2. Acids, Bases and Salts - Board Exam Questions

2 Mark Questions

1) *(a) Write the formula of the ions which (i) acids, and (ii) bases generate in water solutions. (b) Dry HCl gas does not change the colour of dry litmus paper. Why?*
(a) (i) Acids: H^+ (ii) Bases: OH^-
(b) Without water, dry HCl does not give hydrogen ions (H^+).

2) *1 gram of solid sodium chloride was taken in a clean and dry test tube and concentrated sulphuric acid was added to it. (i) Name the gas evolved in the reaction. (ii) What will be observed when this gas is tested with (I) dry, and (II) wet blue litmus paper? Write your conclusion about the nature (acidic/basic) of this gas.*
(i) Hydrogen chloride (HCl) gas.
(ii) (I) Dry blue litmus: no change. (II) Wet blue litmus: turns red.
So HCl gas is acidic.

3) *Define the following terms: (i) Olfactory indicator (ii) Water of crystallization*
(i) Olfactory indicators are substances whose smell changes in an acid or a base.
(ii) Water of crystallisation is the fixed number of water molecules in one formula unit of a salt.

4) *Two solutions M and N give Red and Blue colour respectively with a universal indicator. (i) In which solution will the hydrogen ion concentration be more? Justify your answer. (ii) If both M and N solutions are mixed and the resultant mixture is tested with a universal indicator, it turns green. What is the nature of the salt formed? Justify your answer.*
(i) M, because it is an acid (red).
(ii) Neutral. M is an acid and N is a base, so they neutralise each other.

5) *Some metals react with acids to produce salt and hydrogen gas. Illustrate it with an example. How will you test the presence of this gas?*

$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2(g)$

Test: Bring a burning matchstick near the gas. It burns with a pop sound.

6) *A student took a small amount of copper oxide in a conical flask and added dilute hydrochloric acid to it with constant stirring. He observed a change in colour of the solution. (i) Write the name of the compound formed and its colour. (ii) Write a balanced chemical equation for the reaction involved.*

(i) Copper (II) chloride. It is blue-green.

(ii) $CuO + 2HCl \rightarrow CuCl_2 + H_2O$

7) *A clear solution of slaked lime is made by dissolving $Ca(OH)_2$ in an excess of water. This solution is left exposed to air. The solution slowly goes milky as a faint white precipitate forms. Explain why a faint white precipitate forms, support your response with the help of a chemical equation.*

Calcium hydroxide reacts with the carbon dioxide in the air. It forms calcium carbonate, which does not dissolve, so the solution turns milky.

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

8) *The industrial process used for the manufacture of caustic soda involves electrolysis of an aqueous solution of compound 'X'. In this process, two gases 'Y' and 'Z' are liberated. 'Y' is liberated at cathode and 'Z', which is liberated at anode, on treatment with dry slaked lime forms a compound 'B'. Name X, Y, Z and B.*

X: Sodium chloride Y: Hydrogen

Z: Chlorine B: Bleaching powder

9) *(a) A compound 'A' is used in soda-lime fire-extinguisher and decomposes on heating to form compound 'B'. Compound 'B' is used for removing permanent hardness of water. Identify 'A' and 'B'. (b) Write chemical formula of Plaster of Paris. At what temperature gypsum is heated to obtain Plaster of Paris?*

(a) A: Sodium hydrogen carbonate B: Sodium carbonate

(b) $CaSO_4 \cdot \frac{1}{2}H_2O$. Gypsum is heated at 373 K.

10) *Write balanced chemical equation for the reaction that occurs when: (i) blue coloured copper sulphate crystals are heated and (ii) Sodium hydrogen carbonate is heated during cooking.*

(i) $CuSO_4 \cdot 5H_2O \xrightarrow{\text{(heat)}} CuSO_4 + 5H_2O$

(ii) $2NaHCO_3 \xrightarrow{\text{(heat)}} Na_2CO_3 + H_2O + CO_2$

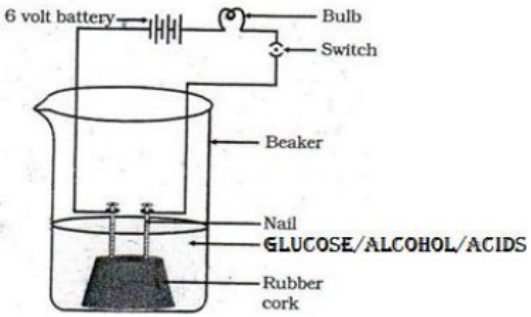
11) *(i) A compound 'X' which is prepared from gypsum has the property of hardening when mixed with proper quantity of water. Identify 'X' and write its chemical formula. (ii) State the difference in chemical composition between baking soda and baking powder.*

(i) X: Plaster of Paris, $CaSO_4 \cdot \frac{1}{2}H_2O$

(ii) Baking soda is only $NaHCO_3$. Baking powder is a mixture of $NaHCO_3$ and tartaric acid.

<u>3 Mark Questions</u>

1) *Design an experimental set-up to demonstrate that "Alcohol and glucose contain hydrogen but are not categorised as acids". Also give the reason to justify this fact.*



The bulb does not glow with alcohol or glucose solution. It glows with an acid solution.

Reason: Acids give ions (H^+) in water, so the solution conducts electricity. Glucose and alcohol do not give ions.

2) *Give reasons: (i) For dilution of an acid, acid is added into water and not water into acid. (ii) Dry HCl gas does not turn blue litmus red whereas dilute hydrochloric acid does. (iii) Blue colour of Copper(II) sulphate crystals turns white on heating.*

(i) Adding acid to water does not cause too much heat in one place, so it is safe.

(ii) Dry HCl does not form ions. Dilute HCl has H^+ ions, which turn blue litmus red.

(iii) The crystals lose their 5 molecules of water of crystallisation.

3) *(i) Suggest a safe procedure of diluting a strong concentrated acid. (ii) Name the salt formed when sulphuric acid is added to sodium hydroxide and write its pH. (iii) Dry HCl gas does not change the colour of dry blue litmus paper. Why?*

(i) Always add the acid slowly to water, stirring all the time.

(ii) Sodium sulphate. pH = 7

(iii) Dry HCl does not form ions.

4) *(a) Name the acid present in ant's sting. (b) Give reason: (i) While diluting an acid, it is recommended that the acid should be added to water. (ii) Baking soda is used as an antacid.*

(a) Methanoic acid

(b) (i) Adding acid to water does not cause too much heat in one place, so it is safe.

(ii) Baking soda is basic. It neutralises the extra acid in the stomach and gives relief.

5) *Give reason for the following: A. A solution of sports electrolyte drink conducts electricity, but coconut oil does not. B. Milkiness disappears when excess of carbon dioxide is passed through lime water. C. An iron bridge near the sea rusts much faster than an iron bridge located in a dry hilly region.*

A. A sports drink has ions (electrolytes) that carry electricity. Coconut oil has no ions.

B. Lime water first turns milky because insoluble calcium carbonate forms. Extra CO_2 changes it into calcium hydrogen carbonate, which dissolves, so the milkiness goes away.

C. Air near the sea has a lot of moisture, which makes iron rust faster. Air in dry hills has little moisture.

6) *Write chemical equations to show what happens when an acid reacts with a (i) metal (ii) base and (iii) carbonate. Write the name of the main product formed in each case.*

(i) $Zn + 2HCl \rightarrow ZnCl_2$ (zinc chloride) + H_2

(ii) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4$ (sodium sulphate) + $2H_2O$

(iii) $Na_2CO_3 + 2HCl \rightarrow 2NaCl$ (sodium chloride) + $H_2O + CO_2$

7) *A metal 'M' on reacting with dilute acid liberates a gas 'G'. The same metal also liberates gas 'G' when reacts with a base. (i) Write the name of gas 'G'. (ii) How will you test the presence of this gas? (iii) Write chemical equations for the reactions of the metal with (1) an acid and (2) a base.*

(i) Hydrogen
(ii) It burns with a pop sound when a burning matchstick is brought near it.
(iii) (1) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
(2) $Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2$

8) *A substance 'X' is used as a building material and is insoluble in water. When it reacts with dil. HCl, it produces a gas which turns lime water milky. (i) Write the chemical name and formula of 'X'. (ii) Write chemical equations for the chemical reactions involved in the above statements.*
(i) Calcium carbonate, $CaCO_3$
(ii) $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$
$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$ (lime water turns milky)

9) *(i) The pH of a sample of tomato juice is 4.6. How is this juice likely to be in taste? Give reason to justify your answer. (ii) How do we differentiate between a strong acid and a weak base in terms of ion-formation in aqueous solutions? (iii) The acid rain can make the survival of aquatic animals difficult. How?*
(i) Slightly sour. pH 4.6 means it is acidic, and acids taste sour.
(ii) A strong acid gives many H^+ ions in water. A weak base gives few OH^- ions.
(iii) Water animals can live only when the pH of water is about 7.0 to 7.8. Acid rain (pH below 5.6) lowers the pH of rivers, so it is hard for them to survive.

10) *(a) Suggest one remedial measure each to counteract the change in pH in human beings in following cases: (i) Production of too much acid in stomach during indigestion (ii) Stung by a honey bee / nettle leaves (b) Fresh milk has a pH of 6. When it changes into curd will its pH increase or decrease? Why?*
(a) (i) Take an antacid. (ii) Apply baking soda.
(b) The pH will decrease, because curd is more acidic than milk.

11) *Comment on the following statements: (i) Bee sting is treated with baking soda paste whereas wasp sting is treated with dilute vinegar. (ii) Farmers treat soil with quicklime when tilling. (iii) Ancient sculptures and marble structures are conserved by treating them with certain chemicals.*

(i) A bee sting is acidic, so a base (baking soda) neutralises it. A wasp sting is basic, so an acid (vinegar) neutralises it.

(ii) To make acidic soil neutral.

(iii) To protect them from the harmful gases in the air and from acid rain.

12) *(a) Sometimes the pH of our mouth gets lower than 5.5. Why? (b) A basic salt 'X' is obtained by heating baking soda followed by crystallisation. Identify 'X' and state its two industrial uses. (c) Why do copper sulphate crystals turn white on heating?*

(a) Bacteria in the mouth break down the sugar and food left after eating, and make acids.

(b) X: Washing soda ($Na_2CO_3 \cdot 10H_2O$). Uses: in the glass, soap and paper industries; in making borax.

(c) They lose their water of crystallisation.

13) *Explain chlor-alkali process with chemical equation. Name the products formed at anode and cathode.*

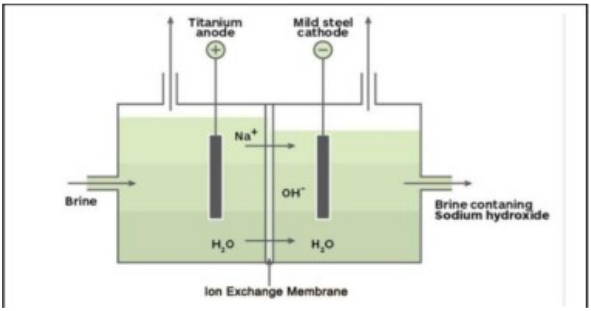
When electricity is passed through brine (sodium chloride solution), it breaks down and forms sodium hydroxide (an alkali) and chlorine. So it is called the chlor-alkali process.

$$2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{(electricity)}} 2NaOH(aq) + H_2(g) + Cl_2(g)$$

At the anode: chlorine (Cl_2) At the cathode: hydrogen (H_2)

Sodium hydroxide solution forms near the cathode.

14) *(a) Identify the gasses evolved at the anode and cathode in the above experimental set up. (b) Name the process that occurs. Why is it called so? (c) Illustrate the reaction of the process with the help of a chemical equation.*



(a) Anode: chlorine Cathode: hydrogen

(b) Chlor-alkali process, because the products are an alkali (sodium hydroxide) and chlorine (along with hydrogen).

(c) $2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{(electric current)}} 2NaOH(aq) + Cl_2(g) + H_2(g)$

15) *Common salt is an important raw material for various chemicals of daily use. State in brief the method of preparation of (i) Sodium hydroxide, and (ii) Sodium hydrogen carbonate from common salt. Write balanced chemical equations of the reactions that occur.*

(i) Electricity is passed through brine. It breaks down and forms NaOH (chlor-alkali process).

$$2NaCl(aq) + 2H_2O \rightarrow 2NaOH(aq) + Cl_2 + H_2$$

(ii) Brine reacts with carbon dioxide and ammonia. Sodium hydrogen carbonate and ammonium chloride form.

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NaHCO_3 + NH_4Cl$$

16) *Write the preparation of the following compounds with balanced chemical equation: (i) NaOH by chlor-alkali process (ii) Baking Soda (iii) Plaster of Paris*

(i) $2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{(electricity)}} 2NaOH(aq) + H_2(g) + Cl_2(g)$

(ii) $NaCl + H_2O + NH_3 + CO_2 \rightarrow NaHCO_3 + NH_4Cl$

(iii) Gypsum is heated at 373 K: $CaSO_4 \cdot 2H_2O \xrightarrow{\text{(373 K)}} CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$

17) *Write the preparation of following compounds with balanced chemical equation: (i) Baking soda (ii) Bleaching powder (iii) Plaster of Paris*

(i) $NaCl + H_2O + NH_3 + CO_2 \rightarrow NaHCO_3 + NH_4Cl$

(ii) Chlorine is passed over dry slaked lime: $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

(iii) Gypsum is heated at 373 K: $CaSO_4 \cdot 2H_2O \xrightarrow{(373\ K)} CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$

18) *(i) In the given series of reactions, name the compounds X and Z. (ii) Which type of reaction is X to Z? $NaCl + H_2O + CO_2 + NH_3 \rightarrow X + Y$; $X \xrightarrow{(\Delta)} Z + H_2O + CO_2$; $Z + 10H_2O \rightarrow Q$ (iii) You are given 3 unknown solutions A, B, and C with pH values of 6, 8 and 9.5 respectively. In which solution will the maximum number of hydronium ions be present? Arrange the given samples in the increasing order of H^+ ion concentration.*

(i) X: $NaHCO_3$ (baking soda) Z: Na_2CO_3 (sodium carbonate)

(ii) Decomposition reaction

(iii) Solution A (lowest pH).

Increasing order of H^+ ions: C < B < A

19) *State the chemical property in each case on which the following uses of baking soda are based upon: (i) as an anti-acids (ii) as a constituent in making baking powder (iii) in soda-acid fire-extinguishers*

(i) It is a mild, non-corrosive basic salt, so it neutralises extra acid.

(ii) It gives out carbon dioxide gas when it reacts with a mild edible acid.

(iii) It reacts with an acid and gives carbon dioxide gas, which puts out the fire.

20) *Write chemical formula of washing soda. How is it obtained from baking soda? List two uses of washing soda.*

$Na_2CO_3 \cdot 10H_2O$

Baking soda is heated to get sodium carbonate. Sodium carbonate is then recrystallised (with water) to get washing soda.

Uses: (i) in the glass industry (ii) in making borax

21) *(a) Give the chemical name and formula of Plaster of Paris. (b) Write the chemical equation of its preparation. (c) Give any two uses of it.*

(a) Calcium sulphate hemihydrate, $CaSO_4 \cdot ½H_2O$

(b) $CaSO_4 \cdot 2H_2O$ (gypsum) —(373 K)→ $CaSO_4 \cdot ½H_2O + 1½H_2O$

(c) For making toys. For supporting fractured bones in the right position.

22) *Write the common name and the chemical name of the compound $CaSO_4 \cdot ½H_2O$. Write the method of its preparation. Give chemical equation for the reaction, when water reacts with $CaSO_4 \cdot ½H_2O$.*

Common name: Plaster of Paris. Chemical name: calcium sulphate hemihydrate.

It is made by heating gypsum ($CaSO_4 \cdot 2H_2O$) at 373 K.

With water, it becomes gypsum again: $CaSO_4 \cdot ½H_2O + 1½H_2O \rightarrow CaSO_4 \cdot 2H_2O$

<u>4 Mark Questions (Case Study)</u>

1) *The pH plays an important role in our daily life. Strength of acids and bases depends on the number of H^+ ions and OH^- ions produced by these respectively. pH scale helps in predicting the strength of acids and bases by measuring hydrogen ion concentration in a solution.*

(a) What type of indicator is used to predict how strong an acid or base is? (1)

Universal indicator

(b) Three solutions A, B and C showed pH as 3, 5 and 7. Which solution has the highest concentration of H^+ ions? (1)

A (pH 3)

(c) What are strong acids and weak acids? (2)

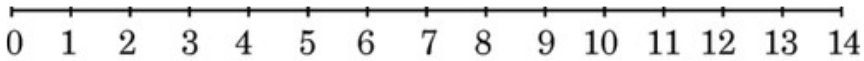
Strong acids give many H^+ ions in water. Weak acids give few H^+ ions in water.

OR (c) (i) Under what condition is rainwater called acid rain? (ii) In the following acids, identify weak acids: Nitric acid, hydrochloric acid, acetic acid, sulphuric acid, formic acid.

(i) When its pH is less than 5.6.

(ii) Acetic acid and formic acid

2) *Acid-base indicators can be used to distinguish between an acid and a base. Universal indicator, a mixture of several indicators, shows different colours at different concentrations of acids and bases, thereby indicating their pH on the pH scale of 0 – 14. The pH of a solution is measured by pH paper, which is a paper impregnated with a universal indicator.*



pH Scale

(a) Solution P is a strong acid while solution Q is a strong base. On the pH scale, where would you place the solutions P and Q? (1)

P: pH 0 to 4 Q: pH 12 to 14

(b) A solution has a pH of 7. Name a compound you would use to (i) increase its pH, and (ii) decrease its pH. (1)

(i) Sodium hydroxide (ii) Hydrochloric acid

(c) (i) When the pH of a solution is decreased from 4 to 2, what effect does it produce on its hydronium ion concentration? State the colour change shown by the pH paper. (2)

The hydronium ion concentration increases.

The pH paper changes from yellow/orange to red/pink.

OR (c) (ii) A person is feeling pain and irritation in the stomach due to indigestion. What could be the pH of the fluid in the stomach? Write the common name of the medicines people use for remedy. Give the chemical name of "milk of magnesia" often used for this purpose.

Low pH, between 1 and 3.

Medicines: antacids.

Milk of magnesia: magnesium hydroxide, $Mg(OH)_2$

3) *The teacher while conducting practicals in the laboratory divided the students into three groups and gave them various solutions to find out their pH and classify them into acidic, basic and neutral solutions.*
Group A – Lemon juice, vinegar, colourless aerated drink
Group B – Tomato juice, coffee, ginger juice
Group C – Sodium hydroxide, sodium chloride, lime water
(a) For the solutions provided, which group is/are likely to have pH value (i) less than 7, and (ii) greater than 7? (1)
(i) Groups A and B (ii) Group C
(b) List two ways of determining pH of a solution. (1)

pH paper and universal indicator

(c) Explain, why the sour substances such as lemon juice are effective in cleaning the tarnished copper vessels. (2)

A copper vessel gets a dull coating of copper oxide, which is basic.

Lemon juice is acidic. It reacts with the copper oxide and forms a salt, which is washed away.

OR (c) "pH has great importance in our daily life." Justify this statement by giving two examples.

• Our stomach needs the right pH to digest food.
• If the pH in the mouth falls, it can cause tooth decay.

4) *Sara took 2 mL of dilute NaOH solution in a test tube and added two drops of phenolphthalein solution to it. The solution turned pink in colour. She added dilute H_2SO_4 to the above solution drop by drop until the solution in the test tube became colourless. 40 drops of dilute H_2SO_4 were used for the change in colour from pink to colourless. When Sara added a drop of NaOH to the solution, the colour changed to back to pink again.*

Sara now tried the activity with different volumes of NaOH and recorded her observation in the table given below:

S. No.	Volume of dil. NaOH taken (mL)	Drops of dil. H_2SO_4 used
1	2	20
2	3	30
3	4	40

A. If Sara used concentrated H_2SO_4 in place of dilute H_2SO_4, how many drops will be required for the change in colour to be observed? (a) 40 (b) < 40 (c) > 40. Justify your answer.

(b) Less than 40. Concentrated H_2SO_4 gives more H^+ ions than the dilute acid, so fewer drops are needed.

B. Sara measured 20 drops of dil. H_2SO_4 and found its volume to be 1 mL. If Sara observed a change in colour of NaOH solution by using 3 mL of H_2SO_4, how many mL of NaOH did she add to the test tube initially?

3 mL of acid = 60 drops. From the table, 20 drops neutralise 2 mL of NaOH. So 60 drops neutralise 6 mL of NaOH.

OR Sara takes 10 drops of dilute H_2SO_4 in the test tube and adds two drops of phenolphthalein solution to it. Then she adds NaOH dropwise. Sara observes a change in colour after adding 20 drops of NaOH. What change in colour would she observe and why?

Colourless changes to pink. Phenolphthalein is colourless in an acid and turns pink when the solution becomes basic.

C. Write a balanced chemical equation for the reaction taking place in the above experiment. Which of the following is true and why? The reaction is a (a) neutralisation and double displacement reaction (b) neutralisation and precipitation reaction (c) precipitation and double displacement reaction (d) neutralisation, double displacement as well as precipitation reaction.

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

(a) Neutralisation and double displacement. The base is neutralised and forms salt and water, and the ions exchange partners. It is not a precipitation reaction, because Na_2SO_4 dissolves in water.

5) *Salts play a very important role in our daily life. Sodium chloride which is known as common salt is used almost in every kitchen. Baking soda is also a salt used in faster cooking as well as in baking industry. The family of salts is classified on the basis of cations and anions present in them.*

(a) Identify the acid and base from which Sodium chloride is formed. (1)

Acid: HCl Base: NaOH

(b) Find the cation and the anion present in Calcium sulphate. (1)

Cation: Ca^{2+} Anion: SO_4^{2-}

(c) "Sodium chloride and washing soda both belong to the same family of salts." Justify this statement. (2)

Salts with the same cation belong to the same family. Sodium chloride (NaCl) and washing soda (Na_2CO_3) both have the cation Na^+.

OR (c) Define the term pH scale. Name the salt obtained by the reaction of Potassium hydroxide and Sulphuric acid and give the pH value of its aqueous solution.

The pH scale is a scale for measuring the hydrogen ion (H^+) concentration in a solution.

Salt: potassium sulphate (K_2SO_4). pH = 7

6) *Common salt is a very important chemical compound for our daily life. It's chemical name is sodium chloride and it is used as a raw material in the manufacture of caustic soda, washing soda, baking soda etc. It is also used in the preservation of pickles, butter, meat etc.*

(i) Name the acid and the base from which common salt can be obtained. (1)

Hydrochloric acid and sodium hydroxide

(ii) State the nature (acidic/basic/neutral) of sodium chloride. Give reason for the justification for your answer. (1)

Neutral, because it is the salt of a strong acid and a strong base.

(iii) (A) What happens when electric current is passed through an aqueous solution of sodium chloride (called brine)? Name the products obtained along with the corresponding places in the electrolytic cell where each of these products is obtained. (2)

(refer 13th 3 mark question)

OR (iii) (B) How is washing soda obtained from sodium chloride? Give chemical equation of the reactions involved in the process.

$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$

$2NaHCO_3 \text{—(heat)}\rightarrow Na_2CO_3 + H_2O + CO_2$

Sodium carbonate is recrystallised to get washing soda: $Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3 \cdot 10H_2O$

7) *Seawater contains many salts dissolved in it. Common salt is separated from these salts. Deposits of solid salt are also found in several parts of the world. These large crystals are often brown due to impurities. This is called rock salt and is mined like coal. The common salt is an important raw material for chemicals of daily use.*

(a) Write balanced chemical equations to show the products formed during electrolysis of brine. (1)

(refer 13th 3 mark question)

(b) List two uses of any one product obtained during electrolysis of brine. (1)

Sodium hydroxide: for removing grease from metals, and for making soaps and detergents.

(c) (i) A mild non-corrosive basic salt 'A', used for faster cooking, is strongly heated to produce a compound 'B', that is used for removing permanent hardness of water. Identify A and B and also write the equation for the reaction that occurs when A is heated. (2)

A: sodium hydrogen carbonate ($NaHCO_3$) B: sodium carbonate (Na_2CO_3)

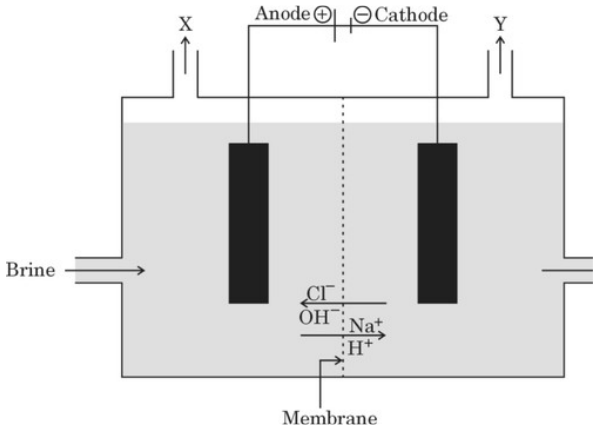
$2NaHCO_3$ —(heat)→ $Na_2CO_3 + H_2O + CO_2$

OR (c) (ii) Define water of crystallisation. Give two examples of salts that have water of crystallisation.

It is the fixed number of water molecules in one formula unit of a salt.

Examples: $CuSO_4 \cdot 5H_2O$ (blue vitriol), $CaSO_4 \cdot 2H_2O$ (gypsum)

8) *In the given diagram, when electricity is passed through an aqueous solution of a common salt, a substance 'Z' is produced, along with the evolution of gases 'X' and 'Y'. When a burning matchstick is brought near the gas 'Y', it burns with a pop sound, whereas 'X' is used for disinfecting drinking water. When 'X' is passed through slaked lime, an insoluble substance 'A' is produced.*



(a) Write the names of the gases 'X' and 'Y'. (1)

X: chlorine Y: hydrogen

(b) Write the balanced chemical equation for the formation of substance 'Z'. (1)

(refer 13th 3 mark question)

(c) (i) What happens: (I) If a drop of red litmus solution is added to the aqueous solution of substance 'Z'? (II) If CO_2 gas is passed through ammoniacal solution of aqueous NaCl? (2)

(I) The red litmus turns blue (Z, sodium hydroxide, is a base).

(II) Sodium hydrogen carbonate and ammonium chloride form: NaCl + H_2O + CO_2 + NH_3 → NH_4Cl + $NaHCO_3$

OR (c) (ii) Identify the substance 'A' and write the balanced chemical equation of the reaction which takes place in its preparation.

A: bleaching powder ($CaOCl_2$)

$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

5 Mark Questions

1) *(i) Five solutions A, B, C, D and E when tested with pH paper showed pH as 4, 1, 13, 7 and 10 respectively. Which solution is: (1) Strongly acidic (2) Strongly alkaline (3) Weakly acidic (4) Neutral and (5) Weakly alkaline? Arrange the solutions in increasing order of H^+ ion concentration.*
(ii) Write the name and formula of (1) an acidic salt and (2) a basic salt giving the name of the parent acid and parent base used to form the salt in each case.

(i) (1) B (2) C (3) A (4) D (5) E

Increasing order of H^+ ions: C < E < D < A < B

(ii) (1) Acidic salt: ammonium chloride (NH_4Cl). Parent acid: hydrochloric acid. Parent base: ammonium hydroxide.

(2) Basic salt: sodium carbonate (Na_2CO_3). Parent acid: carbonic acid. Parent base: sodium hydroxide.

2) *Name and state in brief the process which is used to prepare sodium hydroxide from sodium chloride. In this process along with the main product two gases 'X' and 'Y' are also given off at the two electrodes. Name 'X' and 'Y' specifying the name of their respective electrode at which each gas is obtained. One of these gases when reacts with dry calcium hydroxide produces a compound 'Z' which is widely used in*

water treatment plants and textile industries. Name Z and write chemical equation for the reaction involved in its formation.

Chlor-alkali process. When electricity is passed through sodium chloride solution, it breaks down and forms sodium hydroxide.

X: chlorine (Cl_2), at the anode. Y: hydrogen (H_2), at the cathode.

Z: bleaching powder

$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

3) *An acid 'X' present in tamarind when mixed with 'Y', produces a mixture 'Z'. 'Z' on addition to a dough when heated makes cakes soft and spongy. 'Y' is prepared from common salt and helps in faster cooking.*
(i) Write the common names of 'X', 'Y' and 'Z', and the chemical formula of 'Y'.
(ii) How is 'Y' prepared and how does it help in making cakes soft and spongy? Illustrate the reaction with suitable chemical equation.
(iii) Write the name and chemical formula of a mild base other than 'Y' used as an antacid.

(i) X: tartaric acid Y: baking soda ($NaHCO_3$) Z: baking powder

(ii) Preparation: $NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$

In the cake: $NaHCO_3 + H^+$ (from the acid) $\rightarrow CO_2 + H_2O$ + sodium salt of the acid

The carbon dioxide given out on heating makes the cake soft and spongy.

(iii) Magnesium hydroxide, $Mg(OH)_2$

4) *A few crystals of ferrous sulphate were taken in a dry boiling tube and heated. Tiny water droplets were observed in the tube after some time.*
(i) From where did these water droplets appear? Explain.
(ii) What colour change will be observed during heating?
(iii) How many molecules of water are attached per molecule of $FeSO_4$ crystal? Write the molecular formula of crystalline forms of (I) Copper sulphate, and (II) Sodium carbonate.

(iv) State how is Plaster of Paris obtained from gypsum. Write two uses of Plaster of Paris.

(i) From the water of crystallisation in the ferrous sulphate crystals.
On heating, it comes out as vapour and forms droplets.

(ii) Green changes to white.

(iii) Seven ($FeSO_4 \cdot 7H_2O$). (I) $CuSO_4 \cdot 5H_2O$ (II) $Na_2CO_3 \cdot 10H_2O$

(iv) (refer 21st 3 mark question)