CHEMISTRY

BOOKS - S CHAND CHEMISTRY (HINGLISH)

ATOMS AND MOLECULES

Solved Examples

1. Sodium carbonate reacts with ethanoic acid to form sodium ethanote, carbon dioxide and water. In an experiment, 5.3 g of sodium carbonate reacted with 6 g of ethanoic acid to form 8.2 g of sodium ethanoate, 2.2 g of carbon dioxide and 0.9 g of water. Show that this data verifies the law of conservation of mass.

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2. Calcium carbonate decomposes, on heating , to form calcium oxide and carbon dioxide. When 10 g of calcium carbonate is decomposed completely, then $5.6g$ of calcium of oxide is formed. Calculate the mass of carbon dioxide formed. Which law of chemical combination will you use in solving this problem ?

3. In an experiment, 1.288 g of copper oxide was obtained from 1.03 g of copper. In another experiment 3.672 g of copper oxide gave, on reduction, 2.938 g of copper. Show that these figures verify the law of constant proportions.

4. 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?

5. 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?

6. A $0.24g$ sample of compound of oxygen and boron was found by analysis to contain $0.096g$ of boron and $0.144g$ of oxygen. Calculate the
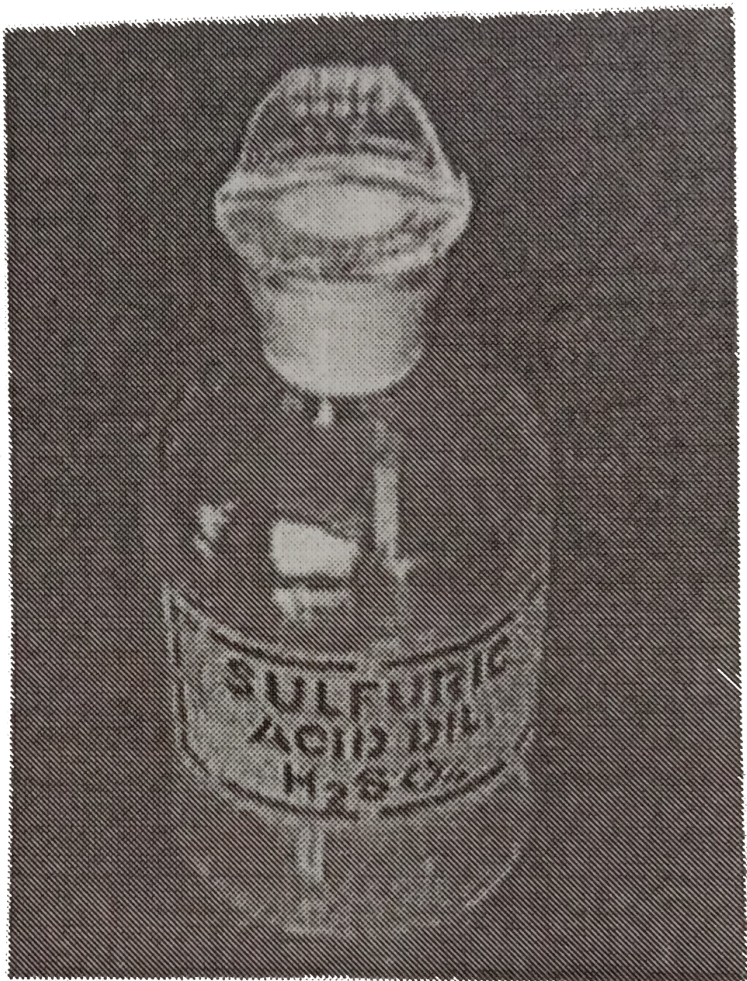
percentage composition of the compound by mass.
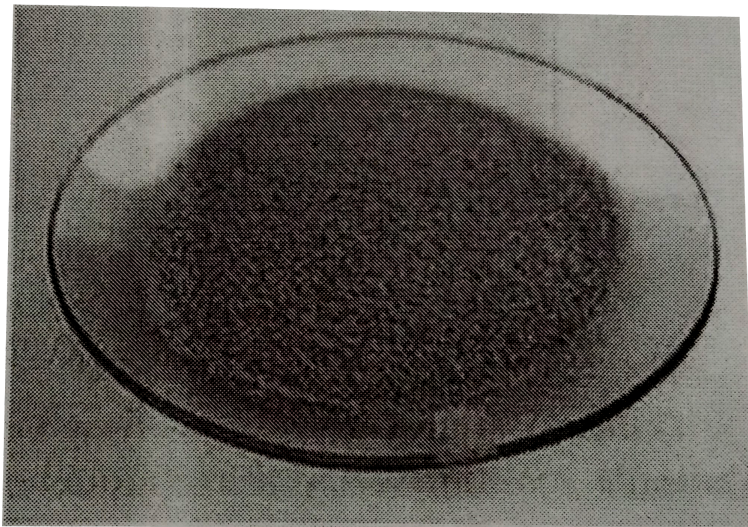
7. Calculate the molecular mass of sulphuric acid (H_2SO_4).

(Given : Atomic masses : $H = 1u$, $S = 32u$, $O = 16u$).

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) $CaCO_3$

9. Calculate the formula mass of potassium carbonate (K_2CO_3) (Given :

Atomic masses : $K = 39u$, $C = 12u$, $O = 16u$)

10. Work out the formula of carbon dioxide.

11. Work out the formula of hydrogen chloride.

12. The valency of carbon is 4 and that of chlorine is 1. What will be the

formua of carbon tetrachloride ?

13. The valency of an element X is 1 and that of oxygen is 2. What will be the formula of the compound formed by the combination of element X with oxygen ?

14. An element E has a valency of 4.

(i) What will be the formula of its chloride ?

(ii) What will be the formula of its sulphide ?

15. An element X shows two valencies of 3 and 5. Work out the formulae of two oxides of this element.

16. An element Z forms an oxide ZO_3.

(a) What is the valency of element Z ?

(b) What will be the formula of fluoride of Z ?

17. Work out the formula for magnesium chloride.

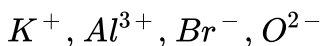**18.** Work out the formula for aluminium sulphate .

19. The symbols of some of the ions are given below :

$K^+, Al^{3+}, Br^-, O^{2-}$

Using this information, write down the formulae of :

(i) Aluminium bromide

(ii) Potassium oxide

20. The valencies of two elements A and B are given below :

Element	Valency
A	$1+$
B	$2+$

(i) What is formula of sulphate of A ?

(ii) What is the formula of nitrate of B ?

21. The formula of the chloride of a metal is MCl_2. What will be the formula of its sulphate.

22. 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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23. How many moles are 5 grams of calcium ? (Atomic mass of calcium $= 40u$).

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24. What is the mass of 4 moles of aluminium atoms?

(Atomic mass of $Al = 27u$)

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25. Calculate the number of atoms in 0.2 mole of sodium (Na).

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26. How many moles are 9.033×10^{24} atoms of helium (He) ?

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27. Calculate the number of iron atoms in a piece of iron weighing $2.8g$ (Atomic mass of iron $= 56u$).

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

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

30. If 1 g of sodium carbon contains x atoms, what will be the number of atoms in 1 g of magnesium ? $(C = 12u, Mg = 24u)$

31. How many grams of neon will have the same number of atoms as 4 grams of calcium ? (Atomic masses : $Ne = 20u$, $Ca = 40u$)

32. The mass of a single atom of an element X is $2.65 \times 10^{-23} g$. What is its atomic mass ? What could this element be ?

33. What is the mass of each one of the following ?

(a) 1 mole of water (H_2O) , (b) 1 mole of ethanol (C_2H_6O)

(c) 1 mole of glucose $(C_6H_{12}O_6)$, (d) 1 mole of cane sugar $(C_{12}H_{22}O_{11})$

(Atomic masses : $H = 1u, C = 12u, O = 16u$)

34. Convert 22 g of carbon dioxide (CO_2) into moles. (Atomic masses : $C = 12u, O = 16u$)

35. What is the mass of 0.5 mole of water (H_2O).

(Atomic masses : $H = 1u, O = 16u$)

36. What is the number of molecules in 0.25 moles of oxygen ?

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37. What is the number of molecules in 0.25 moles of oxygen ?

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38. Convert 12.044×10^{22} molecules of sulphur dioxide into moles.

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39. What is the number of water molecules contained in a drop of water weighing $0.06g$?

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40. Calculate the mass of 3.011×10^{24} molecules of nitrogen gas (N_2).

(Atomic mass : $N = 14u$)

41. The absolute mass of one molecules of a substance is $5.32 \times 10^{-23} g$. What is its molecular mass ? What could this substance be ?

42. In which one of the following cases the number of hydrogen atoms is more ?

Two moles of HCl or One mole of NH_3

43. Calculate the mass of 1 mole of each one of the following:

(a) $NaCl$, (b) $CaCO_3$, (c) $FeSO_4.7H_2O$, (d) Na_2O_2

(Atomic masses :

$H = 1u, C = 12u, O = 16u, Na = 23u, S = 32u, Cl = 35.5u, Ca = 40u,$

)

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44. Which contains more molecules, 4 g of methane (CH_4) or 4g of oxyen (O_2) ?

(Atomic masses : $C = 12u, H = 1, O = 16u)$

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45. If 1 g of sulphur dioxide contains x molecules, what will be the number of molecules in 1 g of methane ?

$(S = 32u, O = 16u, C = 12u, H = 1u)$

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46. How many grams of oxygen gas contain the same number of molecules as 16 grams of sulphur dioxide gas ? $(O = 16u, S = 32u)$

47. 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)

Exercise

1. Write the full form of IUPAC.

2. Name the scientist who gave :

(a) law of conservation of mass.

(b) law of constant proportions.

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3. Name the law of chemical combination :

(a) Which was given by Lavoisier.

(b) Which was given by Proust.

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4. Name the scientist who gave atomic theory of matter.

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

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

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7. Which ancient India philosopher suggested that all matter is composed of very small particles ? What name was given by him to these particles ?

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8. Name any two laws of chemical combination.

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9. If 100 grams of pure water taken from different sources is decomposed by passing electricity, 11 grams of hydrogen and 89 grams of oxygen are always obtained' . Which chemical law is illustrated by this statement ?

10. If 100 grams of calcium carbonate (whether in the form of marble or chalk) are decomposed completely, then 56 grams of calcium oxide and 44 grams of carbon dioxide are obtained'. Which law of chemical combination is illustrated by this statement ?

11. What are the builiding blocks of matter ?

12. How is the size of an atom indicated ?

13. Name the unit in which the radius of an atom is usually expressed.

14. Write the relation between nanometre and metre.

15. The radius of an oxygen atom is $0.073nm$. What does the symbol 'nm' represent ?

16. State whether the following statement is true or false :

The symbol of element cobalt is CO.

17. Define 'molecular mass' of a substance.

18. What is meant by saying that 'the molecular mass of oxygen is 32'?

19. Fill in the following blanks with suitable words :

(a) In water , the proportion of oxygen and hydrogen is . . . . by mass.

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

20. (a) Name the element used as a standard for atomic mass scale.

(b) Which particular atom of the above element is used for this purpose ?

(c) What value has been given to the mass of this reference atom ?

21. Give one major drawback to Dalton's atomic theory of matter.

22. Dalton's atomic theory says that atoms are indivisible. Is this statement still valid ? Give reasons for your answer.

23. Is it possible to see atoms these days? Explain your answer.

24. What is meant by the symbol of an element ? Explain with examples.

25. (a) Give two symbols which have been derived from the "English names " of the element.

(b) Give two symbols which have been derived from the "Latin names" of the elements.

26. Give the names and symbols of five familiar substances which you think are elements.

27. State the chemical symbols for the following element:

Sodium, Potassium, Iron, Copper, Mercury, Silver.

28. Name the element represented by the following symbols :

Hg, Pb, Au, Ag, Sn

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

30. What is the atomicity of the following ?

(a) Oxygen , (b) Ozone , (c) Neon , (d) Sulphur, (e) Phosphorus , (f) Sodium

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31. What is meant by a chemical formula ? Write the folrmulae of one element and one compound

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32. Write the formulae of the following compounds. Also name the element present in them.

(a) Water , (b) Ammonia , (c) Methane , (d) Sulphur dioxide , (e) Ethanol

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33. Explain the difference between $2N$ and N_2.

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34. What do the following abbreviations stand for ?

(i) O , (ii) $2O$, (iii) O_2 , (iv) $3O_2$

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35. What do the symbols, H_2, S and O_4 mean in the formula H_2SO_4 ?

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36. (a) In water from does oxygen gas occur in nature ?

(b) In what form do noble gases occur in nature ?

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37. What is the difference between $2H$ and H_2 ?

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38. What do the following denote ?

(i) N, (ii) 2N, (iii) N_2 , (iv) $2N_2$

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39. What is the significance of the formula of a substance ?

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40. What is the significance of the formula H_2O ?

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41. The molecular formula of glucose is $C_6H_{12}O_6$. Calculate its molecule mass. (Atomic masses : $C = 12u, H = 1u, O = 16u$)

42. Calculate the molecular masses of the following :

(a) Hydrogen, H_2 , (b) Oxygen, O_2, (c) Chlorine, Cl_2 , (d) Ammonia, NH_3 ,

(e) Carbon dioxide, CO_2

(Atomic masses : $H = 1u, O = 16u, Cl = 35.5u, N = 14u, C = 12u$)

43. Calculate the molecular masses of the following compounds :

(a) Methane, CH_4 , (b) Ethane, C_2H_6, (c) Ethane, C_2H_4 , (d) Ethyne, C_2H_2

(Atomic masses: $C = 12u, H = 1u$)

44. Calculate the molecular masses of the following compounds :

(a) Methanol, CH_3OH , (b) Ethanol, C_2H_5OH

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45. Calculate the molecular mass of ethanoic acid, CH_3COOH.

(Atomic masses : $C = 12u, H = 1u, O = 16u$)

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46. Calculate the molecular mass of nitric acid, HNO_3. (Atomic masses :

$H = 1u, N = 14u, O = 16u$)

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47. Calculate the molecular mass of chloroform $(CHCl_3)$. (Atomic masses

: $C = 12u, H = 1u, Cl = 35.5u$)

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48. Calculate the molecular mass of hydrogen bromide (HBr). (Atomic masses : $H = 1u$, $Br = 80u$)

49. Calculate the molecular masses of the following compounds :

(a) Hydrogen sulphide, H_2S , (b) Carbon disulphide, CS_2

(Atomic masses : $H = 1u$, $S = 32u$, $C = 12u$)

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

51. State the law of constant proportions. Give one example to illustrate this law.

52. (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 ?

53. (a) What is the significance of the symbol of an element ? Explain with the help of an example.

(b) Explain the significance of the symbol H.

54. (a) What is an atom ? How do atoms usually exist ?

(b) What is a molecule? Explain with an example.

(c) What is the difference between the molecule of an element and the molecule of a compound ? Give one example of each.

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55. (a) Define atomic mass unit. What is its symbol ?

(b) Define atomic mass of an element.

(c) What is meant by saying that 'the atomic mass of oxygen is 16' ?

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56. The atomicites of ozone, sulphur, phosphorus and argon are respectively :

    A. 8, 3, 4 and 1

    B. 1, 3, 4 and 8

C. 4, 1, 8 and 3

D. 3, 8, 4 and 1

Answer: D

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57. The symbol of a metal element which is used in making thermometers is :

A. Ag

B. Hg

C. Mg

D. Sg

Answer: B

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58. The Latin language name of an element is natrium. The English name of this element is :

A. sodium

B. potassium

C. magnesium

D. sulphur

Answer: A

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59. The atomic theory of matter was proposed by :

A. John Kennedy

B. Lavoisier

C. Proust

D. John Dalton

Answer: D

60. One of the following elements has an atomicity of 'one' . This element is :

A. helium

B. hydrogen

C. sulphur

D. ozone

Answer: A

61. The English name of an element is potassium, its Latin name will be :

A. plumbum

B. cuprum

C. kalium

D. natrium

Answer: C

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62. The law of conservation of mass was given by :

A. Dalton

B. Proust

C. Lavoisier

D. Berzelius

Answer: C

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63. The element having atomicity 'four' is most likely to be :

A. argon

B. fluorine

C. phosphorus

D. francium

Answer: C

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64. If 1.4 g of calcium oxide is formed by the complete decomposition of calcium carbonate, then the amount of calcium carbonate taken and the amount of carbon dioxide formed will be respectively :

A. 2.2 g and 1.1 g

B. 1.1 g and 2.5 g

C. 2.5 g and 1.1 g

D. 5.0 g and 1.1 g

Answer: C

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65. The law of constant proportions was given by

A. Proust

B. Lavoisier

C. Dalton

D. Berzelius

Answer: A

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66. Out of ozone, phosphorus, sulphur and krypton, the elements having the lowest and highest atomicities are respectively :

    A. sulphur and krypton

    B. krypton and ozone

    C. phosphorus and sulphur

    D. krypton and sulphur

Answer: D

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67. One nm is equal to :

    A. $10^{-9}nm$

    B. $10^{-7}cm$

    C. $10^{-9}cm$

    D. $10^{-6}m$

Answer: B

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68. The scientist who proposed the first letter (or first letter and another letter) of the Latin or English name of an element as its symbol, was :

A. Dalton

B. Proust

C. Lavoisier

D. Berzelius

Answer: D

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69. The atoms of which of the following pair of elements are most likely to exist in free state ?

A. hydrogen and helium

B. argon and carbon

C. neon and nitrogen

D. Helium and neon

Answer: B

70. Which of the following elements has the same molecular mass as its atomic mass ?

A. nitrogen

B. neon

C. oxygen

D. chlorine

Answer: B

71. In water, the proportion of oxygen and hydrogen by mass is :

   A. $1:4$

   B. $1:8$

   C. $4:1$

   D. $8:1$

Answer: D

72. In hydrogen peroxide (H_2O_2), the proportion of hydrogen and oxygen by mass is :-

   A. $1:8$

   B. $1:16$

C. $8:1$

D. $16:1$

Answer: B

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73. The symbols of the elements cobalt, aluminium, helium and sodium respectively written by a student are as follows. Which symbol is the correct one ?

A. CO

B. AL

C. He

D. So

Answer: C

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74. Copper sulphate reacts with sodium hydroxide to form a blue precipitate of copper hydroxide and sodium sulphate. In an experiment, $15.95g$ of copper sulphate reacted with 8.0 g sodium hydroxide to form $9.75g$ of copper hydroxide and 14.2 g of sodium sulphate. Which law of chemical conbination is illustrated by this data ? Give reason for your choice.

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75. Potassium chlorate decomposes, on heating, to form potassium chloride and oxygen. When 24.5 g of potassium chlorate is decomposed completely, then $14.9g$ of potassium chloride is formed. Calculate the mass of hydrogen formed. Which law of chemical combination have you used in solving this problem ?

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76. In an experiment, 4.90 g of copper oxide was obtained from 3.92 g of copper. In another experiment, 4.55 g of copper oxide gave, on reduction, 3.64 g of copper. Show with the help of calculation that these figures verify the law of constant proportions.

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77. Magnesium and oxygen combine in the ratio of $3:2$ by mass to form magnesium oxide. What mass of oxygen gas would be required to react completely with 24 g of magnesium ?

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

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79. An liquid compound X of molecular mass 18 u can be obtained from a number of natural sources. All the animals and plants need liquid X for their survival. When an electric current is passed through 200 grams of pure liquid X under suitable conditions, then 178 grams of gas Y and 22 grams of gas Z are produced. Gas Y is produced at the positive electrode whereas gas Z is obtained at the negative electrode. Moreover, gas Y supports combustion whereas gas Z burns itself causing explosions.

(a) Name (i) liquid X (ii) gas, Y and (iii) gas Z.

(b) What is the ratio of the mass of element Z to mass of element Y in the liquid X ?

(c) Which law of chemical combination is illustrated by this example ?

(d) Name two source of liquid X.

(e) State an important use of Y in our life.

80. One of the forms of a naturally occurring solid compound P is usually used for making the floors of houses. On adding a few drops of dilute hydrochloric acid to P, brisk effervescence are produced. When $50g$ of reactant P was heated strongly, than $22g$ of a gas Q and $28g$ of a solid R were produced as products. Gas Q is said to cause global warning whereas solid R is used for white-washing.

(a) What is (i) solid P (ii) gas Q, and (iii) solid R.

(b) What is the total mass of Q and R obtained from 50 g of P ?

(c) How does the total mass of Q and R formed compare with the mass of P taken ?

(d) What conclusion do you get from the comparison of masses of products and reactant ?

(e) Which law of chemical combination is illustrated by the example given in this problem ?

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81. What do we call those particles which have more or less electrons than the normal atoms ?

82. What do we call those particles which have :

(a) more electrons than the normal atoms ?

(b) less electrons than the normal atoms ?

83. Define 'formula mass' of a compound.

84. What do we call those particles which are formed :

(a) by the gain of electrons by atoms ?

(b) by the loss of electrons by atoms ?

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85. State whether the following statements are true or false :

(a) A sodium ion has positive charge because it has more protons than a neutral atom.

(b) A chloride ions has negative charge because it has more electrons than a neutral atom.

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86. Write dow the formulae for the following compounds :

(a) Calcium oxide , (ii) Magnesium hydroxide

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87. An element Z has a valency of 3. What is the formula of oxide of Z ?

88. What is the name of a particle which contains 10 electrons, 11 protons and 12 neutrons?

89. Name the particle which has 18 electrons , 18 neutrons and 17 protons in it.

90. Fill in the following blanks with suitable words :

(a) The particle which is formed by the gain of electrons by an atom is called . . . .

(b) The particle which is formed by the loss of electrons by an atom is called . . . .

(c) The particles which is formed by the loss or gain of electrons by an

atom is called . . . .

(d) A potassium ion has positive charge because it contains less

. . . . than . . . .

(e) A sulphide ion has negative charge because it contains less . . . .

than . . . .

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91. Name the element water is made of. What are the valencies of the

element ? Work out the chemical formula of water.

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92. If the valency of hydrogen is 1 and that of nitrogen is 3, work out the

formula for ammonia.

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93. Work out the formula for sulphur dioxide. (Valencies : $S = 4, O = 2$)

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94. If the valency of carbon is 4 and that of sulphur is 2, work out the formula of the compound formed by the combination of carbon with sulphur. What is the name of this compound ?

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95. An element X has a valency of 4 whereas another element Y has a valency of 1. What will be the formula of the compound formed between X and Y ?

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

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97. An element X of valency 3 conbines with another element Y of valency 2. What will be the formula of the compound formed ?

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98. Work out the formula for magnesium hydrogencarbonate.

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99. An element X has a valency of 2. Write the simplest formula for :

(a) bromide of the element

(b) oxide the element

100. Work out the formulae for the following compounds :

(a) Sodium oxide , (b) Calcium carbonate

101. Calculate the formula masses of following compounds :

(i) Sodium oxide, Na_2O

(ii) Aluminium oxide, Al_2O_3

(Given : Atomic masses : $Na = 23u$, $O = 16u$, $Al = 27u$)

102. Name the following compounds. Also write the symbols/formulae of the ions present in them :

(a) $CuSO_4$, (b) $(NH_4)_2SO_4$, (c) Na_2O , (d) Na_2CO_3 , (e) $CaCl_2$

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

(a) CH_3COONa

(b) $NaCl$

(c) H_2

(d) NH_4NO_3

104. Give the formulae of the compounds formed from the following sets of elements.

a) Calcium and fluroine

b) Hydrogen and sulphur

c) Nitrogen and hydrogen

d) Carbon and chlorine

e) Sodium and oxygen

f) Carbon and oxygen

105. What are ionic and molecular compounds? Give exmples.

106. (a) What is an ion ? How is an ion formed ? Explain with the help of two examples of different ions.

(b) The valencies (or charges) of some of the ions of are given below :

Ion	Valency (Charge)	Ion	Valency (Charge)
Sodium ion	1+	Bromide ion	1−
Ammonium ion	1+	Hydroxide ion	1−
Calcium ion	2+	Sulphate ion	2−
Lead ion	2+	Phosphate ion	3−

Using this information, write down the formulae of the following compunds :

(i) Sodium phosphate , (ii) Ammonium sulphate

(iii) Calcium hydroxide , (iv) Lead bromide

107. (a) What is the difference between a cation and an anion? Explain with examples.

(b) The valencies (or charges) of some of he ions are given below :

Ion	Valency (Charge)	Ion	Valency (Charge)
Sodium ion	1+	Nitrate ion	1–
Copper ion	2+	Sulphide ion	2–

Using this information, write down the formula of :

(i) Sodium sulphide

(ii) Copper nitrate

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108. Explain the formation of (i) sodium ion, and (ii) chloride ion, from their respective atoms giving the number of proton and number of electrons in each one of them. What is the reason for positive charge on a sodium ion and a negative charge on a chloride ion ?

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109. (a) Write the symbols/formulae of two simple ions and two compound ions (or polyatomic ions).

(b) An element Y has a valency of 4. Write the formula for its :

(i) Chloride , (ii) oxide , (iii) sulphate, (iv) carbonate , (v) nitrate

110. (a) Define 'formula unit' of an ionic compound. What is the formula unit of (i) sodium chloride, and (ii) magnesium chloride ?

(b) Calculate the formula masses of the following compounds :

(i) Calcium chloride , (ii) Sodium carbonate

(Given : Atomic masses :

$Ca = 40u, Cl = 35.5u, Na = 23u, C = 12u, O = 16u$)

111. The atomic number of an element X is 13. What will be the number of electrons in its ions X^{3+} ?

A. 11

B. 15

C. 16

D. 10

Answer: D

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112. Which of the following represents a correct chemical formula ?

A. $CaCl$

B. Na_3N

C. $NaSO_4$

D. NaS

Answer: B

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113. If the number of electrons in an ion Z^{3-} is 10, the atomic number of element Z will be :

A. 7

B. 5

C. 10

D. 8

Answer: A

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114. The anion of an element has :

A. more electrons than the normal atom

B. less electrons than the normal atom

C. more protons than the normal atom

D. same number of electrons as normal atom

Answer: A

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115. A particle X has 17 protons, 18 neutrons and 18 electrons. This particle is most likely to be :

A. a cation

B. an anion

C. a molecule

D. a compound

Answer: B

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116. An element which can exhibit valencies of 2, 4 and 6 can be :

A. copper

B. iron

C. mercury

D. sulphur

Answer: D

117. The atomic number of an element E is 16. The number of electrons in its ion E^{2-} will be :

A. 16

B. 18

C. 15

D. 14

Answer: B

118. The cation of an element has :

A. the same number of electrons as its neutral atom

B. more electrons than a neutral atom

C. less protons than a neutral atom

D. less electrons than a neutral atom

Answer: D

119. Two elements X and Y have valencies of 5 and 3, and 3 and 2, respectively. The element X and Y are most likely to be respectively :

A. copper and calcium

B. sulphur and iron

C. phosphorus and nitrogen

D. nitrogen and iron

Answer: D

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120. The number of electrons in an ion Y^{2+} is 10. The atomic number of element Y is most likely to be :

A. 8

B. 12

C. 10

D. 14

Answer: B

121. A particle P has 18 electrons, 20 neutrons and 19 protons. This particle must be :

    A. a molecule

    B. a binary compound

    C. an anion

    D. a cation

Answer: D

122. An ionic compound will be formed by the combination of one of the following pairs of elements. This pair of element is :

    A. chlorine and calcium

B. calcium and sodium

C. sulphur and carbon

D. chlorine and chlorine

Answer: A

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123. Molecular compounds are usually formed by the combination between :

A. a metal and a non-metal

B. two different non-metals

C. two different metals

D. any two gaseous elements

Answer: B

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124. The formula of a compound is X_3Y. The valencies of element X and Y will be respectively :

A. 1 and 3

B. 3 and 1

C. 2 and 3

D. 3 and 2

Answer: A

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125. The formula of the sulphate of an element X is $X_2(SO_4)_3$. The formula of nitride of element X will be :

A. X_2N

B. XN_2

C. XN

D. X_2N_3

Answer:

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126. An element A forms an oxide A_2O_5.

(a) What is the valency of element A ?

(b) What will be the formula of chloride of A ?

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127. An element X forms the following compounds with hydrogen, carbon and oxygen ?

H_2X, CX_2, XO_2, XO_3

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128. If the aluminium salt of an anion X is Al_2X_3, what is the valency of X ? What will be the formula of the magnesium salt of X ?

129. The formula of carbonate of a metal M is M_2CO_3.

(a) What will be the formula of its iodide ?

(b) What will be the formula of its nitride ?

(c) What will be the formula of its phosphate ?

130. The atom of an element X contains 17 protons, 17 electrons and 18 neutrons whereas the atom of an element Y contains 11 protons, 11 electrons and 12 neutrons.

(a) What type of ions will be formed by an atom of element X ? Write the symbol of ion formed.

(b) What will be the number of (i) protons (ii) electrons, and (iii) neutrons,

in the ion formed form X ?

(c) What type of ion will be formed by an atom of element Y ? Write the symbol of ion formed.

(d) What will be the number of (i) protons (ii) electrons, and (iii) neutrons, in the ions formed from Y ?

(e) What is the atomic mass of (i) X, and (ii) Y ?

(f) What could the elements X and Y be ?

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131. What is a group of 6.022×10^{23} particles known as ?

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132. What name is given to the amount of substance containing 6.022×10^{23} particles (atoms, molecules or ions) of a substance ?

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133. What is the numerical value of Avogardo number ?

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134. How many atoms are present in one gram atomic mass of a substance ?

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135. How many molecules are present in one gram molecular mass of a substance ?

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

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137. Convert 12 g of oxygen gas into moles.

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138. How many moles are $3.6g$ of water ?

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139. What name is the mass of 0.2 mole of oxygen atoms ?

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140. Find the mass of 2 moles of oxygen atoms ?

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141. Fill in the following blanks :

(a) 1 mole contains . . . . atoms, molecules or ions of a substance.

(b) A mole represents an .... number of particles of a substances.

(c) 60 g of carbon element are .... moles of carbon atoms.

(d) 0.5 mole of calcium element has a mass of ....

(e) 64 g of oxygen gas contains .... moles of oxygen atoms.

142. (a) How many atoms are there in exactly 12g of carbon-12 element ? $(C = 12u)$

(b) What name is given to this number ?

(c) What name is given to the amount of substance containing this number of atoms ?

143. Calculate the mass of 12.044×10^{25} molecules of oxygen (O_2).

144. What is the number of molecules in 1.5 moles of ammonia ?

145. How many moles of calcium carbonate $(CaCO_3)$ are present in $10g$ of the substance ? $(Ca = 40u, C = 12u, O = 16u)$

146. How many moles of O_2 are there in 1.20×10^{22} oxygen molecules ?

147. If one mole of nitrogen molecules weighs $28g$, calculate the mass of one molecule of nitrogen in grams.

148. How many moles are there in 34.5 g of sodium ? (Atomic mass of $Na = 23u$)

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149. What is the number of zinc atoms in a piece of zinc weighing $10g$? (Atomic mass of $Zn = 65g$)

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150. Calculate the mass of 3.011×10^{24} atoms of carbon.

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

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

153. Calculate the number of moles iin 12.044×10^{25} atoms of phosphorus.

154. Calculate the number of molecules present in a drop of chloroform $(CHCl_3)$ weighing $0.0239g.$ (Atomic masses: $C = 12u, H = 1u, Cl = 35.5u$)

155. What is the mass of 5 moles of sodium carbonate (Na_2CO_3) ?

(Atomic masses : $Na = 32u, C = 12u, O = 16u$)

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156. Calculate the number of molecules in $4g$ of oxygen .

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157. How many moles are represented by 100 g of glucose. $C_6H_{12}O_6$?

$(C = 12u, H = 1u, O = 16u)$

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158. Calculate the mass in grams of 0.17 mole of hydrogen sulphide , H_2S.

(Atomic masses : $H = 1u, S = 32u$)

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159. Show by means of calculations that 5 moles of CO_2 and 5 moles of H_2O do not have the same mass. How much is the difference in their masses ?

160. Calculate the mole ratio of $240g$ of calcium and $240g$ of magnesium. $(Ca = 40, Mg = 24u)$

161. (a) Define mole. What are the two things that a mole represents.

(b) What weight of each element is present in 1.5 moles of sodium sulphate , Na_2SO_3 ?

(Atomic masses : $Na = 23u, C = 12u, O = 16u$)

162. (a) What is meant by 'a mole of carbon atoms' ?

(b) Which has more atoms, 50 g of aluminium or 50 g iron ? Illustrate your answer with the help of calculations.

(Atomic masses : $Al = 27u$, $Fe = 56u$)

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163. (a) Define gram atomic mass of a substance. How much is the gram atomic mass of oxygen ?

(b) How many moles of oxygen atoms are present in one mole of the following compounds ?

(i) Al_2O_3 , (ii) CO_2, (iii) Cl_2O_7 , (iv) H_2SO_4 , (v) $Al_2(SO_4)_3$

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164. (a) Define gram molecular mass of a substance. How much is the gram molecular mass of oxygen ?

(b) If sulphur exists as S_8 molecules, calculate the number of moles in 100 g of sulphur. $(S = 32u)$

165. (a) What is meant by the 'molar mass' of a substance ? State the unit in which molar mass is usually expressed.

Calculate the molar masses of the following substances. Write the result with proper units.

(i) Ozone molecule, O_3 , (ii) Ethanoic acid, CH_3COCH

166. Which of the following pair of element represents a mole ratio of $1:1$?

A. 10 g of calcium and 12 g of magnesium

B. 12 g of magnesium and 6 g of carbon

C. 12 g of carbon and 20 g calcium

D. 20 g of sodium and 20 g of calcium

Answer: B

167. 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)

Answer: d

168. If 32 g of sulphur has x atoms, then the number of atoms in 32 g of oxygen will be :

A. $\dfrac{x}{2}$

B. $2x$

C. x

D. $4x$

Answer: b

169. A student wants to have 3.011×10^{23} atoms each of magnesium and carbon elements. For this purpose, he will have to weigh :

A. 24 g of magnesium and 6 g of carbon

B. 12 g of carbon and 24 g of magnesium

C. 20 g of magnesium and 10 g of carbon

D. 12 g of magnesium and 6g of carbon

Answer: d

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170. The ratio of moles of atoms in 12 g of magnesium and 16 g of sulphur will be :

A. $3:4$

B. $4:3$

C. $1:1$

D. $1:2$

Answer: C

171. If 12 gram of carbon has x atoms, then the number of atoms in 12 grams of magnesium will be :

A. x

B. 2x

C. $\dfrac{x}{2}$

D. $1.5x$

Answer: Chlorine ion, Cl^-

172. Which of the following has the 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

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173. If 1 gram of sulphur dioxide contains x molecules, how many molecules will be present in 1 grams of oxygen ?

$(S = 32u, O = 16u)$

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174. The mass of one molecule of a substance is $4.65 \times 10^{-23}g$. What is its molecular mass ? What colud this substance be ?

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175. Which contains more molecules, 10 g of sulphur dioxide (SO_2) or $10g$ of oxygen (O_2) ?

(Atomic masses : $S = 32u, O = 16u$)

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176. What weight of oxygen gas will contain the same number of molecules as 56 g of nitrogen gas ? $(O = 16u, N = 14u)$

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177. What mass of nitrogen, N_2, will contain the same number of molecules as $1.8g$ of water, H_2O ? (Atomic masses : $N = 14u, H = 1u, O = 16u)$

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178. If one grams of sulphur contains x atoms, calculate the number of atoms in one gram of oxygen element.

(Atomic masses : $S = 32u$, $O = 16u$)

179. How many grams of magnesium will have the same number of atoms as 6 grams of carbon ?

$(Mg = 24u, C = 12u)$

180. The mass of one atom of an element X is $2.0 \times 10^{-23}g$.

(i) Calculate the atomic mass of element X.

(ii) What could element X be ?

181. 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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182. 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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183. Which postulate of Dalton's atomic theory is the result of the law of conservation of mass?

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

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185. Define the atomic mass unit.

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

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187. Write down the formulae of

(i) sodium oxide

(ii) aluminium chloride

(iii) sodium suphide

(iv) magnesium hydroxide

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188. Write down the names of compounds represented by the following formulae:

(i) $Al_2(SO_4)_3$

(ii) $CaCl_2$

(iii) K_2SO_4

(iv) KNO_3

(v) $CaCO_3$

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189. What is meant by the term chemical formula?

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190. How many atoms are present in a

(i) H_2S molecule and

(ii) PO_4^{3-} ion?

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

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

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

194. 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)?

195. 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.

196. When 3.0 g of carbon is burnt in 8.0 g oxygen, 11.0 g of carbon dioxide is produced. What mass of carbon dioxide will be formed when 3.0 g of carbon is burnt in 50.0 g of oxygen? Which law of chemical combination will govern your answer?

197. What are polyatomic ions? Give examples.

198. Write the chemical formulae of the following.

(a) Magnesium chloride

(b) Calcium oxide

(c) Copper nitrate

(d) Aluminium chloride

(e) Calcium carbonate.

199. Give the names of the elements present in the following compounds.

(a) Quick lime

(b) Hydrogen bromide

(c) Baking powder

(d) Potassium sulphate.

200. 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

201. What is the mass of :

(a) 1 mole of nitrogen atoms ?

(b) 4 moles of aluminium atoms ?

(c) 10 moles of sodium sulphate (Na_2SO_3) ?

(Atomic masses : $N = 14u$, $Al = 27u$, $Na = 23u$, $S = 32u$ and $O = 16u$)

202. Convert into moles :

(a) 12 g of oxygen gas

(b) 20 g of water

(c) 22 g of carbon dioxide

(Atomic masses : $O = 16u$, $H = 1u$ and $C = 12u$)

203. What is the mass of :

(a) 0.2 mole of oxygen atoms?

(b) 0.5 mole of water molecules?

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

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205. 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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