

FCI Questions

Patryk Kozłowski

May 11, 2023

1 two differences

$$\langle \Psi | V | \Psi(k \rightarrow k', l \rightarrow l') \rangle = v^{\alpha\beta\gamma\delta} (-1)^{\varepsilon(\kappa_1, \dots, \kappa'_i, \dots, \kappa_j, \dots, \kappa_n)} \quad (1)$$

$$\langle 0 | \left(\prod_{\kappa=(\kappa_n \dots \kappa_3)} a_\kappa \right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger a_\gamma a_\delta a_1^\dagger a_2^\dagger \left(\prod_{\kappa'=(\kappa_3 \dots \kappa_n)} a_{\kappa'}^\dagger \right) | 0 \rangle \quad (2)$$

$$= \langle 0 | \left(\prod_{\kappa=(\kappa_n \dots \kappa_3)} a_\kappa \right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger a_\gamma \delta_{\delta\kappa_1'} a_2^\dagger \left(\prod_{\kappa'=(\kappa_3 \dots \kappa_n)} a_{\kappa'}^\dagger \right) | 0 \rangle \quad (3)$$

$$- \langle 0 | \left(\prod_{\kappa=(\kappa_n \dots \kappa_3)} a_\kappa \right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger a_\gamma a_1^\dagger a_\delta a_2^\dagger \left(\prod_{\kappa'=(\kappa_3 \dots \kappa_n)} a_{\kappa'}^\dagger \right) | 0 \rangle \quad (4)$$

$$= \langle 0 | \left(\prod_{\kappa=(\kappa_n \dots \kappa_3)} a_\kappa \right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger \delta_{\gamma\kappa_2'} \delta_{\delta\kappa_1'} \left(\prod_{\kappa'=(\kappa_3 \dots \kappa_n)} a_{\kappa'}^\dagger \right) | 0 \rangle \quad (5)$$

$$- 0 \quad (6)$$

$$- \langle 0 | \left(\prod_{\kappa=(\kappa_n \dots \kappa_3)} a_\kappa \right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger \delta_{\gamma\kappa_1'} a_\delta a_2^\dagger \left(\prod_{\kappa'=(\kappa_3 \dots \kappa_n)} a_{\kappa'}^\dagger \right) | 0 \rangle \quad (7)$$

$$+ 0 \quad (8)$$

$$= \delta_{\alpha\kappa_1} \delta_{\beta\kappa_2} \delta_{\gamma\kappa_2'} \delta_{\delta\kappa_1'} \quad (9)$$

$$- \delta_{\alpha\kappa_1} \delta_{\beta\kappa_2} \delta_{\gamma\kappa_1'} \delta_{\delta\kappa_2'} \quad (10)$$

$$= v^{122'1'} - v^{121'2'} \quad (11)$$

$$= [mp|nq] - [mq|np] \quad (12)$$

$$= (mp|nq)\delta_{[m][p]}\delta_{[n][q]} - (mq|np)\delta_{[m][q]}\delta_{[n][p]} \quad (13)$$