Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Selina ICSE Solutions for Class 9 Chemistry Chapter 4 The Language of Chemistry

Page No: 8

Question 1.
What is a symbol? What information does it convey?
Solution:
A symbol is the short form which stands for the atom of a specific element or the abbreviations used for the names of elements.

1. It represents a specific element.
2. It represents one atom of an element.
3. A symbol represents how many atoms are present in its one gram (gm) atom.
4. It represents the number of times an atom is heavier than one atomic mass unit (amu) taken as a standard.

Question 2
Why is the symbol S for sulphur, but Na for sodium and Si for silicon?
Solution:
In most cases, the first letter of the name of the element is taken as the symbol for that element and written in capitals (e.g. for sulphur, we use the symbol S). In cases where the first letter has already been adopted, we use a symbol derived from the Latin name (e.g. for sodium/Natrium, we use the symbol Na). In some cases, we use the initial letter in capital together with a small letter from its name (e.g. for silicon, we use the symbol Si).
Question 3.
Write the full form of IUPAC. Name the elements represented by the following symbols:
Au, Pb, Sn, Hg
Solution:
The full form of IUPAC is International Union of Pure and Applied Chemistry.
Names of the elements:
Au – Gold
Pb – Lead
Sn – Tin
Hg – Mercury
Question 4.
If the symbol for Cobalt, Co, were written as CO, what would be wrong with it?
Solution:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Co stands for Cobalt. If we write CO, then it would mean that it is a compound containing two non-metal ions, i.e. carbon and oxygen, which forms carbon monoxide gas.

Question 5(d).

$2H_2$

Solution:

(a) H stands for one atom of hydrogen.
(b) H_2 stands for one molecule of hydrogen.
(c) 2H stands for two atoms of hydrogen.

Question 6.

What is meant by atomicity? Name the diatomic element.

Solution:

The number of atoms of an element that join together to form a molecule of that element is known as its atomicity. Diatomic molecules: H_2, O_2, N_2, Cl_2

Question 7(a).

Explain the terms 'valency' and 'variable valency'.

Solution:

1. Valency of Na is +1 because it can lose one electron.
2. Valency of O is -2 because it can accept two electrons.

Variable valency: It is the combining capacity of an element in which the metal loses more electrons from a shell next to a valence shell in addition to electrons of the valence shell.

Question 7(b).

How are the elements with variable valency named? Explain with an example.

Solution:

If an element exhibits two different positive valencies, then

1. for the lower valency, use the suffix -OUS at the end of the name of the metal
2. for the higher valency, use the suffix -IC at the end of the name of the metal.

Example:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Element	Lower valency	Higher valency
Ferrum (Iron)	Ferrous (Fe^{2+})	Ferric (Fe^{3+})

Question 8.
Give the formula and valency of:

1. aluminate …… .
2. chromate …….. .
3. aluminium …….. .
4. cupric …… .

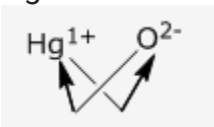
Solution:

	Name	**Formula**	**Valency**
a.	Aluminate	AlO_2	-2
b.	Chromate	CrO_4	-2
c.	Aluminium	Al	+3
d.	Cupric	Cu	+2

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 9.b
What is the significance of formula?
Solution:
Chemical formula: The chemical formula of a substance (element or compound) is a symbolic representation of the actual number of atoms present in one molecule of that substance.
It also indicates the fixed proportion by weight in which atoms combine.

Rules:
(i) The positive and negative radicals are written side by side (+ve first) with their charge as a superscript on the right side.
(ii) Charges are then interchanged and written as a subscript.
(iii) The final formula is written without the sign of charge, e.g. Hg_2O

1. $Hg^{1+}O^{2-}$
2. 

3. Hg_2O

Question 10(a).
What do you understand by the following terms?
Acid radical
Solution:
Acid radical: The electronegative or negatively charged radical is called an acid radical.
Examples: Cl^-, O^{2-}

Question 10(b).
What do you understand by the following terms? Basic radical
Solution:
Basic radical: The electropositive or positively charged radical is called a basic radical.
Examples: K^+, Na^+
Question 11.

Match the following:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Compound	**Formula**
(a) Boric acid	i. NaOH
(b) Phosphoric acid	ii. SiO_2
(c) Nitrous acid	iii. Na_2CO_3
(d) Nitric acid	iv. KOH
(e) Sulphurous acid	v. $CaCO_3$
(f) Sulphuric acid	vi. $NaHCO_3$
(g) Hydrochloric acid	vii. H_2S
(h) Silica (sand)	viii. H_2O

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

(i) Caustic soda (sodium hydroxide)	ix. PH_3
(j) Caustic potash (potassium hydroxide)	x. CH_4
(k) Washing soda(sodium carbonate)	xi. NH_3
(l) Baking soda(sodium bicarbonate)	xii. HCl
(m) Lime stone.(calcium carbonate)	xiii. H_2SO_3
(n) Water	xiv. HNO_3
(o) Hydrogen sulphide	xv. HNO_2
(p) Ammonia	xvi. H_3BO_3
(q) Phosphine	xvii. H_3PO_4

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

(r) Methane	xviii. H_2SO_4

Solution:

Compound	Formula (Ans)
(a) Boric acid	xvi. H_3BO_3
(b) Phosphoric acid	xvii. H_3PO_4
(c) Nitrous acid	xv. HNO_2
(d) Nitric acid	xiv. HNO_3
(e) Sulphurous acid	xiii. H_2SO_3
(f) Sulphuric acid	xviii. H_2SO_4
(g) (a) Hydrochloric acid	xii. HCl

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

(h) Silica (sand)	ii. SiO_2
(i) Caustic soda (sodium hydroxide)	i. NaOH
(j) Caustic potash (potassium hydroxide)	iv. KOH
(k) Washing soda (sodium carbonate)	iii. Na_2CO_3
(l) Baking soda (sodium bicarbonate)	vi. $NaHCO_3$
(m) Lime stone (calcium carbonate)	v. $CaCO_3$
(n) Water	viii. H_2O
(o) Hydrogen sulphide	vii. H_2S
(p) Ammonia	xi. NH_3
(q) Phosphine	ix. PH_3
(r) Methane	x. CH_4

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 12.
Select the basic and acidic radicals in the following compounds.

1. $MgSO_4$
2. $(NH_4)_2SO_4$
3. $Al_2(SO_4)_3$
4. $ZnCO_3$
5. $Mg(OH)_2$

Solution:

	Acidic radical	Basic radical
$MgSO_4$	SO_4^-	Mg^+
$(NH_4)_2SO_4$	SO_4^-	NH_4^+
$Al_2(SO_4)_3$	SO_4^-	Al^{3+}
$ZnCO_3$	CO_3^-	Zn^{2+}
$Mg(OH)_2$	OH^-	Mg^{2+}

Question 13.
Write chemical formula of the sulphate of Aluminium, Ammonium and Zinc.
Solution:
Valencies of aluminium, ammonium and zinc are 3, 1 and 2, respectively.
The valency of sulphate is 2.

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Hence, chemical formulae of the sulphates of aluminium, ammonium and zinc are $Al_2(SO_4)_3$, $(NH_4)_2SO_4$ and $ZnSO_4$.

Question 14.

The valency of an element A is 3 and that of element B is 2. Write the formula of the compound formed by the combination of A and B

Solution:

Formula of the compound = A_2B_3

Question 15.

Write the chemical names of the following compounds:

1. $Ca_3(PO_4)_2$
2. K_2CO_3
3. K_2MnO_4
4. $Mn_3(BO_3)_2$
5. $Mg(HCO_3)_2$
6. $Na_4Fe(CN)_6$
7. $Ba(ClO_3)_2$
8. Ag_2SO_3
9. $(CH_3COO)_2Pb$
10. Na_2SiO_3

Solution:

Chemical names of compounds:

1. $Ca_3(PO_4)_2$ – Calcium phosphate
2. K_2CO_3 – Potassium carbonate
3. K_2MnO_4 – Potassium manganate
4. $Mn_3(BO_3)_2$ – Manganese (II) borate
5. $Mg(HCO_3)_2$ – Magnesium hydrogen carbonate
6. $Na_4Fe(CN)_6$ – Sodium ferrocyanide
7. $Ba(ClO_3)_2$ – Barium chlorate
8. Ag_2SO_3 – Silver sulphite
9. $(CH_3COO)_2Pb$ – Lead acetate
10. Na_2SiO_3 – Sodium silicate

Question 16

Write the basic radicals and acidic radicals of the following and then write the chemical formulae of these compounds.

1. Barium sulphate
2. Bismuth nitrate

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

3. Calcium bromide
4. Ferrous sulphide
5. Chromium sulphate
6. Calcium silicate
7. Potassium ferrocyanide
8. Stannic oxide
9. Magnesium phosphate
10. Sodium zincate
11. Stannic phosphate
12. Sodium thiosulphate
13. Potassium manganate
14. Nickel bisulphate

Solution:

Compounds	Acidic radical	Basic radical	Chemical formulae
Barium sulphate	SO_4^{2-}	Ba^{2+}	$BaSO_4$
Bismuth nitrate	NO_3^-	Bi^{3+}	$Bi(NO_3)_3$
Calcium bromide	Br^-	Ca^{2+}	$CaBr_2$
Ferrous sulphide	S^{2-}	Fe^{2+}	FeS

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Chromium sulphate	SO_4^{2-}	Cr^{3+}	$Cr_2(SO_4)_3$
Calcium silicate	SiO_4^{2-}	Ca^{2+}	Ca_2SiO_4
Potassium ferrocyanide	$[Fe(CN)_6]^{4-}$	K^{1+}	$K_4[Fe(CN)_6]$
Stannic oxide	O^{2-}	Sn^{2+}	SnO_2
Magnesium phosphate	$(PO_4)^{3-}$	Mg^{2+}	$Mg_3(PO_4)_2$
Sodium zincate	ZnO^{2-}	Na^{1+}	Na_2ZnO_2
Stannic phosphate	$(PO_4)^{3-}$	Sn^{4+}	$Sn_3(PO_4)_4$
Sodium thiosulphate	$(S_2O_3)^{2-}$	Na^{1+}	$Na_2S_2O_3$
Potassium manganate	MnO_4^{2-}	K^{1+}	K_2MnO_4

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Nickel bisulphate	HSO_4^{1-}	Ni^{3+}	$Ni(HSO_4)_3$

Question 16.
Give the names of the following compounds.

1. NaClO
2. $NaClO_2$
3. $NaClO_3$
4. $NaClO_4$

Solution:

1. NaClO – Sodium hypochlorite
2. $NaClO_2$ – Sodium chlorite
3. $NaClO_3$ – Sodium chlorate
4. $NaClO_4$ – Sodium perchlorate

Question 18(a).
Complete the following statements by selecting the correct option :
The formula of a compound represents
i. an atom
ii. a particle
iii. a molecule
iv. a combination
Solution:
iii. The formula of a compound represents a molecule.

Question 18(b).
Complete the following statements by selecting the correct option :
The correct formula of aluminium oxide is
i. AlO_3
ii. AlO_2
iii. Al_2O_3
Solution:
iii. The correct formula of aluminium oxide is Al_2O_3.

Question 18(c).
Complete the following statements by selecting the correct option :

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

The valency of nitrogen in nitrogen dioxide (NO_2) is
i. one
ii. two
iii. three
iv. four

Solution:
iv. The valency of nitrogen in nitrogen dioxide (NO_2) is four.

Page No: 13

Question 1.
Balance the following equations:

1. $Fe + H_2O \rightarrow Fe_3O_4 + H_2$
2. $Ca + N_2 \rightarrow Ca_3N_2$
3. $Zn + KOH \rightarrow K_2ZnO_2 + H_2$
4. $Fe_2O_3 + CO \rightarrow Fe + CO_2$
5. $PbO + NH_3 \rightarrow Pb + H_2O + N_2$
6. $Pb_3O_4 \rightarrow PbO + O_2$
7. $PbS + O_2 \rightarrow PbO + SO_2$
8. $S + H_2SO_4 \rightarrow SO_2 + H_2O$
9. $S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$
10. $MnO_2 + HCl \rightarrow MnCl_2 + H_2O + Cl_2$
11. $C + H_2SO_4 \rightarrow CO_2 + H_2O + SO_2$
12. $KOH + Cl_2 \rightarrow KCl + KClO + H_2O$
13. $NO_2 + H_2O \rightarrow HNO_2 + HNO_3$
14. $Pb_3O_4 + HCl \rightarrow PbCl_2 + H_2O + Cl_2$
15. $H_2O + Cl_2 \rightarrow HCl + O_2$
16. $NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$
17. $HNO_3 + H_2S \rightarrow NO_2 + H_2O + S$
18. $P + HNO_3 \rightarrow NO_2 + H_2O + H_3PO_4$
19. $Zn + HNO_3 \rightarrow Zn(NO_3)_2 + H_2O + NO_2$

Solution:
Balanced chemical equations:

1. $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$
2. $3Ca + N_2 \rightarrow Ca_3N_2$
3. $Zn + 2KOH \rightarrow K_2ZnO_2 + H_2$
4. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
5. $3PbO + 2NH_3 \rightarrow 3Pb + 3H_2O + N_2$

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

6. $2Pb_3O_4 \rightarrow 6PbO + O_2$
7. $2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$
8. $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$
9. $S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$
10. $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$
11. $C + 2H_2SO_4 \rightarrow CO_2 + H_2O + SO_2$
12. $2KOH + Cl_2 \rightarrow KCl + KClO + H_2O$
13. $2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$
14. $Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + 4H_2O + Cl_2$
15. $2H_2O + 2Cl_2 \rightarrow 4HCl + O_2$
16. $2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$
17. $2HNO_3 + H_2S \rightarrow 2NO_2 + 2H_2O + S$
18. $P + 5HNO_3 \rightarrow 5NO_2 + H_2O + H_3PO_4$
19. $Zn + 4HNO_3 \rightarrow Zn(NO_3)_2 + 2H_2O + 2NO_2$

Page No: 17

Question 1.
Fill in the blanks:

1. Dalton used symbol _____ for oxygen _____ for hydrogen.
2. Symbol represents _____ atom(s) of an element.
3. Symbolic expression for a molecule is called _____. .
4. Sodium chloride has two radicals. Sodium is a _____ radical while chloride is _____ radical.
5. Valency of carbon in CH_4 is _____ , in C_2H_6_____, in C_2H_4 ___ and in C_2H_2 is ____.
6. Valency of Iron in $FeCl_2$ is _____ and in $FeCl_3$ it is ____ .
7. Formula of iron (ill) carbonate is _____ .

Solution:

1. Dalton used symbol [O] for oxygen,[H] for hydrogen.
2. Symbol represents gram atom(s) of an element.
3. Symbolic expression for a molecule is called molecular formula.
4. Sodium chloride has two radicals. Sodium is a basic radical, while chloride is an acid radical.
5. Valency of carbon in CH_4 is 4, in $C_2H_6$4, in $C_2H_4$4 and in C_2H_2 is 4.
6. Valency of iron in $FeCl_2$ is 2 and in $FeCl_3$ it is 3.
7. Formula of iron (III) carbonate is $Fe_2[CO_3]_3$.

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 2.
Complete the following table.

Acid Radicals / Basic Radicals	Chloride	Nitrate	Sulphate	Carbonate	Hydroxide	Phosphate
Magnesium	$MgCl_2$	$Mg(NO_3)_2$	$MgSO_4$	$MgCO_3$	$Mg(OH)_2$	$Mg_3(PO_4)_2$
Sodium						
Zinc						
Silver						
Ammonium						
Calcium						
Iron (II)						
Potassium						

Solution:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Acid Radicals → Basic Radicals ↓	Chloride	Nitrate	Sulphate	Carbonate	Hydroxide	Phosphate
Magnesium	$MgCl_2$	$Mg(NO_3)_2$	$MgSO_4$	$MgCO_3$	$Mg(OH)_2$	$Mg_3(PO_4)_2$
Sodium	NaCl	$NaNO_3$	Na_2SO_4	Na_2CO_3	NaOH	Na_3PO_4
Zinc	$ZnCl_2$	$Zn(NO_3)_2$	$ZnSO_4$	$ZnCO_3$	$Zn[OH]_2$	$Zn_3[PO_4)_2$
Silver	AgCl	$AgNO_3$	Ag_2SO_4	Ag_2CO_3	AgOH	Ag_3PO_4
Ammonium	NH_4Cl	NH_4NO_3	$[NH_4]_2SO_4$	$[NH_4]_2SO_4$	NH4OH	$[NH_4]_3PO_4$
Calcium	$CaCl_2$	$Ca(NO_3)_2$	$CaSO_4$	$CaCO_3$	$Ca[OH]_2$	$Ca_3[PO_4]_2$
Iron (II)	$FeCl_2$	$Fe(NO_3)_2$	$FeSO_4$	$FeCO_3$	$Fe[OH]_2$	$Fe_3[PO_4]_2$
Potassium	KCl	KNO_3	K_2SO_4	K_2CO_3	KOH	K_3PO_4

Question 3.
Sodium chloride reacts with silver nitrate to produce silver chloride and sodium nitrate

1. Write the equation.
2. Check whether it is balanced, if not balance it.
3. Find the weights of reactants and products.
4. State the law which this equation satisfies.

Solution:
(a) $NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl\downarrow$
(b) It is a balanced equation.
(c) Weights of reactants:NaCl – 58.44, $AgNO_3$ – 169.87
Weights of products: $NaNO_3$ – 84.99, AgCl – 143.32
$NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$
(23+35.5) + (108+14+48) → (23+14+48) + (108+35.5)
58.5 + 170 → 85 + 143.5
228.5 g → 228.5 g

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

(d) Law of conservation of mass: Matter is neither created nor destroyed in the course of a chemical reaction.

Question 4(a).
What information does the following chemical equation convey? $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
Solution:
(a) This equation conveys the following information:

1. The actual result of a chemical change.
2. Substances take part in a reaction, and substances are formed as a result of the reaction.
3. Here, one molecule of zinc and one molecule of sulphuric acid react to give one molecule of zinc sulphate and one molecule of hydrogen.
4. Composition of respective molecules, i.e. one molecule of sulphuric acid contains two atoms of hydrogen, one atom of sulphur and four atoms of oxygen.
5. Relative molecular masses of different substances, i.e. molecular mass of
   Zn = 65
   H_2SO_4 = (2+32+64) = 98
   $ZnSO_4$ = (65+32+64) = 161
   H_2 = 2
6. 22.4 litres of hydrogen are formed at STP.

Question 4(b).
What information do the following chemical equations convey? $Mg + 2HCl \rightarrow MgCl_2 + H_2$
Solution:
(b) This equation conveys the following information:

1. Magnesium reacts with hydrochloric acid to form magnesium chloride and hydrogen gas.
2. 24 g of magnesium reacts with 2(1 + 35.5) = 73 g of hydrochloric acid to produce (24 + 71), i.e. 95 g of magnesium chloride.
3. Hydrogen produced at STP is 22.4 litres.

Question 5(a).
What are polyatomic ions? Give two examples.
Solution:
(a) A poly-atomic ion is a charged ion composed of two or more atoms covalently bounded that can be carbonate (CO_3^{2-}) and sulphate (SO_4^{2-})
Question 5(b).
Name the fundamental law that is involved in every equation.

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Solution:
(b) The fundamental laws which are involved in every equation are:

1. A chemical equation consists of formulae of reactants connected by plus sign (+) and arrow (→) followed by the formulae of products connected by plus sign (+).
2. The sign of an arrow (→) is to read 'to form'. It also shows the direction in which reaction is predominant.

Question 6(a).
What is the valency of : fluorine in CaF_2
Solution:
(a) Valency of fluorine in CaF_2 is -1.
Question 6(b).
What is the valency of :
sulphur in SF_6
Solution:
(b) Valency of sulphur in SF_6 is -6.
Question 6(c).

What is the valency of :

phosphorus in PH_3
Solution:
(c) Valency of phosphorus in PH_3 is +3.

Question 6(d).
What is the valency of : carbon in CH_4
Solution:
(d) Valency of carbon in CH_4 is +4.
Question 6(e).
What is the valency of :
nitrogen in the following compounds:
(i) N_2O_3 (ii) N_2O_5 (iii) NO_2 (iv) NO
Solution:
(e) Valency of nitrogen in the given compounds:

1. N_2O_3 = N is +3
2. N_2O_5 = N is +5
3. NO_2 = N is +4
4. NO = N is +2

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 7.
Why should an equation be balanced? Explain with the help of a simple equation.
Solution:
According to law of conservation of mass, "matter can neither be created nor be destroyed in a chemical reaction". This is possible only, if total number of atoms on the reactants side is equals to total number of atoms on products side. Thus, a chemical reaction should be always balanced.
Let us consider an example,
$Fe + H_2O \rightarrow Fe_3O_4 + H_2$
In this equation number of atoms on both sides is not the same, the equation is not balanced.
The balanced form of this equation is given by,
$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$
Question 8(a).
Write the balanced chemical equations of the following reactions. sodium hydroxide + sulphuric acid → sodium sulphate + water
Solution:
$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$
Question 8(b).
Write the balanced chemical equations of the following reactions. potassium bicarbonate + sulphuric acid → potassium sulphate + carbon dioxide + water
Solution:
$2KHCO_3 + H_2SO_4 \rightarrow K_2SO_4 + 2CO_2 + 2H_2O$

Question 8(c).
Write the balanced chemical equations of the following reactions. iron + sulphuric acid → ferrous sulphate + hydrogen.
Solution:
$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$

Question 8(d).
Write the balanced chemical equations of the following reactions.
chlorine + sulphur dioxide + water → sulphuric acid + hydrogen chloride
Solution:
$Cl_2 + SO_2 + 2H_2O \rightarrow H_2SO_4 + 2HCl$

Question 8(e).
Write the balanced chemical equations of the following reactions. silver nitrate → silver + nitrogen dioxide + oxygen"
Solution:
$2AgNO_3 \rightarrow 2Ag + 2NO_2 + O_2$

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 8(f).
Write the balanced chemical equations of the following reactions.
copper + nitric acid → copper nitrate + nitric oxide + water
Solution:
$3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$

Question 8(g).
Write the balanced chemical equations of the following reactions.
ammonia + oxygen → nitric oxide + water
Solution:
$4NH_3 + 5O_2 \xrightarrow{Pt,800} 6H_2O + 4NO \uparrow + Heat$

Question 8(h).
Write the balanced chemical equations of the following reactions.
barium chloride + sulphuric acid → barium sulphate + hydrochloric acid
Solution:
$BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

Question 8(i).
Write the balanced chemical equations of the following reactions.
zinc sulphide + oxygen → zinc oxide + sulphur dioxide
Solution:
$2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$

Question 8(j).
Write the balanced chemical equations of the following reactions.
aluminium carbide + water → aluminium hydroxide + methane
Solution:
$Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

Question 8(k).
Write the balanced chemical equations of the following reactions.
iron pyrites(FeS_2) + oxygen → ferric oxide + sulphur dioxide
Solution:
$4FeS_2 + 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$

Question 8(l).
Write the balanced chemical equations of the following reactions.
potassium permanganate + hydrochloric acid → potassium chloride + manganese

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

chloride + chlorine + water

Solution:

$2KMnO_4 + HCl \rightarrow 2KCl + 2MnCl_2 + 5Cl_2 + 8H_2O$

Question 8(m).

Write the balanced chemical equations of the following reactions.

aluminium sulphate + sodium hydroxide → sodium sulphate + sodium meta aluminate + water.

Solution:

$Al_2(SO_4)_3 + 8NaOH \rightarrow 3Na_2SO_4 + 2NaAlO_2 + 4H_2O$

Question 8(n).

Write the balanced chemical equations of the following reactions.

aluminium + sodium hydroxide + water → sodium meta aluminate + hydrogen

Solution:

$2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2$

Question 8(o).

Write the balanced chemical equations of the following reactions.

potassium dichromate + sulphuric acid →
potassium sulphate + chromium sulphate + water + oxygen.

Solution:

$2K_2Cr_2O_7 + 8H_2SO_4 \rightarrow 2K_2SO_4 + 2Cr_2(SO_4)_3 + 8H_2O + 3O_2$

Question 8(p).

Write the balanced chemical equations of the following reactions.

potassium dichromate + hydrochloric acid → Potassium chloride + chromium chloride + water + chlorine

Solution:

$K_2Cr_2O_7 + 14HCl \rightarrow 2KCl + 2CrCl_3 + 7H_2O + 3Cl_2$

Question 8(q).

Write the balanced chemical equations of the following reactions.

sulphur + nitric acid → sulphuric acid + nitrogen dioxide + water.

Solution:

$S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$

Question 8(r).

Write the balanced chemical equations of the following reactions.

sodium chloride + manganese dioxide + sulphuric acid → sodium

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

hydrogen sulphate + manganese sulphate + water + chlorine.

Solution:

$2NaCl + MnO_2 + 3H_2SO_4 \rightarrow 2NaHSO_4 + MnSO_4 + 2H_2O + Cl_2$

Question 9(a).

Define atomic mass unit.

Solution:

Atomic mass unit (amu) is equal to one-twelfth the mass of an atom of carbon-12 (atomic mass of carbon taken as 12).

Question 9(b)(ii)

Calculate the molecular mass of the following:

$(NH_4)_2CO_3$

Given atomic mass of Cu = 63·5, H = 1, O= 16, C = 12, N = 14, Mg = 24, S = 32

Solution:

Molecular mass of $(NH_4)_2CO_3$

= (2 × 14) + (8 × 1) + 12 + (3 × 16)

= 28 + 8 + 12 + 48

= 96

Question 9(b)(iii)

Calculate the molecular mass of the following:

$(NH_2)_2CO$

Given atomic mass of Cu = 63·5, H = 1, O= 16, C = 12, N = 14, Mg = 24, S = 32

Solution:

Molecular mass of $(NH_2)_2CO$

= (14 × 2) + (4 × 1) + 12 + 16

= 28 + 4 + 12 + 16

= 60

Question 9(b)(iv)

Calculate the molecular mass of the following:

Mg_3N_2

Given atomic mass of Cu = 63·5, H = 1, O = 16, C = 12, N = 14, Mg = 24, S = 32

Solution:

Molecular mass of Mg_3N_2

= (3 × 24) + (2 × 14)

= 72 + 28

= 100

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 10(a).
Choose the correct answer from the options given below.
Modern atomic symbols are based on the method proposed by
i. Bohr
ii. Dalton
iii. Berzelius
iv. Alchemist
Solution:
iii. Berzelius

Question 10(b).
Choose the correct answer from the options given below.
The number of carbon atoms in a hydrogen carbonate radical is
i. One
ii. Two
iii. Three
iv. Four
Solution:
One

Question 10(c).
Choose the correct answer from the options given below.
The formula of iron (III) sulphate is
i. Fe_3SO_4
ii. $Fe(SO_4)_3$
iii. $Fe_2(SO_4)_3$
iv. $FeSO_4$
Solution:
iii. $Fe_2(SO_4)_3$

Question 10(d).
Choose the correct answer from the options given below.
In water, the hydrogen-to-oxygen mass ratio is
i. 1: 8
ii. 1: 16
iii. 1: 32
iv. 1: 64
Solution:
i. 1:8

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 10(e).
Choose the correct answer from the options given below.
The formula of sodium carbonate is Na_2CO_3 and that of calcium hydrogen carbonate is
i. $CaHCO_3$
ii. $Ca(HCO_3)_2$
iii. Ca_2HCO_3
iv. $Ca(HCO_3)_3$
Solution:
i. $Ca(HCO_3)_2$

Solution 11.
(a) A molecular formula represent The Molecule of an element or of a Compound.
(b) The molecular formula of water (H_2O) represents 18 parts by mass of water.
(c) A balanced equation obeys the law of conservation of mass wherever unbalanced equation does not obey this law.
(d) CO and Co represent carbon-monoxide and cobalt respectively.

Solution 12.

1. Relative molecular mass of CHCl3
   = 12 + 1 + (3 × 35.5)
   = 12 + 1 + 106.5
   = 119.5
2. Relative molecular mass of (NH4)2 Cr2O7
   = (14 × 2) + (1× 8) + (52 × 2) + (16 × 7)
   = 28 + 8 + 104 + 112
   = 252
3. Relative molecular mass of CuSO4· 5H2O
   = 63.5 + 32 + (16 × 4) + 5(2 + 16)
   = 159.5 + 90
   = 249.5
4. Relative molecular mass of (NH4)2SO4
   = (2 × 14) + (8 × 1) + 32 + (4 × 16)
   = 28 + 8 + 32 + 64
   = 132
5. Relative molecular mass of CH3COONa
   = (12 × 2) + (1× 3) + (16 × 2) + 23
   = 24 + 3 + 32 + 23
   = 82
6. Potassium chlorate (KClO3)
   = 39.1+ 35.5 + (16 × 3)

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

= 39.1+ 35.5 + 48
= 122.6

7. Ammonium chloroplatinate (NH4)2PtCl6
= (14 × 2) + (1 × 8) + 195.08 + (35.5 × 6)
= 28 + 8 + 195.08 + 213
= 444.08

Solution 13.

Compound	Empirical formula
(a) Benzene (C_6H_6)	CH
CompoundEmpirical formula (b) Glucose ($C_6H_{12}O_6$)	CH_2O
CompoundEmpirical formula (c) Acetylene (C_2H_2)	CH
CompoundEmpirical formula (d) Acetic acid (CH_3COOH)	CH_2O

Solution 14.

Relative molecular mass of $MgSO_4 \cdot 7H_2O$
=24 + 32 + (16 × 4) + 7(2 + 16)
=24 + 32 + 64 + 126
=246
26 g of Epsom salt contains 126 g of water of crystallisation.
Hence, 100 g of Epsom salt contains

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

$$\frac{100 \times 126}{246} = 51.2$$

The % of H_2O in $MgSO_4 \cdot 7H_2O$ = 51.2

Solution 15.

(a) Relative molecular mass of $Ca(H_2PO_4)_2$

= 40.07 + (1 × 4) + (30.9 × 2) + (16 × 8)
= 40.07 + 4 + 61.8 + 128
= 233.87
233.87 g $Ca(H_2PO_4)_2$ contains 61.8 g P
So, 100 g $Ca(H_2PO_4)_2$ contains

$$\frac{100 \times 61.8}{233.87} = 26.42\,g$$

The % of P in $Ca(H_2PO_4)_2$ is 26.42%.

(b) Relative molecular mass of $Ca_3(PO_4)_2$

= (40.07 × 3) + (30.9 × 2) + (16 × 8)
= 120.21 + 61.8 + 128
= 310.01
310.01 g $Ca_3(PO_4)_2$ contains 61.8 g P
So, 100 g $Ca(H_2PO_4)_2$ contains
(IMAGE)
The % of P in $Ca(H_2PO_4)_2$ is 19.93%.

Solution 16.

Relative molecular mass of $KClO_3$
= 39.09 + 35.5 + (3 × 16)
= 122.59 g

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

122.59 g $KClO_3$ contains 39.09 g K
Hence, 100 g $KClO_3$ contains

$$= \frac{100 \times 39.09}{122.59} = 31.9\,g$$

122.59 g $KClO_3$ contains 35.5 g Cl
Hence, 100 g $KClO_3$ contains

$$= \frac{100 \times 35.5}{122.59} = 28.9\,g$$

122.59 g $KClO_3$ contains 48 g O
Hence, 100 g $KClO_3$ contains

$$= \frac{100 \times 48}{122.59} = 39.1\,g$$

The percentages of K, Cl and O in $KClO_3$ are 31.9%, 28.9% and 39.1%, respectively.

Solution 17.

Relative molecular mass of urea is

Element	No. of atoms	Atomic mass	Total
N	2	14	28
C	1	12	12
H	4	1	4

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

O	1	16	16

[12 + 16 + 28 + 4] = 60
Hence, relative molecular mass of urea = 60

$$\text{Percentage of carbon} = \frac{\text{Wt of carbon}}{\text{Total wt of urea}} \times 100 = \frac{12}{60} \times 100$$
$$= 20 \text{ or } 20\%$$

Selina ICSE Solutions for Class 9 Chemistry Chapter 4 The Language of Chemistry

Page No: 8

Question 1.
What is a symbol? What information does it convey?
Solution:
A symbol is the short form which stands for the atom of a specific element or the abbreviations used for the names of elements.

1. It represents a specific element.
2. It represents one atom of an element.
3. A symbol represents how many atoms are present in its one gram (gm) atom.
4. It represents the number of times an atom is heavier than one atomic mass unit (amu) taken as a standard.

Question 2
Why is the symbol S for sulphur, but Na for sodium and Si for silicon?
Solution:
In most cases, the first letter of the name of the element is taken as the symbol for that element and written in capitals (e.g. for sulphur, we use the symbol S). In cases where the first letter has already been adopted, we use a symbol derived from the Latin name (e.g. for sodium/Natrium, we use the symbol Na). In some cases, we use the initial letter in capital together with a small letter from its name (e.g. for silicon, we use the symbol Si).

Question 3.
Write the full form of IUPAC. Name the elements represented by the following symbols:
Au, Pb, Sn, Hg
Solution:
The full form of IUPAC is International Union of Pure and Applied Chemistry.
Names of the elements:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Au – Gold
Pb – Lead
Sn – Tin
Hg – Mercury

Question 4.
If the symbol for Cobalt, Co, were written as CO, what would be wrong with it?
Solution:
Co stands for Cobalt. If we write CO, then it would mean that it is a compound containing two non-metal ions, i.e. carbon and oxygen, which forms carbon monoxide gas.

Question 5(d).
$2H_2$
Solution:
(a) H stands for one atom of hydrogen.
(b) H_2 stands for one molecule of hydrogen.
(c) 2H stands for two atoms of hydrogen.

Question 6.
What is meant by atomicity? Name the diatomic element.
Solution:
The number of atoms of an element that join together to form a molecule of that element is known as its atomicity. Diatomic molecules: H_2, O_2, N_2, Cl_2

Question 7(a).
Explain the terms 'valency' and 'variable valency'.
Solution:

1. Valency of Na is +1 because it can lose one electron.
2. Valency of O is -2 because it can accept two electrons.

Variable valency: It is the combining capacity of an element in which the metal loses more electrons from a shell next to a valence shell in addition to electrons of the valence shell.

Question 7(b).
How are the elements with variable valency named? Explain with an example.
Solution:
If an element exhibits two different positive valencies, then

1. for the lower valency, use the suffix -OUS at the end of the name of the metal
2. for the higher valency, use the suffix -IC at the end of the name of the metal.

Example:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Element	Lower valency	Higher valency
Ferrum (Iron)	Ferrous (Fe^{2+})	Ferric (Fe^{3+})

Question 8.
Give the formula and valency of:

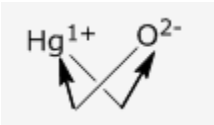
1. aluminate …… .
2. chromate …….. .
3. aluminium ……. .
4. cupric …… .

Solution:

	Name	**Formula**	**Valency**
a.	Aluminate	AlO_2	-2
b.	Chromate	CrO_4	-2
c.	Aluminium	Al	+3
d.	Cupric	Cu	+2

Question 9.b
What is the significance of formula?
Solution:
Chemical formula: The chemical formula of a substance (element or compound) is a symbolic representation of the actual number of atoms present in one molecule of that substance.
It also indicates the fixed proportion by weight in which atoms combine.

Rules:
(i) The positive and negative radicals are written side by side (+ve first) with their charge as a superscript on the right side.
(ii) Charges are then interchanged and written as a subscript.
(iii) The final formula is written without the sign of charge, e.g. Hg_2O

1. $Hg^{1+}O^{2-}$
2. 

3. Hg_2O

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 10(a).
What do you understand by the following terms?
Acid radical
Solution:
Acid radical: The electronegative or negatively charged radical is called an acid radical.
Examples: Cl^-, O^{2-}

Question 10(b).
What do you understand by the following terms? Basic radical
Solution:
Basic radical: The electropositive or positively charged radical is called a basic radical.
Examples: K^+, Na^+

Question 11.

Match the following:

Compound	**Formula**
(a) Boric acid	i. NaOH
(b) Phosphoric acid	ii. SiO_2
(c) Nitrous acid	iii. Na_2CO_3
(d) Nitric acid	iv. KOH
(e) Sulphurous acid	v. $CaCO_3$
(f) Sulphuric acid	vi. $NaHCO_3$
(g) Hydrochloric acid	vii. H_2S
(h) Silica (sand)	viii. H_2O
(i) Caustic soda (sodium hydroxide)	ix. PH_3
(j) Caustic potash (potassium hydroxide)	x. CH_4
(k) Washing soda(sodium carbonate)	xi. NH_3
(l) Baking soda(sodium bicarbonate)	xii. HCl
(m) Lime stone.(calcium carbonate)	xiii. H_2SO_3
(n) Water	xiv. HNO_3

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

(o) Hydrogen sulphide	xv. HNO_2
(p) Ammonia	xvi. H_3BO_3
(q) Phosphine	xvii. H_3PO_4
(r) Methane	xviii. H_2SO_4

Solution:

Compound	**Formula (Ans)**
(a) Boric acid	xvi. H_3BO_3
(b) Phosphoric acid	xvii. H_3PO_4
(c) Nitrous acid	xv. HNO_2
(d) Nitric acid	xiv. HNO_3
(e) Sulphurous acid	xiii. H_2SO_3
(f) Sulphuric acid	xviii. H_2SO_4
(g) (a) Hydrochloric acid	xii. HCl
(h) Silica (sand)	ii. SiO_2
(i) Caustic soda (sodium hydroxide)	i. NaOH
(j) Caustic potash (potassium hydroxide)	iv. KOH
(k) Washing soda (sodium carbonate)	iii. Na_2CO_3
(l) Baking soda (sodium bicarbonate)	vi. $NaHCO_3$
(m) Lime stone (calcium carbonate)	v. $CaCO_3$
(n) Water	viii. H_2O
(o) Hydrogen sulphide	vii. H_2S
(p) Ammonia	xi. NH_3

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

(q) Phosphine	ix. PH_3
(r) Methane	x. CH_4

Question 12.
Select the basic and acidic radicals in the following compounds.

1. $MgSO_4$
2. $(NH_4)_2SO_4$
3. $Al_2(SO_4)_3$
4. $ZnCO_3$
5. $Mg(OH)_2$

Solution:

	Acidic radical	**Basic radical**
$MgSO_4$	SO_4^-	Mg^+
$(NH_4)_2SO_4$	SO_4^-	NH_4^+
$Al_2(SO_4)_3$	SO_4^-	Al^{3+}
$ZnCO_3$	CO_3^-	Zn^{2+}
$Mg(OH)_2$	OH^-	Mg^{2+}

Question 13.
Write chemical formula of the sulphate of Aluminium, Ammonium and Zinc.
Solution:
Valencies of aluminium, ammonium and zinc are 3, 1 and 2, respectively.
The valency of sulphate is 2.
Hence, chemical formulae of the sulphates of aluminium, ammonium and zinc are $Al_2(SO_4)_3$, $(NH_4)_2SO_4$ and $ZnSO_4$.

Question 14.
The valency of an element A is 3 and that of element B is 2. Write the formula of the compound formed by the combination of A and B
Solution:
Formula of the compound = A_2B_3

Question 15.
Write the chemical names of the following compounds:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

1. $Ca_3(PO_4)_2$
2. K_2CO_3
3. K_2MnO_4
4. $Mn_3(BO_3)_2$
5. $Mg(HCO_3)_2$
6. $Na_4Fe(CN)_6$
7. $Ba(ClO_3)_2$
8. Ag_2SO_3
9. $(CH_3COO)_2Pb$
10. Na_2SiO_3

Solution:

Chemical names of compounds:

1. $Ca_3(PO_4)_2$ – Calcium phosphate
2. K_2CO_3 – Potassium carbonate
3. K_2MnO_4 – Potassium manganate
4. $Mn_3(BO_3)_2$ – Manganese (II) borate
5. $Mg(HCO_3)_2$ – Magnesium hydrogen carbonate
6. $Na_4Fe(CN)_6$ – Sodium ferrocyanide
7. $Ba(ClO_3)_2$ – Barium chlorate
8. Ag_2SO_3 – Silver sulphite
9. $(CH_3COO)_2Pb$ – Lead acetate
10. Na_2SiO_3 – Sodium silicate

Question 16

Write the basic radicals and acidic radicals of the following and then write the chemical formulae of these compounds.

1. Barium sulphate
2. Bismuth nitrate
3. Calcium bromide

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

4. Ferrous sulphide
5. Chromium sulphate
6. Calcium silicate
7. Potassium ferrocyanide
8. Stannic oxide
9. Magnesium phosphate
10. Sodium zincate
11. Stannic phosphate
12. Sodium thiosulphate
13. Potassium manganate
14. Nickel bisulphate

Solution:

Compounds	**Acidic radical**	**Basic radical**	**Chemical formulae**
Barium sulphate	SO_4^{2-}	Ba^{2+}	$BaSO_4$
Bismuth nitrate	NO_3^-	Bi^{3+}	$Bi(NO_3)_3$
Calcium bromide	Br^-	Ca^{2+}	$CaBr_2$
Ferrous sulphide	S^{2-}	Fe^{2+}	FeS
Chromium sulphate	SO_4^{2-}	Cr^{3+}	$Cr_2(SO_4)_3$
Calcium silicate	SiO_4^{2-}	Ca^{2+}	Ca_2SiO_4
Potassium ferrocyanide	$[Fe(CN)_6]^{4-}$	K^{1+}	$K_4[Fe(CN)_6]$
Stannic oxide	O^{2-}	Sn^{2+}	SnO_2
Magnesium phosphate	$(PO_4)^{3-}$	Mg^{2+}	$Mg_3(PO_4)_2$
Sodium zincate	ZnO^{2-}	Na^{1+}	Na_2ZnO_2
Stannic phosphate	$(PO_4)^{3-}$	Sn^{4+}	$Sn_3(PO_4)_4$
Sodium thiosulphate	$(S_2O_3)^{2-}$	Na^{1+}	$Na_2S_2O_3$

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Potassium manganate	MnO_4^{2-}	K^{1+}	K_2MnO_4
Nickel bisulphate	HSO_4^{1-}	Ni^{3+}	$Ni(HSO_4)_3$

Question 16.
Give the names of the following compounds.

1. NaClO
2. $NaClO_2$
3. $NaClO_3$
4. $NaClO_4$

Solution:

1. NaClO – Sodium hypochlorite
2. $NaClO_2$ – Sodium chlorite
3. $NaClO_3$ – Sodium chlorate
4. $NaClO_4$ – Sodium perchlorate

Question 18(a).
Complete the following statements by selecting the correct option :
The formula of a compound represents
i. an atom
ii. a particle
iii. a molecule
iv. a combination
Solution:
iii. The formula of a compound represents a molecule.

Question 18(b).
Complete the following statements by selecting the correct option :
The correct formula of aluminium oxide is
i. AlO_3
ii. AlO_2
iii. Al_2O_3
Solution:
iii. The correct formula of aluminium oxide is Al_2O_3.

Question 18(c).
Complete the following statements by selecting the correct option :
The valency of nitrogen in nitrogen dioxide (NO_2) is
i. one

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

ii. two
iii. three
iv. four
Solution:
iv. The valency of nitrogen in nitrogen dioxide (NO_2) is four.

Page No: 13

Question 1.
Balance the following equations:

1. $Fe + H_2O \rightarrow Fe_3O_4 + H_2$
2. $Ca + N_2 \rightarrow Ca_3N_2$
3. $Zn + KOH \rightarrow K_2ZnO_2 + H_2$
4. $Fe_2O_3 + CO \rightarrow Fe + CO_2$
5. $PbO + NH_3 \rightarrow Pb + H_2O + N_2$
6. $Pb_3O_4 \rightarrow PbO + O_2$
7. $PbS + O_2 \rightarrow PbO + SO_2$
8. $S + H_2SO_4 \rightarrow SO_2 + H_2O$
9. $S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$
10. $MnO_2 + HCl \rightarrow MnCl_2 + H_2O + Cl_2$
11. $C + H_2SO_4 \rightarrow CO_2 + H_2O + SO_2$
12. $KOH + Cl_2 \rightarrow KCl + KClO + H_2O$
13. $NO_2 + H_2O \rightarrow HNO_2 + HNO_3$
14. $Pb_3O_4 + HCl \rightarrow PbCl_2 + H_2O + Cl_2$
15. $H_2O + Cl_2 \rightarrow HCl + O_2$
16. $NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$
17. $HNO_3 + H_2S \rightarrow NO_2 + H_2O + S$
18. $P + HNO_3 \rightarrow NO_2 + H_2O + H_3PO_4$
19. $Zn + HNO_3 \rightarrow Zn(NO_3)_2 + H_2O + NO_2$

Solution:
Balanced chemical equations:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

1. $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$
2. $3Ca + N_2 \rightarrow Ca_3N_2$
3. $Zn + 2KOH \rightarrow K_2ZnO_2 + H_2$
4. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
5. $3PbO + 2NH_3 \rightarrow 3Pb + 3H_2O + N_2$
6. $2Pb_3O_4 \rightarrow 6PbO + O_2$
7. $2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$
8. $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$
9. $S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$
10. $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$
11. $C + 2H_2SO_4 \rightarrow CO_2 + H_2O + SO_2$
12. $2KOH + Cl_2 \rightarrow KCl + KClO + H_2O$
13. $2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$
14. $Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + 4H_2O + Cl_2$
15. $2H_2O + 2Cl_2 \rightarrow 4HCl + O_2$
16. $2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$
17. $2HNO_3 + H_2S \rightarrow 2NO_2 + 2H_2O + S$
18. $P + 5HNO_3 \rightarrow 5NO_2 + H_2O + H_3PO_4$
19. $Zn + 4HNO_3 \rightarrow Zn(NO_3)_2 + 2H_2O + 2NO_2$

Page No: 17

Question 1.
Fill in the blanks:

1. Dalton used symbol _____ for oxygen _____ for hydrogen.
2. Symbol represents _____ atom(s) of an element.
3. Symbolic expression for a molecule is called _____. .
4. Sodium chloride has two radicals. Sodium is a _____ radical while chloride is _____ radical.
5. Valency of carbon in CH_4 is _____ , in C_2H_6 _____, in C_2H_4 ___ and in C_2H_2 is ____.

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

6. Valency of Iron in $FeCl_2$ is _____ and in $FeCl_3$ it is ____ .
7. Formula of iron (ill) carbonate is _____ .

Solution:

1. Dalton used symbol [O] for oxygen,[H] for hydrogen.
2. Symbol represents gram atom(s) of an element.
3. Symbolic expression for a molecule is called molecular formula.
4. Sodium chloride has two radicals. Sodium is a basic radical, while chloride is an acid radical.
5. Valency of carbon in CH_4 is 4, in $C_2H_6$4, in $C_2H_4$4 and in C_2H_2 is 4.
6. Valency of iron in $FeCl_2$ is 2 and in $FeCl_3$ it is 3.
7. Formula of iron (III) carbonate is $Fe_2[CO_3]_3$.

Question 2.
Complete the following table.

Acid Radicals Basic Radicals	Chloride	Nitrate	Sulphate	Carbonate	Hydroxide	Phosphate
Magnesium	$MgCl_2$	$Mg(NO_3)_2$	$MgSO_4$	$MgCO_3$	$Mg(OH)_2$	$Mg_3(PO_4)_2$
Sodium						
Zinc						
Silver						
Ammonium						
Calcium						
Iron (II)						
Potassium						

Solution:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Acid Radicals → Basic Radicals ↓	Chloride	Nitrate	Sulphate	Carbonate	Hydroxide	Phosphate
Magnesium	$MgCl_2$	$Mg(NO_3)_2$	$MgSO_4$	$MgCO_3$	$Mg(OH)_2$	$Mg_3(PO_4)_2$
Sodium	NaCl	$NaNO_3$	Na_2SO_4	Na_2CO_3	NaOH	Na_3PO_4
Zinc	$ZnCl_2$	$Zn(NO_3)_2$	$ZnSO_4$	$ZnCO_3$	$Zn[OH]_2$	$Zn_3[PO_4)_2$
Silver	AgCl	$AgNO_3$	Ag_2SO_4	Ag_2CO_3	AgOH	Ag_3PO_4
Ammonium	NH_4Cl	NH_4NO_3	$[NH_4]_2SO_4$	$[NH_4]_2SO_4$	NH4OH	$[NH_4]_3PO_4$
Calcium	$CaCl_2$	$Ca(NO_3)_2$	$CaSO_4$	$CaCO_3$	$Ca[OH]_2$	$Ca_3[PO_4]_2$
Iron (II)	$FeCl_2$	$Fe(NO_3)_2$	$FeSO_4$	$FeCO_3$	$Fe[OH]_2$	$Fe_3[PO_4]_2$
Potassium	KCl	KNO_3	K_2SO_4	K_2CO_3	KOH	K_3PO_4

Question 3.
Sodium chloride reacts with silver nitrate to produce silver chloride and sodium nitrate

1. Write the equation.
2. Check whether it is balanced, if not balance it.
3. Find the weights of reactants and products.
4. State the law which this equation satisfies.

Solution:
(a) $NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl\downarrow$
(b) It is a balanced equation.
(c) Weights of reactants:NaCl – 58.44, $AgNO_3$ – 169.87
Weights of products: $NaNO_3$ – 84.99, AgCl – 143.32
$NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$
(23+35.5) + (108+14+48) → (23+14+48) + (108+35.5)
58.5 + 170 → 85 + 143.5
228.5 g → 228.5 g

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

(d) Law of conservation of mass: Matter is neither created nor destroyed in the course of a chemical reaction.

Question 4(a).
What information does the following chemical equation convey? $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
Solution:
(a) This equation conveys the following information:

1. The actual result of a chemical change.
2. Substances take part in a reaction, and substances are formed as a result of the reaction.
3. Here, one molecule of zinc and one molecule of sulphuric acid react to give one molecule of zinc sulphate and one molecule of hydrogen.
4. Composition of respective molecules, i.e. one molecule of sulphuric acid contains two atoms of hydrogen, one atom of sulphur and four atoms of oxygen.
5. Relative molecular masses of different substances, i.e. molecular mass of
   Zn = 65
   H_2SO_4 = (2+32+64) = 98
   $ZnSO_4$ = (65+32+64) = 161
   H_2 = 2
6. 22.4 litres of hydrogen are formed at STP.

Question 4(b).
What information do the following chemical equations convey? $Mg + 2HCl \rightarrow MgCl_2 + H_2$
Solution:
(b) This equation conveys the following information:

1. Magnesium reacts with hydrochloric acid to form magnesium chloride and hydrogen gas.
2. 24 g of magnesium reacts with 2(1 + 35.5) = 73 g of hydrochloric acid to produce (24 + 71), i.e. 95 g of magnesium chloride.
3. Hydrogen produced at STP is 22.4 litres.

Question 5(a).
What are polyatomic ions? Give two examples.
Solution:
(a) A poly-atomic ion is a charged ion composed of two or more atoms covalently bounded that can be carbonate (CO_3^{2-}) and sulphate (SO_4^{2-})

Question 5(b).
Name the fundamental law that is involved in every equation.
Solution:
(b) The fundamental laws which are involved in every equation are:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

1. A chemical equation consists of formulae of reactants connected by plus sign (+) and arrow (→) followed by the formulae of products connected by plus sign (+).
2. The sign of an arrow (→) is to read 'to form'. It also shows the direction in which reaction is predominant.

Question 6(a).
What is the valency of : fluorine in CaF_2
Solution:
(a) Valency of fluorine in CaF_2 is -1.

Question 6(b).
What is the valency of :
sulphur in SF_6
Solution:

(b) Valency of sulphur in SF_6 is -6.

Question 6(c).

What is the valency of :

phosphorus in PH_3
Solution:
(c) Valency of phosphorus in PH_3 is +3.

Question 6(d).
What is the valency of : carbon in CH_4

Solution:

(d) Valency of carbon in CH_4 is +4.

Question 6(e).
What is the valency of :
nitrogen in the following compounds:
(i) N_2O_3 (ii) N_2O_5 (iii) NO_2 (iv) NO
Solution:
(e) Valency of nitrogen in the given compounds:

1. N_2O_3 = N is +3
2. N_2O_5 = N is +5
3. NO_2 = N is +4
4. NO = N is +2

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Question 7.
Why should an equation be balanced? Explain with the help of a simple equation.
Solution:
According to law of conservation of mass, "matter can neither be created nor be destroyed in a chemical reaction". This is possible only, if total number of atoms on the reactants side is equals to total number of atoms on products side. Thus, a chemical reaction should be always balanced.
Let us consider an example,
$Fe + H_2O \rightarrow Fe_3O_4 + H_2$
In this equation number of atoms on both sides is not the same, the equation is not balanced.
The balanced form of this equation is given by,
$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

Question 8(a).
Write the balanced chemical equations of the following reactions. sodium hydroxide + sulphuric acid → sodium sulphate + water
Solution:
$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

Question 8(b).
Write the balanced chemical equations of the following reactions. potassium bicarbonate + sulphuric acid → potassium sulphate + carbon dioxide + water
Solution:
$2KHCO_3 + H_2SO_4 \rightarrow K_2SO_4 + 2CO_2 + 2H_2O$

Question 8(c).
Write the balanced chemical equations of the following reactions. iron + sulphuric acid → ferrous sulphate + hydrogen.
Solution:
$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$

Question 8(d).
Write the balanced chemical equations of the following reactions. chlorine + sulphur dioxide + water → sulphuric acid + hydrogen chloride
Solution:
$Cl_2 + SO_2 + 2H_2O \rightarrow H_2SO_4 + 2HCl$

Question 8(e).
Write the balanced chemical equations of the following reactions. silver nitrate → silver + nitrogen dioxide + oxygen"
Solution:
$2AgNO_3 \rightarrow 2Ag + 2NO_2 + O_2$

Question 8(f).
Write the balanced chemical equations of the following reactions.

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

copper + nitric acid → copper nitrate + nitric oxide + water
Solution:
$3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$

Question 8(g).
Write the balanced chemical equations of the following reactions.
ammonia + oxygen → nitric oxide + water
Solution:
$4NH_3 + 5O_2 \xrightarrow{Pt.800} 6H_2O + 4NO \uparrow + Heat$

Question 8(h).
Write the balanced chemical equations of the following reactions.
barium chloride + sulphuric acid → barium sulphate + hydrochloric acid
Solution:
$BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

Question 8(i).
Write the balanced chemical equations of the following reactions.
zinc sulphide + oxygen → zinc oxide + sulphur dioxide
Solution:
$2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$

Question 8(j).
Write the balanced chemical equations of the following reactions.
aluminium carbide + water → aluminium hydroxide + methane
Solution:
$Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

Question 8(k).
Write the balanced chemical equations of the following reactions.
iron pyrites(FeS_2) + oxygen → ferric oxide + sulphur dioxide
Solution:
$4FeS_2 + 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$

Question 8(l).
Write the balanced chemical equations of the following reactions.
potassium permanganate + hydrochloric acid → potassium chloride + manganese chloride + chlorine + water
Solution:
$2KMnO_4 + HCl \rightarrow 2KCl + 2MnCl_2 + 5Cl_2 + 8H_2O$

Question 8(m).
Write the balanced chemical equations of the following reactions.
aluminium sulphate + sodium hydroxide → sodium sulphate + sodium meta aluminate + water.

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Solution:
$Al_2(SO_4)_3 + 8NaOH \rightarrow 3Na_2SO_4 + 2NaAlO_2 + 4H_2O$

Question 8(n).
Write the balanced chemical equations of the following reactions.
aluminium + sodium hydroxide + water → sodium meta aluminate + hydrogen
Solution:
$2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 + 3H_2$

Question 8(o).
Write the balanced chemical equations of the following reactions.
potassium dichromate + sulphuric acid → potassium sulphate + chromium sulphate + water + oxygen.
Solution:
$2K_2Cr_2O_7 + 8H_2SO_4 \rightarrow 2K_2SO_4 + 2Cr_2(SO_4)_3 + 8H_2O + 3O_2$

Question 8(p).
Write the balanced chemical equations of the following reactions.
potassium dichromate + hydrochloric acid → Potassium chloride + chromium chloride + water + chlorine
Solution:
$K_2Cr_2O_7 + 14HCl \rightarrow 2KCl + 2CrCl_3 + 7H_2O + 3Cl_2$

Question 8(q).
Write the balanced chemical equations of the following reactions.
sulphur + nitric acid → sulphuric acid + nitrogen dioxide + water.
Solution:
$S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$

Question 8(r).
Write the balanced chemical equations of the following reactions.
sodium chloride + manganese dioxide + sulphuric acid → sodium hydrogen sulphate + manganese sulphate + water + chlorine.
Solution:
$2NaCl + MnO_2 + 3H_2SO_4 \rightarrow 2NaHSO_4 + MnSO_4 + 2H_2O + Cl_2$

Question 9(a).
Define atomic mass unit.
Solution:
Atomic mass unit (amu) is equal to one-twelfth the mass of an atom of carbon-12 (atomic mass of carbon taken as 12).

Question 9(b)(ii)
Calculate the molecular mass of the following:
$(NH_4)_2CO_3$
Given atomic mass of Cu = 63·5, H = 1, O= 16, C = 12, N = 14, Mg = 24, S = 32
Solution:

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Molecular mass of $(NH_4)_2CO_3$
= (2 × 14) + (8 × 1) + 12 + (3 × 16)
= 28 + 8 + 12 + 48
= 96

Question 9(b)(iii)
Calculate the molecular mass of the following:
$(NH_2)_2CO$
Given atomic mass of Cu = 63·5, H = 1, O= 16, C = 12, N = 14, Mg = 24, S = 32
Solution:
Molecular mass of $(NH_2)_2CO$
= (14 × 2) + (4 × 1) + 12 + 16
= 28 + 4 + 12 + 16
= 60

Question 9(b)(iv)
Calculate the molecular mass of the following:
Mg_3N_2
Given atomic mass of Cu = 63·5, H = 1, O = 16, C = 12, N = 14, Mg = 24, S = 32
Solution:
Molecular mass of Mg_3N_2
= (3 × 24) + (2 × 14)
= 72 + 28
= 100

Question 10(a).
Choose the correct answer from the options given below.
Modern atomic symbols are based on the method proposed by
i. Bohr
ii. Dalton
iii. Berzelius
iv. Alchemist
Solution:
iii. Berzelius

Question 10(b).
Choose the correct answer from the options given below.
The number of carbon atoms in a hydrogen carbonate radical is
i. One
ii. Two
iii. Three
iv. Four

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

Solution:
One

Question 10(c).
Choose the correct answer from the options given below.
The formula of iron (III) sulphate is
i. Fe_3SO_4
ii. $Fe(SO_4)_3$
iii. $Fe_2(SO_4)_3$
iv. $FeSO_4$
Solution:
iii. $Fe_2(SO_4)_3$

Question 10(d).
Choose the correct answer from the options given below.
In water, the hydrogen-to-oxygen mass ratio is
i. 1: 8
ii. 1: 16
iii. 1: 32
iv. 1: 64
Solution:
i. 1:8

Question 10(e).
Choose the correct answer from the options given below.
The formula of sodium carbonate is Na_2CO_3 and that of calcium hydrogen carbonate is
i. $CaHCO_3$
ii. $Ca(HCO_3)_2$
iii. Ca_2HCO_3
iv. $Ca(HCO_3)_3$
Solution:
i. $Ca(HCO_3)_2$

Solution 11.
(a) A molecular formula represent The Molecule of an element or of a Compound.
(b) The molecular formula of water (H_2O) represents 18 parts by mass of water.
(c) A balanced equation obeys the law of conservation of mass wherever unbalanced equation does not obey this law.
(d) CO and Co represent carbon-monoxide and cobalt respectively.

Solution 12.

1. Relative molecular mass of CHCl3
   = 12 + 1 + (3 × 35.5)

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

= 12 + 1 + 106.5
= 119.5

2. Relative molecular mass of (NH4)2 Cr2O7
= (14 × 2) + (1× 8) + (52 × 2) + (16 × 7)
= 28 + 8 + 104 + 112
= 252

3. Relative molecular mass of CuSO4· 5H2O
= 63.5 + 32 + (16 × 4) + 5(2 + 16)
= 159.5 + 90
= 249.5

4. Relative molecular mass of (NH4)2SO4
= (2 × 14) + (8 × 1) + 32 + (4 × 16)
= 28 + 8 + 32 + 64
= 132

5. Relative molecular mass of CH3COONa
= (12 × 2) + (1× 3) + (16 × 2) + 23
= 24 + 3 + 32 + 23
= 82

6. Potassium chlorate (KClO3)
= 39.1+ 35.5 + (16 × 3)
= 39.1+ 35.5 + 48
= 122.6

7. Ammonium chloroplatinate (NH4)2PtCl6
= (14 × 2) + (1 × 8) + 195.08 + (35.5 × 6)
= 28 + 8 + 195.08 + 213
= 444.08

Solution 13.

Compound	**Empirical formula**
(a) Benzene (C_6H_6)	CH
CompoundEmpirical formula (b) Glucose ($C_6H_{12}O_6$)	CH_2O
CompoundEmpirical formula (c) Acetylene (C_2H_2)	CH

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

CompoundEmpirical formula	
(d) Acetic acid (CH_3COOH)	CH_2O

Solution 14.
Relative molecular mass of $MgSO_4 \cdot 7H_2O$
$=24 + 32 + (16 \times 4) + 7(2 + 16)$
$=24 + 32 + 64 + 126$
$=246$
26 g of Epsom salt contains 126 g of water of crystallisation.
Hence, 100 g of Epsom salt contains

$$\frac{100 \times 126}{246} = 51.2$$

The % of H_2O in $MgSO_4 \cdot 7H_2O = 51.2$

Solution 15.
(a) Relative molecular mass of $Ca(H_2PO_4)_2$
$= 40.07 + (1 \times 4) + (30.9 \times 2) + (16 \times 8)$
$= 40.07 + 4 + 61.8 + 128$
$= 233.87$
233.87 g $Ca(H_2PO_4)_2$ contains 61.8 g P
So, 100 g $Ca(H_2PO_4)_2$ contains

$$\frac{100 \times 61.8}{233.87} = 26.42\,g$$

The % of P in $Ca(H_2PO_4)_2$ is 26.42%.
(b) Relative molecular mass of $Ca_3(PO_4)_2$
$= (40.07 \times 3) + (30.9 \times 2) + (16 \times 8)$
$= 120.21 + 61.8 + 128$
$= 310.01$
310.01 g $Ca_3(PO_4)_2$ contains 61.8 g P
So, 100 g $Ca(H_2PO_4)_2$ contains
(IMAGE)
The % of P in $Ca(H_2PO_4)_2$ is 19.93%.

Solution 16.
Relative molecular mass of $KClO_3$
$= 39.09 + 35.5 + (3 \times 16)$
$= 122.59$ g

Shop No. 5, "Umang" Vasant Utsav C H S Ltd., Thakur Village, Kandivali E, Mumbai – 400 101 Phone : 8828132765, 9833035468
Email : favouriteacademy@gmail.com

122.59 g $KClO_3$ contains 39.09 g K
Hence, 100 g $KClO_3$ contains

$$= \frac{100 \times 39.09}{122.59} = 31.9\,g$$

122.59 g $KClO_3$ contains 35.5 g Cl
Hence, 100 g $KClO_3$ contains

$$= \frac{100 \times 35.5}{122.59} = 28.9\,g$$

122.59 g $KClO_3$ contains 48 g O
Hence, 100 g $KClO_3$ contains

$$= \frac{100 \times 48}{122.59} = 39.1\,g$$

The percentages of K, Cl and O in $KClO_3$ are 31.9%, 28.9% and 39.1%, respectively.

Solution 17.
Relative molecular mass of urea is

Element	**No. of atoms**	**Atomic mass**	**Total**
N	2	14	28
C	1	12	12
H	4	1	4
O	1	16	16

[12 + 16 + 28 + 4] = 60
Hence, relative molecular mass of urea = 60

$$\text{Percentage of carbon} = \frac{\text{Wt of carbon}}{\text{Total wt of urea}} \times 100 = \frac{12}{60} \times 100$$
$$= 20 \text{ or } 20\%$$