric acid is a strong acid.



##C Pure sulphuric acid will not ionize to give H^+ ions if water is not present, so it does not show acidic properties.##

Section 17.3

|!|EMA041717020O|!

12 M ammonia solution is a stronger
alkali than 1 M sodium hydroxide
solution.

Ammonia reacts with water to give
hydroxide ions.



##C##