

12.ACIDS, BASES & SALTS - PREPARATION & PROPERTIES OF ACIDS

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. Which of the following is a strong acid?

A) H_2SO_3 B) H_2SO_4 C) H_2CO_3 D) H_3PO_4

Answer:B

Solution: Strong acids completely dissociate in water.

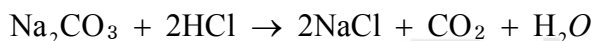
H_2SO_4 is a strong acid; H_2SO_3 , H_2CO_3 , H_3PO_4 are weak.

2. $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow \dots + \text{CO}_2 + \text{H}_2\text{O}$. **(FA & SA- 3 Marks/4 Marks)**

A) NaOH B) NaCl C) Na_2O D) Na

Answer:B

Solution:



Missing product : NaCl.

3. Which acid is present in vinegar?

A) Citric Acid B) Lactic Acid C) Acetic Acid D) Formic Acid

Answer:C

Solution: Vinegar contains acetic acid (CH_3COOH).

4. Which of the following acids is dibasic and weak?

A) HCl B) H_2SO_4
C) $\text{H}_2\text{C}_2\text{O}_4$ (Oxalic Acid) D) HNO_3

Answer:C

Solution: $\text{H}_2\text{C}_2\text{O}_4$ (Oxalic acid) — oxalic acid is dibasic and a weak organic acid (compare to strong mineral acids listed)

5. $\text{P}_2\text{O}_5 + 3\text{H}_2\text{O} \rightarrow \dots$

A) H_3PO_3 B) H_3PO_4 C) $\text{H}_4\text{P}_2\text{O}_7$ D) HPO_3

Answer:B

Solution: $\text{P}_2\text{O}_5 + 3\text{H}_2\text{O} \rightarrow 2\text{H}_3\text{PO}_4$

6. Which gas is evolved when a reactive metal like magnesium reacts with dilute hydrochloric acid?

A) Oxygen B) Chlorine
C) Hydrogen D) Carbon Dioxide

Answer:C

Solution: Reaction: $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\uparrow$

Gas: Hydrogen.

7. An acid which is solid at room temperature is: **(FA & SA- 2 Marks)**

- A)Hydrochloric Acid B)Oxalic Acid C)Nitric Acid D)Acetic Acid

Answer:B

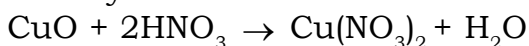
Solution: Hydrochloric acid – gas (HCl) in pure form at room temp.

Oxalic acid – solid

Nitric acid – liquid.

Acetic acid – liquid.

8. Identify the correct statement about the following reaction:



A) It is an example of a neutralization reaction forming salt and water.

B) It is an example of a metal displacing hydrogen from an acid.

C) It is an example of an acid reacting with a metal oxide.

D) Both 1 and 3 are correct.

Answer:D

Solution: The reaction is acid + metal oxide \rightarrow salt + water (neutralization; acid reacting with metal oxide)

9. The acid that cannot be prepared by the direct reaction of its constituent elements is:

A) Hydrochloric Acid (HCl)

B) Hydrobromic Acid (HBr)

C) Nitric Acid (HNO_3)

D) Hydrosulfuric Acid (H_2S)

Answer:C

Solution: HCl: $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl} \rightarrow$ direct

HBr: $\text{H}_2 + \text{Br}_2 \rightarrow 2\text{HBr} \rightarrow$ direct

HNO_3 : $\text{N}_2 + \text{O}_2 \rightarrow \text{NO} \rightarrow \text{NO}_2 \rightarrow \text{HNO}_3$ (not direct combination of elements with water)

H_2S : $\text{H}_2 + \text{S} \rightarrow \text{H}_2\text{S} \rightarrow$ direct

10. A white crystalline solid reacts with dilute sulfuric acid, producing a gas that turns lime water milky but has no effect on acidified potassium dichromate paper. The solid is most likely:

(FA & SA- 5 Marks/8 Marks)

A) Sodium Sulfite (Na_2SO_3)

B) Sodium Carbonate (Na_2CO_3)

C) Zinc Carbonate (ZnCO_3)

D) Both 2 and 3

Answer:D

Solution: Na_2CO_3 and ZnCO_3 produce CO_2 with dilute H_2SO_4 (CO_2 turns lime water milky). Na_2SO_3 would give SO_2 (which would affect acidified dichromate), so A is excluded

JEE ADVANCED LEVEL QUESTIONS**Multi Correct Choice Type:**

11. Which of the following are physical properties of acids?
- A) They turn blue litmus red.
 - B) They feel slippery to touch.
 - C) Their aqueous solutions conduct electricity.
 - D) They have a bitter taste

Answer:A,C

Solution:A) They turn blue litmus red.

- B) They feel slippery to touch. → This is for bases (soapy/slippery).
- C) Their aqueous solutions conduct electricity. (due to ions)
- D) They have a bitter taste → Acids are sour, bases are bitter.

12. Which of the following are mineral (inorganic) acids?

- A) Acetic Acid (CH_3COOH)
- B) Sulfuric Acid (H_2SO_4)
- C) Citric Acid ($\text{C}_6\text{H}_8\text{O}_7$)
- D) Nitric Acid (HNO_3)

Answer:B,D

Solution:A) Acetic Acid — organic (carboxylic acid)

- B) Sulfuric Acid (H_2SO_4) — mineral acid
- C) Citric Acid — organic acid (found in fruits)
- D) Nitric Acid (HNO_3) — mineral acid

13. Which of the following acids are naturally found in food items?

- A) Lactic Acid (in curd)
- B) Hydrochloric Acid (in stomach)
- C) Tartaric Acid (in tamarind)
- D) Sulfuric Acid (in car batteries)

Answer:A,C

Solution:A) Lactic Acid (in curd)

- B) Hydrochloric Acid (in stomach) → (biological acid, not in food items)
- C) Tartaric Acid (in tamarind)
- D) Sulfuric Acid (in car batteries) → (industrial acid, not in food)

14. Which of the following statements are correct for a strong acid?

- A) It ionizes completely in water.
- B) It has a high pH value (e.g., $\text{pH}=10$).
- C) It is a good conductor of electricity in solution.
- D) Acetic acid is an example

Answer:A,C

Solution:A) It ionizes completely in water → Yes

- B) It has a high pH value (e.g., $\text{pH}=10$) → No, strong acid has low pH
- C) It is a good conductor of electricity in solution → Yes
- D) Acetic acid is an example → No, acetic acid is weak

Statement Type :

- A) Both the statements are **TRUE** and **Statement -II** is the correct explanation of **STATEMENT - I**
- B) Both the statements are **TRUE** and **Statement -II** is not the correct

explanation of Statement -I

C) Statement -I is **TRUE** and Statement -II is **FALSE**

D) Statement -I is **FALSE** and Statement -II is **TRUE**

15. **Statement I** : Concentrated sulfuric acid (H_2SO_4) is used as a drying agent for moist gases.

Statement II : Concentrated sulfuric acid is non-volatile and has a strong affinity for water (hygroscopic nature).

Answer:A

Solution:Statement I: True — concentrated H_2SO_4 is a common drying agent.

Statement II: True — it is non-volatile and strongly hygroscopic.

Explanation link: Statement II correctly explains why it is used as a drying agent.

16. **Statement I** : Nitric acid (HNO_3) does not usually liberate hydrogen gas when it reacts with metals like zinc.

Statement II : Nitric acid is a strong oxidizing agent, and it oxidizes the hydrogen gas produced to water.

Answer:A

Solution:Statement I: True — with most metals, HNO_3 produces nitrogen oxides, not H_2 .

Statement II: True — it oxidizes H_2 to H_2O .

Explanation link: Yes, Statement II is the correct reason for Statement I.

Comprehension type

Strong Acids

The acids which undergoes complete ionisation when dissolved in water and furnish large concentration of H^+ ions are called strong acids.

Ex:- Sulphuric acid (H_2SO_4) Hydrochloric acid (HCl) Nitric acid (HNO_3)

Weak acids

The acids which undergoes partial ionisation when dissolved in water and furnish less concentration of H^+ ions are called weak acids.

Ex: Carbonic acid (H_2CO_3) Acetic acid (CH_3COOH)

Nitrous acid (HNO_2) Phosphoric acid (H_3PO_4)

Phosphorous acid (H_3PO_3)

17. According to the provided definition, what is the primary factor that distinguishes a strong acid from a weak acid?
- The number of hydrogen atoms (H^+ ions) each molecule can potentially release.
 - The concentration of the acid solution (dilute or concentrated).
 - The degree or extent of ionization when dissolved in water.
 - Whether the acid is organic or inorganic in origin.

Answer:C

Solution:Strong acids: "complete ionisation" → large concentration of H^+ ions.

Weak acids: "partial ionisation" → less concentration of H^+ ions.

So the key is degree/extent of ionization in water

18. Based on the examples given, which of the following pairs of acids correctly lists one strong acid and one weak acid?

- A) Sulphuric acid and Nitric acid
- B) Hydrochloric acid and Acetic acid
- C) Phosphoric acid and Carbonic acid
- D) Nitrous acid and Phosphorous acid

Answer: B

Solution: Strong acids: H_2SO_4 , HCl , HNO_3

Weak acids: H_2CO_3 , CH_3COOH , HNO_2 , H_3PO_4 , H_3PO_3

- A) Sulphuric acid (strong) and Nitric acid (strong) → both strong
- B) Hydrochloric acid (strong) and Acetic acid (weak)
- C) Phosphoric acid (weak) and Carbonic acid (weak) → both weak
- D) Nitrous acid (weak) and Phosphorous acid (weak) → both weak

Integer Type :

19. A monobasic acid furnishes _____ hydrogen ion(s) (H^+) per molecule upon complete ionization.

Answer: 1

Solution: A monobasic acid furnishes 1 hydrogen ion (H^+) per molecule upon complete ionization.

20. Phosphorous acid (H_3PO_3) has 3 hydrogen atoms in its formula, but it is a dibasic acid. Therefore, the number of hydrogen atoms that are NOT ionizable in a molecule of phosphorous acid is _____.

Answer: 1

Solution: Phosphorous acid (H_3PO_3) has 3 hydrogen atoms, but it is dibasic, meaning only 2 hydrogen atoms are ionizable (replaceable as H^+).

So, the number of non-ionizable hydrogen atoms = $3 - 2 = 1$

Matrix Matching Type :

21. Column I (Non-metal Oxide)

Column II (Acid Formed)

- | | | |
|---|---------|----------------------------|
| 1. $\text{SO}_2 + \text{H}_2\text{O} \rightarrow$ | () | A) H_2SO_4 |
| 2. $\text{SO}_3 + \text{H}_2\text{O} \rightarrow$ | () | B) H_2SO_3 |
| 3. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow$ | () | C) H_2CO_3 |
| 4. $\text{Cl}_2\text{O}_7 + \text{H}_2\text{O} \rightarrow$ | () | D) HClO_4 |

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

Solution:

- | | | |
|---|---------|----------------------------|
| 1. $\text{SO}_2 + \text{H}_2\text{O} \rightarrow$ | () | B) H_2SO_3 |
| 2. $\text{SO}_3 + \text{H}_2\text{O} \rightarrow$ | () | A) H_2SO_4 |
| 3. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow$ | () | C) H_2CO_3 |
| 4. $\text{Cl}_2\text{O}_7 + \text{H}_2\text{O} \rightarrow$ | () | D) HClO_4 |

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CQU'S)

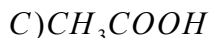
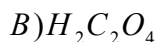
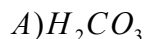
1. The acid present in ant stings is:

- A) Acetic Acid B) Formic Acid C) Citric Acid D) Lactic Acid

Answer: B

Solution: Ant stings contain formic acid (HCOOH).

2.



Answer: A

Solution: $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$ (carbonic acid)

3. Acetic Acid (CH_3COOH) is an example of a:

- A) Strong Acid B) Tribasic Acid C) Volatile Acid D) Weak Acid

Answer: D

Solution: Acetic acid is a weak acid (partially dissociates in water).

4. An acid that is used in the production of fertilizers and explosives is:

- A) Hydrochloric Acid B) Nitric Acid
C) Carbonic Acid D) Boric Acid

Answer: B

Solution: Nitric acid (HNO_3) is used in fertilizers (ammonium nitrate) and explosives.

5. Which of the following is an Oxyacid?

- A) HF B) HI C) H_3PO_4 D) H_2S

Answer: C

Solution: Oxyacids contain oxygen, hydrogen, and another element.

HF – not an oxyacid (no oxygen)

HI – not an oxyacid

H_3PO_4 – oxyacid (contains P, O, H)

H_2S – not an oxyacid

6. The acid that exists as a solid at room temperature is:

- A) Nitric Acid B) Oxalic Acid C) Hydrochloric Acid D) Formic Acid

Answer: B

Solution: Nitric acid – liquid

Oxalic acid – solid

Hydrochloric acid – gas (in pure form HCl gas)
Formic acid – liquid

7. The gas liberated when sodium carbonate reacts with dilute hydrochloric acid is:
A)Hydrogen B)Oxygen C)Chlorine D)Carbon Dioxide

Answer:D

Solution: $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$

Carbonate + acid \rightarrow salt + water + carbon dioxide.

8. Which of the following statements about Phosphoric Acid (H_3PO_4) is CORRECT?
A) It is a weak and volatile acid.
B) It is a strong and tribasic acid.
C) It is a weak and tribasic acid.
D) It is a strong and dibasic acid.

Answer:C

Solution: H_3PO_4 is weak (partial ionization) and tribasic (3 H^+).

9. The reaction $\text{H}_2 + \text{S} \xrightarrow{\Delta} \text{H}_2\text{S}$ is a method for the preparation of:
A)A Hydro acid B)An Oxyacid C)A Strong acid D)A Solid acid

Answer:A

Solution: H_2S is a hydro acid (no oxygen, hydrogen + nonmetal).

10. Which property is common to both dilute HCl and dilute CH_3COOH ?
A)They are strong acids. B)They are highly volatile.
C) They turn blue litmus red. D)They are non-corrosive.

Answer:C

Solution:Both turn blue litmus red (acidic property).

Not both strong (CH_3COOH weak).

Not both highly volatile (HCl gas volatile, CH_3COOH less so).

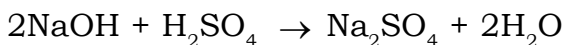
Not both non-corrosive (both can be corrosive in concentrated form).

JEE MAINS LEVEL QUESTIONS

1. $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow$ _____
A) Na_2SO_4 B) H_2O C) Both 1 and 2 D) Na_2O

Answer:C

Solution:Neutralization reaction:



Products: Na_2SO_4 and H_2O .

2. Acid which is commonly colorless but may appear yellowish due to decomposition. **(FA & SA- 3 Marks/4 Marks)**
A) H_2SO_4 B) HCl C) HNO_3 D) H_3PO_4

Answer:C

Solution: Nitric acid (HNO_3) decomposes to NO_2 which dissolves to give yellow color.

3. Hydrogen gas is not evolved when a metal reacts with:

(FA & SA- 5Marks/8 Marks)

- A) Dilute HCl
B) Concentrated H_2SO_4
C) Dilute H_2SO_4
D) All of these

Answer:B

Solution: Concentrated H_2SO_4 is an oxidizing agent; with metals it usually gives SO_2 , not H_2 .

4. The acids which undergo partial ionization when dissolved in water are called:

(FA & SA- 2 Marks)

- A) Strong acids
B) Weak acids
C) Concentrated acids
D) Dilute acids

Answer: B

Solution: The acids which undergo partial ionization when dissolved in water are called Weak acids

5. Nitric acid is also known as:

- A) Aqua fortis B) Muriatic acid C) Oil of vitriol D) Formic acid

Answer:A

Solution: Aqua fortis \rightarrow Nitric acid
Muriatic acid \rightarrow Hydrochloric acid
Oil of vitriol \rightarrow Sulfuric acid
Formic acid \rightarrow Methanoic acid

6. Boric acid is a:

- A) Strong acid B) Weak acid C) Volatile acid D) Tribasic acid

Answer:B

Solution: Boric acid (H_3BO_3) is a weak acid.

7. Which of the following acids is deliquescent in nature?

- A) H_3PO_4 B) HCl C) HNO_3 D) H_2CO_3

Answer:A

Solution: Pure phosphoric acid H_3PO_4 is a hygroscopic crystal, which means it readily absorbs moisture from the air. Deliquescence is an extreme form of hygroscopy where a substance absorbs enough water from the atmosphere to form an aqueous solution. Therefore, phosphoric acid is considered deliquescent.

8. Which acid is known as "king of chemicals"?

- A) H_2SO_4 B) HCl C) HNO_3 D) H_3PO_4

Answer:A

Solution: Sulfuric acid (H_2SO_4) is called the "king of chemicals" due to its widespread industrial use.

9. Another name for ethanoic acid is:

- A) Formic acid B) Acetic acid C) Citric acid D) Oxalic acid

Answer:B

Solution:Ethanoic acid (CH_3COOH) → Common name: Acetic acid

Formic acid → Methanoic acid

Citric acid → Present in citrus fruits

Oxalic acid → Found in spinach and rhubarb

10. Which metal reacts violently with dilute acids?

- A) Copper B) Silver C) Potassium D) Mercury

Answer:C

Solution:Potassium (K) reacts violently with dilute acids, producing H_2 and much heat.

JEE ADVANCED LEVEL QUESTIONS

Multi Correct Answer Type:

11. Which of the following are common strong mineral acids?

- A) Sulfuric Acid (H_2SO_4) B) Nitric Acid (HNO_3)
C) Carbonic Acid (H_2CO_3) D) Hydrochloric Acid (HCl)

Answer:A,B,D

Solution:Strong mineral acids:A) Sulfuric Acid (H_2SO_4), B) Nitric Acid (HNO_3),

D) Hydrochloric Acid (HCl)

C) Carbonic Acid (H_2CO_3) → (weak)

12. Which of the following acids are both organic and weak?

- A) Acetic Acid (CH_3COOH) B) Phosphoric Acid (H_3PO_4)
C) Formic Acid (HCOOH) D) Sulfurous Acid (H_2SO_3)

Answer:A,C

Solution:A) Acetic Acid (CH_3COOH) → organic, weak

B) Phosphoric Acid (H_3PO_4) → inorganic

C) Formic Acid (HCOOH) → organic, weak

D) Sulfurous Acid (H_2SO_3) → inorganic

Statement Type :

A) Both the statements are **TRUE** and **Statement -II** is the correct explanation of **STATEMENT - I**

B) Both the statements are **TRUE** and **Statement -II** is not the correct explanation of Statement -I

C) Statement -I is **TRUE** and Statement -II is **FALSE**

D) Statement -I is **FALSE** and Statement -II is **TRUE**

13. **Statement I** : Zinc metal reacts with dilute sulfuric acid to produce zinc sulfate and hydrogen gas.

Statement II : Metals more reactive than hydrogen displace it from dilute acids.

Answer:A

Solution:Zinc is more reactive than hydrogen and displaces hydrogen from dilute acids, producing salt (zinc sulfate) and hydrogen gas. This exactly supports

Statement I

14. **Statement I** : Sodium carbonate solution reacts with hydrochloric acid to produce carbon dioxide gas.
Statement II : All acid-carbonate reactions are neutralization reactions that produce only salt and water.

Answer:C

Solution: Acid + carbonate produces salt + CO_2 + H_2O , not just salt and water. So Statement I is correct, but Statement II is false because it ignores CO_2 formation and wrongly describes the reaction as normal neutralization.

Comprehension type:

Hydrochloric acid, made in the stomach, kills most of the germs that you swallow with your food and it also makes the conditions right for the food in your stomach to be digested.

Lactic acid made by bacteria feeding on the sugars, may give you tooth decay.

15. What is the primary function of hydrochloric acid in the stomach?
- A) To break down sugars in the food
 - B) To kill germs and create the right conditions for digestion
 - C) To strengthen tooth enamel
 - D) To produce lactic acid for energy

Answer:B

Solution: Hydrochloric acid in the stomach kills harmful microorganisms and provides an acidic medium for the enzyme pepsin to function and digest proteins.

16. Lactic acid may lead to tooth decay. How is this acid produced?
- A) It is directly secreted by the stomach lining.
 - B) It is produced by bacteria feeding on sugars in the mouth.
 - C) It is formed when hydrochloric acid mixes with food.
 - D) It is present in all sugary foods we consume.

Answer:B

Solution: When bacteria in the mouth feed on sugary foods, they produce lactic acid. This acid damages the tooth enamel, leading to tooth decay.

17. Which of the following acids is produced naturally within the human body?
- A) Lactic acid only
 - B) Hydrochloric acid only
 - C) Both hydrochloric acid and lactic acid
 - D) Neither hydrochloric acid nor lactic acid

Answer:C

Solution: Hydrochloric acid is produced in the stomach (by gastric glands). "Lactic acid is produced in muscles during vigorous exercise and by mouth bacteria from sugar breakdown"

Integer Type :

18. A molecule of sulfuric acid (H_2SO_4) contains _____ oxygen atoms.

Answer:4

Solution:Formula: H_2SO_4

2 hydrogen atoms

1 sulfur atom

4 oxygen atoms

19. Oxalic acid has the formula $(\text{COOH})_2$. The total number of ionizable hydrogen atoms (H^+) in one molecule of this acid is _____

Answer:2

Solution:Formula: $(\text{COOH})_2 = \text{C}_2\text{H}_2\text{O}_4$

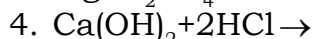
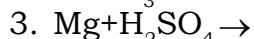
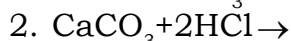
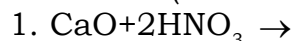
Structure: Two carboxyl groups ($-\text{COOH}$).

Each $-\text{COOH}$ group has one ionizable hydrogen atom (the acidic proton attached to the $-\text{OH}$).

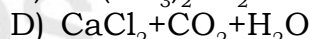
Total ionizable $\text{H}^+ = 2$

Matrix Matching Type :

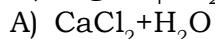
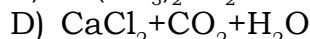
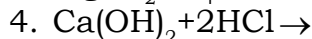
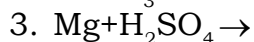
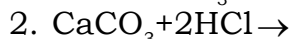
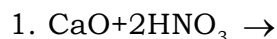
20. Column-I (Reaction)



Column-II (Products)

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

Solution:



KEY

			TEACHING TASK						
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	B	C	C	B	C	B	D	C	D
			JEE ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	20
A,C	B,D	A,C	A,C	A	A	C	B	1	1
21									
1-B,2-A,3-C,4-D									
			LEARNERS TASK						
			CONCEPTUAL UNDERSTANDING QUESTIONS (CQU'S)						
1	2	3	4	5	6	7	8	9	10
B	A	D	B	C	B	D	C	A	C
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
C	C	B	B	A	B	A	A	B	C
			JEE ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	
A,B,D	A,C	A	C	B	B	C	4	2	
20									
1-C,2-D,3-B,4-A									