WEEKLY TEST MEDICAL PLUS -04 TEST - 01 RAJPUR SOLUTION Date 21-07-2019

[CHEMSITRY]

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

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

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

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

$18.5\text{g}Ca(OH)_2 = \frac{100 \times 8.5}{74} = 25\text{g}CaCO_3$

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

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

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

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

1.5 mol $O_2 = 723$ kJ (evolved)

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

51. $100\text{amu} = (100)\left(\frac{1\text{g}}{6.022 \times 10^{23}}\right) = 1.66 \times 10^{-22}\text{g}$

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

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

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

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

Simplest formula : CH_2

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

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

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

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)

56. 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

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

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 $= \frac{100 \times 200}{80} = 250g$

58. 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

∴ Atomic mass $= 54 \times \frac{5}{100} + 56 \times \frac{90}{100} + 57 \times \frac{5}{100}$

= 55.95

59. 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)

60. 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 = $(3.01 \times 10^{21}) - (10^{20}) = 3.01 \times 10^{-21} - 0.1 \times 10^{21}$

= $(3.01 - 0.1) \times 10^{21} = 2.91 \times 10^{21}$

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

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

63. $u_{urea} = \dfrac{15}{60} = \dfrac{1}{4} = 0.25$

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

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

64. 11.11 moles of urea in 1000 g water, i.e., 55.55 moles of H_2O.

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

65. $M = \dfrac{10x\%d}{M_B}$

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

66. $\text{Molarity} = \dfrac{10xd}{M_B} = \dfrac{10 \times 98 \times 1.96}{98} = 19.6M$

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

67. 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 $= \dfrac{0.001}{10}$ 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

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

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

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

Ration $\dfrac{x}{32} : \dfrac{x}{7}$ or 7 : 32

69. 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

70. 300 mL of a gas weighs 0.368 g

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

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

71. Gram molecular mass of NH_3 is 7 g.

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

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

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

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

73. 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 $= \frac{22.4}{N_A} \times 0.02 \times N_A = 0.448L = 448cm^3$

74. 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 = $(2 + 8 + 2 + 7) \times 6.023 \times 10^{23}$

$= 114.437 \times 10^{23}$

75. 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

76. $\underset{42\ g}{CH_3CH = CH_2} + 9/2O_2 \rightarrow 3CO_2 + \underset{3\times18}{3H_2O} = 54g$

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

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

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

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

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

78. Normality = Molarity × acidity of base $Ca(OH)_2$ = N_1 = 0.1 × 2 = 0.2; N_2 = 0.1
$N_1V_1 = N_2V_2$
$Ca(OH)_2HCl$

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

79. 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

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

80. Mw_2 of $CaCO_3$ = 40 + 12 + 48 = 100

Moles of $CaCO_3$ in $10g = \frac{10}{100} = 0.1\,\text{mol} = 0.1\text{ g tom}$

81. $N_1V_1 + N_2V_2 + N_3V_3 = N_4V_4$
($V_4 = V_1 + V_2 + V_3 + V_4$) or V_4 = Final volume = 1 L ≡ 1000 mL

$$5 \times N + 20 \times \frac{N}{2} + 30 \times \frac{N}{3} = N_4 = 100$$

$\therefore \quad N_4 = \frac{N}{40}$

82. Weight of 6.023×10^{23} (Avogardo's number) = Mw of $CuSO_4.5H_2O$ = 249 g
= 1 mol of $CuSO_4.5H_2O$

Weight of 1×10^{22} molecules fo $CuSO_4.5H_2O = \frac{249 \times 1 \times 10^{22}}{6.023 \times 10^{23}} = 4.14g$

83. M_1 = 1.0 M, M_2 = 0.25 M
Let V_1 and V_2 are volumes required.
$(1.0 \times V_1 + 0.25 \times V_2) = 0.75\,(V_1 + V_2)$
$\Rightarrow$ $0.25V_1 = 0.5V_2$, $\Rightarrow V_1 : V_2 = 2 : 1$

84. Molarity, normality, and formality are calculated against the volume of the solution. The volume of the solution changes with change in temperature; therefore, these quantities do not remain constant with temperature

Molality $(m) = \frac{\text{Moles of solute}}{\text{Mas of solvent in kg}}$

The molality of a solution remains independent of temperature because it involves only mass, which is independent of temperature.
M = 0.875

85. D

86. The normality of oxalic acid dihydrate is

$$\frac{6.3}{63} \times \frac{1}{250} \times 100 = 0.4$$

[Ew for $(COOH)_2.2H_2O$ is 63]
NV(acid) = N_2V_2(vase)
or $0.4 \times 10 = 0.1 \times V_2$
or V_2 = 40 mL

87. B

88. C

89. D

90. B