**CHEM 1114**

**Challenge problems 1A and 1B**

**Due Monday 10 September 2012 in class**

* 1. **Two samples of a boron hydride compound are decomposed.**

**The first sample contains 78.5% B; the second sample contains**

**76.9% B. However, the two samples act chemically identical.**

**Provide an explanation. (3 pts)**

**Qualitative explanation**

There are two major isotopes of B, 11B and 10B . Since neutron count plays no role in chemistry, we expect chemistry to be unaffected.

**Numerical explanation**

If we assume the hydride compound is BH3 then 11BH3 contains

100\*11/14 =78.6% 11B while 10BH­3 contains 100\*10/13 = 76.9% 11B

* 1. **A chemistry teacher makes the claim that if a green pea is the nucleus of an atom, that the electronic cloud radius would be about 3 miles away. Is he about right or is he way off in his scaling? (3 pts)**

**Assume green pea has a radius of about 1/8 inch (0.3175 cm)**

**If the pea is the nucleus, the electron cloud should be**

**100,000 \* 1/8 inches away = 12,500 inches**

**Convert to feet: 12,500 inches \* 1 foot/12 inches=1,042 feet**

**Convert to miles: 1,042 feet \* 1 mile/5280 feet = 0.197 miles**

**Teacher is wrong…3 miles is an over-estimate of the distance**