

1. HF energy:

$$E_{HF} = \sum_{n=1}^N \langle n|h_i|n \rangle + \sum_{n=1}^N \sum_{m=1}^N [V_{n,m} - J_{n,m}]$$

when $m=n$

$$\frac{1}{2} \sum_{n,m=1}^N [V_{n,m} - J_{n,m}] = \sum_{n=1}^N \sum_{m=1}^N [V_{n,m} - J_{n,m}]$$

$$\therefore E_{HF} = \sum_{n=1}^N [\langle n|h_i|n \rangle + \sum_{m=1}^N [V_{n,m} - J_{n,m}]] = \sum_{n=1}^N \epsilon_n = \sum_{n=1}^N \epsilon'_n$$

$\therefore \epsilon_n$ is not unique

$$\therefore \epsilon_n = E_{HF}[N] - E_{HF}[N-1] = \langle n|h_i|n \rangle + \sum_{m=1}^N [V_{n,m} - J_{n,m}]$$