ACIDS, BASES AND SALTS

14 . SALTS

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. The salt of weak acids and strong bases gives: **(FA & SA- 2 Marks)**
   A) Acidic solution B) Basic solution
   C) Neutral solution D) None

Answer:B

Solution:Because the anion of a weak acid hydrolyses to give OH^- ions (e.g., $CH_3COONa \rightarrow$ basic).

2. Formula of Mohr's salt is: **(FA & SA- 5 Marks / 8 Marks)**
   A) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
   B) $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$
   C) $CaMg(CO_3)_2$
   D) $Na_2CO_3 \cdot 10H_2O$

Answer:B

Solution:Mohr's salt is Ammonium iron(II) sulfate hexahydrate: $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$

3. Which of the following is a double salt?
   A) Sodium chloride
   B) Potassium nitrate
   C) Carnallite
   D) Calcium sulphate

Answer:C

Solution: Carnallite $(KCl \cdot MgCl_2 \cdot 6H_2O)$ is a double salt.

4. Which of the following is salt of nitric acid?
   A) KNO_3 B) K_2SO_4 C) KCl D) K_2CO_3

Answer:A

Solution:Nitric acid $\rightarrow$nitrate salts $\rightarrow$ KNO_3

5. Which of the following is salt of phosphoric acid?
   A) Na_3PO_4 B) NaCl C) Na_2SO_4 D) $NaNO_3$

Answer:A

Solution:Phosphoric acid $H_3PO_4 \rightarrow$ phosphate salts $\rightarrow Na_3PO_4$.

6. $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$ is:
   A) Potash alum B) Mohr's salt C) Dolomite D) Epsom salt

Answer:B

Solution:$(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$ is Mohr's salt .

7. Which of the following salts will produce an acidic solution when dissolved in water?
   A) Sodium acetate (CH_3COONa) B) Ammonium chloride (NH_4Cl)
   C) Potassium sulphate (K_2SO_4) D) Sodium carbonate (Na_2CO_3)

Answer:B

Solution:NH_4Cl (salt of weak base NH_4OH and strong acid HCl) $\rightarrow$ acidic.

8. Which of the following is an acid salt? **(FA & SA- 3 Marks / 4 Marks)**
   A) $NaHCO_3$ B) NaCl C) Na_2CO_3 D) NaOH

Answer:A

Solution:Contains replaceable hydrogen; derived from partial neutralization of a dibasic acid (H_2CO_3).

9. Ca(OCl)Cl is an example of:
   A) Normal salt B) Acid salt C) Basic salt D) Double salt

Answer:C

Solution:Basic salt — Ca(OCl)Cl (bleaching powder / oxy-chloride form) is treated as a basic/oxy-salt

10. Which of the following is a mixed salt?
   A) $NaKCO_3$ B) NaCl C) Na_2CO_3 D) NaOH

Answer:A

Solution:Mixed salt contains more than one cation or anion from an acid/base: $NaKCO_3$ (two cations Na^+ and K^+).

JEE ADVANCED LEVEL QUESTIONS

Multi Correct Answer Type:

11. Which of the following salts will produce a basic solution when dissolved in water?
   A) Sodium carbonate (Na_2CO_3) B) Ammonium nitrate (NH_4NO_3)
   C) Potassium acetate (CH_3COOK) D) Aluminum chloride ($AlCl_3$)

Answer:A,C

Solution:A salt gives a basic solution when it is made from a strong base and weak acid.

	Salt	Nature in water	Solution type
A)	Na_2CO_3	Salt of strong base (NaOH) and weak acid (H_2CO_3)	Basic
B)	NH_4NO_3	Salt of weak base (NH_4OH) and strong acid (HNO_3)	Acidic
C)	CH_3COOK	Salt of strong base (KOH) and weak acid (CH_3COOH)	Basic
D)	$AlCl_3$	Salt of weak base ($Al(OH)_3$) and strong acid (HCl)	Acidic

12. Which of the following are correctly classified as double salts?
   A) Carnallite - $KCl \cdot MgCl_2 \cdot 6H_2O$
   B) Potassium sodium tartrate - $NaKC_4H_4O_6$

C) Sodium carbonate - Na_2CO_3

D) Potassium alum - $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$

Answer:A,B,D

Solution:Double salts — formed by combining two different simple salts, exist only in solid form, and dissociate completely in water.

Option	Substance	Double Salt
A) $KCl \cdot MgCl_2 \cdot 6H_2O$	Carnallite	Yes
B) $NaKC_4H_4O_6$	Potassium sodium tartrate (Rochelle salt)	Yes
C) Na_2CO_3	Sodium carbonate	No (normal salt)
D) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$	Potash alum	Yes

Statement Type :

A) Statement-I, is True, Statement - II is True; Statement - II is a correct explanation for Statement-I

B) Statement - I is True, Statement is True; Statement -II , is NOT a correct explanation for Statement - I

C) Statement - I is True, Statement - II , is False

D) Statement - I is False, Statement - II is True

13. **Statement I** : $NaHCO_3$ is an acid salt of carbonic acid.
Statement II : Acid salts are formed by partial replacement of hydrogen ions in acids.

Answer:A

Solution:$NaHCO_3$ is formed when only one H? of H2CO3 is replaced by Na? ? partial replacement, which explains why it's an acid salt.

14. **Statement I** : $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ (potash alum) dissociates into simple ions when dissolved in water.
Statement II : Double salts lose their identity in aqueous solution and behave as mixtures of simple salts.

Answer:A

Solution:Double salts like potash alum break into simple ions (K^+, Al^{3+}, SO_4^{2-}) in water and lose their original identity, which explains Statement I

Comprehension type

A salt formed by the complete replacement of replacable hydrogen ions of an acid by a basic radical is called normal salts.

In other words, the salts of strong acids and strong bases will form normal salts because all hydronium ions are replaced by metallic ions. (or) ammonium ions

i.e., all H^+ ions are neutralised by OH^- ions in the solution.

15. A normal salt is defined as one formed by:

A) Partial replacement of hydrogen ions in an acid

B) Complete replacement of hydrogen ions in an acid by a basic radical

C) Mixing two different salts together

D) Reaction between two acids

Answer:B

Solution:A normal salt is produced when all replaceable hydrogen ions (H^+) in an

acid are completely replaced by a metal or basic radica

16. Which of the following pairs will definitely form a normal salt according to the paragraph?
A) Weak acid + Weak base B) Strong acid + Strong base
C) Strong acid + Weak base D) Weak acid + Strong base

Answer:B

Solution:The salts of strong acids and strong bases will form normal salts be cause all hydronium ions are replaced by metallic ions

Integer Type :

17. Potash alum [$K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$] contains _____ number of water molecules per formula unit.

Answer:24

Solution: Potash alum formula: $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O \rightarrow$ Water molecules per formula unit = 24.

18. The total number of oxygen atoms present in one formula unit of hydrated sodium carbonate ($Na_2CO_3 \cdot 10H_2O$) is _____.

Answer:13

Solution: $Na_2CO_3 \cdot 10H_2O$
Na_2CO_3 has 3 O atoms from CO_3^{2-}.
10 $H_2O \rightarrow$ 10 O atoms.
Total = 3 + 10 = 13 oxygen atoms.

Matrix Matching Type :

19.

Acid	**Salt**
a) Hydrochloric acid	1) Sodium oxalate ($Na_2C_2O_4$)
b) Carbonic acid	2) Potassium chloride (KCl)
c) Sulphurous acid	3) Calcium sulphite ($CaSO_3$)
d) Oxalic acid	4)Magnesium carbonate ($MgCO_3$)

Answer:a–2, b–4, c–3, d–1

Solution:

a) Hydrochloric acid	2) Potassium chloride (KCl)
b) Carbonic acid	4)Magnesium carbonate ($MgCO_3$)
c) Sulphurous acid	3) Calcium sulphite ($CaSO_3$)
d) Oxalic acid	1) Sodium oxalate ($Na_2C_2O_4$)

LEARNER'S TASK

CONCEPTUAL UNDERSTANDING QUESTIONS(CUQ'S)

1. A substance formed by the reaction between an acid and a base is called:
A) Oxide B) Alkali C) Salt D) Metal

Answer:C

Solution:Acid + base $\rightarrow$ salt + water.

2. The salts of sulphuric acid are called:
A) Chlorides B) Sulphates C) Nitrates D) Phosphates
Answer:B
Solution:Sulfuric acid $H_2SO_4 \rightarrow$ sulfate salts.

3. Most salts at room temperature exist as:
A) Liquids B) Gases C) Solids D) Plasmas
Answer:C
Solution:Ionic compounds $\rightarrow$ solids.

4. The salt formed by complete neutralization of a strong acid and strong base is called:
A) Acid salt B) Basic salt C) Normal salt D) Double salt
Answer:C
Solution:Complete replacement of H^+ by metal ion $\rightarrow$ normal salt.

5. Salts of nitric acid are called:
A) Nitrates B) Nitrites C) Nitrides D) Ammonium salts
Answer:A
Solution:Nitric acid $HNO_3 \rightarrow$ nitrate salts.

6. Acid salts contain replaceable:
A) H^+ ions B) OH^- ions C) H_2O molecules D) O^{2-} ions
Answer:A
Solution:Acid salts have one or more H^+ ions from acid.

7. Basic salts contain:
A) Only metal ions B) Only OH^- ions
C) Both metal ions and OH^- ions D) Only H^+ ions
Answer:C
Solution:Basic salts contain OH^- ions along with other anions.

8. $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ is:
A) Mohr's salt B) Potash alum C) Dolomite D) Epsom salt
Answer:B
Solution:$K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ is Potash alum.

9. Basic salts can further react with acids to form:
A) Acid salts B) Double salts C) Normal salts D) Complex salts
Answer:C
Solution:Basic salt + acid $\rightarrow$ normal salt.

10. A salt that contains two different cations or anions is called:
A) Mixed salt B) Complex salt C) Normal salt D) Acid salt
Answer:A

Solution:A salt that contains two different cations or anions is called Mixed salt.

JEE MAINS LEVEL QUESTIONS

1. Potassium ferrocyanide ($K_4[Fe(CN)_6]$) is an example of:
   A) Complex salt B) Normal salt C) Double salt D) Basic salt

Answer:A

Solution:Potassium ferrocyanide ($K_4[Fe(CN)_6]$) is an example of Complex salt. Because it contains a complex ion $[Fe(CN)_6]^{4-}$

2. $KCl{\cdot}MgCl_2{\cdot}6H_2O$ is:
   A) Carnallite B) Mohr's salt C) Potash alum D) Dolomite

Answer:A

Solution:$KCl{\cdot}MgCl_2{\cdot}6H_2O$ is Carnallite.

3. The salt which contains more than one type of cation or anion is called:
   A) Acidic salt B) Basic salt C) Mixed salt D) Normal salt

Answer:C

Solution:Mixed salts have more than one cation or anion.

4. Double salts typically exist as: **(FA & SA- 3 Marks / 4 Marks)**
   A) Amorphous solids B) Crystalline solids
   C) Liquids D) Gases

Answer:B

Solution:Double salts $\rightarrow$ typically Crystalline solids

5. The chemical properties of double salts in aqueous solution:
   A) Are identical to their individual constituent salts
   B) Are different from their individual constituent salts
   C) Show properties of complex compounds
   D) Are unpredictable

Answer:A

Solution:Double salts dissociate completely into simple ions and show properties of those ions.

6. In aqueous solution, double salts: **(FA & SA- 5 Marks / 8 Marks)**
   A) Completely dissociate into ions of constituent salts
   B) Form coordination compounds
   C) Remain as molecular compounds
   D) Precipitate out of solution

Answer:A

Solution:In aqueous solution, double salts completely dissociate into ions of constituent salts.

7. Double salts are classified as: **(FA & SA- 2 Marks)**
   A) Coordination compounds B) Simple ionic compounds
   C) Molecular compounds D) Covalent compounds

Answer:B

Solution:Double salts are classified as Simple ionic compounds (not coordination compounds, as they dissociate completely).

8. Which one is NOT an acidic salt?
   A) $NaHCO_3$ B) $NaHSO_4$ C) NaCl D) NaH_2PO_4

Answer:C

Solution:NaCl is a normal salt (no replaceable hydrogen.

9. The salts of phosphoric acid (H_3PO_4) are called:
   A) Phosphites B) Phosphates C) HypophosphatesD) Phosphides

Answer:B

Solution:Salts of $H_3PO_4 \rightarrow$ Phosphates

10. Which of the following are acidic salts?
   A) $NaHCO_3$, $NaHSO_4$ B) NaCl, Na_2SO_4
   C) Na_3PO_4, Na_2CO_3 D) NaOH, KOH

Answer:A

Solution:Acidic salts $\rightarrow$ $NaHCO_3$, $NaHSO_4$ (still have replaceable H^+)

JEE ADVANCED LEVEL QUESTIONS

Multi Correct Answer Type:

11. Which of the following are examples of acid salts?
   A) Sodium sulphate (Na_2SO_4)
   B) Sodium hydrogen sulphate ($NaHSO_4$)
   C) Potassium dihydrogen phosphate (KH_2PO_4)
   D) Sodium hydrogen carbonate ($NaHCO_3$)

Answer:B,C,D

Solution:A) $Na_2SO_4 \rightarrow$ normal salt (no H^+)
   B) $NaHSO_4 \rightarrow$ acid salt (has H^+)
   C) $KH_2PO_4 \rightarrow$ acid salt (two H^+ left from H_3PO_4)
   D) $NaHCO_3 \rightarrow$ acid salt (from H_2CO_3)

12. Which of the following compounds are classified as salts?
   A) Sodium Carbonate (Na_2CO_3)
   B) Hydrochloric Acid (HCl)
   C) Ammonium Chloride (NH_4Cl)
   D) Calcium Hydroxide ($Ca(OH)_2$)

Answer:A,C

Solution:Salt = ionic compound formed from acid–base neutralization.
   A) $Na_2CO_3 \rightarrow$ salt (from NaOH + H_2CO_3)
   B) HCl $\rightarrow$acid
   C) $NH_4Cl \rightarrow$ salt (from NH_3 + HCl)
   D) $Ca(OH)_2 \rightarrow$ base

Statement Type :

A) Statement-I, is True, Statement - II is True; Statement - II is a correct explanation for Statement-I

B) Statement - I is True, Statement is True; Statement -II , is NOT a correct explanation for Statement - I

C) Statement - I is True, Statement - II , is False

D) Statement - I is False, Statement - II is True

13. **Statement I** : Sodium hydrogen carbonate ($NaHCO_3$) is an acid salt.
Statement II : $NaHCO_3$ is formed by the partial replacement of hydrogen ions from carbonic acid (H_2CO_3).

Answer:A

Solution:Statement I: True $\rightarrow$ has replaceable H^+.

Statement II: True $\rightarrow$ correct explanation (carbonic acid has two H^+, one replaced in $NaHCO_3$).

14. **Statement I:** A solution of potassium nitrate (KNO_3) in water is neutral.
Statement II : Salts formed from a strong acid and a strong base produce neutral solutions.

Answer:A

Solution:Statement I: True — KNO_3 solution is neutral because KNO_3 is a salt of strong acid (HNO_3) and strong base (KOH).

Statement II: True — Salts of strong acid + strong base produce neutral solutions.

Comprehension type :

The salt produced by the incomplete nutralisation of a base with an acid, is called basic salt.

The salts of weak acids and strong bases give basic solution. Strong bases fully ionised and give a large amount of hydroxide ions on the other hand weak acids will slightly ionise and there are no sufficient H^+ ions for neutralisaiton. It acts as basic solution.

15. A basic salt is formed by:

A) Complete neutralization of a strong acid and strong base

B) Incomplete neutralization of a base with an acid

C) Crystallization of two simple salts

D) Partial replacement of hydrogen ions in an acid

Answer:B

Solution:Basic salts are formed when a base is not completely neutralized by an acid (incomplete neutralization), leaving replaceable OH^- ions

16. Which type of salt will give a basic solution when dissolved in water?

A) Salt of strong acid and weak base

B) Salt of weak acid and strong base

C) Salt of strong acid and strong base

D) Salt of weak acid and weak base

Answer:B

Solution:A salt formed from a weak acid and strong base gives a basic solution, be

cause the conjugate base of the weak acid hydrolyzes to produce OH^- ions

Integer Type :

17. Mohr's salt, $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$, contains _____ molecules of water of crystallization.

Answer:6

Solution:The number of water molecules of crystallization = 6

18. The total number of hydrogen atoms present in one formula unit of ammonium phosphate, $(NH_4)_3PO_4$, is _____.

Answer:12

Solution:Each NH_4 group has 4 hydrogen atoms, and there are 3 such groups:
Total hydrogen atoms = 3 × 4 = 12

Matrix Matching Type :

19.

Column-I	**Column-II**
a) Blue Vitriol	1)KOH
b) Gypsum	2)$NaNO_3$
c) Caustic Potash	3)$CuSO_4 \cdot 5H_2O$
d) Chile Saltpeter	4)$CaSO_4 \cdot 2H_2O$

A) a - 1, b - 2, c - 3, d - 4 B) a - 3, b - 4, c - 1, d - 2
B) a - 2, b - 1, c - 4, d - 3 D) a - 4, b - 2, c - 3, d - 1

Answer:B

Solution:

a) Blue Vitriol	3)$CuSO_4 \cdot 5H_2O$
b) Gypsum	4)$CaSO_4 \cdot 2H_2O$
c) Caustic Potash	1)KOH
d) Chile Saltpeter	2)$NaNO_3$

KEY

				TEACHING TASK					
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	B	C	A	A	B	B	A	C	A
			JEE ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	
A,C	A,B,D	A	A	B	B	24	13	a–2, b–4, c–3, d–1	
				LEARNER'S TASK					
			CONCEPTUAL UNDERSTANDING QUESTIONS(CUQ'S)						
1	2	3	4	5	6	7	8	9	10
C	B	C	C	A	A	C	B	C	A
			JEE MAINS LEVEL QUESTION						
1	2	3	4	5	6	7	8	9	10
A	A	C	B	A	A	B	C	B	A
			JEE ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	
B,C,D	A,C	A	A	B	B	6	12	B	