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7. FORMULA

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. Select the correct formula for each of the following compounds:

i) Calcium carbonate ii) Calcium hydrogen carbonate

	(i)	ii)		(i)	(ii)
A)	$Ca(OH)_2$	$CaCO_3$	B)	$CaCO_3$	$Ca(HCO_3)_2$
C)	$CaCO_3$	$Ca(OH)_2$	D)	$Ca(HCO_3)_2$	$Ca(OH)_2$

Answer:B

Solution:Calcium carbonate: $CaCO_3$

Calcium hydrogen carbonate: $Ca(HCO_3)_2$

2. Number of electrons transfer takes place from magnesium to oxygen in the formation of magnesium oxide.

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

Answer:C

Solution:Magnesium (Mg) loses 2 electrons to form Mg^{2+}.

Oxygen (O) gains 2 electrons to form O^{2-}.

3. Name of the molecule that will form from two sodium atoms, one carbon atom and three oxygen atoms

A) Sodium Oxide B) Sodium Carbon trioxide

C) Sodium Carbonate D) Sodium Carbon dioxide

Answer:C

Solution:Sodium Carbonate : Na_2CO_3 (2 Na, 1 C, 3 O).

4. The chemical formulae of a compound shows the

A) arrangement of atoms in the compound

B) mass of atoms in each of its molecule

C) number of atoms that have chemically combined in a molecule

D) number of atoms that have been mixed physically mixed in a molecule.

Answer:C

Solution: The chemical formula of a compound shows the Number of

atoms that have chemically combined in a molecule
Example: H_2O shows 2 H atoms + 1 O atom chemically bonded.

5. Formula for calcium carbonate is

A) $CaCO_3$ B)$CaHCO_3$ C) Na_2CO_3 D)$CuCO_3$

Answer:A

Solution:Formula for calcium carbonate is $CaCO_3$

6. What is the formula of hydrochloric acid

A) HCl B) H_2 C) Cl_2 D) H_2SO_4

Answer:A

Solution:The formula of hydrochloric acid HCl

7. Sodium phosphate has the chemical formula

A) $Na_2P_2O_7$ B) Na_3PO_4 C) $Na_4P_2O_7$ D) Na_3PO_3

Answer:B

Solution: Sodium phosphate has the chemical formula:Na_3PO_4

8. A metal M forms a compound M_2HPO_4.What will be the formula of the metal suphate?

A)M_2SO_4 B)MSO_4 C)M_3SO_4 D)M_4SO_4

Answer:A

Solution: $M_2HPO_4 \rightarrow$ metal ion = M^+ (since HPO_4^{2-} requires 2 M^+ to balance)
So M is monovalent
Now combine M^+ with SO_4^{2-}:Need 2 M^+ to balance 1 $SO_4^{2-} \rightarrow M_2SO_4$

9. If the formula of a metal nitrite is $M(NO_2)_2$ then the formula of its dihydrogen phosphate is

A)$M_2(PO_4)_3$ B)$MHPO_4$ C) $M(H_2PO_4)_2$ D)M_2HPO_4

Answer:C

Solution:Valency of M:
Nitrite ion is NO_2^- (monovalent).
$M(NO_2)_2$ implies M^{2+}(since 2 nitrite ions balance the charge).
Dihydrogen phosphate formula:
Dihydrogen phosphate ion is $H_2PO_4^-$
To balance M^{2+}, two $H_2PO_4^-$ ions are needed: $M(H_2PO_4)_2$

10. The chemical formula of potassium per-chlorate is

A) KClO B) $KClO_2$ C) $KClO_3$ D) $KClO_4$.

Answer:D

Solution:Perchlorate ion = ClO_4^-
Potassium ion = $K^+ \rightarrow$The chemical formula of potassium per-chlorate is $KClO_4$

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

11. Which of the following are correct statement
    A) The chemcial formula of water is H_2O
    B) The chemical formula of Sulphuric acid is H_2SO_4
    C) The chemical formula of carbonic acid is H_2CO_2
    D) All the above

Answer:A,B

Solution:A) $H_2O \rightarrow$ Correct formula of water
B) $H_2SO_4 \rightarrow$ Correct formula of sulfuric acid
C) Carbonic acid = H_2CO_3, not H_2CO_2

12. which of the following are di atomic molecules?
    A)Cl_2 B)Br_2 C)I_2 D)O_2

Answer:A,B,C,D

Solution:Cl_2, Br_2, I_2, O_2 are all diatomic molecules, meaning they naturally exist as two-atom molecules in elemental form.

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 :** PCl_5 stands for phosphorous penta chloride.
    Statement II :SO_3 stands for sulphur trioxide

Answer:B

Solution:Statement I: True — "PCl_5" is indeed the correct formula and name for phosphorus pentachloride.
Statement II:oTrue — "SO_3" is correctly named as sulfur trioxide.
Now, check if Statement II explains Statement I.It does not — They are independent facts, not an explanation of each other

Comprehension Type :

Comprehension -I :

Usaully the elements present in a compound are named in order of symbols appearing in formula.

14 . The chemical formula of magnesium nitride is

A) MgN_3 B) Mg_2N_3 C) Mg_3N_2 D) $MgNO_3$

Answer:C

Solution:Magnesium (Mg) has a valency of +2.

Nitride ion (N^{3-}) has a valency of –3.

To balance the charges:““3 Mg^{2+} ions = +6

2 N^{3-} ions = –6

Thus, the correct formula is Mg_3N_2

Comprehension - II :

The representation of a molecule of a substance in terms of symbols & subscripts numbers is known as formule. The representation of a molecule of a substance (element or compoun4) in terms of symbols and subscript numbers is known as the formula.

15. A metal M forms a compound MPO_4. What will be the formula of the metal sulphate?

A) M_2SO_4 B) $M_2(SO_4)_3$ C) MSO_4 D) $M(SO_4)_3$

Answer:B

Solution:The formula MPO_4 indicates:

PO_4^{3-} is the phosphate ion (valency = –3)

So, M must be a +3 ion to balance the –3 charge from PO_4^{3-}

Therefore, M^{3+}

To find the metal sulphate:Sulphate ion = SO_4^{2-} (valency = –2)

We need to balance M^{3+} and SO_4^{2-}

Use cross multiplication:““2 M^{3+} (total +6),3 SO_4^{2-} (total –6)

Thus, the formula is:$M_2(SO_4)_3$

16. The phosphate of a metal has the formula MPO_4. The formula of its nitrate will be:

A) MNO_3 B) $M_2(NO_3)_2$ C) $M(NO_3)_2$ D) $M(NO_3)_3$

Answer:D

Solution:From MPO_4, we know:PO_4^{3-}

So, M must be a +3 ion to balance the –3 charge from PO_4^{3-}

Therefore, M^{3+}

Nitrate ion = NO_3^-

To balance:““M^{3+} and NO_3^- need 3 nitrate ions to balance 1 M^{3+}

So, the correct formula is: $M(NO_3)_3$

Matrix Matching Type :

17. **Column- I** **Column-II**

a. Periodic acid 1) $HClO_3$
b. Chloric acid 2) $HClO_2$
c. Chlorous acid 3) $HClO_4$
d. Per chloric acid 4) HIO_3
5) HIO_4

Answer:a- 5,b - 1,c - 2,d - 3

Solution:

a. Periodic acid 5) HIO_4
b. Chloric acid 1) $HClO_3$
c. Chlorous acid 2) $HClO_2$
d. Per chloric acid 3) $HClO_4$

18. **Column- I** **Column-II**

a) Mercurous chloride 1) $PbCrO_4$
b) Lead chromate 2) $CaOCl_2$
c) Solid carbondioxide 3) CO_2
d) Calcium oxychloride 4) Hg_2Cl_2
5) H_2SO_4

Answer:a-4,b-1,c-3,d-2

Solution:

a) Mercurous chloride 4) Hg_2Cl_2
b) Lead chromate 1) $PbCrO_4$
c) Solid carbondioxide 3) CO_2
d) Calcium oxychloride 2) $CaOCl_2$

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1. Formula for the radicals magnesium and sulphide

A) Mg_2S_3 B) MgS C) Mg_3S_2 D) MgS_2

Answer:B

Solution:Magnesium (Mg^{2+}) + Sulphide (S^{2-}) $\rightarrow$ MgS (charges cancel out).

2. The chemical formula of Potassium super oxide is

A) KO_2 B) K_2O C) K_2O_2 D) KO

Answer:A

Solution:Superoxide has the O_2^- ion, so potassium superoxide is KO_2.

3. In a binary compound, metallic part is given a suffix as?

A) ate B) ite C) ide D)None

Answer:C

Solution:Binary compounds (e.g., NaCl, MgO) use the suffix -ide for the non-metal.

4. In a binary compound, the metal ion is

A) Named second B) Cannot be named

C) Named first with the metal name D) Both a and b

Answer:C

Solution: In a binary compound, the metal ion is Named first with the metal name

Example: Sodium chloride (NaCl), Magnesium oxide (MgO).

5. What is name of the $NaNO_3$ tertiary compound?

A) Sodium nitrite B) Sodium nitride C) Sodium nitrate D)None

Answer:C

Solution:NO_3^- is the nitrate ion, so $NaNO_3$ is sodium nitrate.

6. What is the prefix if oxygen is less than the oxygen present in a compound?

A) Per B) Hypo C) Hyper D) All

Answer:B

Solution: Hypochlorite (ClO^-) has less oxygen than chlorite (ClO_2^-)

7. If Oxygen present in a compound ending with –ate, contains more oxygen than is:

A) Per B) Hypo C) Hyper D) All

Answer:A

Solution: Perchlorate (ClO_4^-) has more oxygen than chlorate (ClO_3^-).

8. The prefix and suffix in binary acids containing hydrogen and non metal like halogen respectively are:

A) Hydro and ic B) ic and hydroC) ate, ite D) ite, ate

Answer:A

Solution: Prefix and suffix in binary acids (hydrogen + halogen): Hydro and ic

Example: Hydrochloric acid (HCl).

9. In naming bases –OH radical are named as hydroxides, after the name of:

A) Metal, B) Non-metal C) Both a and b D) None

Answer:A

Solution: In naming bases, -OH radical is named as hydroxide after the name of Metal

Example: Sodium hydroxide (NaOH), not "sodium oxygen hydrogen".

10. What is trivial name of sodium chloride?

A) Ammonia B) Table salt C) Baking salt D) Water

Answer:B

Solution:NaCl is commonly called table salt.

JEE MAINS LEVEL QUESTIONS

Multi correct answer type:

1. Chemical formula for calcium sulphate is $CaSO_4$. The formula for ferric sulphate will be:

A) $Fe_2(P_2O_7)_3$ B) $Fe_4P_3O_{14}$ C) $Fe_2(SO_4)_3$ D) Fe_3PO_4

Answer:C

Solution:Ferric = Fe^{3+},SO_4^{2-}

Balanced as: $2\ Fe^{3+} + 3\ SO_4^{2-} \rightarrow Fe_2(SO_4)_3$

2. A metal M forms a compound M_2HPO_4. What will be the formula of the metal sulphate?

A) M_2SO_4 B) $M_2(SO_4)_3$ C) MSO_4 D) $M(SO_4)_3$

Answer:A

Solution:HPO_4^{2-} has a -2 charge $\rightarrow$ so M^+

SO_4^{2-} also requires 2 M^+ ions $\rightarrow$ M_2SO_4

3. A formula has

A) Qualitative significance only B) Quantitative significance only

C) Both qualitative and quantitative significance. D) None of these

Answer:C

Solution:Qualitative: tells elements present

Quantitative: tells number of atoms

4. The symbolic representation of actual number of atoms in molecule is called

A) Valency B) Formula C) Both 1 & 2 D) Ion

Answer:B

Solution:. The symbolic representation of actual number of atoms in molecule is called Formula

5. The chemical formula of water is

A) H_2O_2 B) H_2O C) O_2 D) H_2

Answer:B

Solution:The chemical formula of water is H_2O

6. The valency of tin in $SnCl_2$ is A_____ and $SnCl_4$ is B_____.

A)A-2,B-4 B) A-4, B-2 C)A-1,B-1 D) A- 2,B-2

Answer:A

Solution:$SnCl_2$: Tin must be +2

$SnCl_4$: Tin must be +4

7. Identify the right chemical formula for the following compounds.
i) Calcium sulphate ii) Magnesium oxide iii) Potassium nitrite

	i	*ii*	*iii*
A)	$Ca(HSO_4)_2$	MgO	KNO_3
B)	$CaSO_4$	MgO	KNO_2
C)	CaS	Mg_2O_2	KNO_3
D)	None of the above		

Answer:B

Solution:i) Calcium sulphate $\rightarrow$ $CaSO_4$
ii) Magnesium oxide $\rightarrow$ MgO
iii) Potassium nitrite $\rightarrow$ KNO_2

8. Correct formula of a trivalent metal nitride is:
A) M_3N_2 B) M_3N_3 C) MN D) Both B and C

Answer:D

Solution:Trivalent metal (M^{3+}) + Nitride (N^{3-}):
Simplest formula: MN (1:1 ratio).
Alternatively: M_3N_3 (empirically same as MN).

9. Metal sulphate of a metal 'M' is written as $M_2(SO_4)_3$ then its metal chloride is
A)MCl B) MCl_2 C) MCl_3 D) None

Answer:C

Solution:$M_2(SO_4)_3$ implies M^{3+} (since SO_4^{2-} requires 2 M^{3+} for 3 SO_4^{2-}).
Chloride (Cl^-) pairs asMCl_3.

10. The sulphate of a metal has the formula $M_2(SO_4)_3$. The formula for its phosphate
will be
A) $M(HPO_4)_2$ B)M_3 $(PO_4)_2$ C)$M_2(PO_4)_3$ D)MPO_4

Answer:D

Solution:$M_2(SO_4)_3$ confirms M^{3+}.
Phosphate (PO_4^{3-}) pairs as MPO_4 (1:1 ratio, charges cancel).

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

11. In which of the following compounds metal is having valency 1?
A) NaCl B) LiCl C) $MgCl_2$ D) CsCl

Answer:A,B,D

Solution:Na^+, Li^+, and Cs^+ are all alkali metals with a valency of +1.
$MgCl_2$ has magnesium with a valency of +2.

12. Which of the following is a binary compound?

A)NaCl B)Mg_3N_2 C)Al_2O_3 D)CaS.

Answer:A,B,C,D

Solution:A binary compound consists of two different elements.
NaCl: Sodium (Na) + Chlorine (Cl).
Mg_3N_2: Magnesium (Mg) + Nitrogen (N).
Al_2O_3: Aluminum (Al) + Oxygen (O).
CaS: Calcium (Ca) + Sulfur (S).

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 of magnesium and nitrogen is magnesium nitride.
Statement II : Potassium hypo chloride is KClO.

Answer:B

Solution:Statement I:True
Magnesium (Mg) has a valency of +2, and Nitrogen (N) has a valency of -3. So the correct formula is Mg_3N_2, which is called magnesium nitride.
Statement II: True
"Hypo" indicates the lowest oxidation state of chlorine in oxyanions.
So, KClO is potassium hypochlorite.

Comprehension Type :

Comprehension -I:

Usaully the elements present in a compound are named in order of symbols appearing in formula.

14. The chemcial formula of Aluminium oxide is
A) Al_2O_3 B)$Al(OH)_2$ C) Al_3O_2 D) AlO_3

Answer:A

Solution:Al_2O_3 is the correct formula for aluminium oxide.

Comprehension -II

The representation of a molecule of a substance in terms of symbols & subscripts numbers is known as formule. The representation of a molecule of a substance (element or compoun4) in terms of symbols and subscript numbers is known as the formula.

15. Chemical formula for sodium sulphate is Na_2SO_4. The formula for trivalent metal sulphate will be:

A) $M_2(P_2O_7)_3$ B) $M_4P_3O_{14}$ C) $M_2(SO_4)_3$ D) M_3PO_4

Answer:C

Solution:Sodium sulphate: $Na_2SO_4 \rightarrow$ Sodium is a monovalent metal (Na^+). The given question is asking for the sulphate of a trivalent metal (M^{3+}). Sulfate ion is SO_4^{2-}.

Using the criss-cross method for valencies:

M SO_4

3 2 criss-cross the valencies

$M_2(SO_4)_3$

Integer Type :

16. How many molecules of magnesium chloride is formed when 1 volume of magnesium is react withh two volumes of hydrogen chloride

Answer:1

Solution:1 atom (or mole) of Mg reacts with 2 moles of HCl $\rightarrow$ forms 1 molecule of $MgCl_2$

17. Number of hydrogen atoms present in Ammonia.....

Answer:3

Solution:In one molecule of NH3:There are 3 hydrogen atoms

18. Valency of calcium in calcium sulphate.....

Answer:2

Solution:Calcium ion is Ca^{2+}, so its valency = 2

19. Valency of iron in ferric chloride.....

Answer:3

Solution:In $FeCl_3$, each Cl^- has valency 1.

So, Fe must be Fe^{3+} to balance 3 Cl^- ions.

20. Valency of Aluminium in aluminium sulphate...

Answer:3

Solution:Valency of aluminium in aluminium sulphate ($Al_2(SO_4)_3$)

Each SO_4^{2-} ion has valency 2

There are 3 $SO_4^{2-} \rightarrow$ total negative charge = 6

So, 2 Al atoms must balance with +6 $\rightarrow$Each Al has valency 3

KEY

Teaching Task

1	2	3	4	5	6	7	8	9	10
B	C	C	C	A	A	B	A	C	D
11	**12**	**13**	**14**	**15**	**16**	**17**		**18**	
AB	ABCD	B	C	B	D	a-5,b-1,c-2,d-3		a-4,b-1,c-3,d-2	

Learners Task

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1	2	3	4	5	6	7	8	9	10
B	A	C	C	C	B	A	A	A	B

JEE MAIN & ADVANCED LEVEL

1	2	3	4	5	6	7	8	9	10
C	A	C	B	B	A	B	D	C	D
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
DAB	ABCD	B	A	C	1	3	2	3	3