FCI Questions

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1 two differences

$$\langle\Psi|V|\Psi(k \to k', l \to l')\rangle = v^{\alpha\beta\gamma\delta}\,(-1)^{\varepsilon\left(\kappa_1,\ldots,\kappa_i',\ldots,\kappa_j,\ldots,\kappa_n\right)} \tag{1}$$

$$\langle 0|\left(\prod_{\kappa=(\kappa_n\ldots\kappa_3)} a_\kappa\right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger a_\gamma a_\delta a_{1'}^\dagger a_{2'}^\dagger \left(\prod_{\kappa'=(\kappa_3\ldots\kappa_n)} a_{\kappa'}^\dagger\right)|0\rangle \tag{2}$$

$$= \langle 0|\left(\prod_{\kappa=(\kappa_n\ldots\kappa_3)} a_\kappa\right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger a_\gamma \delta_{\delta\kappa_{1'}} a_{2'}^\dagger \left(\prod_{\kappa'=(\kappa_3\ldots\kappa_n)} a_{\kappa'}^\dagger\right)|0\rangle \tag{3}$$

$$- \langle 0|\left(\prod_{\kappa=(\kappa_n\ldots\kappa_3)} a_\kappa\right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger a_\gamma a_{1'}^\dagger a_\delta a_{2'}^\dagger \left(\prod_{\kappa'=(\kappa_3\ldots\kappa_n)} a_{\kappa'}^\dagger\right)|0\rangle \tag{4}$$

$$= \langle 0|\left(\prod_{\kappa=(\kappa_n\ldots\kappa_3)} a_\kappa\right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger \delta_{\gamma\kappa_{2'}} \delta_{\delta\kappa_{1'}} \left(\prod_{\kappa'=(\kappa_3\ldots\kappa_n)} a_{\kappa'}^\dagger\right)|0\rangle \tag{5}$$

$$-0 \tag{6}$$

$$- \langle 0|\left(\prod_{\kappa=(\kappa_n\ldots\kappa_3)} a_\kappa\right) a_2 a_1 a_\alpha^\dagger a_\beta^\dagger \delta_{\gamma\kappa_{1'}} a_\delta a_{2'}^\dagger \left(\prod_{\kappa'=(\kappa_3\ldots\kappa_n)} a_{\kappa'}^\dagger\right)|0\rangle \tag{7}$$

$$+0 \tag{8}$$

$$= \delta_{\alpha\kappa_1}\delta_{\beta\kappa_2}\delta_{\gamma\kappa_{2'}}\delta_{\delta\kappa_{1'}} \tag{9}$$

$$-\delta_{\alpha\kappa_1}\delta_{\beta\kappa_2}\delta_{\gamma\kappa_{1'}}\delta_{\delta\kappa_{2'}} \tag{10}$$

$$= v^{122'1'} - v^{121'2'} \tag{11}$$

$$= [mp|nq] - [mq|np] \tag{12}$$

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