1) How many lithium atoms are present in 0.10 g of Li_2CO_3? Mwt = 73.88 g/mol n = 0.1/73.88 = 1.35*10^-3 mol
N = 6.022*10^23 * 1.35*10^-3 = 8.15*10^20 molecules
so no. of Li atoms = 8.15*10^20 * 2 = 1.63*10^21 atoms

A) 1.6×10^{21} B) 1.0×10^{22} C) 8.0×10^{20} D) 1.6×10^{19}

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2) How many moles in 4.66 g of $C_{13}H_{16}N_2O_2$? Mwt = 232 g/mol n = 4.66/232 = 0.02 mol

A) 121.02 B) 49.79 C) 1081.25 D) 0.02

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3) How many grams are in 3.01×10^{23} molecules of CO_2? Mwt = 44 g/mol

n = 3.01*10^23 / 6.022*10^23 = 0.4998 mol
n = n * Mwt = 0.4998 * 44 = 21.99 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: 57.1/12 = 4.758
H: 6.17/1 = 6.17
N: 9.52/14 = 0.68
O: 27.18/16 = 1.699

$(C_7H_9N_1O_{2.5}) \times 2$
$C_{14}H_{18}N_2O_5$
Mwt = 294

A) $C_{14}H_{18}N_2O_3$ B) $C_{14}H_{18}N_2O_5$ C) $C_{15}H_{19}N_2O_4$ D) $C_{12}H_{18}N_2O_5$

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5) What is the percentage of Fe in $Fe_2(SO_4)_3$?

% Fe = (2*55.85) / ((2*55.85)+(3*32.07)+(12*16)) * 100% = 27.9%

A) 54.8 B) 13.9 C) 27.9 D) 45.2

---

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

$$2NO + O_2 \rightarrow 2NO_2$$

Mwt: 30 32 46

A) One mole of NO will produce 46 g of NO_2 ✓

B) 30 g of NO will react with 32 g of O_2 ✗

C) The reaction of 32 g of O_2 will produce 2 moles of NO_2 ✓

D) One mole of O_2 will produce two moles of NO_2 ✓

---

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

$$C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$$

$2(C_4H_{10} + \frac{13}{2}O_2 \rightarrow 4CO_2 + 5H_2O)$

A) 4, 4, 32, 36 B) 1, 4, 8, 9 C) 2, 13, 8, 10 D) 2, 3, 4, 4

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8) Reaction of 1.00 mole CH_4 with excess Cl_2 forms 96.8 g CCl_4. What is the percent yield of the reaction?

% yield = Actual / Theoritical * 100% (Actual yield)

$$CH_4 + 4Cl_2 \rightarrow CCl_4 + 4HCl$$

Mwt = 153.8 g/mol

1 mol CH_4 → 1 mol CCl_4
mass CCl_4 = 1 * 153.8 = 153.8 g
% y = 96.8 / 153.8 * 100% = 62.9%

A) 57.3 B) 65.9 C) 64.3 D) 62.9

---

9) Calculate the number of moles of Si_3N_4 produced from 0.62 moles of N_2 and 0.75 moles of Si?

L.R.

$$3Si + 2N_2 \rightarrow Si_3N_4$$

$\frac{0.75}{3}$ $\frac{0.62}{2}$

0.25 0.31

3 mol Si ⟶ 1 mol Si_3N_4

0.75 ⟶ X

$X = \frac{0.75}{3} = 0.25$ mol Si_3N_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 $\frac{10}{760}$ torr at 1000 °C. How many atoms are in the container?

$PV = nRT$

$n = \frac{0.013 * 1}{0.082 * 1273} = 1.25 * 10^{-4}$ mol

no. of atoms = n * Ave. no

A) 9.7×10^{17} B) 4.2×10^{17} C) 7.6×10^{19} D) 7.6×10^{17}

---

11) What is the density in g/L of BrF_3 at STP?

STP = 1 atm, 0°C

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

$M_{wt} = 136.9$ g/mol

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?

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

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow \frac{2*2}{400} = \frac{1*3}{T_2} \rightarrow T_2 = 300$ K

$T = 300 - 273 = 27$°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?

$M_{wt} = 20.18$ $M_{wt} = 39.98$

$n_{Ne} = 0.743$ mol

$n_{Ar} = 0.753$ mol

$\chi_{Ne} = 0.4967$

$P_{Ne} = \chi_{Ne} * P_T$

P_T → pressure of the mixture = 10 atm

$P_{Ne} = 0.4967 * 10 = 4.967$

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 L

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

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

A) 70.1 B) 48.2 C) 64.2 D) 75.0

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15) For the reaction: **Zn (*s*) + 2HCl (*aq*) → $ZnCl_2$ (*aq*) + H_2 (*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?

$M_{wt} = 65.41$ g/mol

$PV = nRT$ $n_{H_2} = \frac{\frac{740}{760} * 0.927}{0.082 * (20 + 273)} = \frac{0.974 * 0.927}{0.082 * 293} = 0.0376$ mol

A) 2.46 B) 2.38 C) 2.56 D) 2.31

1 mol Zn ⟶ 1 mol H_2

X ⟵ 0.0376

mol Zn = 0.0376 mol

mass Zn = 0.0376 * 65.41 = 2.46 g