CHEMISTRY

BOOKS - MODERN PUBLISHERS CHEMISTRY (HINGLISH)

SOME BASIC CONCEPTS OF CHEMISTRY

Solved Examples

1. State the number of significant figures in each of the following numbers:

(i) 207.35, (ii) 0.00368, (iii) 653, (iv) 3.653×10^4, (v) 0.378

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2. Express the following in the scientific notation:

(i) 0.0048, (ii) 234,000

(iii) 8008, (iv) 500.0

(v) 6.0012

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3. Calculate the number of significant figures in the following values :

(a) Planck's constant = 6.626×10^{-34} J s

(b) Avogadro number = 6.023×10^{23}

(c) Velocity of light = $3.0 \times 10^{8} ms^{-1}$

(d) Electronic charge = 1.602×10^{-19} C

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4. Calculate the number of significant figures in the following:

(i) 0.0025

(ii) 208

(iii) 5005

(iv) 126,000

(v) 500.0

(vi) 2.0034

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5. Express the following numbers up to four significant figures :

(i) 5.607892

(ii) 32.392800

(iii) 0.007837

(iv) 1.78986×10^3

(v) 60000

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6. Express the following up to three significant places: (a) the height of a man, 5 feet 9 inches in centimetres (1 inch = 2.54 cm) (b) one millionth of one. (c) four thousand (d) decimal equivalent of $2/3$

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7. Calculate to proper significant figures:

(i) 12.6×11.2

(ii) 108/7.2

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

a. $\frac{0.02856 \times 298.15 \times 0.112}{0.5785}$

b. 5×5.364

c. $0.0125 + 0.7864 + 0.0215$

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9. Express the results of the following calculations to the appropriate number of significant figures :

(i) $\frac{3.24 \times 0.08666}{5.006}$

(ii) $\frac{\left(1.36 \times 10^{-4}\right)(0.5)}{2.6}$

(iii) $0.582 + 324.65$

(iv) $2.64 \times 10^{3} + 3.27 \times 10^{2}$

(v) $943 \times 0.00345 + 101.$

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10. The mass of a piece of paper is 0.02 g and the mass of a solid substance and the piece of paper is 20.036 g. If the volume of the solid is 2.16 cm^{3}, calculate the density of the substance up to proper number of significant digits.

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11. Perform the following calculations and express the result to proper number of significant figures :

(i) $144.3m^2 + (2.54m \times 8.4m)$

(ii) $\left(4.05 \times 10^2 mL\right) - \left(0.0225 \times 10^2 mL\right)$

(iii) $\left(3.50 \times 10^2 cm\right)\left(4.00 \times 10^6 cm\right)$

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12. The density of vanadium is $5.96 gcm^{-3}$. Convert the density to SI units of kgm^{-3}.

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13. A jug contains 2L of milk. Calcualte the volume of the milk in m^3

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14. Express each of the following in SI units :

(i) 93 million miles (this is the distance between the earth and the sun).

(ii) 5 feet 2 inches (this is the average height of an Indian female).

(iii) 100 miles per hour (this is the typical speed ofRajdhani Express).

(iv) 0.74 A (this is the bond length of hydrogen molecule).

(v) 46° C (this is the peak summer temperature in Delhi).

(vi) 150 pounds (this is the average weight of an Indian male).

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15. The mass of precious stones is expressed in terms of 'carat'. What is the mass of a ring in grams which contains 0.600 carat diamond and 8.500 g gold given that 1 carat = 3.168 grains and 1 g = 15.4 grains ?

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16. A tennis ball was observed to travel at a speed of 96 miles per hour. Calculate the speed of the ball in metres per second.

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17. (a) Convert the following in kilogram.

(i) $0.91 \times 10^{-27} g$ (mass of electron)

(ii) 1 fg (mass of human DNA molecule)

(b) Convert into metre.

(i) 1.4 Gm (diameter of Sun)

(ii) 40En (thickness of Milky way Galaxy)

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

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19. Carbon and oxygen are known to form two compounds. The carbon content in one of these is $42.9\ \%$ while in the other it is $27.3\ \%$. Show that this data is in agreement with the law of multiple proportions.

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20. 2.0 g of a metal burnt in oxygen gave 3.2 g of its oxide. 1.42 g of the same metal heated in steam gave 2.27 g of its oxide. Which law is shown by this data?

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21. Phosphorus and chlorine form two compounds. The first compound contains 22.54% by mass of phosphorus and 77.46% by mass of chlorine. In the second compound the percentages are 14.88

for phosphorus and 85.12 for chlorine. Show that these data are consistent with the law of multiple proportions.

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22. Three oxides of lead on analysis were found to contain lead as under:

(i) 3.45 g of yellow oxide contains 3.21 g of lead.

(ii) 1.195 g of brown oxide contains 1.035 g of lead.

(iii) 1.77 g of red oxide contains 1.61 g of lead. Show that these data illustrate law of multiple proportions.

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23. Two oxides of a metal contain $27.6\,\%$ and $30.0\,\%$ of Oxygen, respecttively. If the formula of the first be M_3O_4. Find that of the second.

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24. Use data given in the following table to calculate the molar mass of naturaly occuring argon isotopes:

Isotope	Isotopic molar mass	Abundance
$._{}^{36}Ar$	$35.96755 gmol^{-1}$	$0.337\ \%$
$._{}^{38}Ar$	$37.96272 gmol^{-1}$	$0.063\ \%$
$._{}^{40}Ar$	$39.9624 gmol^{-1}$	$99.600\ \%$

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25. The element bron occurs in nature as two isotopes havein atomic masses 10 u and 11 u . What are the percentage abundances of these isotopes in a sample of boron having average atomic mass of 10.8 u?

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26. Calculate

(a) mass of 1.5 gram atoms of calcium (at. mass = 40)

(b) gram atoms in 12.8 g of oxygen (at. mass = 16)

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27. (a) Calculate the gram molecular mass of sugar having molecular formula $C_{12}H_{22}O_{11}$

(b) Calculate

(i) the mass of 0.5 gram molecule of sugar and

(ii) Gram molecule of sugar in 547.2 gram.

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28. Calculate the molecular mass of glucose $(C_6H_{12}O_6)$ molecule.

Given at. masses :

H = 1.008 amu, C = 12.011 amu, O = 16.0 amu.

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29. Calculate

(a) mass of 2.6 gram molecule of SO_2.

(b) number of gram molecules of water in a beaker containing 576 g of water.

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30. How many molecules and atoms of sulphur are present in 0.1 mole of S_8 molecules ?

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31. Calculate the number of moles of iodine in a sample containing 1.0×10^{22} molecules.

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32. (i) Calculate the mass of an atom of silver (atomic mass = 108).

(ii) 1 molecule of naphthalene $(C_{10}H_8)$

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33. Calcualte the mass of

(i) 1 atom of ^{14}C

(ii) 1 molecule of N_2.

(iii) 1 molecule of water

(iv) 100 molecule of sucrose $(C_{12}H_{22}O_{11})$.

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34. Calculate the mass of 1 u (atomic mass, [Unit] in grams.

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35. Calculate the number of molecules and number of atoms present in 11.2 litres of oxygen (O_2) at N.T.P.

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36. The mass of 94.5 mL of a gas at S.T.P. is found to be 0.2231 g. Calculate its molecular mass.

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37. Calculate the number of moles in the following:

(a) 7.85 g of iron, (b) 4.68 mg of silicon

(c) 65.6 μg of carbon.

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38. Calculate the number of molecules in a drop of water weighing 0.05 g (H = 1, O = 16).

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39. Calculate the number of atoms in each of the following (i) 52 moles of Ar (ii) 52 u of He (iii) 52 g of He.

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40. Calculate the number of moles in the following masses:

(i) 1.46 metric tones of Al (1 metric ton $= 10^3$ kg)

(ii) 7.9 mg of Ca

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41. Suppose the chemists had chosen 10^{20} as the number of particles in a mole. What would be the molecular mass of oxygen gas ?

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42. Calculate the number of atoms of each type in 5.3 g of Na_2CO_3.

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43. Calculate the number of molecules present in

(a) 1 kg oxygen,

(b) $1dm^3$ of hydrogen at S.T.P.

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44. Chlorophyll, the green colouring matter of plants responsible for photosynthesis, contains $2.68\,\%$ of magnesium by mass. Calculate the number of magnesium atoms in $2.00g$ of chlorophyll.

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45. Calculate

(a) the actual volume of a molecule of water

(b) the radius of a water molecule assuming to be spherical (density of water $= 1gcm^{-3}$)

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46. Potassium bromide KBr contains $32.9\,\%$ potassium by mass. If $6.40g$ of bromine reacts with $3.60g$ of potassium, calculate the number of moles of potassium which combine with bromide to form KBr.

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47. The cost of table salt (NaCl) and sugar $(C_{12}H_{22}O_{11})$ are Rs 20 per kg and Rs 36 per kg respectively. Calculate their cost per mole.

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48. Silver is a very precious metal and is used in Jewellery. One million atoms of silver weigh 1.79×10^{-16}g. Calculate the atomic mass of silver.

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49. Calculate the weight of carbon monoxide having same number of oxygen atoms as are present in 88 g of carbon dioxide.

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50. A certain public water supply contained 0.10 parts per billion of chloroform $CHCl_3$ How many molecules of $CHCl_3$ would be contained in a 0.05 ml drop of this water ?

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51. A gaseous mixture contains oxygen and nitrogen in the ratio of $1:4$ by weight therefore the ratio of their number of molecules is

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52. Calculate the mass percentage composition of copper pyrites ($CuFeS_2$).

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53. Calculate the percentage composition of the following compounds:

(i) Urea $CO(NH_2)_2$

(ii) Copper sulphate $CuSO_4.\ H_2O$

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54. Ferric sulphate is used in water and sewage treatment and in removal of suspended impurities. Its empirical formula is $Fe_2(SO_4)_3$. Calculate the mass percentage of iron, sulphur and oxygen in this compound.

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55. Calculate the percentage of water of crystallisation in the sample of Mohr salt, $FeSO_4(NH_4)_2SO_4.6H_2O$

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56. Write the empirical formula of the compounds having the molecular formulae :

(i) C_6H_6, (ii) C_6H_{12}, (iii) H_2O_2, (iv) Na_2CO_3, (v) B_2H_6, (vi) N_2O_2, (vii) H_3PO_4, (viii) Fe_2O_3, (ix) C_2H_2, (x) N_2O_5

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57. The molecular mass of an organic compound is 78 and its percentage composition is 92.4% C and 7.6% H. Determine the molecular formula of the compound.

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58. An organic compound on analysis gave the following percentage composition : C = 57.8%, H = 3.6% and the rest is oxygen. The vapour

density of the compound was found to be 83. Find out the molecular formula of the compound

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59. Four gram of copper chloride on analysis was found to contain 1.890g ofcopper (Cu) and 2.110 g of chlorine (Cl). What is the empirical formula of copper chloride ?

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60. A compound contains 4.07 % hydrogen, 24.27% carbon and 71.65% chlorine. Its molecular mass is 98.96. What are its empirical and molecular formulae ?

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61. Determine the empirical formula of an oxide of iron which has $69.9\ \%$ iron and $30.1\ \%$ dioxygen by mass.

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62. (i) Butyric acid contains only C, H and O. $A 4.24mg$ sample of butyric acid is completely burned. It gives $8.45mg$ of carbon dioxide (CO_2) and $3.46mg$ of water. What is the mass percentage of each element in butyric acid?

(ii) If the elemental composition of butyric acid is found to be $54.2\ \%\ C$, $9.2\ \%\ H$ and $36.6\ \%\ O$, determine the empirical formula.

(iii) The molecular mass of butyric acid was determined of experiment to be 88. What is the molecular formula ?

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63. A compound on analysis was found to contain the following composition :

$Na = 14.31\,\%$, $S = 9.97\,\%$, $O = 69.50\,\%$ and $H = 6.22\,\%$

Calculate the molecular formula of the compound assuming that the whole of hydrogen in the compound is present as water of crystallisation. Molecular mass of the compound is 322.

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64. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 litre (Measured at STP) of this welding gas is found weigh $11.6g$. Calculate

(i) empirical formula,

(ii) molar mass of the gas, and

(iii) molecular formula.

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65. A crystalline hydrated sa,t on being rendered anhydrous, loses $45.6\,\%$ of its weight. The precentage composition of anhydrous salt is : $Al = 10.5\,\%$, $K = 15.1\,\%$, $S = 24.8\,\%$ and $I = 49.6\,\%$. Find the empirical formula of the anhydrous and crystalline salt :

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66. How many moles of nitrogen are needed to produce 8.2 moles of ammonia by reaction with hydrogen ?

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67. How many moles of iron can be made from Fe_2O_3 by the use of 16 mol of carbon monoxide in the following reaction :

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

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68. Calculate the amount of water (g) produced by the combustion of 16 g of methane

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69. How many moles of methane are required to produce 22 g of $CO_2(g)$+ after combustion :-

$CH_4(g) + 2O_2(g) + 2H_2O(g)$

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70. Chloringe is prepared in the laboratory by treating magnesse dixoide (MnO_2) with aqueous hydrochlorine acid according to the reaction.

$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$. Therefore 5g of (MnO_2) will react with how many grams of HCl?

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71. What mass of calcium oxide will be obtained by heating 3 mol of $CaCO_3$?

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72. Oxygen is prepared by the catalytic decomposition of potassium chlorate ($KClO_3$). Decomposition of potassium chlorate gives potassium chloride (KCl) and oxygen (O_2). If 2.4 mol of oxygen is needed for an experiment, how many grams of potassium chlorate must be decomposed ?

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73. Calculate the weight of iron which will be converted into its oxide Fe_3O_4 by the action of 14.4 g of steam on it.

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74. How many grams of chlorine are required to completely react with 0.40 g of hydrogen (HJ to yield hydrochloric acid (HCl) ? Also calculate the amount of HCl formed.

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75. What weight of zinc would be required to produce enough hydrogen to reduce completely 8.5 g of copper oxide to copper ?

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76. Calculate the amount of lime $Ca(OH)_2$ required to remove the hardness of 60,000 litres of well water containing 16.2 g of calcium bicarbonate per hundred litre. (Atomic masses Ca = 40, C = 12, O = 16, H = 1)

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77. A mixture of $CaCO_3$ and $MgCO_3$ weighing $1.84g$ on heating left a residue weighing $0.96g$. Calculate the percentage of each in the mixture.

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78. An impure sample of sodium chloride which weighed 1.2 gram gave on treatment with excess of silver nitrate solution 2.4 gram of silver chloride as the precipitate. Calculate the percentage purity of the sample.

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79. A $2.0g$ of mixture of Na_2CO_3 and $NaHCO_3$ loses $0.248g$ when heated to $300^\circ C$, the temperature at which $NaHCO_3$ decomposes

to Na_2CO_3, CO_2 and H_2O. What is the percentage of Na_2CO_3 in mixture?

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80. Calculate the amount of $KClO_3$ needed to supply sufficient oxygen for burning 112 L of CO gas at N.T.P.

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81. What volume of air at N.T.P containing 21 % oxygen by volume is required to completely burn 1000 g of sulphur containing 4 % incombustible matter ?

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82. Calculate the volume of oxygen at N.T.P. that would be required to convert 5.2 L of carbon monoxide to carbon dioxide.

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83. What volume of oxygen at N.T.P is needed to cause the complete combustion of 200 mL of acetylene ? Also calculate the volume of carbon dioxide formed.

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84. In a reaction

$A + B_2 \rightarrow AB_2$

Identify the limiting reagent, if any, in the following reaction mixtures.

a. 300atoms of $A + 200$ molecules of B

b. $2molA + 3molB$

c. 100atoms of $A + 100$ molecules of B

d. $5molA + 2.5molB$

e. $2.5molA + 5molB$

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85. 50.0 kg of $N_2(g)$ and 10.0 kg of $H_2(g)$ are mixed to produce $NH_3(g)$. Calculate the $NH_3(g)$ formed. Identify the limiting reagent in the production of NH_3 in this situation.

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86. 3.0 g of H_2 react with 29.0 g O_2 to yield H_2O

(i) What is the limiting reactant ?

(ii) Calculate the maximum amount of water that can be formed

(iii) Calculate the amount of one of the reactants which remains unreacted.

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87. If 20g of $CaCO_3$ is treated with 20g of HCl. How many grams of CO_2 can be generated according to the following equations?

$CaCO_3 + 2HCl(aq) \rightarrow CaCl_2(aq.) + H_2O(l) + CO_2g$

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88. Dinitrogen and dihydrogen react with each other to produce ammonia according to the following chemical equation:

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

a. Calculate the mass of ammonia produced if $2.00 \times 10^3 g$ dinitrogen reacts with $1.00 \times 10^3 g$ of dihydrogen.

b. Will any of the two reactants remain unreacted?

c. If yes, which one and what would be its mass?

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89. If 11 g of oxalic acid are dissolved in 500 mL of solution (density =1.1 g mL^{-1}), what is the mass % of oxalic acid in solution ?

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90. 2.46 g of sodium hydroxide (molar mass = 40) are dissolved in water and the solution is made to 100 cm^3 in a volumetric flask. Calculate the molarity of the solution

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91. Calculate the molality of a solution containing 20.7 g of potassium carbonate dissolved in 500 mL of solution (assume density of solution = $1gmL^{-1}$).

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92. A solution has been prepared by dissolving 60 g of methyl alcohol in 120 g of water. What are the mole fraction of methyl alcohol and water ?

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93. Calculate the normality of solution containing 31.5 g of hydrated oxalic acid $(H_2C_2O_4.2H_2O)$ in 1250 mL of solution.

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94. A solution is prepared by dissolving 18.25 g of NaOH in distilled water to give 200 ml of solution. Calculate the molarity of the solution.

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95. How many grams of Na_2CO_3 should be dissolved to make 100 cm^3 of 0.15 M Na_2CO_3 solution ?

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96. A solution is prepared by adding 2 g of a substance A to 18 g of water. Calculate the mass per cent of the solute.

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97. Calculate the concentration of nitric acid in moles per litre in a sample which has a density $1.41g/mL$ and the mass percent of nitric acid in it being 69% .

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98. A sample of $NaNO_3$ weighting 0.38 g is placed in a 250 mL volumetric flask. The flask is then filled with water to the mark on the neck. What is the molarity of the solution?

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

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100. If the density of methanol is $0.793kgL^{-1}$ what ia its volume needed for making 2.5 L of its $0.25M$ solution?

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101. How many moles and how many grams of sodium chloride are present in 250 mL of a 0.50 M NaCl solution ?

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102. Calculate the number of Cl^- ions in 100 ml of 0.001 M HCl solution.

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103. A solution of oxalic acid,$(COOH)_2.2H_2O$ is prepared by dissolving 0.63 g of the acid in 250 mL of the solution. Calculate (i) molarity and

(ii) normality of the solution.

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104. $2.82g$ of glucose (molar mass $= 180$) is dissolved in $30g$ of water. Calculate the (i) Molality of the solution (ii) mole fractions of (a) glucose (b) water.

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105. Calculate the molarity of pure water (d=1 g/mL).

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106. A solution has $25\ \%$ of water,$25\ \%$ ethanol and $50\ \%$ acetic acid by mass. Calculate the mol e fraction of each component.

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107. A solution of glucose in water is labelled as 10 percent w/w, what would be the molality and mole fraction of each component in the

solution? If the density of the solution is $1.2 gm L^{-1}$, then what shall be the molarity of the solution?

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108. A sugar syrup of weight $214.2 g$ contains $34.2 g$ of sugar $(C_{12}H_{22}O_{11})$. Calculate

a. the molal concentration.

b. the mole fraction of the sugar in the syrup.

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109. Calculate the volume of 0.015 M HCl solution required to prepare 250 mL of a 5.25×10^{-3} M HCl solution

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110. 250 mL of 1.5 M solution of sulphuric acid is diluted by adding 5L of water. What is the molarity of the diluted solution ?

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111. What volumes of 10 M HCl and 3 M HCl should be mixed to get 1L of 6 M HCl solution?

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112. Commercially availiable concentrated hydrochloric acid contains $38\,\%\,HCl$ by mass. (a) What is the molarity of this solution? The density is $1.19 gm L^{-1}$?

(b) What volume of concentrated HCl is required to make 1.00litre of $0.10 M HCl$?

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113. Commercially available sulphuric acid contains 93% acid by mass and has a density of 1.84 g mL^{-1}.

Calculate (i) the molarity of the solution (ii) volume of concentrated acid required to prepare 2.5 L of 0.50 M H_2SO_4

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114. The density of 3M solution of NaCL is 1.25 gmL^{-1}. Calculate molality of the solution.

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115. What is the molality of a solution of methanol in water in which the mole fraction of methanol is 0.25?

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116. What is the mole fraction of the solute in 2.5 m aqueous solution?

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117. 250 ml of 0.5 M sodium sulphate (Na_2SO_4) solution are added to an aqueous solution containing 10.0g of $BaCl_2$ resulting in the formation of white precipitate of $BaSO_4$. How many moles and how many grams of barium sulphate will be obtained ?

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118. What volume of 0.6 M HCl has enough hydrochloric acid to react exactly with 25 mL of aqueous NaOH having concentration of 0.5 M ?

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119. What volume of 0.250 M HCl (aq) is required to react completely with 22.6 g of sodium carbonate according to the reaction :

$Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O + CO_2$

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

$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$

What mass of $CaCl_2$ will be formed when 250mL of 0.76 M HCl reac ts with 1000 g of $CaCO_3$? Name the limiting reagent. Calculate the number of moles of $CaCl_2$ formed in the reaction.

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Practical Problems

1. Calculate the number of significant figures in the following :

(i) 1.00×10^6

(ii) 0.0050

(c) 1.234

(d) 0.0006

(e) 0.368

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2. Express the following numbers to three significant figures:

(i) 6.023×10^{23}

(ii) 6000

(iii) 32.362400

(iv) 5.6034

(v) decimal equivalent of $\frac{2}{3}$

(vi) 1.6276×10^4

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3. The density of ice is 0.921 g cm^{-3}. Calculate the mass of a cubic block of ice which is 76 mm on each side.

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4. Express the following numbers in exponential notations to three significant figures :

(i) 0.999935

(ii) 0.000002136

(iii) 406721

(iv) 0.000001

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5. Perform the following calculations to proper number of significant figures.

(a) 108/7.2

(b) $\left(1.6 \times 10^{2}\right)^{2}$

(c) $\frac{\left(1.35 \times 10^{-6}\right)(0.4)}{5.6}$

(d) $\frac{3.25 \times 0.0862}{4.002}$

(e) $(1.0042-0.0034)(1.23)$

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6. Calculate

(i) area of a square whose side is 1.2 m

(ii) volume of a sphere whose radius is 1.6 cm

(iii) length of a rectangle having area 10.25 m^2 and breadth 2.5 m

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7. Perform the following calculations upto proper number of significant figures :

(i) $\left(1.20 \times 10^{-6}\right)+\left(6.00 \times 10^{-5}\right)=?$

(ii) $\left(2.164 \times 10^{5}\right)^{1/2} = ?$

(iii) $\left(9.13 \times 10^{-2}\right)\left(7.006 \times 10^{-3}\right) = ?$

(iv) $4.00 \times 10^{-2} + 3.26 \times 10^{-3} + 1 \times 10^{-6} = ?$

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8. Calculate the number of significant figures up to which the following results will be expressed:

(i) $\dfrac{2.36 \times 0.07251}{2.130}$

(ii) $\dfrac{(28.2 - 21.2)\left(1.79 \times 10^{6}\right)}{1.62}$

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9. Round up the following upto three significant figures:

a. 34.216

b. 10.4107

c. 0.04597

d. 2808

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

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11. The wavelength of a yellow line in spectrum of sodium atom is 5896 A. Express it in nm.

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12. How many cubic centimeters $\left(cm^3\right)$ are in a cubic metre $\left(m^3\right)$?

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13. Convert:

(i) $4.86 kgL^{-1}$ to grams per millilitre.

(ii) 1.86 km to cm.

(iii) 6.92×10^{-7} m to micrometres and Angstroms.

(iv) $9.2 \times 10^{-3} cm^3$ to litres.

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14. What is the capacity of a tank 0.8 m long 10 cm wide and 50 mm deep ?

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15. How many cubic centimetres are there in 100 L ?

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16. Convert the following in kilogram:

(i) 500 Mg (mass of jumbo jet loaded)

(ii) 3.34×10^{-24}g (mass of hydrogen molecule)

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17. Express the following in the designated units :

(i) 1.54 mm s^{-1} to pm s^{-1}

(ii) $25gL^{-1}$ to $mgdL^{-1}$

(iii) 25 L to m^3

(iv) $2.66gcm^{-3}$ to $\mu g\mu m^{-3}$

(v) $4.2Lh^{-2}$ to mLs^{-2}

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18. Convert into metre :

(i) 7 nm (diameter of small virus)

(ii) 41 pm (distance of nearest star)

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19. How many seconds are there in 2 days?

Watch Video Solution

20. Convert the following into basic units:

a. $28.7pm$

b. $15.15pm$

c. $25365mg$

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21. The relative abundance of various isotopes of silicon is as Si (28) = 92.25%, Si (29) = 4.65% and Si (30) = 3.10%. Calculate the average atomic mass of silicon.

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Watch Video Solution

22. Calculate the mass of (a) 1.6 gram atoms of oxygen C (b) 5.6 gram atoms of sulphur c) 2.4 gram atoms of iodine.

(Atomic masses : O = 16, S = 32,I = 127)

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23. Calculate the mass of

(i) 2.5 gram molecules of H_2S (ii) 3.6 gram molecules of glucose ($C_6H_{12}O_6$)

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24. Calculate the number of

(i) gram atoms in 669.6 g of iron (at. mass = 55.8)

(ii) gram molecules in 73.6 g of C_2H_5OH.

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25. Which of the following has maximum mass

(a) 2.6 gram atoms of sulphur (b) 2.6 gram molecules of sucrose ($C_{12}H_{22}O_{11}$) (c) 2.6 g of iodine

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26. Calculate the mass of the following

a. One atom of calcium

b. One molecules of SO_2

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27. Calculate the number of atoms in

(i) 0.5 mole atoms of carbon (C^{12})

(ii) 3.2 g of sulphur

(iii) 18.0 g of glucose ($C_6H_{12}O_6$)

(iv) 0.20 mole molecules of oxygen

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28. Calculate the mass of sodium which contains same number of atoms as are present in 15 g of calcium (at. mass of Ca = 40, Na = 23).

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29. What volume is occupied at N.T.P. by

(i) 1.4 g of nitrogen

(ii) 6.023×10^{21} molecules of oxygen

(iii) 0.2 mole of ammonia ?

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30. How many years it would take to spend Avogadro's number of rupees at the rate of 10 lakh rupees per second?

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31. One atom of an element X' weighs 6.644×10^{-23} g. Calculate the number of gram atoms in 80 kg of it.

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32. Calculate the number of molecules and number of atoms present in 5.60 L of ozone (O_3) at N.T.P.

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33. Calculate the number of gold atoms in 300 mg of a gold ring of 20 carat gold (atomic mass of gold = 197, pure gold is 24 carat).

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34. Comprehension # 1

Potash is any potassium mineral that is used for its potassium content. Most of the potash produced in the United States goes into fertilizer. The major sources of potash are potassium choride (KCI) and potassium sulphate (K_2SO_4). Potash production is often reported as the potassium oxide (K_2O) equivalent or the amount of K_2O that could be made from a given mineral. KCI cost $Rs50perkg$ What mass (in kg) of K_2O contains the same number of moles of K atoms as $1.00kgKCI$?

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35. How many molecules of water of hydration are present in 630 mg of oxalic acid $(H_2C_2O_4.2H_2O)$?

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36. How many molecules of CO_2 are present in one litre of air containing 0.03% by volume of CO_2 at STP ?

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37. A dot . containing carbon has 1 microgram weight. Calculate number of carbon atoms used to make the dot.

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38. How many litres of liquid CCl_4 (d = 1.5 g/cc) must be measured out to contain 1×10^{25} Cl atoms ?

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39. Calculate the difference in the number of carbon atoms in 1.0 g of C-14 isotope and 1.0 g of C-12 isotope.

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40. Calculate the mass of oxygen in grams present in 0.1 mole of $Na_2CO_3.10H_2O$

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41. (i) Calculate the mass percentage of various elements present in magnesium sulphate, $MgSO_4$ (ii) Calculate the percentage of cation in ammonium dichromate.

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42. An organic compound containing carbon, hydrogen and oxygen gave the following percentage composition :

C = 40.68%, H = 5.08%

The vapour density of the compound is 59. Calculate the molecular formula of the compound.

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43. (i) Butyric acid contains only C, H and O. $A 4.24mg$ sample of butyric acid is completely burned. It gives $8.45mg$ of carbon dioxide (CO_2) and $3.46mg$ of water. What is the mass percentage of each

element in butyric acid?

(ii) If the elemental composition of butyric acid is found to be $54.2\ \%\ C$, $9.2\ \%\ H$ and $36.6\ \%\ O$, determine the empirical formula.

(iii) The molecular mass of butyric acid was determined of experiment to be 88. What is the moleculare formula ?

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44. An oxide of nitrogen contains 30.43% of nitrogen. The molecular weight of the compound is equal to 92 a.m.u. Calculate the molecular formula of the compound.

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45. Calculate the empirical and molecular formula of the compound having the following percentage composition :

Na = 36.5%, H = 0.8%, P = 24.6%, O = 38.1%

The molecular mass of the compound is 126 a.m.u. Also name the compound

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46. A crystalline compound when heated became anhydrous by losing 51.2 % of the mass. On analysis, the anhydrous compound gave the following percentage composition: Mg = 20.0 %, S = 26.66 % and O = 53.33 %, Calculate the molecular formula of the anhydrous compound and crystalline compound. The molecular mass of anhydrous compound is 120 u.

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47. Calculate the empirical formula of a mineral which has the following percentage composition :

CuO = 44.82%, SiO_2 = 34.83% and water = 20.35% (at. wt. of Cu = 63.5, Si = 28).

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48. Determine the empirical formula of a compound having percentage composition as :

Iron = 20% , sulphur = 11.5% , oxygen = 23.1% and water molecules = 45.4% -(At. mass of Fe = 56, S = 32)

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49. Balance the following equations by hit and trial method:

(a) $KMnO_4 + HCl \rightarrow KCl + MnCl_2 + H_2O + Cl_2$

(b) $H_2S + SO_2 \rightarrow S + H_2O$

(c) $K_2Cr_2O_7 + H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_2 + H_2O + O_2$

(d) $KMnO_4 + KOH \rightarrow K_2MnO_4 + O_2 + H_2O$

(e) $Mg_3N_2 + H_2O \rightarrow Mg(OH)_2 + NH_3$

(f) $Al_4C_3 + H_2O \rightarrow Al(OH)_3 + CH_4$

(g) $FeS_2 + O_2 \rightarrow Fe_2O_3 + SO_2$

(h) $KMnO_4 + H_2S + H_2SO_4 \rightarrow KHSO_4 + MnSO_4 + S + H_2O$

(i) $C_3H_8(g) + O_2(g) \rightarrow CO_2(g) + H_2O(l)$

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50. Balance the following equations by partial equation method:

(i) $NaOH + Cl_2 \rightarrow NaCl + NaClO_3 + H_2O$

(ii) $H_2S + HNO_3 \rightarrow NO + H_2O + S$

(iii) $C + H_2SO_4 \rightarrow CO_2 + SO_2 + H_2O$

(iv) $I_2 + HNO_3 \rightarrow NO_2 + HIO_3 + H_2O$

(i) $P_4 + HNO_3 \rightarrow H_3PO_4 + NO_2 + H_2O$

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51. How much iron can be theoretically obatined by the reduction of 1.0kg of Fe_2O_3?(At.wt.of Fe=56)`

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52. The hourly energy requirement of an astronaut can be satisfied by the energy relesed when 34 g of sucrose $(C_{12}H_{22}O_{11})$ are burnt in his body. How many g of oxygen would be needed to be carried in space capsule to meet his requirement for one day :

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53. How much marble of 96.5% purity would be required to prepare 100 litres of carbon dioxide at S.T.P. when marble is acted upon by dil HCl ?

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54. 5.6 litres of methane gas (CH_4) is ignited in oxygen gas. Calculate the number of moles of CO_2 formed.

A. 25

B. 0.25

C. 0.30

D. 50

Answer: B

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55. Calculate the percentage yield of the reaction if 64 g of $NaBH_4$ with iodine produced 15.0 g of BI_3.

$$NaBH_4 + 4I_2 \rightarrow BI_3 + NaI + 4HI$$

(At. mass, Na = 23, B = 10.8,1 = 127)

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56. NO_2^- ion in KNO_2 is oxidised to NO_3^- ion by the action of $KMnO_4$ in H_2SO_4 solution according to the reaction :

$5KNO_2 + 2KMnO_4 + 3H_2SO_4 \rightarrow 5KNO_3 + 2MnSO_4 + 5I_2 + 8H_2O$

How much KMn04 are needed to oxidise 11.4 g of KNO_2?

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57. How many mL. of aqueous solution of $KMnO_4$ containing $158\frac{g}{L}$ must be used to complete the conversation of $75.0g$ of KI to iodine by the reaction

$KMnO_4 + KI + H_2SO_4 \rightarrow K_2SO_4 + MnSO_4 + I_2 + 6H_2O$

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58. (a) Sample of NaOH weighing 0.38 g is dissolved in water and the solution is made to 50.0 mL in a volumetric flask. What is the molarity of the resulting solution ?

(b) How many moles of NaOH are contained in 27 mL of 0.15 M NaOH solution ?

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59. The density of 3 molal solution of NaOH is 1.110g mL^{-1}. Calculate the molarity of the solution.

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60. A bottle contains 500 ml of 2.4 M HC1 solution. How much water should he added to dilute it to 1.6 M HC1 solution ?

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61. A bottle of concentrated sulphuric acid (density 1.80 g cm^{-3}) is labelled as 86% by weight. What is the molarity of the solution ?

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62. 0.63 g of oxalic acid,$(COOH)_2.2H_2O$ are dissolved in 500 ml of solution. Calculate the molarity of the solution.

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63. How many moles of $NaOH$ are contained in $27mL$ of $0.15MNaOH$?

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64. No. of oxalic acid molecules in 100 ml of 0.01 M oxalic acid is -

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65. What mass of solid AgCl is obtained when 25 ml of 0.068 M $AgNO_3$ reacts with excess of aqueous HCl?

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66. What volume of 0.34 M KOH is sufficient to react with 20 ml of 0.15M H_2SO_4 solution ?

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67. Calculate the volume of $1.00 molL^{-1}$ aqueous sodium hydroxide that is neutralized by $200 mL$ of $2.00 molL^{-1}$ aqueous hydrochloric acid and the mass of sodium chloride produced. Neutralization reaction is,

$$NaOH_{(aq.)} + HCl_{(aq.)} \rightarrow NaCl_{(aq.)} + H_2O_{(l)}$$

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68. In a reaction vessel $0.184g$ of $NaOH$ is required to be added for completing the reaction. How many millilitre of $0.150 M NaOH$

solution should be added for this requirements?

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69. 500mL of 0.25M Na_2SO_4 solution is added to an aquesous solution is 15g of $BaCl_2$ resulting in the formation of a white precipatate of insoluble $BaSO_4$. How many moles and how many grams of $BaSO_4$ are formed.

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70. What mass of $CaCO_3$ is required to react completely with 25 ml of $0.75MHCI$?

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Conceptual Question 1

1. How many significant figures are there in each of the following numbers:

(i) 1.00×10^6, (ii) 0.00010, (ii) π

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2. Convert 22.4 L in cubic metres.

Watch Video Solution

3. What physical quantities are represented by the following units and what are their common names ?

(i) kgm^2s^{-2}

(ii) $kgms^{-2}$

(iii) dm^3

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4. The longest visible rays, at the end of the visible spectrum are 7.8×10^{-7} m in length. Express this length in (i) micrometers and (ii) nanometers

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5. Which of the following mixture are homogeneous ?

(a) Tap water , (b) air , (c) soil , (d) smoke, (e) cloud

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6. Is the molar volume of CO_2 same or different from CO ?

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7. At what temperature do the Celsius and Fahrenheit readings have the same numerical value ?

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8. What is the difference between 0.006 g and $6.00 \times 10^{-3} g$?

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9. Classify the following substances into elements, compounds and mixtures :

(i) Milk (ii) 22 carat gold (iii) Iodized table salt (iv) Diamond (v) Smoke (vi) Steel (vii) Brass (viii) Dry ice (ix) Mercury Or) Air (xi) Aerated drinks (xii) Glucose (xiii) Petrol (xiv) Glass (xv) Wood

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10. Given that density of water is 1 g mL^{-1}. What is the density in SI units?

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11. Is the law of constant composition true for all types of compounds? Explain why or why not?

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12. Which postulate of the Dalton's atomic theory was modified after the discovery of isotopes ?

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Conceptual Question 2

1. Calculate the total number of electrons present in 1.6 g of methane

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2. How many molecules of aspirin (molar mass = 180 amu) are present in 50 mg tablet ?

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3. Lithium exists in nature in the form of two isotopes, Li-6 and Li-7 with atomic masses 6.0151u and 7.0160u and the percentages 8.24 and 91.76 respectively. Calculate average atomic mass.

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4. What is the ratio of molecules between 1 mole of H_2O and 1 mole of sucrose $(C_{12}H_{22}O_{11})$?

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5. If the atomic masses of C and S are 12 and 32 respectively, then atom of S is how many times heavier than an atom of carbon ?

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6. What is the mass of a mole of water containing 50% of heavy water (D_2O)?

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7. What is the mass of a molecule of carbon-14 dioxide $\left({}^{14}CO_2\right)$?

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8. Explain why, the atomic masses of many elements are in fractions and not whole numbers.

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9. What is the approximate molecular mass of dry air containing 78% N_2 and 22% O_2 ?

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10. Chlorine has two naturally occuring isotopes, ^{35}Cl and ^{37}Cl. If the atomi mass of Cl is 35.45, the ratio of natural abundance of ^{35}Cl and ^{37}Cl is closest to

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11. Two bulbs A and B of equal capacity contain 10 g of oxygen (O_2) and ozone (O_3) respectively. Which bulb will have

(i) larger number of molecules?

(ii) larger number of oxygen atoms?

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

(i) Number of moles of carbon atoms.

(ii) Number of moles of hydrogen atoms.`

(iii) Number of molecules of ethane.

Watch Video Solution

13. Which one of the following will have the largest number of atoms?

(i) 1 g Au (s)

(ii) 1 g Na (s)

(iii) 1 g Li (s)

(iv) 1 g of Cl2(g)

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

	% natural abundance	Molar mass
$.^{35}Cl$	75.77	34.9689
$.^{37}Cl$	24.23	36.9659

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Conceptual Question 3

1. Give two examples of molecules having molecular formula same as empirical formula.

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2. Give an example of molecule in which

(i) Ratio of molecular formula and empirical formula is 6 : 1.

(ii) Molecular weight is two times of the empirical formula weight.

(iii) The empirical formula is CH_2O and ratio of molecular formula weight and empirical formula weight is 6.

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3. Write the empirical formula of (i) glucose (ii) sucrose.

Watch Video Solution

4. What are the SI unit of molarity ?

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5. 1.615 g of anhydrous $ZnSO_4$ was left in moist air. After a few days its weight was found to be 2.875 g. What is the molecular formula of hydrated salt ? (At. Mass: Zn=65.5, S=32, O=16, H=1)

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6. Density of water 1000 kg m^{-3} corresponds to .....g cm^{-3}. Complete the statement

Watch Video Solution

7. How are 0.50 m Na_2CO_3 and 0.50 M Na_2CO_3 different ?

Watch Video Solution

8. Calculate the amount of carbon dioxide that could be produced when

a. 1 mol of carbon is burnt in air

b. 1 moles of carbon is brunt in $16g$ of dioxygen.

2 moles of carbon are burnt in $16g$ of dioxygen.

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9. The reactant which is entirely consumed in reaction is known as limiting reagent. In the reaction $2A + 4B \rightarrow 3C + 4D$, when 5 moles of A react with 6 moles of B, then

(a) which is the limiting reagent?

(b) calculate the amount of C formed?

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Advanced Level Problems Accelerate Your Potential For Jee Advance

1. An alloy of metals X and Y weighs 12 g and contains atoms X and Y in the ratio of 2:5. The percentage by mass of X in the sample is 20. If atomic mass of X is 40, what is the atomic mass of metal Y?

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2. Find (i) total number of neutrons, and (II) the total mass of neutrons in 7 mg of C^{14}(assume that mass of neutron=mass of a hydrogen atom)

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3. Calculate the number of molecules of carbon dioxide present in 300 mL of gas at 273K and 2.5 atm pressure.

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4. If atomic mass of carbon was set at 100 u, what would be the value of Avogadro's number ?

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5. A 0.005 cm thick coating of copper is deposited on a plate of 0.5 m^2 total area. Calculate the number of copper atoms deposited on the plate (density of copper = 7.2 g cm^{-3}, atomic mass = 63.5).

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6. Calculate the number of molecules present in a spherical drop of water having a radius 1 mm if density of water is 1 g cm^{-3}.

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7. 1×10^{21} molecules are removed from 280 mg of carbon monoxide. Calculate the number of moles of carbon monoxide left.

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8. 1 gm of a mixture of calcium carbonate and magnesium carbonate gave on ignition 240 mL of carbon dioxide at S.T.P. What is the percentage composition of the mixture ?

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9. One gram of an alloy of aluminium and magnesium when heated with excess of dil. HCI forms magnesium chloride, aluminium chloride and hydrogen. The evolved hydrogen collected over mercury at 0^0C has a volume of 1.2 litre at $0.92atm$ pressure. Calculate the composition of the alloy.

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10. A mixture of sodium chloride and sodium iodide when treated with sulphuric acid gave sodium sulphate equal to the weight of the original mixture. Find the percentage composition of the mixture.

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11. How many ml. of H_2SO_4 density 1.8 g/mL containing 92.5% by volume of H_2SO_4 should be added to 1 litre of 40% solution of H_2SO_4 (density 1.30 g/mL) in order to prepare 50% solution of H_2SO_4 (density 1.4 g/mL) ?

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12. You are given one litre of 0.15 M HCl and one litre of 0.40 M HCl. What is the maximum volume of 0.25 M HCl which you can make from these solutions without adding any water ?

Watch Video Solution

13. A mixture of FeO and Fe_3O_4 when heated in air to a constant weight, gains 5% of its weight. Find the composition of the intial

mixutre.

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14. Gastric juice contains about 3 mg of HCl per millilitre. If a person produces about 225 mL of gastric juice per day, how many antacid tablets each containing 250 mg of $Al(OH)_3$ are needed to neutralise all the HC1 produced in one day ?

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15. A mixture of $H_2C_2O_4$ and $HCOOH$ is heated with conc H_2SO_4. The gas produced is collected and on treatment with KOH solution, the volume of the gas decreases by $\frac{1}{6}$ calculate the molar ratio of the two acids in the original mixture.

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16. a) Calculate the number of chloride of 0.01 M 100 ml $AlCl_3$ solution.

(b) What will be the change in number of chloride ions if the solution is diluted by 100 mL water?

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17. The mole fraction of urea in an aqueous urea solution containing 900 g of water is 0.05. If the density of the solution is $1.2gcm^{-3}$, the molarity of urea solution is _____

Given data: Molar masses of urea and water are $60g\text{mol}^{-1}$ and $18g\text{mol}^{-1}$, respectively)

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Ncert File Solved Ncert Textbook Exercises

1. Calculate the molecular mass of the following :

(i) H_2O

(ii) CO_2

(iii) CH_4

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

Watch Video Solution

3. Determine the empirical formula of an oxide of iron which has $69.9\,\%$ iron and $30.1\,\%$ dioxygen by mass.

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4. Calculate the amount of carbon dioxide that could be produced when

a. 1 mol of carbon is burnt in air

b. 1 moles of carbon is brunt in $16g$ of dioxygen.

2 moles of carbon are burnt in $16g$ of dioxygen.

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

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6. Calculate the concentration of nitric acid in moles per litre in a sample which has a density $1.41g/mL$ and the mass percent of nitric acid in it being 69%.

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Watch Video Solution

7. How much copper can be obtained from $100g$ of copper sulphate $(CuSO_4)$?

Watch Video Solution

8. Determine the molecular formula of an oxide of iron in which the mass percent of iron and oxygen are 69.9 and 30.1, respectively.

Watch Video Solution

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

	% natural abundance	Molar mass
$._{}^{35}Cl$	75.77	34.9689
$._{}^{37}Cl$	24.23	36.9659

Watch Video Solution

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

(i) Number of moles of carbon atoms.

(ii) Number of moles of hydrogen atoms.`

(iii) Number of molecules of ethane.

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

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12. If the density of methanol is $0.793kgL^{-1}$ what ia its volume needed for making 2.5 L of its $0.25M$ 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:

$1Pa = Nm^{-2}$

If the mass of air at sea level is $1034gcm^{-2}$, calculate the pressure in pascal.

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14. What is the SI unit of mass?

Watch Video Solution

15. Match the following prefixes with their multiples:

	Prefixes	Multiples
(i)	micro	10^{6}
(ii)	deca	10^{9}
(iii)	mega	10^{-6}
(iv)	giga	10^{-15}
(v)	femto	10

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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 carcinogen. The level of contamination was 15 ppm (by mass).

(i) Express this in per cent by mass.

(ii) Determine the molality of chloroform in the water sample.

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18. Express the following in the scientific notation:

a. 0.0048

b. 234000

c. 8008

d. 500.0

e. 6.0012

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19. How many significant figures are present in the following?

a. 0.0025

b. 208

c. 5005

d. 126000

e. 500.0

f. 2.0034

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20. Round up the following upto three significant figures:

a. 34.216

b. 10.4107

c. 0.04597

d. 2808

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

	Mass of dinitrogen	Mass of dioxygen
$i.$	$14g$	$16g$
$ii.$	$14g$	$32g$
$iii.$	$28g$	$32g$
$iv.$	$28g$	$80g$

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

d. Fill in the blanks in the following conversions:

I. $1km$= ..... mm= .....pm

II. $1mg =$ ..... $kg =$ ..... ng

III. $1mL$= ..... L= ..... dm^3

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

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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.

a. 300atoms of $A + 200$ molecules of B

b. $2 mol A + 3 mol B$

c. 100atoms of $A + 100$ molecules of B

d. $5 mol A + 2.5 mol B$

e. $2.5 mol A + 5 mol B$

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24. Dinitrogen and dihydrogen react with each other to produce ammonia according to the following chemical equation:

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

a. Calculate the mass of ammonia produced if $2.00 \times 10^3 g$ dinitrogen reacts with $1.00 \times 10^3 g$ of dihydrogen.

b. Will any of the two reactants remain unreacted?

c. If yes, which one and what would be its mass?

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25. How are 0.50 m Na_2CO_3 and 0.50 M Na_2CO_3 different?

Watch Video Solution

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

Watch Video Solution

27. Convert the following into basic units :

(i) 28.7 pm

(ii) 15.15 μs

(iii) 25365 mg

Watch Video Solution

28. Which one of the following will have the largest number of atoms?

(i) 1 g Au (s)

(ii) 1 g Na (s)

(iii) 1 g Li (s)

(iv) 1 g of Cl2(g)

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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.

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30. What will be the mass of one ^{13}C atoms in g?

Watch Video Solution

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

a. $\dfrac{0.02856 \times 298.15 \times 0.112}{0.5785}$

b. 5×5.364

c. $0.0125 + 0.7864 + 0.0215$

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32. Calculate the number of atoms in each of the following (i) 52 moles of Ar (ii) 52 u of He (iii) 52 g of He.

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33. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 litre (Measured at STP) of this welding gas is found weigh $11.6g$. Calculate

(i) empirical formula,

(ii) molar mass of the gas, and

(iii) molecular formula.

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

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$$

What mass of $CaCO_3$ is required to react completely with $25mL$ of $0.75MHCl$?

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35. Chloringe is prepared in the laboratory by treating magnesse dixoide (MnO_2) with aqueous hydrochlorine acid according to the reaction.

$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$. Therefore 5g of (MnO_2) will react with how many grams of HCl?

Watch Video Solution

Ncert File Ncert Exemplar Problems Multiple Choice Question Type I

1. Two students performed the same experiment separately and each one of them recovered two readings of mass which are given below. Correct reading of mass is 3.0 g. On the basis of given data, mark the

correct option out of the following statements.

Student	Readings	
	(I)	(II)
A	3.01	2.99
B	3.05	2.95

A. Results of both the students are neither accurate nor precise.

B. Results of student A are both precise and accurate.

C. Results of student B are neither precise nor accurate.

D. Results of student B are both precise and accurate

Answer: B

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2. A measured temperature on Fahrenheit scale is $200^\circ F$. What will this reading be on Celsius scale ?

A. 40° C

B. 94° C

C. 93.3° C

D. 30° C

Answer: C

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3. What will be the molarity of a solution, which contains 5.85g of $NaCl(s)$ per 500mL?

A. $4molL^{-1}$

B. $20molL^{-1}$

C. $0.2molL^{-1}$

D. $2molL^{-1}$

Answer: C

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4. If 500 mL of a 5 M solution is diluted to 1500 mL, what will be the molarity of the solution obtained ?

A. 1.5 M

B. 1.66 M

C. 0.017 M

D. 1.59 M

Answer: B

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5. The number of atoms present in one mole of an element is equal to Avogadro number. Which of the following element contains the greatest number of atom?

A. 4 g He

B. 46 g Na

C. 0.40 g Ca

D. 12 g He

Answer: D

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6. If the concentration of glucose $(C_6H_{12}O_6)$ in blood is 0.9 g L^{-1}, what will be the molarity of glucose in blood?

A. 5 M

B. 50 M

C. 0.005 M

D. 0.5 M

Answer: C

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7. What will be the molality of the solution containing 18.25 g of HCl gas in 500 g of water?

A. 0.1 m

B. 1 M

C. 0.5 m

D. 1 m

Answer: D

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8. One mole of any substance contains 6.022×10^{23} atoms/molecules. Number of molecules of H_2SO_4 present in 100 mL of 0.02 M H_2SO_4 solution is :

A. 12.044×10^{20} molecules

B. 6.022×10^{23} molecules

C. 1×10^{23} molecules

D. 12.044×10^{23} molecules

Answer: A

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9. What is the mass percent of carbon in carbon dioxide ?

A. 0.00034

B. 0.2727

C. 0.034

D. 0.287

Answer: B

Watch Video Solution

10. The empirical formula and molecular mass of a compound are CH_2O and 180 g respectively. What will be the molecular formula of the compound ?

A. $C_9H_{18}O_9$

B. CH_2O

C. $C_6H_{12}O_6$

D. $C_2H_4O_2$

Answer: C

Watch Video Solution

Watch Video Solution

11. If the density of a solution is 3.12 g mL^{-1}, the mass of 1.5 mL solution in significant figures is

A. 4.7 g

B. 4680×10^{-3}g

C. 4.680 g

D. 46.80 g

Answer: A

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12. Which of the following statements about a compound is incorrect?

A. A molecule of a compound has atoms of different elements.

B. A compound cannot be separated into its constituent elements by physical methods of separation.

C. A compound retains the physical properties of its constituent elements.

D. The ratio of atoms of different elements in a compound is fixed.

Answer: C

Watch Video Solution

13. Which of the following statements is correct about the reaction given below:-

$4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(g)$

A. Total mass of iron and oxygen in reactants = total mass of iron and oxygen in product, therefore it follows law of conservation of mass

B. Total mass of reactants = total mass of product, therefore, law of multiple proportions is followed.

C. Amount of Fe_2O_3 can be increased by taking any one of the reactants (iron or oxygen) in excess.

D. Amount of Fe_2O_3 produced will decrease if the amount of any one of the reactants (iron or oxygen) is taken in excess

Answer: A

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14. Which of the following reactions is not correct according to the law of conservation of mass ?

A. $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$

B. $C_3H_8(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$

C. $P_4(s) + 5O_2(g) \rightarrow P_4O_{10}(g)$

D. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

Answer: B

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15. Which of the following statements indicates that law of multiple proportion is being followed?

A. Sample of carbon dioxide taken from any source will always have carbon and oxygen in the ratio 1:2

B. Carbon forms two oxides namely COa and CO, where masses of oxygen which combine with fixed mass of carbon are in the simple ratio 2 : 1

C. When magnesium bums in oxygen, the amount of magnesium taken for the reaction is equal to the amount of magnesium in magnesium oxide formed.

D. At constant temperature and pressure 200 mL of hydrogen will combine with 100 mL oxygen to produce 200 mL of water vapour

Answer: B

Watch Video Solution

16. One mole of oxygen gas at STP is equal to .....

A. 6.022×10^{23} molecules of oxygen

B. 6.022×10^{23} atoms of oxygen

C. 16 g of oxygen

D. 32 g of oxygen

Answer: A::D

Watch Video Solution

17. Sulphuric acid reacts with sodium hydroxide as follows

$$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$$

when 1L of 0.1M sulphuric acid solution is allowed to react with 1L of 0.1M sodium hydroxide solution, the amount of sodium solphate formed and its molarity in the solution obtained is

A. 0.1 mol L^{-1}

B. 7.10 g

C. 0.025 mol L^{-1}

D. 3.55 g

Answer: B::C

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18. Which of the following pairs have the same number of atoms ?

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

B. 16 g of O_2 and 44 g of CO_2

C. 28 g of N_2 and 32 g of O_2

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

Answer: C::D

Watch Video Solution

19. Which of the following solutions have the same concentration?

A. 20 g of NaOH in 200 mL of solution

B. 0.5 mol of KC1 in 200 mL of solution

C. 40 g of NaOH in 100 mL of solution

D. 20 g of KOH in 200 mL of solution

Answer: A::B

Watch Video Solution

20. 16 g of oxygen have same number of molecules as in :

A. 16 g of CO

B. 28 of N_2

C. 14 g of N_2

D. 2.0 g of H_2

Answer: C

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21. Which of the following terms are unitless ?

A. Molality

B. Molarity

C. mole fraction

D. mass percentage

Answer: C::D

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22. One of the statements of Dalton's atomic theory is given below "Compound are formed when atoms of different element combine in a fixed ratio "

Which of the following laws is not related to this statement?

A. Law of conservation of mass

B. Law of definite proportions

C. Law of multiple proportions

D. Avogadro law

Answer: A::D

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Ncert File Ncert Exemplar Problems Short Answer Questions

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

Watch Video Solution

2. How many significant figures should b e present in the answer of the following calculations?

$$\frac{2.5 \times 1.25 \times 3.5}{2.01}$$

Watch Video Solution

3. What is the symbol for SI unit of mole? How is the mole defined?

Watch Video Solution

4. Differentiate between molarity and molality of a solution .How can we change molality value of solution in to molarity value?

Watch Video Solution

5. Calculate the mass per cent of calcium, phosphorus and oxygen in calcium phosphate $Ca_3(PO_4)_2$.

Watch Video Solution

6. 45.4L of dinitrogen reacted with 22.7L of dioxygen and 45.4 L of nitrous oxide was formed the reaction is given below

$2N_2(g) + O_2(g) \rightarrow 2N_2O(g)$

Which law is being obeyed in this experiment? Write the statement of the law?

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7. If two elements can combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element, are in whole number ratio.

(a) Is this statement true?

(b) It yes, according to which law?

(c) Give one example related to this law.

Watch Video Solution

8. Calculate the average atomic mass of hydrogen using the following data :

Isotope	% Natural abudance mass	Atomic mass(amu)
$.^{1}H$	99.985	1
$.^{2}H$	0.015	2

Watch Video Solution

9. Hydrogen gas is prepared in the laboratory by reacting dilute HCl with granulated zinc, Following reaction takes place

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

Calculate the voluem of hydrogen gas liberated at STP when 32.65 g of zinc reacts with HCl. 1 mol of a gas occupies 22.7 L volume at STP, atomic mass of Zn=65 .3u

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10. The density of 3 molal solution of NaOH is 1.110g mL^{-1}. Calculate the molarity of the solution.

Watch Video Solution

11. Volume of a solution chagnes with chagne in temperature, then what will the molality of the solution be affected by temperature? Give reason for your answer.

Watch Video Solution

12. If 4 g of NaOH dissovles in 36g of H_2O, calculate the mole fraction of each component in the solution. (specific gravity of solution is $1gmL^{-1}$).

Watch Video Solution

13. The reactant which is entirely consumed in reaction is known as limiting reagent. In the reaction $2A + 4B \rightarrow 3C + 4D$, when 5 moles of A react with 6 moles of B, then

(a) which is the limiting reagent?

(b) calculate the amount of C formed?

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Ncert File Ncert Exemplar Problems Assertion And Reason Type Questions

1. Assertion (A) : The empirical mass of ethene is half of its molecular mass

Reason (R) : The empirical formula represents the simplest whole number ratio of various atoms present in a compound.

A. Both A and R are true and R is the correct explanation of A.

B. A is true but R is false.

C. A is false but R is true

D. Both A and R are false

Answer: A

Watch Video Solution

2. Assertion(A) One atomic mass unit is defined as one twelth of the mass of one carbon-12 atom.

Reason(R) Carbon-12 isotope is the most abundant isotope of carbon and has been chosen as standard.

A. Both A and R are true and R is the correct explanation of A.

B. A is true but R is false.

C. A is false but R is true

D. Both A and R are false

Answer: B

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3. Assertion(A) Significant figures for 0.200 is 3 where as for 200 it is 1.

Reason(R) Zero at the end or right of a number are significatn provided they are not on the right side of the decimal point.

A. Both A and R are true and R is the correct explanation of A.

B. A is true but R is false.

C. A is false but R is true

D. Both A and R are false

Answer: C

Watch Video Solution

4. Assertion (A) : Combustion of 16 g of methane gives 18 g of water

Reason (R) : In the combustion of methane, water is one of the products.

A. Both A and R are true and R is the correct explanation of A.

B. A is true but R is false.

C. A is false but R is true

D. Both A and R are false

Answer: C

Watch Video Solution

Ncert File Ncert Exemplar Problems Long Answer Questions

1. A vessel contains 1.6g of dioxygen at STP(273.15k,1atm pressure). The gas is now trasnferred to another vessel at constnat temperature. Whre pressure becomes half of the original pressure. Calculate

(a) Volume of the new vessel.

(b) number of molecuels of dioxygen.

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

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$$

What mass of $CaCl_2$ will be formed when 250mL of 0.76 M HCl reac ts with 1000 g of $CaCO_3$? Name the limiting reagent. Calculate the number of moles of $CaCl_2$ formed in the reaction.

Watch Video Solution

3. Define the law of multiple proportions, Explain it with two examples. How des this law point to the existence of atoms?

Watch Video Solution

4. A b ox contains some identical red coloured balls. Labelleda as A, each weighing 2g. Another box contains identicla blue coloured balls. Labelled as B, each weighing 5g. Consider combination AB,AB_2, A_2B and A_2B_3 and show that law of multiple proportions is applicable.

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Revision Exercises Objective Very Short Answer Questions Passage Based Questions

1. Glucose (dextrose) solutions are given intravenously to patients combined with other drugs. Different concentrations of glucose are used for different purposes. A 5% (w/w) glucose solution is commonly used. The density of this solution is 1.02 g mL^{-1}.

What is the molality of the solution?

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What is the molarity of the solution?

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3. Glucose (dextrose) solutions are given intravenously to patients combined with other drugs. Different concentrations of glucose are used for different purposes. A 5% (w/w) glucose solution is commonly used. The density of this solution is 1.02 g mL^{-1}.

What is the mole fraction of glucose in the solution?

Watch Video Solution

4. Glucose (dextrose) solutions are given intravenously to patients combined with other drugs. Different concentrations of glucose are used for different purposes. A 5% (w/w) glucose solution is commonly used. The density of this solution is 1.02 g mL^{-1}.

How many molecules of glucose are present in 250 mL of the solution?

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5. Glucose (dextrose) solutions are given intravenously to patients combined with other drugs. Different concentrations of glucose are used for different purposes. A 5% (w/w) glucose solution is commonly used. The density of this solution is 1.02 g mL^{-1}.

How much glucose is needed to prepare 500 mL of 0.05 M solution?

Watch Video Solution

6. Lithium oxide is used to remove water from air according to the following reaction:

$$Li_2O(s) + H_2O(g) \rightarrow 2LiOH(s)$$

90 kg of water is to be removed and 45 kg of Li_2O is available.

Which reactant is the limiting reactant?

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7. Lithium oxide is used to remove water from air according to the following reaction:

$$Li_2O(s) + H_2O(g) \rightarrow 2LiOH(s)$$

90 kg of water is to be removed and 45 kg of Li_2O is available.

Calculate the maximum amount of water that will be removed.

Watch Video Solution

8. Lithium oxide is used to remove water from air according to the following reaction:

$$Li_2O(s) + H_2O(g) \rightarrow 2LiOH(s)$$

90 kg of water is to be removed and 45 kg of Li_2O is available.

How much excess reactant (in kg) left?

Watch Video Solution

9. Lithium oxide is used to remove water from air according to the following reaction:

$$Li_2O(s) + H_2O(g) \rightarrow 2LiOH(s)$$

90 kg of water is to be removed and 45 kg of Li_2O is available.

How many moles of Li20 are needed to completely remove 50 kg of water?

Watch Video Solution

10. Lithium oxide is used to remove water from air according to the following reaction:

$$Li_2O(s) + H_2O(g) \rightarrow 2LiOH(s)$$

90 kg of water is to be removed and 45 kg of Li_2O is available.

Define limiting reactant.

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Revision Exercises Objective Very Short Answer Questions True Or False Questions

1. Properties of a compound are average of the properties of its constituent atoms.

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2. There is no difference in writing mass of an object as 7.00 g or 7.0 g

Watch Video Solution

3. The number of ozone molecules present in 1 mole of ozone are

Watch Video Solution

4. Write the differences between mass and weight of an object.

Watch Video Solution

5. A balanced chemical equation is in accordance with

Watch Video Solution

6. Homogeneous mixtures have sharp melting and boiling points.

Watch Video Solution

7. The figure 0.02450 has 4 significant figures.

Watch Video Solution

8. There is no difference between 0.005 or 5.00×10^{-3} g.

Watch Video Solution

9. The empirical and molecular formula of sucrose is same

Watch Video Solution

10. 0.5 mole of S_8 and 0.5 mol of P_4 have same number of polyatomic molecules

View Text Solution

11. Molarity of a solution changes with temperature but molality does not.

Watch Video Solution

12. The empirical formula of glucose is CH_2O.

Watch Video Solution

13. 1 gram atom of C and 1 gram atom of sulphur have same mass.

Watch Video Solution

14. When 3.0 g of H_2 react with 29.0g of O_2 to form water, O_2 is the limiting reactant. statement is true or false

Watch Video Solution

15. Nitrogen and oxygen combine to form N_2O, NO and NO_2. This is in accordance with law of reciprocal proportions.

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Revision Exercises Objective Very Short Answer Questions Fill In The Blanks Questions

1. AZT (azidothymindine) is used for helping .....victims.

Watch Video Solution

2. The prefix pico stands for

Watch Video Solution

3. Name the quantity whose one of the units is pascal (Pa)

Watch Video Solution

4. The number of significant figures in 0.00030 is.....

Watch Video Solution

5. Decimal equivalent of 2/3 is .....upto three significant figures.

Watch Video Solution

6. The empirical formula of hydrogen peroxide is.....

Watch Video Solution

7. The law which does not follow from Dalton's atomic theory is.....

Watch Video Solution

8. The mass of a molecule of carbon-14 dioxide $\left({}^{14}CO_2\right)$ is g.

Watch Video Solution

9. An atom of sulphur is __ times heavier than an atom of carbon.

Watch Video Solution

10. The ratio of atoms of hydrogen in 1 mole of methane and 1 mole of sucrose ($C_{12}H_{22}O_{11}$) is.....

Watch Video Solution

11. .....mol of N_2 are needed to produce 3.8 mol of NH_3 by reaction with hydrogen.

Watch Video Solution

12. If mole fraction of sodium chloride in sodium chloride aqueous solution is 0.35, then mole fraction of water in the solution is

Watch Video Solution

13. The molarity of 0.5 N H_2SO_4 solution is.....

Watch Video Solution

14. Amount of glucose ($C_6H_{22}O_6$) required to prepare 100 mL of 0.1 M solution is:

Watch Video Solution

15. The empirical formula of benzene is:.....

Watch Video Solution

Revision Exercises Assertion Reason Questions

1. Assertion : 22 carat gold is a compound.

Reasons : A compound has fixed composition of the elements present in it.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: D

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2. Assertion : Both 32 g of SO_2 and 8g of CH_4 have same number of molecules

Reason : Equal moles of substances have equal number of molecules.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but remain is correct statement.

Answer: A

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3. Assertion: The standard unit for expressing the mass of atoms is a.m.u.

Reason: a.m.u. stands for mass of 1 atom of carbon.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: C

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4. Assertion: The sum of 154.2 + 6.1 + 23 is 183

Reason: The result of addition is reported to the same number of decimal places as that of the term with least number of decimal places.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: A

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5. Assertion: 1 mol of O and 1 mol of O_2 contain equal number of particles.

Reason: 1 mol of molecules is always double than 1 mol of atoms in all diatomic molecules.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: C

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6. Assertion: Graphite is an element.

Reason: Element is the pure form of a substance containing same kind of atoms.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: A

Watch Video Solution

7. Assertion: Steam is a mixture.

Reason: In a compound, the composition of the elements must be fixed.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: D

Watch Video Solution

8. Assertion: Empirical and molecular formula of Na_2CO_3 is same.

Reason: Na_2CO_3does not form hydrate.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: C

Watch Video Solution

9. Assertion(A) The empirical mass of ethene is half of its molecular mass.

Reason(R) The empirical formula represents the simplest whole number ratio of various atoms present in a compound.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but remain is correct statement.

Answer: A

Watch Video Solution

10. Assertion: Pure water obtained from different sources always contains hydrogen and oxygen in the ratio of 1 : 8 by mass.

Reason: Molecular mass of water is 18.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statements but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

Answer: B

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Revision Exercises Very Short Answer Questions One Word Very Short Sentence Answer

1. Define Avogadro's law

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2. What is meant by a.m.u. ?

Watch Video Solution

3. Define significant figures.

Watch Video Solution

4. What is a mole ?

Watch Video Solution

5. Define precision

Watch Video Solution

6. State the law of define proportion.

Watch Video Solution

7. Define atomic mass of an element in terms of mole concept.

Watch Video Solution

8. Does a balanced chemical equation obey the law of conservation of mass ?

Watch Video Solution

9. Define the term 'molarity of a solution'.

Watch Video Solution

10. Express decimal equivalent of 2/7 to three significant figures

Watch Video Solution

11. Is the molar volume of NH_3 different from that of CO_2?

Watch Video Solution

12. Name a monoatomic gas. What is its valency ?

Watch Video Solution

13. Limiting Reagent

Watch Video Solution

14. Write 0.000623 cm in a scientific notation.

Watch Video Solution

15. Define the law of multiple proportions, Explain it with two examples. How des this law point to the existence of atoms?

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16. What is gram molecular mass ? Give one example.

Watch Video Solution

17. Give one example each of a molecule in which the empirical and molecular formulae are (a) same (b) different.

Watch Video Solution

18. Define mole.

Watch Video Solution

19. Balance the equation :

$$CaF_2 + H_2SO_4 + H_3BO_3 \rightarrow CaSO_4 + BF_3 + H_2O$$

Watch Video Solution

20. How many atoms of carbon are present in 0.1 mole of $C_{12}H_{22}O_{11}$?

Watch Video Solution

21. How many hydrogen atoms are present in 60 a.m.u. of ethane ?

Watch Video Solution

22. What is meant by one gram of atom of iron ?

Watch Video Solution

23. What is the S.I. unit of density ?

Watch Video Solution

24. Name the law which deals with the ratios of the volumes of the gaseous reactants and products.

Watch Video Solution

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

Watch Video Solution

26. An atom of an element is 13 times heavier than the mass of a carbon atom. What is its mass in a.m.u. ?

Watch Video Solution

27. What is the standard for the molecular weights of molecules ?

Watch Video Solution

28. What is the ratio of molar volumes of SO_2 and SO_3 ?

Watch Video Solution

29. State law of reciprocal proportions.

Watch Video Solution

30. What volume will 250 g of mercury occupy ? (Density of mercury =13.6 g cm^{-3})

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Revision Exercises Short Answer Questions Carrying 2 Or 3 Marks

1. What do you understand by the terms element, compound and mixture ? Give two examples in each case

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2. Explain the term mole. What does one mole of ammonia represent ?

Watch Video Solution

3. Give the SI units for (i) volume (ii) speed and (iii) force.

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4. What do you understand by the terms (i) empirical formula and (ii) molecular formula ? How are they related to each other ? Illustrate with an example.

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5. Define molarity. What does 1 M solution of sodium carbonate mean ?

Watch Video Solution

6. Classify the following into elements, compounds or mixtures :

(i) Water (ii) milk (iii) tea (iv) iron (v) sugar (vi) smoke (vii) sulphur (viii) 22 carat gold (ix) iodised table salt (x) gasoline.

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7. What are homogeneous and heterogeneous mixtures ? Which of the following are homogeneous ?

(a) tap water (b) wood (c) soil (d) smoke (e) cloud.

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8. When two substances A and B are mixed together in a pestel and mortar, a large amount of heat is evolved and a new substance C is

formed. C has the properties different from A and B. Is C an element, compound or a mixture?

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9. State the following :

(i) atomic mass (ii) gram atomic mass (iii) gram molar volume.

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10. How would you recover

(i) iodine from a mixture of iodine and salt?

(ii) sulphur from a mixture of carbon and sulphur ?

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11. State Avogadro's hypothesis. In what way, has it given support to Dalton atomic theory ?

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12. How can you deduce the atomicity of hydrogen with the help of Avogadro's hypothesis ?

Watch Video Solution

13. State the following laws of chemical combination and give one example in each case

(i) Law of constant composition.

(ii) Law of multiple proportions.

Watch Video Solution

14. What do you understand by a balanced chemical equation ? What quantitative information does a balanced chemical equation convey ?

Watch Video Solution

15. Explain (i) molarity (ii) limiting reagent.

Watch Video Solution

16. Write the balanced chemical equations for the following reactions :

(i) Manganese dioxide and concentrated hydrochloric acid.

(ii) Sodium thiosulphate and iodine.

(iii) Copper and dilute nitric acid.

(iv) Sulphur dioxide and hydrogen sulphide.

Watch Video Solution

17. Write the empirical formulae of the compounds having the following molecular formulae :

(i) C_6H_6

(ii) C_6H_{12}

(iii) H_2O_2

(iv) H_2O

(v) Na_2CO_3

(vi) B_2H_6

(vii) N_2O_4

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18. Balance the following equations:

(i) $H_3PO_3 \rightarrow H_3PO_4 + PH_3$

(ii) $Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

(iii) $Fe_2(SO_4)_2 + NH_3 + H_2O \rightarrow Fe(OH)_3 + (NH_4)_2SO_4$

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19. What do you understand by the term formula mass ? How does it differ from molecular mass ?

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20. Which of the following has (i) maximum (ii) minimum mass ?

(a) 1 gram atom of C

(b) 1 a.m.u. of an atom

(c) 1 gram mole of sulphur dioxide

(d) 6.02×10^{20} atoms of nitrogen.

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Revision Exercises Long Answer Questions Carrying 5 Marks

1. State the law of conservation of mass. How is it verified experimentally ?

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2. What are laws of chemical combinations ? Discuss any three laws in detail.

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3. Why is it necessary to balance a chemical equation ? Outline briefly the various steps for balancing a chemical equation by hit and trial method.

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4. Write short notes on

(i) Limiting reagent (ii) Avogadro hypothesis (iii) Dalton's atomic theory.

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5. How is mole related to

(i) mass, (ii) volume and (iii) number of molecules of a substance?

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6. Complete the following:

(a) 2 moles....., ..., ...

(b) .....g, ...g, ...g, ...2g.

(c) $\underset{\text{atoms}}{.....H}, \underset{\text{atoms}}{.....H}, 6 \times 10^{23} \underset{\text{atoms}}{H}, \underset{\text{atoms}}{..... H}$

(d) $\underset{\text{total}}{6 \times 10^{20}}$ $\underset{\text{atoms}}{.....\text{total}}$ $\underset{\text{atoms}}{...}$ $\underset{\text{atoms}}{\text{total}}$ $\underset{\text{atoms}}{..... \text{total}}$

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7. What are the main postulates of Dalton's atomic theory ? What were its limitations ? How has the theory been modified ?

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8. Define Avogadro number and mole. What is their importance ?

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9. What are the essentials of a chemical equation ? What is the information conveyed by a chemical equation ?

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10. Explain the following :

(a) Gay Lussac law

(b) Law of definite composition

(c) Empirical and molecular formula

(d) Relation between mole and volume of gases

(e) Limiting reagent.

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Revision Exercises Numerical Problems

1. State the number of significant figures in each of the following :

A. 0.0037

B. 0.00601

C. 1.0001

D. 0.00236

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

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2. Express the following numbers to three significant figures :

A. 6.0263

B. 2.362

C. sixty thousand

D. 2.861×10^5

Answer:

Watch Video Solution

3. Express the result of the following calculations to appropriate number of significant figures :

A. $\frac{7.5 \times 206.8}{0.0512 \times 1002}$

B. 4.20 + 1.6523 + 0.015

C. (1.0042 - 0.0034)(1.23)

D. $\frac{8.5 \times 208.9}{0.054 \times 9261.6}$

Answer: A

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4. Carbon and oxygen are known to form two compounds. The carbon content in one of these is $42.9\ \%$ while in the other it is $27.3\ \%$. Show that this data is in agreement with the law of multiple proportions.

Watch Video Solution

5. Calcualte the amount in grams of:

(i) 2.5 gram atoms of nitrogen

(ii) 3.6 gram mole of carbon dioxide.

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6. Calculate (i) number of molecules present in 2.24 dm^3 of carbon dioxide at N.T.P.

(ii) mass of an atom of oxygen

(iii) number of oxygen atoms in 2 mol of ozone

(iv) volume occupied by 4.4 g of SO_2 at N.T.P.

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7. One atom of nickel weighs 9.75×10^{-23} g. Calculate the atomic mass of nickel

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8. How many molecules are present in 1 kg of hydrogen ?

Watch Video Solution

9. Calculate the total charge of a mole of electrons if the electrical charge on a single electron is 1.60×10^{-19} C.

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10. The volume of a drop of rain was found to be 0.448 ml at N.T.P. How many molecules of water and number of atoms of hydrogen are present in this drop ?

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11. Assuming the atomic mass of a metal M to be 56, calculate the empirical formula of its oxide containing 70.0% M.

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12. Calculate the number of molecules of oxygen in 150 ml of it at 20° C and 750 mm pressure

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13. How many moles of hydrogen, phosphorus and oxygen are there in 0.4 moles of phosphoric acid (H_3PO_4) ?

Watch Video Solution

14. Calculate the molarity of KOH in solution prepared by dissolving $5.6g$ in enough water to form $250mL$ of the solution.

Watch Video Solution

15. A chemist wishes to prepare 6.022×10^{24} molecules of SO_2 according to the reaction :

$S + O_2 \rightarrow SO_2$

How many gram atoms of S and how many grams of O does he need ?

Watch Video Solution

16. A sample of iron has a mass of 1.68 g. Calculate (a) the number of moles of iron present, (6) the number of atoms of iron in the sample

Watch Video Solution

17. 2.5 g of an impure sample of sodium bicarbonate when heated strongly gave 300 ml of carbon dioxide measured at 27°C and 760 mm pressure. Calculate the percentage purity of the sample

Watch Video Solution

18. Which is cheaper

40% HCl at the rate of 6 per kg or 80% H_2SO_4 at the rate of 3.5 per kg required to neutralise 7 kg of KOH.

Watch Video Solution

19. The compound adrenaline is released in the human body in times of stress. It was found by experiment to have the composition 56.8 % C, 6.50 % H, 28.4% O and 8.28% N. What is the empirical formula of adrenaline?

Watch Video Solution

20. What volume of concentrated aqueous sulphuric acid which is 98.0% H_2SO_4 by mass and has a density of 1.84 g mL^{-1} is required to prepare 10.0 L of 0.200 M H_2SO_4 solution ?

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Higher Order Thinking Skills Advanced Level Questions With Answers

1. In the combustion of methane, why is methane regarded as the limiting reactant ?

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2. What is kg-mole ? How many electrons are present in 1 kg mole of methane (CH_4)?

Watch Video Solution

3. Which aqueous solution has higher concentration : 1 molar or 1 molal solution of the same solute ?

Watch Video Solution

4. Will the molarity of a solution at 50°C be same, less or more than molarity at 25°C?

Watch Video Solution

5. Is the law of constant composition true for all types of compounds ? Explain why or why not.

Watch Video Solution

6. When and why is molality preferred over molarity in handling solution in Chemistry?

Watch Video Solution

7. What is the difference in expressing a weight of a solid as 36.5×10^3 g and 36.50×10^3 g ?

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8. How many significant figures are there in V ?

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9. In calculations involving more than one arithmetic operation, rounding off to the proper number of significant figures may be done

once at the end if all the operations are multiplication and/ or division or if they are all additions and/or subtractions but not if they are combinations of additions or subtractions with multiplications or divisions. Explain

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10. Calculate the molarity of water if its density is $1000 kg / m^3$.

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11. Sulphuric acid is generally available in market as 18.0 M solution. How would you prepare 250 mL of 0.50 M aqueous H_2SO_4 ?

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12. A compound (molecular mass = 246) has the following data:

From the data find out

(i) atomic masses of the elements A, B,C and D,

(ii) simple ratio,

(iii) Molecular formula of the compound.

View Text Solution

13. A compound has the following composition by weight , $Na = 18.60\,\%$, $S = 25.80\,\%$, $H = 4.02\,\%$ and $O = 51.58\,\%$

Assuming that all the hydrogen atoms in the compound are part of water of crystallization, the correct molecular formula of the compound is

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14. The vapour density of mixture consisting of NO_2 and N_2O_4 is 38.3 at $26.7^\circ C$. Calculate the number of moles of NO_2 I $100g$ of the mixture.

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15. A solid mixture $5g$ consists of lead nitrate and sodium nitrate was heated below $600^\circ C$ until weight of residue was constant. If the loss in weight is $28\,\%$ find the amount of lead nitrate and sodium nitrate in mixture.

Watch Video Solution

16. A sample of hard water contains 20 mg of Ca^{2+} ions per litre. How many milliequivalents of Na_2CO_3 would be required to soften 1 litre of sample ?

Watch Video Solution

17. Igniting MnO_2 in air converts it quantitatively to Mn_3O_4. A sample of pyrolusite is of the following composition: $MnO_2 = 80\,\%$, SiO_2 and other inert constituents = 15%, and rest bearing H_2O. The sample is ignited to constant weight. What is the percent of Mn in the ignited sample?

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18. The density of gold is 19.3 g cm^{-3}. Calculate the diameter of a solid gold sphere having a mass of 422 g.

Watch Video Solution

19. P_4O_6 and P_4O_{10} are formed by burning P_4 with O_2 as:

$P_4 + 3O_2 \rightarrow P_4O_6$

$P_4 + 5O_2 \rightarrow P_4O_{10}$

What are the masses of P_4O_6 and P_4O_{10} that will be produced by the combustion of 2.0 g of P_4 in 2.0 g of oxygen leaving no P_4 and O_2 ?

Watch Video Solution

Competition File Multiple Choice Questions

1. Which of the following contain highest number of atoms ?

A. 1.0 g of water

B. 1.0 g of silver

C. 1.0 g of nitrogen

D. 1.0 g of propane C_3H_8

Answer: D

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2. Which of the following has maximum mass ?

A. 1.0 mole of H_2 gas

B. 0.5 mole of sucrose $(C_{12}H_{22}O_{11})$

C. 1.2 mole of N_2 at N.T.P.

D. 22.4 L of N_2 at N.T.P.

Answer: B

Watch Video Solution

3. How many molecule are present in one mL of water vapour of STP ?

A. 1

B. 1000

C. 2.69×10^{19}

D. 6.02×10^{20}

Answer: C

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4. 2g of oxygen contains number of atoms equal to that in

A. 0.5 of hydrogen

B. 4g sulphur

C. 7g nitrogen

D. 2.3 g sodium.

Answer: B

Watch Video Solution

5. 40 g of caustic soda contain :

A. 6.02×10^{23} atoms of H

B. 22.4 litres of N_2

C. 6.02×10^{24} molecules of O_2

D. 4 g of Na

Answer: A

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6. 0.6 g of carbon was burnt in the air to form CO_2. The number of molecules of CO_2 introduced into the will be : $C + O_2 \rightarrow CO_2$

Watch Video Solution

7. The total number of electrons present in 3.2 g of methane are :

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8. The number of atoms in 4.25 g of NH_3 is approximately

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9. Haemoglobin contains 0.33% of iron by weight. The molecular weight of heamoglobin is approximately 67200. The number of iron atoms (At. Wt. of Fe=56) present in one molecule of haemoglobin is

Watch Video Solution

10. How many moles of electrons weigh one kilogram?

(Mass of electron $= 9.108 \times 10^{-31}$ kg, Avogadro's number $= 6.023 \times 10^{23}$)

A. 6.022×10^{23}

B. $\frac{1}{9.108} \times 10^{21}$

C. $\frac{6.022}{9.108} \times 10^{24}$

D. $\frac{1}{9.108 \times 6.022} \times 10^8$

Answer: D

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11. An alkaloid contains 17.28% of nitrogen and it's molecular mass is 162. The number of nitrogen atoms present in one molecular of alkaloid is

A. five

B. four

C. three

D. two

Answer: D

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12. Number of atoms in $558.5\ g\ Fe(at.\ wt.55.85)$ is:

A. twice that in 60 g carbon

B. 6.023×10^{22}

C. half life of 8g He

D. $558.6 \times 6.023 \times 10^{23}$

Answer: A

Watch Video Solution

13. The empirical formula of sucrose is :

A. CH_2O

B. CHO

C. $C_{12}H_{22}O_{11}$

D. $C(H_2O)_2$

Answer: C

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14. One mole of calcium phosphide on reaction with excess of water gives

A. one mole of phosphate

B. Two moles of phosphoric acid

C. Two moles of phosphine

D. One mole of phosphorus pentoxide

Answer: C

Watch Video Solution

15. A sample of water contains x % of D_2O. Its molecular weight is 19. The value of'x' is

A. 25

B. 50

C. 33.33

D. 75

Answer: B

Watch Video Solution

16. An organic compound contains, C, H and S. The minimum molecular weight of the compound containing 8% sulphur is : $(\text{atomic weight of} S = 32\text{amu})$

A. 100

B. 200

C. 350

D. 400

Answer: D

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17. An aqueous solution of 6.3 g of oxalic acid dihydrate is made upto 250 mL. The volume of 0.1 N NaOH required to completely neutralise 10 mL of this solution is :

A. 40 mL

B. 20 mL

C. 10 mL

D. 5 mL

Answer: A

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18. A mixture x containing 0.02 mol of $\left[Co(NH_3)_5SO_4\right]Br$ and 0.02 mol of $\left[Co(NH_3)_5Br\right]SO_4$ was prepared in $2L$ of solution.

$1L$ of mixture $X +$ excess $AgNO_3 \rightarrow Y$

$1L$ of mixture $X +$ excess $BaCl_2 \rightarrow Z$

The number of moles of Y and Z are

A. 0.01, 0.01

B. 0.02, 0.01

C. 0.01, 0.02

D. 0.02, 0.02

Answer: A

Watch Video Solution

19. In the Haber process, $30L$ of dhyrgen and $30L$ of dintrogen were taken for reaction which yielded only $50\,\%$ of the expectedf product. What will be the xomposition of the gaseous mixturre under the aforesaid condition in the end?

A. 20 L NH_3, 25 L N_2 and 20 L H_2

B. 10 L NH_3, 25L N_2 and 15 L H_2

C. 20 L NH_3, 10 L N_2 and 30 L H_2

D. 20 L NH_3, 25 L N_2 and 15 L H_2

Answer: B

Watch Video Solution

20. A gas mixture contains $50\,\%$ helium and $50\,\%$ methane by volume. What is the percent by weight of methane in the mixture.

A. 0.1997

B. 0.2005

C. 0.5

D. 0.8003

Answer: D

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21. The mass of carbon anode consumed (giving only carbon dioxide) in the production of $270kg$ of aluminium metal from bauxite by the Hall process is

A. 180 kg

B. 270 kg

C. 540 kg

D. 90 kg

Answer: D

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22. The crystalline salt $Na_2SO_4.xH_2O$ on heating loses 55.9 % of its weight. The formula of the crystalline salt is

A. $Na_2SO_4.5H_2O$

B. $Na_2SO_4.7H_2OI$

C. $Na_2SO_4.2H_2O$

D. $Na_2SO_4.10H_2O$

Answer: D

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23. 20.0 kg of $N_2(g)$ and 3.0 kg of $H_2(g)$ are mixed to produce $NH_3(g)$. The amount of $NH_3(g)$ formed is

A. 17 kg

B. 51 kg

C. 60 kg

D. 34 kg

Answer: A

Watch Video Solution

24. A phosphorus oxide has 43.6% phosphorus (at. mass = 31). The empirical formula of the compound is

A. P_2O_5

B. P_4O_6

C. P_2O_3

D. P_4O_8

Answer: A

Watch Video Solution

25. Commercially available concentrated hydrochloric acid contains 38 % HCl by mass. (i) What is the molarity of the solution if its density is 1.19g cm^{-3} ?

(ii) What volume of concentrated HCl is needed to make 1.0 L of 0.2 M HCl solution ?

A. 10-40 M

B. 5-70 M

C. 12.38M

D. 13.46 M

Answer: C

Watch Video Solution

26. The molarity of a solution obtained by mixing 800 mL of 0.5 M HCl with 200 mL of 1 M HCl will be

A. 0.8 M

B. 0.6 M

C. 0.4 M

D. 0.2 M

Answer: B

Watch Video Solution

27. 4L of water is added to 2L of 6M HCl. The molarity of the final solution is

A. 4 M

B. 2 M

C. 1 M

D. 0.5 M

Answer: B

Watch Video Solution

28. The volume of 10.50 M solution required to prepare 1.0 L of 0.25 M solution of HNO_3 is :

A. 250 mL

B. 500 mL

C. 230 mL

D. 23.8 mL

Answer: D

Watch Video Solution

29. How many moles of sodium chloride present in 250 mL of a 0.50 M NaCl solution ?

A. 0.250 mol

B. 2 mol

C. 0.125 mol

D. 1.0 mol

Answer: C

Watch Video Solution

30. 6 mL of a gaseous hydrocarbon was exploded with excess of oxygen and the product cooled. A contraction of 9 mL was observed. A further contraction of 12 mL was observed on treatment with aqueous KOH. The formula of hydrocarbon is

A. CH_4

B. C_2H_4

C. C_2H_6

D. C_2H_2

Answer: D

Watch Video Solution

1. What volume of oxygen gas (O_2) measured at $0^\circ C$ and 1 atm is needed to burn completely $1L$ of propane gas (C_3H_8) measured under the same condition?

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

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3. Volume occupied by one molecule of water (density = 1 g cm^{-3})

Watch Video Solution

4. Which of the following concentration terms is/are independent of temperature ?

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5. 10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be

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6. The number of molecules in 100 mL of 0.02 NH_2SO_4 is:

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7. If $1\frac{1}{2}$ moles of oxygen combine with Al to form Al_2O_3 the weight of Al used in the reaction is (Al=27)

Watch Video Solution

8. For reaction $A + 2B \rightarrow C$. The amount of C formed by starting the reaction with 5 mole of A and 8 mole of B is :

A. 5 moles

B. 8 moles

C. 16 moles

D. 4 moles

Answer: D

Watch Video Solution

9. One kilogram of a sea water sample contains 6 mg of dissolved O_2. The concentration of O_2 in the sample in ppm is

A. 0.6

B. 6

C. 60

D. 16

Answer: B

Watch Video Solution

10. $25.3g$ sodium carbonate, Na_2CO_3, was dissolved in enough water to make $250mL$ of solution. If sodium carbonate dissociates completely, molar concentration of Na^+ and carbonate ions are respectively :

A. 0.477 M and 0.477 M

B. 0.955 M and 1.910 M

C. 1.910 M and 0.955 M

D. 1.90 M and 1.910 M

Answer: C

Watch Video Solution

11. The number of atoms in 0.1 mol of a triatomic gas is:

A. 1.800×10^{22}

B. 6.026×10^{22}

C. 1.806×10^{23}

D. 3.600×10^{22}

Answer: C

Watch Video Solution

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

A. P_2O_3. PH_3. H_2O

B. P_2O_2, PH_3, H_2O

C. N_2O_3, NH_3, H_2O

D. N_2O, NH_3, H_2O

Answer: A

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13. 20.0 kg of $N_2(g)$ and 3.0 kg of $H_2(g)$ are mixed to produce $NH_3(g)$. The amount of $NH_3(g)$ formed is

A. 17 kg

B. 34 kg

C. 20 kg

D. 3 kg

Answer: A

Watch Video Solution

14. What is the volutme of CO_2 liberted in litres at 1 atmosphere and $0^\circ C$ when 10% of 100 pure calcium carbonate is treated with excess dilute sulphuric acid? (at mass of Ca=40, C=12, O=16)

A. 0.224

B. 2.24

C. 22.4

D. 224

Answer: B

Watch Video Solution

15. Which one of the following is the lightest ?

A. 0.2 mole of hydrogen gas.

B. 6.023×10^{23} molecules of nitrogen.

C. 0.1 mole of oxygen gas.

D. 1 g of water.

Answer: C

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16. When $22.4L$ of $H_2(g)$ is mixed with 11.2 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

Watch Video Solution

17. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much?

A. Mg, 0.16 g

B. O_2, 0.16 g

C. Mg, 0.44 g

D. O_2, 0.28 g

Answer: A

Watch Video Solution

18. The mass of $CaCO_3$ required to react completely with 20 mL of 1.0 M HCl as per the reaction:

$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$ is (At. mass: Ca = 40, C = 12, O = 16)

A. 1 g

B. 2 g

C. 10 g

D. 20 g of KOH in 200 mL of solution

Answer: A

Watch Video Solution

19. Which one of the following has maximum number of molecules ?

A. 16 g of O_2

B. 16 g of NO_2

C. 4 g of N_2

D. 32 g of N_2

Answer: D

Watch Video Solution

20. A mixture of gases contains H_2 and O_2 gases in the ratio of $1:4(w/w)$. What is the molar ratio of the two gases in the mixture?

A. $16:1$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: D

Watch Video Solution

21. If Avogadro number N_A is changed from $6.022 \times 10^{23} mol^{-1}$ to 6 $.022 \times 10^{23} mol^{-1}$, this would change:

A. the ratio of chemical species to each other in a balanced equation.

B. the ratio of elements to each other in a compound.

C. the definition of mass in units of grams

D. the mass of one mole of carbon.

Answer: D

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22. The number of water molecules is maximum in

A. 18 gram of water

B. 18 moles of water

C. 18 molecules of water

D. 1.8 gram of water.

Answer: B

Watch Video Solution

23. 20.0 g of a magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0 g magnesium oxide. What be the percentage purity of magnsesium carbonate in the sample?

A. 60

B. 84

C. 75

D. 96

Answer: B

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24. What is the mole fraction of the solute in a 1.00 m aqueous solution ?

A. 0.0354

B. 0.0177

C. 0.177

D. 1.77

Answer: B

Watch Video Solution

25. What is the mass of the precipitate formed when 50 mL of 16.9% solution of $AgNO_3$ is mixed with 50 mL of 5.8% NaCl solution?

A. 7 g

B. 14 g

C. 28 g of N_2 and 32 g of O_2

D. 3.5 g

Answer: A

Watch Video Solution

26. Suppose the elements X and Y combine to form two compounds of XY_2 and X_3Y_2. When 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g , what are tha atomic masses of X and Y ?

A. 40,30

B. 60,40

C. 20,30

D. 30,20

Answer: A

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27. Which of the following is dependent on temperature?

A. molality

B. molarity

C. mole fraction

D. weight percentage

Answer: B

Watch Video Solution

28. In which case is the number of molecules of water maximum?

A. 18 mL of water

B. 0.18 g of water

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

D. 10^{-3} mol of water.

Answer: A

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29. The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is :

A. 40

B. 10

C. 20

D. 30

Answer: D

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Competition File Multiple Choice Questions From Competitive Examinations Jee Main Other State Boards Engineering Entrance

1. If $1/6$, in place of $1/12$, mass of carbon atom is taken to be the relative atomic mass unit, the mass of one one of a substance will:

A. decrease twice

B. increase two fold

C. remain unchanged

D. be a fraction of molecular mass of the substance.

Answer: A

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2. In the reaction

$$2Al(s) + 6HCl(aq.) \rightarrow 2Al^{3+}(aq.) + Cl^{-}(aq.) + 3H_2(g)$$

A. 33.6 L H_2 (g) is produced regardless fo temperature and pressure for every mole of Al that reacts.

B. 67.2 L H_2(g) at STP is produced for every mole of Al that reacts.

C. 11.2 L H_2 (g) at STP is produced for every mole of HCl (aq) consumed.

D. 6 L HCl (aq) is consumed for every 3 L of H_2(g) is produced.

Answer: C

Watch Video Solution

3. 80 g of oxygen contains as many atoms as in

A. 10 g of hydrogen

B. 5 g of hydrogen

C. 80 g of hydrogen

D. 1 g of hydrogen

Answer: B

Watch Video Solution

4. The volume of 10N and 4N HCL requied to make 1L of 7N HCl are

A. 0.50 L of 10 N HCl and 0.50 L of 4 N HCl

B. 0.60 L of 10 N HCl and 0.40 L of 4 N HCl

C. 0.80 L of 10 N HCl and 0.20 L of 4 N HCl

D. 0.75 L of 10 N HCl and 0.25 L of 4 N HCl

Answer: A

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5. Express of CO_2 is passed through 50 mL of 0.5 M calcium hydroxide solution. After the completion of the reaction, the solution was evaporated to dryness. The solid calcium carbonated was completely neutralized with 0.1 N hydrochloric acid. The volume of hydrochloric acid required is (At mass of carbon = 40)

A. 200 cm^3

B. $500cm^3$

C. $400cm^3$

D. $300cm^3$

Answer: B

Watch Video Solution

6. How much time (in hours) would it take to distribute one Avogadro number of wheat grains if 10^{20} grains are distributed each second?

A. 0.1673

B. 1.673

C. 16.73

D. 167.3

Answer: B

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7. Two oxides of a metal contain 36.4% and 53.4% of oxygen by mass respectively. If the formula of the first oxide is M_2O, then that of the second is

A. M_2O_2

B. MO

C. MO_2

D. M_2O_5

Answer: B

Watch Video Solution

8. A mixture of ethane and ethene occupies 41 L at atm and 500 K. The mixture reacts compeletly with 10/3 mole of oxygen to produce CO_2 and water. The mole fraction of ethane and ethene in the mixture are (R=0.0821L atm $K^{-1}mol^{-1}$ respectively

A. 0.50, 0.50

B. 0.75,0.25

C. 0.67,0.33

D. 0.25,0.75

Answer: C

Watch Video Solution

9. A mixture of $CaCl_2$ and NaCl weighing 4.44 is treated with sodium carbonate solution to precipitate all the Ca^{2+} ions as calcium carbonate. The calcium carbonate so obtained is heated strongly to get 0.56 g of CaO. The percentage of NaCl in the mixture of (atomic mass of Ca=40) is

A. 31.5

B. 75

C. 25

D. 40.2

Answer: B

Watch Video Solution

10. $50cm^3$ of 0.2 N HCl is titrated against 0.1 N NaOH solution. The titration is discontinued after adding $50cm^3$ of NaOH solution. The remaining titration is completed by adding 0.5 N KOH solution. What is the volume of KOH required for completing the titration ?

A. $10cm^3$

B. $12cm^3$

C. $16.2cm^3$

D. $21.0cm^3$

Answer: A

Watch Video Solution

11. A 100% pure sample of a divalent metal carbonate weighing 2 g on complete thermal decomposition releases 448 cc of carbon dioxide at STP. The equivalent mass of the metal is

A. 40

B. 20

C. 28

D. 12

Answer: B

Watch Video Solution

12. The total number of electrons present in $18mL$ of water is .....

A. 6.02×10^{23} atoms of H

B. 6.02×10^{25}

C. 6.02×10^{24}

D. $6.02 \times 18 \times 10^{23}$

Answer: C

Watch Video Solution

13. The volumes of two HCl solution A $(0.5M)$ and $B(0.1M)$ to be mixed for preparing 2 L of 0.2 M HCl are

A. 0.5 L of A + 1.5 L of B

B. 1.5 L of A + 0.5 L of B

C. 1.0 L of A + 1.0 L of B

D. 0.75 L of A + 125 L of B

Answer: A

Watch Video Solution

14. The number of water molecules present in a drop of water weighing 0.018 g is

A. 6.022×10^{26}

B. 6.022×10^{23}

C. 6.022×10^{19}

D. 6.022×10^{20}

Answer: D

Watch Video Solution

15. How many grams of concentrated nitric acid solution should be used to prepare $250mL$ of $2.0MHNO_3$? The concentrated acid is $70\,\%\,HNO_3$:

A. 70.0 g. conc. HNO_3

B. 54.0 g of conc. HNO_3

C. 45.0 g conc. HNO_3

D. 90.0 g conc. HNO_3

Answer: C

Watch Video Solution

16. 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. 0.975 M

B. 0.875 M

C. 1.00 M

D. 1.75 M

Answer: B

Watch Video Solution

17. A gaseous hydrocarbon gives upon combustion, 0.72 g of water and 3.08 g of CO_2. The empirical formula of the hydrocarbon is

A. C_7H_8

B. C_2H_4

C. C_3H_4

D. C_6H_6

Answer: A

Watch Video Solution

18. 10 g of a mixture of BaO and CaO requires 100 cm^3 of 2.5M HCl to react completely. The percentage of calcium oxide in the mixture is approximately (Given molar mass of BaO = 153, CaO = 56)

A. 52.6

B. 55.1

C. 44.9

D. 47.4

Answer: A

Watch Video Solution

19. $25cm^3$ of oxalic acid completely neutralised 0.064g of soldium hydroxied. molarity of the oxalic acid solution is

A. 0.064

B. 0.045

C. 0.015

D. 0.032

Answer: D

Watch Video Solution

20. A 5.82 g silver coin is dissolved in nitric acid. When sodium chloride is added to the solution, all the silver gets precipitated as AgCl. The mass of the precipitated silver chloride is 7.2 g. The percentage of silver in the coin is :

A. 0.603

B. $80\ \%$

C. $93.1\ \%$

D. $70\ \%$

Answer: C

Watch Video Solution

21. A gases mixture contains oxygen and nitrogen in the ratio $1:4$ by weight. Therefore, the ratio of the number of molecules is:

A. $3:16$

B. $1:4$

C. $7:32$

D. $1:8$

Answer: C

Watch Video Solution

22. The number of Cl^- ions in 100 mL of 0.001 M HCl solution is

A. 6.022×10^{23}

B. 6.022×10^{23}

C. 6.022×10^{19}

D. 6.022×10^{24}

Answer: C

Watch Video Solution

23. $0.30g$ of an organic compound containing $C, H,$ and O an combustion yields $0.44g$ of CO_2 and $0.18g$ of H_2O. If its molecular mass is 60μ the molecular mass is formula will be

A. C_3H_8O

B. $C_2H_4O_2$

C. CH_2O

D. C_4H_6O

Answer: B

Watch Video Solution

24. If 27g of water is formed during complete combustion of pure propene (C_3H_8), the mass of propene burnt is

A. 42 g

B. 21 g

C. 14 g of N_2

D. 56 g

Answer: B

Watch Video Solution

25. When 2.46 of hydrated salt (MSO_4xH_2O) is completely dehydrated, 1.20 g of anhydrous salt is obtained. It molecular weight of anhydrous salt is $120gmol^{-1}$, the value of x is

A. 2

B. 4

C. 5

D. 7

Answer: D

Watch Video Solution

26. Calculate the molality of a solution that contains 51.2g of naphthalene, ($C_{10}H_8$) in 500 mL of carbon tetrachloride. The density of CCl_4 is 1.60 g/m

A. 0.250 m

B. 0.500 m

C. 0.750 m

D. 0.840 m

Answer: B

Watch Video Solution

27. An organic compound contains $C = 40\,\%$, $H = 13.33\,\%$, and $N = 46.67\,\%$. Its empirical formula will be

A. C_2H_2N

B. C_3H_7N

C. CH_4N

D. CHN

Answer: C

Watch Video Solution

28. At $300K$ and $1atm, 15mL$ of a gaseous hydrocarbon requires $375mL$ air containing $20\%\ O_2$ by volume for complete combustion. After combustion, the gases occupy $330mL$. 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

A. C_3H_6

B. C_3H_6

C. C_4H_8

D. C_4H_{10}

Answer: B

Watch Video Solution

29. You are given 500 mL of 2N HCl and 500 mL of 5N HCl. What will be the maximum volume of 3 M HCl that you can make from these two

solutions ?

A. 250 mL

B. 500 mL

C. 750 mL

D. 1000 mL

Answer: C

Watch Video Solution

30. In a flask, the weight ratio of CH_4(g) and SO_2(g) at 298 K 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. $2:1$

Answer: C

Watch Video Solution

31. What will be the normality of the salt solution obtained by neutralizing x mL of y (N) HCl with y mL of x (N) NaOH and finally adding (x + y) mL distilled water ?

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

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

C. $\frac{2xy}{x+y}N$

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

Answer: B

Watch Video Solution

32. If $3 \cdot 01 \times 10^{20}$ molecules are removed from 98 mg of H_2SO_4, then the number of moles of H_2SO_4 left are

A. 0.5×10^{-3} mol

B. 0.1×10^{-3} mol

C. 9.95×10^{-2} mol

D. 1.66×10^{-3} mol

Answer: A

Watch Video Solution

33. 10 g of $MgCO_3$ decomposes on heating to 0.1 mole CO_2 and 4g MgO. The percent purity of $MgCO_3$ is (Given that atomic weights of Mg, C and O are 24,12 and 16 u)

A. $24\ \%$

B. 44%

C. 54%

D. 84%

Answer: D

Watch Video Solution

34. The compound $Na_2CO_3.xH_2O$ has 50% H_2O by mass. The value of 'x' is

A. 4

B. 5

C. 6

D. 7

Answer: C

Watch Video Solution

35. $1g$ of a carbonate (M_2CO_3) on treatment with excess HCl produces 0.01186 mole of CO_2. The molar mass of M_2CO_3 in $gmol^{-1}$ is

A. 1186

B. 84.3

C. 118.6

D. 11.86

Answer: B

Watch Video Solution

36. Calculate the molarity of a solution of 30 g of $Co(NO_3)_2.6H_2O$ in 4.3 L of solution? Consider atomic mass of Co = 59u, N - 14u, O = 16u, H

= lu.

A. 0.023 M

B. 0.23 M

C. 0.046 M

D. 0.46 M

Answer: A

Watch Video Solution

37. How many moles of electrons weigh one kilogram?

A. 6.023×10^{23}

B. $\frac{1}{9.108} \times 10^{21}$

C. $\frac{6.023}{6.018} \times 10^{54}$

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

Answer: D

Watch Video Solution

38. A metal M (specific heat 0.16) forms a metal chloride with a 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

Watch Video Solution

39. 1.0 g of Mg is burnt with 0.28 g of O_2 in a closed vessel . Which reactant is left in excess and how much ?

A. Mg, 5.8 g

B. Mg, 0.58 g

C. O_2, 0.24 g

D. O_2, 2.4 g

Answer: B

Watch Video Solution

40. 1 mole of $FeSO_4$ (atomic weight of Fe is $55.84 gmol^{-1}$) is oxidized to $Fe_2(SO_4)_3$. Calculate the equivalent weight of ferrous ion.

A. 55.84

B. 27.92

C. 18.61

D. 111.68

Answer: A

Watch Video Solution

41. The ration of mass per cent of C and H of an organic compound $\left(C_xH_yO_z\right)$is$6:1$. If one molecule of the above compound $(C_xH_YO_z)$ contains half as much oxygen as required to burn one molecule of compound C_xH_Y compleltely to CO_2 and H_2O. The empirial formula of compound $C_xH_yO_z$ is:

A. $C_3H_6O_3$

B. C_2H_4O

C. $C_3H_4O_2$

D. $C_2H_4O_3$

Answer: D

Watch Video Solution

42. 8g of NaOH is dissolved in 18g of H_2O. Mole fraction of NaOH in solution and molality (in mol kg^{-1}) of the solutions respectively are:

A. 0.167, 11.11

B. 0.2, 22.20

C. 0.2, 11.11

D. 0.167, 22.20

Answer: A

Watch Video Solution

43. The amount of sugar $(C_{12}H_{22}O_{11})$ required to prepare 22 L of its 0.1 M aqueous solution is:

A. 768.4 g

B. 117.1 g

C. 752.4 g

D. 136.8 g

Answer: C

Watch Video Solution

44. A solution of sodium sulfate contains 92g of Na^+ ions per kilogram of water. The molality of Na^+ ions in the solution in mol kg^{-1} is

A. 16

B. 8

C. 4

D. 12

Answer: C

Watch Video Solution

45. The combining ratios of hydrogen and oxygen in water and hydrogen peroxide are $1:8$ and $1:16$. Which law is illustrated in this example?

A. Law of definite proportions

B. law of multiple proportions

C. law of conservation of mass

D. Gay Lussac's law of combining volume of gases.

Answer: C

Watch Video Solution

46. The combining ratios of hydrogen and oxygen in water and hydrogen peroxide are 1:8 and 1:16. Which law is illustrated in this example?

A. Law of definite proportions

B. Law of multiple proportions

C. Law of conservation of mass

D. Gay Lussac's law of combining volumes of gases.

Answer: B

Watch Video Solution

47. The mass of AgCl precipitated when a solution containing 11.70 g of NaCl is added to a solution containing 3.4 g of $AgNO_3$ is [Atomic mass of Ag = 108, Atomic mass of Na = 23]

A. 5.74 g

B. 1.17 g

C. 2.87 g

D. 6.8 g

Answer: A

Watch Video Solution

48. A solution of methanol in water is 20% by volume. If the solution and pure methanol have densities of 0.964 kg and 0.793 kg L^{-1} respectively, find the per cent of methanol by weight?

A. 15.8

B. 16.45

C. 17.6

D. 14.8

Answer: B

Watch Video Solution

49. 8g of NaOH is dissolved in 18g of H_2O. Mole fraction of NaOH in solution and molality (in mol kg^{-1}) of the solutions respectively are:

A. 0.167, 11.11

B. 0.2, 22.20

C. 0.2, 11.11

D. 0.167, 22.20

Answer: A

Watch Video Solution

50. For a reaction, $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$, identify dihydrogen (H_2) as a limiting reagent in the following reaction mixtures.

A. 14 g of N_2 + 4 g of H_2

B. 28 g of N_2 + 6g of H_2

C. 56 g of N_2 + 10 g of H_2

D. 35 g of N_2 + 8 g of H_2

Answer: C

Watch Video Solution

51. At 300 K and 1 atmospheric pressure, 10 mL of a hydrocarbon required 55 mL of O_2 for complete combustion, and 40 mL of CO_2 is formed. The formula of the hydrocarbon is:

A. C_4H_8

B. C_4H_7

C. C_4H_{10}

D. C_4H_6

Answer: D

Watch Video Solution

52. The amount of sugar $(C_{12}H_{22}O_{11})$required to prepare 22 L of its 0.1 M aqueous solution is

A. 68.4 g

B. 17.1 g

C. 34.2 g

D. 136.8 g

Answer: A

Watch Video Solution

53. A mixture of 100m mol of $Ca(OH)_2$ and 2g of sodium sulphate was dissolved in water and the volume was made up to 100 mL. The mass of calcium sulphate formed and the concentration of OH^- in resulting solution, respectively, are: (Molar mass of $Ca(OH)_2$, Na_2SO_4 and $CaSO_4$ are 74, 143 and 136 g mol^{-1} respectively, K_{sp} of $Ca(OH)_2$ is 5.5×10^{-6})

A. 1.9 g $0.14 mol L^{-1}$

B. 13.6 g 0.14 mol L^{-1}

C. 1.9 g 0.28 mol L^{-1}

D. 13.6 g, 0.28 mol L^{-1}

Answer: C

Watch Video Solution

54. The percentage composition of carbon by mole in methane is:

A. $80\ \%$

B. $25\ \%$

C. $75\ \%$

D. $20\ \%$

Answer: D

Watch Video Solution

55. The mole fraction of a solvent in aqueous solution of a solute is 0.8. The molality $\left(\text{in mol kg}^{-1}\right)$ of the aqueous solution is:

A. 13.38×10^{-1}

B. 13.88×10^{-2}

C. 13.88

D. 13.88×10^{-3}

Answer: C

Watch Video Solution

56. A solution of sodium sulfate contains 92g of Na^{+} ions per kilogram of water. The molality of Na^{+} ions in the solution in mol kg^{-1} is

A. 16

B. 8

C. 4

D. 12

Answer: C

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Competition File Multiple Choice Questions From Competitive Examinations Jee Advance For Iit Entrance

1. Given that the abundacne of isotopes $.^{54}Fe$, $.^{56}Fe$, and $.^{57}Fe$ is 5%, 90% and 5% respectively. The atomic mass of Fe is

A. 55.85

B. 55.95

C. 55.75

D. 56.05

Answer: B

Watch Video Solution

Competition File Multiple Choice Questions With More Than One Correct Answers

1. Which of the following concentration terms is/are independent of temperature ?

A. Mole fraction

B. Molarity

C. Normality

D. Molality

Answer: A::D

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2. A solution has $25\ \%$ of water,$25\ \%$ ethanol and $50\ \%$ acetic acid by mass. Calculate the mol e fraction of each component.

A. water = 0.502

B. Ethanol = 0.302

C. Acetic acid = 0.196

D. Ethanol + acetic acid = 4.098

Answer: A::D

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3. 8 g of O_2 has the same number of oxygen atoms as

A. $11gCO_2$

B. 14 g of CO

C. 32 g of SO_2

D. 8g O_3

Answer: A::B::D

Watch Video Solution

4. The mass of $\frac{1}{12}$th of ^{12}C is same as that of

A. $\frac{1}{28}$ of N_2

B. 1 u

C. $\frac{1}{8}th$ of O

D. $\frac{1}{12}$th of He

Answer: A::B

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5. In $MgSO_4$ (at. mass : Mg = 24, S = 32, O = 16), the mass percentage of

A. Mg = 80%

B. Mg = 20%

C. S = 26.7%

D. S = 53.3 %

Answer: B::C

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6. The following substances are present in different containers

(i) One gram atom of nitrogen

(ii) One mole of calcium

(iii) One atom of silver

(iv) One mole of oxygen molecules

(v) 1023 atoms of carbon and

(vi) One gram of iron.

The correct order of increasing masses (in grams) is/are

A. $(iii) < (vi) < (i) < (v)$

B. $(iii) < (vi) < (iv) < (ii)$

C. $(vi) < (v) < (i) < (iv)$

D. $(iii) < (ii) < (v) < (iv)$

Answer: B::C

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7. Which of the following concentration factors is affected by change in temperature ?

A. Molality

B. Weight per cent

C. Normality

D. Molarity

Answer: C::D

Watch Video Solution

8. Which of the following units are not correct for the physical quantity ?

A. Acceleration: ms^2

B. Pressure: $kgm^{-2}s^{-2}$

C. Power: Js

D. Frequency: s^{-1}

Answer: B::C

Watch Video Solution

Competition File Multiple Choice Questions Based On The Given Passage Comprehension

1. A mole is a collection of 6.022×10^{23} particles and the number 6.022×10^{23} is called Avogadro number. The mass of this number of atoms in an element is equal to its gram atomic mass and mass of this number of molecules in a compound is equal to its gram molecular mass. The volume occupied by this number of molecules of a gas at N.T.P is 22.4 L. When 6.022×10^{23} molecules of a substance are dissolved in 1L of solution, the solution is known as 1 molar volume.

The mass of 10 molecules of naphthalene $(C_{10}H_8)$

A. 2.12×10^{22}g

B. 2.12×10^{21}g

C. 2.12×10^{23} g

D. 1280 g

Answer: B

Watch Video Solution

2. A mole is a collection of 6.022×10^{23} particles and the number 6.022×10^{23} is called Avogadro number. The mass of this number of atoms in an element is equal to its gram atomic mass and mass of this number of molecules in a compound is equal to its gram molecular mass. The volume occupied by this number of molecules of a gas at N.T.P is 22.4 L. When 6.022×10^{23} molecules of a substance are dissolved in 1L of solution, the solution is known as 1 molar volume. Suppose the chemists would have choosen 10^{20} as the number of particles in a mole, the mass of 1 mole of oxygen gas would be:

A. 5.32×10^{3} g

B. 5.32×10^{-3} g

C. 5.32×10^{-23} g

D. 5.32×10^{3} g

Answer: B

Watch Video Solution

3. A mole is a collection of 6.022×10^{23} particles and the number 6.022×10^{23} is called Avogadro number. The mass of this number of atoms in an element is equal to its gram atomic mass and mass of this number of molecules in a compound is equal to its gram molecular mass. The volume occupied by this number of molecules of a gas at N.T.P is 22.4 L. When 6.022×10^{23} molecules of a substance are dissolved in 1L of solution, the solution is known as 1 molar volume.

One million atoms of silver (at. mass = 107.81) atoms weigh

A. 1.79×10^{-16} g

B. 3.58×10^{-16} g

C. 3.58×10^{6} g

D. 5.32×10^{3} g

Answer: A

Watch Video Solution

4. The earliermethod for determining the molecular weight of proteins was based on chemical analysis. The following composition of proteins were found :

Haemoglobin: 0.335% Fe

Cytochrome protein: 0.376% Fe

Peroxidase enzyme : 0.29% Se

If haemoglobin contains 4 atoms of iron, then approximate molecular mass of haemoglobin is (at. mass of Fe = 55.85)

A. 16700

B. 33400

C. 66800

D. 1670

Answer: C

Watch Video Solution

5. The earliermethod for determining the molecular weight of proteins was based on chemical analysis. The following composition of proteins were found :

Haemoglobin: 0.335% Fe

Cytochrome protein: 0.376% Fe

Peroxidase enzyme : 0.29% Se

The mole % of Se in the enzyme peroxidase is (at. mass of Se = 78.96)

A. 2.16×10^{-3}

B. 2.7×10^{5}

C. 3.67×10^{-3}

D. 1.83×10^{3}

Answer: C

Watch Video Solution

6. The earliermethod for determining the molecular weight of proteins was based on chemical analysis. The following composition of proteins were found :

Haemoglobin: 0.335% Fe

Cytochrome protein: 0.376% Fe

Peroxidase enzyme : 0.29% Se

If the cytochrome protein contains one atom per molecule then the molecular mass of protein is

A. 14850 u

B. 29600 u

C. 32960 u

D. 12840 u

Answer: A

 Watch Video Solution

7. The earliermethod for determining the molecular weight of proteins was based on chemical analysis. The following composition of proteins were found :

Haemoglobin: 0.335% Fe

Cytochrome protein: 0.376% Fe

Peroxidase enzyme : 0.29% Se

How many atoms of Se are present in 1 pg of peroxidase enzyme assuming one molecule of enzyme contains 1 atom of Se (at. mass of Se = 78.96) ?

A. 2.21×10^7

B. 4.52×10^{14}

C. 3.82×10^{21}

D. 2.23×10^6

Answer: B

Watch Video Solution

8. The earliermethod for determining the molecular weight of proteins was based on chemical analysis. The following composition of proteins were found :

Haemoglobin: 0.335% Fe

Cytochrome protein: 0.376% Fe

Peroxidase enzyme : 0.29% Se

How many moles of iron are present in 1 mg of haemoglobin (assuming a molecule of haemoglobin contains 4 Fe atoms)?

A. 1.50×10^{-8}

B. 6.0×10^{-8}

C. 3.0×10^{-8}

D. 1.875×10^{-9}

Answer: B

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9. Oleum or fuming sulphuric acid contains SO_3 dissolved in sulphuric acid and has the molecular formula $H_2S_2O_7$, It is formed by passing SO_3 in H_2SO_4. When water is added to oleum, SO_3 reacts with water to form H_2SO_4.

$SO_3(g) + H_2O(l) \rightarrow H_2SO_4(aq)$

As a result, mass of H_2SO_4 increases. When 100 g sample of oleum is diluted with desired amount of water (in gram) then the total mass of pure H_2SO_4 obtained after dilution is known as percentage labelling of oleum.

% Labelling of oleum = Total mass of H_2SO_4 present in oleum after dilution

or = Mass of H_2SO_4 initially present + Mass of H_2SO_4 produced after dilution

From this, the percentage composition of H_2SO_4 and SO_3 (free) and SO_3 (combined) can be calculated.

The percentage of SO_3 in 109% H_2SO_4 is

A. $9\ \%$

B. $36\ \%$

C. $40\ \%$

D. $60\ \%$

Answer: C

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10. Oleum or fuming sulphuric acid contains SO_3 dissolved in sulphuric acid and has the molecular formula $H_2S_2O_7$, It is formed by passing SO_3 in H_2SO_4. When water is added to oleum, SO_3 reacts with water to form H_2SO_4.

$SO_3(g) + H_2O(l) \rightarrow H_2SO_4(aq)$

As a result, mass of H_2SO_4 increases. When 100 g sample of oleum is diluted with desired amount of water (in gram) then the total mass of pure H_2SO_4 obtained after dilution is known as percentage labelling of oleum.

% Labelling of oleum = Total mass of H_2SO_4 present in oleum after

dilution

or = Mass of H_2SO_4 initially present + Mass of H_2SO_4 produced after dilution

From this, the percentage composition of H_2SO_4 and SO_3 (free) and SO_3 (combined) can be calculated.

The percentage of free SO_3 and H_2SO_4 in 112% H_2SO_4 is

A. 53.6, 46.4

B. 12.0, 88.0

C. 88.0, 12.0

D. 26.8, 73.2

Answer: A

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Competition File Integer Type And Numerical Value Type Questions

1. 1.420 g of anhydrous $ZnSO_4$ was left in moist air. After a few days its weight was found to be 2.528 g. How many water molecules are present in its hydrated salt formula (molar mass of $ZnSO_4$ = 161.5)?

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2. Moles of iron which can be made from Fe_2O_3 by the use of 294 g of carbon monoxide in the reaction :

$Fe_2O_3 + 3CO \rightarrow 2Fe + CO_2$ are:

Watch Video Solution

3. 428 mL of 10 M HCl and 572 mL of 3 M HCl are mixed. The molarity of the resulting solution is

Watch Video Solution

4. Silver (atomic weight $108 g mol^{-1}$) has a density of $10.5 g cm^{-3}$. The number of silver atoms on a surfaces of area $10^{-12} m^2$ can be expressed in scientific notation as $Y \times 10^{-x}$, The value of x is .....

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5. The value of n in the molecular formula $Be_n Al_2 Si_6 O_{18}$ is:

Watch Video Solution

6. Reaction of Br_2 with Na_2CO_3 in aquesous solution gives sodium bromide bromate with evolution of CO_2 gas. The number of sodium bromide molecules involved in the balanced chemical equation is:

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7. $29.2\ \%\ (w/w) HCl$ stock, solution has a density of $1.25 gmL^{-1}$. The molecular weight of HCl is $36.5 gmol^{-1}$. The volume (mL) of stock solution required to prepare a $200mL$ solution of $0.4MHCl$ is :

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8. If the value of Avogadro numberis $6.023 \times 10^{23} mol^{-1}$ and the vaueof Boltzmann constant is $1.380 \times 10^{-23} JK^{-1}$, then the number of significant digits in the calculated value of the universal gas constant is

Watch Video Solution

9. To measure the quantity of $MnCl_2$ dissolved in an queous solution, it was completely converted to $KMnO_4$ using the reaction

$MnCl_2 + K_2S_2O_8 + H_2O \rightarrow KMnO_4 + K_2SO_4 + HCl$(equation not balanced).

Few drops of concentrated HCl were added to this solution and gently warmed. Further , oxalic acid (225 mg) was added in portions till the colour of the permanganate ion disappeared. Calculate the quantity of $MnCl_2$ (in mg) presence in the initial solution.

(Atomic weights in g mol^{-1}: Mn=55,Cl=35.5)

Watch Video Solution

10. The mole fraction of urea in an aqueous urea solution containing 900 g of water is 0.05. If the density of the solution is $1.2gcm^{-3}$, the molarity of urea solution is _____

Given data: Molar masses of urea and water are $60g\text{mol}^{-1}$ and $18g\text{mol}^{-1}$, respectively)

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