

ASSIGNMENT QUESTIONS SET – 3

CHAPTER – 3

ATOMS AND MOLECULES

1. Avogadro's number represents the number of atoms in
(a) 12g of Cl_2 (b) 320g of sulphur
(c) 32g of oxygen (d) 12.7g of iodine
2. The number of moles of carbon dioxide which contain 8 g of oxygen is
(a) 0.5 mol (b) 0.20 mol
(c) 0.40 mol (d) 0.25 mol
3. The total no of ions present in 111 g of CaCl_2 is
(a) One mole (b) Two mole
(c) Three mole (d) Four moles
4. Which of the following weighs the most ?
(a) one g-atom of nitrogen (b) One mole of water
(c) One mole of sodium (d) One molecule of H_2SO_4
5. 5.0 litre of 0.4 M H_2SO_4 Contains-
(a) 2.0 Mole Of H_2SO_4 (b) 0.4 mole H_2SO_4
(c) 5.0 mole H_2SO_4 (d) 2.0 moles H_2O
6. Which of the following correctly represents 360 g of water?
(i) 2 moles of H_2O
(ii) 20 moles of water
(iii) 6.022×10^{23} molecules of water
(iv) 1.2044×10^{25} molecules of water
(a) (i) (b) (i) and (iv)
(c) (ii) and (iii) (d) (ii) and (iv)
7. 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
8. The chemical symbol for nitrogen gas is
(a) Ni (b) N_2 (c) N^+ (d) N
9. The chemical symbol for sodium is
(a) So (b) Sd (c) NA (d) Na
10. Which of the following would weigh the highest?
(a) 0.2 mole of sucrose ($\text{C}_{12} \text{H}_{22} \text{O}_{11}$)
(b) 2 moles of CO_2
(c) 2 moles of CaCO_3
(d) 10 moles of H_2O

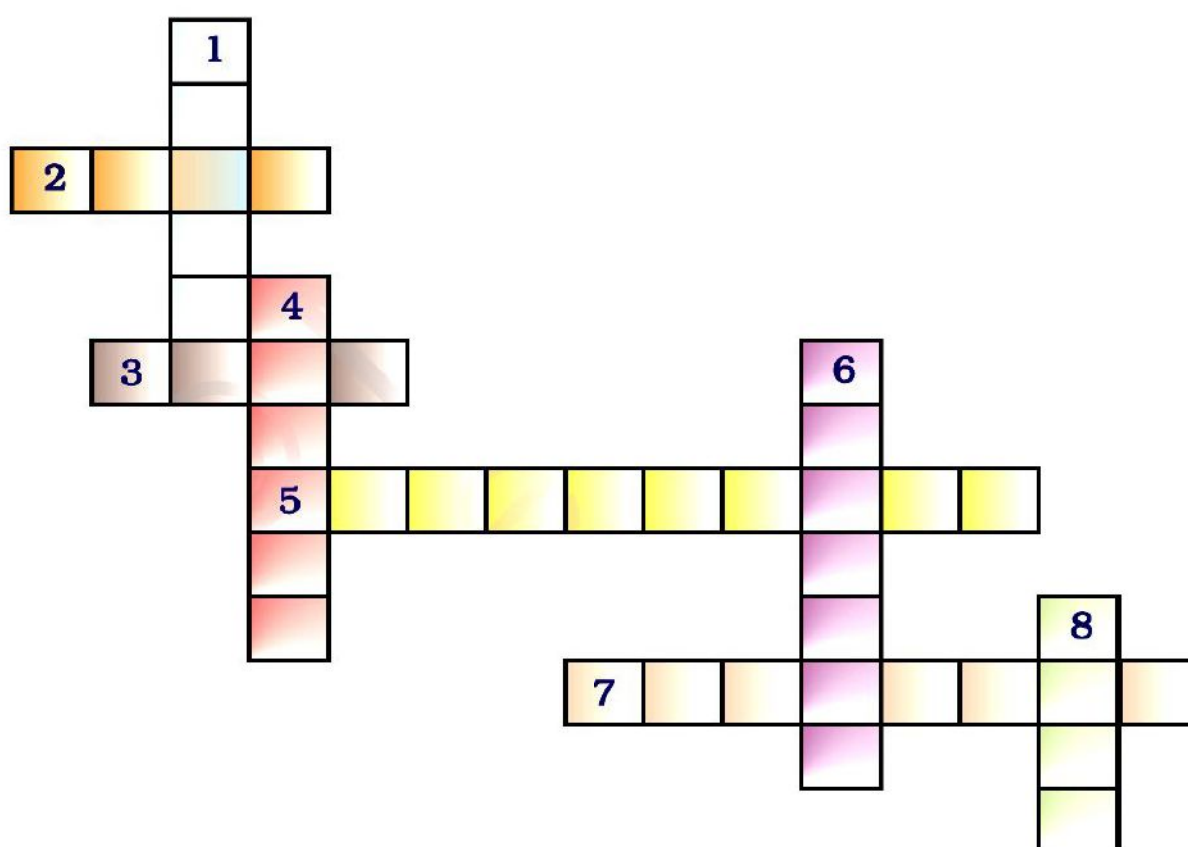
11. Which of the following has maximum number of atoms?
 (a) 18g of H₂O
 (b) 18g of O₂
 (c) 18g of CO₂
 (d) 18g of CH₄
12. Which of the following contains maximum number of molecules?
 (a) 1g CO₂
 (b) 1g N₂
 (c) 1g H₂
 (d) 1g CH₄
13. Mass of one atom of oxygen is
 (a) $\frac{16}{6.023 \times 10^{23}} \text{ g}$ (b) $\frac{32}{6.023 \times 10^{23}} \text{ g}$ (c) $\frac{1}{6.023 \times 10^{23}} \text{ g}$ (d) 8u
14. 3.42 g of sucrose are dissolved in 18g of water in a beaker. The number of oxygen atoms in the solution are
 (a) 6.68×10^{23}
 (b) 6.09×10^{22}
 (c) 6.022×10^{23}
 (d) 6.022×10^{21}
15. 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
16. Which of the following represents a correct chemical formula? Name it.
 (a) CaCl (b) BiPO₄ (c) NaSO₄ (d) NaS
17. Write the molecular formulae for the following compounds
 (a) Copper (II) bromide
 (b) Aluminium (III) nitrate
 (c) Calcium (II) phosphate
 (d) Iron (III) sulphide
 (e) Mercury (II) chloride
 (f) Magnesium (II) acetate
18. Write the molecular formulae of all the compounds that can be formed by the combination of following ions
 Cu²⁺, Na⁺, Fe³⁺, Cl⁻, SO₄²⁻, PO₄³⁻
19. Write the cations and anions present (if any) in the following compounds
 (a) CH₃COONa
 (b) NaCl
 (c) H₂
 (d) NH₄NO₃
20. 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
21. Which of the following symbols of elements are incorrect? Give their correct symbols
- (a) Cobalt CO
 - (b) Carbon c
 - (c) Aluminium AL
 - (d) Helium He
 - (e) Sodium So
22. Give the chemical formulae for the following compounds and compute the ratio by mass of the combining elements in each one of them.
- (a) Ammonia
 - (b) Carbon monoxide
 - (c) Hydrogen chloride
 - (d) Aluminium fluoride
 - (e) Magnesium sulphide
23. State the number of atoms present in each of the following chemical species
- (a) CO_3^{2-}
 - (b) PO_4^{3-}
 - (c) P_2O_5
 - (d) CO
24. Find the ratio by mass of the combining elements in the compound – $\text{C}_2\text{H}_5\text{OH}$.
25. Give the formula of the compound formed by the elements calcium and fluorine.
26. What is the acid radical present in sodium peroxide?
27. Carbon and silicon have the same valency. What is the formula of sodium silicate?
28. What is the ratio by number of atoms in mercurous chloride?
29. Name the element whose Latin name is Stibium.
30. What is the valency of a sulphide ion?
31. How many atoms of oxygen are present in 50g of CaCO_3 ?
32. How many molecules are present in 1 ml of water?
33. What is the unit of measurement of atomic radius?
34. Name the international organization who approves names of elements.
35. How do we know the presence of atoms if they do not exist independently for most of the elements?
36. Give an example to show Law of conservation of mass applies to physical change also.
37. Explain with example that law of conservation of mass is valid for chemical reactions.
38. Is there any exception to law of conservation of mass?

39. In a reaction, 5.3 g of sodium carbonate reacted with 6 g of ethanoic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium ethanoate. Show that these observations are in agreement with the law of conservation of mass.
- sodium carbonate + ethanoic acid \rightarrow sodium ethanoate + carbon dioxide + water
40. If 12 g of carbon is burnt in the presence of 32 g of oxygen, how much carbon dioxide will be formed?
41. A 0.24 g sample of compound of oxygen and boron was found by analysis to contain 0.096 g of boron and 0.144 g of oxygen. Calculate the percentage composition of the compound by weight.
42. When 3.0 g of carbon is burnt in 8.00 g oxygen, 11.00 g of carbon dioxide is produced. What mass of carbon dioxide will be formed when 3.00 g of carbon is burnt in 50.00 g of oxygen? Which law of chemical combination will govern your answer?
43. Magnesium and oxygen combine in the ratio of 3 : 2 by mass to form magnesium oxide. How much oxygen is required to react completely with 12 g of magnesium?
44. Why are Dalton's symbol not used in chemistry?
45. What is the fraction of the mass of water due to neutrons?
46. Does the solubility of a substance change with temperature? Explain with the help of an example.
47. Classify each of the following on the basis of their atomicity.
- | | | | | | |
|------------------------------------|---------------------|----------------------|-----------------------------------|--------------------|-----------------------------------|
| (a) F ₂ | (b) NO ₂ | (c) N ₂ O | (d) C ₂ H ₆ | (e) P ₄ | (f) H ₂ O ₂ |
| (g) P ₄ O ₁₀ | (h) O ₃ | (i) HCl | (j) CH ₄ | (k) He | (l) Ag |
48. You are provided with a fine white coloured powder which is either sugar or salt. How would you identify it without tasting?
49. Calculate the number of moles of magnesium present in a magnesium ribbon weighing 12 g. Molar atomic mass of magnesium is 24g mol⁻¹.
50. Verify by calculating that
- (a) 5 moles of CO₂ and 5 moles of H₂O do not have the same mass.
 - (b) 240 g of calcium and 240 g magnesium elements have a mole ratio of 3:5.
51. Find the ratio by mass of the combining elements in the following compounds.
- (a) CaCO₃ (d) C₂H₅OH
 - (b) MgCl₂ (e) NH₃
 - (c) H₂SO₄ (f) Ca(OH)₂
52. Calcium chloride when dissolved in water dissociates into its ions according to the following equation.
- $$\text{CaCl}_2 (\text{aq}) \rightarrow \text{Ca}^{2+} (\text{aq}) + 2\text{Cl}^- (\text{aq})$$
- Calculate the number of ions obtained from CaCl₂ when 222 g of it is dissolved in water.
53. The difference in the mass of 100 moles each of sodium atoms and sodium ions is 5.48002g. Compute the mass of an electron.

54. Complete the following crossword puzzle (below Figure) by using the name of the chemical elements. Use the data given in below Table

Table 3.2	
Across	Down
2. The element used by Rutherford during his α -scattering experiment	1. A white lustrous metal used for making ornaments and which 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 the element
5. A very reactive non-metal stored under water	6. The metal which exists in the liquid state at room temperature
7. Zinc metal when treated with dilute hydrochloric acid produces a gas of this element which when tested with burning splinter produces a pop sound.	8. An element with symbol Pb



55. Fill in the missing data in the below Table

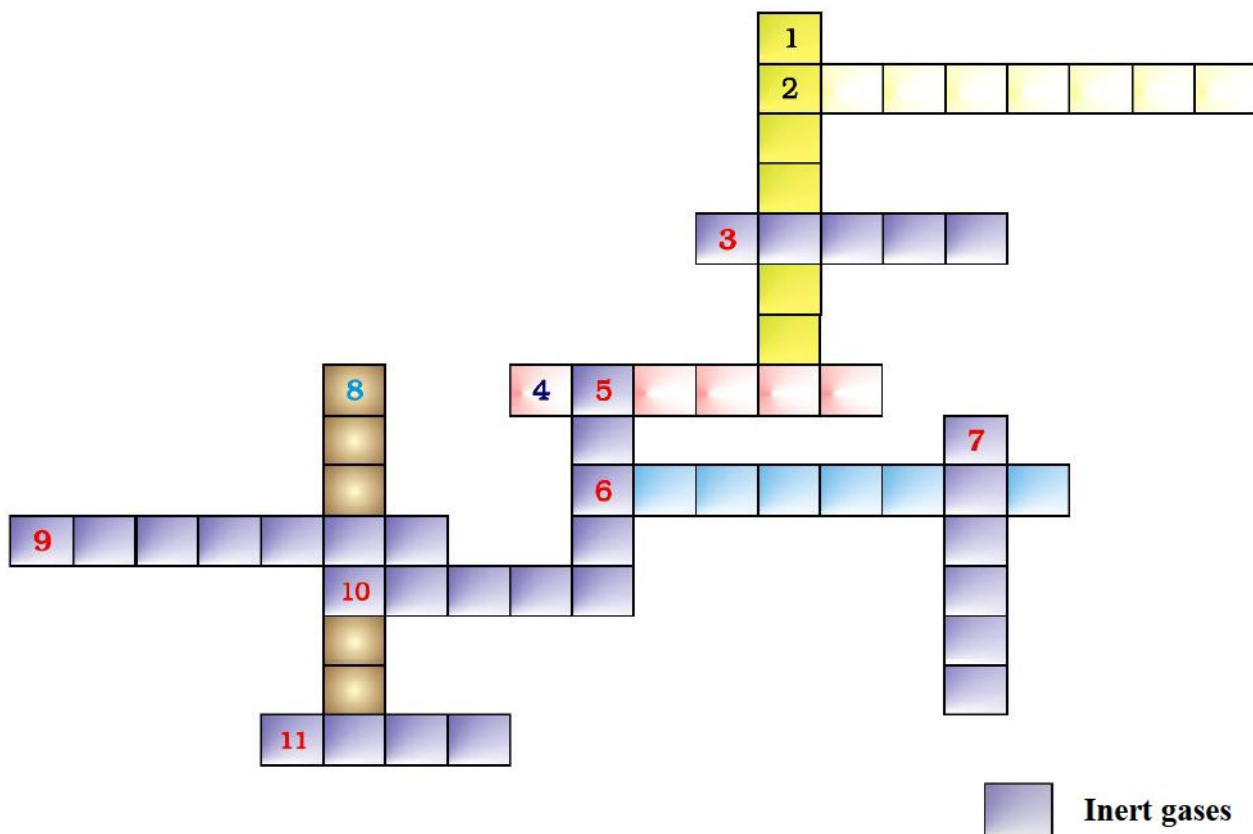
Species	H ₂ O	CO ₂	Na atom	MgCl ₂
Property				
No of moles	2			0.5
No. of particles		3.011×10^{23}		
Mass	36g		115g	

56. The visible universe is estimated to contain 10^{22} stars. How many moles of stars are present in the visible universe?

57. 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}

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



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

59. Express each of the following in kilograms

- 5.84×10^{-3} mg
- 58.34 g
- 0.584g
- 5.873×10^{-21} g

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

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

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

63. 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?

64. 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.
65. 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?
66. A sample of vitamic C is known to contain 2.58×10^{24} oxygen atoms. How many moles of oxygen atoms are present in the sample?
67. Raunak took 5 moles of carbon atoms in a container and Krish also took 5 moles of sodium atoms in another container of same weight. (a) Whose container is heavier? (b) Whose container has more number of atoms?
68. What are ionic and molecular compounds? Give examples.
69. Compute the difference in masses of one mole each of aluminium atoms and one mole of its ions. (Mass of an electron is 9.1×10^{-28} g). Which one is heavier?
70. 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.
71. A sample of ethane (C_2H_6) gas has the same mass as 1.5×10^{20} molecules of methane (CH_4). How many C_2H_6 molecules does the sample of gas contain?
72. 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 $\text{Ca}_3(\text{PO}_4)_2$ is _____.
 (d) Formula of sodium carbonate is _____ and that of ammonium sulphate is -----
 -----.
73. Write the formulae for the following and calculate the molecular mass for each one of them.
 (a) Caustic potash
 (b) Baking powder
 (c) Lime stone
 (d) Caustic soda
 (e) Ethanol
 (f) Common salt
74. 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 $\text{C}_6\text{H}_{12}\text{O}_6$. 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} .
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