

$$H = M_{ll} + \sum_{i=1}^2 -\frac{1}{2}\nabla_i^2 - \frac{z}{r_i} + \frac{l(l+1)}{r_i^2}$$

$$M_{ll'} = \sum_{k=|l-l'|}^{l+l'} C^k(l, l') \frac{r_{<}^k}{r_{>}^{k+1}}$$

$$C^k(l, l') = \frac{1}{2}[(2l+1)(2l'+1)]^{\frac{1}{2}} \times \int P_l(\cos(\theta))P_k(\cos(\theta))P_{l'}(\cos(\theta))$$

$$l=0 \rightarrow H = \frac{1}{r_{>}} + \sum_{i=1}^2 -\frac{1}{2} \nabla_i^2 - \frac{z}{r_i}$$

$$\begin{array}{rcccl}
& & |1\rangle & |2\rangle & |3\rangle \\
A = & \langle 1| & \ddots & & \\
& \langle 2| & & \ddots & \\
& \langle 3| & & & \ddots \\
A_1 = & A \otimes I & & & \\
A_2 = & I \otimes A & & & \\
A_{1,2} = & A \otimes A & & &
\end{array}$$

$$D = \frac{\partial^2 \psi(r_1, r_2)}{\partial r_1^2} = \psi(r_1 + h, r_2) + \psi(r_1 - h, r_2) - 2\psi(r_1, r_2)$$

$$= \begin{bmatrix} -2 & 1 & 0 & \dots \\ 1 & -2 & 1 & \dots \\ 0 & 1 & -2 & \dots \\ \dots & \dots & \dots & \ddots \end{bmatrix}$$

$$\frac{\partial^2 \psi(r_1, r_2)}{\partial r_1^2} + \frac{\partial^2 \psi(r_1, r_2)}{\partial r_2^2} = D \otimes I + I \otimes D$$

$$V = \frac{z}{r_i}$$

$$= \begin{bmatrix} \frac{z}{h} & 0 & 0 & \dots \\ 0 & \frac{z}{2h} & 0 & \dots \\ 0 & 0 & \frac{z}{3h} & \dots \\ \dots & \dots & \dots & \ddots \end{bmatrix}$$

$$V(r_1) + V(r_2) = V \otimes I + I \otimes V$$

$$O = \frac{1}{r_{>}} \begin{matrix} & |11\rangle & |12\rangle & |\dots\rangle & |31\rangle & |\dots\rangle \\ \langle 11| & 1 & & & & \\ \langle 12| & & \frac{1}{2} & & & \\ = & & & \ddots & & \\ \langle \dots| & & & & \ddots & \\ \langle 31| & & & & & \frac{1}{3} \\ \langle dots| & & & & & \ddots \end{matrix}$$