Acids, Bases and Salts

CHAPTER 2

NCERT FOCUS

ANSWERS

Topic 1

1. The curd and sour substances are acidic. They will react with brass (alloy of copper and zinc metals) and copper vessels and will spoil the vessels.

2. The compound *A* must be calcium carbonate because carbonates react with the acids to produce carbon dioxide gas which extinguishes fire, and also the compound formed will be calcium chloride as follows :

$$\underset{\text{Calcium carbonate}}{CaCO_{3(s)}} + \underset{\text{Hydrochloric acid}}{2HCl_{(aq)}} \rightarrow \underset{\text{Calcium chloride}}{CaCl_{2(aq)}} + \underset{\text{Water}}{H_2O_{(l)}} + \underset{\text{Carbon dioxide}}{CO_{2(g)}}$$

3. HCl and HNO_3 produce $H^+_{(aq)}$ ions in aqueous solution, which is responsible for their acidic character.

$$HCl_{(aq)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$$

$$HNO_{3(aq)} \rightarrow H^+_{(aq)} + NO^-_{3\,(aq)}$$

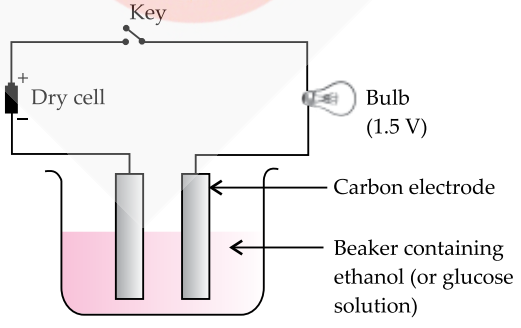
Alcohol (C_2H_5OH) and glucose ($C_6H_{12}O_6$) are covalent compounds and they do not undergo dissociation in aqueous solution. This is evident from the fact that their aqueous solutions do not conduct electricity. Hence, the aqueous solutions of alcohol and glucose do not show acidic character even though they contain hydrogen atoms.

4. **Activity :** To show that alcohols and glucose are not acids.

Materials required : Dilute solution of ethanol and glucose solution.

Apparatus required : Beaker, carbon electrodes, dry cells, bulb 1.5 V, key.

Procedure : Take a beaker and place two carbon electrodes into it. Connect the electrodes to a battery bulb through a key and a dry cell. Pour ethanol into the beaker and press the key. See, if the bulb glows. Bulb does not glow.



Ethanol and glucose solutions do not conduct electricity

Repeat similar experiment with glucose solution. Record your observations.

Observation : It is observed that the bulb does not glow with both the solutions.

Conclusion : The solutions of glucose and ethanol are non-conductors of electricity.

Explanation : Solution of both ethanol and glucose contain hydrogen in their molecule but they do not conduct electricity because these compounds do not produce H^+ ions in solution. Hence, these are not categorised as acids.

5. Basic solutions also have H^+ ions in addition to OH^- ions. They are basic because in these solutions, OH^- ions concentration is greater than H^+ ions concentration.

6. On dissolving excess base in a solution of sodium hydroxide, concentration of OH^- ions per unit volume in the solution increases.

7. When the solution of acid is diluted, the H^+ ions are released from the acid to combine with H_2O and hence, H_3O^+ ions concentration is increased.

8. Distilled water is pure and it does not form ions. Whereas rain water contains impurities in it like acid which contains ions and release them when dissolved in water. Hence, no electricity is conducted by distilled water, but ions are there in rain water so electricity is conducted.

9. Dilution of a concentrated acid, particularly concentrated sulphuric acid, is a highly exothermic reaction. When water is added to a concentrated acid, the heat liberated is so large that the solution starts almost boiling. This may cause spurting of the hot acid solution and harm the person. Excessive local heating may even break the glass container. That is why concentrated acids are diluted by slowly adding concentrated acid into water with constant stirring and not by adding water to the acid.

10. Dry HCl gas does not show acidic character due to absence of H^+ ions and therefore, does not change the colour of the dry litmus paper.

11. Acids ionise only in the presence of water to give ions.

$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

However, in the absence of water, acids do not ionise to give H_3O^+ ions and therefore, do not behave as acids.

12. In test tube *A*, hydrochloric acid is present which is a strong acid as compared to acetic acid present in test tube *B* which is a weak acid.

The fizzing occurs more vigorously in test tube *A* as HCl is strong and dissociates completely into H^+ and Cl^- ions as compared to weak acid which do not dissociate completely.

13. Egg shell contains calcium carbonate. When nitric acid is added to egg shell it is dissolved in the acid giving out carbon dioxide gas.

$$CaCO_3 + 2HNO_3 \longrightarrow Ca(NO_3)_2 + H_2O + CO_2$$

14. *X* is NaOH,

$$\underset{(X)}{2NaOH} + Zn \rightarrow \underset{\text{Sodium zincate } (A)}{Na_2ZnO_2} + H_2$$

$$NaOH + HCl \rightarrow \underset{\text{Sodium chloride } (B)}{NaCl} + H_2O$$

$$NaOH + CH_3COOH \rightarrow \underset{\text{Sodium acetate } (C)}{CH_3COONa} + H_2O$$

15. When zinc metal reacts with a dilute solution of a strong acid, hydrogen gas is evolved. H_2 gas is used for hydrogenation of oil. The gas can be detected by bringing a burning splinter near the mouth of the test tube. The gas burns with a pop sound.

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2\uparrow$$

Topic 2

1. (a) Solution *D* is neutral (pH = 7).
(b) Solution *C* is strongly alkaline (pH = 11).
(c) Solution *B* is strongly acidic (pH = 1).
(d) Solution *A* is weakly acidic (pH = 4).
(e) Solution *E* is weakly alkaline (pH = 9).
pH in the increasing order of hydrogen ion concentration :
pH = 11 < pH = 9 < pH = 7 < pH = 4 < pH = 1

2. The solutions can be distinguished by any acid-base indicator.
(i) Phenolphthalein will give pink colour with base while remain colourless in acid.
(ii) Turmeric solution will turn red in base while remain yellow in acid.

3.

	Substance	Action on litmus paper
(i)	Dry HCl gas	No effect
(ii)	Moistened NH_3 gas	Turns red litmus blue
(iii)	Lemon juice	Turns blue litmus red
(iv)	Carbonated soft drink	Turns blue litmus red
(v)	Curd	Turns blue litmus red
(vi)	Soap solution	Turns red litmus blue

4. (a) The milkman adds baking soda to milk so that the milk becomes slightly alkaline. Thus, milk will not be converted to curd readily.
(b) This will take a longer time to set to curd because it is alkaline and takes longer time for bacteria to make it acidic.

5. Curd is sour in taste and acidic. Therefore, its pH will decrease from pH of 6 to a lower value.

6. If the soil condition is more acidic than optimum conditions.

7. Take three small pieces of red litmus paper. Put one drop each of the given solutions on these litmus papers.
The liquid which turns red litmus into blue is a basic solution. Divide the blue litmus paper so formed into two parts. Put one drop each of the other two liquids separately on these two pieces of litmus paper.
The solution which turns blue litmus paper red is acidic solution. The solution which does not affect the colour of litmus paper is water.

Topic 3

1. Bleaching powder
2. Dry slaked lime, $Ca(OH)_2$.
3. Sodium carbonate (washing soda).
4. When a solution of sodium hydrogen carbonate is heated, it gives sodium carbonate, carbon dioxide and water.

$$2NaHCO_3 \xrightarrow{\Delta} \underset{\text{Sodium carbonate}}{Na_2CO_3} + H_2O + CO_2\uparrow$$

5. It forms gypsum giving a hard solid mass.

$$\underset{\text{Plaster of Paris (White powder)}}{CaSO_4\cdot\frac{1}{2}H_2O} + \frac{3}{2}H_2O \xrightarrow{\Delta} \underset{\text{Gypsum (Solid mass)}}{CaSO_4\cdot 2H_2O}$$

6. Plaster of Paris in contact with moisture (water) changes to solid hard mass, gypsum. Therefore, it gets wasted. Hence it should be stored in moisture proof containers.

$$\underset{\text{Plaster of Paris}}{CaSO_4\cdot\frac{1}{2}H_2O} + \frac{3}{2}H_2O \longrightarrow \underset{\text{Gypsum}}{CaSO_4\cdot 2H_2O}$$

7. **Uses of washing soda :**
(1) It is used for softening of hard water.
(2) It is used for the manufacture of soap, glass, paper, borax, caustic soda, etc.

Uses of baking soda :
(1) It is mainly used in the preparation of baking powder. Baking powder contains sodium hydrogen carbonate and an acid like tartaric acid or citric acid.
(2) It is used in medicines as an antacid to remove acidity of the stomach. Therefore, it is an important constituent of an antacid.

8. The acid present in ant sting is methanoic acid (formic acid). The chemical formula of methanoic acid is HCOOH. To get relief from ant sting, a base like baking soda ($NaHCO_3$) is applied on the area stung by ant.

9. Baking powder ($NaHCO_3$) gives carbon dioxide gas on heating which when passed through limewater, turns it milky.

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$$

$$CO_2 \xrightarrow{Ca(OH)_2} \underset{\text{(milky)}}{CaCO_3\downarrow} + H_2O$$

Washing soda ($Na_2CO_3 \cdot 10H_2O$) on the other hand, does not give CO_2 gas on heating but becomes anhydrous.

$$Na_2CO_3 \cdot 10H_2O \xrightarrow{heat} Na_2CO_3 + 10H_2O$$

10. The sulphate salt is plaster of Paris. Its chemical name is calcium sulphate hemihydrate ($CaSO_4 \cdot \frac{1}{2} H_2O$). It is soft as two formula units of $CaSO_4$ share one molecule of water. When left open it absorbs water and forms gypsum which is a hard solid mass.

$$\underset{\text{Plaster of Paris}}{CaSO_4 \cdot \frac{1}{2} H_2O} + 1\frac{1}{2} H_2O \longrightarrow \underset{\text{Gypsum}}{CaSO_4 \cdot 2H_2O}$$

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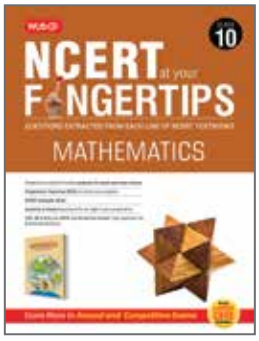

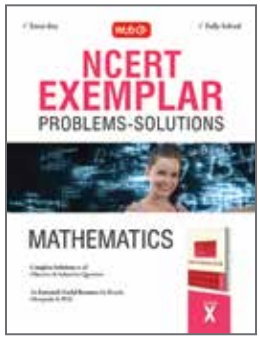

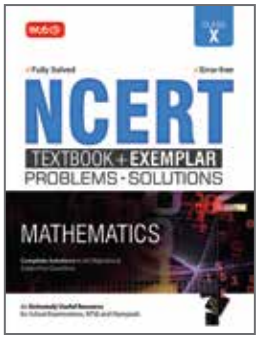

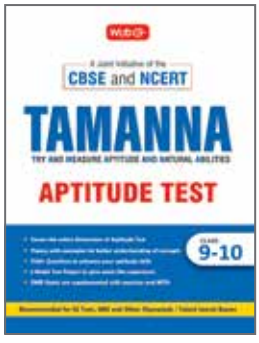

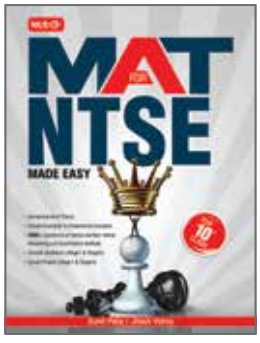

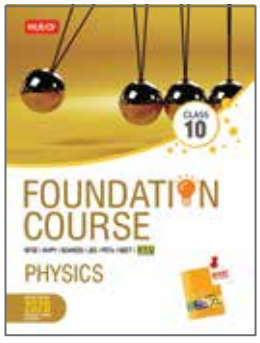

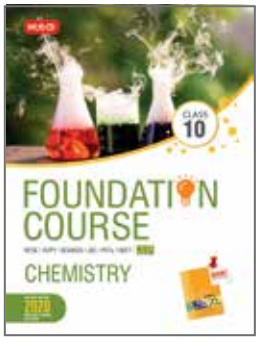

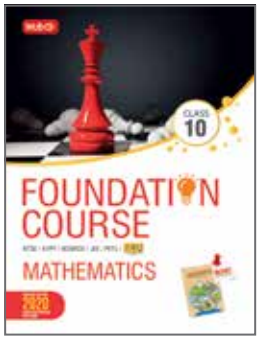

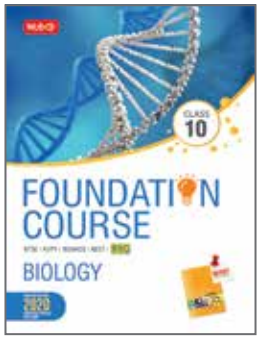

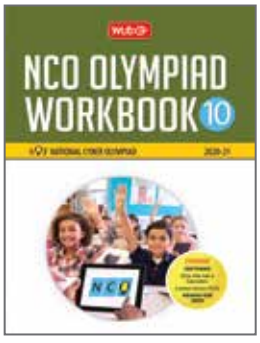

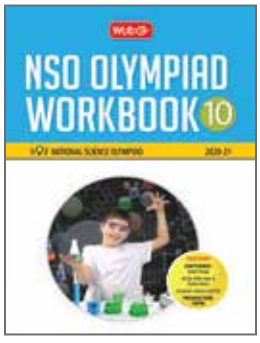

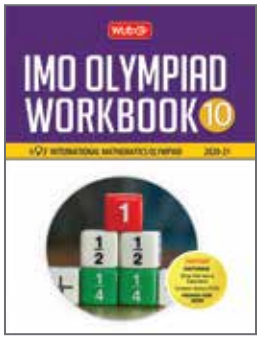

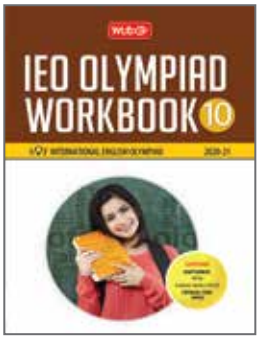

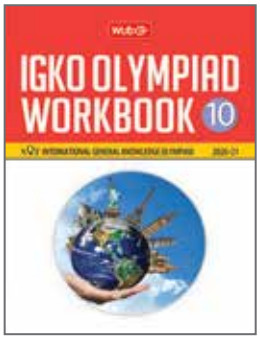

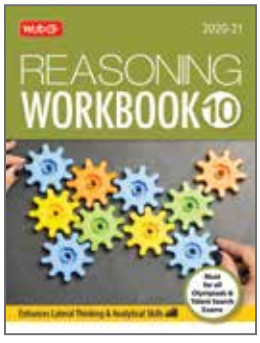

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