

WORKSHEET- STOICHIOMETRY AND CHEMICAL FORMULA CALCUATIONS

SET A:

1. A compound with the formula, $B_xH_{20}O_3$, contains 36.14% by mass oxygen. What is the value of X ?
(Molar masses: B = 10.81, H = 1.008, O = 16.00) Answer: 6
2. A mixture of cobalt (II) oxide and cobalt (III) oxide contains 32.50% by mass cobalt (II) oxide. What is the total number of oxide ions in a 122 g of the mixture? (Molar masses: CoO = 74.932, Co_2O_3 = 165.863)
Answer: 1.22×10^{24} oxide ions
3. A sulfur-containing compound is treated chemically to convert all its sulfur into barium sulfate. A 8.19 g sample of the compound produced 5.46 g barium sulfate. (Molar masses: S = 32.065, $BaSO_4$ = 233.39)
 - a) What is the percent of sulfur in the compound?
Answer: 9.18% S
 - b) If there is one sulfur atom in the molecule, what is the molar mass of the compound ?
Answer: 349 g/mole
4. The percent of aluminum in the compound, Al_2X_3 , is 18.56%. What is the molar mass of element X ?
(Molar mass Al = 26.98) Answer: 79.00 g/mole
5. 3.9104 g sample of a compound made of carbon, hydrogen, nitrogen, and oxygen is burned in air. 3.820 g CO_2 and 3.125 g H_2O are produced. Analysis of the compound for nitrogen showed that it is 46.62% by mass nitrogen. The molar mass of the compound is about 176 ± 5 g/mole. What is the molecular formula of the compound? (Molar masses: C = 12.011, H = 1.008, N = 14.007, O = 16.0, H_2O = 18.02, CO_2 = 44.01) Answer: $C_4H_{16}N_6O_2$

SET B:

1. An excess amount of an aqueous solution of HCl is added to a mixture of $CaCO_3$ and K_2CO_3 . The mixture reacts completely.
$$\begin{aligned}CaCO_3 + 2 HCl &\longrightarrow CaCl_2 + H_2O + CO_2 \\K_2CO_3 + 2 HCl &\longrightarrow 2 KCl + H_2O + CO_2\end{aligned}$$
4.48 g CO_2 and 3.57 g KCl are produced along with some $CaCl_2$ and H_2O . Calculate the mass of the mixture.
Answer: 11.10 g mixture
2. The percent of manganese in the compound, Mn_5X_2 , is 42.10% by mass. What is the molar mass of element X?
Answer: 186.9 g/mole
3. A mixture of potassium phosphate and potassium nitrate contains 36.55% by mass potassium nitrate. What is the total number of potassium ions in 83.5 g mixture?
Answer: 6.32×10^{23} ions
4. A carbon-containing compound was treated chemically to convert all its carbon into $SrCO_3$. A 31.23 g sample of the compound gave 1.203×10^2 g $SrCO_3$.
 - a. What is the percent of carbon in the compound?
Answer: 31.3 % C
 - b. If there are three carbon atoms in one molecule of the compound, what is the molar mass of the compound?
Answer: 114.8 g/mole

5. 80.0 g KClO_3 are mixed with 59.5 g HCl and allowed to react according to the equation:



The amount of Cl_2 produced is 18.7 g. Calculate the percent yield of Cl_2 .

(Molar masses: $\text{KCl} = 74.551$, $\text{KClO}_3 = 122.6$, $\text{HCl} = 36.5$, $\text{ClO}_2 = 67.5$, $\text{Cl}_2 = 71.0$, $\text{H}_2\text{O} = 18.02$ g/mole)

Answer: 80.6%

6. 28.50 g sample of a compound of carbon, sulfur, hydrogen, and oxygen is burned. 35.25 g CO_2 and 14.65 g SO_2 are produced. Analysis for hydrogen showed that the compound is 8.514% by mass hydrogen. The molar mass of the compound is 500 ± 5 g/mole. What is the molecular formula of the compound?

Answer: $\text{C}_{14}\text{H}_{42}\text{S}_4\text{O}_{10}$

SET C:

1. A phosphorus-containing compound is treated chemically to convert all its phosphorus into $\text{Mg}_3(\text{PO}_4)_2$. A 7.88 g sample of the compound gave 4.75 g $\text{Mg}_3(\text{PO}_4)_2$. What is the percent by mass phosphorus in the compound?

Answer: 14.2% P

2. The percent by mass of boron in the compound B_7X_3 is 42.1%. What is the molar mass of X?

Answer: 34.7 g/mole

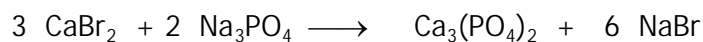
3. A 39.11 g sample of a compound is found to be 86.22% by mass Cr. Also, there are five chromium atoms per molecule of the compound. What is the molar mass of the compound?

Answer: 301.6 g/mole

4. The percent by mass of silicon in the compound Si_8X_3 is 72.33%. What is the molar mass of the element X?

Answer: 28.65 g/mole

5. 22.44 g of CaBr_2 and 16.85 g Na_3PO_4 were allowed to react.



(Molar masses: $\text{CaBr}_2 = 199.9$, $\text{Na}_3\text{PO}_4 = 164.0$, $\text{Ca}_3(\text{PO}_4)_2 = 207.2$, $\text{NaBr} = 102.9$ g/mole)

- a. What mass of $\text{Ca}_3(\text{PO}_4)_2$ is produced in the reaction?

Answer: 7.753 g

- b. How many grams of each reactant are left over?

Answers: 0 g CaBr_2 , 4.58 g Na_3PO_4