Multiple-choice Questions

Q1. Which of the following correctly represents 360 g of water?

(i) 2 moles of H20

(ii) 20 moles of water

(iii) 6.022×10^{23} molecules of water

(iv) 1.2044×10^{25} molecules of water

Choose the option:

(a) (i)

(b) (i) and (iv)

(c) (ii) and (iii)

(d) (ii) and (iv)

Answer: (d) (ii) and (iv)

Explanation: The two moles of water molecules (H_2O) is 36 grams.

Therefore the 20 moles of water molecule (H_2O) will be 360 grams.

Now the mass of 6.022×10^{23} molecules of water molecule is 18g.

Number of molecules = 20 x 6.022 x 10^{23} = 1.2044 x 10^{25} molecules of water

Also the mass of 1.2044×10^{25} of water molecules is 20 x 18g = 360g.

Q2. Which of the following statements is not true about an atom?

(a) Atoms are not able to exist independently.

(b) Atoms are the basic units from which molecules and ions are formed.

(c) Atoms are always neutral in nature.

(d) Atoms aggregate in large numbers to form the matter that we can see, feel or touch.

Answer: (a) Atoms are not able to exist independently.

Explanation: Only the atoms of inert gasses can exist independently. The atoms are the basic units from which the molecules and ions are formed. The atoms are always neutral in nature. The atoms aggregate in a large number to form the matter that we can see, feel or touch.

Q3. The chemical symbol for nitrogen gas is:

(a) N (b) N_2 (c) N^+ (d) N

Answer: (b) N_2

Explanation: The chemical symbol for nitrogen gas is N_2 since the molecules of the nitrogen gas are diatomic in nature.

Q4. The chemical symbol for sodium is:

(a) So (b) Sd (c) NA (d) Na

Answer: (d) Na

Explanation: The chemical symbol for sodium is Na as the name "sodium" has been derived from the Latin word Natrium.

Q5. Which of the following would weigh the highest?

(a) 0.2 mole of sucrose ($C_{12}H_{22}O_{11}$) (b) 2 moles of CO_2

(c) 2 moles of $CaCO_3$ (d) 10 moles of H_2O

Answer: (c) 2 moles of $CaCO_3$

(a) Chemical formula of Sucrose is $C_{12}H_{22}O_{11}$.

Molar Mass of Sucrose = (12 x 12) + (22 x 1) + (11 x 16)

= 144 + 22 + 176 = 342 g

Or 0.2 M Sucrose= 0.2 x 342

0.2 M Sucrose =68.4 g

(b) 1 M carbon dioxide = (1 x 12) + (2 x 16) = 44 g

Or 2 M CO_2 = 44 x 2

2 M CO_2= 88 g

(c) 1 M $CaCO_3$ = (1 x 40) + (1 x 12) + (3 x 16)

= 40 + 12 + 48 = 100 g

Or 2 M $CaCO_3$ = 100 x 2 = 200 g

(d) 1 M H_2O = (2 x 1) + (1 x 16) = 18 g

Or 10 M water = 18 x 1 = 180 g

Therefore the 2 moles of $CaCO_3$ weigh the highest.

Q6. Which of the following has maximum number of atoms?

(a) 18 g of H_2O (b) 18 g of O_2

(c) 18 g of CO_2 (d) 18 g of CH_4

Answer: (d) 18g of CH4

Number of atoms = Mass of substance × Number of atoms in the molecule/ Molar mass × NA

(a) For 18 g of H_2O = $\frac{18g\ x\ 3}{18\ g}$ x N_A = $3N_A$

(b) For 18 g of O_2 = $\frac{18g\ x\ 2}{32\ g}$ x N_A = $1.125N_A$

(c) For 18 g of CO_2 = $\frac{18g\ x\ 2}{44\ g}$ x N_A = $1.23N_A$

(d) For 18 g of CH_4 = = $\frac{18g\ x\ 2}{16\ g}$ x N_A = $5.625N_A$

Therefore 18 grams of CH_4 has a maximum number of atoms.

Q7. Which of the following contains the maximum number of molecules?

(a) 1 g CO2 (b) 1 g N2

(c) 1 g H2 (d) 1 g CH4

Answer: (c) 1 g H2

Number of molecules = $\frac{Mass\ of\ substance}{Molar\ mass}$ x N_A

For 1 g of Hydrogen = 1g/2g x N_A

= 0.5 g N_A

= 0.5 x 6.022 x 10^{23}

=3.011 x 10^{23}

Therefore the molar mass of other molecules is very much higher than that of given mass thus the number of molecules in them will be less than that in hydrogen.

Q8. Mass of one atom of oxygen is

a) 16/ 6.023 × 10^{23}g b) 32/ 6.023 × 10^{23}g

c) 3/ 6.023 × 10^{23}g (d) 8u

Answer: (a) 16/ 6.023 × 10^{23}g

Mass of one atom of oxygen = $\frac{Atomic\ Mass}{N_A}$ = $\frac{16}{6.023\ x\ 10^{23}}$

Q9. 3.42 g of sucrose are dissolved in 18 g of water in a beaker. The number of oxygen atoms in the solution is:

(a) 6.68 x 10 23 (b) 6.09 x 1022

(c) 6.022 x 1023 (d) 6.022 x 1021

Answer: (a) 6.68 x 10 23

The number of moles = $\frac{Mass\ of\ substance}{Molar\ mass}$

The molar mass of sucrose = 342 g

No. of moles for 3.42 g sucrose = $\frac{3.42\ g}{3.42\ g}$ = 0.001 M

1 M sucrose ($C_{11}H_{22}O_{11}$) contains 11 x N_A atoms of oxygen.

Therefore, the number of oxygen atoms in 0.01 M sucrose= 0.11 N_A

No. of moles for 18 g water = $\frac{18\ g}{18\ g}$ = 1 M

1 M water contains 1 N_A oxygen atoms

Therefore, total number of oxygen atoms in given solution,

= 0.11 N_A + 1.0 N_A = 1.11N_A

=1.11 x 6.022 x 10^{23} =6.68 x 10^{23}

Q10. A change in the physical state can be brought about:

(a) Only when energy is given to the system.

(b) Only when energy is taken out from the system.

(c) When energy is either given to, or taken out from the system.

(d) Without any energy change.

Answer: (c) When energy is either given to, or taken out from the system.

A change in the physical state can be brought when the energy is either given to or taken out from the system. When a solid changes into liquid, it absorbs the energy. When a liquid changes into solid, it releases the energy.

Q11. Which of the following represent the correct chemical formula? Name it.

(a) CaCl (b) $BiPO_4$

(c) $NaSO_4$ (d) NaS

Answer: (b) $BiPO_4$

In the option (b), Bismuth (Bi) is trivalent and therefore this depicts the correct chemical formula

In the option (a), Ca is bivalent while the chlorine is monovalent thus the correct chemical formula should be as $CaCl_2$.

In the options (c), Na is monovalent while the sulfate radical is bivalent thus the correct chemical formula should be as Na_2SO_4.

In the options (d), Na is monovalent while the sulfur is bivalent thus the correct chemical formula should be as Na_2S. Therefore the $BiPO_4$ represents the correct chemical formula.

Q12. Write the molecular formulae for the following compounds:

(a) Copper (II) bromide

Answer: The valency of copper (metal) is +2. The valency of bromine (non metal) is -1.

Therefore, the molecular formula of Copper (II) bromide is $CuBr_2$.

(b) Aluminum (III) nitrate

Answer: The valency of aluminum is +3 and the valency of nitrate radical is -1.

Therefore, the molecular formula of Aluminum (III) nitrate is Al $(NO_3)_3$.

(c) Calcium (II) phosphate

Answer: The valency of calcium is +2 and the valency of phosphate radical is -3.

Therefore, the molecular formula of Calcium (II) phosphate is Ca_3 $(PO_4)_2$.

(d) Iron (III) sulfide

Answer: The valency of iron is +3 and the valency of sulfur is -2.

Therefore, the molecular formula of Iron (III) sulfide is Fe_2S_3.

(e) Mercury (II) chloride

Answer: The valency of mercury is +2 and the valency of chlorine is -1.

Therefore, the molecular formula of Mercury (II) chloride is $HgCl_2$.

(f) Magnesium (II) acetate

Answer: The valency of magnesium is +2 and the valency of acetate radical is -1.

Therefore, the molecular formula of Magnesium (II) acetate is $Mg(CH_3COO)_2$.

Q13. Write the molecular formulae of all the compounds that can be formed by the combination of following ions:

Ca^{2+}, Na^+, Fe^{3+}, Cl^-, SO_4^{2-}, PO_4^{3-}

Answer: Following is the molecular formulae of all the compounds that can be formed by the combination of given ions:

- $Fe_2(SO_4)_3$
- $FeCl_3$
- Na_2SO_4
- $CuCl_2$
- $Cu_3(PO_4)_2$
- Na_3PO_4
- $FePO_4$
- $CuSO_4$
- NaCl

Q14. Write the cations and anions present (if any) in the following compounds:

(a) CH3COONa (b) NaCl

(c) H2 (d) NH4NO3

Answer:

Given compounds	**Anions**	**Cations**
(a) CH_3COONa	CH_3COO^-	Na^+
(b) NaCl	Cl^-	Na^+
(c) H_2	It is a covalent compound.	_____

(d) NH_4NO_3	NO_3^-	NH_4^+

Q15. Give the formulae of the compounds formed from the following sets of elements:

(a) Calcium and fluorine

Answer: The valency of calcium is +2 and the valency of fluorine is -1.

The formula of compounds formed from Calcium and fluorine is CaF_2.

(b) Hydrogen and sulfur

Answer: The valency of hydrogen is +1 and the valency of sulfur is -2.

The formula of compounds formed from Hydrogen and sulfur is H_2S.

(c) Nitrogen and hydrogen

Answer: The valency of nitrogen is -3. The valency of hydrogen is +1.

The formula of compounds formed from Nitrogen and hydrogen is NH_3.

(d) Carbon and chlorine

Answer: The valency of carbon is +4 and the valency of chlorine is -1.

The formula of compound formed from Carbon and chlorine is CCl_4.

(e) Sodium and oxygen

Answer: The valency of sodium is +1 and the valency of oxygen is -2.

The compound formed from Sodium and oxygen is Na_2O.

(f) Carbon and oxygen

Answer: The valency of carbon is +4 and the valency of oxygen is -2.

The formula of compounds formed from Carbon and oxygen are CO and CO_2.

Q16. Which of the following symbols of elements are incorrect? Give their correct symbols.

(a) Cobalt-CO

Ans: The given symbol for cobalt is incorrect; the correct symbol of cobalt is Co.

(b) Carbon-c

Answer: The given symbol of Carbon is incorrect, the correct symbol of carbon is C.

(c) Aluminum-AL

Answer:: The given symbol of aluminum is incorrect; the correct symbol of aluminum is Al.

(d) Helium-He

Answer: The given symbol for helium is correct. The correct symbol for Helium is He.

(e) Sodium-So

Answer: The given symbol of sodium is incorrect; the correct symbol of sodium is Na.

Q17. Give the chemical formula for the following compounds and compute the ratio by mass of the combining elements in each one of them.

S. No.	Compounds	Chemical formula	Ratio by mass of the combining elements
(a)	Ammonia	NH_3	N : H = 14:3
(b)	Carbon monoxide	CO	C : O= 12 : 16 = 3 :4
(c)	Aluminium fluoride	HCl	H : Cl = 1 : 35.5
(d)	Aluminium fluoride	AlF_3	Al : F=27:57= 9 : 19
(e)	Magnesium sulphide	MgS	Mg : S = 24 : 32 = 3 : 4

Q18. State the number of atoms present in each of the following chemical species

(a) $CO3^{-2}$

(b) $PO4^{-3}$

(c) P_2O^5

(d) CO

Answer:

(a) $CO3^{-2}$ – **1 + 3 = 4**

(b) $PO4^{-3}$ – **1 + 4 = 5**

(c) P_2O_5 – **2 + 5 = 7**

(d) CO – **1 + 1 = 2**

Q19. What is the fraction of the mass of water due to neutrons?

Answer: By Avogadro number the mass of one mole of neutrons is nearly 1 g.

Therefore the mass of one neutron = $\frac{1\ g}{N_A}$

The mass of one molecule of water= $\frac{Molar\ Mass}{N_A} = \frac{18\ g}{N_A}$

There are total 8 neutrons present in one atom of oxygen.

Therefore the mass of 8 neutrons = $\frac{8\ g}{N_A}$

Hence the fraction of the mass of water due to neutrons is nearly equal to $\frac{8\ g}{18}$

Q20. Does the solubility of a substance change with temperature? Explain with the help of an example.

Answer: Yes the solubility of a substance depends on the temperature. Generally the solubility increases with the increase in temperature. For example: The solubility of sugar is less in cold water as that of in hot water.

(a) F_2

Answer: The atomicity of F_2 is 2 atoms.

(b) NO_2

Answer: The atomicity of NO_2 is 3 atoms.

(c) N_2O

Answer: The atomicity of N_2O is 3 atoms.

(d) C_2H_6

Answer: The atomicity of C_2H_6 is 8 atoms.

(e) P_4

Answer: The atomicity of P_4 is 4 atoms.

(f) H_2O_2

Answer: The atomicity of H_2O_2 is 4 atoms.

(g) P_4O_{10}

Answer: The atomicity of P_4O_{10} is 14 atoms.

(h) O_3

Answer: The atomicity of O_3 is 3 atoms.

(i) HCl

Answer: The atomicity of HCl is 2 atoms.

(j) CH_4

Answer: The atomicity of CH_4 is 5 atoms.

(k) He

Answer: The atomicity of He is 1 atom.

(l) Ag

Answer: The polyatomic.

Q21. Does the solubility of a substance change with temperature? Explain with the help of an example.

Answer: Yes the solubility of a substance depends on the temperature. Generally the solubility increases with the increase in temperature. For example: The solubility of sugar is less in cold water as that of in hot water.

Q22. You are provided with a fine white colored powder which is either sugar or salt. How would you identify it without tasting?

Answer:

Heating: Upon heating sugar melts to liquid form because sucrose has a decomposition point and melting point at temperatures between 190 to 192 degrees Celsius. This will turn sugar to light brown colour. On heating further, sugar gets charred to black colour.

Salt has a melting point of 841 degrees Celsius and 1545.8 degrees Fahrenheit. If we don't heat it to that point no change is observed.

Electrical conductivity: If we dissolve the given substance in water we can check for electrical conductivity to check whether the substance is sugar or salt. If it is salt it conducts electricity. Because salt (NaCl) has positive

sodium ions and negative chloride ions hence salt conducts electricity. But sugar doesn't conduct electricity as sugar has only positive ions.

Q23. Calculate the number of moles of magnesium present in a magnesium ribbon weighing 12 g. Molar atomic mass of magnesium is 24 g mol^{-1}.

Answer:

The number of moles = $\frac{Mass\ of\ magnesium\ ribbon}{Molar\ mass} = \frac{12\ g}{24\ g}$ = 0.5 mol

Therefore, the number of moles of the magnesium present in a magnesium ribbon is 0.5 moles.

Q24. Verify by calculating that:

(a) 5 moles of CO_2 and 5 moles of H_2O do not have the same mass.

Ans: We know that,

The molar mass of CO_2 = 44 g mol^{-1}

Therefore the molar mass of 5 moles of CO_2 = 5 × 44 g = 220 g

Also the molar mass of H_2O = 18 g mol^{-1}

Therefore the molar mass of 5 moles of H_2O = 5 × 18 g = 90 g

By the above solution we conclude that the 5 moles of CO_2 have a mass of 220 g and 5 moles of H_2O have a mass of 90 g

Therefore they do not have the similar mass.

(b) 240 g of calcium and 240 g magnesium elements have a mole ratio of 3 : 5.

Ans: We have,

The number of moles in 240 g Ca metal = $\frac{240}{40}$ = 6

Similarly, the number of moles in 240 g of Mg metal = $\frac{240}{24}$ = 10

Therefore, the mole ratio = 6: 10 = 3: 5

Therefore, the mole ration is 3: 5.

Q25. Find the ratio by mass of the combining elements in the following compounds:

(a) $CaCO_3$

Ans: The mass of Ca = 40

The mass of C = 12

Also the mass of O_3 = 16 x 3 = 48

Therefore their ratio by mass will be 40: 12: 48, i.e. 10 : 3 : 12.

(b) $MgCl_2$

Ans: The mass of M g= 24

And the mass of Cl_2 = 35.5 x 2 = 71

Therefore their ratio by mass will be 24 **:** 71.

(c) H_2SO_4

Ans: The mass of H_2 = 1 x 2 = 2

The mass of S =32

Also the mass of O_4 = 16 x 4 = 64

Therefore their ratio by mass will be 2: 32**:** 64 i.e. 1: 16 **:** 32.

(d) C_2H_5OH

Ans: The mass of C_2 = 12 x 2 = 24

The mass of H_6 = 1 x 6 = 6

Also the mass of O = 16

Therefore their ratio by mass will be 24 **:** 6 **:** 16 i.e. 12 **:** 3 **:** 8.

(e) NH_3

Ans: The mass of N = 14

And the mass of H_3 = 1 x 3 = 3

Therefore, their ratio by mass will be 14 : 3.

(f) Ca $(OH)_2$

Ans: The mass of Ca = 40

The mass of O_2 = 16 x 2 = 32

Also the mass of H_2 = 1 x 2 = 2

Therefore their ratio by mass will be 40 **:** 32 **:** 2 i.e. 20 **:** 16 **:** 1.

Q26. Calcium chloride when dissolved in water dissociates into its ions according to the following equation:

$CaCl_{2(aq)}$ $Cl^{2+}_{(aq)}$ + $2Cl^-_{(aq)}$

Calculate the number of ions obtained from $CaCl_2$ when 222 g of it is dissolved in water.

Answer: We know that,

1 mole of calcium chloride = 111 g

Therefore 2 moles of $CaCl_2$ is equivalent to 222 g of $CaCl_2$.

We get 3 ions from 1 formula unit of $CaCl_2$ thus 1 mol of $CaCl_2$ will give 3 moles of ions.

Also by this 2 moles of $CaCl_2$ will give 6 moles of ions.

Hence the no. of ions = no. of moles of ions × Avogadro number

= $6 \times 6.022 \times 10^{23}$

= 36.132×10^{23}

= 3.6132×10^{24} ions

Hence the number of ions obtained from $CaCl_2$ when 222 g of it is dissolved in water is 3.6132×10^{24} ions.

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

Answer: We have the difference between sodium atom and ion as one electron.

Therefore, for the 100 moles each of sodium atoms and ions there will be a difference of 100 moles of electrons.

Therefore, the mass of 100 moles of electrons = 5.48002 g

Therefore, the mass of 1 mole of electron = $\frac{5.48002\ g}{100}$

Also, the mass of one electron = $\frac{5.48002\ g}{100\ x\ 6.022x10^{23}}$ = $9.1x10^{-28}$ g = $9.1x10^{-31}$ Kg

Therefore, the mass of an electron is $9.1x10^{-31}$ Kg.

Q28. Cinnabar (HgS) is a prominent ore of mercury. How many grams of mercury are present in 225 g of pure HgS? Molar mass of Hg and S are 200.6 g mol-1 and 32 g mol- 1 respectively.

Answer: We have,

The molar mass of HgS = 200.6 + 32

= 232.6 g mol^{-1}

Also, the mass of Hg in 232.6 g of HgS = 200.6 g

Therefore, the mass of Hg in 225 g of HgS = $\frac{200.6\ x\ 225}{232.6}$ =194.04 g

Hence 194.04 grams of mercury are present in 225 g of pure HgS.

Q29. The mass of one steel screw is 4.11 g. 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?

Ans: The one mole of screws weigh = $4.11 \times (6.022 \times 10^{23})$

= 2.475×10^{24} g = 2.475×10^{21} kg

Therefore, $\frac{The\ mass\ of\ Earth}{One\ mole\ screw}$ = $\frac{5.98\ x\ 10^{24}\ Kg}{2.475\ x\ 10^{21}}$ = $2.4x\ 10^3$

Hence the mass of the Earth is 2.4x 103 times to that of the mass of one mole of steel screws.

Therefore, the earth is 2400 times heavier than that of one mole of steel screws.

Q30. A sample of vitamin C is known to contain oxygen atoms. How many moles of oxygen atoms are present in the sample?

Answer: The 1 mole of oxygen atoms = 6.022 × 1023 atoms

Therefore, the number of moles of oxygen atoms = $\frac{2.58\ x\ 10^{24}}{6.022\ x\ 10^{23}}$ = 4.28 moles

Therefore 4.28 moles of oxygen atoms are present in the given sample of vitamin C.

Q31. Raunak took 5 moles of carbon atoms in a container and Krish also took 5 moles of sodium atoms in another container of the same weight.

(a) Whose container is heavier?

Answer: The mass of sodium atoms carried by Krish will be (5 x 23) g = 115g

Also, the mass of carbon atom carried by Raunak will be (5 x 12) g = 60g

Hence the container of Krish is heavier than that of the Raunak's container.

Q32. Fill in the missing data in Table given below:

Species property	**H_2O**	**CO_2**	**Na atom**	**$MgCl_2$**
No. of moles	2	---	---	0.5
No. of particles	---	$3.011x10^{23}$	---	---
Mass	36g	---	115g	---

Answer: The number of particles of H_2O is $2 \times 6.022 \times 10^{23} = 1.2044 \times 10^{24}$

Also the no. of moles of CO_2 = $\frac{(3.011\ x\ 10^{23}\ )}{(6.022\ x\ 10^{23})}$ = 0.5 mol

The molar mass of CO2 = the atomic mass of C + (2 × atomic mass O) = 12 + (2 × 16) = 44 g

The mass of 0.5 moles of CO_2 = 0.5 × 44 g = 22 g

The number of moles of sodium (Na) atom = $\frac{115}{23}$ = 5 mol

The number of particles of sodium (Na) atom = $5 \times 6.022 \times 10^{23} = 3.011 \times 10^{24}$

The molar mass of $MgCl_2$ = atomic mass of Mg + (2 × atomic mass of Cl) = 24 + (2 × 35.5) = 95 g

The molar mass of $MgCl_2$ = atomic mass of Mg + (2 × atomic mass of Cl) = 24 + (2 × 35.5) = 95 g

The number of particles of $MgCl_2$ = $0.5 \times 6.022 \times 10^{23} = 3.011 \times 10^{23}$

Therefore, the complete table is as follows:

Species property	**H_2O**	**CO_2**	**Na atom**	**$MgCl_2$**
No. of moles	2	0.5	5	0.5

No. of particles	1.0244×10^{24}	3.011×10^{23}	3.011×10^{24}	3.011×10^{23}
Mass	36g	22g	115g	47.5g

Q33. The visible universe is estimated to contain 1022 stars. How many moles of stars are present in the visible Universe?

Answer: The number of moles of stars in the visible Universe will be calculated as:

$= 10 / 6.023 \times 10^{23} = 0.0166$ moles

Therefore, the number of moles of stars present in the visible Universe is 0.0166 moles.

Q34. What is the SI prefix for each of the following multiples and submultiples of a unit?

(a) 10^3

Answer: The SI prefix for the above unit is kilo.

(b) 10^{-1}

Answer: The SI prefix for the above unit is deci.

(c) 10^{-2}

Answer: The SI prefix for the above unit is centi.

(d) 10^{-6}

Answer: The SI prefix for the above unit is micro.

(e) 10^{-9}

Answer: The SI prefix for the above unit is nano.

(f) 10^{-12}

Answer: The SI prefix for the above unit is pico.

Q35. Express each of the following in kilograms:

(a) 5.84 × 10-3 mg

Answer: 5.84 × 10-3 mg = 5.84×10^{-9} Kg

(b) 58.34 g

Answer: 58.34 g= 5.834×10^{-2} Kg

(c) 0.584 g

Answer: 0.584 g=5.84×10^{-4} Kg

(d) 5.873×10^{-21} g

Answer: 5.873×10^{-21} g = 5.837×10^{-24}

Q36. Compute the difference in masses of 103 moles each of magnesium atoms and magnesium ions. (Mass of an electron = 9.1 × 10-31 kg)

Answer: There is a difference of two electrons between the Mg^{2+} ion and Mg atom.

Therefore, there will be 2x103 moles of electrons difference between 103 moles of Mg^{2+} and Mg atoms.

Hence the mass of 2 × 103 moles of electrons = (2 x 103 x 6.023 x 10^{23} x 9.1 x 10^{-31}) Kg

= 2 x 6.022 x 9.1 x 10^{-3} Kg

= 1.096 x 10^{-3} Kg

Hence the difference in masses of 103 moles each of magnesium atoms and magnesium ions is 1.096 x 10^{-3} Kg.

Q37. Which has more number of atoms?

100 g of N_2, 100 g of NH_3

Answer: The 100 g of N_2 = $\frac{100\ Moles}{28}$

Therefore, the number of atoms of N_2 = 2 x $\frac{100}{28}$ x 0.622 x 10^{23} = 43.01 x 10^{23}

The 100 g of NH_3 = $\frac{100\ Moles}{17}$

Therefore the number of atoms of NH_3 = 4 x $\frac{100}{17}$ x 6.022 x 10^{23} = =141.69 x 10^{23}

Hence NH_3 has more number of atoms.

Q38. Compute the number of ions present in 5.85 g of sodium chloride.

Answer: The 5.85 g of NaCl = (5.58/5.58) = 0.1 moles

Or we can say 0.1 moles of NaCl particle

Therefore, each NaCl particle is equivalent to one Na+ and one Cl-

For 2 ions

Therefore, the total moles of ions = 0.1 × 2

For 2 moles

No. of ions = 0.2 x 6.02 2x 10^{23} = 1.2042 x 10^{23} ions

Therefore, the number of ions present in 5.85 g of sodium chloride is 1.2042 x 10^{23}.

Q39. 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?

Ans: we know that the one gram of gold sample will contain 0.9 g of gold.

Therefore, the number of moles of gold = $\frac{Mass\ of\ gold}{Atomic\ mass\ of\ gold}$ = $\frac{0.9}{197}$ = 0.0046

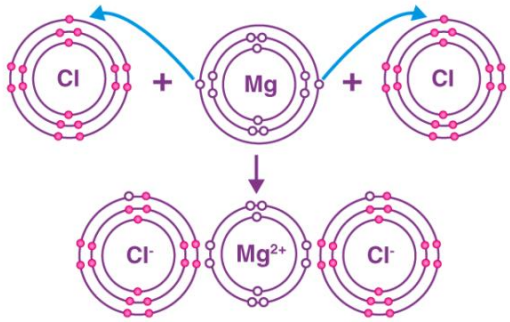
Therefore, one moles of gold contains N_A atoms = 6.022 x 10^{23}

Hence 0.0046 mole of gold will contain = 0.0046 x 6.022 10^{23} = 2.77x10^{21}

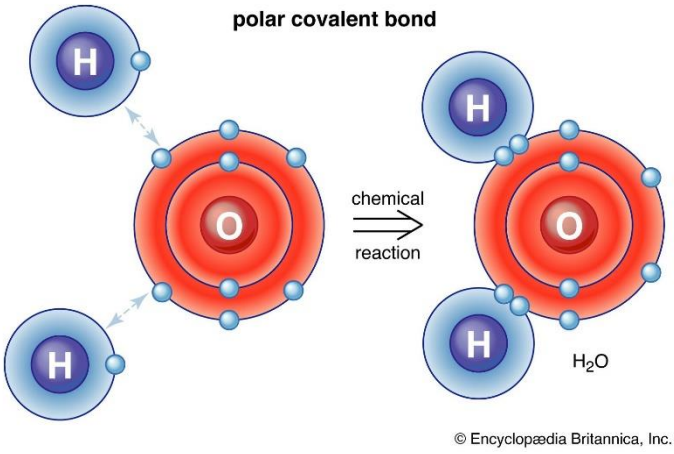
Therefore, the atoms of gold present in one gram of a given sample of gold is 2.77x10^{21}.

Q40. What are ionic and molecular compounds? Give examples.

- **Answer:** The compounds that contain charged species of metals as well as nonmetals are called the ionic compounds. The charged species present are called the ions. An ion is a charged particle and can be charged negatively or positively. A negatively charged ion is called an anion and the positively charged ion is called cation.



- The ionic compounds are formed when the ionic bonds are formed between the different elements through the transfer of electrons. The examples of ionic compounds are sodium chloride, calcium oxide etc.



- The molecular compounds or the covalent compounds are those compounds in which the elements share electrons through the covalent bonds. The examples are water, ammonia, and carbon dioxide etc.

Q41. Compute the difference in masses of one mole each of aluminium atoms and one mole of its ions. (Mass of an electron is 9.1 x 10-28 g). Which one is heavier?

Answer: The mass of 1 mole of aluminium atom is equal to the molar mass of aluminium which is equal to 27 g mol^{-1}.

The aluminium atom needs to lose their three electrons to become an ion Al^{3+}

For the one mole of Al^{3+} ion there will be lose of three moles of electrons.

Therefore, the mass of the three moles of electrons= 3 x (9.1 x 10^{-28}) x 6.022 x 10^{23} g

= 64.400 x 10^{-5} g = 0.00164 g

Therefore, the molar mass of Al^{3+} = (27-0.00164) $gmol^{-1}$ = 26.998

Hence the difference in mass will be as 27 - 26.9964 = 0.0016 g

Q42. 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: We have the mass of silver = m g

Also the mass of gold= m/100 g

The number of atoms of silver=mass x N_A

Atomic mass = m /108 x N_A

Therefore the number of atoms of gold= m/ (100 x1 97) x N_A

Therefore the ratio of number of atoms of gold to that of silver is

= Number of atoms of Au: Number of atoms of Ag

= m / (100 x 197) x N_A : m /108 x N_A

108: 100 x 197 = 1 : 182.41

Q43. A sample of ethane (C_2H_6) gas has the same mass as $1.5x10^{20}$ molecules of methane (CH_4). How many C_2H_6 molecules does the sample of gas contain?

Ans: Mass of 1 molecule of methane (CH_4) = $\frac{16}{N_A}$ g

The mass of $1.5x\ 10^{20}$ molecules of methane = $\frac{1.5\ x\ 10^{20}\ x\ 16}{N_A}\ g$

Mass of x C_2H_6 molecules = $\frac{1.5\ x\ 10^{20}\ x\ 16}{N_A}\ g$

But mass of 1 molecule of C_2H_6 = $\frac{30}{N_A}\ g$

Therefore, Number of molecules of ethane (x) = $\frac{1.5\ x\ 10^{20}\ x\ 16}{N_A}\ x\ \frac{N^A}{30}$ = 0.8×10^{20}

Q44. Fill in the blanks:

(a) In a chemical reaction, the sum of the masses of the reactants and products remains unchanged. This is called _____.

Answer: In a chemical reaction, the sum of the masses of the reactants and products remains unchanged. This is called law of conservation of mass.

(b) A group of atoms carrying a fixed charge on them is called _____.

Ans: A group of atoms carrying a fixed charge on them is called polyatomic ion.

(c) The formula unit mass of $Ca_3(PO_4)_2$ is _____.

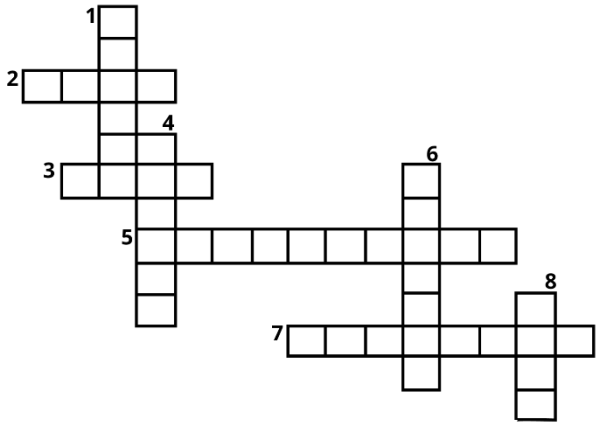
Ans: The formula unit mass of $Ca_3(PO_4)_2$ is (3 × atomic mass of Ca) + (2 × atomic mass of phosphorus) + (8 × atomic mass of oxygen) = 310

(d) Formula of sodium carbonate is _____ and that of ammonium sulphate is _____.

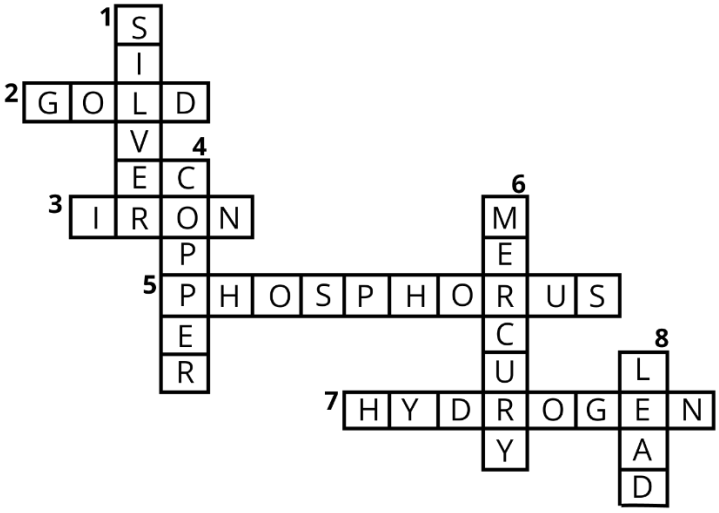
Ans: Formula of sodium carbonate is Na_2CO_3 and that of ammonium sulphate is $(NH_4)_2SO_4$.

Q45. Complete the following crossword puzzle (Fig. 3.1) by using the name of the chemical elements. Use the data given in Table 3.2.

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

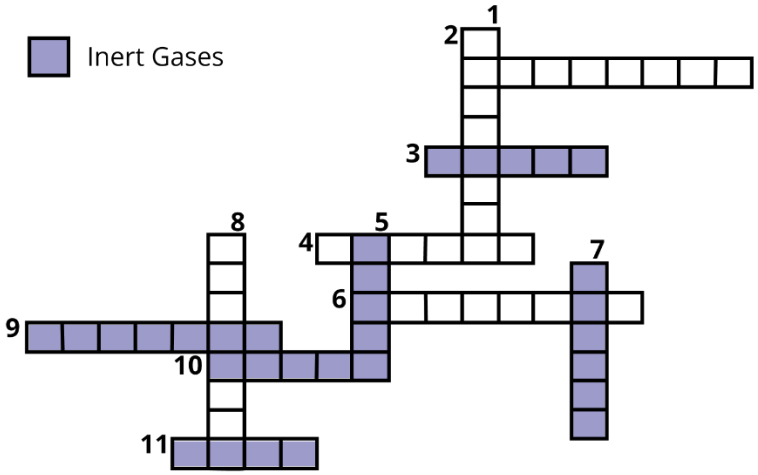


Answer:

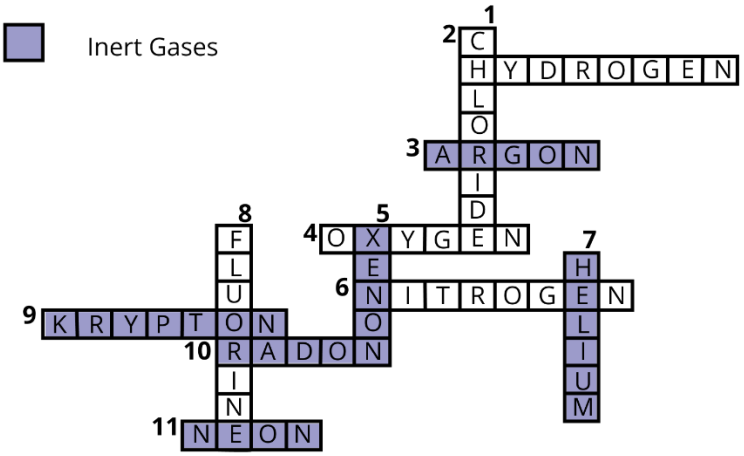


1. Silver (2) Gold (3) iron (4) Copper (5) Phosphorus (6) Mercury (7) Hydrogen (8) Lead

Q46. (a) In this crossword puzzle (Fig 3.2), 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.) (7.) He (8.) F (9.) Kr (10.) Rn (11.) Ne



Answer.



(b) Identify the total number of inert gasses, their names and symbols from this cross word puzzle.

Ans: Insert Gasses: There are six insert gasses in this crossword which are Helium (He), Argon (Ar), Xenon (Xe), Krypton (Kr), Radon (Rn) and Neon (Ne).

Q47. Write the formula for the following and calculate the molecular mass for each one of them. (a) Caustic potash (b) Baking powder (c) Limestone (d) Caustic soda (e) Ethanol (f) Common salt

Answer:

The formulae for the given and calculate the molecular mass for each one of them as is follows:

Sr. No.	Compound	Formula	Molecular mass

a	Caustic Potash	KOH	39 + 16 + 1 = 56u
b	Baking powder	$NaHCO_3$	23 + 1 + 12 + 3 × 16 = 84u
c	Limestone	$CaCO_3$	40 + 12 + 3 × 16 = 100u
d	Caustic soda	NaOH	23 + 16 + 1 = 40u
e	Ethanol	C_2H_5OH	2 × 2 + 5 × 1 + 16 + 1 = 46u
f	Common Salt	NaCl	23 + 35.5 = 58.5

Q48. In photosynthesis, 6 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 be required to produce 18 g of glucose? Compute the volume of water so consumed assuming the density of water to be 1 g cm^{-3}.

Answer: The equation for photosynthesis is as follows:

$6CO_2 + 6\ H_2\ O$ (in the presence of Chlorophyll /Sunlight) → $C_6\ H_{12}\ O_6 + 6O_2$

Therefore 1 mole of glucose needs 6 moles of water and the 180 g of glucose needs (6×18) g of water and 1 g of glucose will need 108/ 180 g of water.

Thus 18 g of glucose will need (108 /180) × 18 g of water i.e. 10.8 g

Now the volume of water used = Mass / Density = 10.8 g/ 1g cm-3

= 10.8 cm^3

Hence the volume of water is 10.8 cm^3.