

1) How many lithium atoms are present in 0.10 g of  $\text{Li}_2\text{CO}_3$ ?  $M_{wt} = 73.88 \text{ g/mol}$   $n = 0.1 / 73.88 = 1.35 \times 10^{-3} \text{ mol}$   
 $N = 6.022 \times 10^{23} \times 1.35 \times 10^{-3} = 8.15 \times 10^{20} \text{ molecules}$   
 so no. of Li atoms =  $8.15 \times 10^{20} \times 2 = 1.63 \times 10^{21}$  atoms

A)  $1.6 \times 10^{21}$

B)  $1.0 \times 10^{22}$

C)  $8.0 \times 10^{20}$

D)  $1.6 \times 10^{19}$

2) How many moles in 4.66 g of  $\text{C}_{13}\text{H}_{16}\text{N}_2\text{O}_2$ ?  $M_{wt} = 232 \text{ g/mol}$   $n = \frac{4.66}{232} = 0.02 \text{ mol}$

A) 121.02

B) 49.79

C) 1081.25

D) 0.02

3) How many grams are in  $3.01 \times 10^{23}$  molecules of  $\text{CO}_2$ ?  $M_{wt} = 44 \text{ g/mol}$   
 $n = \frac{3.01 \times 10^{23}}{6.022 \times 10^{23}} = 0.4998 \text{ mol}$   
 $m = n \times M_{wt} = 0.4998 \times 44 = 21.99 \text{ g}$

A) 0.011

B) 88

C) 22

D) 0.045

4) A compound has the weight percent C = 57.1%, H = 6.17%, N = 9.52% and O = 27.18%. The approximate molecular weight is 295. What is the molecular formula?

C:  $\frac{57.1}{12} = 4.758$

H:  $\frac{6.17}{1} = 6.17$

N:  $\frac{9.52}{14} = 0.68$

O:  $\frac{27.18}{16} = 1.699$

A)  $\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_3$

B)  $\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_5$

C)  $\text{C}_{15}\text{H}_{19}\text{N}_2\text{O}_4$

D)  $\text{C}_{12}\text{H}_{18}\text{N}_2\text{O}_5$

5) What is the percentage of Fe in  $\text{Fe}_2(\text{SO}_4)_3$ ?

$\% \text{ Fe} = \frac{2 \times 55.85}{(2 \times 55.85) + (3 \times 32.07) + (12 \times 16)} \times 100\%$   
 $= \frac{111.7}{279.7} \times 100\% = 27.9\%$

$\text{C}_7\text{H}_9\text{N}_1\text{O}_{2.5}$

$\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_5$   
 $M_{wt} = 294$

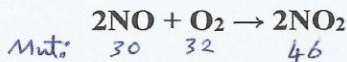
A) 54.8

B) 13.9

C) 27.9

D) 45.2

6) Which statement is not correct for the balanced equation given below?



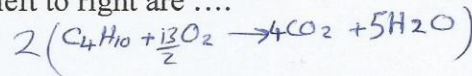
A) One mole of NO will produce 46 g of  $\text{NO}_2$  ✓

B) 30 g of NO will react with 32 g of  $\text{O}_2$  ✗

C) The reaction of 32 g of  $\text{O}_2$  will produce 2 moles of  $\text{NO}_2$  ✓

D) One mole of  $\text{O}_2$  will produce two moles of  $\text{NO}_2$  ✓

7) When the following equation is balanced, the coefficients from left to right are ....



A) 4, 4, 32, 36

B) 1, 4, 8, 9

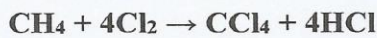
C) 2, 13, 8, 10

D) 2, 3, 4, 4

8) Reaction of 1.00 mole  $\text{CH}_4$  with excess  $\text{Cl}_2$  forms 96.8 g  $\text{CCl}_4$ . What is the percent yield of the reaction?

Actual yield

$\% \text{ yield} = \frac{\text{Actual}}{\text{Theoretical}} \times 100\%$



$M_{wt} = 153.8 \text{ g/mol}$

1 mol  $\text{CH}_4 \rightarrow$  1 mol  $\text{CCl}_4$   
 mass  $\text{CCl}_4 = 1 \times 153.8 = 153.8 \text{ g}$

A) 57.3

B) 65.9

C) 64.3

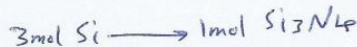
D) 62.9  $\% \text{ yield} = \frac{96.8}{153.8} \times 100\% = 62.9\%$

9) Calculate the number of moles of  $\text{Si}_3\text{N}_4$  produced from 0.62 moles of  $\text{N}_2$  and 0.75 moles of Si?

L.R.



$$\begin{array}{r} 0.75 \\ 3 \\ \hline 0.25 \end{array} \quad \begin{array}{r} 0.62 \\ 2 \\ \hline 0.31 \end{array}$$



$$0.75 \longrightarrow X$$

$$X = \frac{0.75}{3} = 0.25 \text{ mol Si}_3\text{N}_4$$

A) 0.25

B) 0.31

C) 0.40

D) 0.20

10) The pressure of sodium vapor in a 1.00 L container is  $\frac{10 \text{ torr}}{760}$  at 1000 °C. How many atoms are in the container?

$$PV = nRT$$

$$n = \frac{0.013 \times 1}{0.082 \times 1273}$$

$$= 1.25 \times 10^{-4} \text{ mol}$$

no. of atoms =  $n \times \text{Avogadro}$

A)  $9.7 \times 10^{17}$

B)  $4.2 \times 10^{17}$

C)  $7.6 \times 10^{19}$

D)  $7.6 \times 10^{17}$

11) What is the density in g/L of  $\text{BrF}_3$  at STP?

STP  $\Rightarrow$  1 atm, 0 °C  
 $M_{wt} = 136.9 \text{ g/mol}$

$$d = \frac{PM_{wt}}{RT} = \frac{1 \times 136.9}{0.082 \times 273} = 6.11 \text{ g/L}$$

A) 4.35

B) 6.11

C) 5.23

D) 7.02

12) A sample of helium "He" gas occupies 2.00 L at 1520 torr at 400 K. At what temperature (in °C) would the gas occupy 3.0 L and 1.0 atm?

$$\rightarrow = \frac{1520}{760} = 2 \text{ atm}$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \Rightarrow \frac{2 \times 2}{400} = \frac{1 \times 3}{T_2} \rightarrow T_2 = 300 \text{ K}$$

$$T = 300 - 273 = 27^\circ \text{C}$$

A) 300

B) 573

C) 127

D) 27

13) A mixture of 15.0 g Ne and 30.1 g Ar occupies 3.90 L at 10.0 atm and 45 °C. What is the partial pressure (in atm) of Ne?

$$M_{wt} = 20.18$$

$$M_{wt} = 39.98$$

$$n_{\text{Ne}} = 0.747 \text{ mol}$$

$$n_{\text{Ar}} = 0.753 \text{ mol}$$

$$X_{\text{Ne}} = 0.4967$$

$$P_{\text{Ne}} = X_{\text{Ne}} \times P_T$$

$$P_T \rightarrow \text{pressure of the mixture} = 10 \text{ atm}$$

$$P_{\text{Ne}} = 0.4967 \times 10 = 4.967$$

A) 4.96

B) 5.36

C) 5.16

D) 6.12

14) A 2.15 g sample of a gas occupies 750 mL at STP, what is the molecular weight of the gas?

$$0.75 \text{ L}$$

$$d = \frac{m}{V} = \frac{2.15}{0.75} = 2.87 \text{ g/L}$$

$$M_{wt} = \frac{dRT}{P} = \frac{2.87 \times 0.082 \times 273}{1} = 64.25 \text{ g/mol}$$

A) 70.1

B) 48.2

C) 64.2

D) 75.0

15) For the reaction:  $\text{Zn (s)} + 2\text{HCl (aq)} \rightarrow \text{ZnCl}_2 \text{ (aq)} + \text{H}_2 \text{ (g)}$

If 0.927 L of hydrogen gas is released at 740 mm Hg and 20 °C, what is the mass (in g) of Zn?

$$M_{wt} = 65.41 \text{ g/mol}$$

$$PV = nRT$$

$$n_{\text{H}_2} = \frac{740}{760} \times 0.927$$

$$= \frac{0.974 \times 0.927}{0.082 \times 293}$$

$$= 0.0376 \text{ mol}$$

A) 2.46

B) 2.38

C) 2.56

D) 2.31

$$\text{mass Zn} = 0.0376 \times 65.41 \times 3$$

$$= 2.46 \text{ g}$$

