

Acids, Bases and Salts

Solved Intext Exercises

Q1. You have been provided with three test tube. 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 test tube?

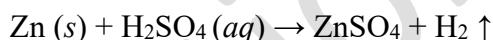
Sol. We put red litmus paper in all the three solutions. The solution which turns red litmus paper blue is basic solution. In rest of the two solutions we put the blue litmus paper obtained above. The solution which turns blue litmus back into red litmus is acidic., The third solution left is distilled water.

Q2. Why should curd and sour substances not kept in brass and copper vessels?

Sol. Curd and sour substances are acidic in nature. Acids reacts with brass and copper as they are metals and produce salts which are poisonous. Therefore, curd and sour substances should not be kept in brass and copper vessels.

Q3. 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?

Sol. Hydrogen gas is usually liberated when an acid reacts with a metal. For example, zinc reacts with sulphuric acid to produces zinc sulphate and hydrogen gas.



The presence of hydrogen gas is tested by bringing a burning candle or splinter near the gas. If the gas burns with a pop sound, it is hydrogen gas.

Q4. A metal compound A reacts with dilute hydrochloric acid effervescence. to produce The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.

Sol. The metal compound A will be calcium carbonate. The gas produced is carbon dioxide.



Q5. Why do HCl, HNO₃, etc, show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

Sol. HCl, HNO₃, etc, show acidic character in aqueous solutions because they produce hydrogen ions, H⁺(aq) only in solution. The hydrogen ions, H⁺(aq) are responsible for the acidic properties. Alcohol and glucose do not produce hydrogen ions, H⁺(aq). Hence they do not show acidic character.

Q6. Why does an aqueous solution of an acid conduct electricity?

Sol. Aqueous solution of an acid conducts electricity because they produce hydrogen ions [H⁺(aq)] which are responsible for electric current to flow.

Q7. Why does dry HCl gas not change the colour of the dry litmus paper?

Sol. Dry HCl gas does not produce H⁺ ion because seperation of H⁺ ions from HCl molecules cannot occur in the absence of water. Hence the colour of dry litmus paper does not change the colour of dry litmus paper due to absence of H⁺ ions.

Q8. While diluting an acid, why it is recommended that the acid should be added to water and not water to the acid?

Sol. Water should never be added to dilute acid because when water is added to the acid, the heat produced is so large that it may cause the mixture to splash out and burn the person standing near it.

Q9. How is the concentration of hydronium ions (H_3O^+) affected when a solution of an acid is diluted?

Sol. The concentration of hydronium ions (H_3O^+) per unit volume decreases.

Q10. How is the concentration of hydroxide ions (OH^-) affected when excess base is dissolved in a solution of sodium hydroxide?

Sol. The concentration of hydroxide ion (OH^-) per unit volume increases.

Q11. 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 is acidic and which one is basic?

Sol. Solution A has more hydrogen ion concentration than solution B. Solution A having pH 6 is acidic. Solution B having pH 8 is basic.

Q12. What effect does the concentration of $\text{H}^+(\text{aq})$ ions have on the nature of the solution?

Sol. Concentration of $\text{H}^+(\text{aq})$ ions makes the solution acidic. The more the concentration of $\text{H}^+(\text{aq})$ ions the stronger the acid is.

Q13. Do basic solutions also have $\text{H}^+(\text{aq})$ ions? If yes, then why are these basic?

Sol. Yes, basic solutions also have $\text{H}^+(\text{aq})$ ions. These are basic because the concentration of hydroxide (OH^-) ions is much more than the concentration of $\text{H}^+(\text{aq})$ ions.

Q14. Under what soil condition do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)?

Sol. A farmer would treat the soil of his field with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate) when the acidity increases in the soil i.e., the amount of acid increases than the required amount.

Q15. What is the common name of the compound CaOCl_2 ?

Sol. Bleaching powder.

Q16. Name the substance which on treatment with chloride yields bleaching powder.

Sol. Dry slaked lime $[\text{Ca}(\text{OH})_2]$

Q17. Name the sodium compound which is used for softening hard water.

Sol. Sodium carbonate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$)

Q18. What will happen if a solution of sodium hydrocarbonate is heated? Give the equation of the reaction involved.

Sol. Carbon dioxide gas is given out



Q19. Write an equation to show the reaction between Plaster of Paris and water.

Sol. $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O} \rightarrow \text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Solved NCERT Exercises

Q1. A solution turns red litmus blue, its pH likely to be

Sol. (d) 10

Q2. A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains.

Sol. (b) HCl. The egg - shells are made of calcium carbonate and gas which turns lime water milky is carbon di oxide gas.

Q3. 10 mL of a solution of NaOH is found to be completely neutralised for 8mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount HCl solution (the same solution as before) required to neutralise it will be

(a) 4mL (b) 8mL (c) 12mL (d) 16mL

Sol. (d) 16 mL

Q4. Which one of the following types of medicines is used for treating indigestion?

Sol. (c) Antacid

Q5. Write word equations 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 aluminium powder.
- (d) dilute hydrochloric acid reacts with iron filings.

Sol.

(a) Zinc + dil Sulphuric acid \rightarrow Zinc Sulphate + Hydrogen gas
 $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2 \uparrow$

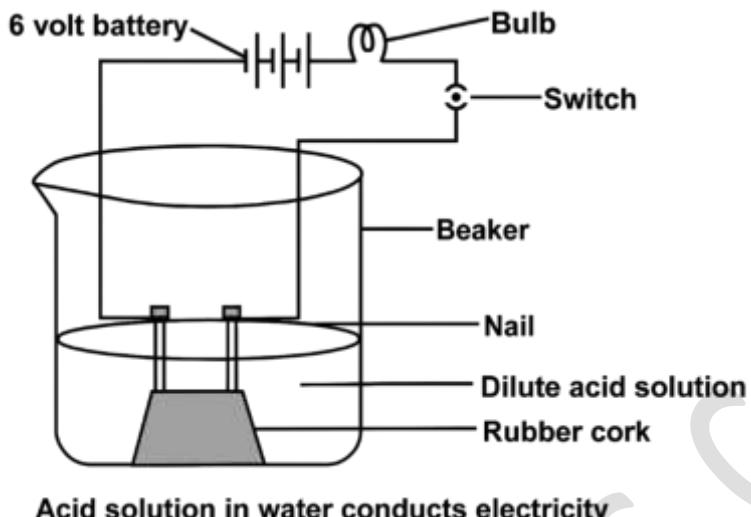
(b) Magnesium + dil Hydrochloric Acid \rightarrow Magnesium chloride + Hydrogen gas
 $Mg + 2HCl \rightarrow MgCl_2 + H_2 \uparrow$

(c) Aluminium + dil Sulphuric Acid \rightarrow Aluminium sulphate + Hydrogen gas
 $2Al + 3H_3SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2 \uparrow$

(d) Iron + dil Hydrochloric acid \rightarrow Iron chloride + Hydrogen gas
 $Fe + 2HCl \rightarrow FeCl_2 + H_2 \uparrow$

Q6. Compounds such as alcohols and glucose also contain hydrogen but are not categorised as acids. Describe an activity to prove it.

Sol. We fix two nails on a cork and place the cork in a 100 mL beaker. We connect the nails to the two terminals of a 6 volt battery through a bulb and switch as shown in figure.



We now pour glucose and alcohol solution one by one in the beaker and switch on the current. We observe that bulb does not glow. Thus glucose and alcohol do not conduct electricity. Hence they are not categorised as acids because acids conduct electricity.

Q7. Why does distilled water not conduct electricity, whereas rainwater does?

Sol. Distilled water does not conduct electricity because it is neutral and does not generate Hydrogen (H^+)_{aq} ions.

Q8. Why do acids not show acidic behaviour in the absence of water?

Sol. Acids do not show acidic behaviour in the absence of water because separation of H^+ ions from acids cannot occur in the absence of water. Acids show acidic behaviour only in the presence of H^+ ions.

Q9. 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) neutrals? (b) strongly alkaline? (c) strongly acidic? (d) weakly acidic?
 (e) weakly alkaline?

Arrange the pH in increasing order of hydrogen-ion concentration.

Sol.

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

pH in increasing order of hydrogen-ion concentration is : $11 < 9 < 7 < 4 < 1$

i.e. solution C < Solution E < Solution D < Solution A < Solution B

Q10. Equal lengths of magnesium ribbons are taken in 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?

Sol. Bacteria changes the fresh milk into curd producing lactic acid, because of the presence of lactic acid in curds, the pH will come down from 6 to a lower value.

Q11. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

Sol. The pH of milk will change and become less than 6 as milk turns into curd. The reason is that curd is more acidic than milk.

Q12. A milkman adds a very small amount of baking soda to fresh milk.

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

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

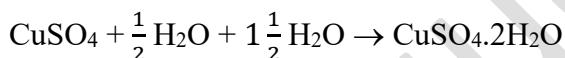
Sol.

(a) He shifts the pH of the fresh milk from 6 to slightly alkaline because it will take more time for the milk to get sour.

(b) The slightly alkaline milk takes a longer time to set into curd because the lactic acid being formed during curdling has first neutralized the Alkali present in it.

Q13. Plaster of Paris should be stored in a moisture-proof container. Explain why.

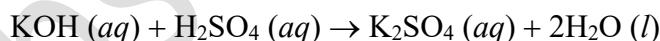
Sol. Plaster of Paris should be stored in a moisture-proof container because if Plaster of Paris comes in contact with water then a slurry is formed which solidifies rapidly into a hard crystalline mass of gypsum.



Q14. What is a neutralisation reaction? Give two examples.

Sol. The reaction between an acid and a base to give a salt and water is known as neutralisation reaction.

Examples: $\text{NaOH} \text{ (aq)} + \text{HCl} \text{ (aq)} \rightarrow \text{NaCl} \text{ (aq)} + \text{H}_2\text{O} \text{ (l)}$



Q15. Give two important uses of washing soda and baking soda.

Sol. Uses of Washing soda

- (i) in the manufacture of glass, soap, paper.
- (ii) removing permanent hardness in water.
- (iii) as a cleaning agent for domestic purposes.
- (iv) in laundry as washing soda.

Uses of Baking soda

- (i) as an ingredient in an antacid
- (ii) as an additive in foods and drinks.
- (iii) as fire extinguisher.

(iv) as a constituent of baking powder.