

## 10. ACIDS, BASES & SALTS - PREPARATION & PROPERTIES OF ACIDS

### SOLUTIONS

### TEACHING TASK

### JEE MAINS LEVEL QUESTIONS

#### Single Answer Type

1. Which of the following is a weak acid?  
 A)  $H_3PO_4$                       B)  $H_2CO_3$                       C)  $HNO_2$                       D) All of these

**Answer:D**

Solution:  $H_3PO_4$  – weak acid  
 $H_2CO_3$  – weak acid  
 $HNO_2$  – weak acid  
 All are weak acids.

2.  $NaHCO_3 + HCl \rightarrow \dots\dots\dots + CO_2 + H_2O$ .  
 A)  $NaOH$                       B)  $NaO$                       C)  $NaCl$                       D)  $Na$

**Answer:C**

Solution:



3. Which acid do not change into their vapours, even on strong heating also.  
**(FA & SA- 2 Marks)**  
 A)  $H_2SO_4$                       B)  $HCl$                       C)  $CH_3COOH$                       D)  $HNO_3$

**Answer:A**

Solution:  $H_2SO_4$  – high boiling point, nonvolatile

$HCl$  – volatile

$CH_3COOH$  – volatile

$HNO_3$  – volatile

4.  $Al(OH)_3 + H_2SO_4 \rightarrow \dots\dots\dots + \dots\dots\dots$  **(FA & SA- 3 Marks / 4 Marks)**  
 A)  $AlH, H_2O$                       B)  $AlSO_4, SO_2$                       C)  $Al_2(SO_4)_3, H_2O$                       D) none

**Answer:C**

Solution: Neutralization:  $2Al(OH)_3 + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 6H_2O$

5. Nitrogen pentoxide + water  $\rightarrow$   
 A) Nitric acid                      B) Nitrous acid

C) Sulphurous acid

D) Swaphuric acid

**Answer:A**Solution:  $N_2O_5 + H_2O \rightarrow 2HNO_3$ 6.  $H_2 + \dots\dots\dots ? \xrightarrow{\text{Boiling}} H_2S$ 

A) Cl

B)  $SO_4$ C)  $SO_3$ 

D) S

**Answer:D**Solution: Direct synthesis:  $H_2 + S \xrightarrow{\Delta} H_2S$ 

7. Metals displace hydrogen from the acids. They release.

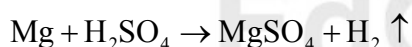
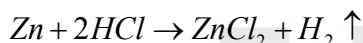
**(FA & SA- 5 Marks/8 Marks)**A)  $H_2$  GasB)  $O_2$  GasC)  $SO_2$  GasD)  $CO_2$  Gas**Answer:A**

Solution: Chemical Reaction Principle:

Metals that are more reactive than hydrogen (located above hydrogen in the reactivity series) can displace hydrogen from acids. The general chemical reaction is:

Metal + acid  $\rightarrow$  salt +  $H_2$  gas

Examples:



Why Hydrogen Gas is Released:

Acids like HCl,  $H_2SO_4$  (dilute) contain  $H^+$  ions in aqueous solution. When a reactive metal comes in contact with the acid, it donates electrons to the  $H^+$  ions, reducing them to hydrogen gas:  $2H^+ + 2e^- \rightarrow H_2 \uparrow$

The metal gets oxidized to metal ions, forming the corresponding salt.

8.  $H_3BO_3$  is in

A) Solid state

B) Liquid state

C) Gaseous state

D) None

**Answer:A**

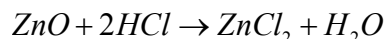
Solution: Boric acid is solid at room temperature.

9.  $ZnO + 2HCl \xrightarrow{?} + H_2O$ A)  $ZnCl_2$ 

B) ZnO

C) Zn

D) ZnCl

**Answer:A**Solution: Metal oxide + acid  $\rightarrow$  salt + water

10. Which of the following acid is present in soft drinks ?

A)  $H_2SO_4$ B)  $H_2NO_3$ C)  $H_2CO_3$ D)  $HNO_3$ **Answer:C**Solution: Carbonic acid ( $H_2CO_3$ ) from dissolved  $CO_2$ .



**Comprehension type**

An acid which contains hydrogen and a non-metallic element, other than oxygen is called Hydroacid.

15. Which of the following acid is Hydro acid

- A) HCN                      B)  $\text{HNO}_2$                       C)  $\text{H}_2\text{SO}_4$                       D)  $\text{H}_2\text{CO}_3$

**Answer:A**

Solution:Hydro acids are binary acids composed of hydrogen + a nonmetal, no oxygen.

A) HCN  $\rightarrow$  Hydrogen + Carbon + Nitrogen  $\rightarrow$  Not purely binary; contains C and N (cyanide), but often classified as a hydro acid (binary acid of a pseudo-halogen).

B)  $\text{HNO}_2 \rightarrow$  Contains O  $\rightarrow$  oxyacid

C)  $\text{H}_2\text{SO}_4 \rightarrow$  Contains O  $\rightarrow$  oxyacid

D)  $\text{H}_2\text{CO}_3 \rightarrow$  Contains O  $\rightarrow$  oxyacid

16. An acid which contain hydrogen and non-metalic element other than oxygen

.....

A) Volatile acid

B) Non volatile acid

C) Hydro acid

D) Oxy acid

**Answer:C**

Solution:An acid which contains hydrogen and a non-metal element other than oxygen is called a Hydro acid.

**Integer Type :**

17. Volatile acids easily charges into their vapours either at room temperature or heating below .....

**Answer:100**

Solution:Volatile acids vaporize at relatively low temperatures — often below  $100^\circ\text{C}$  (since water boils at  $100^\circ\text{C}$ , volatile acids usually vaporize below that).

18. Hydro acids contain \_\_\_\_\_ type of elements.

**Answer:2**

Solution:Hydro acids are binary acids: contain hydrogen and one other nonmetal (e.g., HCl, HBr,  $\text{H}_2\text{S}$ , HCN).

So number of types of elements = 2.

19. Hydrochloric acid, Nitric acid, Sulphuric acid, Phosphoric acid - How many are used for fertilizers?

**Answer:3**

Solution:Hydrochloric acid  $\rightarrow$  Not used in fertilizers

Nitric acid  $\rightarrow$  Used to make ammonium nitrate (fertilizer)

Sulphuric acid  $\rightarrow$  Used to make superphosphate and ammonium sulfate

Phosphoric acid  $\rightarrow$  Used to make phosphate fertilizers

**Matrix Matching Type :**

20. 1)  $N_2O_5 + H_2O$  ( ) A)  $H_3PO_3$   
 2)  $N_2O_3 + H_2O$  ( ) B)  $HNO_3$   
 3)  $P_2O_3 + H_2O$  ( ) C)  $H_3PO_4$   
 4)  $P_2O_5 + H_2O$  ( ) D)  $HNO_2$

**Answer: 1-B, 2-D, 3-A, 4-C**

Solution:

- 1)  $N_2O_5 + H_2O \rightarrow 2HNO_3 \rightarrow$  Nitric acid  $\rightarrow$  B)  $HNO_3$   
 2)  $N_2O_3 + H_2O \rightarrow 2HNO_2 \rightarrow$  Nitrous acid  $\rightarrow$  D)  $HNO_2$   
 3)  $P_2O_3 + 3H_2O \rightarrow 2H_3PO_3 \rightarrow$  Phosphorous acid  $\rightarrow$  A)  $H_3PO_3$   
 4)  $P_2O_5 + 3H_2O \rightarrow 2H_3PO_4 \rightarrow$  Phosphoric acid  $\rightarrow$  C)  $H_3PO_4$

**LEARNERS TASK****CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ'S)**

1. The acid which kills most of the germs then we swallow with food.  
 A)  $H_2SO_4$  B)  $HCl$  C)  $HNO_3$  D)  $H_2CO_3$

**Answer: B**

Solution:  $HCl$  (Hydrochloric acid) Secreted in the stomach (pH ~1.5–3.5) to sterilize food and aid digestion.

2.  $SO_2 + H_2O \rightarrow$   
 A)  $H_2SO_4$  B)  $H_2SO_3$  C)  $HSO_3$  D) None

**Answer: B**Solution:  $SO_2 + H_2O \rightarrow H_2SO_3$ 

3.  $H_2SO_4$  is example for  
 A) strong acid B) Dibasic acid C) Non-volatile acid D) All the above

**Answer: D**

Solution: Strong acid: Fully dissociates in water.

Dibasic acid: Releases 2  $H^+$  ions.

Non-volatile: High boiling point (~337°C).

4. The acids in which more than 30% of the molecules of it ionise in water to furnish  $H^+$  ions, are called\_\_\_\_\_.  
 A) Weak acids B) Strong acids  
 C) Neutral acids D) Inorganic acids

**Answer: B**

Solution: Acids with &gt;30% ionization in water are called Strong acids

Examples:  $\text{HCl}$ ,  $\text{HNO}_3$ ,  $\text{H}_2\text{SO}_4$  (near 100% dissociation).

5. Which of the following is a Hydro acid

- A)  $\text{HCl}$                       B)  $\text{HNO}_3$                       C)  $\text{H}_2\text{SO}_4$                       D)  $\text{H}_2\text{CO}_3$

**Answer:A**

Solution:.. Hydro acid (hydrogen + non-metal, no oxygen): A)  $\text{HCl}$  (Hydrochloric acid)

Others contain oxygen (Oxyacids).

6. The acids which easily charges into their vapours is called

- A) Volatile acids                      B) Non volatile acids  
C) Strong acids                      D) Weak acids

**Answer:A**

Solution: Acids that easily vaporize are called Volatile acids

7. Color of  $\text{HCl}$  is

- A) Colourless                      B) Brown                      C) Red                      D) Pink

**Answer:A**

Solution:Gaseous  $\text{HCl}$  is colorless; solutions are clear.

8.  $\text{H}_2 + \text{Cl}_2 \xrightarrow{\quad} 2\text{HCl}$

- A) Heat                      B) Sunlight                      C) Catalyst                      D) None

**Answer:B**

Solution:Photochemical reaction (forms explosive mix in direct sunlight)

9.  $\text{SO}_3 + \text{H}_2\text{O} \longrightarrow$

- A)  $\text{H}_2\text{SO}_3$                       B)  $\text{H}_2\text{SO}_4$                       C)  $\text{H}_2\text{S}$                       D)  $\text{H}_2\text{CO}_3$

**Answer:B**

Solution: $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$

10. Which of the following acid is heavier than water ?

- A) Sulphuric acid                      B) Hydrochloric acid  
C) Sulphurous acid                      D) Carbonic acid

**Answer:A**

Solution:A) Sulphuric acid ( $\text{H}_2\text{SO}_4$ )

Density:  $\sim 1.84 \text{ g/cm}^3$  (water =  $1 \text{ g/cm}^3$ ).

### JEE MAINS LEVEL QUESTIONS

1.  $\text{Ca(OH)}_2 + \text{H}_2\text{SO}_4 \rightarrow$

- A)  $\text{CaSO}_4$                       B)  $\text{H}_2\text{O}$                       C) Both 1 and 2                      D)  $\text{CaO}$

**Answer:C**

Solution:Balanced Reaction: $\text{Ca(OH)}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + \text{H}_2\text{O}$

Neutralization reaction producing calcium sulfate (gypsum) and water.

2. Acid which is Brown due to impurities

- A)  $H_2SO_4$                       B) HCl                      C)  $H_2CO_3$                       D)  $HNO_3$

**Answer:D**

Solution: Concentrated  $HNO_3$  turns yellow-brown due to dissolved  $NO_2$  gas

(decomposition product).

3. Hydrogen gas is not evolved when ..... is mixed with Zinc.

- A) Dil  $HNO_3$                       B) Conc  $HNO_3$                       C) Dil  $H_2SO_4$                       D) Conc  $H_2SO_4$

**Answer:A**

Solution:  $HNO_3$  (even dilute) is an oxidizing acid. With Zn, it produces  $NO/N_2O/NO_2$  instead of  $H_2$ :  $4Zn + 10HNO_3 \rightarrow 4Zn(NO_3)_2 + NH_4NO_3 + 3H_2O$

4. The acids which undergoes complete ionisation when dissolved in water and furnish large conc of  $H^+$  ions are called. **(FA & SA- 2 Marks)**

- A) Strong acids                      B) weak acids                      C) Volatile acids                      D) Non - Volatile acids

**Answer:A**

Solution: Acids with complete ionization in water (high  $H^+$  concentration): Strong acids

5. Hydro chloric acid is also known as

- A) muriatic acid                      B) Organic acid  
C) Non volatile acid                      D) Weak acid

**Answer:A**

Solution: Hydrochloric acid is also known as Muriatic acid  
Common name used in industrial/cleaning contexts.

6. Chloric acid is a

- A) Strong acid                      B) weak acid                      C) Non volatile acid                      D) Organic acid

**Answer:A**

Solution: Chloric acid ( $HClO_3$ ) is a Strong acid  
Fully dissociates in water:  $HClO_3 \rightarrow H^+ + ClO_3^-$

7. Which of the following acid is a Hygroscopic in nature ?

**(FA & SA- 3 Marks / 4 Marks)**

- A)  $H_2SO_4$                       B) HCl                      C)  $HNO_3$                       D)  $H_2CO_3$

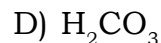
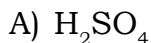
**Answer:A**

Solution: Hygroscopic acid (absorbs moisture from air):  $H_2SO_4$  (Sulfuric acid)

Used as a drying agent due to its strong affinity for water.

8. Which of the following highly corrosive mineral acid ?

(FA &amp; SA- 5 Marks / 8 Marks)

**Answer:A**Solution:  $\text{H}_2\text{SO}_4$  causes severe tissue damage (charring).

9. Another name of formic acid is

- A) Ethanoic acid B) Methanoic acid C) Nitrous acid D) Oxalic acid

**Answer:B**Solution: Another name for formic acid is Methanoic acid ( $\text{HCOOH}$ )

10. A metals will not react with dilute acids ?

- A) Copper B) Silver C) Both 1 and 2 D) Zinc

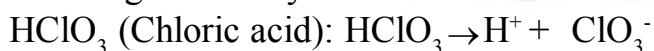
**Answer:C**Solution: Cu and Ag lie below hydrogen in the reactivity series. They cannot displace  $\text{H}^+$  from acids.Exception: They react with oxidizing acids (e.g.,  $\text{HNO}_3$ ).**JEE ADVANCED LEVEL QUESTIONS****Multi Correct Answer Type:**

11. Which of the following are strong acids ?

- A) Chloric acid B) Per chloric acid
- 
- C) Hydronic acid D) Hydro iodic acid

**Answer:A,B,D**

Solution: Strong acids fully dissociate in water:

 $\text{HClO}_4$  (Perchloric acid): One of the strongest known acids. $\text{HI}$  (Hydroiodic acid): Fully ionizes in water.

C) Hydronic acid: Not a standard acid (likely a distractor).

12. Which of the following are weak acids ?

- A) Oxalic acid B) Formic acid C) Benzoic acid D) Hydroic acid

**Answer:A,B,C**

Solution: Weak acids partially dissociate in water: Oxalic acid, Formic acid, Benzoic acid.

**Statement Type :**

A) Both statement I and II are correct and statement II is correct explanation of statement I.

B) Both statement I and II are correct and statement II is not correct explanation of statement I.

C) Statement I is correct and statement II is incorrect.

D) Statement I is incorrect and statement II is correct

13. **Statement I** :  $2\text{HCl} + \text{CuCO}_3 \rightarrow \text{CuCl}_2 + \text{H}_2\text{O} + \text{CO}_2$ **Statement II** : Green solid dissolves with efferve scence to form blue solution.

**Answer:A**

Solution: The reaction between hydrochloric acid (HCl) and copper carbonate ( $\text{CuCO}_3$ ) produces:

Copper chloride ( $\text{CuCl}_2$ , blue solution)

Water ( $\text{H}_2\text{O}$ )

Carbon dioxide ( $\text{CO}_2$ , effervescence)

Balanced equation:  $2\text{HCl} + \text{CuCO}_3 \rightarrow \text{CuCl}_2 + \text{H}_2\text{O} + \text{CO}_2$

Statement-II (True & Explanatory)

Green solid ( $\text{CuCO}_3$ ) dissolves in HCl.

Effervescence ( $\text{CO}_2$  gas bubbles) occurs.

Blue solution ( $\text{CuCl}_2$ ) forms.

This matches the products described in Statement-I.

14. **Statement I** : Acids reacts with bases to form salts and water.  
**Statement II** : When Hydrochloric acid reacts with Iron (III) oxide forms Reddish - Brown Crystals.

**Answer:B**

Solution:

Statement I is correct (neutralization).

Statement II:  $\text{Fe}_2\text{O}_3 + 6\text{HCl} \rightarrow 2\text{FeCl}_3 + 3\text{H}_2\text{O}$ ;

$\text{FeCl}_3$  is yellow/brown, not always reddish-brown crystals. But  $\text{FeCl}_3$  solution is yellow/brown; solid is reddish-brown.

Both correct, but II is not an explanation of I, it's an example.

**Comprehension type**

An acid which contains oxygen, along with hydrogen and one more element is called oxyacids.

15. Which of the following acid is oxy acid ?

A) HCN                      B) HI                      C) HF                      D)  $\text{HCOOH}$

**Answer:D**

Solution: Oxyacids contain hydrogen (H) + oxygen (O) + another element (usually a non-metal).

$\text{HCOOH}$ : Structure is  $\text{H}-\text{C}(=\text{O})-\text{OH}$  (contains C, H, and O).

Other options:

A) HCN (Hydrocyanic acid): No oxygen  $\rightarrow$  Hydroacid.

B) HI (Hydroiodic acid): No oxygen  $\rightarrow$  Hydroacid.

C) HF (Hydrofluoric acid): No oxygen  $\rightarrow$  Hydroacid.

16. Oxalic acid is a

A) Oxy acid                      B) Solid state acid C) Volatile acid                      D) All of the above

**Answer:A,B**

Solution: A) Oxyacid: Contains C, H, and O (structure:  $\text{HOOC}-\text{COOH}$ ).

B) Solid state: Exists as white crystalline solid at room temperature.

C) Volatile acid: Incorrect. Oxalic acid is non-volatile (high melting point).

D) All of the above: False (since it's not volatile).

**Integer Type :**

17. Acid solutions have a PH value .....

**Answer:** <7

Solution: The pH scale ranges from 0 to 14:

Acidic solutions:  $\text{pH} < 7$  (e.g.,  $\text{HCl}$   $\text{pH} \sim 1$ , vinegar  $\text{pH} \sim 3$ ).

Neutral solutions:  $\text{pH} = 7$  (pure water).

Basic solutions:  $\text{pH} > 7$  (e.g.,  $\text{NaOH}$   $\text{pH} \sim 14$ ).

18. Phosphoric acid contains ..... number of phosphorous atoms.

**Answer:** 1

Solution: Molecular formula of phosphoric acid:  $\text{H}_3\text{PO}_4$ .

Contains 1 phosphorus (P) atom, 4 oxygen (O) atoms, and 3 hydrogen (H) atoms.

**Matrix Matching Type :**

19. **Column-I**

**Column-II**

- |  |     |   |
|--|-----|---|
| 1) $\text{NaOH} + \text{H}_2\text{SO}_4$ | ( ) | A) $\text{ZnCl}_2 + \text{H}_2\text{O}$               |
| 2) $\text{ZnO} + \text{HCl}$             | ( ) | B) $\text{ZnCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$ |
| 3) $\text{ZnCO}_3 + \text{HCl}$          | ( ) | C) $\text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$     |
| 4) $\text{Zn} + \text{HCl}$              | ( ) | D) $\text{ZnCl}_2 + \text{H}_2$                       |

**Answer:** P-C, Q-A, R-B, S-D

Solution:

**Column-I**

**Column-II**

P)  $\text{NaOH} + \text{H}_2\text{SO}_4$

C)  $\text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

Q)  $\text{ZnO} + \text{HCl}$

A)  $\text{ZnCl}_2 + \text{H}_2\text{O}$

R)  $\text{ZnCO}_3 + \text{HCl}$

B)  $\text{ZnCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$

S)  $\text{Zn} + \text{HCl}$

D)  $\text{ZnCl}_2 + \text{H}_2$

20. **Column-I**

**Column-II**

A) Acetic acid

A) Ink stain remover

B) Carbonic acid

B) Washing eyes

C) Oxalic acid

C) Softdrinks

D) Boric acid

D) Cooking

**Answer:** P-D, Q-C, R-A, S-B

Solution:

**Column-I**

**Column-II**

P) Acetic acid

D) Cooking

Q) Carbonic acid

C) Softdrinks

R) Oxalic acid

A) Ink stain remover

S) Boric acid

B) Washing eyes

## KEY

			TEACHING TASK						
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
D	C	A	C	A	D	A	A	A	C
			JEE ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	
A,B,C	B,C,D	A	C	A	C	100	2	3	
20	20		LEARNER'S TASK						
1-B,2-D,3-A,4-C			CONCEPTUAL UNDERSTANDING QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	B	D	B	A	A	A	B	B	A
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
C	D	A	A	A	A	A	A	B	C
			JEE ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	
A,B,D	A,B,C	A	B	D	A,B	<7	1	P-C,Q-A,R-B,S-D	
20	20								
P-D,Q-C,R-A,S-B									