

**CHEM 101-082**  
**Work Sheet III (Stoichiometry)**  
**22 and 24 March, 2008**

---

*Dr. Al-Saadi*

I) Complete the following table:

Mass of Sample	Moles of Sample	Molecules in Sample	Total Atoms in Sample
4.24 g C <sub>6</sub> H <sub>6</sub>			
	0.224 mol H <sub>2</sub> O		
		2.71×10 <sup>22</sup> CO <sub>2</sub> molecules	
			3.35×10 <sup>22</sup> total atoms in CH <sub>3</sub> OH sample

II) The element rhenium (Re) has two naturally occurring isotopes, <sup>185</sup>Re and <sup>187</sup>Re, with an average atomic mass of 186.207 amu. Rhenium is 62.60% <sup>187</sup>Re, and the atomic mass of <sup>187</sup>Re is 186.956 amu. Calculate the mass of <sup>185</sup>Re?

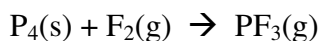
III) Terephthalic acid contains only C, O, and H. The mass compositions were found to be 57.85% carbon and 3.64% hydrogen. If the 0.250 mol of terephthalic acid has a mass of 41.5 g, determine the molecular formula for terephthalic acid.

**IV)** A potential fuel of rocket is a combination of  $B_5H_9$  and  $O_2$ . The two react according to the following balanced equation:



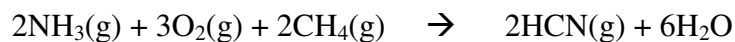
If one tank in a rocket holds 126 g of  $B_5H_9$  and another tank holds 192 g of  $O_2$ , what mass of water can be produced when the contents of the two tanks are mixed with each other?

**V)** Consider the following unbalanced reaction:



What mass of  $F_2$  is needed to produce 120. g of  $PF_3$  if the reaction has a 78.1% yield?

**VI)** Consider the following reaction that is used to produce hydrogen cyanide (HCN):



If  $5.00 \times 10^3$  kg each of  $NH_3$ ,  $O_2$  and  $CH_4$  are reacted, what mass of HCN and of  $H_2O$  will be produced, assuming 85.0% yield?