

$$\langle \Phi_i^a | \hat{H} | \Phi_j^b \rangle = \text{diagram} + \delta_{ab} \left(\text{diagram}_1 + \text{diagram}_2 \right) + \delta_{ij} \left(\text{diagram}_3 + \text{diagram}_4 \right) + \delta_{ab} \delta_{ij} \left(\text{diagram}_5 + \text{diagram}_6 \right).$$

The equation represents the matrix element of the Hamiltonian \hat{H} between two states Φ_i^a and Φ_j^b . The result is expressed as a sum of Feynman diagrams:

- Diagram 1:** A contact diagram where two external lines, labeled a and b at the bottom and i and j at the top, meet at a single vertex.
- Diagram 2:** A term proportional to δ_{ab} containing two diagrams:
 - Diagram 2.1:** Two parallel vertical lines. The left line has an incoming arrow from the bottom labeled j and an outgoing arrow to the top labeled i . The right line has an incoming arrow from the bottom labeled j and an outgoing arrow to the top labeled i . They are connected by a horizontal line with a cross, labeled x .
 - Diagram 2.2:** Two parallel vertical lines with the same external labels as Diagram 2.1. They are connected by a loop labeled (k) .
- Diagram 3:** A term proportional to δ_{ij} containing two diagrams:
 - Diagram 3.1:** Two parallel vertical lines. The left line has an incoming arrow from the bottom labeled b and an outgoing arrow to the top labeled a . The right line has an incoming arrow from the bottom labeled b and an outgoing arrow to the top labeled a . They are connected by a horizontal line with a cross, labeled x .
 - Diagram 3.2:** Two parallel vertical lines with the same external labels as Diagram 3.1. They are connected by a loop labeled (k) .
- Diagram 4:** A term proportional to $\delta_{ab} \delta_{ij}$ containing two diagrams:
 - Diagram 4.1:** A diagram with a horizontal line with a cross labeled x connected to a loop labeled (k) .
 - Diagram 4.2:** A diagram with two loops, labeled (k) and (l) , connected by a horizontal line with a cross labeled x .