

CHEMISTRY

BOOKS - S DINESH & CO CHEMISTRY (HINGLISH)

ATOMS AND MOLECULES

Example

1. In a reaction 4.0g of sodium carbonate were reacted with 10g of hydrochloric acid solution. The product was a mixture of 2.5g of carbon dioxide and 11.5g of sodium chloride solution. Is this data in agreement with the law of conservation of mass?



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2. If $6.3g$ of $NaHCO_3$ are added to $15.0g$ CH_3COOH solution, the residue is found of weight $18.0g$. What is the mass of CO_2 released in the reaction?

A. $4.5g$

B. $3.3g$

C. $2.6g$

D. $2.8g$

Answer: B

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3. In a reaction $5.3g$ of sodium carbonate reactants with $6g$ of ethanoic acid. The products were $2.2g$ of carbon dioxide, $0.9g$ water and some sodium ethanoate. What is the expected weight of sodium ethanoate?

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4. Hydrogen and oxygen combine in the ratio of 1:8 by mass to form water.

What mass of oxygen will be required completely with 4g of hydrogen?

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5. If the law of constant composition is true, what weights of calcium, carbon, and oxygen are present in 1.5g of calcium carbonate, if a sample of calcium carbonate from another source contains the following percentage composition: $Ca = 40.0\%$, $C = 12.0\%$, and $O = 48.0\%$?

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6. 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.

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7. When 5g of calcium is burnt in 2g of oxygen, then 7 g of calcium oxide is produced. What mass of calcium oxide will be produced when 50g of calcium is burnt in 20 g of oxygen ? Which law of chemical combination will govern your answer ?

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8. Write down the formulae of (i) aluminium hydroxide, (ii) hydrogen sulphide (iii) ammonium sulphate, (iv) sodium carbonate (v) calcium phosphate, (vi) potassium chromate.

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9. An element 'X' forms an oxide with formula X_2O_5

(i) State the valency of X.

(ii) Write the formula of (a) chloride (b) sulphate (c) nitrate (d) phosphate of X.

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10. Calculate the molecular mass of the following substance

(i) water (H_2O) (ii) Sulphur dioxide (SO_2)

(iii) Oxygen molecule (O_2) (iv) Carbon monoxide (CO)



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11. Arrive at the chemical formulae of calcium nitrate. Calculate its percentage composition.



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12. On analysing an impure sample of sodium chloride, the percentage of chlorine was found to be 45.5. What is the percentage of pure sodium chloride in the sample ?



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13. Calculate the mass of 0.72gram molecule of carbon dioxide (CO_2)

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14. Calculate the number of moles of iron in a sample containing 10^{22} atoms of iron.

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15. Calculate the number of moles in the following

(i) 28g of He (ii) He of Na. (ii) 60g of Ca

Given gram atomic mass of (i) He=4g (ii) Na=23g (iii)Ca=40g.

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16. Calculate the mass of the following:

(i) 0.5moles of O_2 gas (ii) 0.5moles of O atoms

(iii) 3.011×10^{23} atoms of O (iv) 6.022×10^{23} molecules of O_2

(Given: Gram atomic mass of oxygen=16g)

Gram of molecular mass of oxygen (O_2)=32g)

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17. Calculate the number of oxygen atoms present in 120g of nitric acid (HNO_3)

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18. What is the mass of 'u' of

(a) 1 mole of nitrogen atoms (b) 4 moles of aluminium atoms

(iii) 10 moles of sodium sulphate (d) 5 moles of calcium carbonate.

(Atomic mass of N = $14u$, Al = $27u$, Na = $23u$, S = $32u$, O = $16u$, Ca = $40u$)

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19. Calculate the weight of carbon monoxide having the same number of oxygen atoms as are present in 22g of carbon dioxide

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20. The number of oxygen atoms in 20gram of sulphur trioxide is the same as those present in the X g of ozone. The atomic mass of sulphur and oxygen are 32u and 16u respectively. Find the value of X.

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21. Find out the ratio by mass of combining elements in the following compounds

(a) $MgCO_3$ (b) CH_3OH (c) $CaCl_2$ (d) H_2SO_4 (e) $Ca(OH)_2$ (f) NH_2

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22. Write the chemical formula of the following compounds and also calculate their formula mass

(a) Baking soda (b) Caustic soda (c) Common salt (d) Magnesium (e) Sodium carbonate.

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23. Calculate formula unit mass of $CuSO_4$

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24. Calculate the volume occupied by 66.0g of carbon dioxide (CO_2) under N.T.P conditions.

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1. In a reaction, 5.3 g of sodium carbonate reacted with 6 g of acetic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium acetate. Show that these observations are in agreement with the law of conservation of mass.

sodium carbonate + acetic acid \rightarrow sodium acetate + carbon dioxide + water

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2. Hydrogen and oxygen combine in the ratio of 1:8 by mass to form water. What mass of oxygen gas would be required to react completely with 3 g of hydrogen gas?

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3. Which postulate of Dalton's atomic theory is the result of the law of conservation of mass?

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4. Which postulate of Dalton's atomic theory can explain the law of definite proportions?

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5. Define the atomic mass unit.

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6. Why is it not possible to see an atom with naked eyes?

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7. Write down the formulae of

(i) sodium oxide

(ii) aluminium chloride

(iii) sodium sulphide

(iv) magnesium hydroxide

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8. Write down the names of compounds represented by the following formulae. Also show the ions present in them :

(i) $Al_2(SO_4)_3$, (ii) $CaCl_2$, (iii) K_2SO_4 , (iv) KNO_3 , (v) $CaCO_3$

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9. What is meant by the term chemical formula?

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10. How many atoms are present in a

(i) H_2S molecule and

(ii) PO_4^{3-} ion?

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11. Calculate the molecular masses of H_2 , O_2 , Cl_2 , CO_2 , CH_4 , C_2H_6 , C_2H_4 , NH_3 , CH_3OH .

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12. Calculate the formula unit masses of ZnO , Na_2O , K_2CO_3 , given atomic masses of $Zn = 65 \text{ u}$, $Na = 23 \text{ u}$, $K = 39 \text{ u}$, $C = 12 \text{ u}$, and $O = 16 \text{ u}$.

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13. Calculate the number of moles for the following:

(i) 52 g of He (finding mole from mass)

(ii) $12.044 \times 10_{23}$ number of He atoms (finding mole from number of particles).

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14. Calculate the number of particles in each of the following:

(i) 46 g of Na atoms (number from mass)

(ii) 8gO₂ molecules (number of molecules from mass)

(iii) 0.1 mole of carbon atoms (number from given moles)

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15. If one mole of carbon atoms weighs 12 grams, what is the mass (in grams) of 1 atom of carbon?

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16. Which has more number of atoms, 100 grams of sodium or 100 grams of iron (given, atomic mass of Na = 23 u, Fe = 56 u)?

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1. 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.

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2. 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?

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3. What are polyatomic ions? Give examples.

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4. Write the chemical formulae of the following:

(a) Magnesium chloride (b) Calcium oxide (c) Copper nitrate

(d) Aluminium chloride (e) Calcium carbonate (f) Zinc sulphate.

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5. Give the names of the elements present in the following compounds:

(a) Quicklime (B) Hydrogen bromide (c) Baking soda (D) Potassium sulphate

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6. Calculate the molar mass of the following substances.

(a) Ethyne, C_2H_2

(b) Sulphur molecule, S_8

(c) Phosphorus molecule, P_4 (Atomic mass of phosphorus = 31)

(d) Hydrochloric acid, HCl

(e) Nitric acid, HNO_3



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7. What is the mass of—

- (a) 1 mole of nitrogen atoms?
- (b) 4 moles of aluminium atoms (Atomic mass of aluminium = 27)?
- (c) 10 moles of sodium sulphite (Na_2SO_3)?



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8. Convert into mole.

- (a) 12 g of oxygen gas
- (b) 20 g of water
- (c) 22 g of carbon dioxide.



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9. What is the mass of:

- (a) 0.2 mole of oxygen atoms?

(b) 0.5 mole of water molecules?

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10. Calculate the number of molecules of sulphur (S_8) present in 16 g of solid sulphur.

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11. Calculate the number of aluminium ions present in 0.051 g of aluminium oxide.

(Hint: The mass of an ion is the same as that of an atom of the same element. Atomic mass of Al = 27 u)

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Very Short Answer Questions

1. Out of atoms and molecules, which can exist independently?

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2. What does the symbol 'u' represent?

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3. Write the chemical symbols and Latin names of (i) gold (ii) mercury?

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4. Are the mass of a molecule of a substance and its molar mass same?

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5. How are mass, molar mass and number of moles of a substance related to each other

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6. Avogadro's number represents how many particles?

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7. Give an example of (i) a divalent anion (ii) a trivalent cation (iii) a monovalent anion.

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8. Calculate the molar mass of ethyl alcohol (C_2H_5OH).

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9. If 16g of oxygen contains 1 mole of oxygen atoms, calculate the mass of one atom of oxygen.

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10. What is the valency of calcium in $CaCO_3$?

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11. What happens to an element A if its atom gains two electrons?

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12. Why is a cation so named?

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13. An element Z forms an oxide with formula Z_2O_3 . What is its valency?

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14. The valency of an element A is 4. Write the formula of its oxide.

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15. An element X has valency 3 while the element Y has valency 2. Write the formula of the compound between X and Y

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16. Formula of the carbonate of a metal M is M_2CO_3 . Write the formula of its chloride.

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17. What do you understand from the statement "relative atomic mass of sulphur is 32°?"

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18. Calculate the formula unit mass of $CaCl_2$.

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19. Which of the following represents the correct chemical formula?

(i) $NaSO_4$, (ii) $CaPO_4$ (iii) ZnS (iv) $AlSO_4$

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20. Sample A contains one gram molecules of oxygen molecules and sample B contains one mole of oxygen molecules. What is the ratio of the number of molecules in both the sample?

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21. Gram molecular mass of ammonia (NH_3) is 17 g Is it correct to regard it as formula unit mass also?

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22. Give one example each of polyatomic element and polyatomic ion

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23. Name the element which is used as a reference for the atomic masses of the elements.

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24. Four samples of water [H_2O] are collected from different sources, Each sample on analysis was found to contain same percentage of oxygen.

Which law of chemical combination is demonstrated by the above observation?

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25. Identify the cations and anions in the following compounds:

(a) CH_3COONa (b) NH_3 (c) NH_4Cl (iv) $SrCl_2$.

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26. Classify the following based on atomicity

(a) O_3 (b) P_4 (c) Sg.

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27. Which of the following symbols of elements are incorrect? Write correct symbols

(a) Iron (Ir) (6) Gold (Au) (l) Manganese (M) (d) Potassium (Po) (e) Zinc (ZN)

F Calcium (Ca)

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28. Give the example of trivalent cation and monovalent anion. Write the formula of the compound formed by their combination.

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29. Name the compound $Al_2(SO_4)_3$, and mention the ions present in it.

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30. Write the formulae and the names of the ions formed by the combination of (i) Fe^{3+} and SO_4^{2-} (ii) NH_4^+ and CO_3^{2-}

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31. Name a non-metal which is tetratomic.

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32. Name the cation and anion which constitute the molecule of magnesium oxide.

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33. An element has valency 3. Write the formula of its oxide.

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34. An element has valency 3. Write the formula of its oxide.

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35. What do you understand by 1 amu?

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36. What is meant by atomicity? Explain with two examples.

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37. Write the Latin names of sodium and iron.

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38. What do you understand by the word mole?

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39. What name is given to the number 6.022×10^{23} ?

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Short Answer

1. List the elements present in (i) quick lime (ii) sodium hydrogen carbonate

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2. Convert into moles:

(i) 20g of water (ii) 20g of carbon dioxide

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3. (a) How many moles are present in 11.5g of sodium?

(b) The mass of an atom of element (X) is $2.0 \times 10^{-23} \text{g}$. Calculate its atomic mass.

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4. (a) How many particles are represented by 0.25 mole of an element?

(b) Out of 4g of methane and 11 g of CO_2 , Does they contain equal no. of molecules ($1N_A = 6.022 \times 10^{23}$ molecules)

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5. What is the number of molecules present in 1-5 mole of ammonia (NH_3)?

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6. Write the chemical symbols of two elements

(a) Which are formed from the first letter of the elements name.

(b) Whose name has been taken from the names of the elements in Latin.

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7. (a) Four samples of carbon dioxide (CO_2) were prepared by using different methods. Each sample on analysis was found to contain 27.27% carbon by mass. Name the law which is in agreement with this observation.

(b) Explain why the number of atoms in one mole of hydrogen gas is double the number of atoms in one mole of helium gas.

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8. 10^{22} atoms of an element X are found to have a mass of 930 mg. Calculate the molar mass of the element 'X'.

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9. (a) If the valency of carbon is 4 and that of sulphur is 2, write the formula of the compound formed between carbon and sulphur atoms. Also name the compound.

(b) What is wrong with the statement '1' mole of hydrogen?



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10. Give the formulae of the compounds that will be formed from the following sets of elements.

(a) Calcium and fluorine (b) Magnesium and oxygen (c) Sodium and sulphur (d) Carbon and chlorine (e) Carbon and sulphur (f) Nitrogen and hydrogen.



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11. Verify by calculation that:

4 moles of CO_2 and 6 moles of H_2O do not have same mass in grams.



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12. A sample of vitamin C is known to contain 2.58×10^{24} oxygen atoms.

How many moles of oxygen atoms are present in the sample?



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13. Calculate the total number of ions in 0.585g of sodium chloride.

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14. A flask contains 4.4g of CO_2 gas. Calculate

(b) How many moles of CO_2 gas does it contain?

(b) How many molecules of CO_2 gas are present in the sample.

(c) How many atoms of oxygen are present in the given sample. (Atomic mass of C=12u, O=16)

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15. Determine the molecules mass of:

(i) NH_4OH

(ii) K_2CO_3

CH_3COOH

Given

atomic

masses:

Here, $1.0u$, $O = 16.0u$, $C = 12.0$, $K = 39.0u$, $N = 14.0u$

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16. (i) What is avagadro Constant?

(ii) Calculate the number of particles present in 56g of N_2 molecules.

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17. (a) An element X exhibits variable valencies 3 and 5. Write the formulae of the chlorides of the element.

(b) What is the ratio by mass of the elements present in the chemical formula of magnesium oxide

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18. (a) State the law of conservation of mass

(b) What mass of silver nitrate will react with 5.85 g of sodium chloride to produce 14.35 g of silver chloride and 8.5 g of sodium nitrate if the law of conservation of mass is true?

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19. (a) State the various postulates of Dalton's atomic theory of matter.

(b) Which postulate of Dalton's atomic theory can explain the law of conservation of mass ?

(c) Which postulate of Dalton's atomic theory can explain the law of constant proportions ?

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20. (a) Define Avogadro's number. Why is it also known as Avogadro's constant?

(b) Calculate the molar mass of Na_2O .

(c) Find the mass of 10 moles of carbon dioxide.

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21. How many gram molecules of H_2SO_4 , are present in 4.9 g of the acid?

(b) How many atoms of hydrogen and oxygen are present in 0.15 mole of water (H_2O)?

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22. (a) Calculate the formula unit mass of Na_2SO_4

(b) What is the mass of one mole of sulphur atoms?

(c) Convert 12 g of oxygen into mole.

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23. (a) Define atomic mass unit.

(b) Distinguish between molecular mass and molar mass.

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24. What is meant by the term chemical formula ? Write the chemical formula of calcium oxide. Calculate its formula unit mass.

(Atomic mass of $\text{Ca} = 40u$, $\text{O} = 16u$).

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25. If the law of constant composition is true, what weights of calcium, carbon, and oxygen are present in $1.5g$ of calcium carbonate, if a sample of calcium carbonate from another source contains the following percentage composition: $\text{Ca} = 40.0\%$, $\text{C} = 12.0\%$, and $\text{O} = 48.0\%$?

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26. Calculate formula unit mass of $Al_2(SO_4)_3$

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27. (a) State six postulates of Dalton's atomic theory.

(b) A 0.24g sample of compound of carbon and oxygen on analysis was found to contain 0.096 g of carbon and 0.144 g of oxygen. Find the percentage composition of the compound by weight.

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28. How many grams of sodium will have the same number of atoms as 6 grams of magnesium

(Given $Na = 23u$, $Mg = 24u$)?

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29. Calculate the mass of 1.2044×10^{23} molecules of O_2 (Atomic mass of O = $16u$).

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30. (a) Define polyatomic ions. Write an example.

(b) Calculate the formula unit mass of $CaCO_3$ (Atomic mass of C=12u, Ca=40u, O=16u)

(c) Calculate the molecular mass of the following

(i) HNO_3 (ii) CH_3COOH

Atomic mass of H=1u, N=14u, O=16u, C=12u

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

Cu^{2+} , Na^+ , Fe^{3+} , C^- , SO_4^{2-} .

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32. What are chemical reactions according to the Law of conservation of mass?

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33. Write the chemical formulae of the following:

(a) Magnesium chloride (b) Calcium oxide (c) Sodium sulphide

(d) Aluminium phosphate (e) potassium chloride (f) Calcium carbonate.

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34. A compound XH is formed by the combination of an element X with hydrogen. Find the valency of the element. State the formula of the compound formed by the combination of (a) X with nitrogen (b) X with oxygen.

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35. Calculate the number of molecules of SO_2 present in 44g of it.

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36. Write the formula and names of the compounds formed by the following ions.

(a) Potassium ion and iodide ion.

(b) Sodium ion and sulphide ion.

(c) Aluminium ion and phosphate ion.

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37. Calculate formula unit mass of $Na_2CO_3 \cdot 10H_2O$

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38. Calculate the number of molecular of sulphur (S_8) present in 128g of sulphur.

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39. Calculate the numbe of oxygen atoms present in 120g of nitric acid (HNO_3)

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40. In a chemical reaction, 10.6g of sodium carbonate reacted with 12g of ethanoic acid. The products obtained were 4.4g of carbon dioxide, 16.4 of sodium ethanoate and 1.8g of water.

(a) Write a word equation, clearly showing the reactants and products as given above.

(b) Also show that this data is in aggrement with the law of conservations of mass.

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41. Write the chemical names of the following compounds:

(a) K_2SO_4 (b) $Mg_3(PO_4)_2$ (c) NH_3Cl (d) ZnS (e) Na_2N (f) $AgBr$

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42. How did Berzelius assign symbols to the elements?

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Long Answer

1. (A) The mass of one molecule of a substance is $4.65 \times 10^{-23} g$. What is its molecular mass? What could be substance be?

(b) Which have more molecules? 10g of sulphur dioxide (SO_2) or 10g of oxygen (O_2)?

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2. Which has more atoms?

(a) 10g of nitrogen (N_2)?

10g of ammonia (NH_3)

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3. (a) Explain with the help of a labelled diagram an activity for the verification of law of conservation of mass.

(b) Find the number of atoms present in 100g of sodium and 100g of iron.

(Given that $Na=23u$, $Fe=56u$, $N_0 = 6.022 \times 10^{23}$ per mole)

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4. (a) Give one point of difference between an atom and an ion.

(b) Give one example of each of polyatomic cation and a polyatomic anion.

(c) Identify the correct name of $FeSO_3$ from the given names-Ferrous

sulphate, Ferrous sulphide, Ferrous sulphite.

(d) Write the chemical formulae for the chloride the magnesium.

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5. (a) What do the following observations stand for?

(i) 2O (ii) $3O_2$

(b) Which amongst the following has more number of atoms and how much?

(i) 11.5g of sodium (ii) 15.0g of calcium

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6. (a) Define atomic mass unit. How is it linked with relative atomic mass?

(b) How do you know the presence of atoms if they do not exist independently for most of the elements?

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7. With the help of a labelled diagram describe an activity to demonstrate the law of conservation of mass.

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8. Find the mass of 10 moles of sodium sulphite (Na_2SO_3)

(b) Calculate the number of molecules in 8g of oxygen gas.

(c) Convert 22g of CO_2 into moles.

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9. With the help of an activity, show that there is no change in mass when a chemical change (chemical reaction) take place.

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10. Write the chemical formulae of

(i) Barium chloride

(ii) Magnesium sulphate

(iii) Sodium sulphate

(iv) Ammonium nitrate

(v) Calcium phosphate

(vi) Potassium dichromate



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11. Name the elements which constitute?

(i) Washing soda

(ii) Baking soda

(iii) Quick lime

Also find their percentages in each compound.



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12. Enlist the main postulates of Dalton's Atomic theory. Give two limitations of the theory.



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13. Explain the following (i) Law of conservation of mass (ii) Gram atomic mass (iii) Gram molecular mass.



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14. Weight of copper oxide obtained by heating $2.16g$ of metallic copper with HNO_3 and subsequent ignition was $2.70g$. In another experiment, $1.15g$ of copper oxide on reduction yielded $0.92g$ of copper. Show that the results illustrate the law of definite proportions.



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15. What is the necessity of mole? Describe gram atomic mass and gram molar mass in terms of mole concept. Give one example in each case to support your answer



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16. What weight of calcium has the same number of atoms as are present in 3.2g of sulphur ?



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Hots

1. (a) Why does not the atomic mass of an element represent the actual mass of its atom?

(b) The atomic mass of an element is in fraction. What does it mean?

(c) Why is the value of Avogadro's number 6.022×10^{23} and not any other value? (d) Does one gram mole of a gas occupy 24.4 L under all conditions of temperature and pressure?



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2. A flask P contains 0.5 mole of oxygen gas. Another flask Q contains 0.4 mole of ozone gas. Which of the two flasks contains greater number of oxygen atoms ?

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3. What weight of calcium has the same number of atoms as are present in 3.2g of sulphur ?

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4. Silicon forms a compound with chlorine in which 5.6 g of silicon is combined with 21.3 g of chlorine. Calculate the empirical formula of the compound (Atomic mass : $Si = 28$, $Cl = 35.5$)

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5. In magnesium sulphide, the ratio by mass of Mg and S is 3:4. What is the ratio of number of Mg and S atoms?

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Test Your Knowledge Very Short Answer Questions

1. What is the smallest particle of matter according to Dalton?

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2. A sample of water from a well was analysed. What will be the ratio of hydrogen and oxygen in it by mass?

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3. Do all atoms of a particular element have always the same mass?

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4. Write the symbol of the following of elements (i) Boron (ii) Bismuth (iii) Barium (iv) Bromine.

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5. The formula of a compound is $Ca_3(PO_4)_2$. What is the valency of Ca in it?

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6. Which is used as the standard for comparing the atomic and molecular masses of substances?

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7. What is the value of Avogadro's number of particles?

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8. What does N.T.P. represent?

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9. What is the molar mass of a gas or vapours under N.T.P. conditions?

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10. Identify the cation and anion in the molecular formula of potassium sulphate?

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11. Give the formula of the compound formed by combining Fe^{2+} and Cl^{-} ions

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12. Give one example each of polyatomic element and polyatomic ion

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13. Define the term mol

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14. What do the following denote (i) N (ii) Na_2 ?

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15. Write the chemical formulae of (i) sodium carbonate (ii) calcium sulphate?

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16. Explain gram atomic mass in terms of mole concept.

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17. Why do mixtures not obey the law of constant composition?

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18. What do we call the particles which have less electrons than the normal atoms?

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19. What is the valency of PO_4 in the compound $Ca_3(PO_4)_2$

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20. Calculate the molar mass of sulphuric acid (H_2SO_4).

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21. What is atomicity? Give one example of each of diatomic and triatomic substances.

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22. An element B show valencies of 4 and 6. Write the formulae of its two oxides.

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23. How many atoms are there in 0.25 mole of hydrogen ?

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Test Your Knowledge Short Answer Questions

1. State the law of conservation of mass. Give one example to illustrate this law.

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Very Short

1. Point out the limitations of the law of constant composition if any.

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2. (a) State the various postulates of Dalton's atomic theory of matter.

(b) Which postulate of Dalton's atomic theory can explain the law of conservation of mass ?

(c) Which postulate of Dalton's atomic theory can explain the law of constant proportions ?

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3. Most of the postulates of Dalton's Atomic theory have been found to be defective. Justify.

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4. Give two points of distinction between atom and molecule.

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5. Explain why some elements occur in atomic form while others in molecular form.

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6. How many molecules and atoms of phosphorus are present in 0.1 mole of P_4 molecules?

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7. How many atoms of carbon and oxygen are present in 1.5 mole of CO_2 ?

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8. A mole is quite often called chemist's dozen. Explain.

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9. How many moles and atoms of gold are present in 49.25 g of gold?

(Atomic mass of gold=97u)

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10. Calculate the number of moles in 17g of hydrogen peroxide (H_2O_2).

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11. Convert into moles (a) 12g of oxygen gas (b) 20g of water.

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12. An element B forms an oxide B_2O_3 . Find its valency and write the formula of its bromide.

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1. Which of the following correctly represents 360g 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)

Answer: D



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2. Which of the following statements is not true about atoms ?

- A. Atoms are not able to exist independently.
- B. Atoms are 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

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3. The chemical symbol for nitrogen gas is :

- A. Ni
- B. N_2
- C. N^+
- D. N

Answer: B



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4. The chemical symbol for sodium is

- A. So
- B. Sd
- C. NA
- D. Na

Answer: D



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5. Which of the following would weigh the maximum?

- 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

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

A. 18g of H_2O

B. 18g of O_2

C. 18g of CO_2

D. 18g of CH_4

Answer: D

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

A. $1g\ CO_2$

B. $1g\ N_2$

C. $1g\ H_2$

D. $1g\ CH_4$

Answer: C

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8. Mass of one atom of oxygen is:

A. $\frac{16}{6.023 \times 10^{23}} g$

B. $\frac{32}{6.023 \times 10^{23}} g$

C. $\frac{1}{6.023 \times 10^{23}} g$

D. $8g$

Answer: A

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9. 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}

Answer: A



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10. A change in the physical state can be brought about

- A. only when energy is given in the system.
- B. only when energy is taken out from the sytem
- C. when energy is either given to, or taken out from the system

D. without any energy change.

Answer: D

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Short Answer Questions

1. Which of the following represents a correct chemical formula? Name it.

A. $CaCl$

B. $BiPO_4$

C. $NaSO_4$

D. NaS

Answer:

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2. Write the molecular formulae for the following compounds.

a) Copper (II) bromide

b) Aluminium (III) nitrate

c) Calcium (II) phosphate

d) Iron (III) sulphide

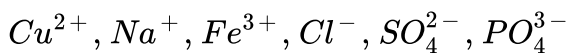
e) Mercury (II) chloride.

f) Magnesium (II) Acetate.



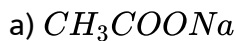
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3. Write the chemical formulae for the following compounds that can be formed by the combination of following ions:



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4. Write the cations and anions present (if any) in the following compounds?



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5. 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



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

Cobalt CO

Carbon c

c) Aluminium AL

d) Helium He

e) Sodium So



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7. 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.

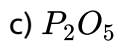
d) Aluminium fluoride.

e) Magnesium sulphide.



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



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



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



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11. Classify each of the following on the basis of their atomicity.

(a) O_3

(b) P_4

(c) S_8



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12. You are provided with a fine white coloured powder which is either sugar or salt. How would you identify it without testing?



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



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1. 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 magnesium elements have a mole ratio of 3:5



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

a) $CaCO_3$

b) $MgCl_2$

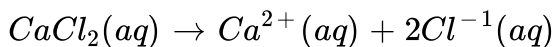
c) H_2SO_4 , d) C_2H_5OH

e) NH_3 , f) $Ca(OH)_2$



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3. Calcium chloride when dissolved in water dissociates into its ions according to the following equations.



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

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

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

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

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7. A sample of vitamin C is known to contain 2.58×10^{24} oxygen atoms. How many moles of oxygen atoms are present in the sample?

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8. 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?

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9. Fill in the missing data in the given table

Species Property	H ₂ O	CO ₂	Na atoms	MgCl ₂
No. of moles	2.0	—	—	0.5
No. of particles	—	3.011×10^{23}	—	—
Mass	36 g	—	115g	—



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



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11. 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}

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12. Express each of the following in kilograms

a) $5.84 \times 10^{-3} \text{mg}$

b) 58.34g

c) 0.584g

d) $5.873 \times 10^{-21} \text{g}$

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

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14. Which has more number of atoms?

100g of N_2 or 100g of NH_3

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

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16. 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?

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

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

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19. 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.

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20. 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?

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21. Fill in the blanks.

a) 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 polyatomic ion.

The formula unit mass of $Ca_3(PO_4)_2$ is 310g.

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



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22. Complete the following crossword puzzle by using the name of the chemical elements. Use the data given in the Table.

TABLE	
Across	Down
2. The element used by Rutherford during his α -scattering experiment.	1. A white lustrous metal used for making coins and which tends to get tarnished (black) in the presence of moist air.
3. A metal 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 sulphuric acid produces a gas which when treated with burning splinter produces a pop sound.	8. An element with symbol Pb.



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23. 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



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24. In photosynthesis, 6 molecules of carbon 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 18g of glucose? Compute the volume of water so consumed assuming the density of water to be $1gcm^{-3}$.



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