**Answer to problem 128, page 424**

**Challenge problem 6**

Let the basic binary have a formula form: MHx since the H in the water is assumed to be from the binary. Since 1.21 g H2O forms, this means:

Moles H2O= 1.21 g \* 1 mole H2O =0.06722 mol H2O

18 g H2O

Mol H = 2 = x

Mol H2O 1 0.06722

* 2\*0.06722= mol H=x= 0.1344

Since we know the molecular mass of MHx=62.09 g/mol, we compute the moles of MHx yielding the above mol count of H:

Mol MHx =1.39 g \*1 mol MHx =0.02239

62.09 g mol-1

Thus, the mol ratio of H/MHx = 0.1344/0.02239 =6.003 ~ 6

If we subtract the mass of 6 H moles from the molecular weight of MHx we get:

Mass of M in MHx=62.09-6\*1.008=56.01

This suggests Fe =M (at. wt. =55.9) and the formula FeH6. However, the latter compound is not observed .

M2H6=> 62.09-6\*1.008 = 56.04 = mass of two M=> 56.04/2= at. mass = 28.02 =>Si (at. Mass 28.09)

**Si­2H6** is a known binary compound called disilane which is a gas at room temperature. Major studies carried out by Alfred Stock and students *( A. Stock, Z. Electrochem* ***32****, 341 (1926)* established much of its chemical and physical character. Notably, it burns spontaneously in air.

Another possibility is **N4H6** which has a molecular mass of 62.09. However, this compound (referred to as tetrazine) has not actually been isolated in pure and stable form. *(c.f. F. Holleman, ‎Egon Wiberg, ‎Nils Wiberg, Inorganic Chemistry, pg. 627 Academic Press[2001])*

Both answers are acceptable. Answers which gave non-existent compounds lost 1 point.