Atomic, Molecular and Equivalent masses

45. (d) 1 atom has mass $= 10.86 \times 10^{-26} kg$

$= 10.86 \times 10^{-23} gm$

$\mathbf{6.023 \times 10^{23}}$atoms has mass $= \mathbf{10.86 \times 10^{-23} \times 6.023 \times 10^{23} = 65.40 gm}$

This is the atomic weight of *Zn*.

46. (b) ∵ 1mole $(COOH)_2 \cdot 2H_2O$ has 96*gm* oxygen

∴0.3 mole $(COOH)_2 \cdot 2H_2O$ has $\mathbf{96 \times 0.3 = 28.8 gm}$

∴ No. of gram atoms of oxygen $= \frac{28.8}{16} = 1.8.$

47. (c) Equimolecular proportion means both gases occupied equal volume $= \frac{2.24}{2}$

$= 1.12L$

For CH_4:

22.4*L* CH_4has mass $= 16gm$

1.12*L* CH_4has mass $= \frac{16}{22.4} \times 1.12 = 0.8gm.$

For C_2H_6

22.4*L* C_2H_6has mass = 30*gm*

1.12*L*C_2H_6has mass $= \frac{30}{22.4} \times 1.12 = \frac{3.0}{2} gm = 1.5gm$

Total mass $= 1.5gm + 0.8gm = 2.3gm.$

48. (c) Let wt. of metal oxide = 100*gm*

wt. of metal = 53*gm*

wt. of oxygen = 47*gm*

Equivalent weight of oxygen$= \frac{\text{wt. of metal}}{\text{wt. of oxygen}} \times 8$

$= \frac{53}{47} \times 8 = 9.02$

Valency $= \frac{2\times V.D}{E+35.5} = \frac{2\times 66}{9+35.5} = \frac{132}{44.5} = 2.96 \approx 3$

$\therefore$ Atomic weight = Equivalent weight × Valency

$= 9.02 \times 3 = 27.06$

49. (b) One gram of hydrogen combines with 80*gm* of bromine.

So, equivalent weight of bromine = 80*gm*

$\because$ 4*gm* of bromine combines with 1*gm* of *Ca*

$\therefore$ 80*gm* of bromine combines with $= \frac{1}{4} \times 80 = 20.$

50. (b) $\overset{+2}{MnSO_4} \rightarrow \overset{+4}{MnO_2}$

Change of valency $= 4 - 2 = 2$

$\therefore$Equivalent weight $= \frac{M}{2}$.

51. (a) $\underset{\substack{2ml\\100ml}}{2PH_3} \rightarrow \underset{\text{(solid)}}{2P} + \underset{\substack{3ml\\150ml}}{3H_2}$

Increase in volume $= 150ml - 100ml = 50ml$increase.

52. (b) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

$\because$ 24*g Mg* evolves 22.4*L* H_2at STP

$\therefore$ 12*g Mg* evolves H_2at STP $\frac{22.4}{24} \times 12$

=11.2*L* at STP.

53. (b) (a) 2*gm* atom of nitrogen = 28*gm*

(b) 6×10^{23} atoms of *C* has mass $= 12gm$

3×10^{23}atoms of *C* has mass $= \frac{12\times 3\times 10^{23}}{6\times 10^{23}} = 6gm$

(c) 1mole of *S* has mass = 32*gm*

(d) 7.0*gm* of *Ag*

So, lowest mass = 6*gm* of *C.*

54. (c) 1mole of any gas at STP occupies 22.4*L.*

55. (b) ∵ 22400*cc* of gas at STP has 6×10^{23}molecules

∴ $1.12 \times \mathbf{10^{-7}}$ of gas at STP has $\frac{6\times10^{23}\times1.12\times10^{-7}}{22400} = .03 \times 10^{14} = 3 \times 10^{12}$.

56. (a) ∵ 2.24*L* of gas has mass = 4.4*gm*

∴ 22.4*L* of gas has mass $= \frac{4.4}{2.24} \times 22.4 = 44$

So given gas is CO_2 because CO_2 has molecular mass=44.

57. (d) 1*L* of air =210*cc* O_2

22400*cc* = 1 mole

$210cc = \frac{1}{22400} \times 210 = 0.0093.$

58. (d) ∵ 22.4*L* of a gas at STP has no. of molecules $= 6.023 \times 10^{23}$

∴ 8.96*L* of a gas at STP has no. of molecules $= \frac{6.02\times10^{23}\times8.96}{22.4} = 2.408 \times 10^{23}$

$= 24.08 \times 10^{22}$.

59. (a) Given equivalent weight of metal = 9

Vapour density of metal chloride = 59.25

∴molecular weight of metal chloride

$= 2 \times V.D = 2 \times 59.25 = 118.5$

∴valency of metal

$= \frac{\text{molecular weight of metal chloride}}{\text{equivalnet weight of metal } +35.5}$

Valency of metal $= \frac{118.5}{9+35.5} = \frac{118.5}{44.5} = 2.66$

Therefore atomic weight of the metal

=equivalent weight ×valency

$= 9 \times 2.66 = 23.9$

60. (d) The density of gas $= \frac{\text{molecular wt. of metal}}{\text{volume}}$

$= \frac{45}{22.4} = 2gmlitre^{-1}$

61. (c) Equivalent weight of bivalent metal = 37.2

∴Atomic weight of metal $= 37.2 \times 2 = 74.4$

∴Formula of chloride $= MCl_2$

Hence, molecular weight of chloride

$(MCl_2) = 74.4 + 2 \times 35.5 = 145.4$

62. (c) As we know that

Equivalent weight $= \frac{\text{weight of metal}}{\text{weight of oxygen}} \times 8$

$= \frac{32}{0.4} \times 8 = 64$

Vapour density $= \frac{\text{mol. wt}}{2}$

Mol. wt $= 2 \times V.D = 2 \times 32 = 64$

As we know that $n = \frac{\text{mol.wt}}{\text{eq. wt}} = \frac{64}{64} = 1$

Suppose, the formula of metal oxide be M_2O_n. Hence the formula of metal oxide $= M_2O$.

63. (b) Molecular weight of NH_3 is 17

According to the mole concept

$17gm\ NH_3$ has molecules $= 6.02 \times 10^{23}$

$\therefore 1gm\ NH_3$ has molecules $= \frac{6.02\times10^{23}}{17}$

$\therefore 4.25gm\ NH_3$ has molecules

$= \frac{6.02\times10^{23}\times4.25}{17} = 1.5 \times 10^{23} molecule$

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