

Chem 2430 HW #4

1. If a diatomic molecule has a rotational constant $= 0.5 \text{ cm}^{-1}$, what is the most populated rotational level at $T = 300 \text{ K}$?
2. a) Show that Y_1^0 and Y_2^0 are orthogonal
b) Show that Y_1^1 and Y_1^{-1} are orthogonal
3. Show that Y_1^0, Y_1^1, Y_1^{-1} have the same energy by substitution into the Schrödinger Eq. for the rigid rotor.
4. For the particle in the spherical well problem

$$V = 0 \text{ for } r < r_0$$

$$V = \infty \text{ for } r \geq r_0$$

Show that $j_0(r)$ and $j_1(r)$ are solutions of the radial equation.