CHAPTER-2
ACIDS, BASES AND SALTS

Q.1. What is the pH of gastric juice, which is realesed during digestion?

Ans. Gastric juice contains hydrochloric acid (HCl) a strong acid thus, the pH of gastric juice is always less than 7.

Q.2.Why sodium carbonate (Na_2CO_3) is a basic salt?

Ans. Sodium carbonate is a basic salt because it is salt of weak acid and strong base.

Q.3. Which gas is evolved when sodium hydrogen carbonate ($NaHCO_3$) is added to acetic acid?

Ans. Carbon dioxide (CO_2) gas is evolved when sodium hydrogen carbonate is added to acetic acid.

Q.4. Out of two salts baking soda and washing soda, which salts does not contain water of crystallisation?

Ans. Baking soda ($NaHCO_3$) does not contain water of crystallisation.

Q.5.What happens when a solution of an acid is mixed with a solution of a base in the test tube?

Ans. When a solution of an acid is mixed with a solution of a base, then the temperature of the solution increases and salt formation takes place alongwith water.

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Q.6. If a few drops of concentrated acid accidentally spills over the hand of a student, what should be done?

Ans. Wash the hand immediately with plenty of water and apply a paste of baking soda ($NaHCO_3$). Here a strong base cannot be used to neutralise the acid due to its corrosive nature.

Q.7. What is the correct method of finding the pH of a solution?

Ans. To test the pH of a solution, it is best to put a drop of solution on the pH paper using a dropper.

Q.8. A few drops of liquid X were added to distilled water it was observed that the pH of the water decreased. What the liquid sample X could be?

Ans. Distilled water has pH = 7

X could be any acid like HCl therefore when it is added to water pH becomes less than 7 .

Q.9. Out of HCl and CH_3COOH, which solution has higher value of pH?

Ans. CH_3COOH (Acetic acid) has higher value of ph than HCl.

Since,CH_3COOH is a weak acid, therefore it ionises partially and hence has a higher pH value (i.e., furnishes less hydrogen ions in solution).

Q.10. A student has four samples A,B,C,D containing dil. HCl, aq KCl, dil. NaOH and distilled water. Which two samples would show equal value of pH?

Ans. Sample B and D will show equal value of pH because both are neutral.

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Q.11. On adding methyl orange to solution A, it imparts a pink colour and on adding it to solution B, a yellow colour is obtained. Write the nature of solution A and B.

Ans. Methyl orange shows red/pink colour in acidic solution but yellow in basic solution Thus, solution A is acid and solution B is basic.

Q.12. The zinc metals used in the laboratory for doing experiments is available in which form, zinc granules or zinc strips?

Ans. Zinc metal is available in zinc granules because it makes the reaction faster as compared to zinc strips.

Q.13. Name any ssalt which does not contain water of crystallisation?

Ans. Zinc sulphate ($ZnSO_4$) is an example of salt that does not contain water of crystallisation.

Q.14. Which gas would be evolved, if sodium bicarbonate is treated with tartaric acid?

Ans. Carbon dioxide gas (CO_2) will evolved if sodium bicarbonate is heated with tartaric acid.

Q.15. What would be the colour of litmus in a solution carbonate?

Ans. Sodium carbonate solution turns red litmus blue because it is a basic salt.

Q.16. Name a carbonate of a metal which has cleasing properties.

Ans. Sodium carbonate ($Na_2CO_3 \cdot 10H_2O$) is a carbonate of a metal which has cleansing properties.

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Q.17. Write the name and chemical formula of the products formed by heating gypsum at 373 k.

Ans. The products formed by heating gypsum at 373 K are

(i) Plaster of Paris or calcium sulphate hemihydrate $CaSO_4 \cdot \frac{1}{2} H_2O$

(ii) Water (H_2O)

Q.18. The pH of a sample of vegetable soup was found to be 6.5. How is the soup likely to taste?

Ans. The soup will taste slightly sour because its pH less than 7.

Q.19. Which bases are called alkalies? Give an example of alkali.

Ans. Water soluble bases are called alkalies.

Examples of alkalies are NaOH, KOH, etc.

Q.20. Write the name and chemical formula of the products formed by the action of chlorine on slaked lime.

Ans. The products formed by the action of chlorine on slaked lime are

(i) Bleaching powder or calcium oxychloride ($CaOCl_2$).

(ii) Water(H_2O).

Q.21. Write a balanced chemical equation for the reaction between sodium carbonate and hydrochloric acid indicating the physical state of the reactants and the products.

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Ans. $Na_2CO_3(s) + 2HCl(aq) \longrightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$

Q.22. Write the balanced chemical equation for a neutralisation reaction, mentioning the physical state of the reactants and the products.

Ans. $HCl(aq) + NaOH(aq) \longrightarrow NaCl(aq) + H_2O(l)$

Q.23. (a) Name the acid present in the ant sting and give its chemical formula.

(b) Also give the common method to get relief from the discomfort caused by the ant sting.

Ans. (a) Formic acid (or methonic acid) HCOOH is present in the ant sting.

(b) By applying some wet baking soda on the affected area, ant sting can be cured.

Q.24. What happens when nitric acid is added to egg shell?

Ans. Egg shells contain calcium carbonate. On reacting it with nitric acid, carbon dioxide gas is produced.

The reaction involved is

$CaCO_3(s) + 2HNO_3(aq) \longrightarrow Ca(NO_3)_2(aq) + H_2O(l) + CO_2(g)$

Q.25. What effect does an increase in concentration of H^+ (aq) in a solution have on the pH of solution?

Ans. pH value of a solution decrease, when concentration of H^+ ion increases.

Q.26. Which one of these has a higher concentration of H^+ ions : 1M HCl or 1M CH_3COOH?

Ans. 1M HCl

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Q.27. Why does 1M HCl solution have a higher concentration of H^+ ions than 1M CH_3COOH solution?

Ans. 1M HCl solution will have a higher concentration of H^+ ions that 1M CH_3COOH because its (HCl) molecules dissociated completely hence more H^+ ions produced.

Being a weaker acid, molecules of CH_3COOH do not dissociate completely, thus H^+ ions are less.

Q.28. Name the gas usually liberated when a dilute acid reacts with a metal. What happens when a burning candle is brought near the gas?

Ans. Hydrogen gas is produced when dilute acid reacts with a metal. When burning candle is brought near the gas it burns with pop sound.

Q.30. How does acetic acid help in the preservation of food?

Ans. Acetic acid kills microorganisms and prevents the oxidation of food materials. Thus, acetic acid helps in the preservation of food.

Q.31. Two solutions A and B have pH values of 5 and 8 respectively. Which solution will be basic in nature?

Ans. Solution B (pH = 8) will be basic because is pH is more than 7.

Q.32. How wil you test a gas which is liberated when hydrochloric acid reacts with an active metal?

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Ans. When a burning matchstick (or wooden splinter) is brought near the mouth of the test tube (containing the reaction mixture), it burns with pop sound. Hence, the gas is hydrogen.

Q.33. How does the flow of acid rain watr into a river makes the survival of aquatic life in the river difficult?

Ans. Acid rain water, if mixed with river water, lowers its pH below 5.6, i.e., makes river water acidic. But the living body works normally within a pH range OF 7-7.8. That's why flow of acid rain water to river makes the survival of aquatic life in the river difficult.

Q.34. Arrange the following in an increasing order of their pH values NaOH solution, blood, lemon juice.

Ans. Lemon juice (pH = 2.2) < Blood

(pH = 7.4) < NaOH (pH = 14)

Q.35. Name the gas evolved when dilute sulphuric acid acts on sodium carbonate.

Ans. Carbon dioxide gas is evolved when dilute sulphuric acid acts on sodium carbonate.

Q.36. Which byproduct of chlor-alkali process is used for manufacture of bleeching powder?

Ans. Chlorine is the byproduct of chlor-alkali process that is used for the manufacture of bleaching powder.

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Q.37. Why is acetic acid called a weak acid though there are four H atoms in the molecule ?

Ans. Acetic acid is called a weak acid (monobasic acid) because only one of the four H atoms of the acid is released as H^+ ion in solution.

Q.38. How does a strong acid differ from a concentrated acid?

Ans. The strength of an acid depends upon its dissociation power whereas concentration depends on water content in the acid.

Q.39. A student dropped few pieces of marble in dilute HCl contained in a test tube. The evolved gas passed through lime water.

(a) What change would be observed in lime water?

(b) Write balanced chemical equation for the above change.

Ans. (a) Lime water turns milky.

(b) $CaCO_3(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$

(Marble) Dilute — Calcium chloride — Water — Carbon dioxode

$CaO_2(g) + Ca(OH)_2(aq) \longrightarrow CaCO_3(aq) + H_2O(l)$

Carbon dioxide — Lime water — Calcium carbonate (Milky)

Q.40. A student prepared solutions of an acid and base in two separate beakers. She forgot to label the solutions and litmus paper is not available in the laboratory. Since, both the solutions are colourless, how will she distinguish between the two?

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Ans. In the absence of litmus, any other indicator like methyl orange, phenolphthalein, etc can be used. Otherwise a natural indicator like turmeric can also be used.

Some common indicator with characteristics colours are tabulated below

S.No.	Indicator	Colour in acidic solution	Colour in neutral solution	Colour in basic solution
(i)	Litmus	Red	Purple	Blue
(ii)	Phenolphthalein	Colourless	Colourless	Pink
(iii)	Methyl orange	Red/Pink	Orange	Yellow

Q.41. How would you distinguish between baking powder and washing soda by heating?

Ans. Baking soda ($NaHCO_3$) on heating produces carbon dioxide (CO_2), which extinguishes a burning match stick.

$$2NaHCO_3(s) \xrightarrow{\Delta} Na_2CO_3(s) + H_2O(l) + CO_2(g)$$

But washing soda ($Na_2CO_3 \cdot 10H_2O$) on heating does not produce any such gas, thus it has no effect on burning match stick.

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

Q.42. Write two observation you make when quicklime is added to water.

Ans. The following two observation we would make when quicklime is added to water

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(i) The mixture starts boiling and lime water is obtained

$$\underset{\text{Quick lime}}{CaO\ (s)} + \underset{\text{Water}}{H_2O(l)} \longrightarrow \underset{\text{Lime water}}{Ca(OH)_2\ (aq)} + \text{Heat}$$

Q.43. A compound X of sodium is commonly used in kitchen for making crispy pakoras. It is also used for curing acidity in the stomach. Identify X. What is its chemical formula? State the reaction which takes place when it is heated during cooking.

Ans. X = Sodium bicarbonate or sodium hydrogen carbonate.

Its formula is $NaHCO_3$.

The reaction involved is

$$\underset{X}{2NaHCO_3(s)} \xrightarrow{\Delta} Na_2CO_3(s) + H_2O(l) + CO_2\uparrow$$

Q.44. (a) Give Arrhenius definition of an acid and a base.

(b) Choose strong acid and strong base from the following

CH_3COOH, NH_4OH,KOH,HCl

Ans.(a) According to the Arrhenius concept, an acid is a substance which can furnish hydrogen ions in its aqueous solution.

(b) Strong acid = HCl

Strong base = KOH

Q.45. What is observed when sulphur dioxide is passed through (a) water? (b) lime water? Also write chemical equations for the reactions that takes place.

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Ans. (a) When SO_2, passed through water, sulphurous acid is formed. The aqueous solution of SO_2turns blue litmus red.

$$SO_2(g) + H_2O(l) \Longleftrightarrow H_2SO_3(aq)$$

Sulphurous acid — Water — Sulphuric acid

(b) But when SO_2 passed through lime water, calcium sulphite (white ppt) is formed, which reacts with excess SO_2 to form calcium hydrogen sulphite. The chemical equation for the reactions are

$$Ca(OH)_2 + SO_2 \longrightarrow CaSO_3 + H_2O$$

Lime water — Sulphurous acid — Calcium sulphite — Water

$$CaSO_3 + H_2O + SO_2 \longrightarrow Ca(HSO_3)_2$$

Calcium sulphite — Water — Excess — Calcium bisulphate

Q.46. A calcium compound which is a yellowish white powder is used as a disinfectant and also in textile industry.

(a) Name the compound.

(b) Which gas is released when this compound is left exposed to air?

Ans. (a) Bleaching powder or calcium oxychloride ($CaOCl_2$).

(b) When exposed to air, it releases Cl_2 gas according to the following reaction with CO_2 present in air.

$$CaOCl_2 + CO_2 \longrightarrow CaCO_3 + Cl_2\uparrow$$

Bleaching powder — (from air) — Calcium carbonate — Chlorine gas

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Q.47. An aqueous solution turns red litmus solution blue. Excess addition of which solution would reserve the change?

Ans. The given solution is alkaline as it changes red litmus blue. When acid is added to the given alkaline solution, first it neutralises the base and further addition of acid makes the solution acidic that turns blue litmus red.

Q.48. State the pH of distilled water and rain water. Justify your answer with proper reasoning.

Ans. pH of distilled water is 7.

In distilled water there is no dissolved mineral.

But in rain water pH is slightly lesser than 7, because it become acidic due to the presence of dissolved CO_2 and SO_2 molecules that were present in the atmosphere.

Q.49. Give the chemical names of acid present in

(a) Ants (b) Lemon (c) Milk (d) Tomato

Ans. (a) Formic acid (methanoic acid)

(b) Citric acid (c) Lactic acid (d) Oxalic acid

Q.50. Name a metal which reacts with alkali to librate hydrogen. Also give the chemical equation.

Ans. Zinc metal reacts with alkalies to liberate hydrogen.

The chemical equation is

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$$Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2 \uparrow$$

Zinc — Sodium hydroxide (alkali) — Sodium zincate — Hydrogen

Q.51. What are antacids? Name one compound that can be used as an antacid.

Ans. Antacid are mild bases which are used to neutalise extra acid produced in the stomach during indigestion.e.g., milk of magnesia [$Mg(OH)_2$].

Q.52. Fresh milk has a pH of 6. When it changes into curd (yogurt), will its pH value increase or decrease? Why?

Ans. When milk changes into curd (yogurt), its pH value decreases. This is because during curd formation, lactic acid is produced which makes it acidic.

Q.53. Why is tartaric acid added into baking soda to get baking powder?

Ans. Tartaric acid is added to neutralise the sodium carbonate formed on heating (by the decomposition of $NaHCO_3$. If it is not added, the cake would taste bitter due to the presence of sodium carbonate in it.

Q.54. Choose strong/weak acid and strong/weak bases from the following compounds

H_2CO_3, HNO_3, CH_3COOH, NaOH, NH_4OH, KOH, $Ca(OH)_2$, HCl

Ans. Strong acids – HNO_3HCl

Weak acids – H_2CO_3, CH_3COOH

Strong bases – NaOH, KOH

Weak bases – $NH_4OH, Ca(OH)_2$

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Q.55. Identify the number of replaceable hydrogen ions (H^*) in the following acids

(a) HCl **(b) CH_3COOH**

(C) H_2SO_4 **(d) H_3PO_4**

(Replaceable H* ions).

Ans. (a) HCL – 1 (b) CH_3COOH – 1

(C) H_2SO_4 – 2 (d) H_2PO_4 – 3

Q.56. Name the salts of sulphuric acid.

Ans. The salts of sulphuric acid are bisulphate and sulphate.

For example, $NaHSO_4$ (sodium hydrogen sulphate), $KHSO_4$ (potassium hydrogen sulphate), Na_2SO_4 (sodium sulphate), etc.

Q.57. (a) Name a strong base and a weak base.

(b) Name a hydrated salt.

Ans. (a) **Strong Base** NaOH (sodium hydroxide)

Weak Base NH_4OH (ammonium hydroxide)

(b) **Hydrated salt** $CuSO_4$. $5H_2O$ copper sulphate crystals.

Q.58. Name a salt of a strong acid HNO_3 and a weak base like NH_4OH. Represent the reaction that takes place.

Ans. A salt of strong acid HNO_3 and a weak base NH_4OH is NH_4NO_3 (Ammonium nitrate).

The reaction involved is

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$HNO_3 + NH_4OH \longrightarrow NH_4NO_3 + H_2O$

Q.59. In one of the industrial processes used for manufacture of sodium hydroxide, a gas X is formed as a byproduct. The gas X react with dry slaked lime to give a compound Y which is used as a bleaching agent in chemical industry. Identify X and Y.

Ans. In the manufacturing of sodium hydroxide hydrogen gas and chlorine gas are formed as byproducts.

So, X is chlorine gas.

When x reacts with dry slaked lime, bleaching powder is formed.

$$Ca(OH)_2 + \underset{X}{Cl_2} \longrightarrow \underset{Y}{CaOCl_2} + H_2O$$

So, Y is bleaching powder.

Q.60. Why is plaster of Paris written as $CaSO_4 \cdot ½\ H_2O$? How is possible to have half a water molecule attached to $CuSO_4$?

Ans. The actual formula of plaster of paris is $2CaSO_4 \cdot H_2O$ which means that one molecule of H_2O is associated with two molecules of $CaSO_4$. The formula for simplicity is written as $CaSO_4 \cdot ½\ H_2O$.

Q.61. What is acid rain? What is its pH?

Ans. When it rains, the gases like CO_2, SO_2, NO_2, etc of the atmosphere dissolve into it and its pH < 7. Thus, when pH of rain water falls below 5 – 6, it is called acid rain.

Q.62. Name any four chemicals for which common salt is used as raw material.

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Ans. For the following chemicals common salt is used as raw material

(i) Sodium hydroxide (NaOH)

(ii) Baking soda ($NaHCO_3$)

(iii) Washing soda ($Na_2CO_3 \cdot 10H_2O$)

(iv) Bleaching powder ($CaOCl_2$)

Q.63. Name the ions present in the following salts. Name the acid and base from which they can be obtained.

Magnesium sulphate, Sodium carbonate, potassium chloride

Ans. Ions, acids and bases of given salts are tabulated below

S.No.	Salt	Ions	Acid required	Base required
(i)	Magnesium sulphate	Mg^{2+} SO_3^{2-}	H_2SO_4	$Mg(OH)_2$
(ii)	Sodium carbonate	Na^+ CO_3^{2-}	H_2CO_3	NaOH
(iii)	Potassium chloride	K^+ Cl^-	HCl	KOH

Q.64. A compound which is prepared from gypsum has the property of hardening when mixed with proper quantity of water.

(a) Identify the compound.

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(b) Write the chemical equation for its preparation.

(c) Mention one important use of this compound.

Ans. (a) Plaster of paris (Calcium sulphate hemihydrate)

(b) $\underset{\text{Gypsum}}{CaSO_4 \cdot 2H_2O} \xrightarrow[373\ K]{Heat} \underset{\text{Plaster of Paris}}{CaSO_4 \cdot \frac{1}{2} H_2O} + 1\frac{1}{2} H_2O$

(C) This compound is used by doctors to support the fractured bones so that they may join in right position.

Q.65. (a) What is alkali? Give an example.

(b) Which of the following substances in water will not show acidic properties?

Sugar, alcohol, acetic acid, urea, nitric acid and carbon dioxide.

Ans. (a) Water soluble bases are called alkalies. E.g., NaOH, KOH. Thus, all alkalies are bases but all bases are not alkali.

(b) Substances which give off H^+ ions in solution show acidic properties.

Out of the substances given, sugar, alcohol and urea do not produce H^+ ions in solutions. Hence they will not show acidic properties.

Q.66. Baking soda is used in small amount in making bread and cake. It helps to make these soft and spongy. An aqueous solution of baking soda turns red litmus blue. It is also used in soda acid fire extinguisher.

Use this information to answer the following questions

(a) How does baking soda help to make cakes and bread soft and spongy?

(b) How does it help in extinguishing fire?

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(c) Is the pH value of baking soda solution lower than or higher than 7?

Ans. (a) When baking powder is added to the mixture during cake preparation, the baking soda present in it, produces CO_2 gas on heating, which makes the cake soft and spongy.

(b) $2NaHCO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O + 2CO_2(g)$

The CO_2 gas produced by the reaction of baking soda and acid in the soda-acid fire extinguisher, helps in extinguishing fire.

(c pH value of baking soda solution is higher than 7, i.e., it is alkaline.

Q.67. What will be the action of the following substances on litmus paper?

(a) Dry HCl gas

(b) Moistened NH_3 gas

(c) Lemon juice

(d) Carbonated soft drink

(e) Curd

(f) Soap solution

Ans. (a) Dry HCl gas has no effect on litmus.

(b) Moistened NH_3 gas turns red litmus blue.

(c) Lemon juice turns blue litmus red.

(d) Carbonated soft drink turns blue litmus red.

(e) Curd turns blue litmus red.

(f) Soap solution turns red litmus blue.

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Q.68. What is meant by 'water of crystallisation' of a substance? Describe an activity to show that blue copper sulphate crystals contain water of crystallisation.

Ans. Crystals of some compounds seem to be dry (or anhydrous), but actually contain some water molecules attached to them. This water is called water of crystallisation and such salts are called hydrated salts.

Q.69. What are strong and weak acids? In the following list of acids, separate strong acids from weak acids.

Hydrochloric acid, citric acid, acetic acid, nitric acid, formic acid, sulphuric acid.

Ans. The acids which ionise almost completely are called strong acids. e.g., mineral acids (expect H_2CO_3).

The acids which ionise only partially or to a lesser extent are called weak acids. e.g., organic acids.

(i) Strong acids Hydrochloric acid, nitric acid, sulphuric acid.

(ii) Weak acids Citric acid, acetic acid, formic acid.

Q.70. State the name and function of the acid produced in our stomach. What remedy would you suggest to a person suffering from indigestion, pain and irritation in the stomach? Name the main ingredient of this remedy and state its functions.

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Ans. Hydrochloric acid is produced in our stomach. It helps in the digestion of food without harming the stomach.

Sometimes, excess of HCl is produced in the stomach which causes pain, irritation and indigestion. It can be cured by taking an antacid like sodium bicarbonate or milk of magnesia.

The alkali present in the remedy neutralises the excess acid and cures the problem.

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