***Q1***: When the following equation is balanced:

$$Fe_2O_3 + 3H_2 \longrightarrow 2Fe + 3H_2O$$

the coefficient of $H_2$, is:

A) 3
B) 4
C) 1
D) 2
E) 5

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***Q2***: The mass (in *g*) of "O" present in 5.0 g of "$K_2Cr_2O_7$" , is: $n = \frac{m}{M}$

A) 1.1 $\frac{5}{294.18} = 0.016996$ mol
B) 0.5
C) 2.4 1 mol $K_2Cr_2O_7 \rightarrow 7$ mol O
D) 1.9 mol O $= 7 * 0.016996 = 0.119$ mol
E) 2.9 mass O $= 0.119 * 16 = 1.9$ g

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***Q3***: The percentage by mass of "Pt" in [$C_6H_{12}N_2O_4Pt$], is:

A) 21.78 % $M = 371.08$ g/mol
B) 61.89 % $\%\,Pt = \frac{195.08}{371.08} * 100\% = 52.57\%$
C) 52.55 %
D) 15.44 %
E) 33.24 %

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***Q4***: The number of calcium atoms "Ca" present in 0.5 g of "$Ca_2P_2O_7$", is: $M = 254.1$ g/mol

A) $3.79\times10^{23}$ $n = \frac{0.5}{254.1} = 1.97*10^{-3}$ mol
B) $3.11\times10^{22}$ 1 mol $Ca_2P_2O_7 \rightarrow 2$ mol Ca
C) $4.51\times10^{22}$ mol Ca $= 1.97*10^{-3} * 2 = 3.94*10^{-3}$ mol
D) $4.26\times10^{21}$ $N = n * Avo. = 3.94*10^{-3} * 6.022*10^{23}$
E) $2.37\times10^{21}$ $= 2.37*10^{21}$ atoms

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***Q5***: A compound contains 63.68% C, 12.38% N, 9.80% H, and 14.14% O by mass. The empirical formula of this compound is:

A) $C_6H_{11}NO$ moles C: $\frac{63.68}{12} = 5.3$ mol $/0.88 = 6$
B) $C_8H_{15}NO$
C) $C_7H_{13}NO_2$ N: $\frac{12.38}{14} = 0.88$ mol $/0.88 = 1$
D) $C_9H_{18}N_2O_3$
E) $C_2H_8N_2O$ H: $\frac{9.8}{1} = 9.8/0.88 = 11$

O: $\frac{14.14}{16} = 0.88/0.88 = 1$

$\boxed{C_6NH_{11}O}$

***Q6***: Given the following reaction:

$$2Fe_2O_3(s) + 3C(s) \longrightarrow 4Fe(s) + 3CO_2(g)$$

If 25.5 g of "$Fe_2O_3$" react with 3.3 g of "C", the mass (in *g*) of "Fe", is: $M_{Fe_2O_3} = 159.7$ $M_C = 12$

A) 10.68 $\boxed{2Fe_2O_3} + 3C \longrightarrow 4Fe$
B) 17.85 n $\frac{0.16}{2}$ $\frac{0.275}{3}$ $n_{Fe} = n_{Fe_2O_3} * \frac{4}{2}$
C) 13.80 0.08 0.092 $= 0.32$ mol
D) 28.78 $\boxed{L.R.}$ mass Fe $= 0.32 * 55.85$
E) 23.94 $= 17.84$ g

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***Q7***: Given the following reaction:

$$3H_2(g) + N_2(g) \longrightarrow 2NH_3(g)$$

If the reaction has a 88.7% yield, then the mass (in *g*) of $H_2$ needed to produce 120 g of "$NH_3$" is:

A) 18.09 $0.887 = \frac{120}{ther.\ yield} \Rightarrow theor.\ yield = \frac{120}{0.887} = 135.3$ g
B) 13.67
C) 27.42 $n_{NH_3} = \frac{135.3}{17} = 7.96$ mol
D) 24.01 mol $H_2 = 7.96 * \frac{3}{2} = 11.94$ mol
E) 36.87 mass $H_2 = 11.94 * 2 = 23.9$ g

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***Q8***: The molarity "M" (in ***mol.L***$^{-1}$) of a solution prepared by dissolving 158.0 g of "$(NH_4)_2SO_4$" in enough water to make 1250 mL solution, is:

A) 1.24 $M_{(NH_4)_2SO_4} = 132.07$ g/mol
B) 0.29 $n = \frac{158}{132.07} = 1.196$ mol
C) 0.96 $M = \frac{n}{V_{(L)}} = \frac{1.196}{1.25} = 0.96$ M
D) 0.48
E) 1.63

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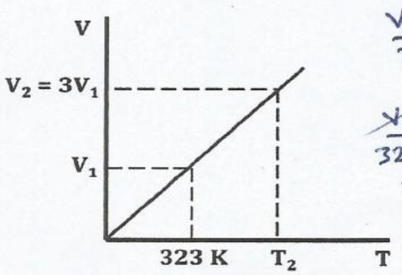
***Q9***: At constant temperature, a sample of gas occupies 5.0 L at 0.98 atm. If the pressure becomes 3.25 atm, the gas volume (in **mL**) will be :

A) 1252 $P_1V_1 = P_2V_2$
B) 2186
C) 2889 $5 * 0.98 = 3.25 * V_{(L)}$
D) 3896 $V_{(L)} = 1.5077$ L $= 1508$ mL
E) 1508

***Q10***: The diagram below shows the change in volume (V) with temperature (T) of an ideal gas at constant pressure (P) and number of mole (n):




$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{\cancel{V_1}}{323} = \frac{3\cancel{V_1}}{T_2}$

$T_2 = 323*3$
$= 969 k$
$= 696 °C$

The final temperature (in *°C*) is:

A) 742
B) 696
C) 498
D) 415
E) 969

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***Q11***: The density (in ***g/L***) of "$CO_2$" gas at -78 °C and 0.98 atm, is:

$+273 = 195 k$

$d = \frac{PM}{RT} = \frac{0.98*44}{0.082*195} = 2.7 \frac{g}{L}$

A) 1.98
B) 1.25
C) 2.38
D) 2.70
E) 3.11

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***Q12***: The volume (in ***L***) of $2.41\times10^{24}$ "$NO_2$" molecules at STP, is:

$n = \frac{N}{Avo} = \frac{2.41*10^{24}}{6.022*10^{23}} = 4\ mol$

1 mol of gas at STP ⟶ 22.4 L
4 mol ⟶ 89.64 L

or $PV = nRT \Rightarrow V = \frac{4*0.082*273}{1} = 89.54\ L$

A) 34.1
B) 22.4
C) 89.7
D) 11.5
E) 67.7

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***Q13***: A 1.995 g of an ideal gas occupies 1.0 L at 20 °C and 1.5 atm. The molar mass (in **g.mol$^{-1}$**), is:

$M = \frac{dRT}{P}$ $d = \frac{1.995(g)}{1(L)} = 1.995 \frac{g}{L}$

$= \frac{1.995*0.082*293}{1.5} = 31.95 \frac{g}{mol}$

A) 32
B) 46 $O_2$
C) 40
D) 54
E) 16

***Q14***: A sample of gas mixture at 750 torr contains 70.0 g of "He" and 30.0 g of "Ar". The partial pressures (in ***torr***) of "He" gas is: $n_{He} = \frac{70}{4} = 17.5$ $n_{Ar} = \frac{30}{40} = 0.75$

$X_{He} = \frac{17.5}{17.5+0.75} = 0.9589$ $X_{Ar} = 0.0411$

$P_{He} = X_{He} * P_T = 0.9589 * 750 = 719.175$ torr

A) 31
B) 375
C) 525
D) 225
E) 719

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***Q15***: A gas sample has a pressure of 1.2 atm at 25°C. If the temperature changes to -23 °C, the final pressure (in ***atm***) of gas, is:

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

$25+273 = 298 k$
$-23+273 = 250 k$

$\frac{1.2}{298} = \frac{P_2}{250}$ $P_2 = 1$ atm

A) 1.50
B) 1.00
C) 1.75
D) 0.75
E) 0.50

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