β-ray Disintegration

Upper state の Energy と Lower state の Energy とが比較的に sharp に define されてゐる様な system. Hamiltonian 中の interaction の項

$$H = \int \{ \psi^\dagger H_E \psi + \chi^\dagger H_P \chi + \underline{\chi^\dagger (\gamma \psi + \psi^\dagger \gamma^\dagger) \chi} \} dv$$

は ~~ψ に~~

$$\cancel{\psi = \psi_0 + \psi'} \qquad \cancel{\psi^\dagger = \psi_0^\dagger + \psi'^\dagger}$$

$$\chi^\dagger \cancel{D\tau_3} \chi$$

$$\chi^\dagger \left(\rho_3 \cdot \frac{1+\tau_3}{2}\right) \chi \quad D$$

$$\psi = \sum_i b_i v_i$$

$$\chi = \sum a_\mu u_\mu .$$

$$\bar{H} = \sum E_i b_i^\dagger b_i + W_\mu a_\mu^\dagger a_\mu + \sum_{\mu\nu}^{i} a_\mu^\dagger (b_i V_{\mu\nu}^i + b_i^\dagger V_{\mu\nu}^{\dagger i}) a_\nu$$

$$V_{\mu\nu}^i = \int \tilde{u}_\mu \cdot \gamma \tilde{v}_i \cdot u_\nu \, dv$$

$$V_{\mu\nu}^{\dagger i} = \int \tilde{u}_\mu \cdot \gamma^\dagger v_i \cdot u_\nu \, dv = \tilde{V}_{\mu\nu}^i$$

$$V_{\mu\nu}^i = \int \sum_{klm} \tilde{u}_\mu^k \cdot \gamma_m^{kl} \tilde{v}_i^m \cdot u_\nu^l \, dv$$

$$V_{\mu\nu}^{\dagger i} = \int \sum_{klm} \tilde{u}_\mu^l \gamma_m^{kl} v_i^m u_\nu^k \, dv$$

$$\tilde{V}_{\nu\mu}^i = V_{\mu\nu}^{\dagger i}$$

$$a_\mu^\dagger = N_\mu V_\mu \Delta_\mu$$

$$a_\nu = \Delta_\nu V_\nu N_\nu$$

$$V_\mu = \prod_{\lambda=1}^{\mu} (1 - 2N_\lambda)$$

$$\bar{H} = \sum_i E_i n_i + \sum_\mu W_\mu N_\mu + \cancel{\sum_{\mu\nu} N_\mu (1-N_\nu) V_\mu \Delta_\mu} \quad V_{\mu\mu}^i$$

$$+ \sum_\mu N_\mu (n_i \kappa_i \Theta_i V_{\mu\mu}^i - (1-n_i) \kappa_i \Theta_i V_{\mu\mu}^{\dagger i})$$

$$+ \sum_{\mu>\nu} N_\mu (1-N_\nu) V_\mu V_\nu \Delta_\mu \Delta_\nu (n_i \kappa_i \Theta_i V_{\mu\nu}^i - (1-n_i) \kappa_i \Theta_i V_{\mu\nu}^{\dagger i})$$

$$- \sum_{\mu<\nu} \overset{N_\mu (1-N_\nu)}{\cancel{(1-N_\mu)(1-N_\nu)}} V_\mu V_\nu \Delta_\mu \Delta_\nu (n_i \kappa_i \Theta_i V_{\mu\nu}^i - (1-n_i) \kappa_i \Theta_i V_{\mu\nu}^{\dagger i})$$

or

$$- \sum_{\mu>\nu} \cancel{N_\mu (1-N_\nu)} \, (1-N_\mu) N_\nu V_\mu V_\nu \Delta_\mu \Delta_\nu (n_i \kappa_i \Theta_i V_{\nu\mu}^i - (1-n_i) \kappa_i \Theta_i V_{\nu\mu}^{\dagger i})$$

$$\bar{H} = \sum_i E_i n_i + \sum_\mu W_\mu N_\mu + \sum_{\mu,i} N_\mu \varkappa_i (n_i V^i_{\mu\mu} - (1-n_i)\tilde{V}^i_{\mu\mu})\,\Theta_i$$

$$+ \sum_{\mu>\nu} \Big[N_\mu(1-N_\nu)(n_i \varkappa_i \Theta_i V^i_{\mu\nu} - (1-n_i)\varkappa_i \Theta_i V^{\dagger i}_{\mu\nu})$$

$$(1-N_\mu)N_\nu\,(n_i \varkappa_i \Theta_i V^i_{\nu\mu} - (1-n_i)\varkappa_i \Theta_i V^{\dagger i}_{\nu\mu})\Big] \nu_\mu \nu_\nu \Delta_\mu \nu_\nu$$

$$\varkappa_i = \prod_{k=1}^{i} (1-2n_k)$$

$$\nu_\mu = \prod_{\lambda=1}^{\mu} (1-2N_\mu)$$

$$\bar{H}\,\Psi(N_1 N_2 \cdots ; n_1 n_2, \cdots)$$

$$= \Big\{\sum_i E_i n_i + \sum_\mu W_\mu N_\mu\Big\}\,\Psi(N_1 N_2 \cdots ; n_1 n_2 \cdots)$$

$$+ \sum_{\mu,i} N_\mu(-\varkappa_i)((1-n_i)V^i_{\mu\mu} - n_i \tilde{V}^i_{\mu\mu})\,\Psi(N_1 N_2 \cdots ; n_1 n_2 \cdots 1-n_i \cdots)$$

$$+ \sum_{\mu>\nu} \Big\{(1+N_\mu)N_\nu \{(1-n_i) V^i_{\mu\nu} - n_i \tilde{V}^i_{\mu\nu}\}(-\varkappa_i)\nu_\mu \nu_\nu \cdot \Psi(N_1 N_2 \cdots 1-N_\mu, \cdots 1-N_\mu ; n_1 \cdots 1-n_i \cdots)$$

$$- N_\mu(1-N_\nu)\{(1-n_i) V^i_{\nu\mu} - n_i \tilde{V}^i_{\mu\nu}\}\Big\}$$

$$W\Psi = \bar{H}\Psi$$

$$W_0 \Psi_0 = \bar{H} \Psi_0$$

$$(W_0 + W_1)(\Psi_0 + \Psi_1) = (\bar{H}_0 + H')(\Psi_0 + \Psi_1)$$

$$W_1\Psi_0 + W_0\Psi_1 = H'\Psi_0 + H_0 \Psi_1$$

$$(W_0 - H_0)\Psi = -(H' - W_1)\Psi_0$$

$$\bar{H}\,\Psi(N_1 N_2 \cdots ; 0, 0, \cdots)$$

$$= \sum_\mu W_\mu N_\mu\,\Psi(N_1 N_2 \cdots ; 0, 0, \cdots)$$

$$- \sum_{\mu,i} N_\mu V^i_{\mu\mu}\,\Psi(N_1, N_2, \cdots ; 0\,0 \cdots \overset{i}{1}, \cdots)$$

$$+ \sum_{\mu>\nu} \cancel{(1-N_\mu)N_\nu \{ V^i_{\mu\nu}}$$

$$\{ N_\mu(1-N_\nu) V^i_{\nu\mu} - (1-N_\mu)N_\nu V^i_{\mu\nu} \}\,\nu_\mu \nu_\nu\,\Psi(\cdots 1-N_\mu \cdots 1-N_\mu \cdots ; 0\,0 \cdots \overset{i}{1}, 0 \cdots)$$

$$\cancel{= \Psi(N_1 N_2 \cdots ; 0, 0, \cdots) =}$$

$$\Psi = \delta_{N_1 N_1'}\,\delta_{N_2 N_2'} \cdots \delta_{n_1 0}\,\delta_{n_2 0} \cdots + \Psi'$$

$$\Big(- \sum_i E_i n_i - \sum_\mu W_\mu N_\mu \Big)\,\Psi'(N_1 N_2 \cdots ; n_1 n_2 \cdots)$$

$$= \Big\{\sum_{\mu,i} N_\mu(-\varkappa_i)((1-n_i)V^i_{\mu\mu} - n_i \tilde{V}^i_{\mu\mu}) + \cdots \quad - \cdots \delta_{NN_1'}\,\delta_{N_2 N_2'} \cdots \delta_{n_1 0} \cdots$$

$$\delta_{NN_1'} \cdots \delta_{n_i, 0} \cdots + \qquad - W'\,\delta_{NN_1'} \cdots$$

$$\cancel{(W' - \quad E_i)} \qquad \Psi'(N_1' N_2' \cdots ; 0\,0 \cdots \overset{i}{1} \cdots)$$

$$(W_0+W_0'+W'')(\Psi_0+\Psi'+\Psi'') = (H_0+H')(\Psi_0+\Psi'+\Psi'')$$

$$W_0\Psi_0 = H_0\Psi_0$$

$$W_0'\Psi_0 + W_0\Psi' = H'\Psi_0 + H_0\Psi' \qquad (W_0-H_0)\Psi' = (H'-W')\Psi_0$$

$$W''\Psi_0 + W'\Psi' + W_0\Psi'' = H_0\Psi'' + H'\Psi', \qquad (W_0-H_0)\Psi'' = (H'-W')\Psi' + W''\Psi_0$$

$$\cancel{(H_0-W_0)\Psi'' = W''\Psi_0 - W'-H'}$$

$$\Psi = \delta_{N_1N_1'}\delta_{N_2N_2'}\cdots\delta_{n_10}\delta_{n_20}\cdots+\Psi'+\Psi''$$

$$W_0 = \sum_\mu W_\mu N_\mu'$$

$$\Big(W_0-\sum_\mu W_\mu N_\mu\Big)\Psi'(N_1N_2,\cdots n_1 n_2\cdots)$$

$$= \sum_{\mu,i} N_\mu(-\varkappa_i)\{(1-n_i)V^i_{\mu\mu} - n_i\tilde V^i_{\mu\mu}\}\,\delta_{N_1N_1'}\cdots\delta_{n_10}\cdots\delta_{n_i0}\cdots$$

$$+\sum_{\mu>\nu,i}\Big[(1-N_\mu)N_\nu\{(1-n_i)V^i_{\mu\nu}-n_i\tilde V^i_{\nu\mu}\} - N_\mu(1-N_\nu)\{(1-n_i)V^i_{\nu\mu}-n_i\tilde V^i_{\mu\nu}\}\Big](-\varkappa_i)\,\nu_\mu\nu_\nu\,\delta_{N_1N_1'-\delta_{1-N_\nu N_\nu'}}\,\delta_{1-N_\mu N_\mu'}\,\delta_{1-n_i0}$$

$$\times(-\varkappa_i)\,\nu_\mu\nu_\nu\,\delta_{NN'}\cdots\delta_{n_10}\cdots - W'\delta_{N_1N_1'}\cdots$$

$$W'=0 \qquad -E_i\,\Psi'(N_1'N_2'\cdots;00\cdots\overset{i}{1},0\cdots)$$

$$= -\sum_\mu N_\mu'\tilde V^i_{\mu\mu} + \sum_{\mu>\nu}\Big[\cancel{(1-N_\mu')N_\nu'}\ N_\mu'(1-N_\nu')\tilde V^i_{\nu\mu} - (1-N_\mu')N_\nu'\tilde V^i_{\mu\nu}\Big]\nu_\mu\nu_\nu$$

$$\{(2N_\mu'-1)W_\mu + (2N_\nu'-1)W_\nu - E_i\}\,\Psi'(N_1'N_2'+N_\nu',\cdots1-N_\mu',\cdots 0,0,\cdots i\,0\,0)$$

$$\Psi_0(H'-W')\Psi'+W''\Psi_0=0.$$

$$-W'' = \Psi_0\Big\{\ \Big\}\Big[\sum_{\mu,i}N_\mu'V^i_{\mu\mu}-\sum_{\mu>\nu}^{i}\{N_\mu'(1-N_\nu')\tilde V^i_{\nu\mu}-(1-N_\mu')N_\nu'\tilde V^i_{\mu\nu}\}\Big]\nu_\mu\nu_\nu$$

$$= \cancel{\sum_i\sum_\mu N_\mu'\ N_\mu'(-\varkappa_i)}\ \Psi'(N_1'N_2'\cdots;00\cdots\overset{i}{1},0,0\cdots)$$

$$-\sum_\mu N_\mu' V^i_{\mu\mu}$$

$$+\sum \cancel{N_\mu'(1-N_\nu')\,V_\mu}\qquad \Psi'(N_1'\cdots1-N_\nu'\cdots1-N_\mu'\cdots;000\,\overset{i}{1}\,0\cdots)$$

$$-\Big[(1-N_\mu')N_\nu'\ V^i_{\mu\nu} - N_\mu'(1-N_\nu')\ V^i_{\nu\mu}\Big]\nu_\mu\nu_\nu$$

$$W'' = \sum_i \left(\sum_\mu N'_\mu \frac{V^i_{\mu\mu} \sum_\nu N'_\nu \tilde{V}^i_{\nu\nu}}{E_i} \right) + \sum_{\mu>\nu} \frac{(1-N'_\mu) N'_\nu |V^i_{\mu\nu}|^2 + N'_\mu (1-N'_\nu) |V^i_{\nu\mu}|^2}{\cancel{(2N'_\mu - 1) W_\mu + 2N_\nu} \quad E_i + (1-2N'_\mu) W_\mu + (1-2N'_\nu) W_\nu}$$

$$= \sum_\mu \sum_\nu N'_\mu N'_\nu \sum_i \frac{V^i_{\mu\mu} \tilde{V}^i_{\nu\nu}}{E_i}$$

$$+ \sum_{\mu>\nu} \underset{\text{neutron}}{(1-N'_\mu)} \underset{\text{proton}}{N'_\nu} \sum_i \frac{|V^i_{\mu\nu}|^2}{E_i + (1-2N'_\mu) W_\mu + (1-2N'_\nu) W_\nu}$$

$$+ \sum_{\mu>\nu} N'_\mu (1-N'_\nu) \sum_i \frac{|V^i_{\nu\mu}|^2}{E_i + (1-2N'_\mu) W_\mu + (1-2N'_\nu) W_\nu}$$

之れ neutron 及び proton が存在する時は、

~~μ が neutron　ν が proton~~

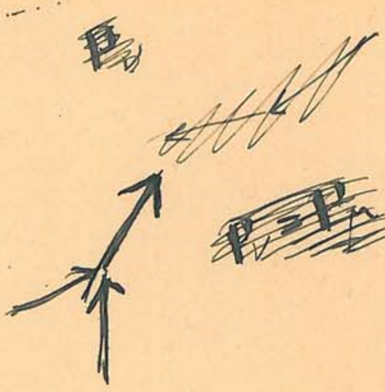
~~$W''=$~~ neutron (μ) と proton (ν) の間に働く ~~force~~ force は．

$|V^i_{\mu\nu}$

~~neutron に對しては．$1-N'_\mu = N^*_\mu$ とおくと．~~

~~$(1-N'_\mu) N'_\nu \sum_i \frac{|V^i_{\mu\nu}|^2}{E_i + (1-2N'_\mu) W_\mu}$.~~

$$e^{-\frac{i}{\hbar} P_\nu x} \quad e^{-pr} \quad e^{P_\mu r}$$



$h\nu/c + P_\nu = P_\mu$!!

$h\nu : \frac{1}{2M} P_\nu^2 = \frac{1}{2M} P_\mu^2$!!

$\frac{h^2}{2M} \left(\frac{\nu}{c}\right)^2 +$

P_μ

$P_\nu \cancel{+ P_\mu} + p = P_\mu$!!

$E_i + W_\nu = W_\mu$!!

$$\sqrt{m^2c^2 + p^2} + \sqrt{M^2c^2 + P_\nu^2} = \sqrt{M^2c^2 + P_\mu^2}$$

$$m^2c^2 + p^2 = \cancel{2Mc^2} \frac{1}{2} (P_\mu^2 - P_\nu^2) \cancel{+ \sqrt{2Mc^2 (P_\mu^2 + P_\nu^2)}}$$

$$\cancel{(mc^2 + p^2)^2} \quad P_\nu^2 + P_\mu^2 + 2Mc^2 + 2\Lambda\, 2Mc^2$$

$$\frac{1}{2} (P_\nu^2 + 2pP_\nu + p^2 - P_\nu^2)$$

$$\cancel{2Mc^2 - mc^2} - 2P_\mu P_\nu$$

$$m^2c^2 - \quad \boxed{m^2c^2 = pP_\nu + \frac{1}{2}p^2.}$$

$$\bar{H} = \sum_\mu W_\mu a_\mu^+ a_\mu + \sum_i E_i b_i^+ b_i + \sum_{\mu,\nu} a_\mu^+ (b_i^+ V_{\mu\nu}^i + b_i V_{\mu\nu}^{+i}) a_\nu$$

$$V_{\mu\nu}^i = \int \tilde{u}_\mu \gamma \tilde{v}_i u_\nu dv$$

$$V_{\mu\nu}^{+i} = \int \tilde{u}_\mu \gamma^+ v_i u_\nu dv$$

$$V_{\mu\nu}^{+i} = \tilde{V}_{\nu\mu}^i . = \sum_{klm} \int \tilde{u}_\mu^l \tilde{\gamma}_m^{kl} v_i^m u_\nu^k dv$$

$$a_\mu^+ = N_\mu \nu_\mu \Delta_\mu \qquad \nu_\mu = \prod_{\lambda=1}^{\mu} (1-2N_\lambda)$$

$$a_\nu = \Delta_\nu \nu_\nu N_\nu$$

$$a_\mu^+ a_\nu = \underbrace{N_\mu(1-N_\nu)}_{\varepsilon_{\mu\nu}} \nu_\mu \nu_\nu \Delta_\mu \Delta_\nu$$

$\varepsilon_{\mu\nu} = +1$ for $\mu > \nu$
$\varepsilon_{\mu\nu} = -1$ for $\mu < \nu$.

$$b_i^+ = n_i \underline{\varkappa_i \Theta_i} \qquad \varkappa_i = \prod_{j=1}^{i} (1-2n_j)$$

$$b_i = \underline{\Theta_i \varkappa_i} n_i$$

$$\bar{H} = \sum_\mu W_\mu N_\mu + \sum_i E_i n_i + \sum_{\mu,\varkappa}^{i} N_\mu (b_i^+ V_{\mu\mu}^i + b_i \tilde{V}_{\mu\mu}^{i})$$
$$+ \sum_{\mu>\nu}^{i} \{ N_\mu (1-N_\nu) \nu_\mu \nu_\nu \Delta_\mu \Delta_\nu (b_i^+ V_{\mu\nu}^i + b_i \tilde{V}_{\nu\mu}^{i})$$
$$- (1-N_\mu) N_\nu \nu_\mu \nu_\nu \Delta_\mu \Delta_\nu (b_i^+ V_{\nu\mu}^i + b_i \tilde{V}_{\mu\nu}^i) \}$$

$$\cancel{\bar{H}\Psi (N_1 N_2 \cdots ; n_1 n_2 \cdots) =}$$

$$\Psi (N_1 N_2 \cdots ; n_1 n_2 \cdots) = \sum a(N_1' N_2' \cdots ; n_1' n_2' \cdots) \delta (N_1' N_2' \cdots ; n_1' n_2' ; N_1 N_2 \cdots ; n_1 n_2 \cdots)$$

$$\cancel{\dot{a}(N_1' N_2' \cdots ; n_1' n_2' \cdots) =}$$

逆

$$\cancel{\bar{H}\Psi \quad i\hbar \dot{a}(N_1' N_2' \cdots ; n_1' n_2' \cdots) = (\sum_\mu W_\mu N_\mu' + \sum_i E_i n_i') a(N_1' N_2' \cdots ; n_1' n_2' \cdots)}$$

$$\cancel{+ \sum_\mu^i N_\mu' \{ V_{\mu\mu}^i a(N_1' N_2' \cdots ; n}$$

$$\bar{H} = H_0 + H_1 .$$

$$\Psi = \Psi_0 + \Psi_1 + \Psi_2 .$$

$$(\bar{H}_0 + H_1)(\Psi_0 + \Psi_1 + \Psi_2) = (W_0 + W_1 + W_2)(\Psi_0 + \Psi_1 + \Psi_2)$$

$$(H_0 - W_0)\Psi_0 = 0,$$

$$(H_0 - W_0)\Psi_1 = (W_1 - H_1)\Psi_0$$

$$(\quad \text{〃} \quad)\Psi_2 = W_2 \cancel{\Psi_0} + (W_1 - H_1)\Psi_1 .$$

$$W_1 = \int \tilde{\Psi}_0 H_1 \Psi_0$$

$$W_2 = \int \tilde{\Psi}_0 H_1 \Psi_1 - \cancel{\ } W_1 \int \Psi_0 \Psi_1 dv$$

$$\Psi = \delta_{N_1 N_1'} \delta_{N_2 N_2'} \cdots \delta_{n_1 0} \delta_{n_2 0}$$

$$\left(\sum_\mu W_\mu (N_\mu - N_\mu') + \sum E_i n_i\right) \Psi_1 = W_1 \delta_{N_1 N_1'} \delta_{N_2 N_2'} \cdots \delta_{n_1 1} \delta_{m 0} \cdots$$

$$+ \cdots$$

$$W_1 = 0.$$

$$\Psi_1 = -\frac{\sum_\mu^i N_\mu (b_i^+ V_{\mu\mu}^i + b_i \tilde{V}_{\mu\mu}^i) + \sum_{\mu>\nu}^i \{ \cdots \}}{\sum_\mu W_\mu (N_\mu - N_\mu') + \sum_i E_i n_i} \Psi_0$$

$$=$$

$$W_2 = \sum_{n_1 n_2 \cdots} \int \tilde{\Psi}_0 H_1 \Psi_1$$

$$\cancel{\bar{H}(N,n) = H_0 + (N_1 N_2 \cdots n_1 n_2 \cdots | H' | N_1' N_2'}$$

$$\bar{H} \Psi(N,n) = H_0 \Psi(N,n) + \sum_{N'n'} (N, n | H_1 | N' n') \Psi(N' n')$$

$$(H_0 - W_0) \Psi_1 = \sum_{N' n'} (N, n | H_1 | N' n') \Psi_0 (N' n')$$

$$\Psi_1 (N, n) = \frac{\sum_{N' n'} (N, n | H_1 | N' n') \Psi_0 (N' n')}{(H_0 - W_0)(N, n)}$$

$$W_2 = \sum \int \tilde{\Psi}_0 H_1 \Psi_1 (N, n)$$

$$= \sum_{N'' n''} \tilde{\Psi}_0 (N, n) \sum (N n | H_1 | N'' n'') \sum_{N' n'} \frac{(N'' n'' | H_1 | N' n') \Psi_0 (N' n')}{(H_0 - W_0)(N'' n'')}$$

$$\cancel{= \sum_{N n} \Psi_0 (N, n) \frac{|(N n | H_1 | N'' n'')|^2}{H_0 (N'' n'') - W_0}}$$

若し $\Psi_0 (N, n) = \delta_{N, N_0} \cdots$

の時には

$$= \sum_i \sum_{N_i'' n_i''} \frac{|(N_0^{(0)} n_0^{(0)} | H_1 | N'' n'')|^2}{\sum_\mu W_\mu (N_\mu'' - N_\mu^{(0)}) + \sum_i E_i (n_i'' - n_i^{(0)})}$$

$$(N^0, n^0 | H_1 | N_1^{(0)}, N_2^{(0)}, \cdots ;$$

$$W_2 = \sum_\mu \sum_\nu N'_\mu N'_\nu \sum_i \frac{V^i \tilde{V}^i}{E_i}$$

$$+ \sum_{\mu \neq \nu} (1 - N'_\mu) N'_\nu \sum_i \frac{|V^i_{\mu\nu}|^2}{E_i + (1 - 2N'_\mu) W_\mu + (1 - 2N'_\nu) W_\nu}$$

$$\sum_i \frac{V^i_{\mu\nu} \cdot \tilde{V}^i_{\kappa\lambda}}{E_i} = \sum_{jk} \int \cdots \int G_{jk}(r\, r') \tilde{u}_\mu \gamma_j u_\nu \cdot \tilde{u}_\kappa \gamma^\dagger_k u_\lambda(r') \, dv\, dv'$$

N'_ν

$\dot{H} \neq 0$!!!

$i\hbar \frac{\partial \psi}{\partial t} = \cancel{(\psi \bar{H} - \bar{H} \psi) + \cdots}$

$i\hbar \frac{\partial \Psi}{\partial t} =$

$\cancel{H_1 = 0}$.

$\bar{H} \Psi$

$i\hbar \dot{N} = \cdots \bar{H} - \bar{H} \cdots$

$i\hbar \dot{n} = \cdots \bar{H} - \bar{H} \cdots$

流

$\cancel{i\hbar (\dot{N} + \dot{n})} =$

$(\cdots | \dot{N} | \cdots) = (N' n' | \bar{H} | N'' n'')$

$\Psi(N' \cdots)(N' \cdots | \dot{b} | N'' \cdots) \Psi(N'' \cdots) =$

$(N' \cdots | \dot{b} | N'' \cdots) = \tilde{\Psi} \dot{b} \Psi = \tilde{\Psi} H b \Psi + \tilde{\Psi} b H \Psi$

$i\hbar \dot{n}_i = b_i^\dagger V^i - b_i V^i$

$i\hbar \dot{b}_i = H_{ij} b_j + A_i$

$-i\hbar \dot{b}^\dagger_i = H_{ij} b^\dagger_j + A'_i$

$i\hbar \dot{n}_i = \underbrace{b^\dagger_i H_{ij} b_j + b^\dagger_j H_{ji} b_i}_{= 0.} + A_i b^\dagger_i + A'_i b_i$

$\cancel{b^\dagger_i b_j}$

$$\bar{H} = \sum_\mu W_\mu N_\mu + \sum_i \varepsilon_i n_i + \sum_{\mu,\nu}^{i} N_\mu (b_i^\dagger V_{\mu\mu}^i + b_i \tilde{V}_{\mu\mu}^i)$$

$$+ \sum_{\mu>\nu} \{ N_\mu(1-N_\nu) V_\mu V_\nu \Delta_\mu \Delta_\nu (b_i^\dagger V_{\mu\nu}^i + b_i \tilde{V}_{\nu\mu}^i)$$

$$- N_\nu(1-N_\mu) V_\mu V_\nu \Delta_\mu \Delta_\nu (b_i^\dagger V_{\nu\mu}^i + b_i \tilde{V}_{\mu\nu}^i) \}$$

$$i\hbar \frac{\partial \Psi(N_1' N_2' \cdots ; t)}{\partial t}$$

$$= \cancel{\bar{H}\,\Psi(N_1' N_2' \cdots)};\ (N_1' N_2' \cdots | \bar{H} | N_1'' N_2'' \cdots t)\, \Psi(N_1'' N_2'' \cdots ; t).$$

$$= \sum_\mu W_\mu N_\mu' + \sum_i \varepsilon_i n_i' \,\Psi(N_1' N_2' \cdots n_1' n_2' \cdots) + \sum_{\mu,\nu}^{i} N_\mu' \{ (n_1' n_2' \cdots | b_i^\dagger | n_1' n_2' \cdots 1-n_i' \cdots) V_{\mu\mu}^i$$

$$+ (n_1' n_2' \cdots | b_i | n_1' n_2' \cdots 1-n_i' \cdots) \tilde{V}_{\mu\mu}^i \} \Psi(N_1' N_2' \cdots n_1' \cdots 1-n_i' \cdots)$$

$$+ \sum_{\mu>\nu} \{ N_\mu'(1-N_\nu') V_\mu' V_\nu' (N_\mu' | \Delta_\mu | \cdots 1-N_\mu' \cdots)(\cdots | \Delta_\nu | \cdots 1-N_\nu' \cdots)$$

$$\} \Psi(\cdots 1-N_\nu' \cdots 1-N_\mu' \cdots 1-n_i' \cdots)$$

$$(\quad | \bar{H} | \quad)(1-S \quad).\ \int v_i(x) \psi^\dagger(x) \psi(x') v_i(x') = n_i$$

$$n_i(1-n_i) = 0,$$

$$\cancel{b_i}\quad b_i = \cancel{0}\qquad \frac{d}{dt}\{n_i(1-n_i)\} = 0.$$

$$\cancel{N_\mu \dot{H} = \dot{H} N_\mu} \qquad \cancel{\dot{n}_i = 0}$$

$$\int \psi^\dagger(x) \psi(x') v_i(x) dv \; v_j^*(x') dv' \qquad \int b_i^\dagger v_i v_j b_j dv = b_i^\dagger b_i$$

$$\dot{H} \neq 0.$$

$$H \qquad i\hbar \frac{d}{dt}(\psi^\dagger(x)\psi(x')) = \{\psi^\dagger(x) \bar{H}_1 - \bar{H}_1 \psi^\dagger(x)\} \psi(x')$$

$$+ \psi^\dagger(x) \{\bar{H}_1 \psi(x') - \psi(x') \bar{H}_1\}$$

$$\cancel{\dot{n}_i = 0},\ \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} + \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} = 0$$

$$+ \{ \psi^\dagger(x) \bar{H}_2 + \bar{H}_2 \psi^\dagger(x) \} \psi(x')$$

$$1 \to 0 \quad \begin{pmatrix} 0 & 0 \\ a_{21} & a_{22} \end{pmatrix} + \begin{pmatrix} a_{11} & 0 \\ a_{21} & 0 \end{pmatrix} = 0$$

$$\dot{n}_i - n_i \qquad n_i - n_i^2 = 0. \qquad \dot{n}_i = \begin{pmatrix} 0 & 0 \\ c & 0 \end{pmatrix}$$

$$- \psi^\dagger(x) \{ \bar{H}_2 \psi(x') + \psi(x') \bar{H}_2 \}$$

$$\cancel{\dot{n}_i(1-2n_i)}$$

$$= \{ \psi^\dagger(x) \{\bar{H}_1 + \bar{H}_2\} - \{\bar{H}_1 - \bar{H}_2\} \psi^\dagger(x) \} \psi(x')$$

$$\dot{n}_i - (\dot{n}_i n_i + n_i \dot{n}_i) = 0$$

$$\dot{n}_i - \dot{n}_i n_i - n_i \dot{n}_i = 0.$$

$$\psi^\dagger(x) (\bar{H}_1 - \bar{H}_2) \psi(x') - \psi(x') (\bar{H}_1 + \bar{H}_2) \}$$

$$\dot{n}_i (1 - n_i) = n_i \dot{n}_i$$

$$i\hbar \frac{d}{dt}(\psi^\dagger(x) \psi(x')) = \psi^\dagger(x) \{ \cancel{(\bar{H}_1 + \bar{H}_2)} \psi(x') (\bar{H}_1 + \bar{H}_2) - (\bar{H}_1 - \bar{H}_2) \psi(x') \}$$

$$+ \{ \psi^\dagger(x) (\bar{H}_1 - \bar{H}_2) - (\bar{H}_1 + \bar{H}_2) \psi^\dagger(x) \} \psi(x')$$

$$i\hbar \frac{d}{dt} (\psi(x') \psi^\dagger(x)) = \psi(x') \{ (\bar{H}_1 + \bar{H}_2) \psi^\dagger(x) - (\bar{H}_1 - \bar{H}_2) \psi^\dagger(x) \}$$

$$+$$