



CHEMISTRY

BOOKS - CHHAYA CHEMISTRY (BENGALI ENGLISH)

SOME BASIC CONCEPTS OF CHEMISTRY

Numerical Example

1. The density of a metallic substance is $7.2 \text{ g} \cdot \text{cm}^{-3}$ Find its density in SI unit.



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2. The wavelength of a radiation is 643.5 nm. Find its wavelength in SI unit.

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3. In diamond, the average distance between two carbon atoms is 1.54 Å. Express the distance between two C-atoms in SI unit.

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4. Express the final result in each case on the basis of significant figures. (1). (2.4+9.389)

(2) 94.48-6.4

$$\frac{4.25 \times 0.078999}{6.007}$$

$$(4) \frac{(2.36 \times 10^{-4})(0.3)}{3.8}$$

$$(5) 3.46 \times 10^3 + 4.58 \times 10^2$$

$$(6) (437 \times 0.00612 + 208)$$

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5. Atomic mass of nitrogen is 14.0067 u. find out the mass of one nitrogen atom (up to 3 significant figures).

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6. If density of water is 1g/mL, then find the number of H-atoms in 45mL water (up to 3 significant figures).

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7. Dimension of an iron block is $4.6\text{in} \times 3.0\text{in} \times 1.9\text{in}$ and density of iron is $7.87/\text{cm}^3$. Find out the mass of the iron block. [Given $1\text{in}=2.54\text{cm}$]

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8. Express 2.65 km distance in inch. [Given $1\text{ km} =1000\text{m}$, $1\text{m}=1.094\text{yd}$, $1\text{yd}=36\text{in}$].

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9. Analysis of 30g of a compound D was found to contain 10g of element A and 20g of element B. again analysis of 45g of another compound E was found to contain 15g of element B and 30g of element C. calculate the amounts of D and E

formed if 15g of A, 60g of B and 15g of C are mixed together and allowed to react with each other. also calculate total mass of the mixture after completion of the reaction. assume that no other reaction is possible except the reaction of B with A and C separately. state which laws of the chemical combination can be utilised in the calculation.

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10. 5g of pure MgO (obtained by reaction of metallic magnesium with oxygen) contains 3g of Mg. again 8.5 g of pure MgO (obtained by heating $MgCO_3$) contains 5.1g of Mg. show that these results are in accordance with the law of constant proportions.

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11. Two compounds A and B consist of tin and oxygen. Compound A contains 78.77% of tin and 21.23% of oxygen while compound B contains 88.12% of tin and 11.88% of oxygen. Show that these data illustrate the law of multiple proportions.

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12. Two oxides of a metal, M were heated separately in hydrogen. The water obtained in each case were carefully collected and weighed. It was observed that- (1) 0.725g of the first oxide gives 0.18g of water and (2) 2.86g of the second oxide gives 0.36g of water. show that these results are in accordance with the law of multiple proportions.

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13. Show that the following experimental data are in agreement with the law of reciprocal proportions: (1) 0.46g of Mg on burning in air forms 0.76g of MgO.

(2) 0.41 g of Mg on reaction with excess of acid produces 380 cm^3 of H_2 at STP.

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14. Ammonia contains 17.65% of hydrogen, water contains 11.11% of hydrogen and nitrous oxide contains 36.36% of oxygen. Show that these data illustrate the law of reciprocal proportions.

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15. 2 volumes of O_3 produce 3 volumes of O_2 on complete decomposition. 40 mL of a mixture of O_3 and O_2 is heated at first and then brought back to the previous temperature and pressure. The volume of the gaseous mixture is now found to be 42 mL. find the percentage composition of O_3 in the gas mixture by volume. the volume of all gases are measured under the same conditions of temperature and pressure.



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16. What is the minimum volume of oxygen that must be mixed with 100 mL of carbon monoxide to convert it completely into carbon dioxide on explosion? Find the volume of carbon dioxide formed at the same temperature and pressure. The volume of all gases are measured under the same conditions of temperature and pressure.



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17. Under the same pressure and temperature, a mixture of 100 mL of water gas and 100 mL of O_2 is subjected to explosion. Find the composition of the gas mixture formed by explosion under the same conditions of pressure and temperature.



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18. Atomic weight of ordinary hydrogen is 1.008. ordinary hydrogen contains two isotopes 1_1H and 2_1H . What is the weight percentage of 2_1H in ordinary hydrogen?



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19. Chlorine occurs in nature in the form of two isotopes with atomic masses 34.97 and 36.97 respectively. The relative abundance of the isotopes are 0.735 and 0.245 respectively.

Find the atomic mass of chlorine.

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20. Determine the mass of 1 F-atom in gram (F-19).

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21. Calculate atomic volume of sodium (atomic weight =23).

Density of sodium = $0.972 \text{ g} \cdot \text{mL}^{-1}$.

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22. Find out the highest and lowest masses from the following

(1) 25.6g oxygen (atomic mass=16)

(2) 2.86 gram-atom of sodium (atomic mass=23)

(3) 0.254 gram-atom of iodine (atomic mass=127).



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23. A compound contains 28g of nitrogen and 72% of metal by weight. In the compound, 3 atoms of metal remain combined with 2 atoms of nitrogen. What is the atomic mass of the metal?



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24. Calculate the number of gram-molecule present in 14.7g of H_2SO_4 .

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25. Calculate the mass of 1.5 gram-molecular of glucose.

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26. If the number of gram-molecule present in 4.8g of oxygen and x g of nitrogen be equal, calculate the value of x.

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27. Calculate the volume of 3.6g of water vapour at 273K temperature and 1 atm pressure.

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28. If the density of water at 273 K be $1.8g \cdot cm^{-3}$, calculate its molar volume at that temperature.

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29. How many mole of water molecules are present in 1.8 mL of water?

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30. Calculate (1) the number of moles and (2) the volume at STP of 0.52g of acetylene.

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31. At STP, the volume of 1 g of a gaseous substance is 280 mL. find its relative molar mass.

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32. The volume of one atom of a metal M is $1.66 \times 10^{-23} \text{ cm}^3$. Find the atomic mass of M (given: density of M = $2.7 \text{ g} \cdot \text{cm}^{-3}$).

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33. Haemoglobin was found to contain 0.335% iron (atomic weight of Fe=56). The molecular weight of haemoglobin is 1.67×10^4 . Find the number of iron atoms in haemoglobin.

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34. The mass of 0.1 mol of X_2Y is 4.4g and the mass of 0.05 mol of XY_2 is 2.3g. Find the atomic masses of X and Y.

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35. A plant virus is found to consist of uniform cylindrical particles whose diameters is 150 Å and length is 5000 Å. The specific volume of the virus is $0.75 \text{ cm}^3/\text{g}$. If the virus is

considered to be a single particle, then find its molecular mass.

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36. If we spend 10 lakh rupees per second then how much time will be required to spend an amount of money which is equal to Avogadro's number?

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37. Find the weight of 12.046×10^{25} number of ammonia molecules.

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38. What is the quantity of charge carried by 1 mol of electron?

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39. Calculate the number of molecules left when 10^{21} molecules of CO_2 are removed from 200 mg of CO_2 .

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40. Find the number of atoms of hydrogen and oxygen present in one spherical drop of water with radius 1 mm at $4^\circ C$.

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41. Find the number of electrons in a drop of sulphuric acid weighing 4.9×10^{-3} mg [assume it to be cent percent pure].

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42. Find the number of (1) atoms and (2) molecules present in 1 g of oxygen.

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43. Calculate the number of O-atoms present in 112 L of CO_2 gas at STP.

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44. Find the number of neutrons present in 5×10^{-4} mol of ^{14}C isotope.

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45. Find the number of hydrogen and oxygen atoms present in 0.09 g of water.

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46. What is the mass of 1 millimol of ammonia? Also find the number of ammonia molecules present in it.

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47. What will be the number of (1) moles of ethylene,
(2) molecules of ethylene,
(3) atoms of carbon in 0.28g of ethylene.

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48. Find the (1) number of moles and (2) quantity in gram,
contained in 100 L of ammonia at STP.

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49. Suppose the human population of the world is 3×10^{10} . If
100 molecules of sugar ($C_{12}H_{22}O_{11}$) are distributed per
head, what is the total quantity of sugar required for
distribution?

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50. Find the number of atoms of nitrogen in (1) 1 gram-mole of NO and (2) 0.5 gram-mole of NO_2 . Which one will be heavier-1 gram-mole of NO or 0.5 gram-mole of NO_2 ?

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51. A mixture contains O_2 and N_2 in the proportion of 1:4 by weight. What will be the ratio of the number of molecules of O_2 and N_2 in the mixture?

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52. A young has given his bride an engagement ringg containing 0.50 carat diamond. How many atoms of carbon is present iin that ring? [1 carat=200 mg].

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53. What is the number of O-atoms present in 44.8 L of ozone gas at STP?

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54. The vapour density of a gaseous element is 5 times that of oxygen. If the element be triatomic, find its atomic mass.

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55. 100 mL of any gas weighs 0.144g at STP. What is the vapour density of the gas?

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56. Vapour density of sulphur relative to nitrogen gas at STP is 9.143. determine the molecular formula of sulphur vapour.

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57. At STP, 250cm^3 of a gas weighs 0.7317g. If the density of H_2 gas at STP be $0.08987\text{g} \cdot \text{L}^{-1}$ then what will be the vapour density of the gas? Determine the molecular mass of the gas.

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58. Volumes of N_2 and O_2 in any gas mixture are 80% and 20% respectively. Determine the average vapour density of the gas mixture.

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59. At $26.7^\circ C$, the vapour density of a gaseous mixture containing NO_2 and N_2O_4 is 38.31. Calculate the number of moles of NO_2 in 100g of that mixture.

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60. Vapour density of a gas, relative to air is 1.528. What is the mass of 2L of the gas at $27^\circ C$ temperature and 750 mm Hg pressure? [vapour density of air, relative to hydrogen=14.4]



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61. Under the same conditions of temperature and pressure, complete combustion of 1 volume of a gaseous hydrocarbon produces 3 volumes of carbon dioxide and 4 volumes of steam. What is the formula of the hydrocarbon?



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62. Under the same conditions of temperature and pressure, a gaseous hydrocarbon contains hydrogen which is twice of its volume. If the vapour density of that hydrocarbon is 14, then what will be its molecular formula?



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63. The weight of 350 mL of a diatomic gas at 0°C temperature and 2 atm pressure is 1g. Calculate the weight of its one atom.

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64. For complete combustion, 24g of a solid element requires 44.8L of O_2 at STP. The gaseous oxide produces in combustion occupies a volume of 44.8 L at STP. What is the molecular mass of the produced gaseous oxide?

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65. A sample of hard water contains 20 mg of Ca^{2+} ions per litre. How many millimoles of Na_2CO_3 would be required to

soften 1 L of the sample. Also calculate the mass of Na_2CO_3 .



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66. Atomic mass & equivalent weight of an element are 27 & 9 respectively. Find the formula of its chloride.



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67. x gram of an element forms y gram of its chloride. Calculate the equivalent weight of the element.



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68. Calculate the relative equivalent weight (E) of copper in cuprous oxide.

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69. A metallic oxide contains 60% metal. Calculate equivalent weight of the metal.

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70. 0.56g of a metallic oxide contains 0.16 of oxygen. Determine the equivalent weight of that metal.

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71. Determine the equivalent weight of: (1) carbonate radical
(2) ferrous sulphate [Fe=56]

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72. When 0.3 g of a metal is dissolved in dilute HCl the volume of H_2 gas liberated is 110 mL at $17^\circ C$ and 755 mm Hg of pressure. [Aqueous tension at $17^\circ C = 14.4$ mm Hg]
Determine the equivalent mass of the metal.

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73. The equivalent mass of a metal is 11.6. when 0.177g of that metal is allowed to react completely with dilute HCl, what will be the volume of H_2 gas liberated at $12^\circ C$ and 766mm Hg pressure?



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74. 20g of a metal reacts with dilute H_2SO_4 to liberate 0.504g of H_2 gas. Calculate the amount of metal oxide formed from 2.0g of the metal.



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75. 3.26g of zinc reacts with acid to liberated 1.12 L of hydrogen gas (H_2) at STP. Calculate the relative equivalent weight of zinc.



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76. 15g of an element (A) reacts completely with 30g of another element (B). Calculate the specific equivalent weight of A if that of B is 60.

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77. 0.362g of a metal is added to an aqueous solution of $AgNO_3$. Consequently, 3.225g of silver is precipitated. What is the equivalent mass of the metal. [Atomic mass of Ag=108, valency=1]

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78. A metallic oxide contains 53% metal. The vapour density of the chloride of the metal is 66. find the atomic weight of the

metal.

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79. A metallic chloride contains 20.2% by mass of metal (M). If the atomic mass of the metal be 27. what is the molecular formula of the metallic chloride?

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80. 8.08g of a metallic oxide on being reduced by H_2 , produces 1.8g of water. Find the quantity of O_2 in the above oxide and the equivalent mass of the metal.

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81. In the following reaction, determine the equivalent weight of H_3PO_4 .



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82. A metallic bromide weighing 1.878g is heated in a current of hydrogen chloride. Consequently 1.0 g of metallic chloride is obtained what is the equivalent mass of the metal?

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83. Hydride of an element A contains 25% of hydrogen by mass. The percentages of oxygen in two oxides of that element are 57.1 and 72.7 respectively. If the atomic mass of

the element be 12 determine the formula of the hydride and the two oxides.

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84. The specific equivalent weight of a solid element is 17.8 and its specific heat is $0.124 \text{ cal} \cdot K^{-1} \cdot g^{-1}$. Find its valency and correct specific atomic mass.

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85. Specific heat of magnesium is 0.262 and magnesium chloride contains 25.5% by weight of magnesium. Determine the atomic mass, valency of magnesium and also the formula of magnesium chloride.

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86. An aqueous solution contains 0.22g of metallic chloride, 0.51g of $AgNO_3$ is required for complete precipitation of chloride from that solution. If specific heat of the metal be 0.057 then what will be the correct atomic mass of that metal? What is the formula of that metallic chloride?

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87. The percentage by weight of chromium in green coloured chromium oxide (chromic oxide) is 68.43 and it is isomorphous with ferric oxide. Estimate the correct atomic weight of chromium.

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88. Potassium manganate and potassium chromate (K_2CrO_4) are isomorphous to each other. Percentage of manganese by mass present in potassium manganate is 27.86. determine atomic mass of manganese.

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89. An element (X) reacts with KOH to form a salt. The salt is isomorphous with potassium permanganate ($KMnO_4$). The oxide of the element X contains 61.2% of oxygen. Determine the formula of the oxide and atomic mass of X.

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90. Oxides of two metals A and B are isomorphous. Atomic weight of B is 43.5 and the vapour density of its chloride is 75. the amount of oxygen present in 1.02 g of the oxide of A is 0.48. determine the atomic weight of A.

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91. 3g of hydrated calcium chloride yields 1.52 g of the anhydrous salt on heating. What is the percentage of water present in the hydrated salt? Find the quantity of water associated per mole of the anhydrous salt.

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92. What is the percentage of P_2O_5 in calcium phosphate



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93. A compound contains 28% of nitrogen and 72% of a metal by mass. In the compound, 3 atoms of the metal remains combined with two atoms of nitrogen. Find the atomic mass of the metal.

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94. Give the percentages of ammonium and sulphate radicals in Mohr salt $[(NH_4)_2SO_4 \cdot FeSO_4 \cdot 6H_2O]$.

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95. Haematite (Fe_2O_3) contains some water in addition to Fe_2O_3 . 4.0 kg of this mineral contains 2.5 kg of iron. Find the purity of Fe_2O_3 in the mineral.



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96. A compound of carbon, hydrogen and oxygen contains 40% of carbon and 6.67% of hydrogen. Vapour density of the compound is 2.813 times of the vapour density of oxygen. Determine the empirical formula and molecular formula of the compound.



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97. A gaseous hydrocarbon contains 75% carbon by mass. 100cm^3 of this gas at STP weighs 0.072g. What is the molecular formula of the hydrocarbon? [Weight of 1 litre hydrogen at STP=0.09g]

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98. A compound on analysis gives the following percentage composition: K=31.83, Cl=28.98 and O=39.19. find the molecular formula of the compound if its molecular mass be 122.5.

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99. 0.93g of a compound containing C, H and N, on burning produces 2.64g CO_2 and 0.63g H_2O . In another experiment,

0.186g of that compound yield 24.62cm^3 of nitrogen at 1 atmospheric pressure at 27°C . Molecular weight of the compound is 93. what is its molecular formula?

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100. A compound composed of carbon, hydrogen and chlorine contains C=10.04% and Cl=89.12%. The vapour density of the compound is 59.75. determine its molecular formula.

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101. 1g of phosphorus on combustion produces 1.77g oxide. What is the empirical formula of the compound? If the vapour density of the compound be 110, what is its molecular formula?



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102. An organic compound contains C, H and O as its constituents. On heating in absence of air, 3.10g of this compound, produces 1.24g of carbon. But if 0.5 g of the compound is burnt in presence of air, 0.3 g of H_2O is formed. 0.05 gram-mole of the compound contains 4.8g of oxygen. what is the molecular formula off the compound?



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103. A hydrocarbon contains 10.5 g of carbon and 1g of hydrogen. The weight of 1 litre of the hydrocarbon at $127^\circ C$ and 1 atm pressure is 2.8g. Determine the molecular formula of the compound.

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104. Combustion of 0.2 of a monobasic organic acid produces 0.505 g CO_2 and 0.0892g H_2O . 0.183g of the above acid requires 15 cm^3 of (N/10) NaOH solution for complete neutralisation. Determine the molecular formula of the organic acid.

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105. How many gram of carbon is to be burnt to produce 33g of CO_2 ?

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106. Find the mass of CaO obtained by heating 100g of a sample of CaCO_3 which is 95% pure.

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107. Calculate the volume of CO_2 (at STP) that can be obtained from 2 kg CaCO_3 .

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108. How much KClO_3 must be heated to produce as much oxygen as that would be obtained from 200g of HgO ?

[Hg=200.5, K=39]

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109. A solution of nitric acid contains 60% nitric acid. The specific gravity of the solution is 1.46. how many grams of HNO_3 solution will be required to dissolve 5g of cupric oxide?

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110. How much water will be produced when electric spark is passed through a mixture of 20g of hydrogen and 200g of oxygen? What amount of oxygen will remain unreacted?

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111. 25.4 g of I_2 and 14.2g of Cl_2 react together to form a mixture of ICl and ICl_3 . What is the ratio of the number of

moles of ICl and ICl_3 in the product mixture?

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112. 1L of a sample of hard water contains 1 mg of each of $CaCl_2$ and $MgCl_2$. Express the hardness of the sample in ppm, in terms of $CaCO_3$.

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113. What amount of calcium oxide will react with 852g of P_4O_{10} ?

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114. What percent by mass of lead nitrate $[Pb(NO_3)_2]$ is reduce when heated strongly?

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115. When a mixture of KI and KCl is heated repeatedly with H_2SO_4 , iodine escapes completely and K_2SO_4 is produced quantitatively. In case of such a mixture, it is observed that the mass of K_2SO_4 is equal to the mass of the mixture of KI and KCl taken. what is the ratio of the masses of KI and KCl in this mixture?

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116. How much of 5% impure $NaNO_3$ and 95% H_2SO_4 will be required to produce 7.5kg nitric acid by the chemical reaction between them?

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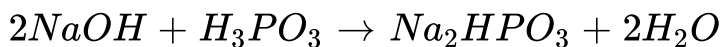
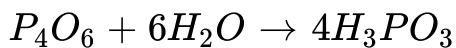
117. 3g of HCl is present per litre of gastric juice produced in human body. If a person produces 2.5 L gastric juice per day, then how many antacid tablets are required to neutralise HCl produced per day. [assume that each tablet contains 400 mg of $Al(OH)_3$].

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118. $(C_2F_4)_n$ is a polymeric substance where n is a large number. It is prepared by polymerisation of C_2F_4 in presence of sulphur catalyst. The final product is found to contain 0.012% of S. find the value of n if the polymeric molecule contains three S-atoms.

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119. Calculate the number of moles of NaOH required to neutralise the solution produced by dissolving 1.1g P_4O_6 in water. Use the following reactions:



(Atomic mass in $g \cdot mol^{-1}$: $P = 31$, $O = 16$).

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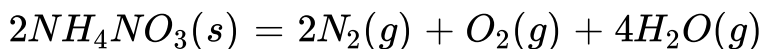
120. A balloon of 1000 L capacity is to be filled up with hydrogen gas at $30^{\circ}C$ and 750 mm pressure. What amount of iron will be required to generate the required volume of hydrogen?

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121. The volume of oxygen liberated at $26^{\circ}C$ and 714 mm pressure due to thermal decomposition of x g of $KClO_3$ and collected over water is 760 mL. what is the value of x? [Given that aqueous tension at $26^{\circ}C = 26\text{mm}$, $K = 39$, $Cl = 35.5$, $O16$]

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122. What volume of gas will be formed at 523 K and 1 atm pressure by the explosive decomposition of 5 g of the ammonium nitrate, according to the given equation?



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123. Ignition of a wooden match-stick involves the combustion of P_4S_3 in oxygen of air to produce a white smoke of P_4O_{10} is oxygen of air to produce a white smoke of P_4O_{10} and gaseous sulphur dioxide (SO_2). Calculate the volume of SO_2 formed at 27°C and 770 mm Hg pressure from the combustion of 0.0546g of P_4S_3 . [P=31,S=32,O=16].

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124. 5.5 g of a pure sample of FeS reacts with dil. H_2SO_4 . H_2S gas so produced is then completely burnt in air. Find the volume of SO_2 thus obtained, measured at $25^\circ C$ and 750 mm pressure of Hg.

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125. 1.78L of chlorine gas at STP is prepared by using 40% HCl by weight according to the following reaction-
 $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$. Find the volume of hydrochloric acid and mass of MnO_2 required to produce this amount of chlorine gas. [specific gravity of the HCl solution=1.12]

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126. If a particular HCl solution contains 22% of the acid by weight, then how much quantity of this acid solution will be required to produce 1L CO_2 gas at $27^\circ C$ & 760 mm pressure from pure $CaCO_3$?

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127. 1.5g of a mixture of $CaCO_3$ and $MgCO_3$, on ignition, produces 360mL of CO_2 at STP. Calculate the percentage composition of the mixture.

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128. Air contains 21% of oxygen by volume. What volume of that air at $27^\circ C$ and 750 mm pressure of Hg will be required

for complete combustion of 60g of a candle. The candle contains 80% of carbon and 20% of hydrogen by mass.

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129. 60 mL of a mixture of CO and H_2 , mixed with 40 mL of O_2 , are subjected to explosion in a eudiometer tube. On cooling the gas mixture after the end of the reaction, the volume is reduced to 30 mL. determine the composition of the gas mixture initially taken. [All volumes are measured at the same temperature and pressure].

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130. 30 mL of a mixture of CO and CO_2 , mixed with 10 mL of oxygen, was exploded by electric spark. The gas mixture

produced was mixed with KOH solution and thoroughly shaken. 5 mL of oxygen was left behind. What was the composition of the original mixture [volume was measured at STP].

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131. 1 L of a mixture of CO and CO_2 , when passed through red hot tube containing charcoal, the volume becomes 1.6 L. all volumes are measured under the same conditions of temperature and pressure. Find the composition of the mixture.

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132. A mixture contains CO , CH_4 and nitrogen. 25cm^3 of the mixture on oxidation in presence of excess oxygen, resulted in the decrease in volume by 16cm^3 . A further contraction of 17cm^3 was observed when the residual gas was treated with KOH solution. what was the composition of the original gaseous mixture of 25cm^3 volume? [All volumes are measured at the same temperature and pressure].



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133. 100 cm^3 of a mixture of CO , C_2H_6 and N_2 is exploded in presence of excess O_2 . On cooling, the observed contraction in volume and the volume of CO_2 formed are both equal to the volume original mixture. Find the volumetric composition of the original volume.

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134. A gaseous mixture contains 50% of H_2 , 40% of CH_4 and 10% of O_2 . What additional volume of O_2 at STP will be required to completely burn 200cc of this gaseous mixture at $27^\circ C$ and 750 mm pressure ?

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135. 25 mL of a mixture containing nitrogen and nitric oxide is passed over heated copper. The volume of gaseous mixture becomes 20 mL. what is the percentage composition of the original mixture. [all volumes are measured at the same temperature].

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136. Combustion of 1 volume of a compound (contains of C, H and N) in air produces 3 volumes of CO_2 and 4.5 volumes water vapour and 0.5 volume of N_2 . Calculate the molecular formula of the compound. [all volumes are measured at same temperature and pressure].



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137. 20cm^3 of a hydrocarbon mixed with 66cm^3 of oxygen is exploded. After cooling the gaseous mixture, the volume becomes 56cm^3 . The volume of this mixture when shaken with KOH solution reduces to 16cm^3 . Determine the formula of the hydrocarbon. [all volumes are measured at the same temperature and pressure].



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138. 20cm^3 of gaseous hydrocarbon mixed with excess of oxygen is exploded. A contraction in the volume of 30cm^3 takes place. On treating the produces gaseous mixture with KOH solution, it suffers a further contraction of 40cm^3 . Determine the molecular formula of the hydrocarbon. [all volumes are measured at the same temperature and pressure].

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139. 3cm^3 of a gaseous hydrocarbon is exploded with excess of oxygen. On cooling the mixture, the observed contraction is found to be 6cm^3 . Vapour density of the hydrocarbon is 14. what is the molecular formula of the hydrocarbon.



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140. A gaseous hydrocarbon of volume 10 mL at STP is mixed with 80 mL of O_2 and burnt completely. As a result, the volume of the gaseous mixture was reduced to 70 mL. On treating the obtained gaseous mixture with KOH solution, the volume becomes 50 mL. Determine the molecular formula of the hydrocarbon.



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141. Volume of a gaseous hydrocarbon is 1.12 L at STP. When it is completely burnt in air, 2.2g of CO_2 & 1.8g of water are formed. Find the volume of oxygen required at STP and also

mass of the compound taken. Give the molecular formula of hydrocarbon.

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142. 5 mL of a gas composed of hydrogen and carbon is mixed with 30 mL of oxygen and exploded with electric sparking. The volume of the gas mixture, obtained by explosion is found to be 25 mL. KOH is then added to the mixture and as a result, its volume is reduced to 15 mL. the residual gas is purely oxygen. all volumes have been measured at STP. what is the molecular formula of the gas?

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143. 10 mL of a gaseous organic compound composed of carbon, hydrogen and oxygen is mixed with 100 mL of oxygen and subjected to explosion. Volume of the mixture produced by explosion when cooled becomes 90 mL. On treatment with KOH, the volume is reduced by 20 mL. Mass of 1 L of gaseous organic compound is 2.053 g at STP. Determine the molecular formula.



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144. When 3 volumes of a gaseous organic compound of carbon, hydrogen & sulphur mixed with excess oxygen is exploded, 3 volumes of carbon dioxide, 3 volumes of sulphur dioxide and 6 volumes of water vapour are produced. What is the formula of the compound?

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145. When an acetylenic hydrocarbon, in presence of excess oxygen is exploded, it shows a contraction in volume by 50 mL. a further contraction of 75 mL is observed when the obtained gas mixture comes in contact with KOH solution. Determine the molecular formula of the compound.

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146. At high temperature gaseous compound, S_4N_4 decomposes to produce N_2 and sulphur vapour. 1 vol. of S_4N_4 on decomposition gives 2.5 vol. of gaseous mixture at STP. Determine formula of sulphur.

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147. When 100 mL of ozonised oxygen is shaken with turpentine oil, volume decreases by 20 mL. when 100 mL of the same sample is heated, the mixture occupies a volume of 110 mL. determine the molecular formula of ozone. [All volumes are measured under same temperature and pressure.]



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148. 8g NaOH is dissolved in water and the solution is made upto 500 mL. find the molarity of solution.



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149. The density of 3(M) solution of NaCl is $1.25g \cdot cm^{-3}$
calculate the molality of the solution.

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150. Calculate the volume of 0.5(M) H_2SO_4 solution required
to dissolve 0.5g of copper (II) carbonate.

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151. Calculate the volume of H_2 gas (at STP) liberated by the
reaction of exces Zn with 500 mL 0.5(N) H_2SO_4 .

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152. Density of 3 molal NaOH solution is $1.110 \text{ g} \cdot \text{mL}^{-1}$.

Calculate the molarity of the solution.

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153. If 4 g of NaOH dissolves in 36g of H_2O , then calculate the mole fraction of each component in the solution. Also, determine the molarity of the solution (specific gravity of solution is $1 \text{ g} \cdot \text{mL}^{-1}$).

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154. 1L of a (N/2) HCl solution was heated in a beaker and it was observed that when the volume of solution got reduced to 600 mL, 3.25 g of HCl was lost. Calculate the normality of the resulting solution.



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Warm Up Exercise

1. Classify the following as pure substance, homogeneous mixture, heterogeneous mixture, element and compound:

(i) Milk,

(ii) Air,

(iii) Petrol

(iv) distilled water

(v) Common

salt (vi) graphite

(vii) Tap-water

(viii) Smoke

(ix) Dry ice

(x) Cold drinks (xi) gun powder.



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2. How will you separate the constituents of a sample of gun powder?



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3. How will you separate the components from a mixture of common salt and potassium nitrate?



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4. Explain why is air sometimes considered as a heterogeneous mixture.

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5. State whether a mixture or a compound is formed when conc. H_2SO_4 is added slowly to water.

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6. Name two drugs which causes intoxication when consumed.

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7. How many significant figures are there in each of following number: (i) 0.437 (ii) 935100 (iii) 2.158×10^4
(iv) 0.00839 (v) 207.39 (vi) 17.00 (vii) 2.0100×10^4
(viii) 6.0×10^{23}
(ix) 0.00070



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8. Express the following up to three significant figures:

(i) 4.309251 (ii) 49.793500 (iii) 0.005728 (iv) 7000
(v) 2.67876×10^3
(vi) decimal equivalent of $2/3$,



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9. Is it correct to consider the law of conservation of mass as the law of mass as the law of indestructibility of matter?

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10. Mention the limitations of the law of conservation of mass.

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11. Mention the limitations of the law of constant proportions.

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12. On heating of 4.9g of $KClO_3$, 1.92g of O_2 is evolved and 2.97g of KCl is obtained as a residue show that these data illustrate the law of conservation of mass.

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13. Is the converse of the law of definite proportions always correct? Explain with an example.

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14. State gay-lussac's law of gaseous volumes.

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15. 10.1g of HCl is mixed with 6.3g of $NaHCO_3$. Calculate the mass of CO_2 released if the residual mixture is found to weigh 12.1 g.

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16. According to Dalton's theory, 'during chemical combination, atoms of different elements combine in a simple whole number ratio' - justify or criticise.

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17. Define an atom in view of Dalton's atomic theory.

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18. Which postulate of Dalton's atomic theory is more or less valid even today?

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19. Mention of limitations of Dalton's atomic theory.

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20. What are Daltonide compounds and Berthollide compounds?

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21. Mention a compound where the constituents atoms are not present in a simple ratio?

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22. How do the discoveries of isotopes and isobars modify Dalton's atomic theory?

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23. State the converse statement of Avogadro's hypothesis and indicate its validity.

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24. What are elementary molecules and compound molecules?

Give examples?



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25. Apply Avogadro's hypothesis to establish gay-lussac's law of gaseous volumes.



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26. Write modified form of Dalton's atomic theory on the basis of Avogadro's hypothesis.



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27. It is proper to consider Avogadro's hypothesis as a law?

Explain.

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28. Define a molecule on the basis of Avogadro's hypothesis.

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29. Define atomic mass according to modern scale.

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30. What was the reason for selecting oxygen, instead of hydrogen, as the standard for defining atomic mass?

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31. What is atomic mass unit?

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32. Mention actual mass of a ^{12}C -atom.

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33. Mention the mass of ^{14}N -atom in amu.

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34. Atomic mass of an element should properly be called average atomic mass. Explain.

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35. What do you mean by 'the mass of an H-atom is 1.008 amu'. Calculate the mass in gram.

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36. Distinguish between actual mass and atomic mass.

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37. Why are the atomic masses generally fractional?

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38. The element, boron has two isotopes (^{10}B and ^{11}B).

Calculate the natural abundance of the isotopes of boron if the atomic mass of the element be 10.8.

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39. What is the magnitude of 1 amu?

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40. Calculate the number of gram-atom present in 2.1g of nitrogne and 0.23 g of sodium.

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41. Define molecular mass according to modern scale.

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42. The molecular mass of sodium chloride is 58.5'. Comment on this statement.

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43. Give an example of a tetra-atomic element and calculate its molecular mass.

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44. Define formula mass.

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45. Molecular mass and formula mass are not always synonymous-explain.

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46. 1g mole oxygen=2 gram-atom oxygen'-justify.

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47. which one is the volume of 2.8g of ethylene gas at STP?

(i) 2.24 L

(ii) 22.4L (iii) 224L (iv) 0.224 L.

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48. Which one is the volume of 1g of oxygen gas at STP?

(i) 0.7 L

(ii) 4.8 L (iii) 1.4 L (iv) 1.2 L.

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49. Is the statement correct or incorrect- 35.5g of chlorine contains 6.022×10^{23} molecules?

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50. Calculate the number of molecules in 0.52g of acetylene.

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51. Find the number of molecules in 1 millimole of CO_2 .

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52. Calculate the number of O-atoms in 0.5 mol of SO_2 .

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53. Calculate the mass of 1 mol of electrons if the mass of one electron be $9.11 \times 10^{-31} \text{ kg}$.

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54. At a temperature of 273K and 1 atm pressure 1L of a gas weighs 2.054g. Calculate its molecular mass.

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55. At same temperature & pressure two flasks of equal volume contain NH_3 & SO_2 gas respectively. Identify the flask

having (i) greater number of molecules (ii) gaseous substance with greater mass (iii) greater number of atoms.



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56. Give the definitions of normal density and vapour density of gaseous substances.



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57. Establish a relation between molecular mass and vapour density of gaseous substances.



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58. Show that the volume of 1 gram-molecule of any gas at 273K temperature and 1 atm pressure is 22.4 L.

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59. Calculate the volume occupied by 1 molecule of any gaseous substance at STP.

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60. Choose the correct options: The vapour density of carbon dioxide is -(i) 22 (ii) $22\text{g} \cdot \text{cm}^{-3}$ (iii) $22\text{g} \cdot \text{L}^{-1}$ (iv) 44.

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61. Discuss the effect of pressure and temperature on the vapour density of gaseous substances.

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62. Carbon dioxide decomposes to form its own volume of oxygen. Find the molecular formula of carbon dioxide if its vapour density is 22.

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63. Under same conditions of temperature and pressure the vapour density of an elementary gas is 5 times than that of oxygen. Calculate the relative atomic mass of the gas if it is diatomic in nature.

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64. The equivalent mass of an element can never be zero-explain.

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65. Establish the relation between equivalent mass and atomic mass of an element.

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66. Calculate the equivalent weight of sulphate ion.

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67. Calculate the equivalent weight of ferrous sulphate [when Fe^{2+} undergoes oxidation to give Fe^{3+} (Fe=56)].

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68. Prove that the equivalent mass of an element varies inversely with its valency.

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69. Sodium thiosulphate is oxidised by iodine to sodium tetrathionate. Calculate equivalent weight of sodium thiosulphate. (Na=23, S=32, O=16).

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70. What do you mean by empirical formula and molecular formula of a compound? Under what conditions, the molecular formula of a compound becomes identical with its empirical formula?

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71. Calculate the percentage composition (by mass) of the constituent elements of sodium sulphate (Na_2SO_4).

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72. An oxide of iron is found to contain 69.9% iron and 30.1% dioxygen (O_2) by mass. Calculate its empirical formula.

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73. Calculate the amount of sodium hydroxide present in 100 mL of 0.1(M) NaOH solution.

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74. Molarity and normality of a solution change with temperature but molality does not. Explain.

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75. 100 mL of 3(N) Na_2CO_3 solution is diluted to 300 mL by adding water. Calculate the normality of this solution.

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76. Find the volume (in mL) of 0.2 (N) NaOH solution required to neutralise 25 mL of 0.2(N) H_2SO_4 solution.

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77. Give the relation between normality & molarity of a solution.

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Question Answer Zone For Board Examination Very Short Answer Type

1. Divide the unit of volume (cm^3) by the unit of area (m^2) and then indicate the resulting unit.



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2. Give example of one antibiotic drug and tranquilizer.



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3. Convert 7.62 cm in inches using unit conversion factor.



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4. Mass of a body determined by an analytical balance (accuracy 0.0001g) was reported to be 10.0008g. Find the no. of significant figures in reported mass.



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5. The length of a table measured by a metre scale (having accuracy of 0.1 cm) was reported to be 76.8 cm. What is the actual length of the table?

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6. Express the fraction $\frac{3}{8}$ in decimal system having two significant figures.

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7. Is the volume of 1 gram-mole of CO_2 greater than, equal to or less than 22.4 L at 300 K and 1 atm?

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8. Give the names of one analgesic and antipyretic drug.

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9. Express 0.00340 cm in exponential form.

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10. Express the mass of one molecule of water in the unit of unified mass.

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11. Calculate the no. of electrons in 2 mol of electrons.



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12. Calculate the mass of diamond that will contain the same number of C-atoms as that in 0.1g of graphite.

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13. The equivalent mass of iron in ferrous oxide is 28. calculate its equivalent mass in ferric oxide.

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14. What do you understand by the statement- "Molecular mass of ammonia is 17 amu" ?

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15. What do you mean by semimolar NaOH solution?



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Question Answer Zone For Board Examination Short Answer Type

1. Differentiate between accuracy and precision.



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2. "Two different elements may combine together in a definite proportion by mass to form two different isomeric compounds. Again two different elements may combine

together in different proportions by mass to produce two different compounds". Comment on this.

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3. Why does Dalton's atomic theory fail to explain Gay-Lussac's law of gaseous volumes?

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4. Two substances A and B are of equal masses and their molecular masses are in the proportions of 2:3. What is the ratio of the numbers of their molecules?

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5. Show that, ratio of the masses of equal volumes of two gases at the same temperature and pressure is equal to the ratio of their molecular masses.

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6. Which are heavier and lighter than air: O_2 , CO_2 , CH_4 , NH_3 , Cl_2 ? [Volumetric composition of air: $N_2 = 74\%$, $O_2 = 24\%$, $CO_2 = 2\%$]

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7. Mass of a sulphur atom is twice of that of an oxygen atom. Hence, the vapour density of sulphur will be twice of that of the vapour density of oxygen-justify?



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8. Out of Cl_2 and O_2 , which one will have greater mass when taken in equal volumes at the same temperature and pressure



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9. At the same temperature and pressure, 1 volume of gas A reacts with 1 volume of gas B to produce 2 volumes of gas C. If the atomicity of the gases A, B and C be x , y and z respectively, then show that both x and y will be either odd or even number.



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10. Calculate the number of hydrogen atoms present in 90 amu of ethane.

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11. Are the species, N_3^- and N^{3-} different? Justify.

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12. "What is the equivalent mass of an element?" Is the question correct? If yes, then explain your answer.

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13. Show that the equivalent mass of a certain element varies inversely with its valency.

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14. Mass of one ^{12}C atom is $1.99236 \times 10^{-23}\text{g}$. Express the value of 1 amu in gram.

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15. An element forms two compounds X and Y in which the element exhibits the valency of 2 and 3 respectively. What is the ratio of the equivalent masses of the element in the two compound?

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16. An element produces X, Y & Z compounds. Equivalent masses of that element in the compound X, Y & Z are in the ratio of 1:2:3. In which of the three compounds, the element exhibits its maximum valency?



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Solved Wbchse Scanner

1. (i) What are meant by empirical formula and molecular formula? Explain with an example.

(ii) A compound composed of carbon, hydrogen and chlorine contains carbon=10.04% and chlorine =89.12%. The vapour

density of the compound is 59.75. Determine its molecular formula.



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2. (i) $Pb(NO_3)_2$ on strong heating loses 32.6% of its mass. Calculate the relative atomic mass of Pb.

(ii) 1 volume of a gaseous compound composed of C, H and N, on combustion in air produces 3 volumes CO_2 , 4.5 volumes water vapour and 0.5 volumes N_2 gas. find the molecular formula of the compound. [all volumes are measured under identical conditions of temperature and pressure].



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3. (i) Fill in the blank: equivalent weight of M in MCl_3 is E. relative atomic mass of M is _____

(ii) Indicate the correct answer: 1g of oxygen gas at STP occupies the volume-

A. 0.7L

B. 4.8L

C. 1.4L

D. 1.2L

Answer: A::B::C



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4. What does 1 mol of electron signify?

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5. (i) Find the number of neutrons in 5×10^{-4} mol of ^{14}C isotope.

(ii) chloride of a metal (A) contains 55.90% of chlorine. 1.0g of metal (A) displaces 1.134g of a metal (B) from its salt. Determine the equivalent weights of (A) and (B).

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6. 5g of an impure sample of common salt on treatment with excess of AgNO_3 solution yields 9.812g of AgCl . What is the percentage impurity of that sample ?

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7. Establish the relationship between molecular weight and vapour density with the help of avogadro's hypothesis.

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8. A gaseous hydrocarbon contains 75% C by weight. 1L of this gas at STP weighs 0.72 g. what is the molecular formula of the hydrocarbon? [weight of 1 L of hydrogen at STP=0.09g].

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9. 25.4g of iodine and 14.2g of chlorine react together to form a mixture of ICl and ICl_3 . Find the ratio of the number of moles of ICl and ICl_3 in the mixture. (Relative atomic mass of Cl and I are 35.5 and 127 respectively).



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10. 1.84 g of a mixture of $CaCO_3$ and $MgCO_3$ was heated to a constant weight. The constant weight of the residue was found to be 0.96g. Calculate the percentage composition of the mixture. (relative atomic masses of Ca and Mg are 40 and 24 respectively).



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11. 10 mL of a mixture of CH_4 , C_2H_4 and CO_2 was exploded with excess oxygen. After explosion, there was a contraction of 17 mL on cooling and there was a further contraction of 14 mL on treatment with KOH. Find out the composition of the mixture.

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12. 10^{21} molecules of CO_2 were expelled from 220 mg of CO_2 .

How many molecules of CO_2 were left?

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13. O_2 and N_2 were present in a mixture in ratio of 1:7 by weight. Calculate the ratio of their number of gram molecules.

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14. What will be the change of mass when 10g of magnesium is heated strongly in oxygen? (Mg=24)

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15. A compound, on analysis shows C=40%, H=6.67% and O=53.33%. Determine the empirical formula of the compound. If molar mass of the compound is 30g mol^{-1} what is its molecular formula?

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16. Calculate the percentage composition of the compound having the molecular formula of $C_6H_{12}O_6$ ($H = 1, C = 12, O = 16$).

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17. Between 100 mL CO_2 and 100 mL NH_3 , which one has greater mass at constant temperature and pressure?

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18. Write the no. of molecules present in 1 millimole of SO_2 .

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19. How many molecules of H_2SO_4 will be present as a residue when 3.0115×10^{21} number of molecules are removed from 400g H_2SO_4 ?

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20. How many electrons are present in 1 millimole of methane?

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21. 2.7 gram of a metal after reaction with excess acid produces 3.36 litre of H_2 at NTP. What is the equivalent weight of the metal.

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22. In two compound of hydrogen and oxygen, hydrogen present in 42.9% and 27.3% respectively. Show that the data support the law of multiple proportions.

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23. A metallic oxide contains 60% of metal. Calculate the equivalent weight of the metal.

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24. Calculate the equivalent weight of phosphate radical.

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25. A polymer contains 0.16% of sulphur by weight. What is the minimum molecular weight of the polymer.

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26. The empirical formula of an organic compound is CH_2O and its molecular weight is 180. what is the molecular formula of the compound? (H=1,C=12,O=16).

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27. How many neutrons are present in 5×10^{-4} moles of ${}^6_{14}C$?

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28. Determine the mass percentage composition of water (H=1, O=16).

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Solved Ncert Exercise

1. Calculate the molar mass: (1) H_2O (2) CO_2

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2. Calculate the mass percent of different elements present in sodium sulphate (Na_2SO_4).

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3. Determine the empirical formula of an oxide of iron which has 69.6% iron and 30.1% dioxygen by mass.

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4. Calculate the amount of carbon dioxide that could be produced when (1) 1 mole of carbon is burnt in air.

(2) 1 mole of carbon is burnt in 16g of dioxygen.

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5. Calculate the mass of sodium acetate (CH_3COONa) required to make 500 mL of 0.375 molar solution. Molar mass of sodium acetate is $82.0245g \cdot mol^{-1}$.

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6. Calculate the concentration of nitric acid in moles per litre in a sample which has a density $1.4 g \cdot mL^{-1}$ and the mass percent of nitric acid in it being 69%.



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7. How much copper can be obtained from 1000g of copper sulphate ($CuSO_4$) ?



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8. Determine the molecular formula of an oxide of iron in which the mass per cent of iron and oxygen are 69.9 and 30.1 respectively (molecular mass is 159.8).



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9. Calculate the atomic mass (average) of chlorine using the following data:



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10. In three moles of ethane (C_2H_6) calculate the following:

(1) Number of moles of carbon atoms.

(2) Number of moles of hydrogen atom. (3) Number of molecules of ethane.



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11. What is the concentration of sugar ($C_{12}H_{22}O_{11}$) in $mol \cdot L^{-1}$ if its 20g are dissolved in enough water to make a final volume up to 2L?



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12. Density of methanol is $0.793 \text{ kg} \cdot \text{L}^{-1}$. What is its volume needed for making 2.5L of its 0.25 (M) solution?

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13. Pressure is determined as force per unit area of the surface. The SI unit of pressure, pascal is as shown below:
 $1 \text{ Pa} = 1 \text{ N} \cdot \text{m}^{-2}$. If mass of air at sea level is $1034 \text{ g} \cdot \text{cm}^{-2}$, calculate the pressure in pascal.

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14. What is the SI unit of mass? How is it defined?

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15. Match the following prefixes with their multiples:



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16. What do you mean by significant figures?

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17. A sample of drinking water was found to be severely contaminated with chloroform. $CHCl_3$, supposed to be carcinogenic in nature. The level of contamination was 15 ppm (by mass). Express this is percent by mass.

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18. Express the following in the scientific notation:

(1) 0.0048

(2) 234,000

(3) 8008

(4) 500.0

(5) 6.0012



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19. How many significant figures are present: (1) 0.0025

(2) 208

(3) 5005

(4) 126,000

(5) 500.0

(6) 2.034

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20. Round up the following upto three significant figures:

(1) (1) 34.216

(2) 10.4107

(3) 0.04597

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21. The following data are obtained when dinitrogen and dioxygen react together to form different compound:



Which law of chemical combination is obeyed by the above experimental data? Give its statement.

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22. If the speed of light is $3.0 \times 10^8 m \cdot s^{-1}$, calculate the distance covered by light in 2.00 ns.

A. $2.00\text{ns} = 2.0 \times 10^9 s$

Therefore, distance transversed=velocity \times time

$$3.0 \times 10^8 m \cdot s^{-1} \times 2.0 \times 10^{-9} s = 0.6m$$

B.

C.

D.

Answer:



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23. In a reaction $A + B_2 \rightarrow AB_2$. Identify the limiting reagent, if any, in the following reaction mixtures.

(1) 300 atoms of A + 200 molecules of B

(2) 2 mol A + 3 mol B

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24. N_2 and H_2 react with to produce ammonia according to the equation: $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

(1) Calculate the mass of ammonia produced if

$2.00 \times 10^3 g$ N_2 reacts with $1.00 \times 10^3 g$ of H_2 .

(2) Will any of the two reactants remain unreacted ?

(3) If yes, which one and what would be its mass?

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25. How are 0.5 mol Na_2CO_3 and 0.5(M) Na_2CO_3 different?

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26. If ten volumes of dihydrogen gas reacts with five volumes of dioxygen gas, how many volumes of water vapour would be produced?

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27. Convert the following into basic units: (1) 28.7 pm

(2) 15.15 pm

(3) 25365 mg

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28. Which of the following will have largest no. of atoms?

(1) 1 g Au (g)

(2) 1g Na (s)

(3) 1g Li (s)

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29. Calculate the molarity of a solution of ethanol in water in which the mole fraction of ethanol is 0.040 (assume the density of water to be one).

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30. What will be the mass of one ^{12}C atom in g?

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31. How many significant figures should be present in the answer of the following calculations?

(1)
$$\frac{0.02856 \times 298.15 \times 0.112}{0.5785}$$

(2) 5×5.364

(3) $0.0125 + 0.7864 + 0.0215$



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32. Use the data given in the following table to calculate the molar mass of naturally occurring argon isotopes:



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33. Calculate the number of atoms in each of the following (1)

52 moles of Ar

(2) 52u of He.



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34. A welding fuel gas contains carbon & hydrogen only.

Burning a small sample of it in oxygen gives 3.38g CO_2 , 0.690g

of H_2O and no other products. A volume of 10.0 L (at STP) of

this welding gas is found to weigh 11.6g. Calculate (1)

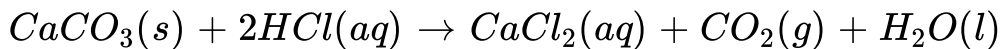
empirical formula,

(2) molar mass of the gas.



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35. Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction.

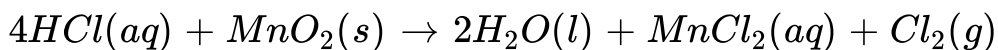


What mass of $CaCO_3$ is required to react completely with 25 mL of 0.75 (M) HCl?



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36. Chlorine is prepared in the laboratory by treating manganese dioxide (MnO_2) with aqueous HCl according to the reaction.



how many grams of HCl reacts with 5.0g of MnO_2 ?



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1. Is moist air heavier than dry air? Explain.

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2. The reactant which is entirely consumed in any reaction is known as the limiting reagent. In the reaction, $2A + 4B \rightarrow 3C + 4D$, if 5 moles of A react with 6 moles of B, then (1) Which is the limiting reagent?
(2) Calculate the amount of C formed.

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3. A granulated sample of aircraft alloy (Al, Mg, Cu) weighing 8.72g was first reacted with alkali and then with very dilute HCl, which left behind a residue. The residue after boiling with alkali weighed 2.10 g and the acid-insoluble residue weighed 0.69g. what is the composition of the alloy?



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4. Equivalent mass of metal M is E and the formula of its oxide is M_xO_y . Show that the valency and atomic mass of metal M are $2y/x$ and $2yE/x$ respectively.



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5. Two gases, A and B having equal mass are kept in two separate vessels under identical conditions of temperature and pressure. If the ratio of their molecular masses be 2:3, find the ratio of the volumes of the vessels.

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6. 1 L of a gaseous element reacts with 2 L of another gaseous element to form 1 L of a gaseous compound (all volumes being measured under identical conditions of temperature and pressure). If both the element are diatomic and their symbols are X and Y respectively, then what will be the molecular formula of the compound.

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7. The vapour density of a gas at $25^{\circ}C$ is 25. what will be its vapour density at $50^{\circ}C$?

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8. Do 1 mol O_2 and 1 mol O signify the same quantity?

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9. The experimental values of the vapour density of either NH_4Cl or PCl_5 is less than that obtained from the equation $D = M/s$. Explain.

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10. There are two natural isotopes of hydrogen (${}^1H > 99\% : {}^2H < 1$). Chlorine also has two natural isotopes (${}^{35}Cl = 75 : {}^{37}Cl = 25\%$). How many different molecules of HCl are possible? Arrange them in the decreasing order of their relative abundance.



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11. At the same temperature and pressure, a gaseous hydride contains twice of its own volume of hydrogen. Vapour density of the hydride is 14. what is its molecular formula?



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12. According to Avogadro's hypothesis, at the same temperature and pressure equal volume of all gases contain equal number of molecules. Can it be concluded from the given statement that "all molecules have equal volume" ?

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13. A mixture of formic acid and oxalic acid is heated with concentrated H_2SO_4 . The gas evolved is collected and treated with KOH solution. The volume of the solution decreases by $\frac{1}{6}$ th of its original volume. Find the molar ratio of the two acids in the original mixture.

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14. Taking N_2 and O_2 as the main components of air (79% N_2 , 21% O_2 by volume), find the average molecular mass of air.

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15. A gaseous hydrocarbon needs 6 times more volume of oxygen (O_2) than itself for complete oxidation. It produces 4 times more CO_2 (by volume) than its own. What is the formula of the hydrocarbon?

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16. What is the equivalent mass of $KH(IO_3)_2$ as an oxidant in presence of 4.0 (N) HCl when ICl becomes the reduced form? [where $K=39.0$ and $I=127.0$]



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17. Which is the limiting reagent in the combustion of methane and why it is called so?



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18. A box contains some identical red balls, labelled as A, each weighing 2 gram. Another box contains identical blue balls, labelled as B, each weighing 5 A_2B and A_2B_3 , show that the law of multiple proportions is applicable for this case.



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19. What is $kg - mol$? Calculate the total number of electrons present in $1kg - mol$ of N_2 .



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Entrance Question Bank

1. 2g of metal carbonate is neutralised completely by 100 mL of 0.1 (N) HCl. The equivalent weight of metal carbonate is-

- A. 50
- B. 100
- C. 150
- D. 200

Answer: D



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2. The weight of oxalic acid that will be required to prepare a 1000 mL (N/20) solution is-

A. $\frac{126}{100}g$

B. $\frac{63}{40}g$

C. $\frac{63}{20}g$

D. $\frac{126}{20}g$

Answer: C



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3. The equivalent weight of $K_2Cr_2O_7$ in acidic medium is expressed in terms of its molecular weight (M) as-

A. $\frac{M}{3}$

B. $\frac{M}{4}$

C. $\frac{M}{6}$

D. $\frac{M}{7}$

Answer: C



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4. Number of hydrogen ions present in 10 millionth part of 1.33 cm^3 of pure water at 25°C is-

A. 6.023 million

B. 60 million

C. 8.01 million

D. 80.23 million

Answer: C



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5. The volume of ethyl alcohol (density 1.15g/cc) that has to be added to prepare 100cc of 0.5 M ethyle alcohol solution in water is-

A. 1.15 cc

B. 2cc

C. 2.15cc

D. 2.30 cc

Answer: B

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6. The system that contains the maximum no. of atoms is-

A. 4.25g of NH_3

B. 8g of O_2

C. 2g of H_2

D. 4g of He

Answer: C

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7. In a flask, the weight ratio of $CH_4(g)$ and $SO_2(g)$ at 298K and 1 bar is 1:2. the ratio of the number of molecules of $SO_2(g)$ and $CH_4(g)$ is-

A. 1:4

B. 4:1

C. 1:2

D. 1:1

Answer: C

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8. What will be the normality of the salt solution obtained by neutralising x mL $y(N)$ HCl with y mL $x(N)$ NaOH, and finally

addition $(x+y)$ mL distilled water-

A. $\frac{2(x+y)}{xy}N$

B. $\frac{xy}{2(x+y)}$

C. $\left(\frac{2xy}{x+y}\right)$

D. $\left(\frac{x+y}{xy}\right)N$

Answer: B



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9. 0.126g of an acid is needed to completely neutralise 20 mL

0.1 N NaOH solution. The equivalent weight of the acid is-

A. 53

B. 40

C. 45

D. 63

Answer: D



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10. You are supplied with 500 mL each of 2(N) HCl and 5(N) HCl. What is the maximum volume of 3(M) HCl that you can prepare using only these two solutions-

A. 250 mL

B. 500 mL

C. 750 mL

D. 1000 mL

Answer: C



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11. A metal M (specific heat=0.16) forms a metal chloride with $\approx 65\%$ chlorine present in it. The formula of the metal chloride will be-

A. MCl

B. MCl_2

C. MCl_3

D. MCl_4

Answer: B



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12. how many moles of electrons will weight one kilogram-

A. 6.022×10^{23}

B. $\frac{1}{9.108} \times 10^{31}$

C. $\frac{6.023}{9.108} \times 10^5$

D. $\frac{1}{9.108 \times 6.023} \times 10^8$

Answer: D



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13. A 5.2 molal aqueous solution of methyl alcohol is supplied.

What is the mole fraction of methyl alcohol in the solution-

A. 0.19

B. 0.086

C. 0.05

D. 0.1

Answer: B



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14. The density of a solution prepared by dissolving 120g of urea (mol. Mass=60u) in 1000g of water is $1.15 \text{ g} \cdot \text{mL}^{-1}$. The molarity of this solution is-

A. 1.78M

B. 1.02M

C. 2.05M

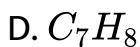
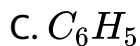
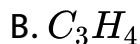
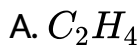
D. 0.50M

Answer: C



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15. A gaseous hydrocarbon gives upon combustion 0.72g water and 3.08g CO_2 . The empirical formula of the hydrocarbon-



Answer: D



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16. A compound with molecular mass 180 is acylated with CH_3COCl to get a compound with molecular mass 390. the number of amino groups present per molecule of the former compound is-

A. 4

B. 5

C. 2

D. 6

Answer: B



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17. The molarity of a solution obtained by mixing 750 mL of 0.5(M) HCl with 250 mL of 2(M) HCl will be-

A. 0.875 M

B. 1.00 M

C. 1.75 M

D. 0.975 M

Answer: A

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18. The ratio of masses of oxygen and nitrogen in a particular gaseous mixture is 1:4. the ratio of number of their gram molecules is -

A. 3: 16

B. 1: 4

C. 7: 32

D. 1: 8

Answer: C



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19. 3g of activated charcoal was added to 50 mL of acetic acid solution (0.06N) in a flask. After an hour it was filtered and the strength of the filtrate was found to be 0.042 (N). The amount of acetic acid absorbed (per gram of charcoal) is-

A. 42 mg

B. 54 mg

C. 18 mg

D. 36 mg

Answer: C



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20. The molecular formula of a commercial resin used for exchanging ions in water softening is $C_8H_7SO_3Na$ (mo. Wt. 206). What would be the maximum uptake of Ca^{2+} ions by the resin when expressed in mole per gram resin-

A. $\frac{2}{309}$

B. $\frac{1}{412}$

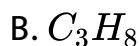
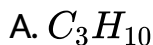
C. $\frac{1}{103}$

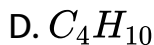
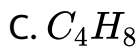
D. $\frac{1}{206}$

Answer: B

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21. At 300 K and 1 atm, 15 mL of gaseous hydrocarbon requires 375 mL air containing 20% O_2 by volume for complete combustion. After combustion the gases occupy 330 mL. assuming that the water formed is in liquid form and the volumes were measured at the same temperature and pressure, the formula of the hydrocarbon is-





Answer: B

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22. The most abundant elements by mass in the body of a healthy human adult are: oxygen (61.4%), carbon (22.9%), hydrogen (10.0%) and nitrogen (2.6%). The weight which a 75kg person would gain if all 1H -atoms are replaced by 2H -atoms is-

A. 7.5kg

B. 10kg

C. 15kg

D. 37.5kg

Answer: A

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23. 1 gram of a carbonate (M_2CO_3) on treatment with excess HCl produces 0.01186 mol of CO_2 . The molar mass of M_2CO_3 in $g \cdot mol^{-1}$ is-

A. 118.6

B. 11.86

C. 1186

D. 84.3

Answer: D



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24. Mole fraction of the solute in 1.00 molal aqueous solution

is-

A. 0.177

B. 0.0177

C. 0.0344

D. 1.77

Answer: B



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25. Which has the maximum number of molecules among the following-

A. 44g CO_2

B. 48g O_3

C. 8g H_2

D. 64g SO_2

Answer: C

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26. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 (M) HNO_3 . The concentrated acid is 70% HNO_3 -

A. 45.0g conc. HNO_3

B. 90.0g conc. HNO_3

C. 70.0g conc. HNO_3

D. 54.0g conc. HNO_3

Answer: A



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27. 1.0g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much (at wt.

Mg=24, O=16)-

A. Mg, 0.16g

B. O_2 , 0.16g

C. Mg , $0.44g$

D. O_2 , $0.28g$

Answer: A

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28. When 22.4 litres of $H_2(g)$ is mixed with 11.2 litres of $Cl_2(g)$, each at STP, the moles of $HCl(g)$ formed is equal to-

A. 1 mol of $HCl(g)$

B. 2 mol of $HCl(g)$

C. 0.5 mol of $HCl(g)$

D. 1.5 mol of $HCl(g)$

Answer: A



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29. Equal masses of H_2 , O_2 and methane have been taken in a container of volume V at temperature $27^\circ C$ in identical conditions. The ratio of the volumes of gases $H_2:O_2$ methane would be-

A. 8 : 16 : 1

B. 16 : 8 : 1

C. 16 : 1 : 2

D. 8 : 1 : 2

Answer: C



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30. If Avogadro number is changed from $6.022 \times 10^{23} \text{mol}^{-1}$ to $6.022 \times 10^{20} \text{mol}^{-1}$ this would change-

- A. the definition of mass in units in gram
- B. the mass of one mole of carbon
- C. the ratio of chemical species, to each other in a balanced equation
- D. the ratio of elements to each toher in a compound

Answer: B



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31. The number of water molecules is maximum in-

A. 18 molecules of water

B. 1.8 g of water

C. 18g of water

D. 18 moles of water

Answer: D



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32. 20.0g of a magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0g magnesium oxide. What will be the percentage purity of magnesium carbonate in the sample (Mg=24)-

A. 75

B. 96

C. 60

D. 84

Answer: D



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33. What is the mass of precipitate formed when 50 mL of 16.9% solution of $AgNO_3$ is mixed with 50 mL of 5.8% NaCl solution (Ag=107.8, N=14, O=16, Na=23, Cl=35.5)-

A. 28g

B. 3.5g

C. 7g

D. 14g

Answer: C

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34. What is the mole fraction of the solute in 1.00 m aqueous solution-

A. 0.177

B. 0.177

C. 0.0354

D. 0.0177

Answer: D

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35. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2 . When 0.1 mol of XY_2 weighs 10g and 0.05 mol of X_3Y_2 weighs 9g, the atomic weights of X and Y are-

A. 40,30

B. 60,40

C. 20,30

D. 30,20

Answer: A



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36. Which of the following is dependent on temperature-

- A. molarity
- B. mole fraction
- C. weight percentage
- D. molality

Answer: A

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37. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4 . The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be-

A. 4.4

B. 1.4

C. 2.8

D. 3

Answer: C



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38. In which case is the number of molecules of water maximum-

A. 10^{-3} mol of water

B. 18 mL of water

C. 0.00224 L of water vapours at 1 atm and 273K

D. 0.18g of water

Answer: B



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39. How much amount of $CuSO_4 \cdot 5H_2O$ is required for liberation of 2.54g of I_2 when titrated with KI-

A. 2.5g

B. 4.99g

C. 2.4g

D. 1.2g

Answer: B



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40. The compound which does not exist as hydrate form-

- A. ferrous sulphate
- B. copper sulphate
- C. magnesium sulphate
- D. sodium chloride

Answer: D



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41. The number of atoms in 52g of He is-

- A. 78.299×10^{24} atoms

B. 7.820×10^{-24} atoms

C. 7.829×10^{24} atoms

D. 78.234×120^{25} atoms

Answer: C



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42. How many significant figures are present in 0.0000135 -

A. 7

B. 8

C. 4

D. 3

Answer: D



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43. The amount of $BaSO_4$ precipitated on mixing $BaCl_2$ (0.5 M) with H_2SO_4 (1M) will correspond to -

A. 0.5 mol

B. 1.0 mol

C. 1.5 mol

D. 2.0 mol

Answer: A



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44. 10 mL of liquid carbon disulphide (specific gravity 2.63) is burnt in oxygen. Find the volume of the resulting gases measured at STP-

A. 23.25 L

B. 22.26 L

C. 23.50 L

D. 20.08L

Answer: A



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45. Mixture of two bivalent metals A and B having mass 2g when dissolved in HCl at STP, 2.24 . H_2 is evolved. What is the

mass of A percent in mixture (Atomic mass of

$A = 15u, B = 30u$)-

A. 1g

B. 1.5g

C. 0.5g

D. 0.75g

Answer: A



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46. The normality of 10% H_2SO_4 solution having density

1.1g/cc is-

A. 2.05N

B. 1.25 N

C. 3.45 N

D. 2.24 N

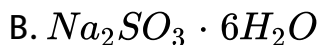
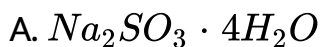
Answer: D

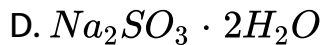


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Mcq Hotspot Single Correct Type

1. A hydrate of Na_2SO_3 completely loses 22.2% of water by mass on strong heating. The hydrate is-





Answer: D

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2. 20g of an acid furnishes 0.5 moles of H_3O^+ ions on complete ionisation in its aqueous solution. The value of 1g eq of that acid will be-

A. 40g

B. 20g

C. 10g

D. 100g

Answer: A



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3. $Fe_2S_3 \rightarrow FeSO_4 + SO_2$: in this reaction the equivalent weight of Fe_2S_3 (assuming S in -2 oxidation state) is-

A. $\frac{M}{4}$

B. $\frac{M}{16}$

C. $\frac{M}{22}$

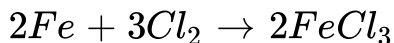
D. $\frac{M}{20}$

Answer: D



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4. The equivalent mass of iron in the reaction is-



- A. half of its molecular mass
- B. one third of its molecular mass
- C. same as its molecular mass
- D. one fourth of its molecular mass

Answer: B



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5. A sample of $Na_2CO_3 \cdot H_2O$ weighing 0.62g is added to 100 ml of 0.1 N H_2SO_4 . The resulting solution will be-

- A. acidic

B. basic

C. neutral

D. amphoteric

Answer: C



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6. The normality of 10% (weight/volume) acetic acid is-

A. 1N

B. 10N

C. 1.66N

D. 0.83N

Answer: C



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7. if the equivalent weight of an element is 32, then the % of oxygen in its oxide is-

A. 16

B. 40

C. 32

D. 20

Answer: D



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8. I^- reduces SO_4^{2-} to H_2S in acidic medium as per the reaction, $8KI + 5H_2SO_4 \rightarrow 4K_2SO_4 + 4I_2 + H_2S + 4H_2O$ to produce 34.0 g H_2S , volume of 0.20 (M) H_2SO_4 required is-

A. 25.0 L

B. 12.5 L

C. 10.0 L

D. 5.0 L

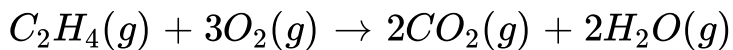
Answer: A



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9. A mixture containing 1 mol of ethane and 4 moles of oxygen is ignited in a sealed container at $100^\circ C$. The reaction

occurring is shown by the equation,



Calculate total no. of mole of gas at the end of the reaction-

A. 2

B. 3

C. 4

D. 5

Answer: D



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10. Mass ratio of Na_2SO_3 and H_2O in $Na_2SO_3 \cdot xH_2O$ is 1:1

thus the ratio of their mole number is-

A. 1:1

B. 1:3

C. 1:7

D. 7:1

Answer: C

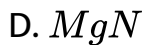
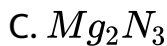


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11. When 0.237g Mg is heated strongly in a nitrogen (N_2) atmosphere, 0.378 of the compound is formed. Hence the compound formed is-

A. Mg_3N_2

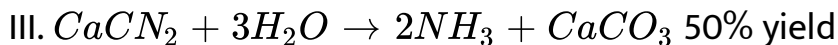
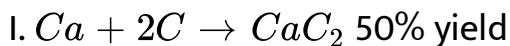
B. Mg_3N



Answer: A

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12. NH_3 is formed in the following steps:



to obtain 2 moles of NH_3 , calcium required is-

A. 1 mol

B. 2 mol

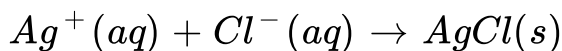
C. 3 mol

D. 4 mol

Answer: D

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13. Silver ions react with chloride ions



5cm^3 of a $0.1\text{mol}/\text{cm}^3$ solution of the chloride of metal X needs 10cm^3 of $0.1\text{ mol}/\text{cm}^3$ silver nitrate for complete reaction. What is the formula of the chloride-

A. XCl_4

B. XCl_2

C. XCl

D. X_2Cl

Answer: B



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14. Equal volumes of H_2S & SO_2 react at NTP to form H_2O and S. $2H_2S + SO_2 \rightarrow 2H_2O + 3S$. In this reaction,

I. H_2S is the limiting reactant.

II. SO_2 is the limiting reactant.

III. Sulphur formed is three times of SO_2 reacted

IV. sulphur formed is 1.5 times of H_2S reacted.

Select the correct statements(s).

A. all except I

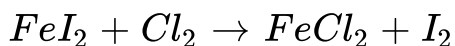
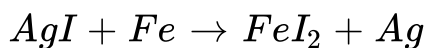
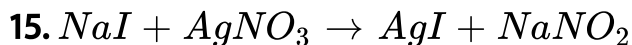
B. all except II

C. all except I, III

D. all except II, IV

Answer: B

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(atomic mass of Ag=108, I=127, Fe=56, N=14, Cl=35.5). The above reaction is carried out by taking 75g of NaI and 255 kg of AgNO_3 . Therefore, the number of moles of iodine formed is-

A. 0.5

B. 500

C. 250

D. 0.25

Answer: C

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16. The mole fraction and molarity of 46% (by weight) aqueous solution of ethanol is-

A. 0.25, 18.52

B. 0.75, 1.0

C. 0.46, 18.52

D. 0.54, 1.0

Answer: A

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17. The amount of $KMnO_4$ required to react with 1 mol of sulphite ion in acidic medium is-

A. $4/5$ mol

B. $3/5$ mol

C. 1 mol

D. $2/5$ mol

Answer: D



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18. A sphere of radius 7 cm contains 56% iron. If the density of the sphere is 1.4g/cm^3 , then the approximate amount of iron

present is-

A. 20

B. 10

C. 15

D. 25

Answer: A



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19. When 800g of a 40% solution by weight was cooled, 100g of solute was precipitated. The percentage composition of the remaining solution is-

A. 31.4 %

B. 20.0 %

C. 50 %

D. 25 %

Answer: A



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20. 0.70g mixture of $(NH_4)_2SO_4$ was boiled with 100 ml of 0.2 N NaOH solution till all the $NH_3(g)$ evolved and get dissolved to 250 mL and 10 mL of this solution was neutralised by using 10 mL of a 0.1 N H_2SO_4 . The percentage purity of the $(NH_4)_2SO_4$ was boiled with 100 ml of 0.2 N NaOH solution till all the $NH_3(g)$ evolved and get dissolved to 250 mL and 10 mL of this solution was neutralised by using

10 mL of a 0.1 N H_2SO_4 solution. the percentage purity of the $(NH_4)_2SO_4$ sample is-

A. 94.3

B. 50.8

C. 47.4

D. 79.8

Answer: A



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21. A 500g tooth paste sample 0.3 g fluoride. What is the concentration of fluoride in ppm?

A. 50 ppm

B. 100 ppm

C. 150 ppm

D. 200 ppm

Answer: D



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22. If in a solution NaCl is present as 5.85g per 500 mL of the solution, then molarity of the solution will be-

A. $4 \text{ mol} \cdot \text{L}^{-1}$

B. $20 \text{ mol} \cdot \text{L}^{-1}$

C. $2 \text{ mol} \cdot \text{L}^{-1}$

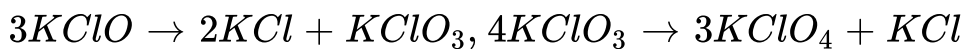
D. $0.2 \text{ mol} \cdot \text{L}^{-1}$

Answer: D



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23. $KClO_4$ can be prepared by the following reaction:



To prepare 200g $KClO_4$, the required amount of Cl_2 is equivalent to-

A. 8.95 equivalent H_2SO_4

B. 129.02L O_2 at STP

C. 11.52 mol oxygen

D. 410.1g chloride

Answer: D



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24. IO_3^- , oxidises SO_3^{2-} to SO_4^{2-} in acidic medium 100mL solution containing 2.14g of KIO_3 reacts with 60mL of 0.5(N) Na_2SO_3 solution. Final oxidation state of iodine in reduced species is-

A. +5

B. +3

C. -1

D. +1

Answer: C



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25. The concentration of both Na_2CO_3 and $NaHCO_3$ is 5.2×10^{-3} mol in their mixture. The amount of 0.1 (M) HCl required to neutralise this mixture completely is-

A. 1.56 L

B. 1.57 L

C. 15.7 L

D. 156.0 mL

Answer: D



[Watch Video Solution](#)

26. 10g of pyrolusite on reaction with conc. HCl liberated 0.1 equivalent of Cl_2 . Percentage purity of pyrolusite sample-

A. 87.0 %

B. 43.5 %

C. 21.75 %

D. 100 %

Answer: B



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27. 100 mL of 30% (m/v) NaOH solution is mixed with 100 mL of 90% (m/v) NaOH solution then the molarity of final solution will be-

A. 1.3

B. 13

C. 1/5

D. 15

Answer: D



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28. 5.3g of M_2CO_3 is dissolved in 150 mL of 1(N) HCl. Unused acid required 100 mL of 0.5(N) NaOH. Hence equivalent weight of M is-

A. 23

B. 12

C. 24

D. 13

Answer: A



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29. Methane was burnt in an incorrectly adjusted burner. The methane was converted into a mixture of carbon dioxide and carbon monoxide in the ratio of 99:1, together with water vapour, what will be the volume of oxygen consumed when y dm^3 of methane is burnt -

A. $\left(2y - \frac{0.01}{2}y\right)dm^3$

B. $(2y - 0.01y)dm^3$

C. $\left(y - \frac{0.01}{2}y\right)dm^3$

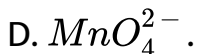
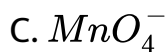
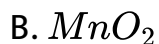
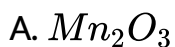
D. $(y - 0.01y)dm^3$

Answer: A



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30. The equivalent weight of $MnSO_4$ is half of its molecular mass when it is converted to-



Answer: B



Watch Video Solution

31. Mass percent of carbon in carbon dioxide is-

A. 0.034

B. 27.27

C. 3.4

D. 28.7

Answer: B



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32. If the concentration of glucose in blood is $0.9 \text{ g} \cdot \text{L}^{-1}$, then its molarity will be-

A. 5

B. 50

C. 0.005

D. 0.5

Answer: C



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33. In an experiment, 4g M_2O_x oxide was reduced to 2.8g of the metal. If the atomic mass of the metal is $56g \cdot mol^{-1}$, the number of O-atoms in the oxide is-

A. 1

B. 2

C. 3

D. 4

Answer: C



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34. Specific volume of a cylindrical virus particle is $6.02 \times 10^{-2} \text{cc} \cdot \text{g}^{-1}$ whose radius and length are 7 \AA & 10 \AA respectively. Molecular mass ($\text{kg} \cdot \text{mol}^{-1}$) of the virus-

A. 1.54

B. 1.54×10^4

C. 3.08×10^4

D. 3.08×10^3

Answer: A



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35. 10 mL of CS_2 (Specific gravity 2.63) is burnt in oxygen.

Volume of the resulting gases at STP is will be-

A. 23.25 L

B. 22.25 L

C. 23.50 L

D. 20.08 L

Answer: A



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36. An element X has the following isotopic composition-

^{200}X : 90%, ^{199}X : 8.9%, ^{202}X : 1.1%. The weighed average

atomic mass of the natural occurring element X is-

A. 201

B. 202

C. 199

D. 200

Answer: D



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37. At room temperature the no of molecules present in 1 drop of water (volume 0.0018 mL and density 1g/cc) is-

A. 6.02×10^{23}

B. 1.084×10^{18}

C. 4.84×10^{17}

D. 6.02×10^{19}

Answer: D

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38. if a signature contains 1mg of C-atom then number of C-atom in the signature is-

A. 6.02×10^{20}

B. 0.502×10^{20}

C. 5.02×10^{23}

D. 5.02×10^{20}

Answer: B

 [Watch Video Solution](#)

39. No. of valence electron present in 4.2g nitride ion is-

A. $2.4N_A$

B. $4.2N_A$

C. $1.6N_A$

D. $3.2N_A$

Answer: A



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40. An element forms four compounds A, B, C & D. ratio of equivalent weight of the compounds is 1:2:3:4. the compound in which the element has highest valency is-

A. A

B. B

C. C

D. D

Answer: A



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41. In which of the following compounds M has the highest equivalent weight-

A. MO

B. MO_2

C. M_2O_3

D. M_2O

Answer: A::D

 [Watch Video Solution](#)

42. Atomic mass of two compounds A and B is 30 and 60 respectively. If Xg of A contains Y atoms then no of atoms present in 2Xg of B is-

A. 2Y

B. Y

C. 4Y

D. Y/2

Answer: B



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43. Density (in $g \cdot mL^{-1}$) of a 3.60(M) H_2SO_4 solution that is 29% H_2SO_4 (Molar mass = $98g \cdot mol^{-1}$) by mass will be-

A. 1.64

B. 1.45

C. 1.22

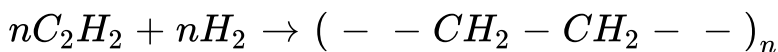
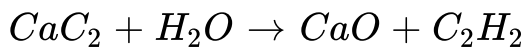
D. 1.88

Answer: C



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44. Polyethylene can be produced from CaC_2 according to the following sequence of reaction.



The mass of polyethylene, which can be produced from 20kg of CaC_2 is-

A. 6.75 kg

B. 7.75 kg

C. 9.75 kg

D. 8.75 kg

Answer: D



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45. The weight of one molecular of a compound $C_{60}H_{122}$ is-

A. $1.3 \times 10^{-20} g$

B. $1.4 \times 10^{-21} g$

C. $1.9924 \times 10^{-24} g$

D. $5.01 \times 10^{-21} g$

Answer: B



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46. A 2.0g mixture of Na_2CO_3 and $NaHCO_3$ suffered a loss of 0.12g on heating. Percentage of Na_2CO_3 in the mixture-

A. 83.8

B. 16.2

C. 38.8

D. 61.2

Answer: A

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47. Which of the following does not have same percentage of carbon as in ethene (C_2H_4)-

A. C_4H_8

B. C_6H_{12}

C. C_6H_{10}

D. C_5H_{10}

Answer: C



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48. x L of nitrogen at STP contains 3×10^{22} molecules. The number of molecules in $\frac{x}{2}$ L of ozone at STP will be-

A. 3×10^{22}

B. 1.5×10^{22}

C. 1.5×10^{21}

D. 1.5×10^{11}

Answer: B



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49. A sample of AlF_3 contains 3×10^{25} F -ions. The number of AlF^{3+} in the sample would be-

A. 3×10^{25}

B. 1×10^{25}

C. 1.5×10^{25}

D. 2×10^{25}

Answer: B



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50. X and Y are the two elements which form X_2Y_3 and X_3Y_4 . 0.2 mol of X_2Y_3 weighs 32g and 0.4 mol of X_3Y_4 weighs 92.8g. The atomic masses of X and Y respectively are-

A. 16u and 56 u

B. 8u and 28u

C. 56u and 16u

D. 28u and 8u

Answer: C



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51. Percentage of Se (atomic weight=78.4) in peroxidase anhydrase enzyme is 0.5% by weight then minimum molecular weight of peroxidase anhydrase enzyme is-

A. 1.568×10^4

B. 1.568×10^3

C. 15.618×10^8

D. 2.136×10^4

Answer: A

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52. How many mole of magnesium phosphate will contain 0.25 mol of oxygen atoms-

A. 0.02

B. 3.125×10^{-2}

C. 1.25×10^{-2}

D. 2.5×10^{-2}

Answer: B



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53. Amount of calcium oxide required, when it reacts with 852g of P_4O_{10} is-

- A. 100g
- B. 1008g
- C. 108g
- D. 1050g

Answer: B



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54. 25.3g of Na_2CO_3 is dissolved in enough water to make 250 ml of solution. If sodium carbonate dissociate completely, molar concentration of sodium ion, Na^+ and carbonate ions, CO_3^{2-} are respectively-

- A. 0.955(M) and 1.910(M)
- B. 1.910(M) and 0.955(M)
- C. 1.90(M) and 1.910(M)
- D. 0.477(M) and 0.477 (M)

Answer: A



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55. How many moles of lead (II) chloride will be formed from a reaction between 6.5g of PbO and 3.2g HCl-

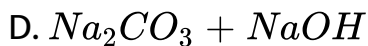
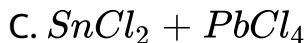
- A. 0.011
- B. 0.029
- C. 0.044
- D. 0.333

Answer: B

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56. Which of the following exist together-

- A. $\text{NaOH} + \text{NaCl}$



Answer: A:D

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57. In 46% (by weight) aqueous solution of ethanol-

A. mole fraction of ethanol is 0.25

B. mole fraction of water is 0.75

C. mole fraction of solvent (as water solvent) is 18.52

D. molarity is $10.00 \text{ mol} \cdot L^{-1}$.

Answer: A::B



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58. A 110% sample of oleum contains-

- A. 44.4 % of SO_3
- B. 55.6% of sulphuric acid
- C. 55.6% of SO_3
- D. 44.4% of sulphur acid

Answer: A::B



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59. The volume of CO_2 formed when a mixture of 2 mol $NaHCO_3$ and 1 mol Na_2CO_3 at STP, is-

- A. 2 equivalent H_2 gas
- B. 6 equivalent O_3 gas
- C. 4 equivalent O_2 gas
- D. 2 equivalent Cl_2 gas

Answer: A::B::C::D

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60. A and B are two element which form AB_2 and A_2B_3 . If 0.18 mol of AB_2 weighs 10.6g and 0.18 mol of A_2B_3 weighs 17.8g then -

A. atomic mass of A is 20.05

B. atomic mass of B is 20.05

C. atomic mass of A is 18.8

D. atomic mass of B is 18.8

Answer: A::D



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61. 100 mL of mixture of CO & CO_2 is mixed with 30 mL of oxygen and sparked in eudiometer. Volume of residual gas after treatment with aqueous KOH was 10 mL which remains unchanged when treated with alkaline pyrogallate. Which of the following are correct-

A. the volume of CO_2 absorbed by KOH is 90 mL

B. the volume of CO initially present was 70 mL

C. the volume of CO initially present was 50 mL

D. the volume of CO_2 absorbed by KOH is 80 mL

Answer: A::B



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62. Which of the following pairs have the same no. of atoms-

A. 16g of $O_2(g)$ and 4g of $H_2(g)$

B. 16g of $O_2(g)$ and 44g of $CO_2(g)$

C. 28g of $N_2(g)$ and 32g of $O_2(g)$

D. 12g of C(s) and 23g of Na(s)

Answer: C::D



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63. 0.6 moles of $K_2Cr_2O_7$ can oxidise-

A. 3.6 mol of $FeSO_4$ to $Fe_2(SO_4)_3$

B. 0.1 mol of $FeSO_4$ to $Fe_2(SO_4)_3$

C. 0.05 mol of Sn^{+2} to Sn^{+4}

D. 1.8 mol of Sn^{+2} to Sn^{+4}

Answer: A::D



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64. The sulphate of metal M contains 20% of M. this sulphate is isomorphous with $ZnSO_4 \cdot 7H_2O$. Which of the following are true about metal M-

- A. atomic mass of metal is 24
- B. metal is bivalent
- C. eq. wt. of metal is 12
- D. the salt of metal is $MgSO_4 \cdot 7H_2O$

Answer: A::B::C::D

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65. 1 mol $BaF_2 + 2mol H_2SO_4 \rightarrow$ resulting mixture will be completely neutralised by-

A. 1 mol of KOH

B. 2 mol of $Ca(OH)_2$

C. 4 mol of KOH

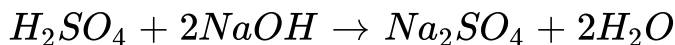
D. 2 mol of KOH

Answer: B::C



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66. Reaction between H_2SO_4 and NaOH is given below-



The amount and molarity of the Na_2SO_4 produced when

0.1(M) 1L H_2SO_4 reacts with 0.1 (M) 1L NaOH will be-

A. 7.10g

B. 3.55g

C. $0.025 \text{ mol} \cdot \text{L}^{-1}$

D. $0.01 \text{ mol} \cdot \text{L}^{-1}$

Answer: A::C



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67. If the density of air is 0.001293g/cm^3 at STP then-

A. vapour density of air is 14.48

B. molecular mass of air is 28.96

C. vapour density of air is 0.001293g/cm^3

D. vap. Density & mol. Mass of air cannot be determined.

Answer: A::B



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68. You are provided with 1 (M) solution of $NaNO_3$ whose density is 1.25g/mL, So, in the solution-

A. the percentage by mass of $NaNO_3 = 6.8$

B. the percentage by mass of $H_2O = 93.2$

C. the molality of the solution is 10.72

D. the solution has 0.2 mol of $NaNO_3$.

Answer: A::B



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69. 4.4 g CO_2 signifies-

- A. 0.1 mol CO_2
- B. 6.02×10^{22} molecules of CO_2
- C. 8.8g of oxygen atom
- D. 1120 mL CO_2 at STP

Answer: A::B



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70. Which of the following have equal concentration-

- A. 200 mL solution of 20g NaOH
- B. 100 mL solution of 40g NaOH

C. 200 mL solution of 0.5 mol KCl

D. 200 mL solution of 20g KOH

Answer: A::C

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71.8g of O_2 has the same number of molecules as-

A. 7g CO

B. 14g N_2

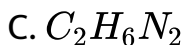
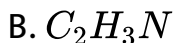
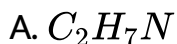
C. 11g CO_2

D. 16g SO_2

Answer: A::C::D

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72. At same temperature and pressure 10cc of an organic compound in the gaseous state were sparked with an excess of O_2 . 20cc of CO_2 and 5cc of N_2 were obtained among the products. Which of the following molecular formulas would fit these data-



Answer: A:B



View Text Solution

73. Which of the following concentration related terms are not affected by the change in temperature-

A. molarity

B. molality

C. normality

D. mole fraction

Answer: B::D



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74. The equivalent weights of sulphur in its oxides are-

A. 32

B. 8

C. 24

D. 5.33

Answer: B::D



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75. Two oxides of a metal contains 50% and 40% metal (M) respectively. Formula of the oxides are-

A. M_2O

B. MO_2

C. MO_3

D. M_2O_5

Answer: B::C

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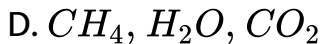
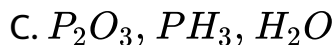
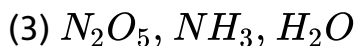
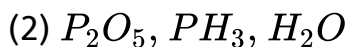
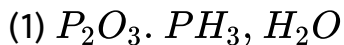
76. Pairs of species having same percentage of carbon are-



Answer: A::C

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77. Which of the following sets of compounds correctly illustrate the law of reciprocal proportions ?



Answer: C::D



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78. Which of the following weigh 32g-

- A. 1 mol oxygen molecules
- B. 1 mol oxygen atoms
- C. 1 mol CO molecules
- D. 22.4 L oxygen molecules (STP)

Answer: A:D



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Exercise Very Short Type Questions

1. Give relation between units of pressure in CGS & SI systems.

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2. Which quantity is measured by 'Angstrom' unit?

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3. Which quantity is measured in 'Pascal' unit?

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4. Who proposed the law of definite proportions?

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5. Give an example where the law of definite proportion falls.



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6. Which law of chemical combination was proposed by richter?



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7. Which measurement is more precise, 4.0g or 4.00g?



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8. What is atomic mas unit?



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9. What do you understand by "Rounding off"?

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10. Give an example of a non-stoichiometric compound.

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11. Who is known as the father of atomic theory?

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12. Give an example of birthollide compound.

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13. Which scale is approved by IUAPC for measuring atomic mass?

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14. Express 1 amu in gram.

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15. What is the actual mass of a ^{12}C -atom.

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16. What is the volume of 1 mol of any gas at STP?

 [Watch Video Solution](#)

 [Watch Video Solution](#)

17. For which type of compounds, "formula mass" is used?

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18. What is the mass of 1L of hydrogen gas at STP?

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19. Who determined the value of Avogadro's number?

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20. What is the number of ions present in "1 mol ion"?



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21. What is normal density of a gas?



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22. How is relative density of a gas related to its normal density?



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23. Which type of elements have fixed equivalent masses?



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24. What is atomic heat?

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25. Why is KOH used in eudiometric experiments?

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Exercise Fill In The Blanks

1. The number of significant figures in 2.500 is ____.

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2. The law of multiple proportion was postulated by ____.



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3. $1\text{L} = \text{_____} \text{dm}^3$.



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4. Dalton's atomic theory can not explain the law of _____.



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5. The sum of 2.3 and 6.54 should be reported as _____.



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6. Quinine is an ___ drug.

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7. $Cu_{1.7}S$ is a _____ compound.

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8. The atomicity of ozone molecular is _____.

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9. Molecular mass of helium = _____ \times relative density.

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10. _____ mass of sodium chloride is 58.45.

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11. 1 millimole = _____ mole.

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12. Mass of 1 gram-atom of oxygen is _____ g.

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13. Physical scale of atomic mass was proposed by _____.

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14. Mass of ___ atom (s) of nitrogen is 14 amu.

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15. Molecular mass of heavy water is _____.

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16. The equivalent mass of copper in CuO is _____.

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17. Equivalent mass of an element varies _____ with its valency.

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18. Law of isomorphism was postulated by_____.

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19. The empirical formula of glucose is_____.

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20. The S.I. unit of molar concentration is_____.

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21. The converse of the law of ____proportion is not true for isomeric compounds.

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22. The equivalent mass of oxidants and reductants depend on the ___of the reaction medium.

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23. _____concentration of a solution does not depend on temperature.

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24. Atomic mass= ____ X valency.

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Exercise Short Types Questions

1. What do you mean by "unit factor"?

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2. What do you mean by "significant figures"? Explain with examples.

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3. State and explain the law of multiple proportion.

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4. State and explain the law of reciprocal proportion.

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5. Write the characteristics of Gay-Lussac's law of gaseous volumes.

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6. State and explain Avogadro's hypothesis.





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7. What is formula mass ? Relative masses of which type of compounds are expressed by formula mass?



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8. What is molar volume ? Write its value at STP.



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9. What are the corollaries of Avogadro's hypothesis?



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10. Prove that, 1 mol of any ideal gas occupies a volume of 22.4 L at STP.

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11. Write the modern definition of avogadro's number.

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12. State the effect of temperature and pressure on absolute density and relative density of a gas.

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13. "What is the equivalent mass of Cu"? Comment on this question.

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14. The equivalent mass of Fe in FeO is

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15. Calculate the equivalent mass of $KMnO_4$ in acid medium.

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16. State Dulong and Petit's law of determination of atomic mass.

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17. What are isomorphous crystals? Give examples.

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18. Show that the equivalent mass of an element cannot be greater than its atomic mass.

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19. Can the equivalent mass of an element be zero? Explain.

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20. The equivalent mass of a certain element may vary. Explain.

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21. The atomic mass of an element is a and the formula of its oxide is M_2O_n . Show that the equivalent mass of the element is $\frac{a}{n}$.

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22. The empirical and the molecular formula of a compound are not always the same. Explain.

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23. What is limiting reagent? Explain with example.

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24. What do you understand by first contraction and second contraction in an eudiometric experiment?

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25. Define the following terms: (a) percentage strength (W/W), (b) molarity (c) molality (d) normality.

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Exercise Numerical Problems

1. Chlorine and oxygen form two different compounds. One of them contains 81.6% chlorine and the other contains 59.7% chlorine. Which law of chemical combination supports these observations.

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2. Two oxides of a metal (M) contain 22.53% and 30.38% of oxygen. If the second oxide be M_2O_3 , find the formula of first oxide.

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3. Three elements X, Y and Z form three different compounds XY, YZ, and XZ. If XY contains 75% X, XZ contains 72.76% Z and YZ contains 11.11% Y, then show that these results illustrate the law of reciprocal proportion.

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4. Calculate the volume of oxygen that will react with hydrogen produced by the decomposition of 50 cm^3 of

ammonia. Both the reactions occur at $18^{\circ}C$ & 76cm of Hg.

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5. Calculate the number of (a) CH_4 molecules (b) C-atoms and (c) H-atoms in 25g of CH_4 gas.

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6. Calculate : (i) mass, (ii) volume at STP, (iii) number of molecules present in 0.5 mol of CO_2 .

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7. Find the mass of carbon that contain the samme number of atoms as contained by 560g of iron (atomic mass=56).

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8. The atomic mass of a metallic element is 54.94. if its density be $7.42 \text{ g} \cdot \text{cm}^{-3}$, find its atomic volume.

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9. Calculate the number of O-atoms in 88g of CO_2 . Also calculate the mass of CO which will contain the same number of O-atoms.

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10. At STP, how many moles of CO_2 are present in 5.6 L of CO_2 ?

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11. 1L of air contains 21% of oxygen by volume at STP. What is the number of moles of oxygen in 1L of air?

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12. Mass of 1 mL of H_2 gas at STP is same as the mass of 9.86×10^{17} atoms of iron. Find the atomic mass of iron.

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13. Find the ratio of the masses of equal volumes of CH_4 , C_2H_4 and C_2H_2 gases under the same temperature and pressure.

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14. The atomic mass of an element is 24. find the actual mass of one atom of that element. If the atomic number of the element is 11, then find out the number of neutrons present in 0.1 gram-atom.

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15. Chlorophyll contains 2.68% of magnesium metal by mass. Calculate the number of Mg atoms present in 2.0g of chlorophyll.



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16. At $27^{\circ}C$ and 780mm pressure 1L of a gas weighs 1.125g.

Find its vapour density.



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17. Vapour density of mercury with respect to air is 6.92.

calculate the number of atoms present in each molecule of mercury vapour. (Given: $Hg=200$ and relative density of air=14.5).



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18. At STP, volumes occupied by 1.0g of hydrogen and 0.6786 g of air are 11.2 L and 0.525 L respectively. Calculate the vapour density of air with respect to hydrogen.

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19. At a certain temperature, the vapour density of sulphur with respect to nitrogen is 9.15. find the number of atoms present in each molecule of sulphur vapour.

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20. 10L of a gas at $0^{\circ}C$ and 760 mm pressure weighs 13.39g. Under identical conditions of temperature and pressure, ass

of 10 L of hydrogen is 0.8928g. What is the molecular mass of the gas?



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21. 5g of a metal on ignition in air forms 9.44g of its oxide. Calculate the equivalent mass of the metal.



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22. Equivalent mass of a metal is 20. How much of the metal will react with chlorine to give 5.0g of metallic chloride.



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23. The equivalent mass of calcium in calcium oxide is 20. find the percentage composition of calcium oxide.

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24. An iron rod of 20g is kept immersed for some time in an aqueous solution of $CuSO_4$. Then the rod is taken out from the solution and weighed. The observed mass is found to be reduced to 13.84g. On the other hand, this chemical reaction displaces 6.985g of copper. if the equivalent mass of iron is 28, what will be the equivalent mass of copper ?

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25. 5.249g of metallic carbonate on being strongly heated liberates 1309.28 mL of CO_2 at $27^\circ C$ and 755 mm pressure of Hg. Find the equivalent mass of the metal.

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26. 1.224g of a metallic carbonate on being strongly heated liberates 1309.28 mL of CO_2 at $27^\circ C$ and 750 mm pressure of Hg. Find the equivalent mass of the metal carbonate.

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27. 1.256g of a metal contains 0.376g of oxygen. If the specific heat of the metal be $0.124 \text{ cal} \cdot ^\circ C^{-1} \cdot g^{-1}$, find the formula of its oxide.



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28. 0.11g of a metallic chloride requires 0.34g of $AgNO_3$ for complete precipitation of chlorine. Specific heat of the metal is $0.152 \text{ cal} \cdot ^\circ C^{-1} \cdot g^{-1}$. Determine the formula of metallic chloride.



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29. Silver sulphide and cuprous sulphide are isomorphous compounds. Silver sulphide contains 12.94% sulphur while cuprous sulphide consists of 20.14% sulphur. Determine equivalent mass of copper.



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30. A sulphate of a metal is isomorphous with $ZnSO_4 \cdot 7H_2O$. In this salt, the percentage of the metal is 9.75. what is the atomic mass of the metal?

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31. Determine the percentage by mass of oxygen and Sb in the compound, Sb_2O_5 . [$Sb = 121.77$].

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32. 9.7g of hydrated copper sulphate on heating loses 3.5 g of water. What is the percentage of water of crystallization?

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33. Determine the percentage by mass of chromium, sulphate radical and water of crystallization in chrome alum $[K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O]$. ($Cr = 52$).

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34. Percentage composition of a salt is $K=8.23\%$, $Al=5.70\%$, $SO_4 = 40.51\%$ and $H_2O = 45.5\%$. What is the empirical formula of the compound? The molecular mass of the compound is 948. what is its molecular formula?

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35. An organic compound consists of C, H and N. 0.5g of the compound, on combustion, forms 1.44g of CO_2 and 0.3785g

of water, find the molecular formula of the compound if its vapour density is 53.35.

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36. Percentage composition of a mineral is:

$CaO = 48\%$, $P_2O_5 = 41.3\%$ and $CaCl_2 10.7\%$.

Determine the formula of that mineral.

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37. An organic compound, consisting of carbon, hydrogen, nitrogen and oxygen contains 40.67% of carbon and 8.47% of hydrogen. 0.5g of that compound gives 94.91mL of nitrogen at STP. What is the empirical formula of that compound?

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38. What amount of magnesium sulphide (MgS) will be produced from 1 g of Mg and 1g of S ?

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39. How much Na_2SO_4 will be required for complete precipitation of 7.336g $BaCl_2$ dissolved in water? What will be the mass of $BaSO_4$ precipitated? [$Ba=137.36$]

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40. What amount of $CaCO_3$ will be just sufficient to produce 1 L of CO_2 at $27^\circ C$ and 760 mmHg pressure? Determine the

quantity of pure carbon required to yield the same amount of CO_2 .

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41. A HNO_3 solution (specific gravity=1.46) contains 75% HNO_3 . How much of this acid will be needed to dissolve 5g of CuO?

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42. Calculate the amount of Cl_2 produced by reaction between 1 g of each of MnO_2 and HCl .

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43. When a mixture of NaCl and NaBr is heated with H_2SO_4 , the halogen components are liberated as their hydric acids leaving Na_2SO_4 as the residue. In an experiment, the mass of Na_2SO_4 left is equal to the mass of $(NaCl + NaBr)$ taken at the beginning of the experiment. calculate the percentages of NaCl and NaBr in the given mixture.

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44. H_2 gas liberated in the reaction of 13g of zinc with dilute H_2SO_4 is separately passed over (i) 10 g and (ii) 20 g of dry cupric oxide. What is the amount of the residue remain in each case?

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45. 1g of a mixture containing Na_2CO_3 and $NaHCO_3$ in equal amounts is heated until a constant mass is obtained. Find the volume of CO_2 gas liberated at STP.

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46. 2g of mixture of $CaCO_3$ and $MgCO_3$ on being treated with dilute HCl gives 536.84 mL of CO_2 at $27^\circ C$ and 750 mm of Hg pressure. What is the composition of the mixture?

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47. What will be the amounts of NH_3 (excess) and Cl_2 required to produce 1L N_2 gas at $27^\circ C$ and 750 mm pressure.

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48. Calculate the volume of O_2 gas required for complete burning of 10 L of acetylene gas. Also calculate the volume of CO_2 produced. All volumes are measured at same temperature and pressure.

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49. A gas-mixture having 1200 mL volume at $27^\circ C$ and 1 atm pressure consists of 80% of methane % 20% of CO. what amount of $KClO_3$ on thermal decomposition produces the same quantity of oxygen as needed for complete combustion of the mixture?

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50. The volume of the gas mixture obtained by passing 400 mL CO_2 over red hot coke was measured to be 600 mL. find the composition of the gas mixture.

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51. 10 mL of a gaseous hydrocarbon is completely combusted with 60 mL of oxygen by passing electric spark. The volume of the gaseous mixture thus yielded on cooling becomes 46 mL, iff the vapour density of the compound is 15, what will be its molecular formula? [All volumes were measured under the same conditions of temperature and pressure.]

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52. 

Determine the values of x , y and z . [All volumes were measured at same temperature and pressure.]

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53. Calculate the strength in-percentage (W/V), moles per litre or molarity, number of gram equivalents of the solute and normality of the following solutions-

(i) 9.125g of HCl in 200 mL of its aqueous solution.

(ii) 60g of NaOH in 3L of its aqueous solution.

(iii) 14.7g H_2SO_4 in 500 mL of its aqueous solution.

(iv) 296 $Ca(OH)_2$ in 10 L of its aqueous solution.

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54. Calculate the molality of a solution prepared by equal volumes of a 40% H_2SO_4 solution (W/V) (density $1.5 \text{ g} \cdot \text{cm}^{-3}$) and 60% H_2SO_4 solution (W/V) (density $1.8 \text{ g} \cdot \text{cm}^{-3}$).

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55. An impure sample of $(NH_4)_2SO_4$ is supplied to a laboratory. 3.6g of the supplied $(NH_4)_2SO_4$ salt on heating with NaOH forms NH_3 gas. 100 mL of $0.5(N)H_2SO_4$ is required for the complete neutralisation of the liberated NH_3 gas. calculate the percentage purity of the impure sample. let us assume, the impurity of the sample is insoluble in NaOH.

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56. A sample of 3.95g of 60% pure chalk (impurities in the chalk are insoluble in HCl), is dissolved in 250 mL of 0.2(M) HCl. What volume (cm^3) of 0.01 (N) NaOH is required to neutralise the excess acid?

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57. 1 L each of three samples of H_2O_2 labelled as 10 volume, 20 volume and 30 volume are mixed together and then diluted to 5 L using water. Find out the relative strength of the resultant solution.

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58. Mass of an empty LPG cylinder is 14.8 kg and when it is filled with n-butane gas, the mass is 29.0 kg and internal pressure is 2.5 atm. After few days mass of the filled gas cylinder decreases to 23.2 kg. Calculate the volume of gas used in m^3 (at $27^\circ C$ & 1 atm).

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59. 0.3 g of a metal reacts with dilute acid and produce 110 mL of H_2 which is collected above water at $17^\circ C$ temperature and 755 mm Hg pressure. Find equivalent mass of the metal. [pressure of water vapour at $17^\circ C = 14.4 \text{ mmHg}$].

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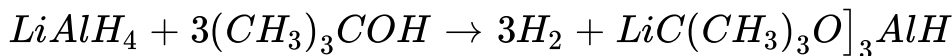
60. Find the volume of ammonia gas (at STP) which on passing through 30 mL 1.0 (N) H_2SO_4 solution, acidity of solution decrease to 0.2 (N).

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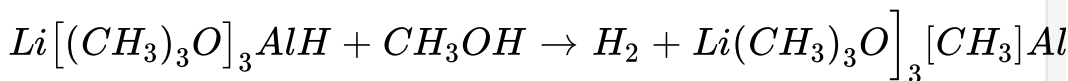
61. A hole is formed on 0.1 mm thick aluminium sheet on pouring of 1 mL 12 (M) HCl. If the HCl is completely used, then find the area (cm^2) of the hole. (density of Al is $2.7g/cm^3$).

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62. 52.5 millimol $LiAlH_4$ reacts with 15.6g (210 millimol) tert-butyl alcohol. In the following reaction 157.5 millimol H_2 is produced.



On adding extra methanol or alcohol in the above reaction, displacement of the 4th hydrogen atom $LiAlH_4$ will be observed by the following reaction.



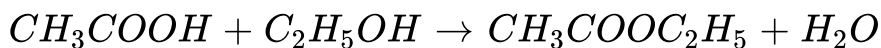
How much H_2 will evolve on adding methanol?

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63. 0.19 g of a impure H_2O_2 sample is dissolved in a 20 mL solution. 0.316g of the solution reacts completely with $KMnO_4$ in presence of H_2SO_4 . Find the purity of H_2O_2 sample.

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64. 20.2 mL of CH_3COOH reacts with 20.1 mL of C_2H_5OH and produce $CH_3COOC_2H_5$ according to the following reaction [density of $CH_3COOC_2H_5$] is 0.902g/mL].



(a) Which one is the limiting reagent in the reaction?

(b) if 27.5 mL of pure $CH_3COOC_2H_5$ is produced, then find the percentage amount of production [density of CH_3COOH and C_2H_5OH are 1.05g/mL and 0.789g/mL respectively].



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65. 0.05g of a commercial sample of $KClO_3$ on decomposition liberated just sufficient oxygen for complete

oxidation of 20 mL CO at $27^{\circ}C$ & 750 mm pressure. Calculate & of $KClO_3$ in the sample.

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66. For complete neutralisation of 25 mL of Na_2CO_3 solution (specific gravity $1.25g \cdot mL^{-1}$), 32.9 mL of HCl solution containing 109.5g of the acid per litre is required. Calculate the volume of 0.84(N) H_2SO_4 that will be neutralised by 125g of Na_2CO_3 solution.

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67. A metal M of atomic mass 54.94 has a density of $7.42g/cm^3$. Calculate the volume occupied and the radius of the atom of this metal assuming it to be a sphere.



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68. 4.08g of a mixture of BaO and unknown carbonate (MCO_3) was heated strongly. The residue weighing 3.64g was dissolved in 100 mL of 1(N) HCl. The excess acid required 16 mL of 2.5(N) NaOH solution for complete neutralisation. Identify the metal.



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Practice Set

1. What do you mean by semimolar NaOH solution?



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2. Give an example of a tetra-atomic element and calculate its molecular mass.

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3. Is the statement correct or incorrect- 35.5g of chlorine contains 6.022×10^{23} molecules?

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4. What is the equivalent weight of $KMnO_4$ in acidic solution?

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5. Define an atom in view of Dalton's theory.

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6. For which type of compounds the term "formula mass". Is used?

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7. Give an example of berthollide compound.

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8. Which is the limiting reagent in the combustion of methane and why it is called so?



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9. Suppose the human population of the world is 3×10^{10} . If 100 molecules of sugar ($C_{12}H_{22}O_{11}$) are distributed per head, what is the total quantity of sugar required for distribution?

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10. A compound on analysis shows C=40%, H=6.67% and O=53.33%. Determine the empirical formula of the compound. If molar mass of the compound is $30g \cdot mol^{-1}$, what is its molecular formula?

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11. A sample of 3.95g of 60% pure chalk (impurities in the chalk are insoluble in HCl), is dissolved in 250 mL of 0.2(M) HCl. What volume (cm^3) of 0.01 (N) NaOH is required to neutralise the excess acid?

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12. What are isomorphous crystals? Give examples.

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13. The equivalent mass of $KMnO_4$ is 'x'. What is the insufficiency in this statement ?

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