9.FORMULA

SOLUTIONS

Teaching Task

1.The formula for magnesium oxide is:

A) MgO B) MgO_2 C) Mg_2O D) $Mg(OH)_2$

Answer:A

Solution:Magnesium (Mg^{2+}) and oxygen (O^{2-}) combine in a 1:1 ratio to form MgO.

2.How many oxygen atoms are in CO_2?

A) 1 B) 2 C) 3 D) 4

Answer:B

Solution:The subscript "2" indicates two oxygen atoms in carbon dioxide.

3.The common name for NaCl is:

A) Baking soda B) Table salt C) Chalk D) Vinegar

Answer:B

Solution:NaCl is sodium chloride, commonly known as table salt.

4.The correct formula for aluminum sulfate is:

A) $AlSO_4$ B) $Al_2(SO_4)_3$ C) $Al_3(SO_4)_2$ D) $Al(SO_4)_3$

Answer:B

Solution: Aluminum (Al^{3+}) and sulfate (SO_4^{2-}) combine in a 2:3 ratio to balance charges.

5.Which compound contains a polyatomic ion?

A) CaO B) Na_2CO_3 C) $FeCl_3$ D) H_2O

Answer:B

Solution:CO_3^{2-} (carbonate) is a polyatomic ion in sodium carbonate.

6.The name for H_3PO_4 is:

A) Phosphorous acid B) Phosphoric acid

C) Hydrogen phosphate D) Trihydrogen phosphate

Answer:B

Solution:The name for H_3PO_4 is Phosphoric acid

7.Iron(III) oxide has the formula:

A) FeO B) Fe_2O_3 C) Fe_3O_4 D) FeO_2

Answer:B

Solution:The (III) indicates Fe^{3+}, which combines with O^{2-} in a 2:3 ratio.

8.If a metal M forms $M_3(PO_4)_2$, its chloride formula would be:

A) MCl B) MCl_2 C) MCl_3 D) M_2Cl_3

Answer:B

Solution:The phosphate formula shows M^{2+} (since $PO_4^{3-} \times 2 = M^{3+} \times 3$). Thus, chloride is MCl_2.

9.The formula for potassium permanganate is:
A) $KMnO_4$ B) K_2MnO_4 C) $K(MnO_4)_2$ D) K_3MnO_4
Answer:A
Solution:The formula for potassium permanganate is $KMnO_4$

10.Why can't water be called "dihydrogen oxide" in everyday life?
A) It's too long
B) The common name "water" is universally understood
C) It would scare people
D) Both A and B
Answer:D
Solution: While chemically accurate, "dihydrogen oxide" is unnecessarily complex when "water" is universally recognized.

MULTICORRECT TYPE
11. Which of the following formulas are correct?
A) Hydrochloric acid = HCl B) Ammonia = NH_4
C) Carbon dioxide = CO_2 D) Sodium hydroxide = Na_2OH
Answer:A,C
Solution:
A) HCl: Correct formula for hydrochloric acid.
B) NH_4: Incorrect. Ammonia is NH_3 (NH_4^+ is the ammonium ion).
C) CO_2: Correct formula for carbon dioxide.
D) Na_2OH: Incorrect. Sodium hydroxide is NaOH.

12. Which of these elements exist as diatomic molecules in nature?
A) Nitrogen B) Ozone C) Phosphorus D) Fluorine
Answer:A,D
Solution:Diatomic elements (form X_2 in nature): N_2 (Nitrogen), F_2 (Fluorine)

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-II 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: CO_2 is named carbon dioxide because it contains one carbon and two oxygen atoms.
Statement II: N_2O is named dinitrogen monoxide because it contains two nitrogen *and one oxygen atom.*
Answer:B
Solution:
Statement I: True.

CO_2 is correctly named carbon dioxide because it contains 1 carbon and 2 oxygen atoms (prefix "di-" for two oxygens).

Statement II: True.

N_2O is correctly named dinitrogen monoxide because it contains 2 nitrogen atoms (prefix "di-") and 1 oxygen atom (prefix "mono-").

COMPREHENSION TYPE:

Comprehension -1:

The symbolic representation of one molecule of a compound representing the number of atoms of various elements present in it is called formula of the compound.

14.What does a chemical formula represent?

A) The color of the compound

B) The number of atoms of each element in one molecule

C) The taste of the compound

D) The state of matter

Answer:B

Solution: Chemical formula represents The number of atoms of each element in one molecule

15.What is the correct formula for a molecule with 1 carbon and 2 oxygen atoms?

A) CO B) CO_2 C) C_2O D) O_2C

Answer:B

Solution:The subscript "2" in CO_2 indicates two oxygen atoms bonded to one carbon atom.

Comprehension -2

The name of binary acids (acids containing hydrogen and one more element) are given by adding prefix hydro- and suffix-ic to the name of second element.

16. What is the correct name for the acid HCl?

A) Chloric acid

B) Hydrochloric acid

C) Chlorous acid

D) Perchloric acid

Answer:B

Solution:Binary acids (H + nonmetal) are named with the prefix hydro- and the suffix *-ic*:

HCl = Hydrochloric acid (not "chloric," which is for oxoacids like $HClO_3$).

17.Which acid is named incorrectly?

A) HF $\rightarrow$Hydrofluoric acid

B) HBr $\rightarrow$ Hydrobromic acid

C) H_2S $\rightarrow$ Sulfuric acid

D) HI $\rightarrow$ Hydroiodic acid

Answer:C

Solution:H_2S is a binary acid (hydrogen + sulfur), so its correct name is hydrosulfuric acid.

Sulfuric acid refers to H_2SO_4 (an oxoacid).

MATRIX MATCH TYPE:

18. Column-I (Acid Name)	**Column-II (Formula)**
(a) Nitrous acid	**(1) HNO_2**
(b) Nitric acid	**(2) HNO_3**
(c) Hyponitrous acid	**(3) H_3PO_4**
(d) Phosphoric acid	**(4) H_3PO_3**
(e) Phosphorous acid	**(5) H_2NO_2**

A) a-1, b-2, c-5, d-3, e-4
B) a-2, b-1, c-5, d-4, e-3
C) a-5, b-4, c-3, d-2, e-1
Answer:A

Solution:

(a) Nitrous acid	(1) HNO_2
(b) Nitric acid	(2) HNO_3
(c) Hyponitrous acid	(5) H_2NO_2
(d) Phosphoric acid	(3) H_3PO_4
(e) Phosphorous acid	(4) H_3PO_3

19.Column-I (Common Name)	**Column-II (Chemical Formula)**
(a) Laughing gas	**(1) Na_2CO_3**
(b) Washing soda	**(2) N_2O**
(c) Quicklime	**(3) CaO**
(d) Blue vitriol	**(4) $CuSO_4 \cdot 5H_2O$**
(e) Baking soda	**(5) $NaHCO_3$**

Options:
A) a-2, b-1, c-3, d-4, e-5
B) a-1, b-2, c-3, d-5, e-4
C) a-3, b-4, c-2, d-1, e-5
Answer:A

Solution:

(a) Laughing gas	(2) N_2O
(b) Washing soda	(1) Na_2CO_3
(c) Quicklime	(3) CaO
(d) Blue vitriol	(4) $CuSO_4 \cdot 5H_2O$
(e) Baking soda	(5) $NaHCO_3$

Learners Task

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1.The formula for aluminum oxide is:

A) AlO B) Al_2O_3 C) Al_3O_2 D) AlO_2

Answer:B

Solution: Aluminum (Al^{3+}) and oxide (O^{2-}) combine in a 2:3 ratio to balance charges.

2.How many oxygen atoms are in SO_3?

A) 1 B) 2 C) 3 D) 4

Answer:C

Solution:The subscript "3" indicates three oxygen atoms in sulfur trioxide

3.The suffix for a binary compound like NaCl is:

A) -ate B) -ite C) -ide D) -ic

Answer:C

Solution: Binary ionic compounds use the suffix -ide (e.g., sodium chloride).

4.The correct name for H_3PO_4 is:

A) Phosphorous acid B) Phosphoric acid

C) Hydrophosphoric acid D) Hypophosphoric acid

Answer:B

Solution: The correct name for H_3PO_4 is Phosphoric acid

5.Which compound contains a polyatomic ion?

A) MgO B) Na_2SO_4

C) $FeCl_3$ D) H_2O

Answer:B

Solution:SO_4^{2-} (sulfate) is a polyatomic ion in sodium sulfate.

6.The prefix for the acid HClO is:

A) Per- B) Hypo- C) Hydro- D) None

Answer:B

Solution:HClO is hypochlorous acid (one oxygen, so hypo- + -ous).

7.Iron(II) sulfide has the formula:

A) FeS B) Fe_2S_3 C) FeS_2 D) Fe_3S_2

Answer:A

Solution: Iron(II) = Fe^{2+}, sulfide = S^{2-} 1:1 ratio (FeS).

8.If a metal M forms $M(NO_3)_2$, its phosphate formula is:

A) $M_3(PO_4)_2$ B) MPO_4 C) $M_2(PO_4)_3$ D) M_3PO_4

Answer:A

Solution:NO_3^- has a 1- charge, so $M(NO_3)_2$ implies M^{2+}. Phosphate (PO_4^{3-}) then forms $M_3(PO_4)_2$

9.The chemical formula for potassium dichromate is:

A) $KCrO_4$ B) $K_2Cr_2O_7$ C) K_3CrO_4 D) KCr_2O_7

Answer:B

Solution:Dichromate ion is $Cr_2O_7^{2-}$, balanced with two K^+ ions.

10.Why is CO called "carbon monoxide" instead of "carbon oxide"?

A) It contains only one oxygen atom

B) The prefix "mono-" is used for the first element

C) Both A and B

D) It's an exception to the rule

Answer:A

Solution:The prefix mono- is used for the second element (oxygen) when there is only one atom.

JEE MAINS LEVEL QUESTIONS

1.The chemical formula for magnesium oxide is:

A) MgO B) MgO_2 C) Mg_2O D) $Mg(OH)_2$

Answer:A

Solution: Magnesium (Mg^{2+}) and oxygen (O^{2-}) combine in a 1:1 ratio to form MgO.

2.How many hydrogen atoms are in H_2SO_4?

A) 1 B) 2 C) 3 D) 4

Answer:B

Solution:The subscript "2" indicates two hydrogen atoms in sulfuric acid.

3.The valency of oxygen in most compounds is:

A) 1 B) 2 C) 3 D) 4

Answer:B

Solution: Oxygen typically gains 2 electrons to achieve stability, giving it a valency of 2 (e.g., in H_2O, MgO).

4.The correct formula for sodium carbonate is:

A) $NaCO_3$ B) Na_2CO_3 C) $Na(CO_3)_2$ D) Na_3CO_4

Answer:B

Solution:Sodium (Na^+) and carbonate (CO_3^{2-}) combine in a 2:1 ratio to balance charges.

5.Which compound contains a sulfate ion?

A) NaCl B) $CaSO_4$ C) KNO_3 D) MgO

Answer:B

Solution:The sulfate ion is SO_4^{2-}, present in calcium sulfate ($CaSO_4$).

6.The valency of aluminum in $AlCl_3$ is:

A) 1 B) 2 C) 3 D) 4

Answer:C

Solution:Aluminum (Al^{3+}) bonds with three chloride ions (Cl^-), indicating a valency of 3.

7.Iron(III) oxide has the formula:

A) FeO B) Fe_2O_3 C) Fe_3O_4 D) FeO_2

Answer:B

Solution: Iron(III) means Fe^{3+}, which combines with O^{2-} in a 2:3 ratio to form Fe_2O_3.

8.If a metal M forms $M(NO_3)_2$, its phosphate formula is:

A) $M_3(PO_4)_2$ B) MPO_4 C) $M_2(PO_4)_3$ D) M_3PO_4

Answer:A

Solution:Nitrate (NO_3^-) has a 1- charge, so $M(NO_3)_2$ implies M^{2+}. Phosphate (PO_4^{3-}) then forms $M_3(PO_4)_2$.

9.The chemical formula for potassium permanganate is:

A) $KMnO_4$ B) K_2MnO_4 C) $K(MnO_4)_2$ D) K_3MnO_4

Answer:A

Solution:The chemical formula for potassium permanganate is $KMnO_4$

10.Why is CO called "carbon monoxide" instead of "carbon oxide"?

A) It contains only one oxygen atom

B) The prefix "mono-" is used for the first element

C) Both A and B

D) It's an exception to the rule

Answer:A

Solution:The prefix "mono-" is used for the second element (oxygen) when there is only one atom. The first element (carbon) doesn't need a prefix if there's only one atom.

ADVANCED LEVEL QUESTIONS

MULTICORRECT TYPE

11. In which of the following compounds is the metal showing a valency of 2?

A) $CaCl_2$ B) $BeCl_2$ C) KCl D) BaO

Answer:A,B,D

Solution:Valency of 2 means the metal forms 2+ ions.

A) $CaCl_2$: Calcium (Ca^{2+}) has a valency of 2.

B) $BeCl_2$: Beryllium (Be^{2+}) has a valency of 2.

D) BaO: Barium (Ba^{2+}) has a valency of 2.

Why not C) KCl?

Potassium (K^+) has a valency of 1, forming KCl.

12. Which of the following are binary compounds?

A) HCl B) CO_2 C) H_2SO_4 D) NaBr

Answer:A,B,D

Solution:Binary compounds consist of two different elements.

A) HCl: Hydrogen + Chlorine.

B) CO_2: Carbon + Oxygen.

D) NaBr: Sodium + Bromine.

Why not C) H_2SO_4?

It contains three elements (H, S, O), making it ternary, not binary.

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-II 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: The compound formed by calcium and chlorine is called calcium chloride.

Statement II: The chemical formula of calcium chloride is CaCl.

Answer:C

Solution:Statement I: True.

The name follows standard IUPAC nomenclature for ionic compounds (metal +

nonmetal with "-ide" suffix).

Statement II: False. Calcium has a valency of +2 and chlorine has -1, so the correct formula is $CaCl_2$ to balance charges.

COMPREHENSION TYPE:

Bases contaning -OH radical are names as hydroxides, after the name of metal.

Examples:

i) NaOH Sodium hydroxide.

ii) NH_4OH Ammonium hydroxide.

14.What is the correct name for the base KOH?

A) Potassium oxide B) Potassium oxygen hydride

C) Potassium hydroxide D) Potassium hydrate

Answer:C

Solution:KOH is composed of potassium (K^+) and hydroxide (OH^-) ions.

15. Which of these is NOT a base?

A) NaOH B) $Ca(OH)_2$ C) NH_4OH D) H_2O

Answer:D

Solution:Bases contaning -OH radical are names as hydroxides, after the name of metal.

A) NaOH (sodium hydroxide) = strong base.

B) $Ca(OH)_2$ (calcium hydroxide) = base.

C) NH_4OH (ammonium hydroxide) = weak base.

H_2O is amphoteric (can act as both acid and base) but is not classified as a base in standard contexts.

Water (H_2O) is neutral/amphoteric, not a base.

INTEGER TYPE:

16. Number of oxygen atoms in one molecule of carbon dioxide = ___

Answer:2

Solution:The subscript "2" in CO_2 indicates two oxygen atoms.

17. Valency of sodium in sodium oxide (Na_2O) = ___

Answer:1

Solution:Na_2O shows a 2:1 ratio of Na to O.

Oxygen has a valency of 2, so each sodium (Na) must have a valency of 1 to balance the compound.

18. Number of chlorine atoms in one molecule of calcium chloride ($CaCl_2$) = ___

Answer:2

Solution:The subscript "2" in $CaCl_2$ indicates two chlorine atoms.

19. Valency of zinc in zinc nitrate ($Zn(NO_3)_2$) = ___

Answer:2

Solution:The formula shows two nitrate ions (NO_3^-) bonded to one zinc (Zn).

Since each NO_3^- has a 1- charge, zinc must be Zn^{2+} (valency = 2).

20. Number of atoms in one molecule of sulphur dioxide (SO_2) = ___
Answer:3
Solution:1 sulfur (S) + 2 oxygen (O) atoms = 3 atoms total.

KEY

				Teaching Task					
1	2	3	4	5	6	7	8	9	10
A	B	B	B	B	B	B	B	A	D
11	12	13	14	15	16	17	18	19	
A,C	A,D	B	B	B	B	C	A	A	
				Learners Task					
			CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)						
1	2	3	4	5	6	7	8	9	10
B	C	C	B	B	B	A	A	B	A
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
A	B	B	B	B	C	B	A	A	A
			ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	20
A,B,D	A,B,D	C	C	D	2	1	2	2	3

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