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Class 9 Science Chapter 4 Measurement of Matter Textbook Questions and Answers

1. Give examples.

a. Positive radicals
Answer:
Na^+– Sodium ion, K^+ – Potassium ion

b. Basic radicals
Answer:
Na^+ – Sodium ion, K^+ – Potassium ion, Ag^+ – Silver ion

c. Composite radicals
Answer:
SO_4^{2-}, NH_4^+
d. Metals with variable valency
Answer:
(a) Iron (Ferrum)
(i) Fe^{2+} – Ferrous [Iron – II]
(ii) Fe^{3+} – Ferric [Iron – III]

(b) Copper (Cuprum)
(i) Cu^+ – Cuprous [Copper -1]
(ii) Cu^{2+} – Cupric [Copper – II]

(c) Mercury (Hydragyrum)
(i) Hg^+ – Mercurous [Mercury -1]
(ii) Hg^{2+} – Mercuric [Mercury – II]

e. Bivalent acidic radicals
Answer:
O^{2-} – Oxide, S^{2-} – Sulphide, CO_3^{2-} – Carbonate
f. Trivalent basic radicals
Answer:
Al^{3+} – Aluminium, Cr^{3+} – Chromium, Fe^{3+} – Ferric.

2. Write symbols of the following elements and the radicals obtained from them, and indicate the charge on the radicals.

Mercury, potassium, nitrogen, copper, sulphur, carbon, chlorine, oxygen
Answer:

Elements	Symbols	Radicals	Charge of Radicals
Mercury	Hg	Hg^+ (Mercurous) Hg^{2+} (Mercuric)	+1 +2
Potassium	K	K^+ (Potassium)	+1
Nitrogen	N	N^{3-} (Nitride)	-3
Copper	Cu	Cu^+ (Cuprous) Cu^{2+} (Cupric)	+1 +2
Sulphur	S	S^{2-} (Sulphide)	-2
Carbon	C	–	-
Chlorine	Cl	Cl^- (Chloride)	-1
Oxygen	O	O^{2-} (Oxide)	-2

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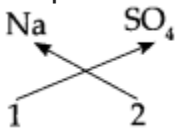
3. Write the steps in deducing the chemical formulae of the following compounds.
Sodium sulphate, potassium nitrate, ferric phosphate, calcium oxide, aluminium hydroxide
Answer:
In order to write the chemical formulae of compounds, it is necessary to know the symbols and valency of various radicals.

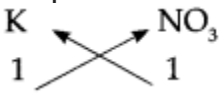
1. Sodium Sulphate:
Step – 1 : To write the symbols of the radicals (Basic radicals on the left and acidic radicals on the right)
$NaSO_4$
Step – 2 : To write the valency below the respective radical.

Na	SO_4
1	2

Step – 3: To cross-multiply as shown by arrows the number of radicals.



Step – 4 : To write down the chemical formula of the compound.
Na_2SO_4
(Sodium sulphate)
2. Potassium Nitrate:
Step -1 : To write the symbols of the radicals (Basic radicals on the left and acidic radicals on the right)
$K\ NO_3$
Step – 2 : To write the valency below the respective radical.
$K1NO_31$
Step – 3: To cross-multiply as shown by arrows the number of radicals.



Step – 4 : To write down the chemical formula of the compound.
KNO_3
(Potassium nitrate)
3. Ferric phosphate:
Step -1 : To write the symbols of the radicals (Basic radicals on the left and acidic radicals on the right)
$Fe\ PO_4$
Step – 2 : To write the valency below the respective radical.

Fe	PO_4	
~~3~~	~~3~~	Dividing by
1	1	common factor

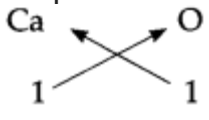
Step – 3: To cross-multiply as shown by arrows the number of radicals.

Step – 4 : To write down the chemical formula of the compound.
$FePO_4$
(Ferric phosphate)

4. Calcium oxide:
Step – 1 : To write the symbols of the radicals (Basic radical on the left and acidic radicals on the right)
Ca O
Step – 2 : To write the valency below the respective radical.

Ca	O	
~~2~~	~~2~~	Dividing by common factor
1	1	

Step – 3: To cross-multiply as shown by arrows the number of radicals.



Step – 4 : To write down the chemical formula of the compound.
CaO
(Calcium oxide)

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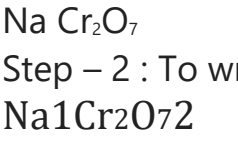
5. Aluminium hydroxide:
Step – 1 : To write the symbols of the radical (Basic radical on the left and acidic radical on the right)
Al OH
Step – 2 : To write the valency below the respective radical.

Al	OH
3	1

Step – 3: To cross-multiply as shown by arrows the number of radicals.

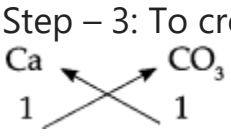


Step – 4 : To write down the chemical formula of the compound.
$Al(OH)_3$
(Aluminium hydroxide)

6. Calcium carbonate:
Step – 1 : To write the symbols of the radical (Basic radical on the left and acidic radicals on the right)
Ca CO_3
Step – 2 : To write the valency below the respective radical.

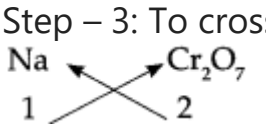
Ca	CO_3	
2	2	..... Dividing by
1	1	common factor

Step – 3: To cross-multiply as shown by arrows the number of radicals.



Step – 4 : To write down the chemical formula of the compound.
$CaCO_3$
(Calcium Carbonate)

7. Sodium dichromate:
Step – 1 : To write the symbols of the radicals (Basic radical on the left and acidic radical on the right)
Na Cr_2O_7
Step – 2 : To write the valency below the respective radical.
$Na1Cr_2O_72$
Step – 3: To cross-multiply as shown by arrows the number of radicals.



Step – 4 : To write down the chemical formula of the compound.
$Na2Cr_2O_7$
(Sodium dichromate)

4. Write answers to the following questions and explain your answers.

a. Explain how the element sodium is monovalent.

Answer:

1. The number of protons or electrons (atomic number) in Sodium (Na) atom is 11. Therefore the electronic configuration of sodium atom is (2, 8,1).
2. In chemical reaction, sodium atom has the capacity to give away le_ from its outermost orbit to form Na+ ion with stable electronic configuration (2, 8).
3. As sodium atom gives away le- and a cation of sodium is formed, hence the valency of sodium is 1 and therefore, the element sodium is monovalent.

b. M is a bivalent metal. Write down the steps to find the chemical formulae of its compounds formed with the radicals, sulphate and phosphate.
Answer:
M is a bivalent metal. Following are the steps to find the chemical formulae of its compounds formed with the radicals, sulphate and phosphate:

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(i) Compound of metal 'M' with radical sulphate

Step – 1: To write the symbols of the radicals (Basic radicals on the left and acidic radicals on the right)

M SO_4

Step – 2: To write the valency below the respective radical.

M	SO_4	[Dividing valency
~~2~~	~~2~~	by common factor]
1	1	

Step – 3: To cross multiply as shown by arrows the number of radicals.

Step – 4: To write down the chemical formula of the compound.

M SO_4

(ii) Compound of metal 'M' with radical phosphate.

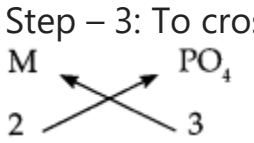
Step – 1: To write the symbols of the radicals (Basic radicals on the left and acidic radicals on the right)

M PO_4

Step – 2: To write the valency below the respective radical.

M	PO_4
2	3

Step – 3: To cross multiply as shown by arrows the number of radicals.



Step – 4: To write down the chemical formula of the compound.

$M_3 (PO_4)_2$

c. Explain the need for a reference atom for atomic mass. Give some information about two reference atoms.

Answer:

- The mass of an atom is concentrated in its nucleus and it is due to the protons (p) and neutrons (n) in it.
- Since an atom is very very tiny, it was not possible to measure atomic mass accurately. Therefore, the concept of relative mass of an atom was formed.
- To express relative mass of an atom, reference of atom is considered. The two reference atoms were as follows:

(a) Hydrogen (H) atom: The hydrogen atom is the lightest. The relative mass of a hydrogen atom is 1 which has only 1 proton in its nucleus. On this scale, the relative atomic mass of many elements comes out to be fractional. Therefore, carbon was selected as a reference atom.

(b) Carbon (C) atom: The carbon atom is selected as reference atom. In this scale, the relative mass of a carbon atom is accepted as 12.

- The relative atomic mass of 1 hydrogen (H) atom compared to the carbon (C) atom becomes

d. What is meant by Unified Atomic Mass.

Answer:

- During earlier time, relative mass of an atom was considered for measuring the mass of an atom directly. But since the founding of unified mass, relative mass is not accepted henceforth.
- Unified atomic mass is the unit of atomic mass called as Dalton.
- Its symbol is 'u'. lu = 1.66053904 x 10^{-27} kg.

e. Explain with examples what is meant by a 'mole' of a substance.

Answer:

- A mole is that quantity of a substance whose mass in grams is equal in magnitude to the molecular mass of that substance in Daltons.
- For example: Atomic mass of oxygen atom (O) is 16u. Thus, the molecular mass of oxygen molecule (O_2) is 16 x 2 = 32u. Therefore, 32 g of oxygen is 1 mole of oxygen.

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5. Write the names of the following compounds and deduce their molecular masses.
Na_2SO_4, K_2CO_3, CO_2, $MgCl_2$, NaOH, $AlPO_4$, $NaHCO_3$
Answer:

Name of compound	Molecule	Constituent elements	Atomic mass (u)	Number of atoms in molecule	Atomic mass × number of atoms	Mass of the constituents u
Sodium sulphate	Na_2SO_4	Sodium	23	2	23 × 2	46
		Sulphur	32	1	32 × 1	32
		Oxygen	16	4	16 × 4	64
Molecular mass = Sum of constituent atomic masses Molecular mass of (Na_2SO_4) = (Atomic mass of Na) × 2 + (Atomic mass of S) × 1 + (Atomic mass of O) × 4						Molecular Mass 142

6. Two samples 'm' and 'n' of slaked lime were obtained from two different reactions. The details about their composition are as follows:
'sample m' mass : 7g
Mass of constituent oxygen : 2g
Mass of constituent calcium : 5g
'sample n' mass : 1.4g
Mass of constituent oxygen : 0.4g
Mass of constituent calcium : 1.0g

Which law of chemical combination does this prove? Explain.
Answer:
(i) The expected proportion by weight of the constituent elements of quick lime that is calcium oxide would be from its known molecular formula CaO. The atomic mass of Ca and O are 40 and 16 respectively. This means, the proportion by weight of the constituent elements Ca and O in the compound CaO is 40 :16 which is 5 : 2.

(ii) Now, for the given sample'm' of CaO = 5 g
mass of given sample = 7 g
mass of constituent Ca in sample'm' = 5 g
mass of constituent O in sample'm' = 2 g

(iii) This means that 7 g of calcium oxide contairis 5 g of calcium (Ca) and 2 g of oxygen (O); apd the proportion by weight of calcium and oxygen in it is 5 : 2.

(iv) Now, for the given sample 'n' of CaO mass of given sample CaO = 1.4 g
Mass of constituent Ca in sample 'n' = 1.0 g
Mass of constituent O in sample 'n' = 0.4 g
This means that 1.4g of calcium oxide contains 1.0 g of calcium (Ca) and 0.4 g of oxygen (O); and the proportion by weight of calcium and oxygen in it is 5 : 2.

(v) Above samples'm' and 'n' of calcium oxide (CaO) shows that the proportion by weight of the constituent elements in different samples of a compound is always constant that is the proportion by weight of calcium (Ca) and oxygen (O) in different samples of calcium oxide (CaO) is constant.

(vi) The experimental value of proportion by weight of the constituent elements matched with the expected proportion calculated by molecular mass. This proves and verifies the law of constant proportion.

The law states that 'The proportion by weight of the constituent elements in the various samples of a compound is fixed'.

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7. Deduce the number of molecules of the following compounds in the given quantities.
32g oxygen, 90g water, 8.8g carbon dioxide, 7.1g chlorine.

Class 9 Science Chapter 4 Measurement Of Matter Notes Question 1.
32g oxygen
Answer:
Given : Mass of oxygen (O_2) m = 32g
To find : Number of molecules in 32g of oxygen.
Solution : Atomic mass of oxygen (O) = 16
∴ Molecular mass of oxygen (O_2) M = 16 x 2 = 32
According to the formula, Number of moles in the given O_2 (n)

$$= \frac{\text{Mass of } O_2 \text{ in grams (m)}}{\text{Molecular mass of } O_2 \text{ (M)}}$$

$$= \frac{32}{32} = 1$$

$$\therefore \quad n = 1 \text{ mol}$$

1 mol of O_2 contains 6.022 x 10^{23} molecules that is 32 g of 02 contains 6.022 * 10^{23} molecules of O_2.
32g of oxygen contains 6.022 x 10^{23} molecules of oxygen.

Class 9 Science Chapter 4 Measurement Of Matter Answers Question 2.
90g water
Answer:
Given : Mass of water (H_2O) m = 90g.
To find : Number of molecules in 90g of water.
Solution : Molecular mass of (H_2O) M = (Atomic mass of H) x 2 + (Atomic mass of O) x 1
∴ Molecular mass of (H_2O) M = 1 x 2 +16
∴ Molecular mass of (H_2O) M = 18
According to the formula,
Number of moles in the given H_2O (n)

$$= \frac{\text{Mass of } H_2O \text{ in grams (m)}}{\text{Molecular mass of } H_2O \text{ (M)}}$$

$$= \frac{90}{18} = 5$$

$$\therefore \quad n = 5 \text{ mol}$$

1 mol of H_2O contains 6.022 x 10^{23} molecules.
5 mol of H_2O contains 5 x 6.022 x 10^{23} molecules. = 30.11 x 10^{23} molecules, that is 90g of H_2O contains 30.11 x 10^{23} molecules of H20.
90g of water contains 30.11 x 10^{23} molecules of water.

4 Measurement Of Matter Exercise Question 3.
8.8g carbon dioxide
Answer:
Given : Mass of Carbon dioxide (CO_2)m = 8.8g.
To find : Number of molecules in 8.8g of carbon dioxide.
Solution : Molecular mass of (CO_2)M = (Atomic mass of C) x 1 + (Atomic mass of O) x 2
∴ Molecular mass of (CO_2)M = 12 x 1 + 16 x 2 = 12 + 32
Molecular mass of (CO_2)M = 44
According to the formula, Number of moles in the given CO_2 (n)

$$= \frac{\text{Mass of } CO_2 \text{ in grams (m)}}{\text{Molecular mass of } CO_2 \text{ (M)}}$$

$$= \frac{8.8}{44} = 0.2$$

$$\therefore \quad n = 0.2 \text{ mol}$$

∴ 1 mol of CO_2 contains 6.022 x 10^{23} molecules.
∴ 0.2 mol of CO_2 contains 0.2 x 6.022 x 10^{23} molecules.
= 1.2044 x 10^{23} molecules,

that is 8.8g of CO_2 contains 1.2044 x 10^{23} molecules of CO_2.
8.8g of CO_2 contains 1.2044 x 10^{23} molecules of CO_2.

Class 9 Science Solutions Maharashtra Board Question 4.
7.1g chlorine
Answer:
Given : Mass of Chlorine (Cl_2)m = 7.1g.
To find : Number of molecules in 7.1g of chlorine.
Solution : Atomic mass of (Cl) = 35.5
∴ Molecular mass of chlorine (Cl_2)M = 35.5 x 2 = 71
According to the formula, Number of moles in the given Cl_2 (n)

$$= \frac{\text{Mass of } Cl_2 \text{ in grams (m)}}{\text{Molecular mass of } Cl_2 \text{ (M)}}$$

$$= \frac{7.1}{71}$$

$$= 0.1$$

$$\therefore \quad n = 0.1 \text{ mol}$$

∴ 1 mol of Cl_2 contains 6.022 x 10^{23} molecules.
∴ 0.1 mol of Cl_2 contains 0.1 x 6.022 x 10^{23} molecules.
= 0.6022 x 10^{23} molecules,
that is 7.1g of Cl_2 contains 0.6022 x 10^{23} molecules of Cl_2.
7.1g of Cl_2 contains 0.6022 x 10^{23} molecules of chlorine.

8. If 0.2 mol of the following substances are required how many grams of those substances should be taken? Sodium chloride, magnesium oxide, calcium carbonate
Answer:
Given : Number of moles of sodium chloride (NaCl) n = 0.2 mol
To find : Mass in grams of 0.2 mol of NaCl
Solution:
Molecular mass of (NaCl)M = (Atomic mass of Na) x 1 + (Atomic mass of Cl) x 1
= 23 x 1 + 35.5 x 1
= 23 + 35.5
Molecular mass of (NaCl)M = 58.5
According to the formula,
Number of moles in the given NaCl (n)

$$= \frac{\text{Mass of NaCl in grams (m)}}{\text{Molecular mass of NaCl (M)}}$$

$$\therefore \quad 0.2 = \frac{\text{Mass of NaCl in grams (m)}}{58.5}$$

Mass of NaCl in grams (m) = 0.2 x 58.5
Mass of NaCl in grams (m) = 11.7 g
Mass of 0.2 mole of NaCl is 11.7g

Class 9 Science Chapter 3 Current Electricity Intext Questions and Answers

Maharashtra State Board Class 9 Science Solutions Question 1.
What is the type of chemical bond in NaCl and $MgCl_2$?
Answer:

- The type of chemical bond in NaCl and $MgCl_2$ is ionic bond.

9th Class Science Chapter 4 Measurement Of Matter Question 2.
Determine the valencies of H, Cl, O and Na from the molecular formulae H_2, HC1, H_2O and NaCl.
Answer:
(i) In the molecular formula HCl

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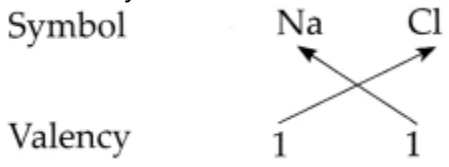
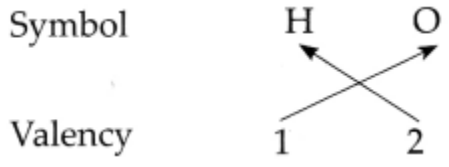


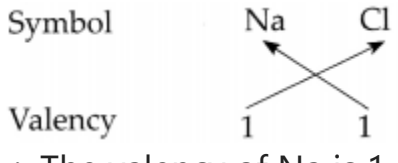
∴ The valency of H is 1 and Cl is 1.

(ii) In the molecular formula H_2O



∴ The valency of H is 1 and O is 2.

(iii) In the molecular formula NaCl



∴ The valency of Na is 1 and Cl is 1.
∴ From all the above, the valencies of the given elements are as follows : H = 1, Cl = 1, O = 2 and Na = l.

Measurement Of Matter Class 9 Exercise Answers Question 3.
How is an element indicated in Chemistry?
Answer:
In chemistry an element is indicated by its symbol.

Question 4.
Write down the symbols of the elements you know.
Answer:
Symbols of some elements are

- Hydrogen – H
- Helium – He
- Boron – B
- Carbon – C
- Aluminium – A1

Question 5.
Write down the symbols for the following elements.
Antimony, Iron, Gold, Silver, Mercury, Lead, Sodium
Answer:
The symbols of given elements are as follows:

- Antimony – Sb
- Iron – Fe
- Gold – Au
- Silver – Ag
- Mercury – Hg
- Lead – Pb
- Sodium – Na

Following are atomic masses of a few elements in Daltons and the molecular formulae of some compounds. Deduce the molecular masses of those compounds:

Atomic masses – H(l), 0(16), N(14), C(12), K(39), S(32) Ca(40), Na(23), Cl(35.5), Mg(24), Al(27)

Question 1.
Molecular formula – NaCl
Answer:
Molecular mass of NaCl (M)
= (Atomic mass of Na) x 1 + (Atomic mass of Cl) x 1

= (23 x 1) + (35.5 x 1)
= 23 + 35.5
= 58.5
∴ Molecular mass of NaCl (M) = 58.5

Question 2.
Molecular formula – $MgCl_2$
Answer:
Molecular mass of $MgCl_2$ (M)
= (Atomic mass of Mg) x 1 + (Atomic mass of Cl) x 2
= (24 x 1) + (35.5 x 2)
= 24 + 71
= 95
∴ Molecular mass of $MgCl_2$ (M) = 95?

Question 3.
Molecular formula – KNO_3
Answer:
Molecular mass of KNO_3 (M)
= (Atomic mass of K) x 1 + (Atomic mass of N) x 1 + (Atomic mass of O) x 3
= (39 x 1) + (14 x 1) + (16 x 3)
= 39 + 14 + 48
= 101
Molecular mass of KNO_3 (M) = 101

Question 4.
Molecular formula – H_2O_2
Answer:
Molecular mass of H_2O_2 (M)
= (Atomic mass of H) x 2 + (Atomic mass of O) x 2
= (1 x 2) + (16 x 2)
= 2 + 32
= 34
∴ Molecular mass of H_2O_2 (M) = 34.

Question 5.
Molecular formula – $A1C1_3$
Answer:
Molecular mass of $A1C1_3$ (M)
= (Atomic mass of Al) x 1 + (Atomic mass of Cl) x 3
= (27 x 1) + (35.5 x 3)
= 27 + 106.5
= 133.5
∴ Molecular mass of $A1C1_3$ (M) = 133.5

Question 6.
Molecular formula – $Ca(OH)_2$
Answer:
Molecular mass of $Ca(OH)_2$ (M)
= (Atomic mass of Ca) x 1 + (Atomic mass of O + Atomic Mass of H) x 2
= (40 x 1) + (16 + 1) x 2
= 40 + (17 x 2)
= 40 + 34
= 74
∴ Molecular mass of $Ca(OH)_2$ (M)
= 74

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Question 7.
Molecular formula – MgO
Answer:
Molecular mass of MgO (M)
= (Atomic mass of Mg) x 1 + (Atomic mass of 0)xl
= (24 x 1) + (16 x 1)
= 24 + 16
= 40
Molecular mass of MgO (M) = 40

Question 8.
Molecular formula – H2S04
Answer:
Molecular mass of H2S04 (M)
= (Atomic mass of H) x 2 + (Atomic mass of S) x 1 + (Atomic mass of O) x 4
= (1 x 2) + (32xl) + (16×4)
= 2 + 32 + 64
= 98
Molecular mass of H2S04 (M) = 98

Question 9.
Molecular formula – HN03
Answer:
Molecular mass of HN03 (M)
= (Atomic mass of H) x 1 + (Atomic mass of N) x 1 + (Atomic mass of O) x 3
= (lxl)+ (14xl)+ (16×3)
= 1 + 14 + 48
= 63
Molecular mass of HNOs (M) = 63

Question 10.
Molecular formula – NaOH
Answer:
Molecular mass of NaOH (M)
= (Atomic mass of Na) x 1 + (Atomic mass of O) x 1 + (Atomic mass of H) x 1
= (23 x 1) + (16 x 1) + (l x l)
= 23 + 16 + 1
= 40
Molecular mass of NaOH (M) = 40

Question 11.
How many molecules of water are there in 36 g water?
Answer:
Given : Mass of water (H_2O) m = 36g
To find : Number of molecules in 36g of water
Solution :
Molecular mass of (H_2O) M = (Atomic mass of H) x 2 + (Atomic mass of O) x 1 Molecular mass of (H_2O) M = (1 x 2) + 16 x 1
Molecular mass of (H_2O) M = 18
According to the formula,
Number of moles in the given H_2O (n)

$$= \frac{\text{Mass of } H_2O \text{ in grams (m)}}{\text{Molecular mass of } H_2O \text{ (M)}}$$

$$= \frac{36}{18} = 2$$

$$\therefore \quad n = 2 \text{ mol}$$

1 mol of H_2O contains 6.022×10^{23} molecules.

∴ 2 mol of H_2O contains 2 x 6.022 x 10^{23} molecules.
= 12.044 x 10^{23} molecules, that is 36g of H_2O contains 12.044 x 10^{23} molecules of H_2O.
36 g of water contains 12.044 x 10^{23} molecules of water.

Question 12.
How many molecules of H2S04 are there in a 49 g sample?
Answer:
Given : Mass of Sulphuric acid (H_2SO_4) m = 49g
To find : Number of molecules in 49g of H_2SO_4
Solution:
Molecular mass of (H_2SO_4) M = (Atomic mass of H) x 2 + (Atomic mass of S) x 1 + (Atomic mass of O) x 4
Molecular mass of (H_2SO_4)M = (1 x 2) + (32 x 1) + (16 x 4)
= 2 + 32 + 64
= 98.
According to the formula,
Number of moles in the given H_2SO_4 (n)

$$= \frac{\text{Mass of } H_2SO_4 \text{ in grams (m)}}{\text{Molecular mass of } H_2SO_4 \text{ (M)}}$$

$$= \frac{49}{98} = \frac{1}{2} = 0.5$$

$$\therefore \quad n = 0.5 \text{ mol}$$

∴ 1 mol of H_2SO_4 contains 6.022 x 10^{23} molecules.
∴ 0.5 mol of H_2SO_4 contains 0.5 x 6.022 x 10^{23} molecules.
= 3.011 x 10^{23} molecules,
that is 49g of H_2SO_4 contains 3.011 x 10^{23} molecules of H_2SO_4.
49 g of Sulphuric acid contains 3.011 x 10^{23} molecules of H_2SO_4.

Question 13.
Fill the following tables.
Answer:

Element	Atomic Mass
Oxygen	16
Sodium	23
Aluminium	27
Phosphorus	31
Argon	39.9
Potassium	39

Question 14.
Complete the following chart.

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Answer:

Element	Atomic number	Electronic Configuration	Valence Electrons	Valency
Lithium	3	**2, 1**	1	1
Beryllium	**4**	2, 2	2	**2**
Boron	**5**	**2, 3**	3	3
Carbon	6	**2, 4**	**4**	4
Nitrogen	**7**	2, 5	5	**3**
Oxygen	8	**2, 6**	**6**	2
Fluorine	**9**	2, 7	**7**	1
Neon	**10**	2, 8	8	0
Sodium	11	**2, 8, 1**	**1**	**1**
Magnesium	**12**	2, 8, 2	**2**	2
Aluminium	**13**	**2, 8, 3**	3	3
Silicon	**14**	2, 8, 4	**4**	4

Question 15.
The relative atomic masses of some elements in the chart below are given. You have to find the relative atomic masses of the others.
Answer:

Element	Atomic mass	Element	Atomic mass	Element	Atomic mass
Hydrogen	1	Oxygen	**16**	Phosphorus	**31**
Helium	4	Fluorine	19	Sulphur	32
Lithium	7	Neon	20	Chlorine	**35.5**
Beryllium	9	Sodium	**23**	Argon	**39.9**
Boron	11	Magnesium	24	Potassium	39
Carbon	12	Aluminium	**27**	Calcium	40
Nitrogen	14	Silicon	28		

Question 16.
Classify the following radicals into simple radicals and composite radicals: (Use your brain power;
$Ag^{+}, Mg^{2+}, Cl^{-}, SO_4^{2-}, Fe^{2+}, ClO_3^{-}, NH_4^{+}, Br^{-} NO_3^{-}, Na^{+}, Cu^{+}$
Answer:

Simple radicals	Composite radicals
Ag^{+}	SO_4^{2-}
Mg^{2+}	ClO_3^{-}
Cl	NH_4^{+}
Fe^{2+}	NO_3^{-}
Br^{-}	
Na^{+}	
Cu^{+}	

Question 17.
Which are the basic radicals and which are the acidic radicals among the following?

$Ag^{+}, Cu^{2+}, Cl^{+}, I, SO^{2-}_{4}, Fe^{3+}, Ca^{2+}, NO_3; S_2, NH^{+}_{4} K^{+}, MnO_4, Na^{+}$

Answer:

Basic Radical	Acidic Radical
(i)Ag^{+}	(i) Cl^{-}
(ii) Cu^{2+}	(ii) I^{-}
(iii) Fe^{3+}	(iii) SO^{2-}_{4}
(iv) Ca^{2+}	(iv) NO^{-}_{3}
Wnh;	(v) S^{2-}
(vi) K^{+}	(vi) MnO^{-}_{4}
(vii) Na^{+}	

Give examples:

Question 1.
Make a list of elements in the monoatomic and in the diatomic molecular state. (Make a list and discuss;
Answer:

- Elements in the monoatomic molecular state are: Helium (He), Neon (Ne), Argon (Ar), Sodium (Na), Copper (Cu),
- Elements in the diatomic molecular state are:
  Oxygen (O_2), Nitrogen (N_2), Hydrogen (H_2), Chlorine (Cl_2), Fluorine (F_2).

Problem-based questions

Answer the following questions:

Question 1.
Is it possible to weigh one molecule using a weighing balance?
Answer:
No, it is not possible to weigh one molecule using a weighing balance.

Question 2.
Will the number of molecules be the same in equal weights of different substances?
Answer:
No, the number of molecules will not be the same in equal weights of different substances.

Question 3.
If we want equal number of molecules of different substances, will it work to take equal weights of those substances.
Answer:
No, if we want equal number of molecules of different substances, it will not work to take equal weights of those substances.

Answer the following:

Question 1.
What is the Dalton's atomic theory?
Answer:
Dalton's Atomic theory-

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    - All matter is made of atoms. Atoms are indivisible and indestructible.
    - All atoms of a given element are identical in mass and properties.
    - Compounds are formed by a combination of two or more different kinds of atoms.
    - A chemical reaction is a rearrangement of atoms.

Question 2.
How are compounds formed?
Answer:
Compounds are formed by a chemical combination of two or more different kinds of atoms.

Question 3.
What are the molecular formulae of salt, slaked lime, water, lime, limestone?
Answer:
The molecular formulae for
Salt – Sodium chloride – NaCl
Slaked lime – Calcium hydroxide $Ca(OH)_2$
Water – H_2O
Lime – Calcium oxide – CaO
Lime stone – Calcium carbonate – $CaCO_3$

Question 4.
From which experiments was it discovered that atoms have an internal structure? When?
Answer:

- In 1911, Earnest Rutherford conducted a well known experiment called as 'Gold foil experiment'.
- From this experiment it was discovered that atoms have internal structure.

Question 5.
What are the two parts of an atom? What are they made up of?
Answer:
The two parts of atoms are nucleus and extra nuclear part. Nucleus is made up of positively charged protons and electrically neutral neutrons and the extra nuclear part is made up of negatively charged electrons revolving around the nucleus in different orbits.

Open-ended questions

Q.3. 2. Answer the following questions:

Question 1.
How will the compounds, $MgCl_2$ and CaO be formed from their elements?
Answer:
(1) Magnesium Chloride ($MgCl_2$)
Magnesium atom (Mg): Electronic configuration
$(2,8,2) \longrightarrow -2e^-$ Magnesium ion Mg^{2+} (2,8).
Chlorine atom (Cl). Electronic configuration $(2,8,7) \longrightarrow +1e^-$ Chloride ion Ch (2,8,8).
∴ $Mg^{2+} + 2CT \rightarrow MgCl_2$ (Magnesium Chloride)

- A Magnesium atom gives away $2e^-$ and a cation of Magnesium (Mg^{2+}) is formed, hence, the valency of magnesium is two.
- Two chlorine atoms takes le^- each and forms two anions of chlorine ($2Cl^-$) (chloride), and thus, the valency of chlorine is one.
- After the give and take of electrons is over, the electronic configuration of all the resulting ions has a complete octet.
- Due to the attraction between the unit but opposite charges on all the ions, one chemical bond known as ionic bond is formed between Mg^{2+} and $2C1^-$ each and the compound $MgCl_2$ is formed.

(2) Calcium Oxide (CaO)
Calcium atom (Ca): Electronic configuration
$(2,8,8,2) \longrightarrow -2e^-$ Calcium ion Ca^{2+} (2,8,8).
Oxygen atom (O). Electronic configuration (2,6)

$\longrightarrow +2e^-$ Oxygen ion O^{2-} (2,8).

$\therefore Ca^{2+} + O^{2-} \rightarrow CaO$

- A calcium atom gives away 2er and a cation of calcium (Ca^{2+}) is formed, hence, the valency of calcium is two.
- An oxygen atom takes $2e^-$ and forms anions of oxygen (O^{2-}) (oxide), and thus, the valency of oxygen is two.
- After the give and take of electrons is over, the electronic configuration of both the resulting ions has a complete octet.
- Due to the attraction between the unit but opposite charges on the two ions, one chemical bond known as ionic bond is formed between Ca^{2+} and O^{2-} and the compound CaO is formed.

Question 2.

- Take 56 g calcium oxide in a large conical flask and put 18 g water in it.
- Observe what happens.
- Measure the mass of the substance formed.
- What similarity do you find? Write your inference.

Answer:

(i) When 18 g of water is added to 56 g of calcium oxide, calcium oxide combines with water to form calcium hydroxide $Ca(OH)_2$

(ii) The mass of calcium hydroxide formed is 74 g.?

(iii) In this activity the total mass of reactants, Calcium oxide + Water = 56 g +18 g = 74 g.
It is equal to the mass of the product formed. $Ca(OH)_2$ = 74g.

This activity verifies the Law of Conservation of Matter, i.e., in a chemical reaction, the total weight of the reactants is same as the total weight of the products formed due to the chemical reactions.

Question 3.

- Take a solution of calcium chloride in a conical flask and a solution of sodium sulphate in a test tube.
- Tie a thread to the test tube and insert it in the conical flask.
- Seal the conical flask with an airtight rubber cork.
- Weigh the conical flask using a balance.
- Now tilt the conical flask so that the solution in the test tube gets poured in the conical flask.
- Now weigh the conical flask again.

Answer:

- In this activity, a white precipitate of CaS04 in NaOl is seen in the conical flask after the reaction.
- There is no change in the weight of the flask before and after the reaction.
- This activity verifies the Law of Conservation of Matter i.e., in a chemical reaction, the total weight of the reactants is same as the total weight of the products formed due to the chemical reactions.

Question 4.

Using the chart of ions/radicals and the cross-multiplication method, write the chemical formulae of the following compounds : Calcium carbonate, Sodium bicarbonate, Silver chloride, Calcium hydroxide, Magnesium oxide, Ammonium phosphate, Cuprous bromide, Copper sulphate, Potassium nitrate, Sodium dichromate.

Ions/Radicals

Basic Radicals				Acidic Radicals			
H^+	Hydrogen	Al^{3+}	Aluminium	H^-	Hydride	MnO_4^-	Permanganate
Na^+	Sodium	Cr^{3+}	Chromium	F^-	Fluoride	ClO_3^-	Chlorate
K^+	Potassium	Fe^{3+}	Ferric	Cl^-	Chloride	BrO_3^-	Bromate
Ag^+	Silver	Au^{3+}	Gold	Br^-	Bromide	IO_3^-	Iodate
Cu^+	Cuprous	Sn^{4+}	Stannic	I^-	Iodide	CO_3^{2-}	Carbonate
Hg^+	Mercurous	NH_4^+	Ammonium	O^{2-}	Oxide	SO_4^{2-}	Sulphate
Cu^{2+}	Cupric/Copper			S^{2-}	Sulphide	SO_3^{2-}	Sulphite
Mg^{2+}	Magnesium			N^{3-}	Nitride	CrO_4^{2-}	Chromate
Ca^{2+}	Calcium					$Cr_2O_7^{-2}$	Dichromate
Ni^{2+}	Nickel			OH^-	Hydroxide	PO_4^{3-}	Phosphate
Co^{2+}	Cobalt			NO_3^-	Nitrate		
Hg^{2+}	Mercuric			NO_2^-	Nitrite		
Mn^{2+}	Manganese			HCO_3^-	Bicarbonate		
Fe^{2+}	Ferrous (Iron II)			HSO_4^-	Bisulphate		
Sn^{2+}	Stannous			HSO_3^-	Bisulphite		
Pt^{2+}	Platinum						

Answer:
Calcium carbonate – $CaCO_3$ Sodium bicarbonate – $NaHCO_3$ Silver chloride – AgCl, Calcium hydroxide – $Ca(OH)_2$, Magnesium oxide – MgO, Ammonium phosphate – $(NH_4)_3PO_4$, Cuprous bromide – CuBr, Copper sulphate – $CuSO_4$, Potassium nitrate – KNO_3, Sodium dichromate – $Na_2Cr_2O_7$.

Class 9 Science Chapter 3 Current Electricity Additional Important Questions and Answers

(A) Select the correct option:

Question 1.
The proportion by weight of hydrogen and oxygen in water is ..... .
(a) 8 : 1
(b) 2 : 1
(c) 1 : 2
(d) 1 : 8
Answer:
(d) 1: 8

Question 2.
The proportion by weight of carbon and oxygen in carbon dioxide is ..... .
(a) 8 : 3
(b) 3 : 8
(c) 3 : 2
(d) 2 : 3
Answer:
(b) 3 : 8

Question 3.
A nucleus of an atom is made up of positively charged ..... and electrically neutral ..... .
(a) protons; neutrons
(b) electrons; neutrons
(c) neutrons; protons
(d) neutrons; electrons
Answer:
(a) protons; neutrons

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Question 4.
The size of an atom is determined by its ..... .
Answer:
radius

Question 5.
Atomic radius is expressed in ..... .
(a) milimetres
(b) centimetres
(c) nanometres
(d) picometres
Answer:
(c) nanomet res

Question 6.
The atomic size depends on the number of ..... in the atom.
(a) protons
(b) nucleus
(c) neutrons
(d) electron orbits
Answer:
(d) electron orbits

Question 7.
The mass of an atom is concentrated in its ..... .
(a) protons
(b) nucleus
(c) neutrons
(d) electrons
Answer:
(b) nucleus

Question 8.
The total number of protons and neutrons in the atomic nucleus is called the ..... .
(a) atomic number
(b) electronic configuration
(c) atomic mass number
(d) valency
Answer:
(c) atomic mass number

Question 9.
A ..... is that quantity of a substance whose mass in grams is equal in magnitude to the molecular mass of that substance in Daltons.
(a) mole
(b) dalton
(c) dozen
(d) gross
Answer:
(a) Mole

Question 10.
Avogadro's number is denoted by the symbol ..... .
(a) N_G
(b) N_v
(c) N_A
(d) N_D

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Answer:
(c) N_A

Question 11.
A mole of any substance stands for ..... molecules.
(a) 60.22×10^{23}
(b) 6.022×10^{22}
(c) 6.022×10^{23}
(d) 60.22×10^{22}
Answer:
(a) 60.22×10^{23}

Question 12.
The capacity of an element to combine is called its ..... .
(a) valency
(b) electronic configuration
(c) atomic number
(d) volence electrons
Answer:
(a) valency

Question 13.
Electronic configuration of sodium atom is ..... .
(a) (2, 8, 3)
(b) (2, 8, 7)
(c) (2, 8, 2)
(d) (2, 8,1)
Answer:
(d) (2,8,1)

Question 14.
Electronic configuration of chlorine atom is ..... .
(a) (2, 8, 3)
(b) (2, 8, 7)
(c) (2, 8, 2)
(d) (2, 8, 1)
Answer:
(b) (2, 8, 7)

Question 15.
Positively charged ions are called as ..... .
(a) cations
(b) anions
(c) nucleous
(d) protons
Answer:
(a) cations

Question 16.
Negatively charged ions are called as ..... .
(a) cations
(b) anions
(c) nucleus
(d) electrons
Answer:
(b) anions

Question 17.
Iron (Fe) exhibits the variable valencies ..... .
(a) 1 and 2
(b) 2 and 3
(c) 3 and 4
(d) 2 and 4
Answer:
(b) 2 and 3

Question 18.
Cationic radicals are called as ..... radicals.
(a) basic
(b) acidic
(c) neutral
(d) mixed
Answer:
(a) basic

Question 19.
Anionic radicals are called as ..... radicals.
(a) basic
(b) acidic
(c) neutral
(d) mixed
Answer:
(b) acidic

Question 20.
The unit Dalton is used to express .....
(a) atomic mass
(b) atomic radius
(c) atomic number
(d) mass number
Answer:
(a) atomic mass

Question 21.
The valency of element with electronic configuration ..... is 2.
(a) (2,5)
(b) (2, 4)
(c) (2, 6)
(d) (2, 7)
Answer:
(c) (2, 6)

Question 22.
The symbol of Avogadro's number is ..... .
(a) ND
(b) N0
(c) NB
(d) NA
Answer:
(d) NA

Question 23.
…… is bicarbonate radical.
(a)HCO_{2-3}(b)CO_{-3}(c)HCO_{-3}(d)CO_{2-3}
Answer:
(c) HCO_{-3}

Question 24.
Molecular formula of sodium sulphate is …… .
(a) $Na(SO_4)_2$
(b) Na_2SO_4
(c)$Na_2(SO_4)_2$
(d)$NaSO_4$
Answer:
(b) Na_2SO_4

Question 25.
…… is a composite radical.
(a) Fe^{3+}
(b) Ca^{2+}
(c) NH_4^+
(d) S^{2-}
Answer:
(c) NH

Question 26.
A mole of any substance stands for …… molecules.
(a) 6.022×10^{23}
(b) 6.022×10^{22}
(c) 60.22×10^{23}
(d) 60.22×10^{22}
Answer:
(a) 6.022×10^{23}

Question 27.
The mass of an atom is concentrated in its …… .
(a) nucleus
(b) electrons
(c) extranuclear part
(d) protons
Answer:
(a) nucleus

Question 28.
…… g of water make 1 mole of water.
(a) 32
(b) 33
(c) 16
(d) 18
Answer:
(d) 18

Complete the analogy:

(1) Electron : extra nuclear part:: Neutron …… .
(2) Sodium: (2, 8, 1):: Chlorine:: …… .
(3) K : basic radical :: Br^- : …… .
(4) Cut: simple radical:: NH_4^+ : …… .
(5) Sodium sulphate: Na_2SO_4:: Potassium Sulphate: …… .

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(6) Mercurous: Hg^{+}:: Mercuric : ..... .
(7) Positively charged ion : cation:: Negatively charged ion : ..... .
(8) 12: 1 dozen :: 144 : ..... .
(9) Hydrogen : ⊙ :: Copper : ..... .
(10) Law of constant proportions : J. L. Proust::
Law of conservation of matter : ..... .
Answer:
(1) nucleus
(2) (2, 8, 7)
(3) acidic radical
(4) composite radical
(5) K_2SO_4
(6) Hg^{2+}
(7) anion
(8) 1 gross
(9) ©
(10) Antoine Lavoisier.

Match the columns:

Column A'	Column 'B'
Example	Atomic radius (in metres)
(1) Water molecule (2) Haemoglobin molecule (3) Hydrogen atom	(a) 10^{-10} (b) 10^{-9} (c) 10^{-8}

Answer:
(1-b),
(2- c),
(3 – a)

Column 'A'	Column 'B'
Element	Atomic mass
(1) Neon	(a) 35.5
(2) Silicon	(b) 32
(3) Chlorine	(c) 28
(4) Sulphur	(d) 20

Answer:
(1 – d),
(2 – c),
(3 – a),
(4 – b)

Column ‘A’	Column ‘B’
Molecule	Molecular mass in grams
(1) h_2	(a) 32 g
(2) H_2O	(b) 34 g
(3) O_2	(c) 2 g
(4) H_2O_2	(d) 18 g

Answer:
(1 – c),
(2 – d),
(3 – a),
(4 – b)

Column ‘A’	Column B’
Radicals	Names
(1) $Cr_2O^{2-}_7$	(a) Carbonate
(2) ClO^{-}_3	(b) Chromate
(3) CO^{2-}_3	(c) Dichromate
(4) CrO^{2-}_4	(d) Chlorate

Answer:
(1 – c),
(2 – d),
(3 – a),
(4 – b)

Answer the following in one sentence:

Question 1.
What are valence electrons?
Answer:
The electrons present in the outermost orbit of an atom are called valence electrons.

Question 2.
Give the formula to determine the number of moles of a substance.
Answer:
The formula to determine the number of moles of a substance is as given below.

$$\text{Number of moles of a substance (n)} = \frac{\text{Mass of substance in grams (m)}}{\text{Molecular mass of substance (M)}}$$

Question 3.
What are basic radicals? Give examples.

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Answer:
The radicals which are formed by removal of electrons from the atoms of metals are called as basic radicals, e.g., Na+, Cu2+

Question 4.
What are acidic radicals? Give examples.
Answer:
The radicals which are formed by adding electrons to the atoms of non-metals are called as acidic radicals, e.g., CT, S2-

State whether the following statement is 'True' or 'False'. Correct the false statement.

(1) Molecular state of oxygen is monoatomic.
(2) The capacity of an element to combine is called its valency.
(3) Anionic radicals are basic radicals.
(4) The magnitude of charge on any radical is its atomic number.
(5) In a chemical reaction, mass of original matter and mass of matter newly formed as a result of chemical change are equal.
(6) The proportion by weight of carbon and oxygen in carbon dioxide is 3 : 5.
(7) Relative mass of hydrogen is 1.
(8) The number of molecules in a given quantity of a substance is determined by its atomic mass.
(9) Avogadro's number is 6.022×10^{23}
(10) Valency of sodium is 2.
Answer:
(1) False. Molecular state of oxygen is diatomic:
(2) True
(3) False. Anionic radicals are acidic radicals.
(4) False. Magnitude of charge on any radical is its valency.
(5) True
(6) False. The proportion by weight of carbon and oxygen in carbon dioxide is 3 : 8.
(7) True
(8) False. The number of molecules in a given quantity of a substance is determined by its molecular mass.
(9) True
(10) False. Valency of sodium is 1.

Name the following:

Question 1.
Scientist who gave Law of Conservation of Matter.
Answer:
Antoine Lavoisier

Question 2.
Scientist who gave Law of Constant Proportion.
Answer:
J. L. Proust

Question 3.
What are protons and neutrons present in nucleus together called as?
Answer:
Nucleons

Question 4.
Unit used to express atomic radius.
Answer:
Nanometre

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Question 5.
The number (p + n) in the atomic nucleus is called as?
Answer:
Atomic mass number

Question 6.
Name the unit of atomic mass.
Answer:
Dalton (u)

Question 7.
Write molecular formula of two ionic compounds containing chlorine.
Answer:
NaCl, $MgCl_2$

Question 8.
Give two monoatomic radicals.
Answer:
Na^+, Cl^-

Question 9.
Give two examples of simple radicals.
Answer:
Ag^+, O^{2-}

Give scientific reasons:

Question 1.
An atom is electrically neutral though it contains charged particles.
Answer:

- An atom is made up of a nucleus and an extranuclear part. Protons and neutrons are present in the nucleus.
- The nucleus is positively charged. The extranuclear part is made up of negatively charged electrons.
- Protons are positively charged, electrons are negatively charged and neutrons are without any charge.
- The magnitude of their charges is the same when they are equal in number.
- Hence, the negative charge on all the extra, nuclear electrons together balances the positive charge on the
- nucleus.
- Therefore, an atom is electrically neutral though it contains charged particles.

Question 2.
Neon is chemically inert element.
Answer:

- Atomic number of neon is 10, so its electronic configuration is (2, 8). There are 8 electrons in its 2nd shell, fulfilling its capacity.
- Thus, neon has a complete octet.
- It has a stable orbit therefore, it does not indulge in chemical reactions. Hence, neon is a chemically inert element.

Question 3.
The valency of sodium (Na) is one.
Answer:

- The electronic configuration of sodium (Na) is (2, 8,1). It has 1 electron in its 3rd orbit.

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    - It tends to give up this electron so that it is left up with (2, 8), having 8 electrons in the second orbit, with a stable state.
    - The loss of one electron leads to the formation of sodium ion (Na+) which is positively charged as it has lost one electron.

Question 4.
The valency of chlorine (Cl) is one.
Answer:

- The electronic configuration of chlorine (Cl) is (2, 8, 7). It has 7 electrons in its 3rd orbit.
- It tends to take one electron from another atom so that it has 8 electrons in the outermost orbit with electronic configuration (2,8,8) with stable state.
- The gaining of one electron leads to formation of chloride ion (Cl^-) which is negatively charged as it has gained one electron.

Question 5.
The valency of Magnesium (Mg) is two.
Answer:

- The electronic configuration of Magnesium (Mg) is (2,8,2), it has 2 electrons in its 3rd orbit.
- It tends to give these '2' electrons so that it is left up with (2, 8), having 8 electrons in the second orbit, with a stable state.
- The loss of two electrons leads to the formation of Magnesium ion (Mg2+) which is double positively charged as it has lost two electrons.

Question 6.
Valency is always a whole number.
Answer:

- The number of electrons that an atom of an element gives away, takes up or shares forming a bond is called the valency of that element.
- These electrons are always in whole numbers and not in fractions.
- Therefore, valency is always a whole number.

Question 7.
Atomic size of potassium is bigger than atomic size of sodium.
Answer:

- The atomic size of an element depends on the number of electron orbits in the atom of that element.
- The greater the number of orbits, the larger the size.
- Atomic number of potassium (K) is 19. Hence, its electronic configuration is (2, 8, 8,1). While atomic number of sodium (Na) is 11. Hence its electronic configuration is (2, 8,1)
- Number of orbits in potassium atom is 4, while that in sodium atom is 3.
- Hence, atomic size of potassium is bigger than atomic size of sodium.

Question 8.
The atomic size of sodium is bigger than atomic size of Magnesium.
Answer:

- The atomic size of an element depends on the number of electron orbits in the atom of that element.
- If 2 atoms have the same outermost orbit, then the atom having the larger number of electrons in the outermost orbit is smaller than the one having fewer electrons in the same outermost orbit.
- Atomic number of sodium (Na) is 11. Hence, its electronic configuration is (2, 8, 1) while atomic number of magnesum (Mg) is 12 and hence its electronic configuration is (2, 8, 2).
- As compared to sodium atom Magnesum atom has larger number of electrons n its electronic configuration.
- Therefore, atomic size of sodium is bigger than atomic size of Magnesium.

Write the names of the following compounds and deduce their molecular masses:

Atomic masses : H(1), 0(16), N(14), C(12), K(39), S(32), Ca(40), Na(23), C1(35.5), Mg(24), A1(27), P(31)

Question 1.
Molecular mass of K_2CO_3
Answer:

Name of compound	Molecule	Constituent elements	Atomic mass (u)	Number of atoms in molecule	Atomic mass × number of atoms	Mass of the constituents u
Potassium carbonate	K_2CO_3	Potassium Carbon Oxygen	39 12 16	2 1 3	39 × 2 12 × 1 16 × 3	78 12 48
Molecular mass = Sum of constituent atomic masses Molecular mass of (K_2CO_3) = (Atomic mass of K) × 2 + (Atomic mass of C) × 1 + (Atomic mass of O) × 3						Molecular Mass 138

Question 2.
Molecular mass of CO_2
Answer:

Name of compound	Molecule	Constituent elements	Atomic mass (u)	Number of atoms in molecule	Atomic mass × number of atoms	Mass of the constituents u
Carbon dioxide	CO_2	Carbon Oxygen	12 16	1 2	12 × 1 16 × 2	12 32
Molecular mass = Sum of constituent atomic masses Molecular mass of (CO_2) = (Atomic mass of C) × 1 + (Atomic mass of O) × 2						Molecular Mass 44

Question 3.
Molecular mass of $MgCl_2$
Answer:

Name of compound	Molecule	Constituent elements	Atomic mass (u)	Number of atoms in molecule	Atomic mass × number of atoms	Mass of the constituents u
Magnesium chloride	$MgCl_2$	Magnesium Chlorine	24 35.5	1 2	24 × 1 35.5 × 2	24 71
Molecular mass = Sum of constituent atomic masses Molecular mass of ($MgCl_2$) = (Atomic mass of Mg) × 1 + (Atomic mass of Cl) × 2						Molecular Mass 95

Question 4.
Molecular mass of NaOH
Answer:

Name of compound	Molecule	Constituent elements	Atomic mass (u)	Number of atoms in molecule	Atomic mass × number of atoms	Mass of the constituents u
Sodium hydroxide	NaOH	Sodium Oxygen Hydrogen	23 16 1	1 1 1	23 × 1 16 × 1 1 × 1	23 16 1
Molecular mass = Sum of constituent atomic masses Molecular mass of (NaOH) = (Atomic mass of Na) × 1 + (Atomic mass of O) × 1 + (Atomic mass of H) × 1						Molecular Mass 40

Question 5.
Molecular mass of $AlPO_4$
Answer:

Name of compound	Molecule	Constituent elements	Atomic mass (u)	Number of atoms in molecule	Atomic mass × number of atoms	Mass of the constituents u
Aluminium phosphate	$AlPO_4$	Aluminium	27	1	27 × 1	27
		Phosphorus	31	1	31 × 1	31
		Oxygen	16	4	16 × 4	64
Molecular mass = Sum of constituent atomic masses Molecular mass of $(AlPO_4)$ = (Atomic mass of Al) × 1 + (Atomic mass of P) × 1 + (Atomic mass of O) × 4						Molecular Mass 122

Question 6.
Molecular mass of $NaHCO_3$
Answer:

Name of compound	Molecule	Constituent elements	Atomic mass (u)	Number of atoms in molecule	Atomic mass × number of atoms	Mass of the constituents u
Sodium bicarbonate	$NaHCO_3$	Sodium	23	1	23 × 1	23
		Hydrogen	1	1	1 × 1	1
		Carbon	12	1	12 × 1	12
		Oxygen	16	3	16 × 3	48
Molecular mass = Sum of constituent atomic masses Molecular mass of $(NaHCO_3)$ = (Atomic mass of Na) × 1 + (Atomic mass of H) × 1 + (Atomic mass of C) × 1 + (Atomic mass of O) × 3						Molecular Mass 84

Numerical.

Question 1.
Magnesium Oxide:
Answer:
Given : Number of moles of Magnesium oxide (MgO)n = 0.2 mol
To find : Mass in grams of 0.2 mol of MgO
Solution:
Molecular mass of (MgO)M
= (Atomic mass of Mg) x 1 + (Atomic mass of O) x 1
= 24 x 1 + 16 x 1
= 24 + 16
Molecular mass of (MgO)M = 40
According to the formula Number of moles in the given MgO (n)

$$= \frac{\text{Mass of MgO in grams (m)}}{\text{Molecular mass of MgO (M)}}$$

$$\therefore \quad 0.2 = \frac{\text{Mass of MgO in grams (m)}}{40}$$

Mass of MgO in grams (m) = 0.2 x 40
Mass of MgO in grams (m) = 8 g.
Mass of 0.2 mole of MgO is 8 g

Question 2.
Calcium Carbonate:
Answer:
Given : Number of moles of Calcium carbonate ($CaCO_3$) n = 0.2 mol
To find : Mass in grams of 0.2 mol of $CaCO_3$
Solution:
Molecular mass of ($CaCO_3$) M
= (Atomic mass of Ca) x 1 + (Atomic mass of C) x 1 + (Atomic mass of O) x 3
= (40 x l) + (12 x 1) +(16 x 3)

= 40+ 12+ 48

Molecular mass of ($CaCO_3$) M = 100

According to the formula Number of moles in the given $CaCO_3$ (n)

$$= \frac{\text{Mass of } CaCO_3 \text{ in grams (m)}}{\text{Molecular mass of } CaCO_3 \text{ (M)}}$$

$$\therefore \quad 0.2 \quad = \quad \frac{\text{Mass of } CaCO_3 \text{ in grams (m)}}{100}$$

∴ Mass of $CaCO_3$ in grams (m) = 0.2 x 100

∴ Mass of $CaCO_3$ in grams (m) = 20 g

Mass of 0.2 mole of $CaCO_3$ is 20 g

State laws/Define the following:

Question 1.

Law of Conservation of Matter.

Answer:

In a chemical reaction, the total weight of the reactants is same as the total weight of the products formed due to chemical reaction.

Question 2.

Law of Constant Proportion.

Answer:

The proportion by weight of the constituent elements in the various samples of a compound is fixed.

Question 3.

Molecular Mass:

Answer:

The molecular mass of a substance is the sum of the atomic masses of all the atoms in a single molecule of that substance.

Question 4.

Mole

Answer:

A mole is that quantity of a substance whose mass in grams is equal in magnitude to the molecular mass of that substance in Daltons.

Question 5.

Valency

Answer:

The capacity of an element to combine is called its valency.

Question 6.

Electronic definition of Valency

Answer:

The number of electrons that an atom of an element gives away or takes up while forming an ionic bond is called valency of that element.

Question 7.

Radicals

Answer:

The positively or negatively charged ions that take part independently in chemical reactions are called radicals.

Question 8.

Atomic size determination

Answer:

- *Digvijay*
- *Arjun*

The size of an atom is determined by its radius. The atomic radius of an isolated atom is the distance between the nucleus of an atom and its outermost orbit.

Question 9.
Atomic mass number
Answer:
The number of protons and neutrons in the atomic nucleus is called the atomic mass number.

Question 10.
Unified mass
Answer:
Unified mass is the standard unit of atomic mass that quantifies mass on an atomic or molecular scale. Its symbol is 'u'.
1 u = 1.66053904 x 10^{-27} kg.

Question 11.
Molecular mass of a substance
Answer:
The molecular mass of a substance is the sum of the atomic masses of all the atoms in a single molecule of that substance. Like atomic mass, molecular mass is also expressed in the unit Dalton (u).

Answer the following questions:

Question 1.
What is variable valency?
Answer:

- Under different conditions, the atoms of some elements give away or take up a different number of electrons.
- In such cases, those elements exhibit more than one valency.
- This property of elements is called variable valency.

Complete the following table:

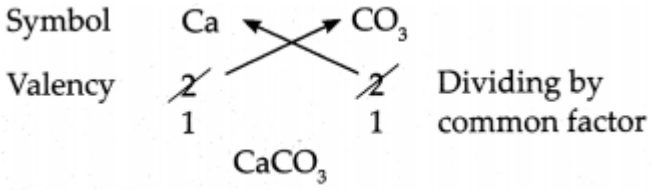
Question 1.
Write down the cations and anions obtained from the compounds in the following chart.
Answer:

Base	Cation	Anion	Acid	Cation	Anion
NaOH	Na^+	OH^-	**HCl**	H^+	Cl^-
KOH	K^+	OH^-	**HBr**	H^+	Br^-
$Ca(OH)_2$	Ca^{2+}	OH^-	**HNO_3**	H^+	NO_3^-

Answer the following questions:

Question 1.
Using the chart of ions/radicals and the cross-multiplication method, write the chemical formulae of the following compounds:

(a) Calcium carbonate
Answer:



∴ Chemical formula of Calcium carbonate is $CaCO_3$

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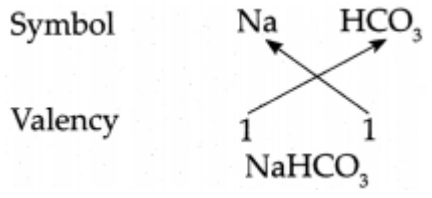
(b) Sodium bicarbonate

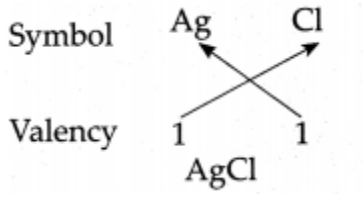
Answer:



∴ Chemical formula of Sodium bicarbonate is $NaHCO_3$

(c) Silver chloride

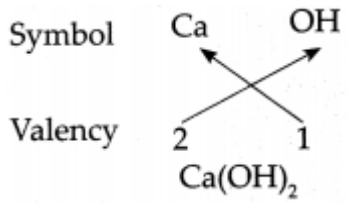
Answer:



∴ Chemical formula of Silver chloride is AgCl

(d) Calcium hydroxide Answer: Symbol Ca OH

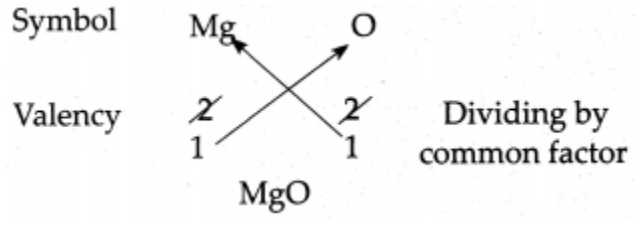
Answer:



∴ Chemical formula of Calcium hydroxide is $Ca(OH)_2$

(e) Magnesium oxide

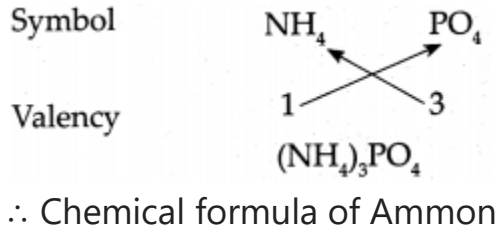
Answer:



∴ Chemical formula of Magnesium oxide is MgO

(f) Ammonium phosphate

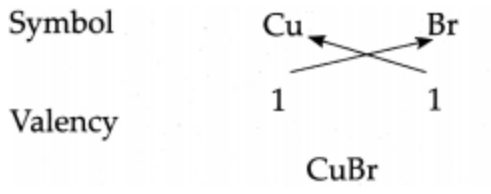
Answer:



∴ Chemical formula of Ammonium phosphate is $(NH_4)_3PO_4$

(g) Cuprous bromide

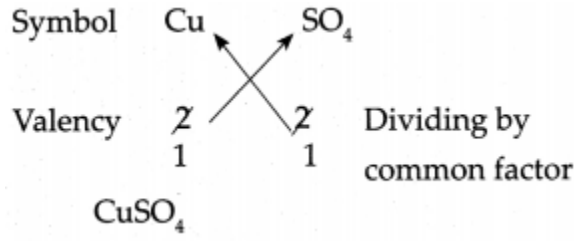
Answer:



∴ Chemical formula of Cuprous bromide is CuBr.

(h) Copper sulphate

Answer:



∴ Chemical formula of Copper sulphate is $CuSO_4$.

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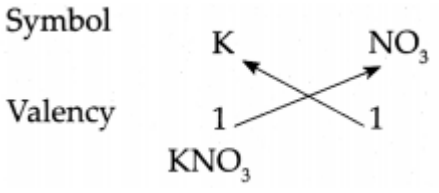
- *Arjun*

(i) Potassium nitrate

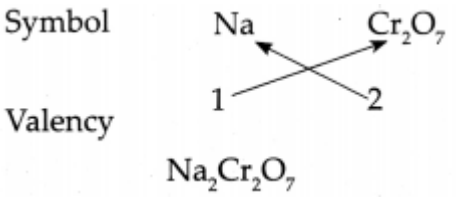
Answer:



∴ Chemical formula of Potassium nitrate is KNO_3.

(j) Sodium dichromate

Answer:



∴ Chemical formula of Sodium dichromate is $Na_2Cr_2O_7$.