Class 9 Chapter 3 Atoms and Molecules Important Questions with Answers

Short Answer Type Questions

Q1. Which of the following represents a correct chemical formula? Name it.
(a) CaCl
(b) $BiPO_4$
(c) $NaSO_4$
(d) NaS

Answer:

(b), $BiPO_4$ represents the correct formulae of bismuth phosphate.

Q2. Write the molecular formulae for the following compounds
(a) Copper (I) bromide
(b) Aluminium (III) nitrate
(c) Calcium (II) phosphate
(d) Iron (III) sulphide
(e) Mercury (I) chloride
(f) Magnesium (I) acetate

Answer:

(a) The molecular formula of Copper (I) bromide is $CuBr_2$.
(b) The molecular formula of Aluminium (III) nitrate is $Al(NO_3)_3$.
(c) The molecular formula of Calcium (II) phosphate is $Ca_3(PO_4)_2$.
(d) The molecular formula of Iron (III) sulphide is Fe_2S_3.
(e) The molecular formula of Mercury (I) chloride is $HgCl_2$.
(f) The molecular formula of Magnesium (I) acetate is $Mg(CH_3COO)_2$.

Q3. Write the molecular formulae of all the compounds that can be formed by the combination of the following ions.
Cu^{2+}, Na^+, Fe^{3+}, Cl^-, SO_4^{2-}, PO_4^{3-}.

Answer:

The molecular formula of the compounds formed by the combination of Cu^{2+}, Na^+, Fe^{3+}, Cl^-, SO_4^{2-}, and PO_4^{3-} are $CuCl_2$, $CuSO_4$, NaCl, Na_2SO_4, $FeCl_3$, and $Fe_2(SO_4)_3$.

Q4. Write the cations and anions present (if any) in the following compounds
(a) CH_3COONa
(b) NaCl
(c) H_2
(d) NH_4NO_3

Answer:

(a) The cation and anion present in CH_3COONa are Na^+ and CH_3COO^-.
(b) The cation and anion present in NaCl are Na^+ and Cl^-.
(c) There is no cation and anion in H_2.
(d) The cation and anion present in NH_4NO_3 are NH_4^+ and NH_3^-.

Q5. Give the formulae of the compounds formed from the following sets of elements
(a) Calcium and fluorine
(b) Hydrogen and sulphur
(c) Nitrogen and hydrogen
(d) Carbon and chlorine
(e) Sodium and oxygen
(f) Carbon and oxygen

Answer:

(a) The formulae of the compound formed by Calcium and fluorine is CaF_2.
(b) The formulae of the compound formed by Hydrogen and sulphur is H_2S.
(c) The formulae of the compound formed by Nitrogen and hydrogen is NH_3.
(d) The formulae of the compound formed by Carbon and chlorine is CCl_4.
(e) The formulae of the compound formed by Sodium and oxygen is Na_2O.
(f) The formulae of the compound formed by Carbon and oxygen is CO_2.

Q6. Which of the following symbols of elements are incorrect? Give their correct symbols

S. No.	Element	Formula
1.	Cobalt	CO
2.	Carbon	c
3.	Aluminium	AL
4.	Helium	He

5.	**Sodium**	**So**

Answer:

The formula for cobalt, carbon, aluminium, and sodium is incorrect, while the formula for helium is correct.
The correct formulas are enlisted below.

S. No.	Element	Correct Formula
1.	**Cobalt**	**Co**
2.	**Carbon**	**C**
3.	**Aluminium**	**Al**
4.	**Helium**	**He**
5.	**Sodium**	**Na**

Q7. Give the chemical formulae for the following compounds and compute the ratio by mass of the combining elements in each one of them. (You may use appendix-III).
(a) Ammonia
(b) Carbon monoxide
(c) Hydrogen chloride
(d) Aluminium fluoride
(e) Magnesium sulphide

Answer:

(a) The chemical formula of ammonia is NH_3, and its mass ratio is Mass of N: Mass of H = 14: 3.
(b) The chemical formula of Carbon monoxide is CO, and its mass ratio is Mass of C: Mass of O = 12: 16 = 3:4.
(c) The chemical formula of Hydrogen chloride is HCl, and its mass ratio is Mass of H: Mass of Cl = 1: 35.5.
(d) The chemical formula of Aluminium fluoride is AlF_3, and its mass ratio is Mass of Al: Mass of F = 27: 19.
(e) The chemical formula of Magnesium sulphide is MgS, and its mass ratio is Mass of Mg: Mass of S = 24: 32 = 3: 4.

Q8. State the number of atoms present in each of the following chemical species

(a) CO_3^{2-}
(b) PO_3^{3-}
(c) P_2O_5
(d) CO

Answer:

(a) There are four atoms in CO_3^{2-}.
(b) There are four atoms in PO_3^{3-}.
(c) There are seven atoms in P_2O_5.
(d) There are two atoms in CO.

Q9. What is the fraction of the mass of water due to neutrons?

Answer:

The mass of one neutron = 1 amu.
The mass of one water molecule = 18 amu.
The oxygen atom has eight neutrons, while the hydrogen atom has 0 neutrons.
So the mass of neutrons in one water molecule is eight amu.
The fraction of mass of water due to neutrons = 8 / 18 = 4 / 9.

Q10. Does the solubility of a substance change with temperature? Explain with the help of an example.

Answer:

Yes, the solubility of a substance changes with temperature. The solubility generally increases with an increase in temperature.
Example: You can dissolve more sugar in hot water than in cold water.

Q11. Classify each of the following based on their atomicity.
(a) F_2
(b) NO_2
(c) N_2O
(d) C_2H_6
(e) P_4
(f) H_2O_2
(g) P_4O_{10}
(h) O_3
(i) HCl
(i) CH_4

(k) He
(l) Ag

Answer:

Monoatomic	Diatomic	Triatmoc	Polyatomic
He	F_2	NO_2	C_2H_6
Ag	HCl	N_2O	P_4
O_3	H_2O_2		
P_4O_{10}			
CH_4			

Q12. You are provided with a fine white coloured powder, either sugar or salt. How would you identify it without tasting it?

Answer:

We can differentiate sugar and salt by
(a) Heating salts separately. Sugar will melt while salt will not.
(b) Dissolving them separately in water. The salt solution will conduct electricity due to Na^+ ion and Cl^- while the sugar solution will not conduct electricity. So, we can immediately tell the difference by testing a drop of the solution with an ohmmeter.

Q13. Calculate the number of moles of magnesium present in a magnesium ribbon weighing 12 g. The molar atomic mass of magnesium is 24g mol^{-1}.

Answer:

Given
Mass of magnesium ribbon = 12 g
Molar mass of magnesium = 24 g
Number of moles = Mass / Molar Mass
Number of moles = 12 / 24
Number of moles = 0.5 moles.
Hence, there are half moles of magnesium in a 12 g magnesium ribbon.

Long Answer Type Questions

Q1. Verify by calculating that
(a) 5 moles of CO_2 and 5 moles of H_2O do not have the same mass.
(b) 240 g of calcium and 240 g of magnesium elements have a mole ratio of 3:5.

Answer:

(a) The number of moles of CO_2 = 5 moles
Molar mass of CO_2 = 44 g mol^{-1}.
Hence, the mass of 5 moles of CO_2 = the number of moles of CO_2 X molar mass of CO_2.
Hence, the mass of 5 moles of CO_2 = 5 X 44.
Hence, the mass of 5 moles of CO_2 = 220 g.

The number of moles of H_2O = 5 moles
Molar mass of H_2O = 18 $gmol^{-1}$.
Hence, the mass of 5 moles of H_2O = the number of moles of H_2O X molar mass of H_2O.
Hence, the mass of 5 moles of H_2O = 5 X 18.
Hence, the mass of 5 moles of H_2O = 90 g.

Thus, we can see the mass of 5 moles of CO_2 and 5 moles of H_2O is not the same.

(b) Mass of calcium = 240 g
Molar mass of calcium = 40
Number of moles = 240 / 40
Number of moles = 6

Mass of magnesium = 240 g
Molar mass of magnesium = 24 g
Number of moles = 240 / 24
Number of moles = 10
Mole ratio of calcium and magnesium = the number of moles of calcium/number of moles of magnesium
Mole ratio of calcium and magnesium = 6 / 10
Mole ratio of calcium and magnesium = 3 / 5
Hence, the mole ratio of 240 g of calcium and 240 g of magnesium is 3:5.

Q2. Find the ratio by mass of the combining elements in the following compounds. (You may use Appendix-III)
(a) $CaCO_3$

(b) $MgCl_2$
(c) H_2SO_4
(d) C_2H_5OH
(e) NH_3
(f) $Ca(OH)_2$

Answer:

(a) The ratio of the mass of $CaCO_3$
Ca: C: O X 3
40: 12: (16 X 3)
40: 12: 48
10: 3: 12
Hence, the ratio of the mass of $CaCO_3$ is 10: 3: 12.

(b) The ratio of the mass of $MgCl_2$
Mg: Cl X 2
24: 35.5 X 2
24: 71.
Hence, the ratio of the mass of $MgCl_2$ is 24:71.

(c) The ratio of the mass of H_2SO_4
H X 2: S: O X 4
1 X 2: 32: 64
2: 32: 64
1: 16: 32.
Hence, the ratio of the mass of H_2SO_4 is 1: 16: 32.

(d) The ratio of the mass of C_2H_5OH
C X 2: H X 6: O
12 X 2: 1 X 6: 16
24: 6: 16
12: 3: 8.
Hence, the ratio of the mass of C_2H_5OH is 12: 3: 8.

(e) The ratio of the mass of NH_3
N: H X 3
14: 1 X 3
14: 3.
Hence, the ratio of the mass of NH_3 is 14: 3.

(f) The ratio of the mass of $Ca(OH)_2$
Ca: O X 2: H X 2
40: 16 X 2: 1 X 2
40: 32: 2
20: 16: 1
Hence, the ratio of the mass of $Ca(OH)_2$ is 20: 16: 1.

Q3. When dissolved in water, calcium chloride dissociates into its ions according to the following equation.
$CaCl_2$ (aq) → Ca^{2+} (aq) + 2 Cl^- (aq)
Calculate the number of ions obtained from $CaCl_2$ when 222 g of it is dissolved in water.

Answer:

1 mole of $CaCl_2$ gives 111 g of $CaCl_2$
∴ 222 g of $CaCl_2$ is equal to 2 moles of $CaCl_2$.
Since one formula unit, $CaCl_2$ gives three ions.
Therefore, 1 mol of $CaCl_2$ will give 3 moles of ions.
And, 2 moles of $CaCl_2$ would give 3 X 2 = 6 moles of ions.
The number of ions = the number of moles of ions × Avogadro number.
The number of ions = 6 X 6.022 X 10^{23}.
The number of ions = 36.132 X 10^{23}.
The number of ions = 3.6132 X 10^{24} ions.

Q4. The difference in the mass of 100 moles of sodium atoms and sodium ions is 5.48002 g. Compute the mass of an electron.

Answer:

$Na \rightarrow Na^+ + e^-$
A sodium atom and ion differs by one electron.
For 100 moles each of sodium atoms and ions, there would be a difference of 100 moles of electrons.
Mass of 100 moles of electrons = 5.48002 g

Mass of 1 mole of electron = 5.48002 / 100 g

Mass of one electron = 5.48002 / (100 X 6.022 X 10^{23})
Mass of one electron = 9.1 X 10^{-28} g
Mass of one electron = 9.1 X 10^{-31} kg
Hence, mass of one electron is equal to 9.1 X 10^{-31} kg.

Q5. Cinnabar (HgS) is a prominent ore of mercury. How many grams of mercury are present in 225 g of pure HgS? The molar mass of Hg and S is 200.6 g mol^{-1} and 32 g mol^{-1}, respectively.

Answer:

Molar mass of HgS = molar mass of Hg + molar mass of S
Molar mass of Hg = 200.6 g mol^{-1}
Molar mass of S = 32 g mol^{-1}
Molar mass of HgS = (200.6 + 32) g mol^{-1}
Molar mass of HgS = 232.6 g mol^{-1}

1 molecule of HgS contains one atom of Hg
232.6 g of HgS contains 200.6 g of Hg
225 g of HgS contains (200.6 X 225) / 232.6 of Hg
225 g of HgS contains 45135 / 232.6 of Hg
225 g of HgS contains 194.04g of Hg

Hence, 225 g of HgS contains 194.04g of Hg.

Q6. The mass of one steel screw is 4.11g. Find the mass of one mole of these steel screws. Compare this value with the mass of the Earth (5.98×10^{24} kg). Which one of the two is heavier, and by how many times?

Answer:

Mass of one steel screw= 4.11 g.
Thus, the mass of one mole of screw = 4.11 X N_A = 4.11 X 6.022 X $10^{23.}$
One mole of screws weighs 2.475 X 10^{24} g = 2.475 X 10^{21} kg
Ratio of mass of earth to the mass of screw = Mass of the earth / Mass of 1 mole of screws
Ratio of mass of earth to the mass of screw = 5.98 X 10^{24} kg / 2.75 X 10^{21} kg
Ratio of mass of earth to the mass of screw = 2.4 X 10^3
Hence, the mass of the earth is 2.4 X 10^3 times more than the mass of screw.
Or the earth is 2400 times heavier than a mole of the screw.

Q7. A sample of vitamin C is known to contain 2.58 x10^{24} oxygen atoms. How many moles of oxygen atoms are present in the sample?

Answer:

Given
The number of oxygen atoms in the given sample = 2.58 X $10^{24.}$

We know that 1 mole contains 6.022 X 10^{23} oxygen atoms
So,
2.58 X 10^{24} oxygen atoms = 2.58 X 10^{24} / 6.022 X 10^{23}
2.58 X 10^{24} oxygen atoms = 4.28 moles.

Q8. Raunak took 5 moles of carbon atoms in a container, and Krish took 5 moles of sodium atoms in another container of the same weight. (a) Whose container is heavier? (b) Whose container has more number of atoms?

Answer:

As both containers are of the same mass, the mass of atoms will decide which will be heavier.
Mass of 5 moles of sodium atoms in Krish's container = (5 × 23) g = 115 g.
Mass of 5 moles of carbon atom in Raunak's container =(5 × 12) g = 60 g.
Hence, Krish's container is heavier.

Q9. Fill in the missing data in Table 3.1
Table 3.1

Species	H_2O	CO_2	Na Atom	$MgCl_2$
Property				
No. of moles	**2**	**-**	**-**	**0.5**
No. of particles	**-**	**3.011 X 10^{23}**	**-**	**-**
Mass	**36 g**	**-**	**115 g**	**-**

Answer:

Species	H_2O	CO_2	Na Atom	$MgCl_2$
Property				
No. of moles	**2**	**0.5**	**5**	**0.5**
No. of particles	**12.044 X 10^{24}**	**3.011 X 10^{23}**	**3.011 X 10^{23}**	**3.011 X 10^{23}**
Mass	**36 g**	**22 g**	**115 g**	**47.5 g**

Q10. The visible universe is estimated to contain 1022 stars. How many moles of stars are present in the visible universe?

Answer:

1 mole of stars = 6.023×10^{23}.
Hence, the number of moles of stars = $10^{22} / N_A = 10^{22} / 6.023 \times 10^{23} = 0.0166$ moles.

Q11. What is the SI prefix for each of the following multiples and submultiples of a unit?
(a) 10^3
(b) 10^{-1}
(c) 10^{-2}
(d) 10^{-6}
(e) 10^{-9}
(f) 10^{-12}

Answer:

(a) 10^3: Kilo
(b) 10^{-1}: Deci
(c) 10^{-2}: Centi
(d) 10^{-6}: Micro
(e) 10^{-9}: Nano
(f) 10^{-12}: Pico

Q12. Express each of the following in kilograms
(a) 5.84×10^{-3} mg
(b) 58.34 g
(c) 0.584 g
(d) 5.873×10^{-21} g

Answer:

(a) 5.84×10^{-3} mg = 5.84×10^{-9} kg
(b) 58.34 g = 5.834×10^{-2} kg
(c) 0.584 g = 5.84×10^{-4} kg
(d) 5.873×10^{-21} g = 5.873×10^{-24} kg

Q13. Compute the difference in masses of 10^3 moles each of magnesium atoms and magnesium ions. (Mass of an electron = 9.1×10^{-31} kg)

Answer:

$Mg \rightarrow Mg^{+2} + 2\ e^{-}$
A Mg^{2+} ion, and Mg atom differs by two electrons.
10^3 moles of Mg^{2+} and Mg atoms would differ by 10^3 X 2 moles of electrons.
Mass of 2 X 10^3 moles of electrons = 2 X 10^3 × 6.023 × 10^{23} × 9.1 × 10^{-31} kg
Mass of 2 X 10^3 moles of electrons = 2 X 6.022 X 9.1 X 10^{-5} kg
Mass of 2 X 10^3 moles of electrons = 109.6004 X 10^{-5} kg
Mass of 2 X 10^3 moles of electrons = 1.096 X 10^{-3} kg

Q14. Which has more number of atoms?
100g of N_2 or 100 g of NH_3.

Answer:

(i) 100 g N_2 contains = 100 / 28 moles
Number of molecules = (100 X 6.022×10^{23}) / 28
Number of atoms = (100 X 6.022×10^{23} X 2) / 28 = 43.01 X 10^{23}

(ii) 100g NH_3 contains = 100 / 17 moles
100g NH_3 contains = (100 X 6.022 X 10^{23}) / 17 molecules
100g NH_3 contains = (100 X 6.022 X 10^{23} X 4) / 17 atoms
100g NH_3 contains = 141.69 X 10^{23}
Hence, NH_3 would have more atoms than N_2.

Q15. Compute the number of ions present in 5.85 g of sodium chloride.

Answer:

5.85 g of NaCl contains 5.85 / 58.5 moles of NaCl particle
5.85 g of NaCl contains 0.1 moles of NaCl particle.
Each NaCl particle contains one Na^+ and one Cl^- ion.
Total moles of ions = 0.1 X 2 = 0.2 moles
No. of ions = 0.2 X 6.022 X 10^{23} = 1.2042 X 10^{23} ions.

Q16. A gold sample contains 90% of gold and the rest copper. How many atoms of gold are present in one gram of this sample of gold?

Answer:

As the sample is 90% pure.

So one gram of sample will have 90 / 100 = 0.9 gm of Gold.
The number of moles of Gold = Mass of Gold / Atomic mass of gold.
The number of moles of Gold = 0.9 / 197.
The number of moles of Gold = 0.0046.
According to the mole concept,
Gold's one mole contains NA atoms = 6.022 X 10^{23} atoms.
Hence, 0.0046 moles of Gold will contain = 0.0046 X 6.022 X $10^{23.}$
Hence, 0.0046 moles of Gold will contain = 2.77 X 10^{21} atoms.

Q17. What are ionic and molecular compounds? Give examples.

Answer:

Ionic compounds are those compounds that contain charged species. The charged species are called ions. An ion is a charged particle and can be positively or negatively charged. A positively charged ion is a cation, while a negatively charged ion is an anion. The transfer of electrons forms ionic compounds. Example: sodium chloride and calcium oxide.

Molecular compounds are formed by sharing electrons through covalent bonds. Example: water, ammonia, carbon dioxide.

Q18. Compute the difference in masses of one mole of aluminium atoms and one mole of its ions. (Mass of an electron is 9.1 × 10^{-28} g). Which one is heavier?

Answer:

Mass of 1 mole of aluminium atom = Molar mass of aluminium = 27 g $mole^{-1}$
An aluminium atom loses three electrons to form an Al^{3+} ion.
For one mole of Al^{3+} ion, three moles of electrons will be lost.
Hence, the mass of three moles of electrons = 3 X (9.1 X 10^{-28}) X 6.022 X 10^{23} g.
Mass of three moles of electrons = 27.3 X 10^{-28} X 6.022 X 10^{23} g.
Mass of three moles of electrons = 164.400 X 10^{-5} g
Mass of three moles of electrons = 0.00164 g

Hence, the molar mass of Al^{+3} = (27 − 0.00164) g mol^{-} = 26.998 g mol^{-}
Difference in mass = 27 – 26.9984 = 0.0016 g
Hence, aluminium atom is 0.0016 g heavier than aluminium ions.

Q19. A silver ornament of mass 'm' gram is polished with gold equivalent to 1% of the mass of silver. Compute the ratio of the number of atoms of gold and silver in the ornament.

Answer:

Mass of silver = m g
Mass of gold = m / 100 g
Number of atoms of Ag = m / (108 × Na)
Number of atoms of Au = m / (100 × 197 × Na)
Au: Ag ≡ m / (100 × 197 × Na) : m / (108 × Na)
= 108: 100 X 197
= 108: 19700

Q20. The ethane (C_2H_6) gas sample has the same mass as 1.5 x10^{20} molecules of methane (CH_4). How many C_2H_6 molecules does the sample of gas contain?

Answer:

Mass of 1 molecule of CH_4 = 16 / Na g
Mass of 1.5 X 10^{20} molecules of methane = (1.5 X 10^{20} X 16) / Na
Mass of x molecules of C_2H_6 is = (1.5 X 10^{20} X 16) / Na
We know that mass of 1 molecule of C_2H_6 = 30 / Na g
Hence, the number of molecules of ethane (x) = (1.5 X 10^{20} X 16 X Na) / (30 X Na)
Number of molecules of ethane (x) = 0.8 X 10^{20}.

Q21. Fill in the blanks
(a) In a chemical reaction, the sum of the masses of the reactants and products remains unchanged. This is called _____.
(b) A group of atoms carrying a fixed charge on them is called _____
(c) The formula unit mass of Cag(PO4)2 is _____
(d) Formula of sodium carbonate is _____, and that of ammonium sulphate is _____

Answer:

(a) In a chemical reaction, the sum of the masses of the reactants and products remains unchanged. This is called the Law of conservation of mass.
(b) A group of atoms carrying a fixed charge on them is called a polyatomic ion.
(c) The formula unit mass of $Ca_3(PO_4)_2$ is 310 g.
(d) Formula of sodium carbonate is Na_2CO_3, and that of ammonium sulphate is $(NH_4)_2SO_4$.

Q22. Complete the following crossword puzzle (Fig. 3.1) by using the name of the chemical elements. Use the data given in Table 3.2.
Table 3.2

Across	Down
2. The element used by Rutherford during his alpha scattering experiment	1. A lustrous white metal used for making ornaments tends to get tarnished black in the presence of moist air
3. An element which forms rust on exposure to moist air	4. Both brass and bronze are alloys of element
5. A very reactive non-metal stored underwater	6. The metal exists in the liquid state at room temperature
7. When treated with dilute hydrochloric acid, zinc metal produces gas of this element which, when tested with a burning splinter.	8. An element with the symbol Pb

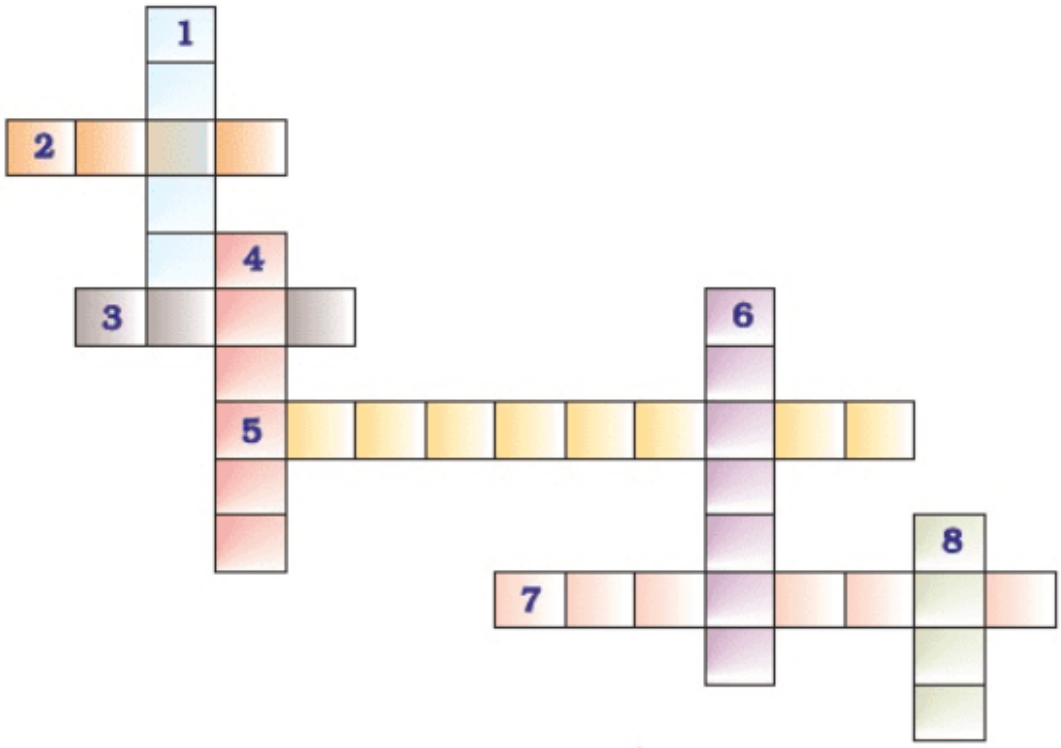

Fig. 3.1

Answer:

Across	Down
2. Gold	1. Silver
3. Iron	4. Copper
5. Phosphorous	6. Mercury
7. Hydrogen	8. Lead

Q23. (a) In this crossword puzzle (Fig 3.2), the names of 11 elements are hidden. Symbols of these are given below. Complete the puzzle.

1. Cl
2. H
3. Ar
4. O
5. Xe
6. N
7. He
8. F
9. Kr
10. Rn
11. Ne

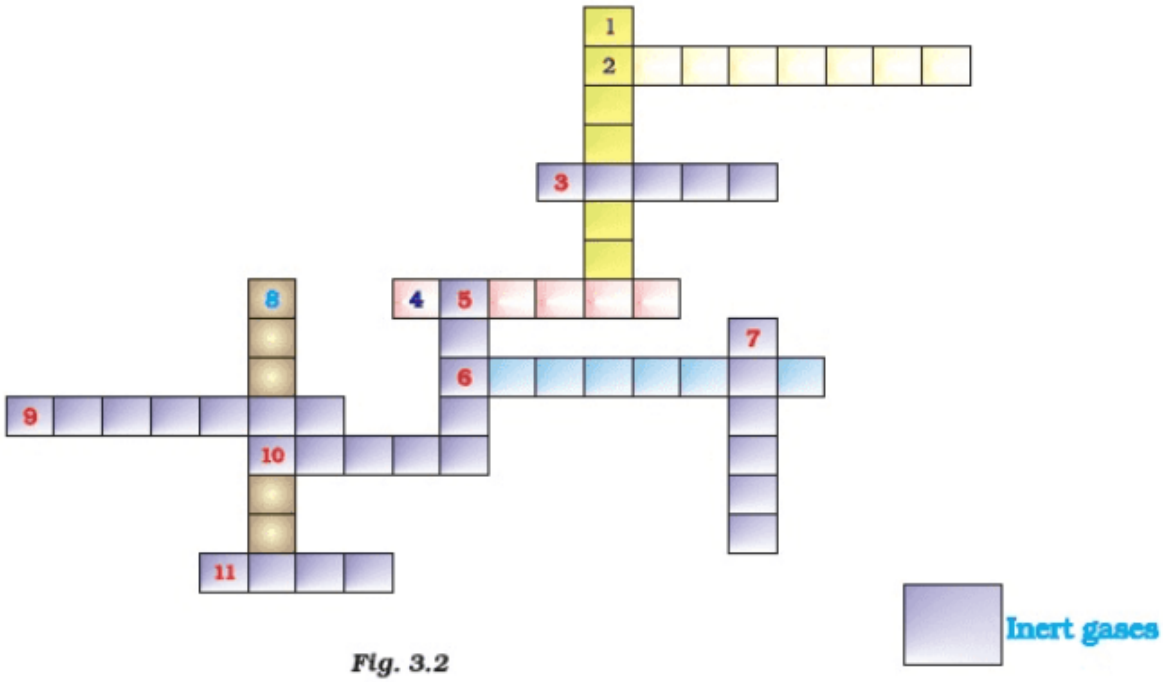

Fig. 3.2

(b) Identify the total number of inert gases, their names and symbols from this crossword puzzle.

Answer:

(a) 1. Cl: Chlorine
2. H: Hydrogen
3. Ar: Argon
4. O: Oxygen
5. Xe: Xenon
6. N: Nitrogen
7. He: Helium
8. F: Fluorine
9. Kr: Krypton
10. Rn: Radon
11. Ne: Neon

(b) There are five inert gases in this crossword puzzle. Their names and symbols are Argon (Ar), Xenon (Xe), Helium (He), Krypton (Kr) and Radon (Rn).

Q24. Write the formulae for the following and calculate the molecular mass for each of them.
(a) Caustic potash
(b) Baking powder

(c) Limestone
(d) Caustic soda
(e) Ethanol
(f) Common salt

Answer:

(a) The formulae of Caustic potash is KOH.
The molecular mass of Caustic potash is 39 + 16 + 1 = 56 u.
(b) The formulae of Baking powder is $NaHCO_3$.
The molecular mass of Baking powder is 23 + 1 + 12 + 3 X 16 = 84 u.
(c) The formulae of Limestone is $CaCO_3$.
The molecular mass of Limestone is 40 + 12 + 3 X 16 = 100 u.
(d) The formulae of Caustic soda is NaOH.
The molecular mass of Caustic soda is 23 + 16 + 1 = 40 u.
(e) The formulae of Ethanol is C_2H_5OH.
The molecular mass of 2 × 2 + 5 X 1 + 16 + 1 = 46 u.
(f) The formulae of Common salt is NaCl.
The molecular mass of Common salt is 23 + 35.5 = 58.5 u.

Q25. In photosynthesis, six molecules of carbon dioxide combine with an equal number of water molecules through a complex series of reactions to give a molecule of glucose having a molecular formula $C_6H_{12}O_6$. How many grams of water would produce 18 g of glucose? Compute the volume of water consumed, assuming the density of water to be 1g cm^{-3}.

Answer:

$6\ CO_2 + 6\ H_2O \rightarrow C_6H_{12}O_6 + 6\ O_2$

1 mole of glucose requires 6 moles of water.

180 g of glucose requires 108 g of water.
1 g of glucose will require 108 / 180 g of water.
18 g of glucose would need (108 X 18) / 180 g of water
18 g of glucose would need = 10.8 g of water

Volume of water used = Mass / Density = 10.8 / 1 = 10.8 cm^3.

CBSE Class 9 Science Chapter 3 Extra Questions

Q1. What is the compound $Al_2(SO4)_3$, and give the ions present in it?

Answer:

The given compound is aluminium sulphate.
It contains two ions: Al^{3+} and SO_4^{2-}.

Q2. What is an atomic mass unit'? How is it linked with relative atomic mass?

Answer:

Atomic mass unit is defined as the 1 / 12 of the mass of carbon - 12 atom C - 12.
The relative atomic mass of an element is the number of times one atom of the element is heavier than the 1 / 12 times the mass of an atom of carbon-12.

Q3. What is Avogadro's number? Why is it also known as Avogadro's constant?

Answer:

Avogadro's number is the number of particles (atoms, molecules or ions) present in one mole of any substance. It is known as Avogadro's constant because its value is fixed (6.022×10^{23}) irrespective of the nature of the particles.

Q4. Which are the six postulates of Dalton's atomic theory?

Answer:

Postulates of Dalton's atomic theory
1. The matter is composed of indivisible particles called atoms.
2. Atoms of the same element are similar in shape and mass but differ from the atoms of different elements.
3. Atoms can neither be created nor be destroyed.
4. Atoms of different elements combine in fixed, simple, whole-number ratios to form a compound.
5. Atoms of the same element can combine in more than one ratio to form two or more compounds.
6. The atom is the tiniest unit of matter that can take part in a chemical reaction.