

## Problem set 1

due Thursday September 11, 2008

1. Show explicitly that  $\hat{A}_3\hat{A}_3 = \sqrt{3}\hat{A}_3$

2. Suppose that the electron configuration of Be is  $1s^2 2s^2$ . Calculate the energy of Be using the following integrals.

$$\langle 1s | -\frac{1}{2}\nabla^2 | 1s \rangle = 6.77222$$

$$\langle 2s | -\frac{1}{2}\nabla^2 | 2s \rangle = 0.544767$$

$$\langle 1s | \frac{4}{r} | 1s \rangle = 14.71180$$

$$\langle 2s | \frac{4}{r} | 2s \rangle = 2.16517$$

$$J_{1s1s} = \langle 1s(1)1s(2) | \frac{1}{r_{12}} | 1s(1)1s(2) \rangle = 2.26966$$

$$J_{2s2s} = \langle 2s(1)2s(2) | \frac{1}{r_{12}} | 2s(1)2s(2) \rangle = 0.35423$$

$$J_{1s2s} = \langle 1s(1)2s(2) | \frac{1}{r_{12}} | 1s(1)2s(2) \rangle = 0.49544$$

$$K_{1s2s} = \langle 1s(1)2s(2) | \frac{1}{r_{12}} | 2s(1)1s(2) \rangle = 0.02803$$