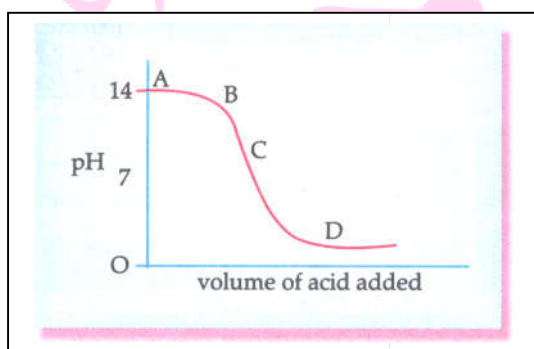


Objective Type Questions

(1 Mark each)

I. Multiple choice questions

1. The graph given below depicts a neutralization reaction (acid + alkali  $\rightarrow$  salt + water).  
The pH of a solution changes as we add excess of acid to an alkali.



Which letter denotes the area of the graph where both acid and salt are present?

- a) A                      b) B                      c) C                      d) D

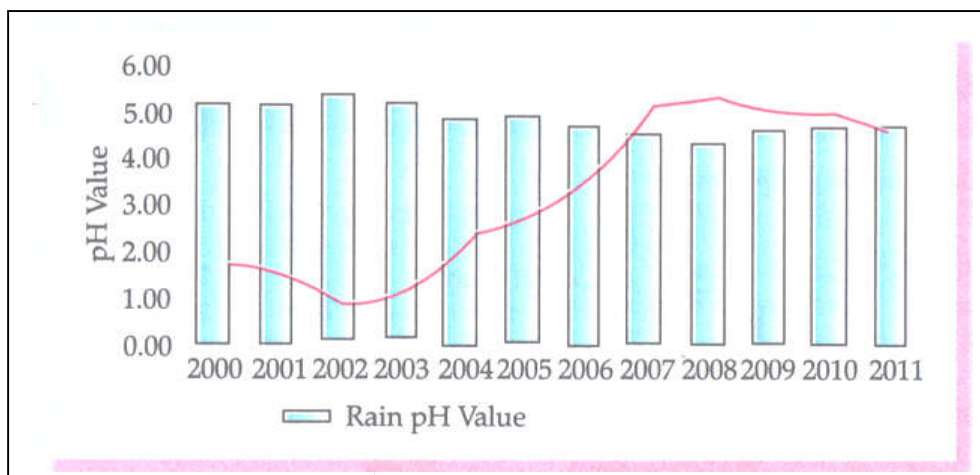
2. Which of the given options correctly represents the parent acid and base calcium carbonate?

Option	Parent Acid	Parent Base
A	HCl	NaOH
B	$H_2CO_3$	$Ca(OH)_2$
C	$H_3PO_3$	$CaSO_4$
D	$H_2SO_4$	$CaSO_4$

3. How will you protect yourself from the heat generated while diluting a concentrated acid?

- a) By adding acid to water with constant stirring.  
b) By adding water to acid with constant stirring.  
c) By adding water to acid followed by base.  
d) By adding base to acid with constant stirring.

4. In which year is concentration of hydrogen ion the highest?



a) 2002

b) 2008

c) 2011

d) 2005

5. Vinay observed that the stain of curry on a white shirt becomes reddish-brown when soap is scrubbed on it, but it turns yellow again when the shirt is washed with plenty of water. What might be the reason for his observation?

i) Soap is acidic in nature.

ii) Soap is basic in nature.

iii) Turmeric is a natural indicator which gives reddish tinge in bases.

iv) Turmeric is natural indicator which gives reddish tinge in acids.

a) (i) and (ii)

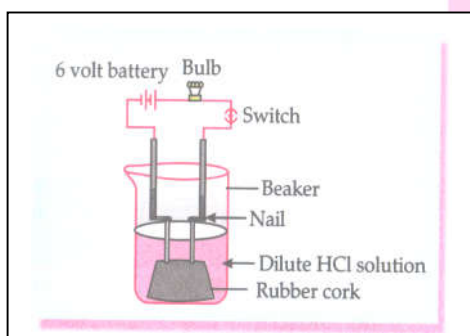
b) (ii) and (iii)

c) (i) and (iv)

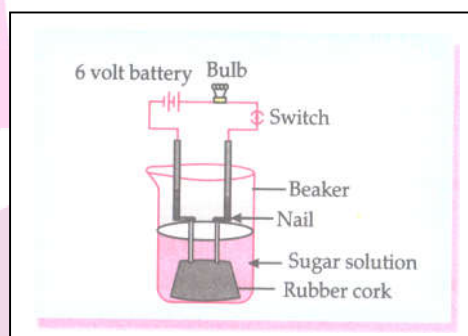
d) (ii) and (iv)

6. In which of the following setups would the bulb glow?

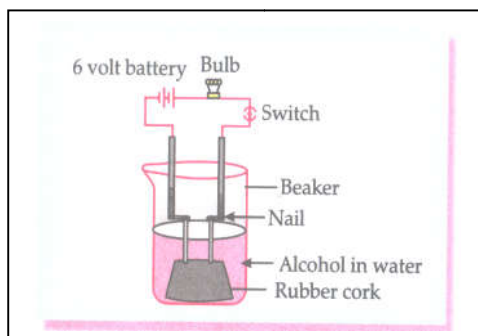
i)



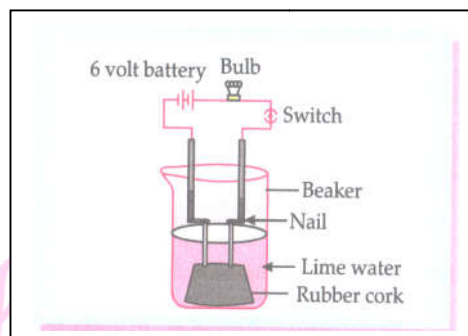
ii)



iii)



iv)



a) (i) and (ii)

b) (i) and (iv)

c) (ii), (iii) and (iv)

d) (i), (ii) and (iv)

7. Which of the following oxide(s) is /are soluble in water to form alkalies?

i)  $Na_2O$

ii)  $SO_2$

iii)  $K_2O$

iv)  $NO_2$

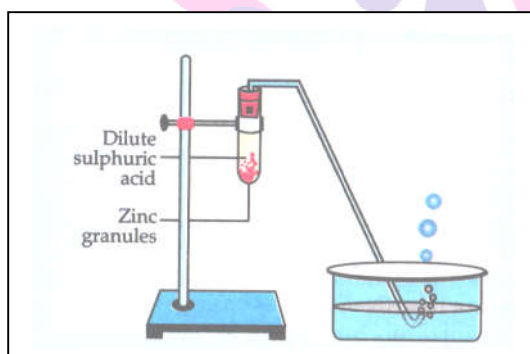
a) (i) and (iii)

b) (i) only

c) (ii) and (iv)

d) (iii) only

8. Study the diagram given below and identify the gas formed in the reaction.



a) Carbon dioxide which extinguishes the burning candle.

b) Oxygen due to which the candle burns more brightly.

c) Sulphur dioxide which produces a suffocating smell.

d) Hydrogen which while burning produces a popping sound.

9. Which of the options in the given table are correct?

Option	Natural source	Acid Present
(i)	Orange	Oxalic acid
(ii)	Sour milk	Lactic acid
(iii)	Ant sting	Mathanoic acid
(iv)	Tamarind	Acetic acid

a) (i) and (ii)

b) (i) and (iv)

c) (ii) and (iii)

d) (iii) and (iv)

10. Select from the following the statement which is true for bases.

- a) Bases are bitter and turn blue litmus red.
- b) Bases have a pH less than 7.
- c) Bases are sour and change red litmus to blue.
- d) Bases turn pink when a drop of phenolphthalein is added to them.

11. Study the following table and choose the correct option:

S.n	Salt	Parent Acid	Parent Base	Nature of Salt
a)	Sodium Chloride	HCl	NaOH	Basic
b)	Sodium Carbonate	$H_2CO_3$	NaOH	Neutral
c)	Sodium Sulphate	$H_2SO_4$	NaOH	Acidic
d)	<b>Sodium Acetate</b>	<b><math>CH_3COOH</math></b>	<b>NaOH</b>	<b>Basic</b>

12. Consider the pH value of the following acidic samples:

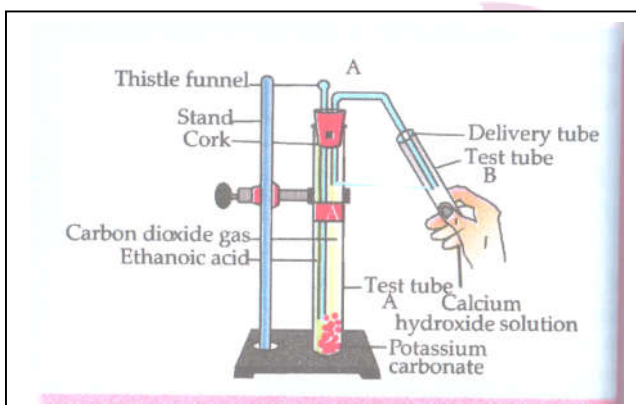
S. No	Sample	pH Value
1.	Lemon Juice	2.2
2.	Gastric Juice	1.2
3.	Vinegar	3.76
4.	Dil. Acetic acid	3.0

The decreasing order of their  $H^+$  ion concentration is

- a)  $3 > 4 > 1 > 2$
- b)  $2 > 1 > 3 > 4$
- c)  $2 > 1 > 4 > 3$
- d)  $3 > 4 > 2 > 1$

13. Study the experimental set up shown in given figure and choose the correct option from the following:

	P	Q	Change observed in calcium hydroxide solution
a)	$K_2CO_3$	$Cl_2$ gas	No change
b)	$KHCO_3$	$CO_2$ gas	No Change
c)	$KHCO_3$	$H_2$ gas	Turns milky
d)	$K_2CO_3$	$CO_2$ gas	Turns milky

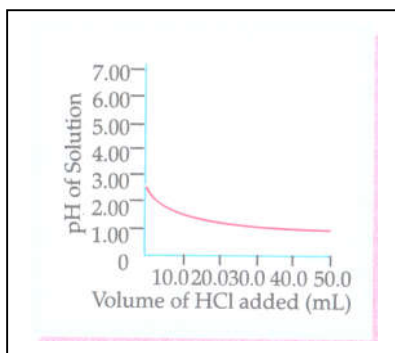


14. 50.0 mL of tap water was taken in a beaker. Hydrochloric acid was added drop to water. The temperature and pH of the solution was noted. The following graph was obtained. Choose the correct statements related to this activity.

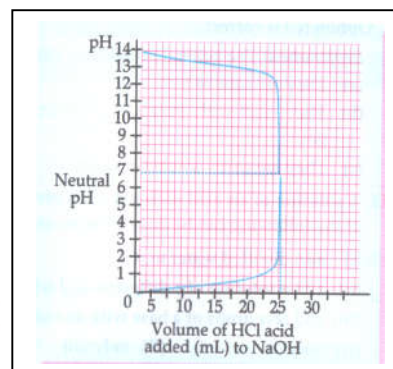
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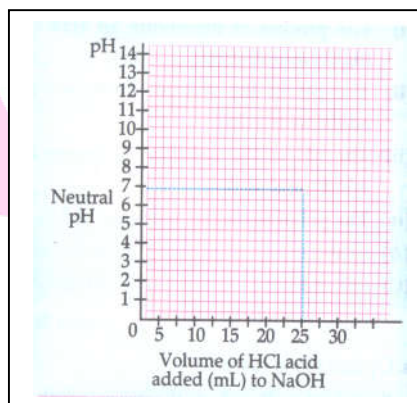
P.



Q.



R.



a) only P

b) only Q

c) either P or Q

d) any of them - P, Q or R

20. Anand took four colourless solutions P, Q, R and S and performed the following tests. What is the definite conclusion that Anand can reach?

	Solution P	Solution Q	Solution R	Solution S
With methyl orange	No change in colour	Turns red	No change in colour	No change in colour
With phenolphthalein	No Change in colour	No Change in colour	No Change in colour	Turns pink
With red litmus	No Change in colour	No Change in colour	No Change in colour	Turns litmus blue
With blue litmus	No Change in colour	Turns litmus red	No Change in colour	No Change in colour

a) Both P and S are salt solutions.

b) Both Q and S are basic solutions.

c) Both Q and R are salt solutions.

d) Both P and R are neutral solutions.

21. Some activities cause the soil and water resources in that area to become acidic. Once these activities are stopped, the land has to be treated to enable plants to grow once again. Which of the following should be added to the land to decrease the acidity permanently and allow plants to grow once again?

a) Water which is neutral

b) Calcium oxide which is basic.

c) Sodium chloride which is neutral.

d) Dilute hydrochloric acid solution.

22. Payal has to arrange the following in decreasing order of hydroxide ion concentration.

Wine (pH 4.0), milk of magnesia (pH 10.5), blood (pH 7.4)

Which of the following arrangements is correct?

- a) Wine → milk of magnesia → blood
- b) Blood → milk of magnesia → wine
- c) **Milk of magnesia → blood → wine**
- d) Wine → blood → milk of magnesia

23. In an aqueous solution 'A'. Phenolphthalein solution colour is pink. On addition of an aqueous solution 'B' to 'A' the pink colour disappears. Which of the following statement is true for solution 'A' and 'B'.

- a) A is strongly basic and B is a weak base
- b) A is strongly acidic and B is a weak acid
- c) **A has pH greater than 7 and B has pH less than 7.**
- d) A has pH less than 7 and B has pH greater than 7.

24. Which one of the following can be used as an acid-base indicator by a visually impaired student?

- a) Litmus
- b) Turmeric
- c) **Vanilla essence**
- d) Petunia leaves

## II. Multiple choice questions

(1 Mark each)

1. Which of the following salts do not have the water of crystallisation?

- i. leaching powder
- ii. Plaster of Paris
- iii. Washing soda
- iv. Baking soda
- a. (ii) and (iv)
- b. (i) and (iii)
- c. (ii) and (iii)
- d. **(i) and (iv)**

2. Baking soda is a mixture of:

- a. Sodium carbonate and acetic acid
- b. Sodium carbonate and tartaric acid
- c. **Sodium hydrogen carbonate and tartaric acid**
- d. Sodium hydrogen carbonate and acetic acid

3. The chemical formula for plaster of Paris is:

- a.  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- b.  $\text{CaSO}_4 \cdot \text{H}_2\text{O}$
- c.  **$\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$**
- d.  $2\text{CaSO}_4 \cdot \text{H}_2\text{O}$

4. Identify the basic salt from the following salts:

- a.  **$\text{Na}_2\text{CO}_3$**
- b.  $\text{NH}_4\text{Cl}$
- c.  $\text{NaNO}_3$
- d.  $\text{KCl}$



5. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to
- a) absorb the evolved gas.
  - b) moisten the gas.
  - c) absorb moisture from the gas.**
  - d) absorb  $Cl^-$  ions from the evolved gas.
6. Which of the following salts does not contain water of crystallisation?
- a) Blue Vitriol
  - b) Baking Soda**
  - c) Washing Soda
  - d) Gypsum
7. Sodium carbonate is a basic salt because it is a salt of
- a) Strong acid and strong base.
  - b) weak acid and weak base.
  - c) strong acid and weak base.
  - d) weak acid and strong base.**
8. Common salt besides being used in kitchen can also be used as the raw material for making.
- i) Washing soda
  - ii) bleaching powder
  - iii) baking soda
  - iv) slaked lime
- a) (i) and (i)
  - b) (i), (ii) and (iv)
  - c) (i), (ii) and (iii)**
  - d) (i), (iii) and (iv)
9. Which of the following is not a salt?
- a) Sodium chloride
  - b) Slaked lime**
  - c) Lead sulphide
  - d) Zinc nitrate
10. A compound is prepared from gypsum upon heating to a temperature of 373 K and it changes back to gypsum on adding water. Which is the incorrect statement about the compound?
- a) The compound is used for setting fractured bones.
  - b) The compound is called Plaster of Paris which is calcium sulphate dihydrate with a formula  $CaSO_4 \cdot 2H_2O$ .**
  - c) If heated at higher temperature, the compound becomes dehydrated and is called dead burnt plaster.
  - d) Both (A) and (B).



11. A milkman adds a very small amount of baking soda to fresh milk. Why?

- a) To increase the rate of fermentation
- b) To decrease the rate of fermentation**
- c) To increase its quality
- d) To make paneer

12. Which of the given substances is used in the following applications?

- i. It is used as a fire proofing material.
- ii. It is used for sealing gaps in laboratory apparatus.
- iii. It is used in making toys.

- a) Bleaching powder
- b) Plaster of Paris**
- c) Baking soda
- d) Washing soda

13. The gas which is passed through dry slaked lime to produce bleaching powder is:

- a)  $H_2$
- b)  $O_2$
- c)  $Cl_2$**
- d)  $N_2$

14. Which of the following statements is correct about water of crystallization?

- a) Crystals of salts obtain their shape.
- b) Crystals of salts obtain their colour
- c) Crystals of salts form a part of crystal structure.
- d) All of the above.**

15. In the given chemical reactions, Salt X  $\rightarrow$  Salt Y + Gas Z

- Salt X is commonly used in bakery product.
- Salt Y is common constituent of washing powder.
- Gas Z turns lime water milky.

The X, Y and Z in the given chemical reaction is:

	X	Y	Z
(A)	Sodium carbonate	Sodium Chloride	Carbon dioxide
(B)	Sodium carbonate	Water	Carbon dioxide
<b>(C)</b>	<b>Sodium hydrogen carbonate</b>	<b>Sodium carbonate</b>	<b>Carbon dioxide</b>
(D)	Sodium hydrogen carbonate	Calcium carbonate	Carbon dioxide

## I. Assertion & Reason

**Directions :** In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- (A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
- (B) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
- (C) Assertion (A) is true but reason (R) is false.
- (D) Assertion (A) is false but reason (R) is true.

1. **Assertion (A)** : When zinc is added to dilute hydrochloric acid, hydrogen is given off.  
**Reason (R)** : Hydrogen chloride molecules contain hydrochloric acid and hydrogen atoms.

**Ans: option (B) is correct.**

2. **Assertion (A)** : Gas bubbles are observed when sodium carbonate is added to dilute hydrochloric acid.  
**Reason (R)** : Carbon dioxide is given off in the reaction.

3. **Assertion (A)** : Ammonia solution is an alkali.  
**Reason (R)** : Ammonia solution turns blue litmus paper red.

**Ans: Option (C) is correct.**

4. **Assertion (A)** : If a few drops of concentrated acid accidentally spills over the hand of a student, wash the hand immediately with plenty of water and apply a paste of baking soda.  
**Reason (R)** : A strong base cannot be used to neutralize the acid due to its corrosive nature.

**Ans: Option (A) is correct.**

5. **Assertion (A)** : When milk changes into curd, its pH value increases.  
**Reason (R)** : During curd formation, lactic acid is produced which makes it acidic.

**Ans: Option (D) is correct.**

6. **Assertion (A)** : Universal indicator gives green colour with distilled water.  
**Reason (R)** : pH of distilled water is 7 and it is neutral.

**Ans: Option (A) is correct.**

7. **Assertion (A)** : An aqueous solution of an acid conducts electricity.  
**Reason (R)** : An acid in the aqueous solution ionises to produce  $H^+$  ions and the corresponding negative ions.

**Ans: Option (A) is correct**

8. **Assertion (A)** : Basic solutions also have  $H^+$  ions in addition to  $OH^-$  ions.  
**Reason (R)** : In these solutions,  $H^+$  ions are greater than  $OH^-$  ions.

**Ans: Option (D) is correct.**

## II. Assertion & Reason

**Directions** : In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- (A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).  
(B) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).  
(C) Assertion (A) is true but reason (R) is false.  
(D) Assertion (A) is false but reason (R) is true.

1. **Assertion (A)** : Fresh milk in which baking soda is added, takes a longer time to set as curd.

**Reason (R)** : Baking soda decreases the pH value of fresh milk to below 6.

**Ans. Option (C) is correct.**

2. **Assertion (A)** : Sodium hydrogen carbonate is used as an ingredient in antacids.

**Reason (R)** :  $NaHCO_3$  is a mild non-corrosive basic salt.

**Ans. Option (B) is correct.**

3. **Assertion (A)** : Sodium carbonate is commonly used as an ingredient in antacid tablets.

**Reason (R)** : Sodium carbonate is a basic salt.

**Ans. Option (D) is correct.**

4. **Assertion (A)** : After white washing the walls, a shiny white finish on walls is obtained after two to three days.

**Reason (R)** : Calcium oxide reacts with carbon dioxide to form Calcium Hydrogen Carbonate which gives shiny white finish.

**Ans. Option (C) is correct.**

5. **Assertion (A)** : When common salt is kept open, it absorbs moisture from the air.  
**Reason (R)** : Common salt contains magnesium chloride.

**Ans. Option (A) is correct.**

6. **Assertion (A)** : Baking soda creates acidity in the stomach.  
**Reason (R)** : Baking soda is alkaline.

**Ans. Option (D) is correct.**

7. **Assertion (A)** : Plaster of Paris is used by doctors for setting fractured bones.  
**Reason (R)** : When Plaster of Paris is mixed with water and applied around the fractured limbs, it sets into a hard mass.

**Ans. Option (A) is correct.**

8. **Assertion (A)** : Sodium hydrogen carbonate is an acidic salt.  
**Reason (R)** : It is a salt produced by the neutralisation reaction between a strong base (NaOH) and a weak acid ( $H_2CO_3$ ).

**Ans. Option (D) is correct.**

### **I. Very Short Answer Type Questions.**

(1 marks each)

1. Give one word for substance which dissociates on dissolving in water to produce hydrogen ions. [ $H^+$  (aq) ions.]

**Ans:** Acid.

2. Two solutions X and Y are tested with universal indicator. Solution X turns orange whereas solution Y turns red. Which of the solutions is a stronger acid?

**Ans:** Solution Y is a stronger acid as strength of red colour is more than orange on the universal indicator scale.

3. What happens to pH when milk changes to curd? Why?

**Ans:** When milk changes into curd, its pH will decrease. Because curd contains lactic acid, so  $H^+$  ion concentration increases and thus pH will decrease.

4. Name the gas liberated when an acid reacts with a metal?

**Ans.** Hydrogen

5. If two solutions of different pH 2 and 5 are given, which will be stronger acid and why?

**Ans.:** The Solution contains pH 2 will be stronger acid. Because acidity will increase with decreasing pH value.

6. Why 1 M HCl has higher concentration of  $H^+$  ions than 1 M  $CH_3COOH$ ?

Ans: 1 M HCl has higher concentration of  $H^+$  ions because when HCl dissolves in water it dissociates completely into ions while 1 M  $CH_3COOH$  is a weak acid and does not dissociate into ions completely.

## II. Very Short Answer Type Questions.

(1 mark each)

1. Name two main constituent of baking powder?

Ans: Sodium bicarbonate and Tartaric acid.

2. Name a salt which does not contain water of crystallisation.

Ans: Baking Soda.

3. Name the colour of litmus in a solution of sodium carbonate.

Ans. The Colour of litmus in a solution of sodium carbonate is blue.

4. Write the chemical name for  $Na_2CO_3 \cdot 10H_2O$ .

Ans: Sodium carbonate decahydrate.

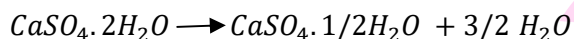
5. Give one word for water soluble base.

Ans. Alkali

6. Write the name and chemical formula of the products formed by heating Gypsum at 373K.

Ans: The chemical formula of Gypsum:  $CaSO_4 \cdot 2H_2O$ . When gypsum is heated at 373 K, we get plaster of Paris.

Chemical equation:



So, Calcium Sulphate Hemihydrate salt ( $CaSO_4 \cdot \frac{1}{2}H_2O$ ) is produced after heating gypsum.

7. During summer season a milkman usually adds a very small amount of baking soda to fresh milk. Give one reason.

Ans: Milkman adds a very small amount of baking soda so as to prevent spoilage of milk. It leads to change in pH which does not allow bacteria and enzymes to act and milk does not become sour due to fermentation.

Next Generation School



## I. Short Answer Type Questions. I

(2 marks each)

1. Blue litmus solutions is added to two test tubes A and B containing dilute HCl and NaOH solution respectively. In which test tube, a colour change will be observed? State the colour change and give its reason.

Ans. Test Tube A

It changes the colour from blue to red Hydrochloric acid turns blue litmus red.

2. What is observed when 2mL of dilute hydrochloric acid is added to 1 g of sodium carbonate taken in a clean and dry test tube? Write chemical equation for the reaction involved.

Ans. Brisk effervescence is produced.



3. What is brine? What happens when an electric current is passed through it? Write chemical equation for it.

Ans. Buine is the cold and concentrated solution of sodium chloride.

When electricity is passed through it, Nacl breakes to give ions in the solution.



Sodium Chloride      Sodium ions      Chloride ions

4. Liquid has a pH less than 7 which represent an acidic solution.

a. State the nature of solution, if its pH increases from 7 to 14.

b. Mention the ion whose concetration increases with the increas in pH value.

Ans: a. The nature of solution is basic. As the pH increases from 7 to 14, the strength of alkali also increased. So, the nature fo solution will be basic.

b. Hydroxide ion or hydroxyl ion or OH ion.

## II. Short Answer Type Questions

(2 marks each)

1. List two main sources of common salt in nature? Name any two compounds where common salt is used as a raw material?

Ans. Common Salt can be produced by evaporation sea water. Common Salt can be used to manufacture substances like sodium hydroxide and baking soda.



2. a. What is the term used for  $10H_2O$  attached in  $Na_2SO_4 \cdot 10H_2O$ ? What is its function?  
b. Write the chemical equation to explain the preparation of  $Na_2SO_4 \cdot 10H_2O$ ?

Ans: a. It is known as water of crystallization.

It imparts shape and colour to the crystal.



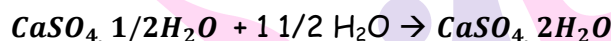
3. Bee-sting leaves a chemical substance that causes pain and irritation. Name the chemical substance. Identify the type of substance which may give relief on the sting area when applied on it.

Ans: Methanoic acid ( $HCOOH$ ).

Use of baking soda can give relief on the stung area when applied on it.

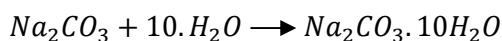
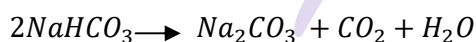
4. State the chemical name of plaster of Paris. Write a chemical equation to show the reaction between Plaster of Paris and water.

Ans: Chemical name of plaster of Paris is calcium sulphate hemi hydrate.



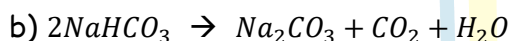
5. State in brief preparation of washing soda from baking soda. Write balanced chemical equation involved.

Ans: Sodium hydrogen carbonate (baking soda) on heating gives sodium carbonate which on recrystallisation gives washing soda.



6. a. Name the product formed when sodium hydrogen carbonate is heated.  
b. Write the chemical equation for the reaction involved in the above.

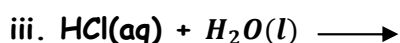
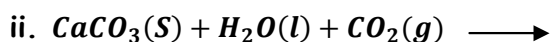
Ans. a) When sodium hydrogen carbonate is heated, sodium carbonate carbon dioxide and water are formed.

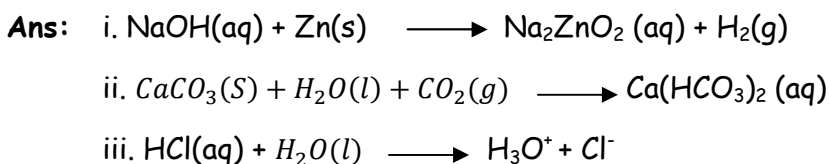


### I. Short Answer Type Questions - II

(3 marks each)

1. Complete and balance the following chemical equations:





2. You are provided with 90 mL of distilled water and 10 mL of concentrated sulphuric acid to prepare dilute sulphuric acid.

- What is the correct way of preparing dilute sulphuric acid? Give reason.
- How will the concentration of  $\text{H}_3\text{O}^+$  ions change on dilution?

**Ans.** a. While Preparing Dilute Sulphuric Acid in a Laboratory, Acid is added slowly to water (Water is never added to the acid as it will be the exothermic process which can cause Fatal to the person) with constant stirring because it will not cause any harm to the Person or any Apparatus in the laboratory.

If water is directly added to the acid then there will be sudden increase in temperature and the acids being in bulk tends to spurts out with serious Consequences.

b.  $\text{H}_3\text{O}^+$  ions will decrease on dilution.

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

b. Dry hydrogen chloride gas does not change the colour of dry litmus paper. Why?

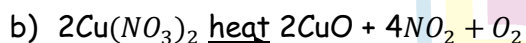
**Ans:**a. The process of diluting an acid is highly exothermic, and on the addition of acid to the water the excess heat is absorbed by water.

b. Because HCl does not form  $\text{H}^+/\text{H}_3\text{O}^+$  ions in dry condition.

4. On heating blue coloured powder of copper (II) nitrate in a boiling tube, black copper oxide,  $\text{O}_2$  and a brown gas X is formed.

- Identify the type of reaction and the gas X.
- Write balanced chemical equation of the reaction.
- Write the pH range of aqueous solution of the gas X.

**Ans:** a) Decomposition / Thermal decomposition The gas X is  $\text{NO}_2$  or (nitrogen dioxide)



c) Range less than 7 (or 0-6.9pH)

5. 2 ml of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed, a gas evolves which is bubbled through a soap solution before testing. Write the equation of the chemical reaction involved and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid.



**Ans:**  $\text{Zn} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$

When a burning splinter is brought near the gas, it burns with a pop sound.

Gas - Hydrogen /  $\text{H}_2$

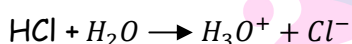
6. 1 g of solid sodium chloride is taken in a clean and dry test tube and 2 mL of conc. Sulphuric acid is added to it. If the gas evolved is tested first with dry and then with wet blue litmus paper, in which case will the litmus paper change colour? Give reason for your answer. What inference can be drawn about the nature of the evolved gas? Support your answer with chemical equation the reaction.

**Ans:** Wet blue litmus paper.

When the gas is tested with dry litmus paper, it shows no change in colour. This is because ions are not formed in the absence of water.

But with wet litmus paper hydrogen ions are produced and thus change in colour is observed. It has acidic nature.

Due to presence of  $\text{H}_3\text{O}^+$  ions.



7. In the electrolysis of water,

- Name the gas collected at anode and cathode.
- Why is the volume of gas collected at one electrode double than the other?
- What would happen if dil  $\text{H}_2\text{SO}_4$  is not added to water?

**Ans:** a. In the electrolysis of water, the gas collected at cathode is: Hydrogen. The gas collected at anode is: Oxygen.

- The gas which is collected in double the amount during the electrolysis of water is Hydrogen. This is because water contains two parts of hydrogen element as compared to one part of oxygen element by volume.
- Pure water is a bad conductor of electricity, by adding drops of sulphuric acid; we make it a good conductor of electricity.

8. 'Sweet tooth may lead to tooth decay'. Explain. What is the role of tooth paste in preventing cavities?

**Ans:** Sweet tooth leads to tooth decay, which is caused by the action of bacteria on food particles remaining in the mouth and acid is formed. As a result, the pH of the mouth falls below 5.5 and the tooth enamel dissolves resulting in cavities. Toothpastes are generally basic, they neutralise the excess acid produced in the mouth and prevent tooth decay.

9. "pH has a great importance in our daily life" explain by giving three examples.

Ans: Any three points given below:

- Plants and animals are pH sensitive:** Living organisms can survive only in narrow range of pH change.
- pH of the Soil:** Plants require a specific pH range for their healthy growth.
- pH in our digestive system:** Our stomach produces hydrochloric acid that helps in the digestion of food. During indigestion, the stomach produces too much acid that cause pain and irritation.
- Change in pH causes tooth decay:** Tooth decay start when the pH of the mouth is lower than 5.5. tooth enamel gets corroded when th pH in the mouth is below 5.5.
- Self - defence by plants and animals through chemical warfare:** Bee-sting leaves an acid causing pain and irritation. Applying a mild base like baking soda on the stung area provides relief.

10. Explain the action of dilute hydrochloric acid on the following with chemical equation:

- Magnesium ribbon
- Sodium hydroxide
- Crushed egg shells

Ans: a.  $\text{Mg} + 2\text{HCl} \longrightarrow \text{MgCl}_2 + \text{H}_2 \uparrow$

Hydrogen gas is produced.

b.  $\text{HCl} + \text{NaOH} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$

Neutralisation reaction

c.  $2\text{HCl}(\text{aq}) + \text{CaCO}_3(\text{s}) \longrightarrow \text{CaCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{aq}) + \text{CO}_2(\text{g})$

Calcium chloride is formed.

## II. Short Answer Type Questions - II

(3 marks each)

1. A compound 'X' of sodium is used as an antacid and it decomposes on strong heating.

- Name the compound 'X' and give its chemical formula.
- Write a balanced chemical equation to represent the decomposition of 'X'.
- Gvie one use of compound 'X' besides an antacid.

Ans:

- Sodium bicarbonate / Sodium hydrogen carbonate / baking soda and its formula is  $\text{NaHCO}_3$





c) It is used in fire extinguisher and for baking.

2. List the important products of the Chloro - alkali process. Write one important use of each.

Ans:

Products: Hydrogen, Chlorine, Sodium hydroxide.

Uses: Hydrogen: In the production of margarine ammonia as a fuel.

Chlorine: Water treatment swimming pools production of PVC/Disinfectants CFCs/Pesticides.

Sodium hydroxide: For decreasing metal surface / in making soaps and detergents / paper making / artificial fibres.

3. How is washing soda prepared from sodium carbonate? Give its chemical equation. State the type of this salt. Name the type of hardness of water which can be removed by it?

Ans:

- By re-crystallisation of sodium carbonate.
- $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O} \rightarrow \text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
- Basic Salt
- Permanent hardness.

4. During electrolysis of brine, a gas 'G' is liberated at anode when this gas 'G' is passed through slaked lime, a compound 'C' is formed, which is used for disinfecting drinking water.

- Write formula of 'G' and 'C'
- State the chemical equation involved
- What is common name of compound 'C'? Give its chemical name.

Ans:

- $\text{G} = \text{Cl}_2$
- $\text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$
- Common name: Bleaching powder
- Common name: Calcium oxychloride

Note: Give full credit for writing common name only.

5. A white powder is added while baking cakes to make it soft and spongy. Name its main ingredients. Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during baking.

Ans: Baking Powder



Baking soda and tartaric acid.

On heating or mixing with water, sodium bicarbonate reacts with hydrogen ion from acid and releases  $CO_2$  that makes the cake soft and fluffy.

Tartaric acid is used to avoid the bitter taste by reacting with  $Na_2CO_3$  formed.



6. Identify the acid and the base from which sodium chloride is obtained. Which type of salt is it? When is it called rock salt? How is rock salt formed?

Ans:

- Acid - Hydrochloric acid/HCl
- Neutral salt
- When it forms brown crystals combined with impurities.
- Drying up of seas.

7. Identify the acid and base which form sodium hydrogen carbonate. Write chemical equation in support of your answer. State whether this compound is acidic, basic or neutral. Also, write its pH value.

Ans:

- Acid -  $H_2CO_3$
- Base - NaOH
- $NaOH + H_2CO_3 \longrightarrow NaHCO_3 + H_2O$
- Sodium hydrogen carbonate is a weak base and its pH is 8.3.

8. How is sodium hydroxide manufactured in industries? Name the process. In this process a gas X is formed as by-product. This gas reacts with lime water to give a compound Y, which is used as a bleaching agent in the chemical industry. Identify X and Y and write the chemical equation of the reactions involved.

Ans:

- When electricity is passed through an aqueous solution of sodium chloride (brine).
- Chlor - alkali process
- $X = Cl_2$
- $Y = CaOCl_2$
- $2NaCl(aq) + 2H_2O(l) \longrightarrow Cl_2(g) + H_2(g)$
- $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$



9. Identify the compound of calcium which is used for plastering of fractured bones. With the help of chemical equation show how is it prepared and what special precautions should be taken during the preparation of this compound.

Ans: Plaster of Paris:  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$

Calcium Sulphate Hemihydrate

Preparation:



Precaution:

Gypsum should not be heated above 373 K other wise it will form  $\text{CaSO}_4$ .

10. a. For the preparation of cakes, baking powder is used. If at home your mother uses baking soda instead of baking powder, how will it affect the taste of the cake and why?

b. How is baking soda be converted into baking powder?

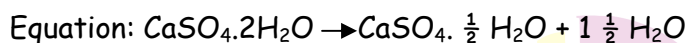
c. What makes the cake soft and spongy?

Ans:

- The cake will have a bitter taste because of the formation of  $\text{Na}_2\text{CO}_3$  sodium carbonate while baking/heating
- By adding tartaric acid
- The liberated  $\text{CO}_2$  gas.

11. A compound which prepared from gypsum has the property of hardening when mixed with a proper quantity of water. Identify the compound and write its chemical formula. Write the chemical equation for its preparation. Mention one use of the compound.

Ans.: The name of the compound is Plaster of Paris. Its chemical formula is  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$



It is used in the hospitals mainly as plaster for supporting fractured bones in the right position.

12. A sanitary worker uses a white chemical having strong smell of chlorine gas to disinfect the water tank.

- Identify the chemical compound, write its chemical formula.
- Give chemical equation for its preparation.
- Write its two uses other than disinfection.

Ans:

- Bleaching powder:  $\text{CaOCl}_2$
- $\text{Ca}(\text{OH})_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$

iii. Two uses other than disinfection are:

a. Paper Industries

b. Chemical Industries

13. i) A white powder is an active ingredient of antacids and is used in preparation of baking powder. Name the compound and explain that how it is manufactured. Give chemical equation.

ii) Write a chemical equation to show the effect of heat on this compound.

Ans: i. Compound is  $\text{NaHCO}_3$ /baking soda / sodium hydrogen carbonate

Manufacture:  $\text{NH}_3 + \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{NH}_4\text{Cl} + \text{NaHCO}_3$

ii.  $2\text{NaHCO}_3 \xrightarrow{\text{heat}} \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$

14. In one of the industrial processes, used for manufacture of sodium hydroxide, a gas X is formed as by-product. The gas 'X' reacts with dry slaked lime to give a compound 'Y' which is used as bleaching agent in textile industry. Identify X and Y.

Ans: i) X = Chlorine gas, Y = Calcium oxychloride

ii)  $\text{Ca}(\text{OH})_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$

(Dry slaked (chlorine) (Calcium (Water) lime oxy-chloride) (Bleaching agent)

### I. Long Answer Type Questions.

(5 marks each)

1. Match the following pH values 1, 7, 10, 13 to the solutions given below:

- Milk of Magnesia
- Gastric juices
- Brine
- Aqueous Sodium hydroxide.

Amit and Rita decided to bake a cake and added baking soda to the cake batter. Explain with a balanced reaction, the role of the baking soda. Mention any other use of baking soda.

Ans: Milk of Magnesia 10

Gastric juices: 1

Brine: 7

Aqueous Sodium hydroxide: 13

Baking soda undergoes thermal decomposition to form  $\text{Na}_2\text{CO}_3$ ,  $\text{CO}_2$  and  $\text{H}_2\text{O}$ ;

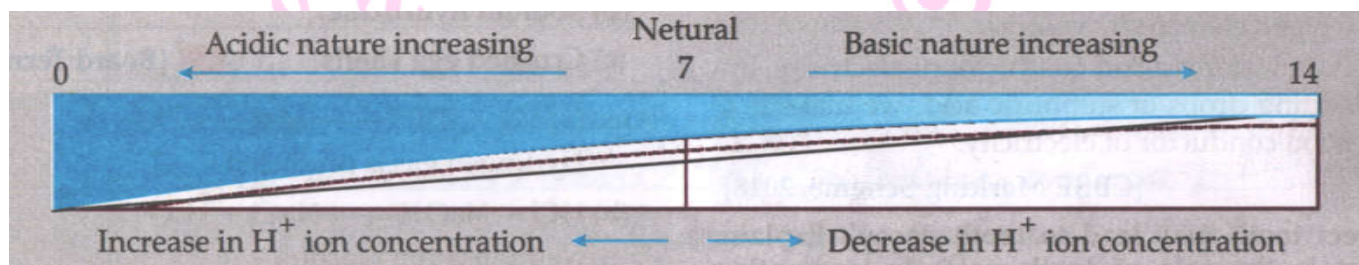
$\text{CO}_2$  makes the cake fluffy & soft.

$\text{NaHCO}_3 \xrightarrow{\text{heat}} \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$

2. a. Define pH scale. Draw a figure showing variation of pH with the change in concentration of  $H^+$  (aq) and  $OH^-(aq)$  ions.
- b. Mention the range of pH of acidic solution, basic solution and neutral solution respectively.

**Ans:** a) Scale for measuring  $[H^+]$  concentration in a solution is called pH scale.

Refer to below figure:



- b. pH of Neutral solution is 7.  
pH of acidic solution is 0 to below 7.  
pH of Basic solution is above 7 to 14.
3. a. Define universal indicator. For what purpose it is used?
- b. Two solutions A and B have pH values of 3.0 and 9.5 respectively. Which of these will turn litmus solution from blue to red and which will turn phenolphthalein from colourless to pink?
- c. Water is a neutral substance. What colour will you get when you add a few drops of universal indicator to a test tube containing distilled water?

**Ans.** a) Universal indicator is a mixture of many different indication (or dyes) which give different colours at different pH values of the entire pH scale. The colour produced by universal indicator is used to find the pH value of acid or base by matching the colour with the colours on pH colour chart.

b) Solution A is acidic and will turn litmus solution from blue to red.  
Solution B is basic and will turn phenolphthalein from colourless to pink.

c) Green colour will be obtained.

4. Account for the following:

- a. State the relation between hydrogen ion concentration of an aqueous solution and its pH.
- b. An aqueous solution has a pH value of 7.0. Is this solution acidic, basic or neutral?
- c. Which has a higher pH value, 1 M HCl or 1 M NaOH solution?





- d. Tooth enamel is one of the hardest substances in our body. How does it undergo damage due to eating chocolates and sweets? What should we do to prevent it?
- e. How do  $[H^+]$  ions exist in water?

- Ans:** a) if  $H^+$  ion concentration is more, pH will be less and vice versa or pH of a solution is inversely proportional to  $H^+$  ion concentration or  
 $pH = -\log[H^+]$
- b) This solution is neutral
- c) 1M NaOH solution
- d) When the pH in the mouth is below 5.5, bacteria present in the mouth produce acids by degradation of sugar and corrode the tooth enamel. It can be prevented by using toothpastes which are generally basic.
- e) As hydronium  $[H_3O]^+$  ion.

## II. Long Answer Type Questions.

(5 marks each)

- Four samples A, B, C and D change the colour of pH paper or solution to Green, Reddish-pink, blue and Orange. Their pH was recorded as 7, 2, 10.5 and 6 respectively.
  - Which of the samples has the highest amount of Hydrogen ion concentration? Arrange the four samples in the decreasing order of their pH.
  - Rahul found that the Plaster of Paris, which he stored in a container, has become very hard and lost its binding nature. What is the reason for this? Also, write a chemical equation to represent the reaction taking place.
  - Give any one use of Plaster of Paris other than for plastering or smoothening of walls.

**Ans:**

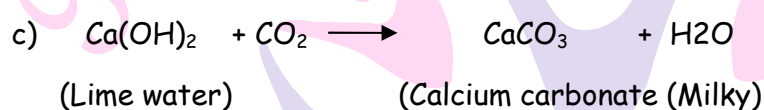
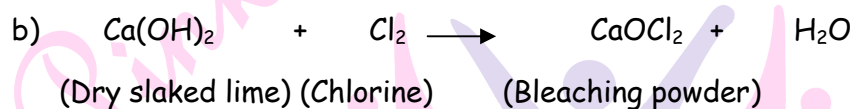
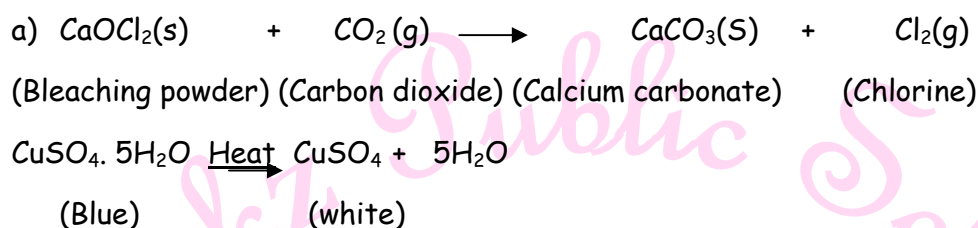
- B (reason: low pH, high  $H^+$  ion concentration) decreasing order: C, A, D, B
  - Due to moisture in the atmosphere it is converted into Gypsum  

$$CaSO_4 + 1\frac{1}{2} H_2O \rightarrow CaSO_4 \cdot 2H_2O$$
  - Making toys/dolls or statues / fixing broken limbs / making decorative materials.
2. Write balanced chemical equation for the following statements:
- Bleaching powder is kept open in air.
  - Blue crystals of copper sulphate are heated
  - Chlorine gas is passed through dry slaked lime.

d. Carbon dioxide gas is passed through lime water.

e. NaOH solution is heated with zinc granules.

Ans:



3. Give suitable reasons for the following statements:

- Rain water conducts electricity but distilled water does not.
- We feel burning sensation in the stomach when we overeat.
- A tarnished copper vessel regains its shine when rubbed with lemon.
- The crystals of washing soda change to white powder on exposure to air.
- An aqueous solution of sodium chloride is neutral but an aqueous solution of sodium carbonate is basic.

Ans:

- Distilled water does not conduct electricity because it does not contain any ionic compound like acids, bases or salts dissolved in it.
- When we overeat, excess of acid is produced in the stomach which causes burning sensation.
- Copper vessels tarnish due to formation of basic copper carbonate which gets neutralized when rubbed with lemon and the copper vessel regains its shine.
- Washing soda is sodium carbonate decahydrate which when exposed to air loses 10 molecules of water and changes to white powder.
- Sodium chloride is a salt of strong acid HCl and strong base NaOH, so it is neutral. Sodium carbonate is a salt of weak acid  $\text{H}_2\text{CO}_3$  and strong base NaOH, so it is basic.

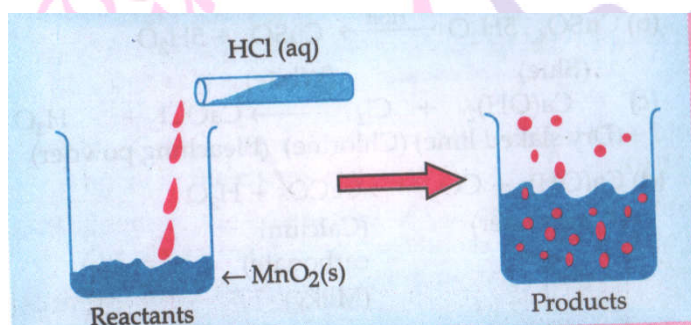
## Competency Based Questions

(4 Marks each)

### Case based MCQs

1. Read the given passage and answer any four questions, of the following.

The reaction between  $\text{MnO}_2$  with  $\text{HCl}$  is depicted in the following diagram. It was observed that a gas with bleaching abilities was released.



- The chemical reaction between  $\text{MnO}_2$  and  $\text{HCl}$  is an example of:
  - displacement reaction
  - Combination reaction
  - redox reaction
  - Decomposition reaction
- Chlorine gas reacts with \_\_\_\_\_ to form bleaching powder.
  - dry  $\text{Ca(OH)}_2$
  - Dil. Solution of  $\text{Ca(OH)}_2$
  - conc. Solution of  $\text{Ca(OH)}_2$
  - Dry  $\text{CaO}$
- Identify the correct statement from the following:
  - $\text{MnO}_2$  is getting reduced whereas  $\text{HCl}$  is getting oxidized.
  - $\text{MnO}_2$  is getting oxidized whereas  $\text{HCl}$  is getting reduced.
  - $\text{MnO}_2$  and  $\text{HCl}$  both are getting reduced.
  - $\text{MnO}_2$  and  $\text{HCl}$  both are getting oxidized.
- In the above discussed reaction, what is the nature of  $\text{MnO}_2$ ?
  - Acidic oxide
  - Basic oxide
  - Neutral oxide
  - Amphoteric oxide
- What will happen if we take dry  $\text{HCl}$  gas instead of aqueous solution of  $\text{HCl}$ ?
  - Reaction will occur faster.
  - Reaction will not occur.
  - Reaction rate will be slow.
  - Reaction rate will remain the same.

II. Read given passage and answer any 4 question of the following.

### Frothing in Yamuna:

The Primary reason behind the formation of the toxic foam is high phosphate content in the wastewater because of detergents used in dyeing industries, dhobi ghat Yamuna's pollution level is so bad that parts of it have been labelled 'dead' as there is no oxygen in it for aquatic life to survive.



1. Predict the pH value of the water of river Yamuna of the reason for froth is high content of detergents dissolved in it.

- a. 10-11                      b. 5-7                      c. 2-5                      d. 7

2. Which of the following statements is correct for the water with detergents dissolved in it?

- a. low concentration of hydroxide ion ( $\text{OH}^-$ ) and high concentration of hydronium ion ( $\text{H}^3\text{O}^+$ )  
 b. high concentration of hydroxide ion ( $\text{OH}^-$ ) and low concentration of hydronium ( $\text{H}^3\text{O}^+$ ).  
 c. high concentration of hydroxides ion ( $\text{OH}^-$ ) as well as hydronium ion ( $\text{H}^3\text{O}^+$ ).  
 d. equal concentration of both hydroxide ion ( $\text{OH}^-$ ) and hydronium ion ( $\text{H}^3\text{O}^+$ ).

3. The table provides the pH value of four solutions p, Q, R and S

Solution	pH value
P	2
Q	9
R	5
S	11

Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration?

- a)  $P > Q > R > S$                       b)  $P > S > Q > R$   
 c)  $S < Q < R < P$                       d)  $S < P < Q < R$

4. High content of phosphate ion in river Yamuna may lead to:

- a) decreased level of dissolved oxygen and increased level of dissolved oxygen and no effect of growth of algae.
- b) decreased level of dissolved oxygen and no effect of growth of algae.
- c) Increased level of dissolved oxygen and increased growth of algae.
- d) Decreased level of dissolved oxygen and decreased growth of algae.

5. If a sample of water containing detergents is provided to you, which of the following methods will you adopt to neutralize it?

- a) Treating the water with baking soda
- b) Treating the water with vinegar
- c) Treating the water with caustic soda
- d) Treating the water with washing soda

III. The pH values of many common liquids are given in the table below.

Substance	pH
Battery acid	<1.0
Stomach acid	2.0
Lemon Juice	2.4
Cola	2.5
Apple juice	3.5
Black Coffee	5.0
Acid rain	5.6
Milk	6.5
Distilled water	7.0
Human saliva	7.5
Sea water	8.0
Soap	9.0-10.0
Milk of magnesia	10.5
Ammonia	11.5
Bleach	12.5

Study the above table and answer the following questions from Q1 to Q4.

1. Which of these is a neutralisation reaction?

- a. mixing sea water and bleach
- b. Mixing lemon juice and soap
- c. mixing milk and black tea
- d. Mixing cola and distilled water

2. Which of these is a valid conclusion that can be drawn from the table?

- a. Many common food items are quite acidic in nature.
- b. Our stomach contains a liquid which is a weak acid.



- c. Sea water is neither acidic nor basic – it is neutral
- d. Acid rain, in spite of its name, is basic in nature.

**3. Amit has black coffee with milk. Which of the following is most likely to be true about the pH of the mixture?**

- a. It will be less than that of black coffee.
- b. It will be more than that of distilled water
- c. It will be more than that of acid rain.
- d. It will be less than that of apple juice.

**4. Which of the following would be the best for a person suffering from acidity?**

- a. Cola
- b. Milk
- c. Black tea
- d. Milk of magnesia

### Case based Subjective Questions

I. pH is a unit of measure which describes the degree of acidity or alkalinity of a solution. It is measured on a scale of 0 to 14. The term pH is derived from "p," the mathematical symbol for negative logarithm, and "H," the chemical symbol for Hydrogen. The formal definition of pH is: the negative logarithm of Hydrogen ion activity.  $\text{pH} = -\log[\text{H}^+]$ . pH provides needed quantitative information by expressing the degree of activity of an acid or base in terms of its hydrogen ion activity. The pH value of a substance is directly related to the ratio of hydrogen ion  $[\text{H}^+]$  and hydroxyl ion  $[\text{OH}^-]$  concentrations. If the  $\text{H}^+$  concentration is greater than the  $\text{OH}^-$ , the material is acidic. If the  $\text{OH}^-$  concentration is greater than its  $\text{H}^+$ , the material is basic. If equal numbers of  $\text{H}^+$  and  $\text{OH}^-$  ions are present, the material is neutral. In clean water, neutral hydrogen ion concentration is  $10^{-7}$  gram-equivalents per litre. Solution with a pH of less than 7 is considered acidic.

**1. State the nature of solution, if its pH increases from 7 to 14.**

**Ans:** Basic

**2. Mention the ion whose concentration increases with the increase in pH value.**

**Ans:** Hydroxide ions ( $\text{OH}^-$ )

**3. What is meant by the term pH of a solution? Suggest a method that is generally used for measuring the pH value.**

**Ans:** pH is a unit of measure which describes the degree of acidity or alkalinity of a solution

4. The pH of rain water collected from two cities A and B was found to be 6 and 5 respectively. The water of which city is more acidic?

Ans: city B

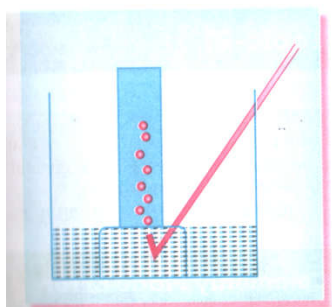
II. Priyanka performed an experiment to understand that heat is produced when a few drops of concentrated sulphuric acid is slowly added into a beaker containing water. For this, she took 10 mL water in a beaker and added a few drops of concentrated  $\text{H}_2\text{SO}_4$  to it. Then she swirled the beaker slowly. During the process, a vigorous reaction takes place. It is an exothermic process.

1. Why is it recommended that acid should be added to water and not water to the acid?
2. How will the concentration of hydrogen ion get affected if an acid is diluted?
3. What is this process called? Define the process.
4. If we have hydrochloric acid and acetic acid of equal concentration, which will be a stronger acid and why?

Ans:

1. Dilution of concentrated acid is an exothermic process. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns, when the acid is added to water slowly with constant stirring, the mixture will not splash out.
2. Concentration of  $\text{H}^+$  decreases with increase in dilution.
3. Dilution of the acid. Dilution of an acid or base means mixing an acid or base with water. This is done to decrease the concentration of ions ( $\text{H}_3\text{O}^+/\text{OH}^-$ ) per unit volume.
4. Hydrochloric acid will be a stronger acid, because it produces more  $\text{H}^+$  ions.

III. Metals react with acids at different rates, depending on how reactive the metals are. Dilute acids react with relatively reactive metals such as magnesium, aluminium, zinc and iron. One of the products of the reaction is a salt. Now, in order to study this, Sonia treated a metal with dilute sulphuric acid. A gas evolved is collected by the method shown in the figure.



Generation School



1. Name the gas evolved.
2. The evolved gas is the gas soluble or insoluble in water?
3. How will you test the gas?

OR

If the metal used above is zinc then write the chemical equation for the evolution of gas.  
Write on industrial use of the gas evolved.

Ans:

1. Hydrogen gas
2. The evolved gas is soluble in water.
3. Test of H<sub>2</sub> Gas - Bring a burning matchstick near the gas jar. It burns with a pop Sound.

OR



Liquid hydrogen is used as a fuel in rockets.



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