

- 1) Write the Slater Determinant for the ground state of Beryllium.

$$\Psi_g = \begin{vmatrix} \psi_{1s}(1)\alpha(1) & \psi_{1s}(1)\beta(1) & \psi_{2s}(1)\alpha(1) & \psi_{2s}(1)\beta(1) \\ \psi_{1s}(2)\alpha(2) & \psi_{1s}(2)\beta(2) & \psi_{2s}(2)\alpha(2) & \psi_{2s}(2)\beta(2) \\ \psi_{1s}(3)\alpha(3) & \psi_{1s}(3)\beta(3) & \psi_{2s}(3)\alpha(3) & \psi_{2s}(3)\beta(3) \\ \psi_{1s}(4)\alpha(4) & \psi_{1s}(4)\beta(4) & \psi_{2s}(4)\alpha(4) & \psi_{2s}(4)\beta(4) \end{vmatrix}$$

- 2) What physical property does each of the quantum numbers deal with (i.e. what do they tell us?)?

n : Energy

l : Angular momentum \rightarrow shape of subshell

m : Angular momentum \rightarrow orientation of subshell

s : spin

m_s : spin orientation.

- 3) If $n=5$ what are the allowed values of l , m , s and m_s ?

$$n = 5$$

$$l = 0, 1, 2, 3, 4$$

$$m = 0, \pm 1, \pm 2, \pm 3, \pm 4$$

$$s = \frac{1}{2}$$

$$m_s = -\frac{1}{2}, \frac{1}{2}$$