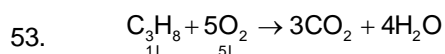


WEEKLY TEST MEDICAL PLUS -02 TEST - 02 RAJPUR
SOLUTION Date 30-06-2019

[CHEMISTRY]

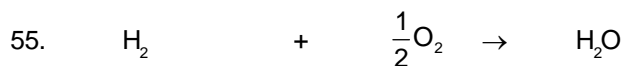
46.
$$\text{Molarity} = \frac{w}{M_b} \times \frac{1000}{V(\text{in mL})}$$
- $$^w[\text{Ca(OH)}_2] = \frac{0.5 \times 74 \times 500}{1000} = 18.5\text{g}$$
- $$\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$$
- $$74\text{g Ca(OH)}_2 = 100\text{g CaCO}_3$$
- $$18.5\text{g Ca(OH)}_2 = \frac{100 \times 8.5}{74} = 25\text{g CaCO}_3$$
47. Molar mass of $\text{C}_{60}\text{H}_{122} = 842\text{g}$
- Mass of one molecule = $\frac{842}{6.02 \times 10^{23}} = 842 \times 1.66 \times 10^{-24} = 1.4 \times 10^{-21}\text{g}$
48. $15\text{ L H}_2(\text{g})$ at STP = $\frac{15}{22.4} \times 6.02 \times 10^{23} = 4.03 \times 10^{23}$ molecules
- $15\text{ L N}_2(\text{g})$ at STP = $\frac{15}{22.4} \times 6.02 \times 10^{23} = 1.34 \times 10^{23}$ molecules
- $0.5\text{ g H}_2(\text{g})$ at STP = $\frac{0.5}{2} \times 6.02 \times 10^{23} = 1.5 \times 10^{23}$ molecules
- $10\text{ g O}_2(\text{g})$ at STP = $\frac{10}{32} \times 6.02 \times 10^{23} = 1.88 \times 10^{23}$ molecules
49.
$$\text{H}_2(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}$$
- 30 mL 15 mL
- Volume of $\text{O}_2(\text{g})$ left = $20 - 15 = 5\text{ mL}$
50. Average atomic weight = $\frac{(200 \times 90) + (199 \times 8) + (202 \times 2)}{100} = 199.96 = 200\text{amu}$
51.
$$\text{CH}_3\text{OH} + \frac{3}{2} \text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}; \Delta H = -723\text{kJ}$$
- $1.5\text{ mol O}_2 = 723\text{ kJ (evolved)}$
- $1\text{ mole O}_2 = \frac{723}{1.5} = 482\text{ kJ}$
52. $100\text{amu} = (100) \left(\frac{1\text{g}}{6.022 \times 10^{23}} \right) = 1.66 \times 10^{-22}\text{g}$
- Mass of 7.0×10^{22} molecules = $\frac{7.0 \times 10^{22}}{6.022 \times 10^{23}} \times 46 = 5.35\text{g}$
- Mass of $8.0 \times 10^{-1}\text{ mol} = 0.8 \times 46\text{ g} = 36.8\text{ g}$



$$54. \quad C = \frac{38.71}{12} = 3.22, H = 9.67, O = \frac{51.62}{16} = 3.22$$

Simple ratio C : H : O = 1 : 3 : 1

Empirical formula = CH₃O



$$1 \text{ mol} \quad \frac{1}{2} \text{ mol} \quad 1 \text{ mol}$$

$$\frac{10}{2} = 5 \text{ mol} \quad \frac{64}{32} = 2 \text{ mol} \quad ?$$

⇒ O₂ is limiting reagent

⇒ Moles of H₂O = 4 moles

$$56. \quad \text{Ratio of atoms C : H : O} = \frac{85.6}{12} : \frac{14.4}{1} : 7.13 : 14.4 : 1 : 2$$

Simplest formula : CH₂

$$57. \quad M = \frac{w_B}{V} \times \frac{100}{M_B}$$

$$w_B = \frac{2.5 \times 300 \times 90}{1000} = 67.5 \text{ g}$$

$$58. \quad \text{Number of atoms} = 3 \times \text{Number of moles} \times \text{Avogadro Number}$$

$$= 3 \times 0.1 \times 6.02 \times 10^{23} = 1.806 \times 10^{23}$$

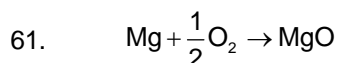
$$59. \quad 44 \text{ g } CO_2 = 1 \text{ mole} = N_A \text{ molecules}$$

$$48 \text{ g } O_2 = 1.5 \text{ mole} = 1.5 N_A \text{ molecules}$$

$$8 \text{ g } H_2 = 4 \text{ mole} = 4N_A \text{ molecules}$$

$$64 \text{ g } SO_2 = 2 \text{ mole} = 2N_A \text{ molecules}$$

$$60. \quad \text{Molarity} = \frac{\text{Moles}}{V \text{ in mL}} = \frac{(6.02 \times 10^{20}) / (6.02 \times 10^{23})}{(100) / (1000)} = 0.01 \text{ M}$$



$$16 \text{ g oxygen} = 24 \text{ g Mg}$$

$$0.56 \text{ g oxygen} = \frac{24 \times 0.56}{16} = 0.84 \text{ g Mg}$$

Given mass of Mg is 1.0 g which is surplus by 1.0 – 0.84 = 0.16 g (Left)

$$62. \quad \text{Pressure exerted by } H_2 = \text{mole fraction of } H_2 \times \text{total pressure}$$

Suppose w gram of both CH₄ and H₂ were taken.

$$\text{Moles of } H_2 = \frac{w}{M.W} = \frac{w}{2}; \text{ Moles of } CH_4 = \frac{w}{16}$$

$$\text{Mole fraction } H_2 = \frac{w/2}{\frac{w}{2} + \frac{w}{16}} = \frac{8}{9}$$

$$\text{Pressure exerted by } H_2 = \frac{8}{9} \times \text{total pressure}$$

63. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
 $\frac{100\text{g}}{22.4\text{L at STP}} \rightarrow \frac{56\text{g}}{22.4\text{L at STP}} + \frac{44\text{g}}{22.4\text{L at STP}}$
 $22.4\text{ L CO}_2 \equiv 100\text{ g CaCO}_3$
 $44.8\text{ L CO}_2 = \frac{100 \times 44.8}{22.4} = 200\text{ g CaCO}_3$
 For the use of 80 g CaCO_3 , the amount taken = 100 g
 For the use of 200 g CaCO_3 , the amount taken = $\frac{100 \times 200}{80} = 250\text{g}$
64. The average isotopic mass or atomic mass = $\sum m_i \times \frac{x_i}{100}$
 where m_i = mass of i^{th} isotope, x_i = abundance of i^{th} isotope
 \therefore Atomic mass = $54 \times \frac{5}{100} + 56 \times \frac{90}{100} + 57 \times \frac{5}{100}$
 $= 55.95$
65. Mass of Fe in one mole of haemoglobin = 0.33% of 67200
 $= \frac{0.33}{100} \times 67200 = 22.176\text{g}$
 No. of moles of Fe atoms per mole of haemoglobin = $\frac{22.176}{56}$
 $= 3.96 = 4$ (whole number)
66. $490\text{ mg H}_2\text{SO}_4 = 490 \times 10^{-3}\text{ g H}_2\text{SO}_4 = \frac{490 \times 10^{-3}}{98}\text{ mol}$
 $= \frac{490 \times 10^{-3} \times 6.02 \times 10^{23}}{98}$ molecules = 3.01×10^{21} molecules
 Molecules left over = $(3.01 \times 10^{21}) - (10^{20}) = 3.01 \times 10^{21} - 0.1 \times 10^{21}$
 $= (3.01 - 0.1) \times 10^{21} = 2.91 \times 10^{21}$
67. $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
 22400 mL of methane requires = 20 mL of oxygen.
 This means that 20 mL of methane will burn completely using 20 mL of oxygen.
 \therefore Volume of the gas left will be of oxygen only = $(50 - 20) = 30\text{ mL}$
68. $m = \frac{m}{d - M(M_B \text{ kg})} = \frac{0.5}{1.02 - 0.5 \times \frac{40}{1000}} = \frac{0.5}{1.02 - 0.02} = 0.5$
69. $u_{\text{urea}} = \frac{15}{60} = \frac{1}{4} = 0.25$
 $u_{\text{H}_2\text{O}} = \frac{175.5}{18} = 9.75$
 $\chi_{\text{urea}} = \frac{0.25}{0.25 + 9.75} = \frac{0.25}{10} = 0.025$
70. 11.11 moles of urea in 1000 g water, i.e., 55.55 moles of H_2O .
 $\chi_{\text{urea}} = \frac{11.11}{11.11 + 55.55} = \frac{1}{6} = 0.17$
71. $M = \frac{10x\%d}{M_B}$
 $\Rightarrow d = \frac{MM_B}{10x\%} = \frac{3.6 \times 98}{10 \times 29} = 1.216\text{g mL}^{-1}$



$$72. \quad \text{Molarity} = \frac{10 \times d}{M_b} = \frac{10 \times 98 \times 1.96}{98} = 19.6 \text{ M}$$

$$\text{Normality of } \text{H}_2\text{SO}_4 = 2 \times \text{Molarity} = 2 \times 19.6 = 39.2 \text{ N}$$

73. 1 L or 1000 mL of 0.001 M HCl solution contains 0.001 mole of Cl^- ions

$$\therefore 100 \text{ mL of } 0.001 \text{ M HCl solution will contain} = \frac{0.001}{10} \text{ mol of } \text{Cl}^- \text{ ions}$$

1 mol of Cl^- ions $\equiv 6.023 \times 10^{23}$ Cl^- ions [\because Avogadro's law]

$$\therefore 10^{-4} \text{ mol of } \text{Cl}^- \equiv 6.023 \times 10^{23} \times 10^{-4} \text{ } \text{Cl}^- \text{ ions}$$

$$6.023 \times 10^{19} \text{ } \text{Cl}^- \text{ ions}$$

74. Let the mass of $\text{O}_2 = x$ and that of $\text{N}_2 = 4x$

$$\text{No. of molecules of } \text{O}_2 = \frac{x}{32}$$

$$\text{No. of molecules of } \text{N}_2 = \frac{4x}{28} = \frac{x}{7}$$

$$\text{Ratio } \frac{x}{32} : \frac{x}{7} \text{ or } 7 : 32$$

75. The ratio of number of molecules is the same as the ratio of number of their moles,
For the same weight x , ratio of number of molecules of O_2 and SO_2 will be

$$76. \quad \text{Ratio of atoms C : H : Cl} :: \frac{47.5}{12} : \frac{2.54}{1} : \frac{50}{35.5} :: 3.96 : 2.54 : 1.41 :: 2.8 : 1.8 : 1$$

$$:: 14 : 9 : 5$$

$$\text{Empirical formula} = \text{C}_{14}\text{H}_9\text{Cl}_5$$

77. 300 mL of a gas weighs 0.368 g

$$1 \text{ mL of a gas will weigh} = \frac{0.368}{300} \text{ g}$$

$$22400 \text{ mL of a gas will weigh} = \frac{0.368}{300} \times 22400 = 27.477 \approx 27.5 \text{ g}$$

78. Gram molecular mass of NH_3 is 17 g.

$$\therefore \text{No. of molecules in } 4.25 \text{ g of } \text{NH}_3 = \frac{4.25}{17} N_A = \frac{N_A}{4}$$

Now, one molecule of NH_3 contains 4 atoms

$$\therefore \frac{N_A}{4} \text{ molecules contain } \frac{N_A}{4} \times 4 = N_A \text{ atoms}$$

Again, 32 g of $\text{O}_2 = N_A$ molecules = $2N_A$ atoms

$$\therefore 8 \text{ g of } \text{O}_2 = \frac{N_A}{32} \times 8 = \frac{N_A}{4} \text{ molecules } \frac{2N_A}{32} \times 8 = \frac{N_A}{2} \text{ atoms}$$

On the other hand,

$$2 \text{ g of } \text{H}_2 = N_A \text{ molecules} = 2N_A \text{ atoms}$$

$$4 \text{ g of He} = N_A \text{ atoms} \quad [\because \text{gram atomic mass of He} = 4 \text{ g}]$$

79. $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$
100 g of CaCO_3 gives 1 mole or 6.023×10^{23} molecules of CO_2

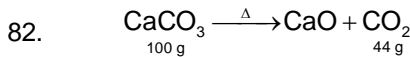
$$10^{-3} \text{ g of } \text{CaCO}_3 \text{ gives} = \frac{6.023 \times 10^{23}}{100} \times 10^{-3}$$

$$= 6.023 \times 10^{18} \text{ molecules of } \text{CO}_2$$

80. Number of atoms in 800 mg of Ca = $\frac{800 \times 10^{-3}}{40} \times N_A = 0.02 N_A$ atoms
 N_A atom of neon are present in 22.4 L

$\therefore 0.02 N_A$ atoms of neon are present in = $\frac{22.4}{N_A} \times 0.02 \times N_A = 0.448 \text{ L} = 448 \text{ cm}^3$

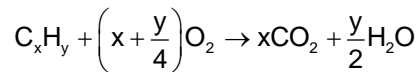
81. Ammonium dichromate is $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$.
 1 mole consists of 2 atoms of N, 8 atoms of H, 2 atoms of Cr, and 7 atoms of O.
 So, total no. of atoms = $(2 + 8 + 2 + 7) \times 6.023 \times 10^{23}$
 $= 114.437 \times 10^{23}$



83. Moles of water produced = $\frac{0.72}{18} = 0.04$

Moles of CO_2 produced = $\frac{3.08}{44} = 0.07$

Equation for combustion of an unknown hydrocarbon, C_xH_y is



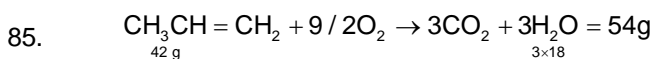
$\Rightarrow x = 0.07$ and $\frac{y}{2} = 0.04 \Rightarrow y = 0.08$ and $\frac{x}{y} = \frac{0.07}{0.08} = \frac{7}{8}$

\therefore The empirical formula of the hydrocarbon is C_7H_8

84. $\frac{16}{2x + 16} = 0.364$

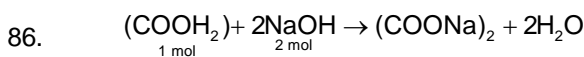
$16 = 0.728x + 5.824$ or $x = 13.978$

For MO = $\frac{16}{13.978 + 16} \times 100 = 534\%$



54g of $\text{H}_2\text{O} \equiv 42$ g of propene

$\therefore 24$ g of $\text{H}_2\text{O} = \frac{42}{54} \times 27 = 21$ g



Mol. of mass of NaOH = 40 g mol^{-1}

No. of moles in 0.064 g of NaOH = $\frac{0.064}{40} = 0.0016$

No. of mole of oxalic acid = $\frac{0.0016}{2} = 8 \times 10^{-4}$

Volume of solution (in L) = $\frac{25}{1000}$

Hence, molarity = $\frac{\text{No. of moles of solute}}{\text{Volume of solution (in L)}}$

$= 8 \times 10^{-4} \times \frac{1000}{25} = 0.032 \text{ M}$

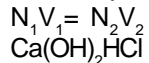
87. $100 \text{ cc of } 0.5 \text{ M ethyl alcohol} \equiv 10 \times 0.5 \times 10^{-3} \text{ mole} = 5 \times 10^{-2} \text{ mole}$

Weight of ethyl alcohol required = $5 \times 10^{-2} \times 46 \text{ g} = 2.3 \text{ g}$ [\because molecular weight of ethyl alcohol = 46]

$$\therefore d = \frac{\text{Mass}}{\text{Volume}} \Rightarrow 1.15 = \frac{2.3}{V} \Rightarrow V = \frac{2.30}{1.15} = 2$$

\therefore Volume required = 2cc

88. Normality = Molarity \times acidity of base $\text{Ca(OH)}_2 = N_1 = 0.1 \times 2 = 0.2$; $N_2 = 0.1$



$$0.2 \times V_1 = 0.1 \times 10 \Rightarrow V_1 = \frac{0.1 \times 10}{0.2} = 5 \text{ mL}$$

89. Number of gram equivalents of HCl = $\frac{\text{Normality} \times V}{1000} = \frac{0.1 \times 100}{1000} = 0.01$

Number of gram equivalents of metal carbonate = number of gram equivalents of HCl

$$\frac{w}{E} = 0.01 \Rightarrow \frac{2}{E} = 0.01 \Rightarrow E = 200$$

90. Equivalent weight = $\frac{\text{Mass of metal} \times 1120}{\text{Volume of hydrogen in mL}}$

Given, mass of metal = 0.32 g

Volume of hydrogen at NTP = 112 mL

$$\text{Equivalent weight} = \frac{0.32 \times 11200}{112} = 32$$