

Chem. 540  
Instructor: Nancy Makri

### Models – Problem 6

Consider a quantum mechanical particle moving in two dimensions with the following Hamiltonian:

$$\hat{H} = \frac{\hat{p}_x^2}{2m} + \frac{\hat{p}_y^2}{2m} + V(\hat{x}, \hat{y}),$$

where

$$V(\hat{x}, \hat{y}) = \frac{1}{2}m\omega_x^2\hat{x}^2 + \frac{1}{2}m\omega_y^2\hat{y}^2.$$

- Sketch this potential and write out the energy eigenvalues for this system. Notice that you need two quantum numbers to specify each state. Are there degenerate levels?
- Now suppose that  $\omega_x = 2\omega_y$ . Make a diagram of the six lowest energy states of the system, labeling the states and indicating the corresponding energy levels.