5. Chemistry in Everyday Life

Exercise Questions

1. Question

Aqueous solution of a base :

A. converts blue litmus into red

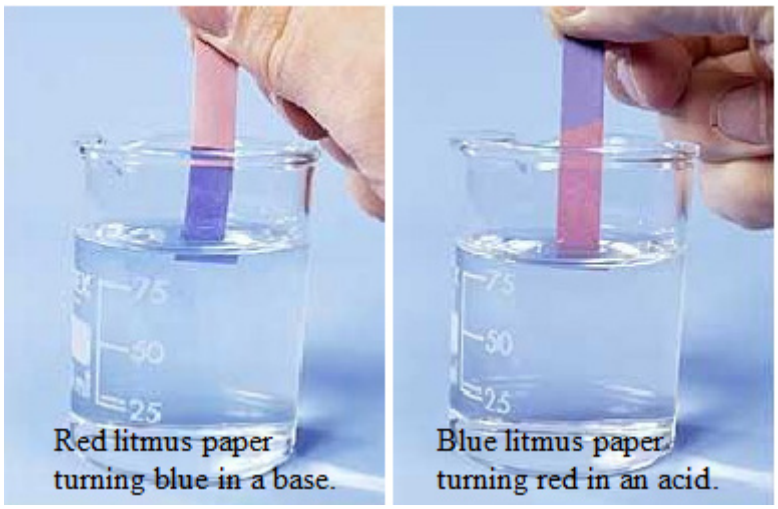
B. Converts red litmus into blue

C. make litmus solution colorless

D. has no effect on litmus solution

Answer

Bases convert red litmus into blue whereas acids convert blue litmus into red. This means aqueous solution of base will also convert red litmus into blue.



2. Question

Solutions of acid and base are electrically:

A. bad conductor

B. good conductor

C. semi conductor

D. not affected

Answer

Solution of acids and bases are electrically good conductor. They contain a large number of ions.

i. When acid is dissolved in water, it releases hydrogen (H^+) ions.

ii. When base is dissolved in water, it releases OH^- ions.

Both the ions (H^+ and OH^-) act as charge carriers and hence conduct electricity.

3. Question

pH is negative log of concentration of which ions of any acidic solution is :

A. $[H_2O]$

B. $[OH^-]$

C. $[H^+]$

D. $[Na^+]$

Answer

pH is negative logarithm of hydrogen ion concentration present in any solution:

$pH = -\log[H^+]$

Note: pH scale was given by Sorenson in 1909. pH scale represents hydrogen ion concentration of any solution.

4. Question

pH of any acidic solution is :

A. 7

B. 14

C. 11

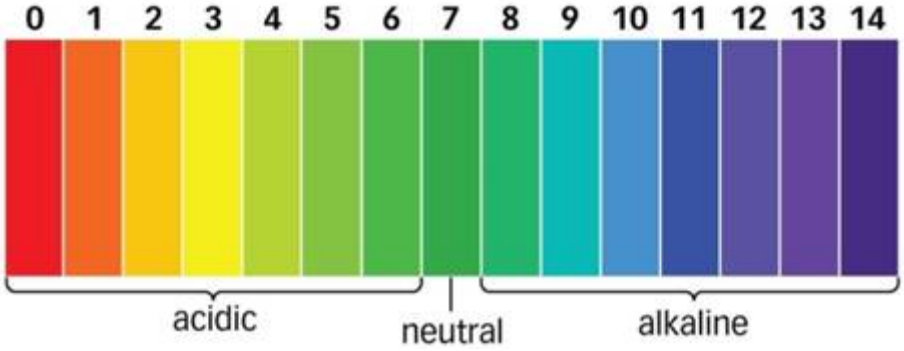
D. 4

Answer

pH of any acidic solution is less than 7

pH of any basic/alkaline solution is greater than 7.

pH of any neutral solution is equal to 7.



Hence, among the given options, pH of any acidic solution is 4.

On the other hand, 7 shows the pH of any neutral solution.

11 and 14 show the pH of any basic solutions.

5. Question

The digestion of food in our stomach occurs in which medium?

A. Acidic

B. basic

C. Neutral

D. Changeable

Answer

The digestion of food in our stomach occurs in acidic medium. Before food arrives in the stomach, the stomach normally has a pH between 5 to 6. As the food arrives and digestion takes place, the pH falls to 3 (acidic medium).

6. Question

Following substance is used in fire extinguishers :

A. Sodium Carbonate

B. Sodium Hydrogen Carbonate

C. Plaster of Paris

D. Sodium Chloride

Answer

Sodium hydrogen carbonate ($NaHCO_3$) which is also known as baking soda or eatable soda.

i. Soda acid fire extinguishers contain a mixture of sulphuric acid and baking soda inside it.

ii. When knob of the fire extinguisher is pressed, sulphuric acid get mixed with baking soda which produces a lot of CO_2 gas.

$$NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O + 2CO_2$$

Baking Soda — Sulphuric acid

iii. CO_2 gas covers the surroundings of fire.

iv. It stops the supply of air to the burning substance.

v. Hence, fire gets extinguished.

7. Question

Which one is washing soda :

A. $NaHCO_3$

B. NaCI

C. $CaSO_4$. 1/2 H_2O

D. $Na_2CO_3.10H_2O$

Answer

The chemical name of washing soda is sodium carbonate decahydrate. It contains ten water molecules of crystallization. The chemical formula of washing soda is $Na_2CO_3.10H_2O$.

8. Question

Which gas is released when bleaching powder is kept open in air :

A. H_2

B. O_2

C. CI_2

D. CO_2

Answer

When bleaching powder is kept open in air, it reacts with CO_2 which is present in air to form calcium carbonate and chlorine gas. The reaction takes place:

$$CaOCl_2 + CO_2 \rightarrow CaCO_3 + Cl_2$$

Bleaching powder — Calcium carbonate

Thus, chlorine gas is released when bleaching powder is kept in open air.

9. Question

Soaps work in :

A. Soft water

B. Hard water

C. Both soft and hard water

D. None of these

Answer

Soaps work well in soft water. In hard water, soaps are not able to perform cleansing action. In hard water, calcium and magnesium salts of higher fatty acids are formed which are insoluble in water. They get precipitated. Hence, soaps work well in only soft water not in hard water.

10. Question

In Micelle formation, Hydrocarbon tail is :

A. inside

B. outside

C. changeable

D. at any side

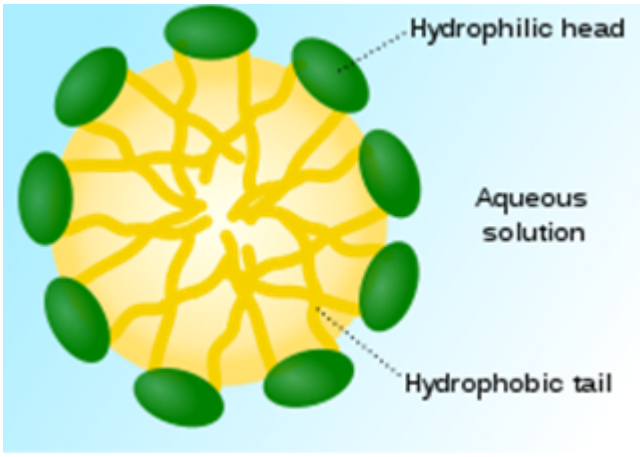
Answer

In micelle formation:

i. Hydrophobic tail remains inside the solution and attracts the oily dirt.

ii. The hydrophilic polar head remains outside and reacts with water.

iii. Thus, oily dirt gets surrounded by a micelle.



Micelle structure

11. Question

Proton (H^+)acceptor species are :

A. Acid

B. Salt

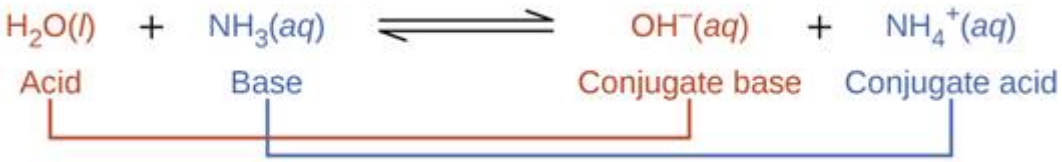
C. None of these

D. Base

Answer

According to Bronsted Lowry concept, bases are the substances which accept proton.

For example:



Here ammonia (NH_3) is a proton acceptor, hence it is base. Base

changes into conjugate acid (NH_4^+) by accepting proton (H^+)

12. Question

Which acid is found in sting of red ant?

Answer

The acid which is found in the sting of red ant is formic acid. This acid causes irritation and pain on skin. Not only red ant, but the sting of honeybees and spiders also inject formic acid into the skin.

13. Question

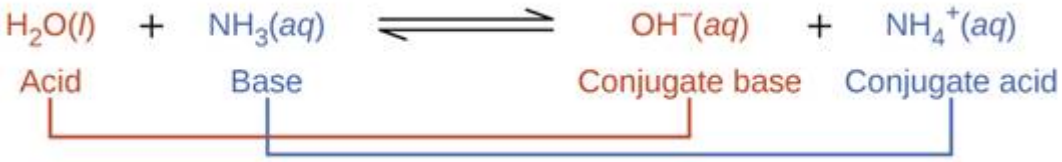
What are called proton donor compounds?

Answer

According to Bronsted Lowry concept, acids are the

substances which donate proton.

For example:



Here water (H_2O) is a proton donor, hence it is acid. Acid

changes into conjugate base (OH^-) by losing proton (H^+)

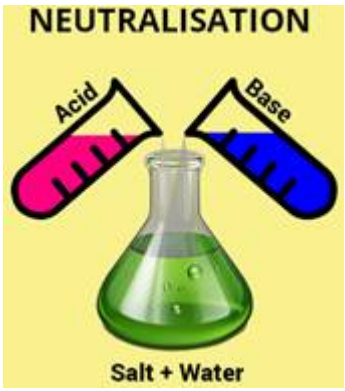
14. Question

What is meant by neutralization?

Answer

The reaction between an acid and a base to give a salt and water is called neutralization reaction. All acids get neutralized and loose their acidic properties when reacted with bases

Base + Acid → Salt + Water



For example: When sodium hydroxide (a base) and HCl (an acid) reacts together, they form a common salt (NaCl) and water:

$NaOH + HCl \rightarrow NaCl + H_2O$

15. Question

How drinking water can be disinfected?

Answer

Drinking water can be disinfected by using bleaching powder [$Ca(OCl)_2$].

i. Bleaching powder is an agent which removes and kills the unwanted bacteria, microorganisms and germs in the drinking water.

ii. If the microorganisms and germs are not removed from drinking water, then it can cause number of harmful diseases.

iii. Hence, drinking water must be made disinfected by using bleaching powder.

16. Question

How the reaction between acid and metallic oxide occurs? Write equation.

Answer

When acid reacts with metallic oxide, it produces salt and water.

Metallic oxide + acid → Salt + water

For example: When copper oxide (metal oxide) reacts with hydrochloric acid, it forms copper chloride (salt) and water. The reaction takes place is given below:

$CuO + HCl \rightarrow CuCl_2 + H_2O$

Metal oxides produce salt and water on reaction with acids, hence these are basic in nature.

17. Question

In pH, what is indicated by p and H?

Answer

In pH, "p" denotes a german term- potenz which means strength and "H" represents hydrogen. The pH scale was given by Sorenson in 1909.

18. Question

What remedy will you take to treat hyperacidity in your stomach?

Answer

We will use antacids like milk of magnesia [$Mg(OH)_2$] or $Al(OH)_3$ solution to treat acidity problem in the stomach.

These are the mild bases which neutralize the effect of hydrochloric acid produced in the stomach. These maintain the pH of stomach and as a result decrease acidity.

19. Question

Write two salts of sodium.

Answer

Two salts of sodium are:

Sodium chloride (NaCl)

When NaOH (base) and HCl (acid) are reacted togerther, give sodium chloride (common salt) and water.

$NaOH + HCl \rightarrow NaCl + H_2O$

Sodium sulphate (Na_2SO_4)

When NaOH (base) and H_2SO_4 (acid) reacts together, they give sodium sulphate (salt) and water.

$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

20. Question

Give definition of base according to Lewis theory.

Answer

According to Lewis theory, bases are defined as "the substances which loose/donate electron pairs are called bases". That is electrons pair species are bases.

For example:

$H^- + BH_3 \rightarrow BH_4^-$

Base Acid Lewis complex

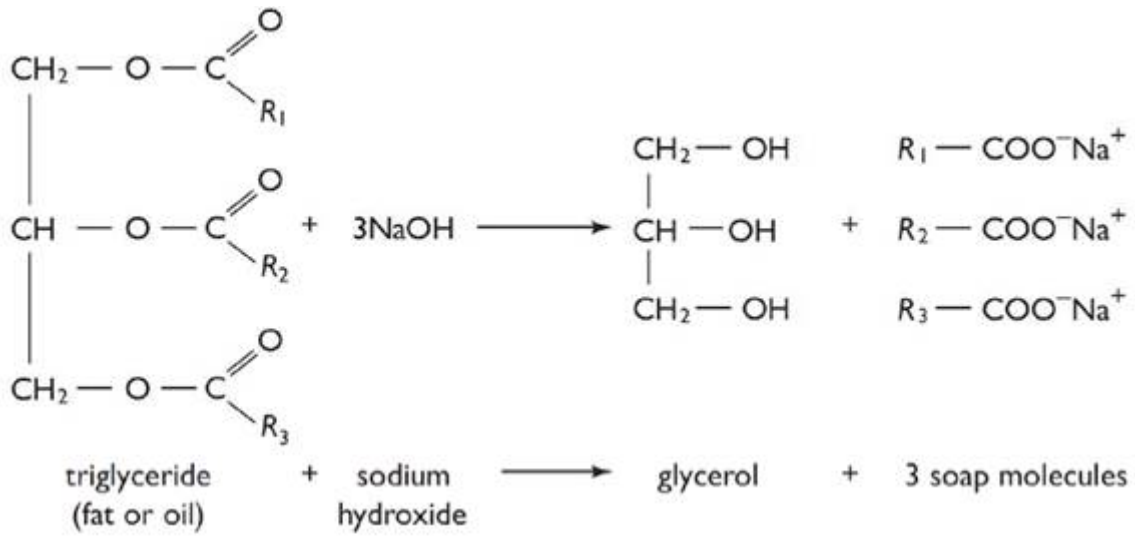
In the above reaction, base donates a proton to acid (BH_3) which gives a Lewis complex.

21. Question

What is saponification?

Answer

When fatty acids like oil are heated with aqueous solution of sodium hydroxide or potassium hydroxide, form soaps which are the sodium or potassium salts of fatty acid containing long hydrocarbon chain from C_{12} to C_{18}. This process is called saponification reaction.



In the above reaction, soaps get separated by adding sodium chloride.

22. Question

What is property of detergent?

Answer

Properties of detergents are:

i. Detergents work well both in soft water as well as hard water.

ii. These are sodium alkyl sulphonates.

iii. When detergents perform cleansing action, scum is not formed.

23. Question

Which substance is used in making plaster when bone gets fractured?

Answer

Plaster of Paris ($CaSO_4.1/2\ H_2O$) is used to join fractured bones. When Plaster of Paris is mixed with water and applied around the fractured bones, it becomes solid and sets into a hard mass. Hence, it is used to join the fractured bones.

24. Question

The concentration of hydrogen ion in any solution is 1×10^{-4} gram mole/litre. Find out value of pH of this solution. Also state that this solution is acidic or basic.

Answer

Given:

Concentration of hydrogen ion = $[H^+] = 1 \times 10^{-4}$

To calculate the pH of this solution, apply the formula given below:

pH= -log [1×10^{-4}]

pH= -log [-4 log 10]

pH= log 4

pH = 0.602

pH of the solution is 0.6. Hence it is an acidic solution (less than 7)

25. Question

Write name and uses of any two strong acids and two bases.

Answer

Strong acids	Strong bases
Hydrochloric acid (HCl) i. It is used to remove metal stains. ii. It is used to purify the table salt.	Sodium hydroxide (NaOH) i. It is used in the synthesis of soap, paper, and other chemicals. ii. It is used in the preparation of lipids and oils.
Sulphuric acid (H_2SO_4) i. It is used in the production of fertilizers. ii. It is used to prepare other important chemicals like HCl, nitric acid etc.	Potassium hydroxide (KOH) i. It is used to prepare soaps by saponification. ii. It is used in petroleum refining.

26. Question

Differentiate between soap and detergent.

Answer

Difference between soap and detergents:

Soaps	Detergents
i. Soaps work well in soft water.	Detergents work well in both soft and hard water.
ii. Soaps cannot perform a cleansing action.	Detergents are broadly used in cleaning purpose.
iii. These are sodium or potassium salts of fatty acids.	These are sodium alkyl sulphonates or sodium alkyl benzene sulphonates.
iv. In hard water, calcium and magnesium salts of higher fatty acids are formed which are insoluble in water.	In hard water, sulphonates are water soluble.
v. They get precipitate and form scum.	They do not precipitate like soap. Scum is not formed

27. Question

Write the definition of acid and base according to Arrhenius theory.

Answer

According to Arrhenius theory:

Acids are the substances which release hydrogen ion when dissolved in water.

For example: $HCl \rightarrow H^+ + Cl^-$

$HNO_3 \rightarrow H^+ + NO_3^-$

These both are acids (hydrochloric acid and nitric acid) because they release H^+ ion in the aqueous solution.

The acids which are completely ionized in the solution are called strong acids. But some acids are incompletely ionized in water, are called weak acids.

Bases are the substances which release hydroxyl ions (OH^-) when dissolved in water.

For example $NaOH \rightarrow K^+ + OH^-$

$KOH \rightarrow K^+ + OH^-$

These both are bases (sodium hydroxide and potassium hydroxide) because they release OH^- ion in the aqueous solution.

The bases which are completely ionized in the solution are called strong bases. But some bases are incompletely ionized in water, are called weak bases.

28. Question

What is pH? Explain the pH range of acidic and basic solution.

Answer

pH scale:

i. It is used to measure the strength of any acid or base.

ii. It represents hydrogen ion concentration ($[H^+]$) of any solution.

iii. "p" stands for potenz which means strength and "H" stands for hydrogen.

iv. pH is a negative log of the concentration of hydrogen ions:

$pH = -\log [H^+]$

v. Acidic solutions have a pH less than 7.

vi. Basic solutions have a pH greater than 7.

vii. Neutral solutions have pH equal to 7.

viii. The strength of an acid depends upon the H^+ and OH^- ions. Greater concentration of H^+ ions shows strong acids and greater concentration of OH^- ions shows strong bases.

29. Question

What do you mean by water molecules of crystallization? Give examples.

Answer

Water molecules of crystallization:

i. Salts mainly exist in crystalline form.

ii. Sometimes they have some water molecules present as crystallization water molecules.

iii. When we write chemical formula of salt along with a number of water molecules present, is called crystallization water molecules.

For examples:

Washing soda – $Na_2CO_3.10H_20$

Here 10 molecules of water are present as water molecules of crystallization.

Gypsum – $CaSO_4.2H_2O$

Here 2 molecules of water are present as water molecules of crystallization.

30 A. Question

What happens when :

Curd or sour substances are kept in metal utensils.

Answer

When curd or sour substances are kept in metal utensils, they become toxic. Curd and sour substances are acidic in nature and when they kept in metal utensils, curd or sour substances react with them. This makes them toxic and can cause food poisoning to us. Hence, it is not advised to keep curd and sour substances in the metal utensils.

30 B. Question

What happens when :

Teeth are not cleaned after food at night.

Answer

When teeth are not cleaned after food at night, some bacteria present in our mouth reacts with remains of food on teeth and produce acid. As a result, acid reduces the pH of mouth. If the pH falls to 5.5, then enamel of teeth can degrade.

Hence, it is advised by our elders that after food, cleaning of teeth is a must.

31. Question

A compound A reacts with H_2SO_4 acid and releases gas B with effervescence. Gas B burns with a pop sound. State names of A and

B and the chemical equation.

Answer

It is given that a compound A reacts with H_2SO_4 acid and releases gas B with effervescence. Gas B burns with a pop sound.

If the gas burns with a pop sound, this means gas B is hydrogen. Hydrogen gas gives pop sound when it burns.

The compound A must be a metal, i.e., zinc. When zinc reacts with H_2SO_4, it releases hydrogen gas and forms a salt. The reaction is:

$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

Thus, compound A is zinc

B is hydrogen gas.

32. Question

Explain acid and based according to Bronsted Lowry and theory.

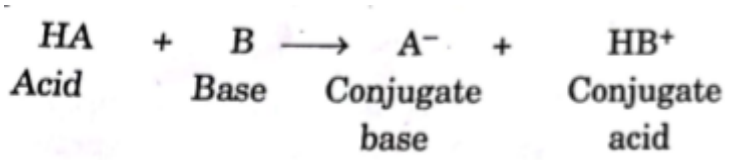
Answer

According to Bronsted Lowry theory:

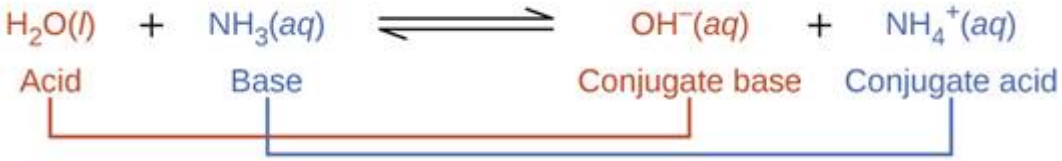
Acids are the substances which donate a proton.

Bases are the substances which accept a proton.

They give conjugate acid-base pair concept.



For example:



Here water (H_2O) is a proton donor, hence it is acid. Acid

changes into the conjugate base by losing a proton (H^+)

Ammonia (NH_3) is a proton acceptor, hence it is base. Base

changes into conjugate acid by accepting a proton (H^+)

33. Question

State the uses of pH in daily life.

Answer

Uses of pH in daily life:

The sting of insects: When a honeybee, ant or spiders sting a person, they inject an acidic liquid (formic acid) into the body. This causes too much pain and irritation. Baking soda (sodium hydrogen carbonate $NaHCO_3$) is a mild non-corrosive base.

When it is applied to the stung area, it reduces the effect of acid by neutralizing the excess acid. As a result, the pain and irritation are reduced.

Acidity in the stomach: Acidity causes pain and irritation in the stomach. Milk of magnesia [$Mg(OH)_2$] or $Al(OH)_3$ solution are used to treat acidity problem in the stomach.

These are the mild bases which neutralize the effect of hydrochloric acid produced in the stomach. These maintain the pH of the stomach and as a result decrease acidity.

Tooth decay: When teeth are not cleaned after food at night, some bacteria present in our mouth reacts with remains of food on teeth and produce acid. As a result, acid reduces the pH of mouth. If the pH falls to 5.5, then enamel of teeth can degrade.

Hence, we should brush our teeth with toothpaste (basic) which reduces the effect of acid in the mouth.

34 A. Question

Write name, method of preparation and uses of following :

NaOH,

Answer

(i) NaOH

Name: Sodium hydroxide

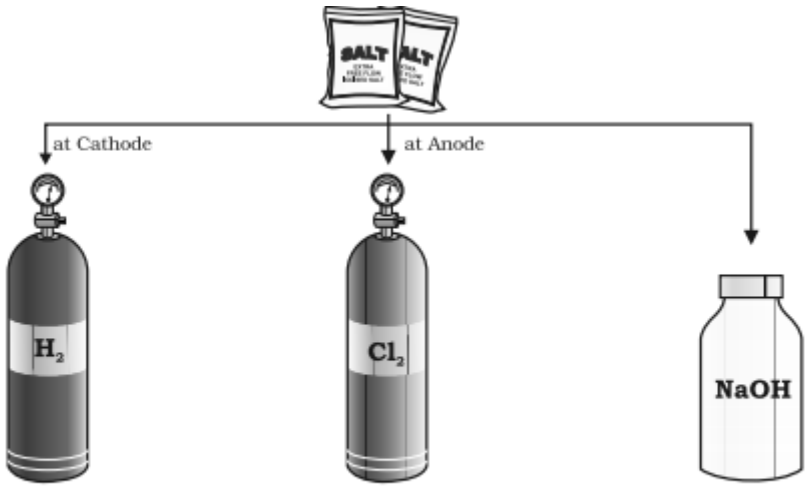
Methods of preparation: When a concentrated solution of sodium chloride is electrolyzed, it forms sodium hydroxide (NaOH), chlorine gas and hydrogen gas.

Chlorine gas is formed at the anode (positive charge) and hydrogen gas at the cathode (negative charge)

The reaction takes place is given as:

$2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 + H_2$

The above reaction is called chlor-alkali process.



Chlor-alkali process

Uses:

a. It is used in the synthesis of soap, paper, and other chemicals.

b. It is used in the preparation of oils.

c. It is used in the refining of petroleum

34 B. Question

Write name, method of preparation and uses of following :

$NaHCO_3$

Answer

Name: Sodium hydrogen carbonate or baking soda

Methods of preparation: Baking soda is prepared by passing carbon dioxide gas in the solution of sodium carbonate.

$$\underset{\text{Sodium Carbonate}}{Na_2CO_3} + CO_2 + H_2O \rightarrow \underset{\text{Sodium Carbonate}}{2NaHCO_3}$$

Uses:

a. It is used in fire extinguishers.

b. It is used as a mild antiseptic.

c. It is used as a laboratory reagent.

d. It is also used as an antacid to reduce acidity in the stomach.

34 C. Question

Write name, method of preparation and uses of following :

$Na_2CO_3.10H_2O$

Answer

Name: Sodium carbonate decahydrate or Washing soda

Methods of preparation: Washing soda is prepared by Solvay process. On heating baking soda, sodium carbonate is obtained

$$\underset{\text{Baking soda}}{NaHCO_3} + \text{heat} \rightarrow \underset{\text{Sodium carbonate}}{Na_2CO_3} + H_2O + CO_2$$

On recrystallization od sodium carbonate, washing soda is formed:

$Na_2CO_3 + 10H_2O$ + crystallization $\rightarrow Na_2CO_3.10H_2O$

Uses:

a. It is used for washing and cleaning purpose.

b. It is used in paper, paint and textile industry.

c. It is used as a laboratory reagent.

34 D. Question

Write name, method of preparation and uses of following :

$CaOCl_2$

Answer

Name: Bleaching powder or calcium hypochlorite

Methods of preparation:

When dry slaked lime is passed through chlorine gas, it forms bleaching powder. The reaction takes place is given as:

$$\underset{\text{Slaked lime}}{Ca(OH)_2} + Cl_2 \rightarrow \underset{\text{Bleaching powder}}{CaOCl_2} + H_2O$$

Uses:

a. It is used for disinfecting drinking water to make it germfree.

b. It is used for bleaching cotton and linen in the textile industry.

c. It is used to bleach dirty clothes in the laundry.

34 E. Question

Write name, method of preparation and uses of following :

$CaSO_4$. 1/2 H_2O.

Answer

Name: Calcium sulphate hemihydrate or Plaster of Paris (POP)

Methods of preparation: When gypsum is heated upto 393K to produce Plaster of Paris.

$$\underset{\text{Gypsum}}{2CaSO_4.2H_2O} + \text{heat (393K)} \rightarrow \underset{\text{Plaster of Paris}}{CaSO_4.\ ½\ H_2O}$$

Uses:

a. It is used in building construction.

b. It is mainly used to join fractured bones.

c. It is used in the formation of statues.

35. Question

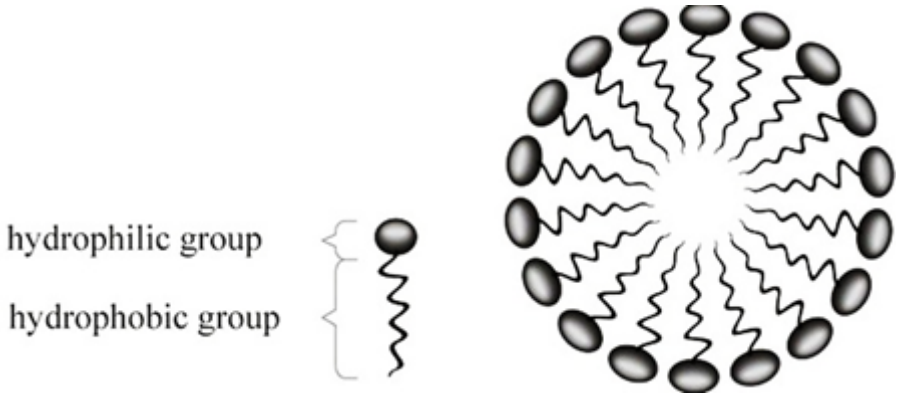
How are Micelles formed? Discuss the mechanism also.

Answer

i. Soaps and detergents clean clothes in micelle formation.

ii. Soap contains a hydrophilic polar head and a hydrophobic tail.

iii. Soap molecules after ionization in water, arrange themselves around oily dirt in such a manner that generally spherically shaped micelles are formed.

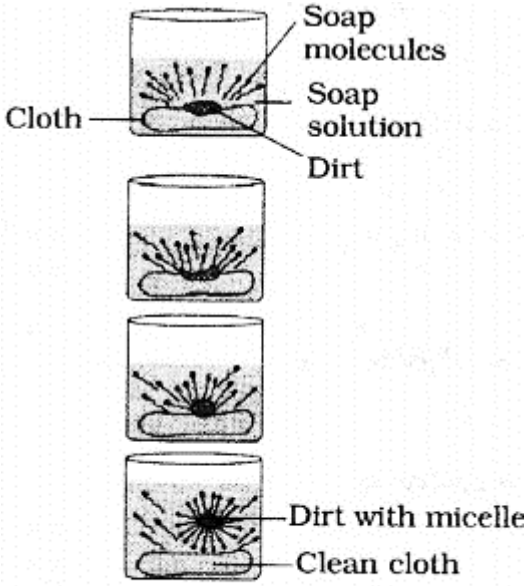


iv. During micelle formation, hydrophobic tail attracts the dirt particles and remains inside whereas the hydrophilic polar head remains outside and reacts with water.

v. Thus, oil dirt gets surrounded by micelle.

vi. All micelles are negative charges. Hence, do not precipitate.

vii. As a result, when soaps are applied n dirty clothes in water, all dirt gets removed by water and clothes become clean.



Representing the cleansing action of soap