

NCERT SOLUTIONS OF ACIDS, BASES AND SALTS

QUESTION1: You have been provide with three taste tubes. One of them contains distilled water and the other two contains an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each tube?

Answer:

We know from the chapter concept that

Basic solution	Litmus paper change to blue
Acid Solution	No change
Neutral solution	No change

Thus, basic solution can be easily identified.

When acid and a base react with each other. They neutralize each other to form salt and water.

So following steps can be taken to distinguish the test tubes with the help of litmus paper

Step 1: Let us mark the three taste tubes as P, Q, and R respectively

Step2: A drop of solution in taste tube A is put on the red litmus paper. Same is repeated with solution B and C. If either of them change colour to blue, then it is basic. Therefore, out of three, one is eliminated.

Step 3: Out of remaining two, anyone can be acidic or neutral. Now a drop of basic solution is mixed with a drop of each of the remaining two solutions separately and then a drop of each solution is put on the red litmus paper.

If the colour of red litmus turns blue, then that solution is neutral and if there is no change in colour, then that solution is acidic.

This is because acidic and basic solutions neutralize each other. Hence , we can distinguish between the three types of solutions.

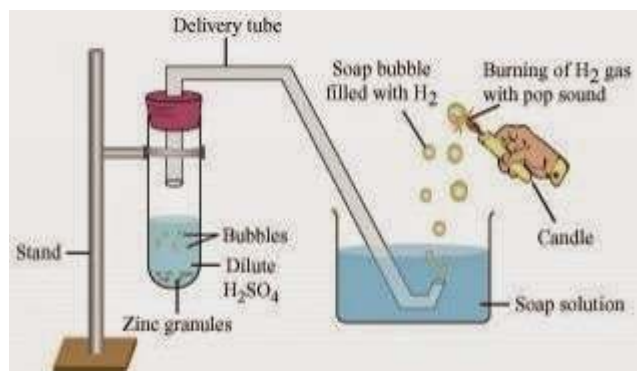
QUESTION 2: Why should curd and sour substances not be kept in brass and copper vessels?

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Answer: Curd and other sour substances contain acids. Therefore, when they are kept in copper and brass vessels, the metal reacts with the acid to liberate hydrogen gas and harmful products, thereby spoiling the food.

QUESTION 3 which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas?

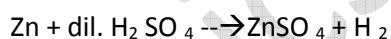
Answer: Hydrogen gas is usually liberated when an acid reacts with a metal.



Example

Procedure: Step 1: Take few pieces of zinc granules and add 5 ml of dilute H_2SO_4

Step 2: Shake it and pass gas produced into a soap solution. The bubbles are formed in the soap solution. These soap bubbles contain hydrogen gas.



Test for hydrogen gas: The evolved hydrogen gas can be tested by bringing a burning candle near the soap bubbles. Hydrogen gas burns with a pop sound.

QUESTION 4: Metal compound A reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.

Answer:

Metal compound A should be compounds of Ca as a calcium salt is formed in the product. We know that CO_2 extinguishes a burning candle. Also, since carbon dioxide is liberated, therefore, it must be a carbonate. Hence, it is calcium carbonate.



Hence metal compound A is calcium carbonate.

QUESTION 5: Why do HCL, HNO₃, etc., show acidic characters in aqueous solutions while solution of compounds like alcohol and glucose do not show acidic character?

Answer: HCL and HNO₃ dissociate in the presence of water to form hydrogen or hydronium ions.

Although aqueous solutions of glucose and alcohol contain hydrogen, these cannot dissociate in water to form hydrogen or hydronium ions. Hence they do not show acidic character.

QUESTION 6 : Why does an aqueous solution of acid conduct electricity?

Answer: Acid dissociate in aqueous solutions to form ions. These ions are responsible for conduction of electricity.

QUESTION 7 : Why does dry HCL gas not change the colour of the dry litmus paper?

Answer: Dry HCL gas does not change the colour of the dry litmus paper because it does not contain hydrogen or hydronium ions.

QUESTION 8: While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

Answer: As the reaction between an acid and water is exothermic reaction, It is recommended that acid should be added to water and not water to the acid because the process of dissolving an acid in water is exothermic. If water is added to acid, since large amount of acid is present, a large amount of heat is generated, the mixture splashes out and causes burns.

QUESTION 9: How is the concentration of hydronium ions (H₃O⁺) affected when a solution of an acid is diluted?

Answer: When an acid is diluted, the concentration of hydronium ions (H₃O⁺) per unit volume decreases. This means that the strength of the acid decreases.

QUESTION 10: How is the concentration of hydroxide ions (OH⁻) affected when excess base is dissolved in a solution of sodium hydroxide?

Answer: the concentration of hydroxide ions (OH⁻) would increase when excess base is dissolved in a solution hydroxide.

QUESTION 11 : You have two solutions A and B . The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration ? Which of this acidic and which one is basic?

Answer:

We know from the chapter concept that

pH < 7	Acidic Solution
pH=7	Neutral solution
pH > 7	Basic solution

A pH value of less than 7 indicates an acidic solution, while greater than 7 indicates a basic solution. Therefore, the solution with pH = 6 is acidic and has more hydrogen ion concentration than the solution pH = 8 which is basic.

QUESTION 12: What effect does the concentration of $H^+(aq)$ ions have on the nature of the solution?

Answer: The concentration of H^+ ions is directly proportional to the acidity of a solution.

If the concentration of H^+ ions is increased, the solution becomes more acidic. If the concentration of H^+ ions decreased, the solution becomes less acidic or more basic.

QUESTION 13: Do basic solutions also have $H^+(aq)$ ions? If yes then why are they basic?

Answer: Yes, a basic solution also has $H^+(aq)$ ions. However their concentration is less as compared to the concentration of $OH^-(aq)$ ions that makes the solution basic.

QUESTION 14: Under what soil condition do you think a farmer would treat the soil of his field with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)?

Answer: As calcium oxide, calcium hydroxide and calcium carbonate are basic in nature. So, when an acid reacts with a base, a neutralization reaction takes place.

So if the soil is acidic and improper for cultivation, then to neutralize the acidity of the soil, the farmer would treat the soil with quick lime or slaked lime or chalk.

QUESTION 15: What is the common name of compound $CaOCl_2$?

Answer: Bleaching powder.

QUESTION 16: Name the substance which on treatment with chlorine yields bleaching powder?

Answer: Calcium hydroxide $[Ca(OH)_2]$

QUESTION 17: Name sodium compound which is used for softening hard water?

Answer: Washing soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) is used for softening hard water.

QUESTION 18: What will happen if a solution of sodium hydrocarbonate is heated?

Answer: When a solution of sodium hydrocarbon ate is heated, sodium carbonate and water are formed with the evolution of carbon dioxide gas.

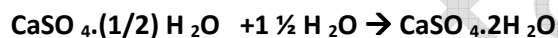


NaHCO_3 : sodium hydrocarbonate

Na_2CO_3 : Sodium Carbonate

QUESTION 19: Write an equation to show the reaction between Plaster of Paris and water?

Answer: The chemical equation for the reaction of Plaster of Paris and water can be represented as:



Plaster of pares $\rightarrow \text{CaSO}_4 \cdot (1/2) \text{H}_2\text{O}$

Gypsum $\rightarrow \text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

QUESTION 20: A solution turns red litmus blue, its pH is likely to be

(a) 1

(b) 4

(c) 5

(d) 10

Answer: Bases turns red litmus blue and acids turn litmus red . Basic solution has a pH value more than 7. Since the solution turns red litmus blue, its pH is likely to be 10

QUESTION 21 A solution reacts with crushed egg-shells to give a gas that turns lime water milky. The solution contains

(a) NaCl

(b) HCL

(c) LiCl

(d) KCl

Answer: HCL

QUESTION 22: 10 mL of a solution of NaOH is found to be completely neutralized by 8 mL of a given solution of HCL. If we take 20mL of the same solution of NaOH, the amount of HCL solution (the same solution as before) required to neutralize it will be:

(a) 4mL

(b) 8mL

(c) 12mL

(d) 16mL

Answer: (d) 16mL

QUESTION 23 Which one of the following types of medicines is used for treating indigestion?

(a) Antibiotic

(b) Analgesic

(c) Antacid

(d) Antiseptic

Answer: Antacid

QUESTION 24: Write word equation and then balanced equations for the reaction taking place when-

(a) Dilute sulphuric acid reacts with zinc granules.

(b) Dilute hydrochloric acid reacts with magnesium ribbon.

(c) Dilute sulphuric acid reacts with aluminum powder.

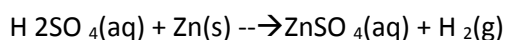
(d) Dilute hydrochloric acid reacts with iron filings.

Answer:

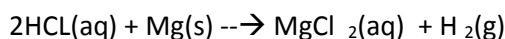
How to solve these type of question

- First convert the word equation into skeletal equation
- Start by finding out how many atoms of each type are on each side of the equation
- You can make a little table listing the numbers of each atom for the left hand side and for the right hand side
- Balance the different Atoms on both side of equation by multiply the chemical species on the side which doesn't have enough atoms of that type by the number required to bring it up to the same as the other side.

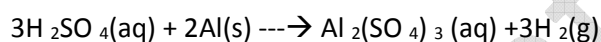
(a) Sulphuric acid + Zinc \rightarrow Zinc sulphate + Hydrogen



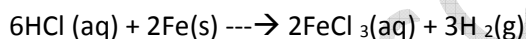
(b) Hydrochloric acid + Magnesium \rightarrow Magnesium chloride + Hydrogen



(c) Sulphuric acid + Aluminium \rightarrow Aluminum sulphate + Hydrogen

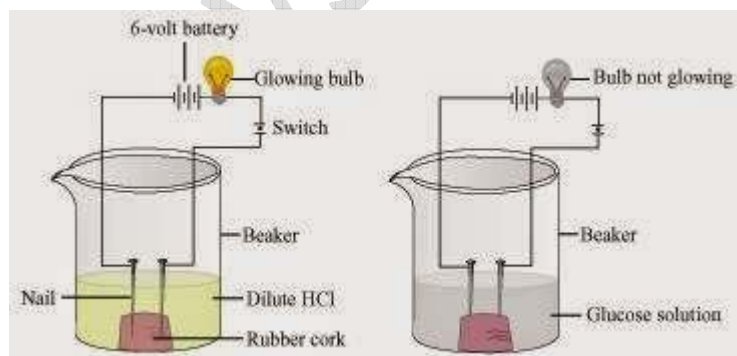


(d) Hydrochloric acid + iron \rightarrow Ferric chloride + Hydrogen



QUESTION 25 Compound such as alcohols and glucose also contain hydrogen but are not categorized as acids. Describe an activity to prove it.

Answer:



Procedure:

Step 1: Two nails are fitted in a cork and are kept it in a 100mL beaker.

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Step 2: The nails are then connected to the two terminals of a 6-volt battery through a bulb and switch.

Step 3: Some dilute HCl is poured in the beaker and current is switched on.

Step 4: The same experiment is then performed with glucose solution and alcohol solution.

Observations: It will be observed that the bulb glows in the HCl solution and does not glow in the glucose solution.

HCl dissociate into H^+ (aq) and Cl^- (aq) ions. These ions conduct electricity in the solution which results in the glowing of the bulb. On the other hand, the glucose solution which does not dissociate into ions. Therefore, it does not conduct electricity.

Conclusion: From this activity, it can be concluded that all acids contain hydrogen but not all compounds containing hydrogen are acids.

That is why, though alcohol and glucose contain hydrogen, they are not categorized as acids.

QUESTION 26 Why does distilled water not conduct electricity, whereas rain water does?

Answer: Distilled water is a pure form of water and is devoid of any ionic species. Therefore, it does not conduct electricity. Rain water, being an impure form of water, contains many ionic species such as acid and therefore, it conducts electricity.

QUESTION 27 Why do acids not show acidic behavior in the absence of water?

Answer: Acids do not show acidic behavior in the absence of water because there are no hydrogen ions available for conduction of electricity. Acids dissociate in the presence of water to give free hydrogen ions. It is the hydrogen ions that are responsible for the acidic behavior.

QUESTION 28: Five solutions A, B, C, D and E when tested with universal indicator showed pH as 4, 1, 11, 7 and 9, respectively. Which solution is

- (a) neutral?
- (b) strongly alkaline?
- (c) strongly acidic?
- (d) weakly acidic?
- (e) weakly alkaline?

Arrange the pH in increasing order of the concentration of hydrogen ions

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Answer

We know from the chapter concept that

pH < 7	Acidic Solution
pH=7	Neutral solution
pH > 7	Basic solution

- (a) Neutral →Solution D with pH 7
- (b) Strongly alkaline →Solution C with pH 11
- (c) Strongly acidic →Solution B with pH 1
- (d) Weakly acidic →Solution A with pH 4
- (e) Weakly alkaline →Solution E with pH 9

Arrangement in increasing order of concentration of hydrogen ions $11 < 9 < 7 < 4 < 1$

QUESTION 29: Equal lengths of magnesium ribbons are taken in the test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH_3COOH) is added to test tube B. In which test tube will the fizzing occur more vigorously and why?

Answer: The fizzing will occur strongly on the test tube A, in which hydrochloric acid (HCl) is added. This is because HCl is a stronger acid than CH_3COOH and therefore produces hydrogen gas at a faster speed due to which fizzing occurs.

QUESTION 30 Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

ANSWER:

We know from the chapter concept that

pH < 7	Acidic Solution
pH=7	Neutral solution
pH > 7	Basic solution

The pH of milk is 6. As it changes to curd, the pH will reduce because curd is acidic in nature. The acid present in it decreases the pH.

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QUESTION 31: A milkman adds a very small amount of baking soda to fresh milk.

(a) Why does he shift the pH of the milk from 6 to slightly alkaline?

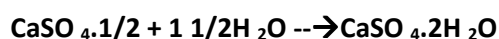
(b) Why does this milk take a long time to set as curd?

Answer: (a) The milkman shift the pH of the fresh milk from 6 to slightly alkaline because in alkaline condition, milk does not set as curd easily.

(b) Since this milk is slightly basic than usual milk, acids produced to set the curd are neutralized by the base. Therefore, it takes a longer time for the curd to set.

QUESTION 32 Plaster of Paris should be stored in moisture –proof container. Explain why?

Answer: Plaster of Paris should be store in moisture – proof container because Plaster of Paris, a powdery mass, absorbs water (moisture) to form a hard solid known as gypsum.



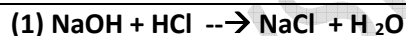
Plaster of	Water	Gypsum
Paris		(Hard solid)

QUESTION 33: What is neutralization reaction? Give two examples.

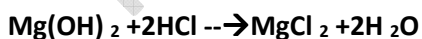
Answer:

Neutralization reaction: A reaction in which an acid and base react with each other to give a salt and water is termed as neutralization reaction. In this reaction, energy is evolved in the form of heat.

For example:



(2) During indigestion (Caused due to production of excess of hydrochloric acid in the stomach), we administer an antacid (generally milk of magnesia, $\text{Mg}(\text{OH})_2$ which is basic in nature) The antacid neutralizes the excess of acids and thus give relief from indigestion.



QUESTION 34: Give two important uses of washing soda and baking soda.

Answer: Two important used of washing soda and baking soda is as follows:

Washing soda	Baking soda
<p>(a) It is used in glass, soap, and paper industries.</p> <p>(b) It is used to remove permanent hardness of water.</p>	<p>(a) It is used as baking powder. Baking powder is a mixture of baking soda and a mild acid known as tartaric acid. When it is heated or mixed in water, it releases Carbon dioxide gas that makes bread or cake fluffy.</p> <p>(b) It is used in soda –acid fire extinguishers</p>