INTEGRATED PLUS

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11. 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) HC*l* B) H_2 C) Cl_2 D) H_2SO_4

Answer:A

Solution:The formula of hydrochloric acid HC*l*

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 hydro C) 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