

Ricordando che nella funzione di Green ci sono ph analizziamo le 4 possibilità:

$$G^{RPA}(m i n j) = \sum_{p q k l} G^0(m i k p) \left\{ \delta_{p n} \delta_{k j} + \langle k p | V | q l \rangle G^{RPA}(q l n j) + \langle k p | V | l q \rangle G^{RPA}(l q n j) \right\} \quad (10)$$

$$G^0(m i k p) = 0$$

$$G^0(m i k p) = \frac{\delta_{m p} \delta_{i k}}{\epsilon_m - \epsilon_i - E}$$

$$A \quad G^{RPA}(m i n j) = \frac{1}{\epsilon_m - \epsilon_i - E} \left\{ \delta_{m n} \delta_{i j} + \sum_{q l} \left[\langle m i | V | q l \rangle G^{RPA}(q l n j) + \langle m i | V | l q \rangle G^{RPA}(l q n j) \right] \right\}$$

$$B \quad G^{RPA}(i m n j) = \frac{1}{\epsilon_m - \epsilon_i + E} \left\{ \delta_{m n} \delta_{i j} + \sum_{q l} \left[\langle i m | V | q l \rangle G^{RPA}(q l n j) + \langle i m | V | l q \rangle G^{RPA}(l q n j) \right] \right\}$$

$$C \quad G^{RPA}(i m j n) = \frac{1}{\epsilon_m - \epsilon_i + E} \left\{ \delta_{m n} \delta_{i j} + \sum_{q l} \left[\langle i m | V | q l \rangle G^{RPA}(q l j n) + \langle i m | V | l q \rangle G^{RPA}(l q j n) \right] \right\}$$

$$D \quad G^{RPA}(m i j n) = \frac{1}{\epsilon_m - \epsilon_i - E} \left\{ \delta_{m n} \delta_{i j} + \sum_{q l} \left[\langle m i | V | q l \rangle G^{RPA}(q l j n) + \langle m i | V | l q \rangle G^{RPA}(l q j n) \right] \right\}$$

$$A \quad \sum_{q l} \left\{ (\epsilon_m - \epsilon_i) \delta_{m q} \delta_{i l} - \langle m i | V | l q \rangle - E \delta_{m q} \delta_{i l} \right\} G^{RPA}(q l n j) - \langle m i | V | q l \rangle G^{RPA}(l q n j) = \delta_{m n} \delta_{i j}$$

$$B \quad \sum_{q l} \left\{ [(\epsilon_m - \epsilon_i) \delta_{m q} \delta_{i l} - \langle i m | V | q l \rangle + E \delta_{m q} \delta_{i l}] G^{RPA}(l q n j) - \langle i m | V | l q \rangle G^{RPA}(q l n j) \right\} = \delta_{m n} \delta_{i j}$$

$$D \quad \sum_{q l} \left\{ [(\epsilon_m - \epsilon_i) \delta_{m q} \delta_{i l} - \langle m i | V | l q \rangle - E \delta_{m q} \delta_{i l}] G^{RPA}(q l j n) - \langle m i | V | q l \rangle G^{RPA}(l q j n) \right\} = \delta_{m n} \delta_{i j}$$

$$C \quad \sum_{q l} \left\{ [(\epsilon_m - \epsilon_i) \delta_{m q} \delta_{i l} - \langle i m | V | q l \rangle + E \delta_{m q} \delta_{i l}] G^{RPA}(l q j n) - \langle i m | V | l q \rangle G^{RPA}(q l j n) \right\} = \delta_{m n} \delta_{i j}$$

Nota che: $\langle i m | V | q l \rangle = \langle m i | V | l q \rangle^*$

Definiamo le matrici:

$$A_{m i q l} = (\epsilon_m - \epsilon_i) \delta_{m q} \delta_{i l} - \langle m i | V | l q \rangle \quad (11a)$$

$$B_{m i q l} = -\langle m i | V | q l \rangle \quad (11b)$$