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CHAPTER 2 ACID, BASE AND SALTS

MCQ TYPE QUESTIONS

1. The colour of phenolphthalein in acidic medium is-

- (a) Yellow
- (b) Pink
- (c) Colourless
- (d) Blue

Answers at last Page

2. The gas which burns with a pop sound –

- (a) H₂
- (b) CO₂
- (c) O₂
- (d) CH₄

3. Milkiness of limewater disappear when excess CO₂ is passed due to the formation of-

- (a) Calcium hydroxide
- (b) Calcium chloride
- (c) Calcium bicarbonate
- (d) Calcium carbonate

4. The acid present in tomato is-

- (a) Lactic acid
- (b) Oxalic acid
- (c) Tartaric acid
- (d) Methanoic acid

5. The common name for the substance used as antacid-

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

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6. Calcium carbonate reacts with hydrochloric acid to form X, Y, Z. What are X, Y, Z ?

(a) X:Ca(OH)₂, Y:H₂O, Z:CO₂

(b) X:CaCl₂, Y:H₂O, Z:CO₂

(c) X:Ca(OH)₂, Y:H₂O, Z:H₂

(d) X:CaCl₂, Y:H₂O, Z:H₂

7. When you clean a metal vessel with tamarind the reaction taking place is:

Metaloxide+X-----→ Salt+Water. What is X here?

(a) Acid

(b) Base

(c) Hydrogen

(d) Carbon dioxide

8. Brine is an

(a) aqueous solution of sodium hydroxide

(b) aqueous solution of sodium carbonate

(c) aqueous solution of sodium chloride

(d) aqueous solution of sodium bicarbonate

9. Sodium carbonate is a basic salt because it is a salt of a

(a) strong acid and strong base

(b) weak acid and weak base

(c) strong acid and weak base

(d) weak acid and strong base

10. Nettle sting is a natural source of which acid?

(a) Methanoic acid

(b) Lactic acid

(c) Citric acid

(d) Tartaric acid

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11. Tooth enamel is made up of
- (a) calcium phosphate
 - (b) calcium carbonate
 - (c) calcium oxide
 - (d) potassium
12. Rain is called acid rain when its:
- (a) pH falls below 7
 - (b) pH falls below 6
 - (c) pH falls below 5.6
 - (d) pH is above 7
13. Farmers neutralize the effect of Acidity on soil by adding
- (a) Slaked Lime
 - (b) Gypsum
 - (c) Caustic Soda
 - (d) Baking Soda
14. In which pH range does our body work to survive in the atmosphere?
- (a) 5.5 to 8.5
 - (b) 7.0 to 7.8
 - (c) 2.3 to 7.0
 - (d) 7.5 to 12.5
15. The pH of a solution is 7. How can you increase its pH?
- (a) By adding a small amount of acid
 - (b) By adding a small amount of base.
 - (c) By adding a small amount of salt.
 - (d) By passing carbon dioxide gas through it.
16. Which gas is evolved when acids react with metals?
- (a) O₂
 - (b) CO₂

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(c) H_2

(d) N_2

17. Which of the following gives the correct increasing order of acidic strength?

(a) Water < Acetic acid < Hydrochloric acid

(b) Water < Hydrochloric acid < Acetic acid

(c) Acetic acid < Water < Hydrochloric acid

(d) Hydrochloric acid < Water < Acetic acid

18. One of the constituents of baking powder is sodium hydrogen carbonate, the other constituent is

(a) hydrochloric acid

(b) tartaric acid

(c) acetic acid

(d) sulphuric acid

19. The pH of three solutions X, Y and Z is 6, 4 and 8 respectively. Which of the following is the correct order of acidic strength?

(a) $X > Y > Z$

(b) $Z > Y > X$

(c) $Y > X > Z$

(d) $Z > X > Y$

20. What is gastric acid present in the stomach composed of?

(a) Hydrochloric acid

(b) Sulphuric acid

(c) Nitric acid

(d) Lactic acid

ASSERTION AND REASON QUESTIONS:

DIRECTION: Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

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- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. **Assertion (A)** : The acid must be added to water with constant stirring.

Reason(R) : Mixing of an acid with water decreases the concentration of H^+ ions per unit volume.

Q.2. **Assertion(A)**: Copper sulphate crystals are wet because it contains water of crystallization.

Reason(R): Water of crystallization is the fixed number of molecules of water present in one formula unit of salt.

Q.3. **Assertion(A)**: The aqueous solution of glucose and alcohol do not show acidic character.

Reason(R) : Aqueous solution of glucose and alcohol do not give H^+ ions .

Q.4. **Assertion(A)**: Pure water is neither acidic nor basic.

Reason(R) : The pH of a solution is inversely proportional to the the concentration of H^+ ions in it.

Q.5. **Assertion(A)**: Weak acids have low electrical conductivity.

Reason(R) : Strong acids and weak acids have equal concentration of H^+ ions in their solutions.

CASE STUDY BASED QUESTIONS:

Q.1. **Read the following and answer the questions :**

There are many substances which are used to detect the solutions as acidic or basic. They are called Acid-Base indicators. Depending upon the property of the indicator, we have different groups of Acid-Base indicators. Some indicators show different colors in acidic or basic medium and some indicators give different odors in acidic and basic medium. These indicators are either extracted from the plants or synthesized in the laboratory or industry.

1.1. Which of the following will turn red litmus blue?

- A.) Amla juice
- B.) lemon juice
- C.) Soft drink
- D.) Baking soda

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Taj mahal, the seventh wonder of the world, is made of white stone. This white stone contains the same substance 'A' that is present in chalk powder and lime-stone. It is turning yellow due to polluted air. If it is cleaned by an acidic cleaner, a gas 'B' is released, which when passed through a solution 'C', forms the same substance which is present in the white stone that was used to make Taj mahal.

2.1. The substance A is-

- A.) Ca_3CO_2 C.) $\text{Ca}(\text{OH})_2$
B.) CaCO_3 D.) CaSO_4

2.2. Gas B is-

- A.) Hydrogen C.) Chlorine
B.) Nitrogen D.) Carbon di oxide

2.3. Solution C is-

- A.) CaCl_2 C.) $\text{Ca}(\text{OH})_2$
B.) CaCO_3 D.) CaSO_4

2.4. What is the nature of the substance A?

- A.) Acidic C.) Neutral
B.) Basic D.) None

2.5. The polluted air around Taj mahal leads to the following problem because of which it is getting Marble cancer:

- A.) Global Warming C.) Green House Effect

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B.) Acid Rain

D.) All are correct

Q.3. Read the following and answer the questions :

A scale for measuring hydrogen ion concentration in a solution, called pH scale has been developed. The p in pH stands for 'potenz' in German, meaning power. On the pH scale we can measure pH from 0 to 14. pH should be thought of simply as a number which indicates the acidic or basic nature of a solution. Higher the hydronium ion concentration, lower is the Ph value.

3.1. Which one of the following will have the highest hydrogen ion concentration?

A.) pH=1.1

C.) pH =3.3

B.) pH = 2.2

D.) pH =4.4

3.2. How is the hydrogen ion concentration and pH related to each other?

A.) They are inversely proportional.

B.) They are directly proportional.

C.) They are equal.

D.) They have no relation.

3.3. A basic solution could have a pH of-

A.) 3

C.) 7

B.) 5

D.) 9

3.4. The table provides the pH 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?

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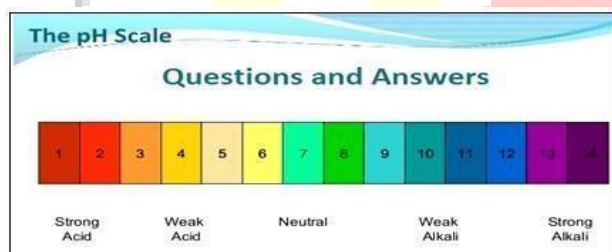
- A.) $P > Q > R > S$
- B.) $P > S > Q > R$
- C.) $S < Q < R < P$
- D.) $S < P < Q < R$

3.5. If the pH of any solution is 13, then the color obtained on adding universal indicator to it will be:

- A.) Red
- B.) Orange
- C.) Green
- D.) Purple

Q.4. Read the following and answer the questions :

The Ph value of any solution is a number which simply represents the acidity and basicity of that solution. The pH value of any solution is numerically equal to the logarithm of the inverse of the hydrogen ion(H^+) concentration.



4.1. The pH value for distilled water would be:

- A.) 5
- B.) 6
- C.) 7
- D.) 10

4.2. Using above picture can you predict the colour of Ph paper when dipped in limejuice:

- A.) Dark Red
- B.) Light Orange
- C.) Green
- D.) Blue

4.3. The nature of toothpaste is:

- A.) Neutral
- B.) Acidic
- C.) Basic
- D.) Can be acidic or basic

4.4. If a solution gives dark blue color and water is added to it, its color will become:

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- A.) Dark blue C.) Light blue to green
B.) Red D.) Purple

4.5. Universal indicator strip gives green colour when put in our mouth before eating food. This indicates that:

- A.) The pH of saliva is basic in nature
B.) The pH of saliva is near neutral
C.) Saliva is acidic in nature
D.) All are in correct

Q.5. Read the following and answer the questions :

Water of crystallization is the fixed number of water molecules present in one formula unit of a salt. Water of crystallization or water(s) of hydration are water molecules that are present inside crystals. Water is often incorporated in the formation of crystals from aqueous solutions. A salt with associated water of crystallization is known as a hydrate.

5.1. Which of the following salt does not contain water of crystallisation?

- A.) Blue Vitriol C.) Washing soda
B.) Baking Soda D.) Gypsum

5.2. The temperature at which Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) into Plaster of Paris ($\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$)

- A.) 373K C.) 374K
B.) 273K D.) 430K

5.3. The formula of Plaster of Paris is $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$, it is to be noted that half water molecule is shown to be attached as water of crystallization. This indicates that

- A.) Only half water molecule is present in Calcium Sulphate crystal
B.) Two formula units of Calcium Sulphate share one molecule of water.
C.) Two formula units of calcium Sulphate share two molecules of water
D.) Two formula units of Calcium Sulphate share one and a half molecules of water.

5.4. Given below are some chemicals. Select the one that have 7 molecules of water attached in hydrated form:

- A.) Blue vitriol C.) POP

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B.) Green Vitriol D.) Washing Soda

5.5. When blue vitriol is heated its color changes from:

A.) White to Blue C.) White to Green

B.) Blue to White D.) Blue to Green

Very short answer type questions

Q.1. Name an olfactory indicator?

Ans- Onion

Q.2. The pH of an aqueous solution decreases from 3 to 2. What will happen to the nature of the solution ?

Ans- The acidic character of the solution will further increases.

Q.3. What is the chemical name and chemical formula of baking soda?

Ans- Sodium Hydrogen Carbonate or Sodium bicarbonate. Its formula is NaHCO_3 .

Q.4. Which bases are called alkalis? Give an example.

Ans- Water soluble bases are called alkalis. e.g.- NaOH

Q.5. Name the gas evolved when dilute HCl reacts with sodium bi carbonate? How is it recognized?

Ans- The gas evolved is CO_2 . When it is passed through lime water, it becomes milky.

Short answer type questions.

Q.1. A sample of bleaching powder was kept in an air tight container. After a month, it lost some of its chlorine content. How will you account for it?

Ans- Bleaching powder if kept even in an air tight container will slowly decompose of its own and form calcium chlorate and calcium chloride. The reaction is called auto oxidation. This will result in decrease in its Chlorine contents.

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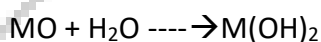


Q.2. An old man complained of acute pain in stomach. Doctor gave him a small antacid tablet and he got immediate relief. What actually happened?

Ans- The old man was suffering from acute acidity. Antacid tablet contains NaHCO_3 . It reacts with the acid HCl formed because of acidity and neutralizes its effect.

Q.3. The oxide of a metal M was water soluble. When a blue litmus strip was dipped in this solution, it did not undergo any change in color. Predict the nature of the oxide.

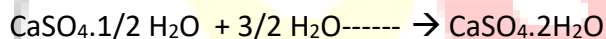
Ans- The metal oxide (MO) is of basic in nature. It dissolves in water to form metal hydroxide as follow.



A blue litmus does not undergo any change in color in the basic medium.

Q.4. A doctor applied surgical bandages on the fractured bones of a patient after making it wet. What changes are likely to occur?

Ans- Surgical bandages are made from plaster of Paris. When applied on the fractured bones after making them wet, it changes into a hard mass called Gypsum.



Q.5. Fresh milk has pH of 6. When it changes to curd, will its pH value increase or decrease? Why?

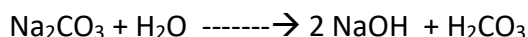
Ans- When fresh milk changes to curd, the pH of the solution is likely to decrease. Actually, lactose present in milk gets converted to lactic acid when curd is formed from milk. Therefore, the medium becomes more acidic and its pH decreases.

Long answer type questions

Q.1. What will you observe when-

- (i) Red litmus paper introduced into a solution of sodium carbonate.
- (ii) A methyl orange drop is added to dilute hydrochloric acid.
- (iii) A drop of phenolphthalein is added to the solution of lime water.
- (iv) Blue litmus is introduced into a solution of Ferric chloride.

Ans- (i) The color of litmus paper will change to blue. Sodium carbonate dissolves in to water to form NaOH and Carbonic acid H_2CO_3 . The solution is basic in nature since NaOH is a strong base and carbonic acid is a weak acid.



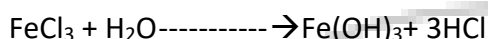
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- (ii) In the acidic solution, the color of methyl orange will change to reddish.
- (iii) Lime water contains traces of Calcium hydroxide Ca(OH)_2 . It is therefore basic in nature. The colour of phenolphthalein will become pink.
- (iv) Ferric chloride solution on reaction with water will form ferric hydroxide and HCl. Since the acid is strong, the solution will be acidic. Therefore the color of blue litmus will change to red.

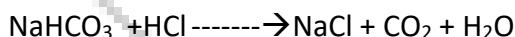


Q.2. (a) Why does an aqueous solution of an acid conduct electricity?

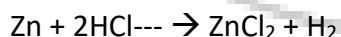
- (b) How does the concentration of hydrogen ion changes the solution of an acid is diluted with water?
- (c) Which has a higher pH value ; a concentrated or dilute HCl?
- (d) What would you observe on adding dilute HCl to
 - (i) Sodium bicarbonate placed in a test tube.
 - (ii) Zinc metal in a test tube.

Ans- (a) An aqueous solution of an acid conducts electricity because in water an acid dissociates to give ions. Since current is carried by the movements of ions, a.q. solution of acid conduct electricity.

- (b) Upon dilution, more of acid dissociates into ions Therefore concentration of hydrogen ion increases.
- (c) Although more H^+ ions are formed upon dilution , but the number of ions per unit volume decrease. Therefore, pH will increase upon dilution.
- (d) (i) CO_2 gas would evolve accompanied by brisk effervescences.



- (ii) Hydrogen gas would evolve accompanied by brisk effervescences.



Q.3. Explain why:

- (i) Common salt becomes sticky during the rainy season
- (ii) Blue vitriol changes to white upon heating.
- (iii) If bottle full of Conc. Sulphuric acid is left open in the atmosphere by accident, the acid starts flowing out of the bottle of its own.

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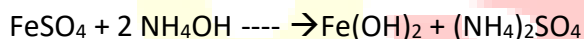
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- Ans- (i) Common salt contains the impurity of $MgCl_2$ which is of deliquescent in nature. When exposed to atmosphere, it becomes moist. Therefore common salt becomes sticky during the rainy season.
- (ii) Blue vitriol ($CuSO_4 \cdot 5H_2O$) upon heating changes to anhydrous copper sulphate which is white in color.
- (iii) Concentrated Sulphuric acid is highly hygroscopic. It absorbs moisture from air and gets diluted. Since the volume increases, the acid starts flowing out of the bottle.

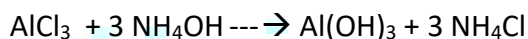
- Q.4. (a) What is the action of red litmus on (i) dry ammonia gas (ii) solution of Ammonia gas.
- (b) State the observation you would make on adding ammonium hydroxide to aqueous solution of (i) Ferrous Sulphate (ii) Aluminium Chloride.

- Ans- (a) (i) Red litmus has no action on dry ammonia because it does not have hydroxyl ion.
- (ii) When it interacts with ammonia solution it turns blue as the solution has hydroxyl ion.

- (b) (i) A green precipitate of ferrous hydroxide will be formed



- (ii) A white precipitate is formed



- Q.5. (a) Name the raw materials used in the manufacture of Sodium carbonate in Solvay process?
- (b) How is sodium bicarbonate formed during Solvay process separated from a mixture of NH_4Cl and $NaHCO_3$?
- (c) How is sodium carbonate obtained from Sodium bicarbonate?

Ans-(a) The raw materials used are: $NaCl$, Lime stone or $CaCO_3$ and NH_3

- (b) $NaHCO_3$ is sparingly soluble or less soluble in water and gets separated as a precipitate while NH_4Cl remains in solution. The filtrate is removed by filtration.

- (c) $NaHCO_3$ is converted to sodium carbonate upon heating.



ANSWER KEYS

MULTIPLE CHOICE QUESTIONS:

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Q1.C	Q2.A	Q3.C	Q4.B	Q5.D
Q6.B	Q7.A	Q8.C	Q9.D	Q10.A
Q11.A	Q12.C	Q13.A	Q14.B	Q15.B
Q16.C	Q17.A	Q18.B	Q19.C	Q20.A

ASSERTION AND REASONING

Q1.B	Q2.D	Q3.A	Q4.B	Q5.C
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CASE STUDY BASED QUESTIONS

1.1 D	1.2 A	1.3 C	1.4 B	1.5
2.1. B	2.2. D	2.3. C	2.4. B	2.5.B
3.1. A	3.2.B	3.3D	3.4.C	3.5.D
4.1.C	4.2.B	4.3C	4.4C	4.5A
5.1B	5.2A	5.3B	5.4B	5.5B

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