

Fall 2011 CHEM 760: Introductory Quantum Chemistry

Homework 5 Due: **N/A**

Not to be turned in for a grade. For practice only.

1. True or False.

Textbook Problems 6.1, 6.5, 6.7, 6.8, 6.38, 6.54

2. Textbook Problems 6.14, 6.15, 6.16, 6.19, 6.21, 6.29, 6.30, 6.31, 6.44

3. Prove that  $\langle V \rangle = 2\langle E \rangle$  and consequently  $\frac{\langle V \rangle}{\langle \hat{T} \rangle} = -2$ , for a  $2p_0$  electron.

4. Using the explicit expressions for  $Y_l^m(\theta, \phi)$ , shows that

$$|Y_1^1(\theta, \phi)|^2 + |Y_1^0(\theta, \phi)|^2 + |Y_1^{-1}(\theta, \phi)|^2 = \text{constant}$$

This is a special case of the general theorem

$$\sum_{m=-l}^l |Y_l^m(\theta, \phi)|^2 = \text{constant}$$

Known as Unsöld's theorem. What is the physical significance of this result?