

Chemistry: Chapter 18 Salts and neutralization

Combined Science (Chemistry Part): Chapter 18 Salts and neutralization

Section 18.1

|!|EMA041818001O|!

Which of the following is NOT a neutralization reaction?

- A. $\text{ZnO(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{ZnSO}_4\text{(aq)} + \text{H}_2\text{O(l)}$
- B. $\text{Cu(OH)}_2\text{(s)} + 2\text{H}^+\text{(aq)} \rightarrow \text{Cu}^{2+}\text{(aq)} + 2\text{H}_2\text{O(l)}$
- C. $\text{H}^+\text{(aq)} + \text{OH}^-\text{(aq)} \rightarrow \text{H}_2\text{O(l)}$
- D. $\text{Fe}^{3+}\text{(aq)} + 3\text{OH}^-\text{(aq)} \rightarrow \text{Fe(OH)}_3\text{(s)}$



##D##

|!|EMA041818002O|!

Which of the following substances can neutralize an alkaline solution?

- A. Sulphur dioxide
- B. Sodium sulphate
- C. Sodium hydrogencarbonate
- D. Carbon monoxide



##A##

|!|EMB041818003O|!

There is NO reaction between limewater and

- A. carbon dioxide.
- B. potassium sulphate solution.
- C. ethanoic acid.
- D. aqueous ammonia.



##D##

|!|EMB041818004O|!

X is a white solid. When dilute sulphuric acid is added to *X*, a colourless gas is produced. When mixed with lead(II) nitrate solution, an aqueous solution of *X* gives a white precipitate. *X* is probably

- A. magnesium carbonate.
- B. ammonium carbonate.
- C. sodium chloride.

D. ammonium chloride.



##B##

|!|EMA041818005O|!

Which of the following equations best represents the reaction between dilute nitric acid and potassium hydroxide?

- A. $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- B. $\text{NO}_3^- + \text{K}^+ \rightarrow \text{KNO}_3$
- C. $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$
- D. $\text{H}^+ + \text{NO}_3^- \rightarrow \text{HNO}_3$



##C The reaction is neutralization that involves the combination of H^+ ions and OH^- ions to form water.##

|!|EMA041818006O|!

Which of the following ionic equations represents neutralizing aqueous potassium hydroxide with dilute hydrochloric acid?

- A. $\text{K}^+ + \text{Cl}^- \rightarrow \text{KCl}$
- B. $\text{HCl} + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{Cl}^-$
- C. $\text{K}^+ + \text{HCl} \rightarrow \text{KCl} + \text{H}^+$
- D. $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$



##D In neutralization, hydrogen ions combine with hydroxide ions to form water.##

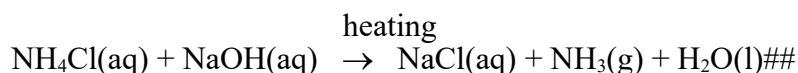
|!|EMB041818007O|!

A white solid dissolves in water to form an acidic solution. The solution reacts with aqueous sodium hydroxide on heating to give a gas. The solid is probably

- A. calcium oxide.
- B. sodium carbonate.
- C. ammonium chloride.
- D. sodium chloride.



##C Calcium oxide and sodium carbonate dissolve to give alkaline solution. Sodium chloride is neutral. Ammonium chloride is a strong acid-weak base salt, so its aqueous solution should be acidic. It forms ammonia when heated with aqueous sodium hydroxide.



!|EMA041818008O|!

A base reacts with an acid to give

- A. salt and carbon dioxide only.
- B. water only.
- C. salt and water only.
- D. salt, water and carbon dioxide only.



##C##

!|EMA041818009O|!

When dilute hydrochloric acid is added to iron(II) oxide,

- A. iron and water are formed.
- B. iron(II) chloride and carbon dioxide are formed.
- C. iron(II) chloride and water are formed.
- D. only iron(II) chloride is formed.



##C When an acid reacts with a base, only salt and water are formed.##

!|EMA041818010O|!

What gaseous product is formed when dilute sulphuric acid reacts with magnesium oxide?

- A. Hydrogen
- B. Carbon dioxide
- C. Sulphur dioxide
- D. None



##D The products are magnesium sulphate and water, there is no gaseous product formed.##

!|EMB041818011O|!

Two bottles were found in the laboratory. One bottle was known to contain potassium chloride solution. The other bottle was known to contain potassium carbonate solution. The labels had fallen off from the bottles.

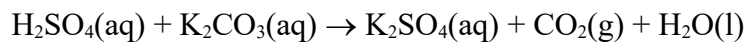
Which of the following substances could be used to distinguish the two solutions?

- A. Dilute potassium hydroxide
- B. Blue litmus solution

- C. Dilute sulphuric acid
- D. Sodium chloride solution



##C Dilute sulphuric acid reacts with potassium carbonate solution to give carbon dioxide but not with potassium chloride.



The reagent which reacts with sulphuric acid to give out a gas is potassium carbonate.##

|!|EMA041818012O|!

A hydrochloric acid solution has a pH value of 3. Which of the following substances would increase the pH value of the solution when mixed with it?

- (1) Dilute ammonia solution
 - (2) Dilute sulphuric acid
 - (3) Water
- A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)



##B Addition of OH^- from ammonia solution will use up H^+ in $\text{HCl}(\text{aq})$, decreasing the H^+ ion concentration and thus increasing the pH. Addition of dilute sulphuric acid will just increase the concentration of H^+ ion and thus decrease the pH. Dilution with water will again decrease the concentration of H^+ ion in the solution, thus the pH increases.##

Section 18.2

|!|EMA041818013O|!

Which of the following always occur(s) when an acid is neutralized with an alkali?

- (1) There is a decrease in pH.
 - (2) A salt is formed.
 - (3) Heat is given out.
 - (4) A gas is produced.
- A. (3) only
 - B. (1) and (4) only
 - C. (2) and (3) only
 - D. (1), (2), (3) and (4)



##C##

|!|EMA041818014O|!

Which of the following statements about the reaction of aqueous ammonia with sulphuric acid is correct?

- A. The reaction is endothermic.
- B. A coloured solution is formed.
- C. Ammonia is produced.
- D. Ammonium sulphate is the product formed.



##D##

|!|EMB041818015O|!

In an experiment, 20 cm³ of 0.5 M nitric acid is added slowly into 10 cm³ of 1.0 M potassium hydroxide solution. Which of the following statements about the experiment is correct?

- A. The concentration of nitrate ions in the mixture remains unchanged.
- B. The mixture does not conduct electricity at the end of the experiment.
- C. The pH value of the mixture decreases.
- D. The temperature of the mixture decreases.



##C As acid is added into an alkali, the pH decreases. Neutralization is an exothermic reaction, and therefore the temperature should rise. The number of moles of nitrate ions does not change but the total volume increases so the concentration of nitrate ions decreases. At the end of the experiment, aqueous potassium nitrate, which contains mobile ions to conduct electricity, is formed.##

Section 18.3

|!|EMB041818016O|!

A certain solution is known to be either dilute nitric acid, hydrochloric acid or sulphuric acid. Which of the following can be added to identify it as sulphuric acid?

- A. Ba(NO₃)₂ solution to see if a precipitate forms
- B. An indicator to determine the pH
- C. NH₃(aq) to obtain NH₄⁺(aq)
- D. CH₃COONa(aq) to form CH₃COOH(aq)



##A##

!!|EMA041818017O|!

Which of the following methods is best for preparing sodium nitrate?

- A. Add sodium sulphate solution to nitric acid.
- B. Add sodium to nitric acid.
- C. Add sodium hydroxide solution to nitric acid.
- D. Add sodium to zinc nitrate solution.



##C##

!!|EMA041818018O|!

Which of the following statements about salts is INCORRECT?

- A. Salts can be made by reacting acids with metal oxides.
- B. Salts are ionic compounds.
- C. Salts can be made by neutralizing acids with alkalis.
- D. Salts never contain water of crystallization.



##D $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ is a typical example of salt containing water of crystallization.##

!!|EMA041818019O|!

Which of the following reactions will NOT give a white precipitate?

- A. $\text{NaCl(aq)} + \text{AgNO}_3\text{(aq)}$
- B. $\text{MgSO}_4\text{(aq)} + \text{NaOH(aq)}$
- C. $\text{Ca(OH)}_2\text{(aq)} + \text{CO}_2\text{(g)}$
- D. $\text{CuSO}_4\text{(aq)} + \text{NH}_3\text{(aq)}$



##D A gives AgCl(s) . B gives $\text{Mg(OH)}_2\text{(s)}$. C gives $\text{CaCO}_3\text{(s)}$. All these precipitates are white. D gives blue precipitates of $\text{Cu(OH)}_2\text{(s)}$.##

!!|EMA041818020O|!

Which of the following salts is best prepared by titration method?

- A. Copper(II) chloride
- B. Iron(II) sulphate
- C. Zinc sulphate
- D. Sodium chloride



##D Sodium chloride is prepared from a soluble base and an acid. The titration method can only be done with an alkali/ a soluble carbonate and an acid. The other

cations cannot come from alkalis or soluble carbonates.##

||EMB041818021O||

Which of the following substances should NOT be used with hydrochloric acid to prepare magnesium chloride?

- A. Magnesium hydroxide
- B. Magnesium nitrate
- C. Magnesium carbonate
- D. Magnesium oxide



##B Magnesium nitrate is not used to react with hydrochloric acid to give magnesium chloride. The others are all insoluble solids which react with hydrochloric acid to give a soluble salt, magnesium chloride. Magnesium chloride can be obtained by crystallization.##

||EMA041818022O||

Which of the following salts could be obtained as an insoluble product from the reaction between a dilute acid and an aqueous salt?

- A. Iron(II) sulphate
- B. Copper(II) nitrate
- C. Calcium sulphate
- D. Magnesium chloride



##C Calcium sulphate is insoluble. It is obtained by the reaction of an acid (dilute sulphuric acid) and a soluble salt of calcium such as calcium nitrate.##

||EMA041818023O||

Which of the following salts can be prepared directly by precipitation method?

- A. PbSO_4
- B. K_2CO_3
- C. $\text{Ca}(\text{NO}_3)_2$
- D. NH_4Cl



##A PbSO_4 is insoluble in water. It can be prepared by mixing $\text{Pb}(\text{NO}_3)_2(\text{aq})$ with $\text{Na}_2\text{SO}_4(\text{aq})$.##

||EMA041818024O||

Which of the following reactions CANNOT be used to prepare zinc sulphate?

- A. zinc + dilute sulphuric acid
- B. zinc oxide + dilute sulphuric acid
- C. zinc carbonate + dilute sulphuric acid
- D. zinc nitrate + dilute sulphuric acid



##D There is no reaction between nitrate salt with dilute sulphuric acid. Therefore, zinc sulphate will not form.##

|!|EMA041818025O|!

Which of the following techniques is/ are commonly used to prepare insoluble salts?

- (1) Filtration
 - (2) Titration
 - (3) Crystallization
- A. (1) only
 - B. (2) only
 - C. (1) and (3) only
 - D. (2) and (3) only



##A##

|!|EMB041818026O|!

Which of the following equations represents a practicable way of preparing the salt underlined?

- A. $\text{Mg}(\text{OH})_2 + \text{Na}_2\text{SO}_4 \rightarrow \underline{\text{MgSO}_4} + 2\text{NaOH}$
- B. $\text{NH}_3 + \text{HNO}_3 \rightarrow \underline{\text{NH}_4\text{NO}_3}$
- C. $\text{Cu} + \text{H}_2\text{SO}_4 \rightarrow \underline{\text{CuSO}_4} + \text{H}_2$
- D. $\text{AgCl} + \text{NaNO}_3 \rightarrow \underline{\text{NaCl}} + \text{AgNO}_3$



##B Titration method can be used for B because the salt is soluble. The other options are not possible because $\text{Mg}(\text{OH})_2$ is a base and has no reaction with Na_2SO_4 which is a salt. AgCl is an insoluble salt and cannot be used to prepare NaCl which is a soluble salt. Cu will not react with sulphuric acid to form hydrogen gas.##

|!|EMA041818027O|!

Which of the following mixtures of three substances will dissolve completely in water to give a clear solution?

- A. NaCl , KNO_3 and NaNO_3
- B. NaCl , CaCO_3 and KOH

- C. Na_2CO_3 , NaOH and AgCl
- D. NaOH , $\text{Mg}(\text{OH})_2$ and $\text{Cu}(\text{OH})_2$



##A CaCO_3 , AgCl , $\text{Mg}(\text{OH})_2$ and $\text{Cu}(\text{OH})_2$ are insoluble in water.##

!|EMA041818028O|!

Why caves are usually found in mountains mainly composed of limestone?

- A. Limestone reacts with acid rain to form calcium hydroxide, which is then washed away by the rain.
- B. A type of bacterium feeds on limestone.
- C. Limestone dissolves in carbonic acid formed by dissolving of carbon dioxide in rainwater.
- D. Limestone dissolves in the moisture in the atmosphere gradually.



##C Limestone contains calcium carbonate, which reacts with carbonic acid in rainwater to form water-soluble salts. The salts can be washed away easily. Caves are formed as a result.##

!|EMB041818029O|!

Why a statue made of limestone is easily corroded when it is placed at a region which sometimes experiences acid rain?

- A. Limestone and acid rain react to form a product, which is corrosive to limestone.
- B. Limestone and acid rain react to form a product, which can be easily washed away.
- C. Limestone enhances the acidity of acid rain to make it more corrosive.
- D. Acid rain initiates the self-corrosion of limestone.



##B Limestone is calcium carbonate. Calcium carbonate reacts with acid to form a salt that can be easily washed away.##

!|EMB041818030O|!

Two buildings, both using marble as the building material, are located at district *P* and district *Q* respectively. The air pollution in district *Q* is much more serious than in district *P*. Which of the following statements about the erosion rates of the two buildings is correct?

- A. The two buildings erode at the same rate.
- B. The building in district *P* erodes faster.

- C. The building in district *Q* erodes faster.
- D. There is insufficient information to deduce which building erodes faster.



##C Sulphur dioxide and nitrogen oxides are common air pollutants. They dissolve in rainwater to form acid. Marble is calcium carbonate which reacts with acid. The product salts are soluble in water and can be easily washed away.##

!!|EMB041818031O|!

An ancient statue made of marble in an area with plenty of rainfall, is being eroded as time goes by. It is because

- A. rainwater reacts with marble to form a corrosive product.
- B. marble enhances the corrosiveness of rainwater.
- C. rainwater washes away the particles of the statue.
- D. The carbonic acid in rainwater reacts with marble to form a product, which can be easily washed away.



##D A and B are wrong. C is wrong as the effect of rainwater is not strong enough to cause an abrasion of marble.##

!!|EMA041818032O|!

Which of the following statements about crystallization is correct?

- A. A well-formed crystal can be formed from hot concentrated salt solution by fast cooling.
- B. A newly formed crystal should be washed with hot water after filtration.
- C. Solute particles need time to arrange themselves in a regular pattern in order to form large crystal.
- D. Crystallization cannot be done under room temperature.



##C The formation of a well-formed crystal requires slow cooling of a hot concentrated salt solution. Washing with hot water may wash away the product obtained and thus decreasing the yield.##

!!|EMA041818033O|!

Which of the following methods is suitable for preparing calcium carbonate solid?

- A. Bubbling carbon dioxide into limewater until it becomes clear and then evaporating the water by heating.
- B. Adding calcium sulphate to sodium carbonate solution and then filtering the solid formed.

- C. Adding potassium carbonate solution to calcium chloride solution and then filtering the solid formed.
- D. Adding carbonic acid to calcium metal until the calcium metal completely dissolves.



##C To prepare an insoluble salt by precipitation, we should first prepare two solutions. One solution contains the cation (calcium chloride solution contains calcium ions) while the other contains the anion of the insoluble salt (potassium carbonate solution contains carbonate ions). Calcium sulphate is only slightly soluble in water and hence B is incorrect.##

||EMBO41818034O||

The table below shows the observations of the chemical tests of three ionic compounds.

Compound	Adding barium chloride solution acidified by dilute HNO_3	Adding dilute hydrochloric acid	Flame test
QT	White precipitate	No observable change	Brick-red
XZ	Colourless solution	Colourless gas bubbles	Golden yellow
X_2T	White precipitate	No observable change	Golden yellow

Which of the following combinations of ions involved is most likely to be correct?

- | | X | Q | T | Z |
|----|---------------|-------------|---------------|-----------------------|
| A. | Potassium ion | Sodium ion | Carbonate ion | Sulphate ion |
| B. | Sodium ion | Calcium ion | Sulphate ion | Hydrogencarbonate ion |
| C. | Calcium ion | Sodium ion | Sulphate ion | Hydrogencarbonate ion |
| D. | Sodium ion | Calcium ion | Sulphate ion | Carbonate ion |



##B From the results of flame test, we predict that X and Q are sodium ion and calcium ion respectively. So the answer should be B or D. When we look at the reactions between XZ and acidified barium chloride solution, the products are barium hydrogencarbonate and sodium chloride. Both of them are colourless and soluble in water.##

Section 18.4

||EMBO41818035O||

When a magnesium ribbon is placed in sodium hydrogensulphate solution,

- A. a gas is given off.

- B. a precipitate is formed.
- C. the pH value of the solution decreases.
- D. there is no reaction.



##A##

|!|EMA041818036O|!

Which of the following statement(s) about 25.0 cm³ of 0.1 M sodium hydroxide solution and 25.0 cm³ of 0.1 M ammonia solution is/ are correct?

- (1) They have the same pH value.
 - (2) They turn methyl orange indicator yellow.
 - (3) Each of them requires 25.0 cm³ of 0.1 M hydrochloric acid for complete neutralization.
- A. (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)



##C##

|!|EMA041818037O|!

Which of the following combinations is INCORRECT?

	<u>Salt</u>	<u>Parent acid</u>
A.	Sodium carbonate	Carbonic acid
B.	Lead(II) chloride	Hydrochloric acid
C.	Ammonium nitrate	Nitric acid
D.	Copper(II) sulphide	Sulphuric acid



##D The parent acid of the salt copper(II) sulphide is H₂S, not H₂SO₄.##

|!|EMA041818038O|!

What is the name of the salt with formula Na₂SO₃?

- A. Sodium sulphide
- B. Sodium sulphite
- C. Sodium sulphate
- D. Sodium sulphur



##B##

!!|EMB041818039O|!

Which of the following statements about the reaction of 25 cm³ of 0.1 M sodium hydroxide solution and 25 cm³ of 0.1 M sulphuric acid is/ are correct?

- (1) Heat energy is absorbed.
 - (2) An acid salt is produced.
 - (3) Sulphur dioxide is produced.
- A. (1) only
 - B. (2) only
 - C. (1) and (3) only
 - D. (2) and (3) only



##B All neutralization is exothermic, heat energy is given out instead of absorbed. As there is not enough no. of moles of NaOH to remove all the ionizable hydrogen in H₂SO₄, an acid salt will be formed instead of a normal salt. Sulphur dioxide is not produced.##

!!|EMB041818040O|!

Which of the following salts is soluble in water?

- A. Sodium nitrate
- B. Lead(II) sulphate
- C. Magnesium carbonate
- D. Potassium hydroxide



##A Although potassium hydroxide is soluble in water, it is a base not a salt.##

Section 18.5

!!|EMA041818041O|!

Liquid waste from an electroplating factory is acidic. The fish in a nearby river will probably be killed by the waste. To prevent this, a substance is added to the waste before its disposal. Which of the following is preferred?

- A. Sodium hydroxide
- B. Sodium chloride
- C. Ammonium chloride
- D. Slaked lime



##D##

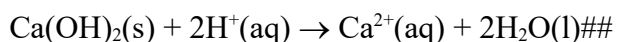
!!|EMA041818042O|!

Which of the following substances is commonly used to reduce soil acidity?

- A. Ammonium sulphate
- B. Sodium chloride
- C. Magnesium nitrate
- D. Calcium hydroxide



##D Calcium hydroxide is an alkali that can neutralize excess acid in soil.



!!|EMB041818043O|!

In an accident, some hydrochloric acid is spilt out. Which of the following substances, when added in excess, would neutralize the acid without leaving any alkaline solution?

- A. Sodium nitrate
- B. Limewater
- C. Calcium carbonate
- D. Water



##C Sodium nitrate and water are neutral and therefore they can't neutralize acid.

Limewater is alkaline, however, excess of it makes the resultant solution alkaline.

Calcium carbonate is insoluble in water and can react with nitric acid to neutralize it.

Any excess remains insoluble.##

!!|EMA041818044O|!

Which of the following chemicals is/are used to neutralize the excess acid in stomach?

- (1) Mg(OH)_2
- (2) Ca(OH)_2
- (3) NaOH
- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)



##A Mg(OH)_2 is found in 'Milk of Magnesia'. Ca(OH)_2 is found in limewater which is sometimes given to babies for neutralizing the acid in stomach.##

!!|EMA041818045O|!

Which of the following is NOT used to neutralize the acidic liquid waste from industries?

- A. Sodium hydroxide
- B. Sodium carbonate
- C. Calcium carbonate
- D. Calcium hydroxide



##A Sodium hydroxide is not used because it is irritating and corrosive and will affect marine lives.##

!!|EMB041818046O|!

Lime can be used to reduce the acidity of soil. It is because

- A. lime absorbs acid.
- B. lime gives alkaline products when dissolved in water.
- C. lime reacts with soil to form alkaline products.
- D. lime prevents acidic substances dissolving in soil.



##B Lime is calcium oxide. It dissolves in water to form calcium hydroxide, which can neutralize the acidity of soil.##

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:

- 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 18.1

!!|EMA041818047O|!

Copper(II) oxide is a soluble base.

Copper(II) oxide reacts with dilute sulphuric acid.



##C Copper(II) oxide is an insoluble base but reacts with dilute sulphuric acid.##

|!|EMA041818048O|!

Sodium carbonate is a base.

Sodium carbonate reacts with dilute acid to give a salt, water and carbon dioxide.



##C A base is one that reacts with acid to give a salt and water only. But sodium carbonate also produces carbon dioxide.##

|!|EMA041818049O|!

Sodium ion and chloride ion are spectator ions in the reaction between hydrochloric acid and sodium hydroxide solution.

Sodium ion and chloride ion do not react in the neutralization reaction.



##A##

Sections 18.2–18.3

|!|EMA041818050O|!

CaCO_3 can be prepared by bubbling CO_2 into limewater.

CaCO_3 is insoluble in water.



##A CaCO_3 in the form of white precipitate can be separated out by filtration.##

|!|EMA041818051O|!

$\text{PbCl}_2(\text{s})$ can be prepared by titration method.

$\text{PbCl}_2(\text{s})$ is a white precipitate.



##C PbCl_2 is an insoluble salt. We cannot get $\text{Pb}^{2+}(\text{aq})$ from $\text{Pb}(\text{OH})_2$ because it is insoluble in water.##

|!|EMA041818052O|!

Mixing $\text{CuSO}_4(\text{aq})$ with $\text{Na}_2\text{CO}_3(\text{aq})$ can be used to prepare CuCO_3 .

CuCO_3 is an insoluble salt.



##A##

Section 18.4

|!|EMA041818053O|!

Sodium hydroxide is used to neutralize
the excess acid in stomach.

Sodium hydroxide is a base.



##C Sodium hydroxide is irritating and corrosive, it cannot be used for this
purpose.##

|!|EMA041818054O|!

Magnesium sulphate is not a salt.

Salt refers to sodium chloride only.



##D Salts refer to compounds formed during neutralization. Sodium chloride is only
one of the salts. Sodium chloride is sometimes called table salt as a food seasoning.##

Section 18.5

|!|EMA041818055O|!

Farmers sometimes add slaked lime to
soil.

Slaked lime can neutralize the acid in
soil.



##A##

|!|EMA041818056O|!

Limewater will turn milky in the
presence of carbon dioxide.

It is sometimes given to babies as a kind
of medication.



##B Limewater is sometimes given to babies to neutralize the excess acid in the
stomach.##