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

[CHEMISTRY]

46. $\text{Molarity} = \frac{w}{M_B} \times \frac{1000}{V(\text{in mL})}$

$^{w}[Ca(OH)_2] = \frac{0.5 \times 74 \times 500}{1000} = 18.5g$

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_3O$

$74g\ Ca(OH)_2 = 100\ g\ CaCO_3$

$18.5gCa(OH)_2 = \frac{100 \times 8.5}{74} = 25gCaCO_3$

47. Molar mass of $C_{60}H_{122} = 842$ g

Mass of one molecule $= \frac{842}{6.02 \times 10^{23}} = 842 \times 1.66 \times 10^{-24} = 1.4 \times 10^{-21}g$

48. 15 L $H_2(g)$ at STP $= \frac{15}{22.4} \times 6.02 \times 10^{23} = 4.03 \times 10^{23}$ molecules

15 L $N_2(g)$ at STP $= \frac{15}{22.4} \times 6.02 \times 10^{23} = 1.34 \times 10^{23}$ molecules

0.5 g $H_2(g)$ at STP $= \frac{0.5}{2} \times 6.02 \times 10^{23} = 1.5 \times 10^{23}$ molecules

10 g $O_2(g)$ at STP $= \frac{10}{32} \times 6.02 \times 10^{23} = 1.88 \times 10^{23}$ molecules

49. $\underset{30\text{ mL}}{H_2(g)} + \frac{1}{2}\underset{15\text{ mL}}{O_2(g)} \rightarrow H_2O$

Volume of $O_2(g)$ left = 20 – 15 = 5 mL

50. Average atomic weigth $= \frac{(200 \times 90) + (199 \times 8) + (202 \times 2)}{100} = 199.96 = 200amu$

51. $CH_3OH + \frac{3}{2}O_2 \rightarrow CO_2 + 2H_2O;\ \Delta H = -723kJ$

1.5 mol O_2 = 723 kJ (evolved)

1 mole $O_2 = \frac{723}{1.5} = 482$ kJ

52. $100amu = (100)\left(\frac{1g}{6.022 \times 10^{23}}\right) = 1.66 \times 10^{-22}g$

Mass of 7.0×10^{22} molecules $= \frac{7.0 \times 10^{22}}{6.022 \times 10^{23}} \times 46h = 5.35g$

Mass of 8.0×10^{-1} mol = 0.8 × 46 g = 36.8 g

53. $\underset{1L}{C_3H_8} + \underset{5L}{5O_2} \rightarrow 3CO_2 + 4H_2O$

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

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

Empirical formula = CH_3O

55. $H_2 \quad + \quad \frac{1}{2}O_2 \rightarrow H_2O$

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

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

$\Rightarrow$ O_2 is limiting reagent

$\Rightarrow$ Moles of H_2O = 4 moles

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

Simplest formula : CH_2

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

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

58. Number of atoms = 3 × Number of moles × Avogadro Number

= 3 × 0.1 × 6.02 × 10^{23} = 1.806 × 10^{23}

59. 44 g CO_2 = 1 mole = N_A molecules

48 g O_2 = 1.5 mole = 1.5 N_A molecules

8 g H_2 = 4 mole = 4N_A molecules

64 g SO_2 = 2 mole = 2N_A molcules

60. $\text{Molarity} = \frac{\text{Moles}}{\text{V in mL}} = \frac{(6.02\times10^{20})/(6.02\times10^{23})}{(100)/(1000)} = 0.01M$

61. $Mg + \frac{1}{2}O_2 \rightarrow MgO$

16 g oxygen = 24 g Mg

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

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

62. Pressure exerted by H_2 = mole fraction of H_2 × total pressure

Suppose w gram of both CH_4 and H_2 were taken.

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

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

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

63. $\underset{100g}{CaCO_3} \rightarrow CaO + \underset{22.4 L at STP}{CO_2}$

22.4 L $CO_2 \equiv$ = 100 g $CaCO_3$

44.8 L $CO_2 = \frac{100 \times 44.8}{22.4} = 200g\ CaCO_3$

For the use of 80 g $CaCO_3$, the amount taken = 100 g

For the use of 200 g $CaCO_3$, the amount taken $= \frac{100 \times 200}{80} = 250g$

64 The averge 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

$= \frac{0.33}{100} \times 67200 = 22.176g$

No. of moles of Fe atoms per mole of haemoglobin $= \frac{221.76}{56}$

= 3.96 = 4 (whole number)

66. 490 mg H_2SO_4 = 490 × 10^{-3} g H_2SO_4 $= \frac{490 \times 10^{-3}}{98}$ mol

$= \frac{490 \times 10^{-3} \times 6.02 \times 10^{23}}{98}$ molecules = 3.01 × 10^{21} molecules

Molecules left over = (3.01 × 10^{21}) – (10^{20}) = 3.01 × 10^{-21} – 0.1 × 10^{21}

= (3.01 – 0.1) × 10^{21} = 2.91× 10^{21}

67. $CH_4 + O_2 \rightarrow CO_2 + 2H_2O$

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 mL

68. $m = \frac{m}{d - M(M_B kg)} = \frac{0.5}{1.02 - 0.5 \times \frac{40}{1000}} = \frac{0.5}{1.02 - 0.02} = 0.5$

69. $u_{urea} = \frac{15}{60} = \frac{1}{4} = 0.25$

$u_{H_2O} = \frac{175.5}{18} = 9.75$

$\chi_{urea} = \frac{0.25}{0.25 + 9.75} = \frac{0.25}{10} = 0.025$

70. 11.11 moles of urea in 1000 g water, i.e., 55.55 moles of H_2O.

$\chi_{urea} = \frac{11.11}{11.11 + 55.55} = \frac{1}{6} = 0.17$

71. $M = \frac{10x\%d}{M_B}$

$\Rightarrow d = \frac{MM_B}{10x\%} = \frac{3.6 \times 98}{10 \times 29} = 1.216 g\ mL^{-1}$

72. Molarity $= \frac{10xd}{M_B} = \frac{10 \times 98 \times 1.96}{98} = 19.6M$

Normality of H_2SO_4 = 2 × Molarity = 2 × 19.6 = 39.2 N

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

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

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

$\therefore$ 10^{-4} mol of $Cl^- \equiv 6.022 \times 10^{23} \times 10^{-4}$ Cl^- ions

6.022×10^{19} Cl^- ions

74. Let the mass of O_2 = x and that of N_2 = 4x

No. of molecules of $O_2 = \frac{x}{32}$

No. of molecules of $N_2 = \frac{4x}{28} = \frac{x}{7}$

Ration $\frac{x}{32} : \frac{x}{7}$ 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. Ratio fo 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

Empirical formula = $C_{14}H_9Cl_5$

77. 300 mL of a gas weighs 0.368 g

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

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

78. Gram molecular mass of NH_3 is 7 g.

$\therefore$ No. of molecules in 4.25 g of $NH_3 = \frac{4.25}{17} N_A = \frac{N_A}{4}$

Now, one molecule of NH_3 contans 4 atoms

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

Again, 32 g of $O_2 = N_A$ molecules = $2N_A$ atoms

$\therefore$ 8 g of $O_2 = \frac{N_A}{32} \times 8 = \frac{N_A}{4}$ molecules $\frac{2N_A}{32} \times 8 = \frac{N_A}{2}$ atoms

On the other hand,

2g of H_2 = N_A molecules = $2N_A$ atoms

4g of He = N_A atoms [$\because$ gram atomic mass of He = 4g]

79. $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

100 g of $CaCO_3$ gives 1 mole or 6.023×10^{23} molecules of CO_2

10^{-3} g of $CaCO_3$ gives $= \frac{6.023 \times 10^{23}}{100} \times 10^{-3}$

$= 6.023 \times 10^{18}$ molecules of CO_2

80. Number of atoms in 800 mg of Ca $= \frac{800 \times 10^{-3}}{40} \times N_A = 0.02N_A$ atoms

N_A atom of neon are present in 22.4 L

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

81. Ammonium dichromate is $(NH_4)_2Cr_2O_7$.
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) × 6.023 × 10^{23}
= 114.437 × 10^{23}

82. $\underset{100\ g}{CaCO_3} \xrightarrow{\Delta} CaO + \underset{44\ g}{CO_2}$

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

$$C_xH_y + \left(x + \frac{y}{4}\right)O_2 \rightarrow xCO_2 + \frac{y}{2}H_2O$$

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

85. $\underset{42\ g}{CH_3CH = CH_2} + 9/2O_2 \rightarrow 3CO_2 + \underset{3 \times 18}{3H_2O} = 54g$

54g pf $H_2P \equiv 42$ g of propene

$\therefore$ 24 g of $H_2O = \frac{42}{54} \times 27 = 21g$

86. $\underset{1\ mol}{(COOH_2)} + \underset{2\ mol}{2NaOH} \rightarrow (COONa)_2 + 2H_2O$

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 $(\text{in L}) = \frac{25}{1000}$

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

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

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

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

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

$\therefore$ Volume required = 2cc

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

$N_1V_1 = N_2V_2$

$Ca(OH)_2HCl$

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

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

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

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

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

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