Spin-orbitals, terms, and wave functions for two-electrons in the 32 crystallographic point groups

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This tables collect symbolic expressions for the terms of two-electrons under the point group symmetry of the 32 crystallographic point groups.

In the expressions for the wave functions for the various terms under each group the vertical bars denote determinantal states of the two enclosed spin-orbital symbols. If the symbol for a spin orbital is decorated with a top bar that denotes that it has spin down, if not decorated thus then it has spin up. The different wave functions are grouped under headings in red that denote the origin of the wave functions that follow, in the sense of which two irreducible representations gave way to them. Each term may contain more that one basis for the irreducible representation of the term, if this is the case then the several bases can be identified as grouping of wave functions under the same red heading, with the same value for M and a full collection of component symbols for the irreducible representation of the term.

The provided expressions for the wave functions are eigenvectors of S^2, S_z, and together with the adequate other wave functions in the term form bases for the corresponding irreducible representation. The "z-axis" here may be taken as any axis that is convenient to choose according to the symmetries of the different groups.

For the electronic access to these tables, an electronic version is provided in the GitHub repository for `qdef` in the file `./Data/2e-terms.pkl`. It consists of a python dictionary whose keys are labels for the different groups, and whose values are `qdefcore.Term` objects that include symbolic expressions for the wave functions as well as additional information for the corresponding term.

Contents

1 Spin-orbitals

Group C_1

$A{\cdot}A:$

$|\alpha\overline{\alpha}|$

Group C_i

$A_g{\cdot}A_g:$

$|\alpha_g\overline{\alpha_g}|$

$A_u{\cdot}A_u:$

$|\alpha_u\overline{\alpha_u}|$

Group C_2

$A{\cdot}A:$

$|\alpha\overline{\alpha}|$

$B{\cdot}B:$

$|\beta\overline{\beta}|$

Group C_s

$A^{'}{\cdot}A^{'}:$

$|\alpha\overline{\alpha}|$

$A^{''}{\cdot}A^{''}:$

$|\beta\overline{\beta}|$

Group C_{2h}

$A_g{\cdot}A_g:$

$|\alpha_g\overline{\alpha_g}|$

$B_u{\cdot}B_u:$

$|\beta_u\overline{\beta_u}|$

$A_u{\cdot}A_u:$

$|\alpha_u\overline{\alpha_u}|$

$B_g{\cdot}B_g:$

$|\beta_g\overline{\beta_g}|$

Group D_2

$A_1{\cdot}A_1:$

$|\alpha\overline{\alpha}|$

$B_1{\cdot}B_1:$

$|\beta\overline{\beta}|$

$B_2{\cdot}B_2:$

$|\gamma\overline{\gamma}|$

$B_3{\cdot}B_3:$

$|\zeta\overline{\zeta}|$

Group C_{2v}

$A_1{\cdot}A_1:$

$|\alpha\overline{\alpha}|$

$B_2{\cdot}B_2:$

$|\zeta\overline{\zeta}|$

$B_1{\cdot}B_1:$

$|\gamma\overline{\gamma}|$

$A_2{\cdot}A_2:$

$|\beta\overline{\beta}|$

Group D_{2h}

$A_{1g}{\cdot}A_{1g}:$

$|\alpha_g\overline{\alpha_g}|$

$B_{3u}{\cdot}B_{3u}:$

$|\zeta_u\overline{\zeta_u}|$

$B_{1u}{\cdot}B_{1u}:$

$|\beta_u\overline{\beta_u}|$

$B_{2u}{\cdot}B_{2u}:$

$|\gamma_u\overline{\gamma_u}|$

$A_{1u}{\cdot}A_{1u}:$

$|\alpha_u\overline{\alpha_u}|$

$B_{3g}{\cdot}B_{3g}:$

$|\zeta_g\overline{\zeta_g}|$

$B_{1g}{\cdot}B_{1g}:$

$|\beta_g\overline{\beta_g}|$

$B_{2g}{\cdot}B_{2g}:$

$|\gamma_g\overline{\gamma_g}|$

Group C_4

$A{\cdot}A:$

$|\alpha\overline{\alpha}|$

$E^1{\cdot}E^1:$

$|\gamma\overline{\gamma}|$

$E^2{\cdot}E^2:$

$|\zeta\overline{\zeta}|$

$B{\cdot}B:$

$|\beta\overline{\beta}|$

Group S_4

$A{\cdot}A:$

$|\alpha\overline{\alpha}|$

$E^1{\cdot}E^1:$

$|\gamma\overline{\gamma}|$

$E^2{\cdot}E^2:$

$|\zeta\overline{\zeta}|$

$B \cdot B$:

$|\beta\overline{\beta}|$

Group C_{4h}

$\Gamma^1 \cdot \Gamma^1$:

$|\gamma_1\overline{\gamma_1}|$

$\Gamma^2 \cdot \Gamma^2$:

$|\gamma_2\overline{\gamma_2}|$

$\Gamma^3 \cdot \Gamma^3$:

$|\gamma_3\overline{\gamma_3}|$

$\Gamma^4 \cdot \Gamma^4$:

$|\gamma_4\overline{\gamma_4}|$

$\Gamma^5 \cdot \Gamma^5$:

$|\gamma_5\overline{\gamma_5}|$

$\Gamma^6 \cdot \Gamma^6$:

$|\gamma_6\overline{\gamma_6}|$

$\Gamma^7 \cdot \Gamma^7$:

$|\gamma_7\overline{\gamma_7}|$

$\Gamma^8 \cdot \Gamma^8$:

$|\gamma_8\overline{\gamma_8}|$

Group D_4

$A_1 \cdot A_1$:

$|\alpha\overline{\alpha}|$

$A_2 \cdot A_2$:

$|\beta\overline{\beta}|$

$B_2 \cdot B_2$:

$|\zeta\overline{\zeta}|$

$B_1 \cdot B_1$:

$|\gamma\overline{\gamma}|$

$E \cdot E$:

$|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\mu\overline{\mu}|$

Group C_{4v}

$A_1 \cdot A_1$:

$|\alpha\overline{\alpha}|$

$A_2 \cdot A_2$:

$|\beta\overline{\beta}|$

$B_2 \cdot B_2$:

$|\zeta\overline{\zeta}|$

$B_1 \cdot B_1$:

$|\gamma\overline{\gamma}|$

$E \cdot E$:

$|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\mu\overline{\mu}|$

Group D_{2d}

$A_1 \cdot A_1$:

$|\alpha\overline{\alpha}|$

$B_1 \cdot B_1$:

$|\gamma\overline{\gamma}|$

$A_2 \cdot A_2$:

$|\beta\overline{\beta}|$

$B_2 \cdot B_2$:

$|\zeta\overline{\zeta}|$

$E \cdot E$:

$|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\mu\overline{\mu}|$

Group D_{4h}

$A_{1g} \cdot A_{1g}$:

$|\alpha_g\overline{\alpha_g}|$

$A_{2g} \cdot A_{2g}$:

$|\beta_g\overline{\beta_g}|$

$B_{2g} \cdot B_{2g}$:

$|\zeta_g\overline{\zeta_g}|$

$A_{2u} \cdot A_{2u}$:

$|\beta_u\overline{\beta_u}|$

$B_{2u} \cdot B_{2u}$:

$|\zeta_u\overline{\zeta_u}|$

$B_{1u} \cdot B_{1u}$:

$|\gamma_u\overline{\gamma_u}|$

$A_{1u} \cdot A_{1u}$:

$|\alpha_u\overline{\alpha_u}|$

$B_{1g} \cdot B_{1g}$:

$|\gamma_g\overline{\gamma_g}|$

$E_u \cdot E_u$:

$|\eta_u\overline{\eta_u}|$, $|\eta_u\mu_u|$, $|\eta_u\overline{\mu_u}|$, $|\overline{\eta_u}\mu_u|$, $|\overline{\eta_u}\overline{\mu_u}|$, $|\mu_u\overline{\mu_u}|$

$E_g \cdot E_g$:

$|\eta_g\overline{\eta_g}|$, $|\eta_g\mu_g|$, $|\eta_g\overline{\mu_g}|$, $|\overline{\eta_g}\mu_g|$, $|\overline{\eta_g}\overline{\mu_g}|$, $|\mu_g\overline{\mu_g}|$

Group C_3

$A \cdot A$:

$|\alpha\overline{\alpha}|$

$E^1 \cdot E^1$:

$|\beta\overline{\beta}|$

$E^2 \cdot E^2$:

$|\gamma\overline{\gamma}|$

Group S_6

$A_g \cdot A_g$:

$|\alpha_g\overline{\alpha_g}|$

$A_u \cdot A_u$:

$|\alpha_u\overline{\alpha_u}|$

$E_u^1 \cdot E_u^1$:

$|\beta_u\overline{\beta_u}|$

$E_u^2 \cdot E_u^2$:

$|\gamma_u \overline{\gamma_u}|$

$E_g^2 \cdot E_g^2$:

$|\gamma_g \overline{\gamma_g}|$

$E_g^1 \cdot E_g^1$:

$|\beta_g \overline{\beta_g}|$

Group D_3

$A_1 \cdot A_1$:

$|\alpha\overline{\alpha}|$

$A_2 \cdot A_2$:

$|\beta\overline{\beta}|$

$E \cdot E$:

$|\gamma\overline{\gamma}|$, $|\gamma\zeta|$, $|\gamma\overline{\zeta}|$, $|\overline{\gamma}\zeta|$, $|\overline{\gamma}\overline{\zeta}|$, $|\zeta\overline{\zeta}|$

Group C_{3v}

$A_1 \cdot A_1$:

$|\alpha\overline{\alpha}|$

$A_2 \cdot A_2$:

$|\beta\overline{\beta}|$

$E \cdot E$:

$|\gamma\overline{\gamma}|$, $|\gamma\zeta|$, $|\gamma\overline{\zeta}|$, $|\overline{\gamma}\zeta|$, $|\overline{\gamma}\overline{\zeta}|$, $|\zeta\overline{\zeta}|$

Group D_{3d}

$A_{1g} \cdot A_{1g}$:

$|\alpha_g \overline{\alpha_g}|$

$A_{1u} \cdot A_{1u}$:

$|\alpha_u \overline{\alpha_u}|$

$A_{2u} \cdot A_{2u}$:

$|\beta_u \overline{\beta_u}|$

$A_{2g} \cdot A_{2g}$:

$|\beta_g \overline{\beta_g}|$

$E_g \cdot E_g$:

$|\gamma_g \overline{\gamma_g}|$, $|\gamma_g \zeta_g|$, $|\gamma_g \overline{\zeta_g}|$, $|\overline{\gamma_g} \zeta_g|$, $|\overline{\gamma_g}\,\overline{\zeta_g}|$, $|\zeta_g \overline{\zeta_g}|$

$E_u \cdot E_u$:

$|\gamma_u \overline{\gamma_u}|$, $|\gamma_u \zeta_u|$, $|\gamma_u \overline{\zeta_u}|$, $|\overline{\gamma_u} \zeta_u|$, $|\overline{\gamma_u}\,\overline{\zeta_u}|$, $|\zeta_u \overline{\zeta_u}|$

Group C_6

$A \cdot A$:

$|\alpha\overline{\alpha}|$

$B \cdot B$:

$|\beta\overline{\beta}|$

$E'^1 \cdot E'^1$:

$|\eta\overline{\eta}|$

$E'^2 \cdot E'^2$:

$|\mu\overline{\mu}|$

$E''^2 \cdot E''^2$:

$|\zeta\overline{\zeta}|$

$E''^1 \cdot E''^1$:

$|\gamma\overline{\gamma}|$

Group C_{3h}

$A' \cdot A'$:

$|\alpha\overline{\alpha}|$

$A'' \cdot A''$:

$|\beta\overline{\beta}|$

$E''^2 \cdot E''^2$:

$|\zeta\overline{\zeta}|$

$E''^1 \cdot E''^1$:

$|\gamma\overline{\gamma}|$

$E'^2 \cdot E'^2$:

$|\mu\overline{\mu}|$

$E'^1 \cdot E'^1$:

$|\eta\overline{\eta}|$

Group C_{6h}

$\Gamma^1 \cdot \Gamma^1$:

$|\gamma_4 \overline{\gamma_4}|$

$\Gamma^2 \cdot \Gamma^2$:

$|\gamma_5 \overline{\gamma_5}|$

$\Gamma^3 \cdot \Gamma^3$:

$|\gamma_6 \overline{\gamma_6}|$

$\Gamma^4 \cdot \Gamma^4$:

$|\gamma_7 \overline{\gamma_7}|$

$\Gamma^5 \cdot \Gamma^5$:

$|\gamma_8 \overline{\gamma_8}|$

$\Gamma^6 \cdot \Gamma^6$:

$|\gamma_9 \overline{\gamma_9}|$

$\Gamma^7 \cdot \Gamma^7$:

$|\gamma_{10} \overline{\gamma_{10}}|$

$\Gamma^8 \cdot \Gamma^8$:

$|\gamma_{11} \overline{\gamma_{11}}|$

$\Gamma^9 \cdot \Gamma^9$:

$|\gamma_{12} \overline{\gamma_{12}}|$

$\Gamma^{10} \cdot \Gamma^{10}$:

$|\gamma_1 \overline{\gamma_1}|$

$\Gamma^{11} \cdot \Gamma^{11}$:

$|\gamma_2 \overline{\gamma_2}|$

$\Gamma^{12} \cdot \Gamma^{12}$:

$|\gamma_3 \overline{\gamma_3}|$

Group D_6

$A_1 \cdot A_1$:

$|\alpha\overline{\alpha}|$

$B_1 \cdot B_1$:

$|\gamma\overline{\gamma}|$

$B_2 \cdot B_2$:

$|\zeta\overline{\zeta}|$

$A_2 \cdot A_2$:

$|\beta\overline{\beta}|$

$E_2 \cdot E_2$:

$|\nu\overline{\nu}|$, $|\nu\xi|$, $|\nu\overline{\xi}|$, $|\overline{\nu}\xi|$, $|\overline{\nu}\overline{\xi}|$, $|\xi\overline{\xi}|$

$E_1 \cdot E_1$:

$|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\mu\overline{\mu}|$

Group C_{6v}

$A_1 \cdot A_1$:

$|\alpha\overline{\alpha}|$

$B_2 \cdot B_2$:

$|\zeta\overline{\zeta}|$

$B_1 \cdot B_1$:

$|\gamma\overline{\gamma}|$

$A_2 \cdot A_2$:

$|\beta\overline{\beta}|$

$E_2 \cdot E_2$:

$|\nu\overline{\nu}|$, $|\nu\xi|$, $|\nu\overline{\xi}|$, $|\overline{\nu}\xi|$, $|\overline{\nu}\overline{\xi}|$, $|\xi\overline{\xi}|$

$E_1 \cdot E_1$:

$|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\mu\overline{\mu}|$

Group D_{3h}

$A_1^{'} \cdot A_1^{'}$:

$|\alpha\overline{\alpha}|$

$A_2^{''} \cdot A_2^{''}$:

$|\zeta\overline{\zeta}|$

$A_1^{''} \cdot A_1^{''}$:

$|\gamma\overline{\gamma}|$

$A_2^{'} \cdot A_2^{'}$:

$|\beta\overline{\beta}|$

$E^{'} \cdot E^{'}$:

$|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\mu\overline{\mu}|$

$E^{''} \cdot E^{''}$:

$|\nu\overline{\nu}|$, $|\nu\xi|$, $|\nu\overline{\xi}|$, $|\overline{\nu}\xi|$, $|\overline{\nu}\overline{\xi}|$, $|\xi\overline{\xi}|$

Group D_{6h}

$A_{1g} \cdot A_{1g}$:

$|\alpha_g\overline{\alpha_g}|$

$A_{2u} \cdot A_{2u}$:

$|\beta_u\overline{\beta_u}|$

$A_{1u} \cdot A_{1u}$:

$|\alpha_u\overline{\alpha_u}|$

$B_{1g} \cdot B_{1g}$:

$|\gamma_g\overline{\gamma_g}|$

$B_{2g} \cdot B_{2g}$:

$|\zeta_g\overline{\zeta_g}|$

$B_{1u} \cdot B_{1u}$:

$|\gamma_u\overline{\gamma_u}|$

$B_{2u} \cdot B_{2u}$:

$|\zeta_u\overline{\zeta_u}|$

$A_{2g} \cdot A_{2g}$:

$|\beta_g\overline{\beta_g}|$

$E_{2g} \cdot E_{2g}$:

$|\nu_g\overline{\nu_g}|$, $|\nu_g\xi_g|$, $|\nu_g\overline{\xi_g}|$, $|\overline{\nu_g}\xi_g|$, $|\overline{\nu_g}\overline{\xi_g}|$, $|\xi_g\overline{\xi_g}|$

$E_{1u} \cdot E_{1u}$:

$|\eta_u\overline{\eta_u}|$, $|\eta_u\mu_u|$, $|\eta_u\overline{\mu_u}|$, $|\overline{\eta_u}\mu_u|$, $|\overline{\eta_u}\overline{\mu_u}|$, $|\mu_u\overline{\mu_u}|$

$E_{1g} \cdot E_{1g}$:

$|\eta_g\overline{\eta_g}|$, $|\eta_g\mu_g|$, $|\eta_g\overline{\mu_g}|$, $|\overline{\eta_g}\mu_g|$, $|\overline{\eta_g}\overline{\mu_g}|$, $|\mu_g\overline{\mu_g}|$

$E_{2u} \cdot E_{2u}$:

$|\nu_u\overline{\nu_u}|$, $|\nu_u\xi_u|$, $|\nu_u\overline{\xi_u}|$, $|\overline{\nu_u}\xi_u|$, $|\overline{\nu_u}\overline{\xi_u}|$, $|\xi_u\overline{\xi_u}|$

Group T

$A \cdot A$:

$|\alpha\overline{\alpha}|$

$E^1 \cdot E^1$:

$|\beta\overline{\beta}|$

$E^2 \cdot E^2$:

$|\gamma\overline{\gamma}|$

$T \cdot T$:

$|\zeta\overline{\zeta}|$, $|\zeta\eta|$, $|\zeta\overline{\eta}|$, $|\overline{\zeta}\eta|$, $|\overline{\zeta}\overline{\eta}|$, $|\zeta\mu|$, $|\zeta\overline{\mu}|$, $|\overline{\zeta}\mu|$, $|\overline{\zeta}\overline{\mu}|$, $|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\mu\overline{\mu}|$

Group T_h

$A_g \cdot A_g$:

$|\alpha_g\overline{\alpha_g}|$

$A_u \cdot A_u$:

$|\alpha_u\overline{\alpha_u}|$

$E_u^1 \cdot E_u^1$:

$|\beta_u\overline{\beta_u}|$

$E_u^2 \cdot E_u^2$:

$|\gamma_u\overline{\gamma_u}|$

$E_g^2 \cdot E_g^2$:

$|\gamma_g\overline{\gamma_g}|$

$E_g^1 \cdot E_g^1$:

$|\beta_g\overline{\beta_g}|$

$T_g \cdot T_g$:

$|\zeta_g\overline{\zeta_g}|$, $|\zeta_g\eta_g|$, $|\zeta_g\overline{\eta_g}|$, $|\overline{\zeta_g}\eta_g|$, $|\overline{\zeta_g}\overline{\eta_g}|$, $|\zeta_g\mu_g|$, $|\zeta_g\overline{\mu_g}|$, $|\overline{\zeta_g}\mu_g|$, $|\overline{\zeta_g}\overline{\mu_g}|$, $|\eta_g\overline{\eta_g}|$, $|\eta_g\mu_g|$, $|\eta_g\overline{\mu_g}|$, $|\overline{\eta_g}\mu_g|$, $|\overline{\eta_g}\overline{\mu_g}|$, $|\mu_g\overline{\mu_g}|$

$T_u{\cdot}T_u$:

$|\zeta_u\overline{\zeta_u}|$, $|\zeta_u\eta_u|$, $|\zeta_u\overline{\eta_u}|$, $|\overline{\zeta_u}\eta_u|$, $|\overline{\zeta_u}\overline{\eta_u}|$, $|\zeta_u\mu_u|$, $|\zeta_u\overline{\mu_u}|$, $|\overline{\zeta_u}\mu_u|$, $|\overline{\zeta_u}\overline{\mu_u}|$, $|\eta_u\overline{\eta_u}|$, $|\eta_u\mu_u|$, $|\eta_u\overline{\mu_u}|$, $|\overline{\eta_u}\mu_u|$, $|\overline{\eta_u}\overline{\mu_u}|$, $|\mu_u\overline{\mu_u}|$

Group O

$A_1{\cdot}A_1$:

$|\alpha\overline{\alpha}|$

$A_2{\cdot}A_2$:

$|\beta\overline{\beta}|$

$E{\cdot}E$:

$|\gamma\overline{\gamma}|$, $|\gamma\zeta|$, $|\gamma\overline{\zeta}|$, $|\overline{\gamma}\zeta|$, $|\overline{\gamma}\overline{\zeta}|$, $|\zeta\overline{\zeta}|$

$T_1{\cdot}T_1$:

$|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\eta\nu|$, $|\eta\overline{\nu}|$, $|\overline{\eta}\nu|$, $|\overline{\eta}\overline{\nu}|$, $|\mu\overline{\mu}|$, $|\mu\nu|$, $|\mu\overline{\nu}|$, $|\overline{\mu}\nu|$, $|\overline{\mu}\overline{\nu}|$, $|\nu\overline{\nu}|$

$T_2{\cdot}T_2$:

$|\xi\overline{\xi}|$, $|\xi\phi|$, $|\xi\overline{\phi}|$, $|\overline{\xi}\phi|$, $|\overline{\xi}\overline{\phi}|$, $|\xi\chi|$, $|\xi\overline{\chi}|$, $|\overline{\xi}\chi|$, $|\overline{\xi}\overline{\chi}|$, $|\phi\overline{\phi}|$, $|\phi\chi|$, $|\phi\overline{\chi}|$, $|\overline{\phi}\chi|$, $|\overline{\phi}\overline{\chi}|$, $|\chi\overline{\chi}|$

Group T_d

$A_1{\cdot}A_1$:

$|\alpha\overline{\alpha}|$

$A_2{\cdot}A_2$:

$|\beta\overline{\beta}|$

$E{\cdot}E$:

$|\gamma\overline{\gamma}|$, $|\gamma\zeta|$, $|\gamma\overline{\zeta}|$, $|\overline{\gamma}\zeta|$, $|\overline{\gamma}\overline{\zeta}|$, $|\zeta\overline{\zeta}|$

$T_2{\cdot}T_2$:

$|\xi\overline{\xi}|$, $|\xi\phi|$, $|\xi\overline{\phi}|$, $|\overline{\xi}\phi|$, $|\overline{\xi}\overline{\phi}|$, $|\xi\chi|$, $|\xi\overline{\chi}|$, $|\overline{\xi}\chi|$, $|\overline{\xi}\overline{\chi}|$, $|\phi\overline{\phi}|$, $|\phi\chi|$, $|\phi\overline{\chi}|$, $|\overline{\phi}\chi|$, $|\overline{\phi}\overline{\chi}|$, $|\chi\overline{\chi}|$

$T_1{\cdot}T_1$:

$|\eta\overline{\eta}|$, $|\eta\mu|$, $|\eta\overline{\mu}|$, $|\overline{\eta}\mu|$, $|\overline{\eta}\overline{\mu}|$, $|\eta\nu|$, $|\eta\overline{\nu}|$, $|\overline{\eta}\nu|$, $|\overline{\eta}\overline{\nu}|$, $|\mu\overline{\mu}|$, $|\mu\nu|$, $|\mu\overline{\nu}|$, $|\overline{\mu}\nu|$, $|\overline{\mu}\overline{\nu}|$, $|\nu\overline{\nu}|$

Group O_h

$A_{1g}{\cdot}A_{1g}$:

$|\alpha_g\overline{\alpha_g}|$

$A_{2u}{\cdot}A_{2u}$:

$|\beta_u\overline{\beta_u}|$

$A_{1u}{\cdot}A_{1u}$:

$|\alpha_u\overline{\alpha_u}|$

$A_{2g}{\cdot}A_{2g}$:

$|\beta_g\overline{\beta_g}|$

$E_u{\cdot}E_u$:

$|\gamma_u\overline{\gamma_u}|$, $|\gamma_u\zeta_u|$, $|\gamma_u\overline{\zeta_u}|$, $|\overline{\gamma_u}\zeta_u|$, $|\overline{\gamma_u}\overline{\zeta_u}|$, $|\zeta_u\overline{\zeta_u}|$

$E_g{\cdot}E_g$:

$|\gamma_g\overline{\gamma_g}|$, $|\gamma_g\zeta_g|$, $|\gamma_g\overline{\zeta_g}|$, $|\overline{\gamma_g}\zeta_g|$, $|\overline{\gamma_g}\overline{\zeta_g}|$, $|\zeta_g\overline{\zeta_g}|$

$T_{1g}{\cdot}T_{1g}$:

$|\eta_g\overline{\eta_g}|$, $|\eta_g\mu_g|$, $|\eta_g\overline{\mu_g}|$, $|\overline{\eta_g}\mu_g|$, $|\overline{\eta_g}\overline{\mu_g}|$, $|\eta_g\nu_g|$, $|\eta_g\overline{\nu_g}|$, $|\overline{\eta_g}\nu_g|$, $|\overline{\eta_g}\overline{\nu_g}|$, $|\mu_g\overline{\mu_g}|$, $|\mu_g\nu_g|$, $|\mu_g\overline{\nu_g}|$, $|\overline{\mu_g}\nu_g|$, $|\overline{\mu_g}\overline{\nu_g}|$, $|\nu_g\overline{\nu_g}|$

$T_{2g}{\cdot}T_{2g}$:

$|\xi_g\overline{\xi_g}|$, $|\xi_g\phi_g|$, $|\xi_g\overline{\phi_g}|$, $|\overline{\xi_g}\phi_g|$, $|\overline{\xi_g}\overline{\phi_g}|$, $|\xi_g\chi_g|$, $|\xi_g\overline{\chi_g}|$, $|\overline{\xi_g}\chi_g|$, $|\overline{\xi_g}\overline{\chi_g}|$, $|\phi_g\overline{\phi_g}|$, $|\phi_g\chi_g|$, $|\phi_g\overline{\chi_g}|$, $|\overline{\phi_g}\chi_g|$, $|\overline{\phi_g}\overline{\chi_g}|$, $|\chi_g\overline{\chi_g}|$

$T_{1u}{\cdot}T_{1u}$:

$|\eta_u\overline{\eta_u}|$, $|\eta_u\mu_u|$, $|\eta_u\overline{\mu_u}|$, $|\overline{\eta_u}\mu_u|$, $|\overline{\eta_u}\overline{\mu_u}|$, $|\eta_u\nu_u|$, $|\eta_u\overline{\nu_u}|$, $|\overline{\eta_u}\nu_u|$, $|\overline{\eta_u}\overline{\nu_u}|$, $|\mu_u\overline{\mu_u}|$, $|\mu_u\nu_u|$, $|\mu_u\overline{\nu_u}|$, $|\overline{\mu_u}\nu_u|$, $|\overline{\mu_u}\overline{\nu_u}|$, $|\nu_u\overline{\nu_u}|$

$T_{2u}{\cdot}T_{2u}$:

$|\xi_u\overline{\xi_u}|$, $|\xi_u\phi_u|$, $|\xi_u\overline{\phi_u}|$, $|\overline{\xi_u}\phi_u|$, $|\overline{\xi_u}\overline{\phi_u}|$, $|\xi_u\chi_u|$, $|\xi_u\overline{\chi_u}|$, $|\overline{\xi_u}\chi_u|$, $|\overline{\xi_u}\overline{\chi_u}|$, $|\phi_u\overline{\phi_u}|$, $|\phi_u\chi_u|$, $|\phi_u\overline{\chi_u}|$, $|\overline{\phi_u}\chi_u|$, $|\overline{\phi_u}\overline{\chi_u}|$, $|\chi_u\overline{\chi_u}|$

2 Terms and wave functions

2.1 Group C_1

Component labels

$A : \{\alpha\}$

2.1.1 ^1A

a^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a^2, {}^1A, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

2.2 Group C_i

Component labels

$A_g : \{\alpha_g\}$ —— $A_u : \{\alpha_u\}$

2.2.1 ^1A_g

a_g^2

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_g\alpha_g\rangle}$$

$$\Psi_1(a_g^2, {}^1A_g, M=0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

a_u^2

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_2(a_u^2, {}^1A_g, M=0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

2.2.2 ^3A_u

$a_g a_u$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_g a_u, {}^3A_u, M=-1, \alpha_u) = |\overline{\alpha_g}\overline{\alpha_u}|$$

$$\Psi_2(a_g a_u, {}^3A_u, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$$\Psi_3(a_g a_u, {}^3A_u, M=1, \alpha_u) = |\alpha_g\alpha_u|$$

2.2.3 ^1A_u

$a_g a_u$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_g a_u, {}^1A_u, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

2.3 Group C_2

Component labels

$A : \{\alpha\}$ —— $B : \{\beta\}$

2.3.1 ^1A

a^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a^2, {}^1A, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

b^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(b^2, {}^1A, M=0, \alpha) = -|\overline{\beta}\beta|$$

2.3.2 ^3B

ab

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(ab, {}^3B, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$

$$\Psi_2(ab, {}^3B, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$$\Psi_3(ab, {}^3B, M=1, \beta) = |\alpha\beta|$$

2.3.3 ^1B

ab

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(ab, {}^1B, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

2.4 Group C_s

Component labels

$A^{'} : \{\alpha\}$ —— $A^{''} : \{\beta\}$

2.4.1 $^1A^{'}$

$\left(a^{'}\right)^2$

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(\left(a^{'}\right)^2, {}^1A^{'}, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

$\left(a^{''}\right)^2$

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(\left(a^{''}\right)^2, {}^1A^{'}, M=0, \alpha) = -|\overline{\beta}\beta|$$

2.4.2 $^3A^{''}$

$a^{'}a^{''}$

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a^{'}a^{''}, {}^3A^{''}, M{=}{-1}, \beta) = \left|\overline{\alpha}\overline{\beta}\right|$$
$$\Psi_2(a^{'}a^{''}, {}^3A^{''}, M{=}0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}\left|\alpha\overline{\beta}\right|}{2}$$
$$\Psi_3(a^{'}a^{''}, {}^3A^{''}, M{=}1, \beta) = |\alpha\beta|$$

2.4.3 $^1A^{''}$

$a^{'}a^{''}$

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a^{'}a^{''}, {}^1A^{''}, M{=}0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}\left|\alpha\overline{\beta}\right|}{2}$$

2.5 Group C_{2h}

Component labels

$A_g : \{\alpha_g\}$ —— $B_u : \{\beta_u\}$ —— $A_u : \{\alpha_u\}$ —— $B_g : \{\beta_g\}$

2.5.1 ^1A_g

a_g^2

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_g\alpha_g\rangle}$$

$$\Psi_1(a_g^2, {}^1A_g, M{=}0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

b_u^2

$$\boxed{\Delta E = \langle\beta_u\beta_u||\beta_u\beta_u\rangle}$$

$$\Psi_2(b_u^2, {}^1A_g, M{=}0, \alpha_g) = -\left|\overline{\beta_u}\beta_u\right|$$

a_u^2

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_3(a_u^2, {}^1A_g, M{=}0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

b_g^2

$$\boxed{\Delta E = \langle\beta_g\beta_g||\beta_g\beta_g\rangle}$$

$$\Psi_4(b_g^2, {}^1A_g, M{=}0, \alpha_g) = -\left|\overline{\beta_g}\beta_g\right|$$

2.5.2 ^3B_u

$a_g b_u$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle\alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_1(a_g b_u, {}^3B_u, M{=}{-1}, \beta_u) = \left|\overline{\alpha_g}\overline{\beta_u}\right|$$
$$\Psi_2(a_g b_u, {}^3B_u, M{=}0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}\left|\alpha_g\overline{\beta_u}\right|}{2}$$
$$\Psi_3(a_g b_u, {}^3B_u, M{=}1, \beta_u) = |\alpha_g\beta_u|$$

$a_u b_g$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\beta_g\beta_g\rangle + \langle\alpha_u\beta_g||\alpha_u\beta_g\rangle}$$

$$\Psi_4(a_u b_g, {}^3B_u, M{=}{-1}, \beta_u) = \left|\overline{\alpha_u}\overline{\beta_g}\right|$$
$$\Psi_5(a_u b_g, {}^3B_u, M{=}0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}\left|\alpha_u\overline{\beta_g}\right|}{2}$$
$$\Psi_6(a_u b_g, {}^3B_u, M{=}1, \beta_u) = |\alpha_u\beta_g|$$

2.5.3 ^1B_u

$a_g b_u$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle\alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_1(a_g b_u, {}^1B_u, M{=}0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}\left|\alpha_g\overline{\beta_u}\right|}{2}$$

$a_u b_g$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\beta_g\beta_g\rangle + \langle\alpha_u\beta_g||\alpha_u\beta_g\rangle}$$

$$\Psi_2(a_u b_g, {}^1B_u, M{=}0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}\left|\alpha_u\overline{\beta_g}\right|}{2}$$

2.5.4 ^3A_u

$a_g a_u$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle \alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_ga_u, {}^3A_u, M=-1, \alpha_u) = |\overline{\alpha_g}\overline{\alpha_u}|$$
$$\Psi_2(a_ga_u, {}^3A_u, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$
$$\Psi_3(a_ga_u, {}^3A_u, M=1, \alpha_u) = |\alpha_g\alpha_u|$$

$b_g b_u$

$$\boxed{\Delta E = \langle \beta_u\beta_g||\beta_u\beta_g\rangle - \langle \beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_4(b_gb_u, {}^3A_u, M=-1, \alpha_u) = |\overline{\beta_u}\overline{\beta_g}|$$
$$\Psi_5(b_gb_u, {}^3A_u, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$
$$\Psi_6(b_gb_u, {}^3A_u, M=1, \alpha_u) = |\beta_u\beta_g|$$

2.5.5 ^1A_u

$a_g a_u$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle \alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_ga_u, {}^1A_u, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$b_g b_u$

$$\boxed{\Delta E = \langle \beta_u\beta_g||\beta_u\beta_g\rangle + \langle \beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_2(b_gb_u, {}^1A_u, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

2.5.6 ^3B_g

$a_g b_g$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle \alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_gb_g, {}^3B_g, M=-1, \beta_g) = |\overline{\alpha_g}\overline{\beta_g}|$$
$$\Psi_2(a_gb_g, {}^3B_g, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$
$$\Psi_3(a_gb_g, {}^3B_g, M=1, \beta_g) = |\alpha_g\beta_g|$$

$a_u b_u$

$$\boxed{\Delta E = \langle \beta_u\alpha_u||\beta_u\alpha_u\rangle - \langle \beta_u\beta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_4(a_ub_u, {}^3B_g, M=-1, \beta_g) = |\overline{\beta_u}\overline{\alpha_u}|$$
$$\Psi_5(a_ub_u, {}^3B_g, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$
$$\Psi_6(a_ub_u, {}^3B_g, M=1, \beta_g) = |\beta_u\alpha_u|$$

2.5.7 ^1B_g

$a_g b_g$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle \alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_gb_g, {}^1B_g, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$

$a_u b_u$

$$\boxed{\Delta E = \langle \beta_u\alpha_u||\beta_u\alpha_u\rangle + \langle \beta_u\beta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_2(a_ub_u, {}^1B_g, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$

2.6 Group D_2

Component labels

$$A_1 : \{\alpha\} \text{ --- } B_1 : \{\beta\} \text{ --- } B_2 : \{\gamma\} \text{ --- } B_3 : \{\zeta\}$$

2.6.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle \alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

b_1^2

$$\boxed{\Delta E = \langle \beta\beta||\beta\beta\rangle}$$

$$\Psi_2(b_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

b_2^2

$$\boxed{\Delta E = \langle \gamma\gamma||\gamma\gamma\rangle}$$

$$\Psi_3(b_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\gamma}\gamma|$$

b_3^2

$$\boxed{\Delta E = \langle \zeta\zeta || \zeta\zeta \rangle}$$

$$\Psi_4(b_3^2, {}^1A_1, M=0, \alpha) = -|\overline{\zeta}\zeta|$$

2.6.2 $^3B_1$

a_1b_1

$$\boxed{\Delta E = -\langle \alpha\alpha || \beta\beta \rangle + \langle \alpha\beta || \alpha\beta \rangle}$$

$$\Psi_1(a_1b_1, {}^3B_1, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1b_1, {}^3B_1, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1b_1, {}^3B_1, M=1, \beta) = |\alpha\beta|$$

b_2b_3

$$\boxed{\Delta E = -\langle \gamma\gamma || \zeta\zeta \rangle + \langle \gamma\zeta || \gamma\zeta \rangle}$$

$$\Psi_4(b_2b_3, {}^3B_1, M=-1, \beta) = |\overline{\gamma}\overline{\zeta}|$$
$$\Psi_5(b_2b_3, {}^3B_1, M=0, \beta) = \frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$
$$\Psi_6(b_2b_3, {}^3B_1, M=1, \beta) = |\gamma\zeta|$$

2.6.3 $^1B_1$

a_1b_1

$$\boxed{\Delta E = \langle \alpha\alpha || \beta\beta \rangle + \langle \alpha\beta || \alpha\beta \rangle}$$

$$\Psi_1(a_1b_1, {}^1B_1, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

b_2b_3

$$\boxed{\Delta E = \langle \gamma\gamma || \zeta\zeta \rangle + \langle \gamma\zeta || \gamma\zeta \rangle}$$

$$\Psi_2(b_2b_3, {}^1B_1, M=0, \beta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$

2.6.4 $^3B_2$

a_1b_2

$$\boxed{\Delta E = -\langle \alpha\alpha || \gamma\gamma \rangle + \langle \alpha\gamma || \alpha\gamma \rangle}$$

$$\Psi_1(a_1b_2, {}^3B_2, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1b_2, {}^3B_2, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(a_1b_2, {}^3B_2, M=1, \gamma) = |\alpha\gamma|$$

b_1b_3

$$\boxed{\Delta E = -\langle \beta\beta || \zeta\zeta \rangle + \langle \beta\zeta || \beta\zeta \rangle}$$

$$\Psi_4(b_1b_3, {}^3B_2, M=-1, \gamma) = |\overline{\beta}\overline{\zeta}|$$
$$\Psi_5(b_1b_3, {}^3B_2, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_6(b_1b_3, {}^3B_2, M=1, \gamma) = |\beta\zeta|$$

2.6.5 $^1B_2$

a_1b_2

$$\boxed{\Delta E = \langle \alpha\alpha || \gamma\gamma \rangle + \langle \alpha\gamma || \alpha\gamma \rangle}$$

$$\Psi_1(a_1b_2, {}^1B_2, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

b_1b_3

$$\boxed{\Delta E = \langle \beta\beta || \zeta\zeta \rangle + \langle \beta\zeta || \beta\zeta \rangle}$$

$$\Psi_2(b_1b_3, {}^1B_2, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

2.6.6 $^3B_3$

a_1b_3

$$\boxed{\Delta E = -\langle \alpha\alpha || \zeta\zeta \rangle + \langle \alpha\zeta || \alpha\zeta \rangle}$$

$$\Psi_1(a_1b_3, {}^3B_3, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(a_1b_3, {}^3B_3, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(a_1b_3, {}^3B_3, M=1, \zeta) = |\alpha\zeta|$$

b_1b_2

$$\boxed{\Delta E = -\langle \beta\beta || \gamma\gamma \rangle + \langle \beta\gamma || \beta\gamma \rangle}$$

$$\Psi_4(b_1b_2, {}^3B_3, M=-1, \zeta) = |\overline{\beta}\overline{\gamma}|$$
$$\Psi_5(b_1b_2, {}^3B_3, M=0, \zeta) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_6(b_1b_2, {}^3B_3, M=1, \zeta) = |\beta\gamma|$$

2.6.7 $^1B_3$

a_1b_3

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_3, {}^1B_3, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

b_1b_2

$$\boxed{\Delta E = \langle\beta\beta||\gamma\gamma\rangle + \langle\beta\gamma||\beta\gamma\rangle}$$

$$\Psi_2(b_1b_2, {}^1B_3, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$

2.7 Group C_{2v}

Component labels

$A_1 : \{\alpha\}$ —— $B_2 : \{\zeta\}$ —— $B_1 : \{\gamma\}$ —— $A_2 : \{\beta\}$

2.7.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

b_2^2

$$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_2(b_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\zeta}\zeta|$$

b_1^2

$$\boxed{\Delta E = \langle\gamma\gamma||\gamma\gamma\rangle}$$

$$\Psi_3(b_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\gamma}\gamma|$$

a_2^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_4(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

2.7.2 $^3B_2$

a_1b_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^3B_2, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(a_1b_2, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(a_1b_2, {}^3B_2, M=1, \zeta) = |\alpha\zeta|$$

a_2b_1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle - \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_4(a_2b_1, {}^3B_2, M=-1, \zeta) = |\overline{\gamma}\overline{\beta}|$$
$$\Psi_5(a_2b_1, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$
$$\Psi_6(a_2b_1, {}^3B_2, M=1, \zeta) = |\gamma\beta|$$

2.7.3 $^1B_2$

a_1b_2

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2b_1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle + \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_2(a_2b_1, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$

2.7.4 $^3B_1$

a_1b_1

$$\boxed{\Delta E = -\langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^3B_1, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1b_1, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(a_1b_1, {}^3B_1, M=1, \gamma) = |\alpha\gamma|$$

a_2b_2

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle - \langle\zeta\zeta||\beta\beta\rangle}$$

$$\Psi_4(a_2b_2, {}^3B_1, M=-1, \gamma) = |\overline{\zeta}\overline{\beta}|$$
$$\Psi_5(a_2b_2, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$
$$\Psi_6(a_2b_2, {}^3B_1, M=1, \gamma) = |\zeta\beta|$$

2.7.5 $^1B_1$

a_1b_1

$$\boxed{\Delta E = \langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

a_2b_2

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle + \langle\zeta\zeta||\beta\beta\rangle}$$

$$\Psi_2(a_2b_2, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$

2.7.6 $^3A_2$

a_1a_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

b_1b_2

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle - \langle\zeta\zeta||\gamma\gamma\rangle}$$

$$\Psi_4(b_1b_2, {}^3A_2, M=-1, \beta) = |\overline{\zeta}\overline{\gamma}|$$
$$\Psi_5(b_1b_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$
$$\Psi_6(b_1b_2, {}^3A_2, M=1, \beta) = |\zeta\gamma|$$

2.7.7 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

b_1b_2

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle + \langle\zeta\zeta||\gamma\gamma\rangle}$$

$$\Psi_2(b_1b_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$

2.8 Group D_{2h}

Component labels

$A_{1g} : \{\alpha_g\}$ —— $B_{3u} : \{\zeta_u\}$ —— $B_{1u} : \{\beta_u\}$ —— $B_{2u} : \{\gamma_u\}$ —— $A_{1u} : \{\alpha_u\}$ —— $B_{3g} : \{\zeta_g\}$ —— $B_{1g} : \{\beta_g\}$ —— $B_{2g} : \{\gamma_g\}$

2.8.1 $^1A_{1g}$

a_{1g}^2

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_g\alpha_g\rangle}$$

$$\Psi_1(a_{1g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

b_{3u}^2

$$\boxed{\Delta E = \langle\zeta_u\zeta_u||\zeta_u\zeta_u\rangle}$$

$$\Psi_2(b_{3u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\zeta_u}\zeta_u|$$

b_{1u}^2

$$\boxed{\Delta E = \langle\beta_u\beta_u||\beta_u\beta_u\rangle}$$

$$\Psi_3(b_{1u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\beta_u}\beta_u|$$

b_{2u}^2

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\gamma_u\gamma_u\rangle}$$

$$\Psi_4(b_{2u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\gamma_u}\gamma_u|$$

a_{1u}^2

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_5(a_{1u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

b_{3g}^2

$$\boxed{\Delta E = \langle \zeta_g \zeta_g || \zeta_g \zeta_g \rangle}$$

$$\Psi_6(b_{3g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\zeta_g}\zeta_g|$$

b_{1g}^2

$$\boxed{\Delta E = \langle \beta_g \beta_g || \beta_g \beta_g \rangle}$$

$$\Psi_7(b_{1g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\beta_g}\beta_g|$$

b_{2g}^2

$$\boxed{\Delta E = \langle \gamma_g \gamma_g || \gamma_g \gamma_g \rangle}$$

$$\Psi_8(b_{2g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\gamma_g}\gamma_g|$$

2.8.2 $^3B_{3u}$

$a_{1g}b_{3u}$

$$\boxed{\Delta E = -\langle \alpha_g \alpha_g || \zeta_u \zeta_u \rangle + \langle \alpha_g \zeta_u || \alpha_g \zeta_u \rangle}$$

$$\Psi_1(a_{1g}b_{3u}, {}^3B_{3u}, M=-1, \zeta_u) = |\overline{\alpha_g}\overline{\zeta_u}|$$

$$\Psi_2(a_{1g}b_{3u}, {}^3B_{3u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$

$$\Psi_3(a_{1g}b_{3u}, {}^3B_{3u}, M=1, \zeta_u) = |\alpha_g\zeta_u|$$

$b_{1u}b_{2g}$

$$\boxed{\Delta E = -\langle \beta_u \beta_u || \gamma_g \gamma_g \rangle + \langle \beta_u \gamma_g || \beta_u \gamma_g \rangle}$$

$$\Psi_4(b_{1u}b_{2g}, {}^3B_{3u}, M=-1, \zeta_u) = |\overline{\beta_u}\overline{\gamma_g}|$$

$$\Psi_5(b_{1u}b_{2g}, {}^3B_{3u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

$$\Psi_6(b_{1u}b_{2g}, {}^3B_{3u}, M=1, \zeta_u) = |\beta_u\gamma_g|$$

$b_{1g}b_{2u}$

$$\boxed{\Delta E = \langle \gamma_u \beta_g || \gamma_u \beta_g \rangle - \langle \gamma_u \gamma_u || \beta_g \beta_g \rangle}$$

$$\Psi_7(b_{1g}b_{2u}, {}^3B_{3u}, M=-1, \zeta_u) = |\overline{\gamma_u}\overline{\beta_g}|$$

$$\Psi_8(b_{1g}b_{2u}, {}^3B_{3u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\beta_g}|}{2}$$

$$\Psi_9(b_{1g}b_{2u}, {}^3B_{3u}, M=1, \zeta_u) = |\gamma_u\beta_g|$$

$a_{1u}b_{3g}$

$$\boxed{\Delta E = -\langle \alpha_u \alpha_u || \zeta_g \zeta_g \rangle + \langle \alpha_u \zeta_g || \alpha_u \zeta_g \rangle}$$

$$\Psi_{10}(a_{1u}b_{3g}, {}^3B_{3u}, M=-1, \zeta_u) = |\overline{\alpha_u}\overline{\zeta_g}|$$

$$\Psi_{11}(a_{1u}b_{3g}, {}^3B_{3u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$

$$\Psi_{12}(a_{1u}b_{3g}, {}^3B_{3u}, M=1, \zeta_u) = |\alpha_u\zeta_g|$$

2.8.3 $^1B_{3u}$

$a_{1g}b_{3u}$

$$\boxed{\Delta E = \langle \alpha_g \alpha_g || \zeta_u \zeta_u \rangle + \langle \alpha_g \zeta_u || \alpha_g \zeta_u \rangle}$$

$$\Psi_1(a_{1g}b_{3u}, {}^1B_{3u}, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$

$b_{1u}b_{2g}$

$$\boxed{\Delta E = \langle \beta_u \beta_u || \gamma_g \gamma_g \rangle + \langle \beta_u \gamma_g || \beta_u \gamma_g \rangle}$$

$$\Psi_2(b_{1u}b_{2g}, {}^1B_{3u}, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

$b_{1g}b_{2u}$

$$\boxed{\Delta E = \langle \gamma_u \beta_g || \gamma_u \beta_g \rangle + \langle \gamma_u \gamma_u || \beta_g \beta_g \rangle}$$

$$\Psi_3(b_{1g}b_{2u}, {}^1B_{3u}, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\beta_g}|}{2}$$

$a_{1u}b_{3g}$

$$\boxed{\Delta E = \langle \alpha_u \alpha_u || \zeta_g \zeta_g \rangle + \langle \alpha_u \zeta_g || \alpha_u \zeta_g \rangle}$$

$$\Psi_4(a_{1u}b_{3g}, {}^1B_{3u}, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$

2.8.4 $^3B_{1u}$

$a_{1g}b_{1u}$

$$\boxed{\Delta E = -\langle \alpha_g \alpha_g || \beta_u \beta_u \rangle + \langle \alpha_g \beta_u || \alpha_g \beta_u \rangle}$$

$$\Psi_1(a_{1g}b_{1u}, {}^3B_{1u}, M=-1, \beta_u) = |\overline{\alpha_g}\overline{\beta_u}|$$

$$\Psi_2(a_{1g}b_{1u}, {}^3B_{1u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$$\Psi_3(a_{1g}b_{1u}, {}^3B_{1u}, M=1, \beta_u) = |\alpha_g\beta_u|$$

$b_{2g}b_{3u}$

$$\boxed{\Delta E = \langle \zeta_u \gamma_g || \zeta_u \gamma_g \rangle - \langle \zeta_u \zeta_u || \gamma_g \gamma_g \rangle}$$

$$\Psi_4(b_{2g}b_{3u}, {}^3B_{1u}, M=-1, \beta_u) = |\overline{\zeta_u}\overline{\gamma_g}|$$

$$\Psi_5(b_{2g}b_{3u}, {}^3B_{1u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\zeta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\gamma_g}|}{2}$$

$$\Psi_6(b_{2g}b_{3u}, {}^3B_{1u}, M=1, \beta_u) = |\zeta_u\gamma_g|$$

$b_{2u}b_{3g}$

$$\boxed{\Delta E = -\langle \gamma_u \gamma_u || \zeta_g \zeta_g \rangle + \langle \gamma_u \zeta_g || \gamma_u \zeta_g \rangle}$$

$$\Psi_7(b_{2u}b_{3g}, {}^3B_{1u}, M=-1, \beta_u) = |\overline{\gamma_u}\overline{\zeta_g}|$$

$$\Psi_8(b_{2u}b_{3g}, {}^3B_{1u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\zeta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\zeta_g}|}{2}$$
$$\Psi_9(b_{2u}b_{3g}, {}^3B_{1u}, M=1, \beta_u) = |\gamma_u\zeta_g|$$

$a_{1u}b_{1g}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\beta_g\beta_g\rangle + \langle\alpha_u\beta_g||\alpha_u\beta_g\rangle}$$

$$\Psi_{10}(a_{1u}b_{1g}, {}^3B_{1u}, M=-1, \beta_u) = |\overline{\alpha_u\beta_g}|$$
$$\Psi_{11}(a_{1u}b_{1g}, {}^3B_{1u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$
$$\Psi_{12}(a_{1u}b_{1g}, {}^3B_{1u}, M=1, \beta_u) = |\alpha_u\beta_g|$$

2.8.5 $^1B_{1u}$

$a_{1g}b_{1u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle\alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_1(a_{1g}b_{1u}, {}^1B_{1u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$b_{2g}b_{3u}$

$$\boxed{\Delta E = \langle\zeta_u\gamma_g||\zeta_u\gamma_g\rangle + \langle\zeta_u\zeta_u||\gamma_g\gamma_g\rangle}$$

$$\Psi_2(b_{2g}b_{3u}, {}^1B_{1u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\gamma_g}|}{2}$$

$b_{2u}b_{3g}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\zeta_g\zeta_g\rangle + \langle\gamma_u\zeta_g||\gamma_u\zeta_g\rangle}$$

$$\Psi_3(b_{2u}b_{3g}, {}^1B_{1u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\zeta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\zeta_g}|}{2}$$

$a_{1u}b_{1g}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\beta_g\beta_g\rangle + \langle\alpha_u\beta_g||\alpha_u\beta_g\rangle}$$

$$\Psi_4(a_{1u}b_{1g}, {}^1B_{1u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

2.8.6 $^3B_{2u}$

$a_{1g}b_{2u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\gamma_u\gamma_u\rangle + \langle\alpha_g\gamma_u||\alpha_g\gamma_u\rangle}$$

$$\Psi_1(a_{1g}b_{2u}, {}^3B_{2u}, M=-1, \gamma_u) = |\overline{\alpha_g\gamma_u}|$$
$$\Psi_2(a_{1g}b_{2u}, {}^3B_{2u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$
$$\Psi_3(a_{1g}b_{2u}, {}^3B_{2u}, M=1, \gamma_u) = |\alpha_g\gamma_u|$$

$b_{1g}b_{3u}$

$$\boxed{\Delta E = \langle\zeta_u\beta_g||\zeta_u\beta_g\rangle - \langle\zeta_u\zeta_u||\beta_g\beta_g\rangle}$$

$$\Psi_4(b_{1g}b_{3u}, {}^3B_{2u}, M=-1, \gamma_u) = |\overline{\zeta_u\beta_g}|$$
$$\Psi_5(b_{1g}b_{3u}, {}^3B_{2u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\zeta_u}\beta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\beta_g}|}{2}$$
$$\Psi_6(b_{1g}b_{3u}, {}^3B_{2u}, M=1, \gamma_u) = |\zeta_u\beta_g|$$

$b_{1u}b_{3g}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\zeta_g\zeta_g\rangle + \langle\beta_u\zeta_g||\beta_u\zeta_g\rangle}$$

$$\Psi_7(b_{1u}b_{3g}, {}^3B_{2u}, M=-1, \gamma_u) = |\overline{\beta_u\zeta_g}|$$
$$\Psi_8(b_{1u}b_{3g}, {}^3B_{2u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\beta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_g}|}{2}$$
$$\Psi_9(b_{1u}b_{3g}, {}^3B_{2u}, M=1, \gamma_u) = |\beta_u\zeta_g|$$

$a_{1u}b_{2g}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\gamma_g\gamma_g\rangle + \langle\alpha_u\gamma_g||\alpha_u\gamma_g\rangle}$$

$$\Psi_{10}(a_{1u}b_{2g}, {}^3B_{2u}, M=-1, \gamma_u) = |\overline{\alpha_u\gamma_g}|$$
$$\Psi_{11}(a_{1u}b_{2g}, {}^3B_{2u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$
$$\Psi_{12}(a_{1u}b_{2g}, {}^3B_{2u}, M=1, \gamma_u) = |\alpha_u\gamma_g|$$

2.8.7 $^1B_{2u}$

$a_{1g}b_{2u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\gamma_u\gamma_u\rangle + \langle\alpha_g\gamma_u||\alpha_g\gamma_u\rangle}$$

$$\Psi_1(a_{1g}b_{2u}, {}^1B_{2u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$

$b_{1g}b_{3u}$

$$\boxed{\Delta E = \langle\zeta_u\beta_g||\zeta_u\beta_g\rangle + \langle\zeta_u\zeta_u||\beta_g\beta_g\rangle}$$

$$\Psi_2(b_{1g}b_{3u}, {}^1B_{2u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\beta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\beta_g}|}{2}$$

$b_{1u}b_{3g}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\zeta_g\zeta_g\rangle + \langle\beta_u\zeta_g||\beta_u\zeta_g\rangle}$$

$$\Psi_3(b_{1u}b_{3g}, {}^1B_{2u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\beta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_g}|}{2}$$

$a_{1u}b_{2g}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\gamma_g\gamma_g\rangle + \langle\alpha_u\gamma_g||\alpha_u\gamma_g\rangle}$$

$$\Psi_4(a_{1u}b_{2g}, {}^1B_{2u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$

2.8.8 $^3A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_{1g}a_{1u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\alpha_g}\overline{\alpha_u}|$$
$$\Psi_2(a_{1g}a_{1u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$
$$\Psi_3(a_{1g}a_{1u}, {}^3A_{1u}, M=1, \alpha_u) = |\alpha_g\alpha_u|$$

$b_{3g}b_{3u}$

$$\boxed{\Delta E = \langle\zeta_u\zeta_g||\zeta_u\zeta_g\rangle - \langle\zeta_u\zeta_u||\zeta_g\zeta_g\rangle}$$

$$\Psi_4(b_{3g}b_{3u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\zeta_u}\overline{\zeta_g}|$$
$$\Psi_5(b_{3g}b_{3u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\zeta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\zeta_g}|}{2}$$
$$\Psi_6(b_{3g}b_{3u}, {}^3A_{1u}, M=1, \alpha_u) = |\zeta_u\zeta_g|$$

$b_{1g}b_{1u}$

$$\boxed{\Delta E = \langle\beta_u\beta_g||\beta_u\beta_g\rangle - \langle\beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_7(b_{1g}b_{1u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\beta_u}\overline{\beta_g}|$$
$$\Psi_8(b_{1g}b_{1u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$
$$\Psi_9(b_{1g}b_{1u}, {}^3A_{1u}, M=1, \alpha_u) = |\beta_u\beta_g|$$

$b_{2g}b_{2u}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_g||\gamma_u\gamma_g\rangle - \langle\gamma_u\gamma_u||\gamma_g\gamma_g\rangle}$$

$$\Psi_{10}(b_{2g}b_{2u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\gamma_u}\overline{\gamma_g}|$$
$$\Psi_{11}(b_{2g}b_{2u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$$
$$\Psi_{12}(b_{2g}b_{2u}, {}^3A_{1u}, M=1, \alpha_u) = |\gamma_u\gamma_g|$$

2.8.9 $^1A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_{1g}a_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$b_{3g}b_{3u}$

$$\boxed{\Delta E = \langle\zeta_u\zeta_g||\zeta_u\zeta_g\rangle + \langle\zeta_u\zeta_u||\zeta_g\zeta_g\rangle}$$

$$\Psi_2(b_{3g}b_{3u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\zeta_g}|}{2}$$

$b_{1g}b_{1u}$

$$\boxed{\Delta E = \langle\beta_u\beta_g||\beta_u\beta_g\rangle + \langle\beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_3(b_{1g}b_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

$b_{2g}b_{2u}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_g||\gamma_u\gamma_g\rangle + \langle\gamma_u\gamma_u||\gamma_g\gamma_g\rangle}$$

$$\Psi_4(b_{2g}b_{2u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$$

2.8.10 $^3B_{3g}$

$a_{1g}b_{3g}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\zeta_g\zeta_g\rangle + \langle\alpha_g\zeta_g||\alpha_g\zeta_g\rangle}$$

$$\Psi_1(a_{1g}b_{3g}, {}^3B_{3g}, M=-1, \zeta_g) = |\overline{\alpha_g}\overline{\zeta_g}|$$
$$\Psi_2(a_{1g}b_{3g}, {}^3B_{3g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$
$$\Psi_3(a_{1g}b_{3g}, {}^3B_{3g}, M=1, \zeta_g) = |\alpha_g\zeta_g|$$

$a_{1u}b_{3u}$

$$\boxed{\Delta E = \langle\zeta_u\alpha_u||\zeta_u\alpha_u\rangle - \langle\zeta_u\zeta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_4(a_{1u}b_{3u}, {}^3B_{3g}, M=-1, \zeta_g) = |\overline{\zeta_u}\overline{\alpha_u}|$$
$$\Psi_5(a_{1u}b_{3u}, {}^3B_{3g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\zeta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\alpha_u}|}{2}$$
$$\Psi_6(a_{1u}b_{3u}, {}^3B_{3g}, M=1, \zeta_g) = |\zeta_u\alpha_u|$$

$b_{1u}b_{2u}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\gamma_u\gamma_u\rangle + \langle\beta_u\gamma_u||\beta_u\gamma_u\rangle}$$

$$\Psi_7(b_{1u}b_{2u}, {}^3B_{3g}, M=-1, \zeta_g) = |\overline{\beta_u}\overline{\gamma_u}|$$
$$\Psi_8(b_{1u}b_{2u}, {}^3B_{3g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$
$$\Psi_9(b_{1u}b_{2u}, {}^3B_{3g}, M=1, \zeta_g) = |\beta_u\gamma_u|$$

$b_{1g}b_{2g}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\gamma_g\gamma_g\rangle + \langle\beta_g\gamma_g||\beta_g\gamma_g\rangle}$$

$$\Psi_{10}(b_{1g}b_{2g}, {}^3B_{3g}, M=-1, \zeta_g) = |\overline{\beta_g}\overline{\gamma_g}|$$
$$\Psi_{11}(b_{1g}b_{2g}, {}^3B_{3g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\gamma_g}|}{2}$$
$$\Psi_{12}(b_{1g}b_{2g}, {}^3B_{3g}, M=1, \zeta_g) = |\beta_g\gamma_g|$$

2.8.11 $^1B_{3g}$

$a_{1g}b_{3g}$

$$\boxed{\Delta E = \langle \alpha_g \alpha_g || \zeta_g \zeta_g \rangle + \langle \alpha_g \zeta_g || \alpha_g \zeta_g \rangle}$$

$$\Psi_1(a_{1g}b_{3g}, {}^1B_{3g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$

$a_{1u}b_{3u}$

$$\boxed{\Delta E = \langle \zeta_u \alpha_u || \zeta_u \alpha_u \rangle + \langle \zeta_u \zeta_u || \alpha_u \alpha_u \rangle}$$

$$\Psi_2(a_{1u}b_{3u}, {}^1B_{3g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\alpha_u}|}{2}$$

$b_{1u}b_{2u}$

$$\boxed{\Delta E = \langle \beta_u \beta_u || \gamma_u \gamma_u \rangle + \langle \beta_u \gamma_u || \beta_u \gamma_u \rangle}$$

$$\Psi_3(b_{1u}b_{2u}, {}^1B_{3g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$

$b_{1g}b_{2g}$

$$\boxed{\Delta E = \langle \beta_g \beta_g || \gamma_g \gamma_g \rangle + \langle \beta_g \gamma_g || \beta_g \gamma_g \rangle}$$

$$\Psi_4(b_{1g}b_{2g}, {}^1B_{3g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\gamma_g}|}{2}$$

2.8.12 $^3B_{1g}$

$a_{1g}b_{1g}$

$$\boxed{\Delta E = -\langle \alpha_g \alpha_g || \beta_g \beta_g \rangle + \langle \alpha_g \beta_g || \alpha_g \beta_g \rangle}$$

$$\Psi_1(a_{1g}b_{1g}, {}^3B_{1g}, M=-1, \beta_g) = |\overline{\alpha_g}\overline{\beta_g}|$$
$$\Psi_2(a_{1g}b_{1g}, {}^3B_{1g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$
$$\Psi_3(a_{1g}b_{1g}, {}^3B_{1g}, M=1, \beta_g) = |\alpha_g\beta_g|$$

$b_{2u}b_{3u}$

$$\boxed{\Delta E = \langle \zeta_u \gamma_u || \zeta_u \gamma_u \rangle - \langle \zeta_u \zeta_u || \gamma_u \gamma_u \rangle}$$

$$\Psi_4(b_{2u}b_{3u}, {}^3B_{1g}, M=-1, \beta_g) = |\overline{\zeta_u}\overline{\gamma_u}|$$
$$\Psi_5(b_{2u}b_{3u}, {}^3B_{1g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\zeta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\gamma_u}|}{2}$$
$$\Psi_6(b_{2u}b_{3u}, {}^3B_{1g}, M=1, \beta_g) = |\zeta_u\gamma_u|$$

$a_{1u}b_{1u}$

$$\boxed{\Delta E = \langle \beta_u \alpha_u || \beta_u \alpha_u \rangle - \langle \beta_u \beta_u || \alpha_u \alpha_u \rangle}$$

$$\Psi_7(a_{1u}b_{1u}, {}^3B_{1g}, M=-1, \beta_g) = |\overline{\beta_u}\overline{\alpha_u}|$$
$$\Psi_8(a_{1u}b_{1u}, {}^3B_{1g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$
$$\Psi_9(a_{1u}b_{1u}, {}^3B_{1g}, M=1, \beta_g) = |\beta_u\alpha_u|$$

$b_{2g}b_{3g}$

$$\boxed{\Delta E = \langle \zeta_g \gamma_g || \zeta_g \gamma_g \rangle - \langle \zeta_g \zeta_g || \gamma_g \gamma_g \rangle}$$

$$\Psi_{10}(b_{2g}b_{3g}, {}^3B_{1g}, M=-1, \beta_g) = |\overline{\zeta_g}\overline{\gamma_g}|$$
$$\Psi_{11}(b_{2g}b_{3g}, {}^3B_{1g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\zeta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\gamma_g}|}{2}$$
$$\Psi_{12}(b_{2g}b_{3g}, {}^3B_{1g}, M=1, \beta_g) = |\zeta_g\gamma_g|$$

2.8.13 $^1B_{1g}$

$a_{1g}b_{1g}$

$$\boxed{\Delta E = \langle \alpha_g \alpha_g || \beta_g \beta_g \rangle + \langle \alpha_g \beta_g || \alpha_g \beta_g \rangle}$$

$$\Psi_1(a_{1g}b_{1g}, {}^1B_{1g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$

$b_{2u}b_{3u}$

$$\boxed{\Delta E = \langle \zeta_u \gamma_u || \zeta_u \gamma_u \rangle + \langle \zeta_u \zeta_u || \gamma_u \gamma_u \rangle}$$

$$\Psi_2(b_{2u}b_{3u}, {}^1B_{1g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\gamma_u}|}{2}$$

$a_{1u}b_{1u}$

$$\boxed{\Delta E = \langle \beta_u \alpha_u || \beta_u \alpha_u \rangle + \langle \beta_u \beta_u || \alpha_u \alpha_u \rangle}$$

$$\Psi_3(a_{1u}b_{1u}, {}^1B_{1g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$

$b_{2g}b_{3g}$

$$\boxed{\Delta E = \langle \zeta_g \gamma_g || \zeta_g \gamma_g \rangle + \langle \zeta_g \zeta_g || \gamma_g \gamma_g \rangle}$$

$$\Psi_4(b_{2g}b_{3g}, {}^1B_{1g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\gamma_g}|}{2}$$

2.8.14 $^3B_{2g}$

$a_{1g}b_{2g}$

$$\boxed{\Delta E = -\langle \alpha_g \alpha_g || \gamma_g \gamma_g \rangle + \langle \alpha_g \gamma_g || \alpha_g \gamma_g \rangle}$$

$$\Psi_1(a_{1g}b_{2g}, {}^3B_{2g}, M=-1, \gamma_g) = |\overline{\alpha_g}\overline{\gamma_g}|$$
$$\Psi_2(a_{1g}b_{2g}, {}^3B_{2g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$
$$\Psi_3(a_{1g}b_{2g}, {}^3B_{2g}, M=1, \gamma_g) = |\alpha_g\gamma_g|$$

$b_{1u}b_{3u}$

$$\boxed{\Delta E = \langle \zeta_u \beta_u || \zeta_u \beta_u \rangle - \langle \zeta_u \zeta_u || \beta_u \beta_u \rangle}$$

$$\Psi_4(b_{1u}b_{3u}, {}^3B_{2g}, M=-1, \gamma_g) = |\overline{\zeta_u}\overline{\beta_u}|$$
$$\Psi_5(b_{1u}b_{3u}, {}^3B_{2g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\zeta_u}\beta_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\beta_u}|}{2}$$

$\Psi_6(b_{1u}b_{3u}, {}^3B_{2g}, M=1, \gamma_g) = |\zeta_u\beta_u|$

$a_{1u}b_{2u}$

$$\boxed{\Delta E = \langle\gamma_u\alpha_u||\gamma_u\alpha_u\rangle - \langle\gamma_u\gamma_u||\alpha_u\alpha_u\rangle}$$

$\Psi_7(a_{1u}b_{2u}, {}^3B_{2g}, M=-1, \gamma_g) = |\overline{\gamma_u\alpha_u}|$

$\Psi_8(a_{1u}b_{2u}, {}^3B_{2g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\gamma_u}\alpha_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\alpha_u}|}{2}$

$\Psi_9(a_{1u}b_{2u}, {}^3B_{2g}, M=1, \gamma_g) = |\gamma_u\alpha_u|$

$b_{1g}b_{3g}$

$$\boxed{\Delta E = \langle\zeta_g\beta_g||\zeta_g\beta_g\rangle - \langle\zeta_g\zeta_g||\beta_g\beta_g\rangle}$$

$\Psi_{10}(b_{1g}b_{3g}, {}^3B_{2g}, M=-1, \gamma_g) = |\overline{\zeta_g\beta_g}|$

$\Psi_{11}(b_{1g}b_{3g}, {}^3B_{2g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\zeta_g}\beta_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\beta_g}|}{2}$

$\Psi_{12}(b_{1g}b_{3g}, {}^3B_{2g}, M=1, \gamma_g) = |\zeta_g\beta_g|$

2.8.15 ${}^1B_{2g}$

$a_{1g}b_{2g}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\gamma_g\gamma_g\rangle + \langle\alpha_g\gamma_g||\alpha_g\gamma_g\rangle}$$

$\Psi_1(a_{1g}b_{2g}, {}^1B_{2g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$

$b_{1u}b_{3u}$

$$\boxed{\Delta E = \langle\zeta_u\beta_u||\zeta_u\beta_u\rangle + \langle\zeta_u\zeta_u||\beta_u\beta_u\rangle}$$

$\Psi_2(b_{1u}b_{3u}, {}^1B_{2g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\beta_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\beta_u}|}{2}$

$a_{1u}b_{2u}$

$$\boxed{\Delta E = \langle\gamma_u\alpha_u||\gamma_u\alpha_u\rangle + \langle\gamma_u\gamma_u||\alpha_u\alpha_u\rangle}$$

$\Psi_3(a_{1u}b_{2u}, {}^1B_{2g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\alpha_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\alpha_u}|}{2}$

$b_{1g}b_{3g}$

$$\boxed{\Delta E = \langle\zeta_g\beta_g||\zeta_g\beta_g\rangle + \langle\zeta_g\zeta_g||\beta_g\beta_g\rangle}$$

$\Psi_4(b_{1g}b_{3g}, {}^1B_{2g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\beta_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\beta_g}|}{2}$

2.9 Group C_4

Component labels

$A:\{\alpha\}$ —— $E^1:\{\gamma\}$ —— $E^2:\{\zeta\}$ —— $B:\{\beta\}$

2.9.1 ${}^1A$

a^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$\Psi_1(a^2, {}^1A, M=0, \alpha) = -|\overline{\alpha}\alpha|$

e^1e^2

$$\boxed{\Delta E = \langle\gamma\gamma||\zeta\zeta\rangle + \langle\gamma\zeta||\gamma\zeta\rangle}$$

$\Psi_2(e^1e^2, {}^1A, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$

b^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$\Psi_3(b^2, {}^1A, M=0, \alpha) = -|\overline{\beta}\beta|$

2.9.2 ${}^3E^1$

ae^1

$$\boxed{\Delta E = \langle\alpha\gamma||\alpha\gamma\rangle}$$

$\Psi_1(ae^1, {}^3E^1, M=-1, \gamma) = |\overline{\alpha\gamma}|$

$\Psi_2(ae^1, {}^3E^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$

$\Psi_3(ae^1, {}^3E^1, M=1, \gamma) = |\alpha\gamma|$

be^2

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle}$$

$\Psi_4(be^2, {}^3E^1, M=-1, \gamma) = |\overline{\zeta\beta}|$

$\Psi_5(be^2, {}^3E^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$

$\Psi_6(be^2, {}^3E^1, M=1, \gamma) = |\zeta\beta|$

2.9.3 $^1E^1$

ae^1

$$\boxed{\Delta E = \langle \alpha\gamma || \alpha\gamma \rangle}$$

$$\Psi_1(ae^1, {}^1E^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

be^2

$$\boxed{\Delta E = \langle \zeta\beta || \zeta\beta \rangle}$$

$$\Psi_2(be^2, {}^1E^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$

2.9.4 $^3E^2$

ae^2

$$\boxed{\Delta E = \langle \alpha\zeta || \alpha\zeta \rangle}$$

$$\Psi_1(ae^2, {}^3E^2, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(ae^2, {}^3E^2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(ae^2, {}^3E^2, M=1, \zeta) = |\alpha\zeta|$$

be^1

$$\boxed{\Delta E = \langle \gamma\beta || \gamma\beta \rangle}$$

$$\Psi_4(be^1, {}^3E^2, M=-1, \zeta) = |\overline{\gamma}\overline{\beta}|$$
$$\Psi_5(be^1, {}^3E^2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$
$$\Psi_6(be^1, {}^3E^2, M=1, \zeta) = |\gamma\beta|$$

2.9.5 $^1E^2$

ae^2

$$\boxed{\Delta E = \langle \alpha\zeta || \alpha\zeta \rangle}$$

$$\Psi_1(ae^2, {}^1E^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

be^1

$$\boxed{\Delta E = \langle \gamma\beta || \gamma\beta \rangle}$$

$$\Psi_2(be^1, {}^1E^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$

2.9.6 ^3B

ab

$$\boxed{\Delta E = -\langle \alpha\alpha || \beta\beta \rangle + \langle \alpha\beta || \alpha\beta \rangle}$$

$$\Psi_1(ab, {}^3B, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(ab, {}^3B, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(ab, {}^3B, M=1, \beta) = |\alpha\beta|$$

2.9.7 ^1B

ab

$$\boxed{\Delta E = \langle \alpha\alpha || \beta\beta \rangle + \langle \alpha\beta || \alpha\beta \rangle}$$

$$\Psi_1(ab, {}^1B, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$\left(e^1\right)^2$

$$\boxed{\Delta E = \langle \gamma\gamma || \gamma\gamma \rangle}$$

$$\Psi_2(\left(e^1\right)^2, {}^1B, M=0, \beta) = -|\overline{\gamma}\gamma|$$

$\left(e^2\right)^2$

$$\boxed{\Delta E = \langle \zeta\zeta || \zeta\zeta \rangle}$$

$$\Psi_3(\left(e^2\right)^2, {}^1B, M=0, \beta) = -|\overline{\zeta}\zeta|$$

2.9.8 ^3A

e^1e^2

$$\boxed{\Delta E = -\langle \gamma\gamma || \zeta\zeta \rangle + \langle \gamma\zeta || \gamma\zeta \rangle}$$

$$\Psi_1(e^1e^2, {}^3A, M=-1, \alpha) = |\overline{\gamma}\overline{\zeta}|$$
$$\Psi_2(e^1e^2, {}^3A, M=0, \alpha) = \frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$
$$\Psi_3(e^1e^2, {}^3A, M=1, \alpha) = |\gamma\zeta|$$

2.10 Group S_4

Component labels

$A : \{\alpha\}$ —— $E^1 : \{\gamma\}$ —— $E^2 : \{\zeta\}$ —— $B : \{\beta\}$

2.10.1 ^1A

a^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a^2, {}^1A, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

e^1e^2

$$\boxed{\Delta E = \langle\gamma\gamma||\zeta\zeta\rangle + \langle\gamma\zeta||\gamma\zeta\rangle}$$

$$\Psi_2(e^1e^2, {}^1A, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$

b^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_3(b^2, {}^1A, M=0, \alpha) = -|\overline{\beta}\beta|$$

2.10.2 $^3E^1$

ae^1

$$\boxed{\Delta E = \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(ae^1, {}^3E^1, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(ae^1, {}^3E^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(ae^1, {}^3E^1, M=1, \gamma) = |\alpha\gamma|$$

be^2

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle}$$

$$\Psi_4(be^2, {}^3E^1, M=-1, \gamma) = |\overline{\zeta}\overline{\beta}|$$
$$\Psi_5(be^2, {}^3E^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$
$$\Psi_6(be^2, {}^3E^1, M=1, \gamma) = |\zeta\beta|$$

2.10.3 $^1E^1$

ae^1

$$\boxed{\Delta E = \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(ae^1, {}^1E^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

be^2

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle}$$

$$\Psi_2(be^2, {}^1E^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$

2.10.4 $^3E^2$

ae^2

$$\boxed{\Delta E = \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(ae^2, {}^3E^2, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(ae^2, {}^3E^2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(ae^2, {}^3E^2, M=1, \zeta) = |\alpha\zeta|$$

be^1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle}$$

$$\Psi_4(be^1, {}^3E^2, M=-1, \zeta) = |\overline{\gamma}\overline{\beta}|$$
$$\Psi_5(be^1, {}^3E^2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$
$$\Psi_6(be^1, {}^3E^2, M=1, \zeta) = |\gamma\beta|$$

2.10.5 $^1E^2$

ae^2

$$\boxed{\Delta E = \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(ae^2, {}^1E^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

be^1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle}$$

$$\Psi_2(be^1, {}^1E^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$

2.10.6 ^3B

ab

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(ab, {}^3B, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(ab, {}^3B, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(ab, {}^3B, M=1, \beta) = |\alpha\beta|$$

2.10.7 ^1B

ab

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(ab, {}^1B, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$\left(e^1\right)^2$

$$\boxed{\Delta E = \langle\gamma\gamma||\gamma\gamma\rangle}$$

$$\Psi_2(\left(e^1\right)^2, {}^1B, M=0, \beta) = -|\overline{\gamma}\gamma|$$

$\left(e^2\right)^2$

$$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_3(\left(e^2\right)^2, {}^1B, M=0, \beta) = -|\overline{\zeta}\zeta|$$

2.10.8 ^3A

e^1e^2

$$\boxed{\Delta E = -\langle\gamma\gamma||\zeta\zeta\rangle + \langle\gamma\zeta||\gamma\zeta\rangle}$$

$$\Psi_1(e^1e^2, {}^3A, M=-1, \alpha) = |\overline{\gamma}\overline{\zeta}|$$
$$\Psi_2(e^1e^2, {}^3A, M=0, \alpha) = \frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$
$$\Psi_3(e^1e^2, {}^3A, M=1, \alpha) = |\gamma\zeta|$$

2.11 Group C_{4h}

Component labels

$\Gamma^1 : \{\gamma_1\}$ —— $\Gamma^2 : \{\gamma_2\}$ —— $\Gamma^3 : \{\gamma_3\}$ —— $\Gamma^4 : \{\gamma_4\}$ —— $\Gamma^5 : \{\gamma_5\}$ —— $\Gamma^6 : \{\gamma_6\}$ —— $\Gamma^7 : \{\gamma_7\}$ —— $\Gamma^8 : \{\gamma_8\}$

2.11.1 $^1\Gamma^1$

$\left(\gamma^1\right)^2$

$$\boxed{\Delta E = \langle\gamma_1\gamma_1||\gamma_1\gamma_1\rangle}$$

$$\Psi_1(\left(\gamma^1\right)^2, {}^1\Gamma^1, M=0, \gamma_1) = -|\overline{\gamma_1}\gamma_1|$$

$\gamma^2\gamma^3$

$$\boxed{\Delta E = \langle\gamma_2\gamma_2||\gamma_3\gamma_3\rangle + \langle\gamma_2\gamma_3||\gamma_2\gamma_3\rangle}$$

$$\Psi_2(\gamma^2\gamma^3, {}^1\Gamma^1, M=0, \gamma_1) = -\frac{\sqrt{2}|\overline{\gamma_2}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_3}|}{2}$$

$\left(\gamma^4\right)^2$

$$\boxed{\Delta E = \langle\gamma_4\gamma_4||\gamma_4\gamma_4\rangle}$$

$$\Psi_3(\left(\gamma^4\right)^2, {}^1\Gamma^1, M=0, \gamma_1) = -|\overline{\gamma_4}\gamma_4|$$

$\left(\gamma^5\right)^2$

$$\boxed{\Delta E = \langle\gamma_5\gamma_5||\gamma_5\gamma_5\rangle}$$

$$\Psi_4(\left(\gamma^5\right)^2, {}^1\Gamma^1, M=0, \gamma_1) = -|\overline{\gamma_5}\gamma_5|$$

$\gamma^6\gamma^7$

$$\boxed{\Delta E = \langle\gamma_6\gamma_6||\gamma_7\gamma_7\rangle + \langle\gamma_6\gamma_7||\gamma_6\gamma_7\rangle}$$

$$\Psi_5(\gamma^6\gamma^7, {}^1\Gamma^1, M=0, \gamma_1) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_7}|}{2}$$

$\left(\gamma^8\right)^2$

$$\boxed{\Delta E = \langle\gamma_8\gamma_8||\gamma_8\gamma_8\rangle}$$

$$\Psi_6(\left(\gamma^8\right)^2, {}^1\Gamma^1, M=0, \gamma_1) = -|\overline{\gamma_8}\gamma_8|$$

2.11.2 $^3\Gamma^2$

$\gamma^1\gamma^2$

$$\boxed{\Delta E = \langle\gamma_1\gamma_2||\gamma_1\gamma_2\rangle}$$

$$\Psi_1(\gamma^1\gamma^2, {}^3\Gamma^2, M=-1, \gamma_2) = |\overline{\gamma_1}\overline{\gamma_2}|$$
$$\Psi_2(\gamma^1\gamma^2, {}^3\Gamma^2, M=0, \gamma_2) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_2}|}{2}$$
$$\Psi_3(\gamma^1\gamma^2, {}^3\Gamma^2, M=1, \gamma_2) = |\gamma_1\gamma_2|$$

$\gamma^3\gamma^8$

$$\boxed{\Delta E = \langle\gamma_3\gamma_8||\gamma_3\gamma_8\rangle}$$

$$\Psi_4(\gamma^3\gamma^8, {}^3\Gamma^2, M=-1, \gamma_2) = |\overline{\gamma_3}\overline{\gamma_8}|$$
$$\Psi_5(\gamma^3\gamma^8, {}^3\Gamma^2, M=0, \gamma_2) = \frac{\sqrt{2}|\overline{\gamma_3}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_8}|}{2}$$
$$\Psi_6(\gamma^3\gamma^8, {}^3\Gamma^2, M=1, \gamma_2) = |\gamma_3\gamma_8|$$

$\gamma^4\gamma^7$

$$\boxed{\Delta E = \langle\gamma_4\gamma_7||\gamma_4\gamma_7\rangle}$$

$$\Psi_7(\gamma^4\gamma^7, {}^3\Gamma^2, M=-1, \gamma_2) = |\overline{\gamma_4}\overline{\gamma_7}|$$
$$\Psi_8(\gamma^4\gamma^7, {}^3\Gamma^2, M=0, \gamma_2) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_7}|}{2}$$
$$\Psi_9(\gamma^4\gamma^7, {}^3\Gamma^2, M=1, \gamma_2) = |\gamma_4\gamma_7|$$

$\gamma^5\gamma^6$

$$\boxed{\Delta E = \langle\gamma_5\gamma_6||\gamma_5\gamma_6\rangle}$$

$$\Psi_{10}(\gamma^5\gamma^6, {}^3\Gamma^2, M=-1, \gamma_2) = |\overline{\gamma_5}\overline{\gamma_6}|$$
$$\Psi_{11}(\gamma^5\gamma^6, {}^3\Gamma^2, M=0, \gamma_2) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_6}|}{2}$$
$$\Psi_{12}(\gamma^5\gamma^6, {}^3\Gamma^2, M=1, \gamma_2) = |\gamma_5\gamma_6|$$

2.11.3 $^1\Gamma^2$

$\gamma^1\gamma^2$

$$\boxed{\Delta E = \langle\gamma_1\gamma_2||\gamma_1\gamma_2\rangle}$$

$$\Psi_1(\gamma^1\gamma^2, {}^1\Gamma^2, M=0, \gamma_2) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_2}|}{2}$$

$\gamma^3\gamma^8$

$$\boxed{\Delta E = \langle\gamma_3\gamma_8||\gamma_3\gamma_8\rangle}$$

$$\Psi_2(\gamma^3\gamma^8, {}^1\Gamma^2, M=0, \gamma_2) = -\frac{\sqrt{2}|\overline{\gamma_3}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_8}|}{2}$$

$\gamma^4\gamma^7$

$$\boxed{\Delta E = \langle\gamma_4\gamma_7||\gamma_4\gamma_7\rangle}$$

$$\Psi_3(\gamma^4\gamma^7, {}^1\Gamma^2, M=0, \gamma_2) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_7}|}{2}$$

$\gamma^5\gamma^6$

$$\boxed{\Delta E = \langle\gamma_5\gamma_6||\gamma_5\gamma_6\rangle}$$

$$\Psi_4(\gamma^5\gamma^6, {}^1\Gamma^2, M=0, \gamma_2) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_6}|}{2}$$

2.11.4 $^3\Gamma^3$

$\gamma^1\gamma^3$

$$\boxed{\Delta E = \langle\gamma_1\gamma_3||\gamma_1\gamma_3\rangle}$$

$$\Psi_1(\gamma^1\gamma^3, {}^3\Gamma^3, M=-1, \gamma_3) = |\overline{\gamma_1}\overline{\gamma_3}|$$
$$\Psi_2(\gamma^1\gamma^3, {}^3\Gamma^3, M=0, \gamma_3) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_3}|}{2}$$
$$\Psi_3(\gamma^1\gamma^3, {}^3\Gamma^3, M=1, \gamma_3) = |\gamma_1\gamma_3|$$

$\gamma^2\gamma^8$

$$\boxed{\Delta E = \langle\gamma_2\gamma_8||\gamma_2\gamma_8\rangle}$$

$$\Psi_4(\gamma^2\gamma^8, {}^3\Gamma^3, M=-1, \gamma_3) = |\overline{\gamma_2}\overline{\gamma_8}|$$
$$\Psi_5(\gamma^2\gamma^8, {}^3\Gamma^3, M=0, \gamma_3) = \frac{\sqrt{2}|\overline{\gamma_2}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_8}|}{2}$$
$$\Psi_6(\gamma^2\gamma^8, {}^3\Gamma^3, M=1, \gamma_3) = |\gamma_2\gamma_8|$$

$\gamma^4\gamma^6$

$$\boxed{\Delta E = \langle\gamma_4\gamma_6||\gamma_4\gamma_6\rangle}$$

$$\Psi_7(\gamma^4\gamma^6, {}^3\Gamma^3, M=-1, \gamma_3) = |\overline{\gamma_4}\overline{\gamma_6}|$$
$$\Psi_8(\gamma^4\gamma^6, {}^3\Gamma^3, M=0, \gamma_3) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_6}|}{2}$$
$$\Psi_9(\gamma^4\gamma^6, {}^3\Gamma^3, M=1, \gamma_3) = |\gamma_4\gamma_6|$$

$\gamma^5\gamma^7$

$$\boxed{\Delta E = \langle\gamma_5\gamma_7||\gamma_5\gamma_7\rangle}$$

$$\Psi_{10}(\gamma^5\gamma^7, {}^3\Gamma^3, M=-1, \gamma_3) = |\overline{\gamma_5}\overline{\gamma_7}|$$
$$\Psi_{11}(\gamma^5\gamma^7, {}^3\Gamma^3, M=0, \gamma_3) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_7}|}{2}$$
$$\Psi_{12}(\gamma^5\gamma^7, {}^3\Gamma^3, M=1, \gamma_3) = |\gamma_5\gamma_7|$$

2.11.5 $^1\Gamma^3$

$\gamma^1\gamma^3$

$$\boxed{\Delta E = \langle\gamma_1\gamma_3||\gamma_1\gamma_3\rangle}$$

$$\Psi_1(\gamma^1\gamma^3, {}^1\Gamma^3, M=0, \gamma_3) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_3}|}{2}$$

$\gamma^2\gamma^8$

$$\boxed{\Delta E = \langle\gamma_2\gamma_8||\gamma_2\gamma_8\rangle}$$

$$\Psi_2(\gamma^2\gamma^8, {}^1\Gamma^3, M=0, \gamma_3) = -\frac{\sqrt{2}|\overline{\gamma_2}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_8}|}{2}$$

$\gamma^4\gamma^6$

$$\boxed{\Delta E = \langle\gamma_4\gamma_6||\gamma_4\gamma_6\rangle}$$

$$\Psi_3(\gamma^4\gamma^6, {}^1\Gamma^3, M=0, \gamma_3) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_6}|}{2}$$

$\gamma^5\gamma^7$

$$\boxed{\Delta E = \langle\gamma_5\gamma_7||\gamma_5\gamma_7\rangle}$$

$$\Psi_4(\gamma^5\gamma^7, {}^1\Gamma^3, M=0, \gamma_3) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_7}|}{2}$$

2.11.6 $^3\Gamma^4$

$\gamma^1\gamma^4$

$$\boxed{\Delta E = -\langle\gamma_1\gamma_1||\gamma_4\gamma_4\rangle + \langle\gamma_1\gamma_4||\gamma_1\gamma_4\rangle}$$

$$\Psi_1(\gamma^1\gamma^4, {}^3\Gamma^4, M=-1, \gamma_4) = |\overline{\gamma_1}\overline{\gamma_4}|$$
$$\Psi_2(\gamma^1\gamma^4, {}^3\Gamma^4, M=0, \gamma_4) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_4|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_4}|}{2}$$
$$\Psi_3(\gamma^1\gamma^4, {}^3\Gamma^4, M=1, \gamma_4) = |\gamma_1\gamma_4|$$

$\gamma^2\gamma^6$

$$\boxed{\Delta E = -\langle\gamma_2\gamma_2||\gamma_6\gamma_6\rangle + \langle\gamma_2\gamma_6||\gamma_2\gamma_6\rangle}$$

$$\Psi_4(\gamma^2\gamma^6, {}^3\Gamma^4, M=-1, \gamma_4) = |\overline{\gamma_2}\overline{\gamma_6}|$$
$$\Psi_5(\gamma^2\gamma^6, {}^3\Gamma^4, M=0, \gamma_4) = \frac{\sqrt{2}|\overline{\gamma_2}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_6}|}{2}$$
$$\Psi_6(\gamma^2\gamma^6, {}^3\Gamma^4, M=1, \gamma_4) = |\gamma_2\gamma_6|$$

$\gamma^3\gamma^7$

$$\boxed{\Delta E = -\langle\gamma_3\gamma_3||\gamma_7\gamma_7\rangle + \langle\gamma_3\gamma_7||\gamma_3\gamma_7\rangle}$$

$$\Psi_7(\gamma^3\gamma^7, {}^3\Gamma^4, M=-1, \gamma_4) = |\overline{\gamma_3}\overline{\gamma_7}|$$
$$\Psi_8(\gamma^3\gamma^7, {}^3\Gamma^4, M=0, \gamma_4) = \frac{\sqrt{2}|\overline{\gamma_3}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_7}|}{2}$$
$$\Psi_9(\gamma^3\gamma^7, {}^3\Gamma^4, M=1, \gamma_4) = |\gamma_3\gamma_7|$$

$\gamma^5\gamma^8$

$$\boxed{\Delta E = -\langle\gamma_5\gamma_5||\gamma_8\gamma_8\rangle + \langle\gamma_5\gamma_8||\gamma_5\gamma_8\rangle}$$

$$\Psi_{10}(\gamma^5\gamma^8, {}^3\Gamma^4, M=-1, \gamma_4) = |\overline{\gamma_5}\overline{\gamma_8}|$$
$$\Psi_{11}(\gamma^5\gamma^8, {}^3\Gamma^4, M=0, \gamma_4) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_8}|}{2}$$
$$\Psi_{12}(\gamma^5\gamma^8, {}^3\Gamma^4, M=1, \gamma_4) = |\gamma_5\gamma_8|$$

2.11.7 $^1\Gamma^4$

$\gamma^1\gamma^4$

$$\boxed{\Delta E = \langle\gamma_1\gamma_1||\gamma_4\gamma_4\rangle + \langle\gamma_1\gamma_4||\gamma_1\gamma_4\rangle}$$

$$\Psi_1(\gamma^1\gamma^4, {}^1\Gamma^4, M=0, \gamma_4) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_4|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_4}|}{2}$$

$\gamma^2\gamma^6$

$$\boxed{\Delta E = \langle\gamma_2\gamma_2||\gamma_6\gamma_6\rangle + \langle\gamma_2\gamma_6||\gamma_2\gamma_6\rangle}$$

$$\Psi_2(\gamma^2\gamma^6, {}^1\Gamma^4, M=0, \gamma_4) = -\frac{\sqrt{2}|\overline{\gamma_2}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_6}|}{2}$$

$\gamma^3\gamma^7$

$$\boxed{\Delta E = \langle\gamma_3\gamma_3||\gamma_7\gamma_7\rangle + \langle\gamma_3\gamma_7||\gamma_3\gamma_7\rangle}$$

$$\Psi_3(\gamma^3\gamma^7, {}^1\Gamma^4, M=0, \gamma_4) = -\frac{\sqrt{2}|\overline{\gamma_3}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_7}|}{2}$$

$\gamma^5\gamma^8$

$$\boxed{\Delta E = \langle\gamma_5\gamma_5||\gamma_8\gamma_8\rangle + \langle\gamma_5\gamma_8||\gamma_5\gamma_8\rangle}$$

$$\Psi_4(\gamma^5\gamma^8, {}^1\Gamma^4, M=0, \gamma_4) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_8}|}{2}$$

2.11.8 $^3\Gamma^5$

$\gamma^1\gamma^5$

$$\boxed{\Delta E = -\langle\gamma_1\gamma_1||\gamma_5\gamma_5\rangle + \langle\gamma_1\gamma_5||\gamma_1\gamma_5\rangle}$$

$$\Psi_1(\gamma^1\gamma^5, {}^3\Gamma^5, M=-1, \gamma_5) = |\overline{\gamma_1}\overline{\gamma_5}|$$
$$\Psi_2(\gamma^1\gamma^5, {}^3\Gamma^5, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_5}|}{2}$$
$$\Psi_3(\gamma^1\gamma^5, {}^3\Gamma^5, M=1, \gamma_5) = |\gamma_1\gamma_5|$$

$\gamma^2\gamma^7$

$$\boxed{\Delta E = -\langle\gamma_2\gamma_2||\gamma_7\gamma_7\rangle + \langle\gamma_2\gamma_7||\gamma_2\gamma_7\rangle}$$

$$\Psi_4(\gamma^2\gamma^7, {}^3\Gamma^5, M=-1, \gamma_5) = |\overline{\gamma_2}\overline{\gamma_7}|$$
$$\Psi_5(\gamma^2\gamma^7, {}^3\Gamma^5, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_2}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_7}|}{2}$$
$$\Psi_6(\gamma^2\gamma^7, {}^3\Gamma^5, M=1, \gamma_5) = |\gamma_2\gamma_7|$$

$\gamma^3\gamma^6$

$$\boxed{\Delta E = -\langle\gamma_3\gamma_3||\gamma_6\gamma_6\rangle + \langle\gamma_3\gamma_6||\gamma_3\gamma_6\rangle}$$

$$\Psi_7(\gamma^3\gamma^6, {}^3\Gamma^5, M=-1, \gamma_5) = |\overline{\gamma_3\gamma_6}|$$
$$\Psi_8(\gamma^3\gamma^6, {}^3\Gamma^5, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_3}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_6}|}{2}$$
$$\Psi_9(\gamma^3\gamma^6, {}^3\Gamma^5, M=1, \gamma_5) = |\gamma_3\gamma_6|$$

$\gamma^4\gamma^8$

$$\boxed{\Delta E = -\langle\gamma_4\gamma_4||\gamma_8\gamma_8\rangle + \langle\gamma_4\gamma_8||\gamma_4\gamma_8\rangle}$$

$$\Psi_{10}(\gamma^4\gamma^8, {}^3\Gamma^5, M=-1, \gamma_5) = |\overline{\gamma_4\gamma_8}|$$
$$\Psi_{11}(\gamma^4\gamma^8, {}^3\Gamma^5, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_8}|}{2}$$
$$\Psi_{12}(\gamma^4\gamma^8, {}^3\Gamma^5, M=1, \gamma_5) = |\gamma_4\gamma_8|$$

2.11.9 $^1\Gamma^5$

$\gamma^1\gamma^5$

$$\boxed{\Delta E = \langle\gamma_1\gamma_1||\gamma_5\gamma_5\rangle + \langle\gamma_1\gamma_5||\gamma_1\gamma_5\rangle}$$

$$\Psi_1(\gamma^1\gamma^5, {}^1\Gamma^5, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_5}|}{2}$$

$\gamma^2\gamma^7$

$$\boxed{\Delta E = \langle\gamma_2\gamma_2||\gamma_7\gamma_7\rangle + \langle\gamma_2\gamma_7||\gamma_2\gamma_7\rangle}$$

$$\Psi_2(\gamma^2\gamma^7, {}^1\Gamma^5, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_2}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_7}|}{2}$$

$\gamma^3\gamma^6$

$$\boxed{\Delta E = \langle\gamma_3\gamma_3||\gamma_6\gamma_6\rangle + \langle\gamma_3\gamma_6||\gamma_3\gamma_6\rangle}$$

$$\Psi_3(\gamma^3\gamma^6, {}^1\Gamma^5, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_3}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_6}|}{2}$$

$\gamma^4\gamma^8$

$$\boxed{\Delta E = \langle\gamma_4\gamma_4||\gamma_8\gamma_8\rangle + \langle\gamma_4\gamma_8||\gamma_4\gamma_8\rangle}$$

$$\Psi_4(\gamma^4\gamma^8, {}^1\Gamma^5, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_8}|}{2}$$

2.11.10 $^3\Gamma^6$

$\gamma^1\gamma^6$

$$\boxed{\Delta E = \langle\gamma_1\gamma_6||\gamma_1\gamma_6\rangle}$$

$$\Psi_1(\gamma^1\gamma^6, {}^3\Gamma^6, M=-1, \gamma_6) = |\overline{\gamma_1\gamma_6}|$$
$$\Psi_2(\gamma^1\gamma^6, {}^3\Gamma^6, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_6}|}{2}$$
$$\Psi_3(\gamma^1\gamma^6, {}^3\Gamma^6, M=1, \gamma_6) = |\gamma_1\gamma_6|$$

$\gamma^2\gamma^5$

$$\boxed{\Delta E = \langle\gamma_2\gamma_5||\gamma_2\gamma_5\rangle}$$

$$\Psi_4(\gamma^2\gamma^5, {}^3\Gamma^6, M=-1, \gamma_6) = |\overline{\gamma_2\gamma_5}|$$
$$\Psi_5(\gamma^2\gamma^5, {}^3\Gamma^6, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_2}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_5}|}{2}$$
$$\Psi_6(\gamma^2\gamma^5, {}^3\Gamma^6, M=1, \gamma_6) = |\gamma_2\gamma_5|$$

$\gamma^3\gamma^4$

$$\boxed{\Delta E = \langle\gamma_3\gamma_4||\gamma_3\gamma_4\rangle}$$

$$\Psi_7(\gamma^3\gamma^4, {}^3\Gamma^6, M=-1, \gamma_6) = |\overline{\gamma_3\gamma_4}|$$
$$\Psi_8(\gamma^3\gamma^4, {}^3\Gamma^6, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_3}\gamma_4|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_4}|}{2}$$
$$\Psi_9(\gamma^3\gamma^4, {}^3\Gamma^6, M=1, \gamma_6) = |\gamma_3\gamma_4|$$

$\gamma^7\gamma^8$

$$\boxed{\Delta E = \langle\gamma_7\gamma_8||\gamma_7\gamma_8\rangle}$$

$$\Psi_{10}(\gamma^7\gamma^8, {}^3\Gamma^6, M=-1, \gamma_6) = |\overline{\gamma_7\gamma_8}|$$
$$\Psi_{11}(\gamma^7\gamma^8, {}^3\Gamma^6, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_8}|}{2}$$
$$\Psi_{12}(\gamma^7\gamma^8, {}^3\Gamma^6, M=1, \gamma_6) = |\gamma_7\gamma_8|$$

2.11.11 $^1\Gamma^6$

$\gamma^1\gamma^6$

$$\boxed{\Delta E = \langle\gamma_1\gamma_6||\gamma_1\gamma_6\rangle}$$

$$\Psi_1(\gamma^1\gamma^6, {}^1\Gamma^6, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_6}|}{2}$$

$\gamma^2\gamma^5$

$$\boxed{\Delta E = \langle\gamma_2\gamma_5||\gamma_2\gamma_5\rangle}$$

$$\Psi_2(\gamma^2\gamma^5, {}^1\Gamma^6, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_2}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_5}|}{2}$$

$\gamma^3\gamma^4$

$$\boxed{\Delta E = \langle\gamma_3\gamma_4||\gamma_3\gamma_4\rangle}$$

$$\Psi_3(\gamma^3\gamma^4, {}^1\Gamma^6, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_3}\gamma_4|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_4}|}{2}$$

$\gamma^7\gamma^8$

$$\boxed{\Delta E = \langle\gamma_7\gamma_8||\gamma_7\gamma_8\rangle}$$

$$\Psi_4(\gamma^7\gamma^8, {}^1\Gamma^6, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_8}|}{2}$$

2.11.12 $^{3}\Gamma^{7}$

$\gamma^1\gamma^7$

$$\boxed{\Delta E = \langle\gamma_1\gamma_7||\gamma_1\gamma_7\rangle}$$

$$\Psi_1(\gamma^1\gamma^7, {}^{3}\Gamma^7, M=-1, \gamma_7) = |\overline{\gamma_1}\overline{\gamma_7}|$$
$$\Psi_2(\gamma^1\gamma^7, {}^{3}\Gamma^7, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_7}|}{2}$$
$$\Psi_3(\gamma^1\gamma^7, {}^{3}\Gamma^7, M=1, \gamma_7) = |\gamma_1\gamma_7|$$

$\gamma^2\gamma^4$

$$\boxed{\Delta E = \langle\gamma_2\gamma_4||\gamma_2\gamma_4\rangle}$$

$$\Psi_4(\gamma^2\gamma^4, {}^{3}\Gamma^7, M=-1, \gamma_7) = |\overline{\gamma_2}\overline{\gamma_4}|$$
$$\Psi_5(\gamma^2\gamma^4, {}^{3}\Gamma^7, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_2}\gamma_4|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_4}|}{2}$$
$$\Psi_6(\gamma^2\gamma^4, {}^{3}\Gamma^7, M=1, \gamma_7) = |\gamma_2\gamma_4|$$

$\gamma^3\gamma^5$

$$\boxed{\Delta E = \langle\gamma_3\gamma_5||\gamma_3\gamma_5\rangle}$$

$$\Psi_7(\gamma^3\gamma^5, {}^{3}\Gamma^7, M=-1, \gamma_7) = |\overline{\gamma_3}\overline{\gamma_5}|$$
$$\Psi_8(\gamma^3\gamma^5, {}^{3}\Gamma^7, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_3}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_5}|}{2}$$
$$\Psi_9(\gamma^3\gamma^5, {}^{3}\Gamma^7, M=1, \gamma_7) = |\gamma_3\gamma_5|$$

$\gamma^6\gamma^8$

$$\boxed{\Delta E = \langle\gamma_6\gamma_8||\gamma_6\gamma_8\rangle}$$

$$\Psi_{10}(\gamma^6\gamma^8, {}^{3}\Gamma^7, M=-1, \gamma_7) = |\overline{\gamma_6}\overline{\gamma_8}|$$
$$\Psi_{11}(\gamma^6\gamma^8, {}^{3}\Gamma^7, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_8}|}{2}$$
$$\Psi_{12}(\gamma^6\gamma^8, {}^{3}\Gamma^7, M=1, \gamma_7) = |\gamma_6\gamma_8|$$

2.11.13 $^{1}\Gamma^{7}$

$\gamma^1\gamma^7$

$$\boxed{\Delta E = \langle\gamma_1\gamma_7||\gamma_1\gamma_7\rangle}$$

$$\Psi_1(\gamma^1\gamma^7, {}^{1}\Gamma^7, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_7}|}{2}$$

$\gamma^2\gamma^4$

$$\boxed{\Delta E = \langle\gamma_2\gamma_4||\gamma_2\gamma_4\rangle}$$

$$\Psi_2(\gamma^2\gamma^4, {}^{1}\Gamma^7, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_2}\gamma_4|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_4}|}{2}$$

$\gamma^3\gamma^5$

$$\boxed{\Delta E = \langle\gamma_3\gamma_5||\gamma_3\gamma_5\rangle}$$

$$\Psi_3(\gamma^3\gamma^5, {}^{1}\Gamma^7, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_3}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_3\overline{\gamma_5}|}{2}$$

$\gamma^6\gamma^8$

$$\boxed{\Delta E = \langle\gamma_6\gamma_8||\gamma_6\gamma_8\rangle}$$

$$\Psi_4(\gamma^6\gamma^8, {}^{1}\Gamma^7, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_8}|}{2}$$

2.11.14 $^{3}\Gamma^{8}$

$\gamma^1\gamma^8$

$$\boxed{\Delta E = -\langle\gamma_1\gamma_1||\gamma_8\gamma_8\rangle + \langle\gamma_1\gamma_8||\gamma_1\gamma_8\rangle}$$

$$\Psi_1(\gamma^1\gamma^8, {}^{3}\Gamma^8, M=-1, \gamma_8) = |\overline{\gamma_1}\overline{\gamma_8}|$$
$$\Psi_2(\gamma^1\gamma^8, {}^{3}\Gamma^8, M=0, \gamma_8) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_8}|}{2}$$
$$\Psi_3(\gamma^1\gamma^8, {}^{3}\Gamma^8, M=1, \gamma_8) = |\gamma_1\gamma_8|$$

$\gamma^4\gamma^5$

$$\boxed{\Delta E = -\langle\gamma_4\gamma_4||\gamma_5\gamma_5\rangle + \langle\gamma_4\gamma_5||\gamma_4\gamma_5\rangle}$$

$$\Psi_4(\gamma^4\gamma^5, {}^{3}\Gamma^8, M=-1, \gamma_8) = |\overline{\gamma_4}\overline{\gamma_5}|$$
$$\Psi_5(\gamma^4\gamma^5, {}^{3}\Gamma^8, M=0, \gamma_8) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_5}|}{2}$$
$$\Psi_6(\gamma^4\gamma^5, {}^{3}\Gamma^8, M=1, \gamma_8) = |\gamma_4\gamma_5|$$

2.11.15 $^{1}\Gamma^{8}$

$\gamma^1\gamma^8$

$$\boxed{\Delta E = \langle\gamma_1\gamma_1||\gamma_8\gamma_8\rangle + \langle\gamma_1\gamma_8||\gamma_1\gamma_8\rangle}$$

$$\Psi_1(\gamma^1\gamma^8, {}^{1}\Gamma^8, M=0, \gamma_8) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_8}|}{2}$$

$(\gamma^2)^2$

$$\boxed{\Delta E = \langle\gamma_2\gamma_2||\gamma_2\gamma_2\rangle}$$

$$\Psi_2((\gamma^2)^2, {}^{1}\Gamma^8, M=0, \gamma_8) = -|\overline{\gamma_2}\gamma_2|$$

$(\gamma^3)^2$

$$\boxed{\Delta E = \langle\gamma_3\gamma_3||\gamma_3\gamma_3\rangle}$$

$$\Psi_3((\gamma^3)^2, {}^{1}\Gamma^8, M=0, \gamma_8) = -|\overline{\gamma_3}\gamma_3|$$

$\gamma^4\gamma^5$

$$\boxed{\Delta E = \langle\gamma_4\gamma_4||\gamma_5\gamma_5\rangle + \langle\gamma_4\gamma_5||\gamma_4\gamma_5\rangle}$$

$\Psi_4(\gamma^4\gamma^5, {}^1\Gamma^8, M=0, \gamma_8) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_5}|}{2}$

$(\gamma^6)^2$

$\boxed{\Delta E = \langle\gamma_6\gamma_6||\gamma_6\gamma_6\rangle}$

$\Psi_5((\gamma^6)^2, {}^1\Gamma^8, M=0, \gamma_8) = -|\overline{\gamma_6}\gamma_6|$

$(\gamma^7)^2$

$\boxed{\Delta E = \langle\gamma_7\gamma_7||\gamma_7\gamma_7\rangle}$

$\Psi_6((\gamma^7)^2, {}^1\Gamma^8, M=0, \gamma_8) = -|\overline{\gamma_7}\gamma_7|$

2.11.16 $^3\Gamma^1$

$\gamma^2\gamma^3$

$\boxed{\Delta E = -\langle\gamma_2\gamma_2||\gamma_3\gamma_3\rangle + \langle\gamma_2\gamma_3||\gamma_2\gamma_3\rangle}$

$\Psi_1(\gamma^2\gamma^3, {}^3\Gamma^1, M=-1, \gamma_1) = |\overline{\gamma_2}\overline{\gamma_3}|$
$\Psi_2(\gamma^2\gamma^3, {}^3\Gamma^1, M=0, \gamma_1) = \frac{\sqrt{2}|\overline{\gamma_2}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_3}|}{2}$
$\Psi_3(\gamma^2\gamma^3, {}^3\Gamma^1, M=1, \gamma_1) = |\gamma_2\gamma_3|$

$\gamma^6\gamma^7$

$\boxed{\Delta E = -\langle\gamma_6\gamma_6||\gamma_7\gamma_7\rangle + \langle\gamma_6\gamma_7||\gamma_6\gamma_7\rangle}$

$\Psi_4(\gamma^6\gamma^7, {}^3\Gamma^1, M=-1, \gamma_1) = |\overline{\gamma_6}\overline{\gamma_7}|$
$\Psi_5(\gamma^6\gamma^7, {}^3\Gamma^1, M=0, \gamma_1) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_7}|}{2}$
$\Psi_6(\gamma^6\gamma^7, {}^3\Gamma^1, M=1, \gamma_1) = |\gamma_6\gamma_7|$

2.12 Group D_4

Component labels

$A_1 : \{\alpha\}$ —— $A_2 : \{\beta\}$ —— $B_2 : \{\zeta\}$ —— $B_1 : \{\gamma\}$ —— $E : \{\eta, \mu\}$

2.12.1 $^1A_1$

a_1^2

$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$

$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$

a_2^2

$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$

$\Psi_2(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$

b_2^2

$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$

$\Psi_3(b_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\zeta}\zeta|$

b_1^2

$\boxed{\Delta E = \langle\gamma\gamma||\gamma\gamma\rangle}$

$\Psi_4(b_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\gamma}\gamma|$

e^2

$\boxed{\Delta E = \langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$

$\Psi_5(e^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$

2.12.2 $^3A_2$

a_1a_2

$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$

$\Psi_1(a_1a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$
$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$
$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$

b_1b_2

$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle - \langle\zeta\zeta||\gamma\gamma\rangle}$

$\Psi_4(b_1b_2, {}^3A_2, M=-1, \beta) = |\overline{\zeta}\overline{\gamma}|$
$\Psi_5(b_1b_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$
$\Psi_6(b_1b_2, {}^3A_2, M=1, \beta) = |\zeta\gamma|$

e^2

$$\boxed{\Delta E = \langle \mu\eta || \mu\eta \rangle - \langle \mu\mu || \eta\eta \rangle}$$

$$\Psi_7(e^2, {}^3A_2, M=-1, \beta) = -|\overline{\eta\mu}|$$
$$\Psi_8(e^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$
$$\Psi_9(e^2, {}^3A_2, M=1, \beta) = -|\eta\mu|$$

2.12.3 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle \alpha\alpha || \beta\beta \rangle + \langle \alpha\beta || \alpha\beta \rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

b_1b_2

$$\boxed{\Delta E = \langle \zeta\gamma || \zeta\gamma \rangle + \langle \zeta\zeta || \gamma\gamma \rangle}$$

$$\Psi_2(b_1b_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$

2.12.4 $^3B_2$

a_1b_2

$$\boxed{\Delta E = -\langle \alpha\alpha || \zeta\zeta \rangle + \langle \alpha\zeta || \alpha\zeta \rangle}$$

$$\Psi_1(a_1b_2, {}^3B_2, M=-1, \zeta) = |\overline{\alpha\zeta}|$$
$$\Psi_2(a_1b_2, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(a_1b_2, {}^3B_2, M=1, \zeta) = |\alpha\zeta|$$

a_2b_1

$$\boxed{\Delta E = -\langle \beta\beta || \gamma\gamma \rangle + \langle \beta\gamma || \beta\gamma \rangle}$$

$$\Psi_4(a_2b_1, {}^3B_2, M=-1, \zeta) = |\overline{\beta\gamma}|$$
$$\Psi_5(a_2b_1, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_6(a_2b_1, {}^3B_2, M=1, \zeta) = |\beta\gamma|$$

2.12.5 $^1B_2$

a_1b_2

$$\boxed{\Delta E = \langle \alpha\alpha || \zeta\zeta \rangle + \langle \alpha\zeta || \alpha\zeta \rangle}$$

$$\Psi_1(a_1b_2, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2b_1

$$\boxed{\Delta E = \langle \beta\beta || \gamma\gamma \rangle + \langle \beta\gamma || \beta\gamma \rangle}$$

$$\Psi_2(a_2b_1, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$

e^2

$$\boxed{\Delta E = \langle \mu\eta || \mu\eta \rangle + \langle \mu\mu || \eta\eta \rangle}$$

$$\Psi_3(e^2, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} - \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$

2.12.6 $^3B_1$

a_1b_1

$$\boxed{\Delta E = -\langle \alpha\alpha || \gamma\gamma \rangle + \langle \alpha\gamma || \alpha\gamma \rangle}$$

$$\Psi_1(a_1b_1, {}^3B_1, M=-1, \gamma) = |\overline{\alpha\gamma}|$$
$$\Psi_2(a_1b_1, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(a_1b_1, {}^3B_1, M=1, \gamma) = |\alpha\gamma|$$

a_2b_2

$$\boxed{\Delta E = -\langle \beta\beta || \zeta\zeta \rangle + \langle \beta\zeta || \beta\zeta \rangle}$$

$$\Psi_4(a_2b_2, {}^3B_1, M=-1, \gamma) = |\overline{\beta\zeta}|$$
$$\Psi_5(a_2b_2, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_6(a_2b_2, {}^3B_1, M=1, \gamma) = |\beta\zeta|$$

2.12.7 $^1B_1$

a_1b_1

$$\boxed{\Delta E = \langle \alpha\alpha || \gamma\gamma \rangle + \langle \alpha\gamma || \alpha\gamma \rangle}$$

$$\Psi_1(a_1b_1, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

a_2b_2

$$\boxed{\Delta E = \langle \beta\beta || \zeta\zeta \rangle + \langle \beta\zeta || \beta\zeta \rangle}$$

$$\Psi_2(a_2b_2, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

e^2

$$\boxed{\Delta E = -\langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_3(e^2, {}^1B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$

2.12.8 ^3E

a_1e

$$\boxed{\Delta E = -\langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e, {}^3E, M=-1, \eta) = |\overline{\alpha}\overline{\eta}|$$
$$\Psi_2(a_1e, {}^3E, M=-1, \mu) = |\overline{\alpha}\overline{\mu}|$$
$$\Psi_3(a_1e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_4(a_1e, {}^3E, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_5(a_1e, {}^3E, M=1, \eta) = |\alpha\eta|$$
$$\Psi_6(a_1e, {}^3E, M=1, \mu) = |\alpha\mu|$$

a_2e

$$\boxed{\Delta E = -\langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_7(a_2e, {}^3E, M=-1, \mu) = -|\overline{\beta}\overline{\eta}|$$
$$\Psi_8(a_2e, {}^3E, M=-1, \eta) = |\overline{\beta}\overline{\mu}|$$
$$\Psi_9(a_2e, {}^3E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_{10}(a_2e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_{11}(a_2e, {}^3E, M=1, \mu) = -|\beta\eta|$$
$$\Psi_{12}(a_2e, {}^3E, M=1, \eta) = |\beta\mu|$$

b_2e

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle - \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_{13}(b_2e, {}^3E, M=-1, \mu) = |\overline{\zeta}\overline{\eta}|$$
$$\Psi_{14}(b_2e, {}^3E, M=-1, \eta) = |\overline{\zeta}\overline{\mu}|$$
$$\Psi_{15}(b_2e, {}^3E, M=0, \mu) = \frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_{16}(b_2e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{17}(b_2e, {}^3E, M=1, \mu) = |\zeta\eta|$$
$$\Psi_{18}(b_2e, {}^3E, M=1, \eta) = |\zeta\mu|$$

b_1e

$$\boxed{\Delta E = -\langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_{19}(b_1e, {}^3E, M=-1, \eta) = |\overline{\gamma}\overline{\eta}|$$
$$\Psi_{20}(b_1e, {}^3E, M=-1, \mu) = -|\overline{\gamma}\overline{\mu}|$$
$$\Psi_{21}(b_1e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_{22}(b_1e, {}^3E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\gamma}\mu|}{2} - \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$
$$\Psi_{23}(b_1e, {}^3E, M=1, \eta) = |\gamma\eta|$$
$$\Psi_{24}(b_1e, {}^3E, M=1, \mu) = -|\gamma\mu|$$

2.12.9 ^1E

a_1e

$$\boxed{\Delta E = \langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_2(a_1e, {}^1E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$

a_2e

$$\boxed{\Delta E = \langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_3(a_2e, {}^1E, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_4(a_2e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$

b_2e

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle + \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_5(b_2e, {}^1E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_6(b_2e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

b_1e

$$\boxed{\Delta E = \langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_7(b_1e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_8(b_1e, {}^1E, M=0, \mu) = \frac{\sqrt{2}|\overline{\gamma}\mu|}{2} - \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$

2.13 Group C_{4v}

Component labels

$$A_1:\{\alpha\} \text{ —— } A_2:\{\beta\} \text{ —— } B_2:\{\zeta\} \text{ —— } B_1:\{\gamma\} \text{ —— } E:\{\eta,\mu\}$$

2.13.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

a_2^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

b_2^2

$$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_3(b_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\zeta}\zeta|$$

b_1^2

$$\boxed{\Delta E = \langle\gamma\gamma||\gamma\gamma\rangle}$$

$$\Psi_4(b_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\gamma}\gamma|$$

e^2

$$\boxed{\Delta E = \langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_5(e^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$

2.13.2 $^3A_2$

a_1a_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

b_1b_2

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle - \langle\zeta\zeta||\gamma\gamma\rangle}$$

$$\Psi_4(b_1b_2, {}^3A_2, M=-1, \beta) = |\overline{\zeta}\overline{\gamma}|$$
$$\Psi_5(b_1b_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$
$$\Psi_6(b_1b_2, {}^3A_2, M=1, \beta) = |\zeta\gamma|$$

e^2

$$\boxed{\Delta E = \langle\mu\eta||\mu\eta\rangle - \langle\mu\mu||\eta\eta\rangle}$$

$$\Psi_7(e^2, {}^3A_2, M=-1, \beta) = -|\overline{\eta}\overline{\mu}|$$
$$\Psi_8(e^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$
$$\Psi_9(e^2, {}^3A_2, M=1, \beta) = -|\eta\mu|$$

2.13.3 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

b_1b_2

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle + \langle\zeta\zeta||\gamma\gamma\rangle}$$

$$\Psi_2(b_1b_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$

2.13.4 $^3B_2$

a_1b_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^3B_2, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(a_1b_2, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(a_1b_2, {}^3B_2, M=1, \zeta) = |\alpha\zeta|$$

a_2b_1

$$\boxed{\Delta E = -\langle\beta\beta||\gamma\gamma\rangle + \langle\beta\gamma||\beta\gamma\rangle}$$

$$\Psi_4(a_2b_1, {}^3B_2, M=-1, \zeta) = |\overline{\beta}\overline{\gamma}|$$
$$\Psi_5(a_2b_1, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_6(a_2b_1, {}^3B_2, M=1, \zeta) = |\beta\gamma|$$

2.13.5 $^1B_2$

a_1b_2

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2b_1

$$\boxed{\Delta E = \langle\beta\beta||\gamma\gamma\rangle + \langle\beta\gamma||\beta\gamma\rangle}$$

$$\Psi_2(a_2b_1, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$

e^2

$$\boxed{\Delta E = \langle\mu\eta||\mu\eta\rangle + \langle\mu\mu||\eta\eta\rangle}$$

$$\Psi_3(e^2, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} - \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$

2.13.6 $^3B_1$

a_1b_1

$$\boxed{\Delta E = -\langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^3B_1, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1b_1, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(a_1b_1, {}^3B_1, M=1, \gamma) = |\alpha\gamma|$$

a_2b_2

$$\boxed{\Delta E = -\langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_4(a_2b_2, {}^3B_1, M=-1, \gamma) = |\overline{\beta}\overline{\zeta}|$$
$$\Psi_5(a_2b_2, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_6(a_2b_2, {}^3B_1, M=1, \gamma) = |\beta\zeta|$$

2.13.7 $^1B_1$

a_1b_1

$$\boxed{\Delta E = \langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

a_2b_2

$$\boxed{\Delta E = \langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_2(a_2b_2, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

e^2

$$\boxed{\Delta E = -\langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_3(e^2, {}^1B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$

2.13.8 ^3E

a_1e

$$\boxed{\Delta E = -\langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e, {}^3E, M=-1, \eta) = |\overline{\alpha}\overline{\eta}|$$
$$\Psi_2(a_1e, {}^3E, M=-1, \mu) = |\overline{\alpha}\overline{\mu}|$$
$$\Psi_3(a_1e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_4(a_1e, {}^3E, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_5(a_1e, {}^3E, M=1, \eta) = |\alpha\eta|$$
$$\Psi_6(a_1e, {}^3E, M=1, \mu) = |\alpha\mu|$$

a_2e

$$\boxed{\Delta E = -\langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_7(a_2e, {}^3E, M=-1, \mu) = -|\overline{\beta}\overline{\eta}|$$
$$\Psi_8(a_2e, {}^3E, M=-1, \eta) = |\overline{\beta}\overline{\mu}|$$
$$\Psi_9(a_2e, {}^3E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_{10}(a_2e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_{11}(a_2e, {}^3E, M=1, \mu) = -|\beta\eta|$$
$$\Psi_{12}(a_2e, {}^3E, M=1, \eta) = |\beta\mu|$$

b_2e

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle - \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_{13}(b_2e, {}^3E, M=-1, \mu) = |\overline{\zeta}\overline{\eta}|$$
$$\Psi_{14}(b_2e, {}^3E, M=-1, \eta) = |\overline{\zeta}\overline{\mu}|$$
$$\Psi_{15}(b_2e, {}^3E, M=0, \mu) = \frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_{16}(b_2e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{17}(b_2e, {}^3E, M=1, \mu) = |\zeta\eta|$$
$$\Psi_{18}(b_2e, {}^3E, M=1, \eta) = |\zeta\mu|$$

b_1e

$$\boxed{\Delta E = -\langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_{19}(b_1e, {}^3E, M=-1, \eta) = |\overline{\gamma}\overline{\eta}|$$

$$\Psi_{20}(b_1e, {}^3E, M=-1, \mu) = -|\overline{\gamma}\overline{\mu}|$$
$$\Psi_{21}(b_1e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_{22}(b_1e, {}^3E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\gamma}\mu|}{2} - \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$
$$\Psi_{23}(b_1e, {}^3E, M=1, \eta) = |\gamma\eta|$$
$$\Psi_{24}(b_1e, {}^3E, M=1, \mu) = -|\gamma\mu|$$

2.13.9 ^1E

a_1e

$$\boxed{\Delta E = \langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_2(a_1e, {}^1E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$

a_2e

$$\boxed{\Delta E = \langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_3(a_2e, {}^1E, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_4(a_2e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$

b_2e

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle + \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_5(b_2e, {}^1E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_6(b_2e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

b_1e

$$\boxed{\Delta E = \langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_7(b_1e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_8(b_1e, {}^1E, M=0, \mu) = \frac{\sqrt{2}|\overline{\gamma}\mu|}{2} - \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$

2.14 Group D_{2d}

Component labels

$A_1 : \{\alpha\}$ —— $B_1 : \{\gamma\}$ —— $A_2 : \{\beta\}$ —— $B_2 : \{\zeta\}$ —— $E : \{\eta, \mu\}$

2.14.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

b_1^2

$$\boxed{\Delta E = \langle\gamma\gamma||\gamma\gamma\rangle}$$

$$\Psi_2(b_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\gamma}\gamma|$$

a_2^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_3(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

b_2^2

$$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_4(b_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\zeta}\zeta|$$

e^2

$$\boxed{\Delta E = \langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_5(e^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$

2.14.2 $^3B_1$

a_1b_1

$$\boxed{\Delta E = -\langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^3B_1, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1b_1, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(a_1b_1, {}^3B_1, M=1, \gamma) = |\alpha\gamma|$$

a_2b_2

$$\boxed{\Delta E = -\langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_4(a_2b_2, {}^3B_1, M=-1, \gamma) = |\overline{\beta}\overline{\zeta}|$$
$$\Psi_5(a_2b_2, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_6(a_2b_2, {}^3B_1, M=1, \gamma) = |\beta\zeta|$$

2.14.3 $^1B_1$

a_1b_1

$$\boxed{\Delta E = \langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

a_2b_2

$$\boxed{\Delta E = \langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_2(a_2b_2, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

e^2

$$\boxed{\Delta E = \langle\mu\eta||\mu\eta\rangle + \langle\mu\mu||\eta\eta\rangle}$$

$$\Psi_3(e^2, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} - \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$

2.14.4 $^3A_2$

a_1a_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

b_1b_2

$$\boxed{\Delta E = -\langle\gamma\gamma||\zeta\zeta\rangle + \langle\gamma\zeta||\gamma\zeta\rangle}$$

$$\Psi_4(b_1b_2, {}^3A_2, M=-1, \beta) = |\overline{\gamma}\overline{\zeta}|$$
$$\Psi_5(b_1b_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$
$$\Psi_6(b_1b_2, {}^3A_2, M=1, \beta) = |\gamma\zeta|$$

e^2

$$\boxed{\Delta E = \langle\mu\eta||\mu\eta\rangle - \langle\mu\mu||\eta\eta\rangle}$$

$$\Psi_7(e^2, {}^3A_2, M=-1, \beta) = -|\overline{\eta}\overline{\mu}|$$
$$\Psi_8(e^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$
$$\Psi_9(e^2, {}^3A_2, M=1, \beta) = -|\eta\mu|$$

2.14.5 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

b_1b_2

$$\boxed{\Delta E = \langle\gamma\gamma||\zeta\zeta\rangle + \langle\gamma\zeta||\gamma\zeta\rangle}$$

$$\Psi_2(b_1b_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$

2.14.6 $^3B_2$

a_1b_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^3B_2, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(a_1b_2, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(a_1b_2, {}^3B_2, M=1, \zeta) = |\alpha\zeta|$$

a_2b_1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle - \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_4(a_2b_1, {}^3B_2, M=-1, \zeta) = |\overline{\gamma}\overline{\beta}|$$
$$\Psi_5(a_2b_1, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$
$$\Psi_6(a_2b_1, {}^3B_2, M=1, \zeta) = |\gamma\beta|$$

2.14.7 $^1B_2$

a_1b_2

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2b_1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle + \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_2(a_2b_1, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$

e^2

$$\boxed{\Delta E = -\langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_3(e^2, {}^1B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$

2.14.8 ^3E

a_1e

$$\boxed{\Delta E = -\langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e, {}^3E, M=-1, \eta) = |\overline{\alpha\eta}|$$
$$\Psi_2(a_1e, {}^3E, M=-1, \mu) = |\overline{\alpha\mu}|$$
$$\Psi_3(a_1e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_4(a_1e, {}^3E, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_5(a_1e, {}^3E, M=1, \eta) = |\alpha\eta|$$
$$\Psi_6(a_1e, {}^3E, M=1, \mu) = |\alpha\mu|$$

b_1e

$$\boxed{\Delta E = -\langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_7(b_1e, {}^3E, M=-1, \mu) = |\overline{\gamma\eta}|$$
$$\Psi_8(b_1e, {}^3E, M=-1, \eta) = |\overline{\gamma\mu}|$$
$$\Psi_9(b_1e, {}^3E, M=0, \mu) = \frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_{10}(b_1e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\gamma}\mu|}{2} + \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$
$$\Psi_{11}(b_1e, {}^3E, M=1, \mu) = |\gamma\eta|$$
$$\Psi_{12}(b_1e, {}^3E, M=1, \eta) = |\gamma\mu|$$

a_2e

$$\boxed{\Delta E = -\langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_{13}(a_2e, {}^3E, M=-1, \mu) = -|\overline{\beta}\overline{\eta}|$$
$$\Psi_{14}(a_2e, {}^3E, M=-1, \eta) = |\overline{\beta}\overline{\mu}|$$
$$\Psi_{15}(a_2e, {}^3E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_{16}(a_2e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_{17}(a_2e, {}^3E, M=1, \mu) = -|\beta\eta|$$
$$\Psi_{18}(a_2e, {}^3E, M=1, \eta) = |\beta\mu|$$

b_2e

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle - \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_{19}(b_2e, {}^3E, M=-1, \eta) = |\overline{\zeta}\overline{\eta}|$$
$$\Psi_{20}(b_2e, {}^3E, M=-1, \mu) = -|\overline{\zeta}\overline{\mu}|$$
$$\Psi_{21}(b_2e, {}^3E, M=0, \eta) = \frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_{22}(b_2e, {}^3E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\zeta}\mu|}{2} - \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{23}(b_2e, {}^3E, M=1, \eta) = |\zeta\eta|$$
$$\Psi_{24}(b_2e, {}^3E, M=1, \mu) = -|\zeta\mu|$$

2.14.9 ^1E

a_1e

$$\boxed{\Delta E = \langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_2(a_1e, {}^1E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$

b_1e

$$\boxed{\Delta E = \langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_3(b_1e, {}^1E, M=0, \mu) = -\frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_4(b_1e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\gamma}\mu|}{2} + \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$

a_2e

$$\boxed{\Delta E = \langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_5(a_2e, {}^1E, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_6(a_2e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$

b_2e

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle + \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_7(b_2e, {}^1E, M=0, \eta) = -\frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_8(b_2e, {}^1E, M=0, \mu) = \frac{\sqrt{2}|\overline{\zeta}\mu|}{2} - \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

2.15 Group D_{4h}

Component labels

$A_{1g} : \{\alpha_g\}$ —— $A_{2g} : \{\beta_g\}$ —— $B_{2g} : \{\zeta_g\}$ —— $A_{2u} : \{\beta_u\}$ —— $B_{2u} : \{\zeta_u\}$ —— $B_{1u} : \{\gamma_u\}$ ——
$A_{1u} : \{\alpha_u\}$ —— $B_{1g} : \{\gamma_g\}$ —— $E_u : \{\eta_u, \mu_u\}$ —— $E_g : \{\eta_g, \mu_g\}$

2.15.1 $^1A_{1g}$

a_{1g}^2

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\alpha_g\alpha_g\rangle}$$

$$\Psi_1(a_{1g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

a_{2g}^2

$$\boxed{\Delta E = \langle \beta_g\beta_g||\beta_g\beta_g\rangle}$$

$$\Psi_2(a_{2g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\beta_g}\beta_g|$$

b_{2g}^2

$$\boxed{\Delta E = \langle \zeta_g\zeta_g||\zeta_g\zeta_g\rangle}$$

$$\Psi_3(b_{2g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\zeta_g}\zeta_g|$$

a_{2u}^2

$$\boxed{\Delta E = \langle \beta_u\beta_u||\beta_u\beta_u\rangle}$$

$$\Psi_4(a_{2u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\beta_u}\beta_u|$$

b_{2u}^2

$$\boxed{\Delta E = \langle \zeta_u\zeta_u||\zeta_u\zeta_u\rangle}$$

$$\Psi_5(b_{2u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\zeta_u}\zeta_u|$$

b_{1u}^2

$$\boxed{\Delta E = \langle \gamma_u\gamma_u||\gamma_u\gamma_u\rangle}$$

$$\Psi_6(b_{1u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\gamma_u}\gamma_u|$$

a_{1u}^2

$$\boxed{\Delta E = \langle \alpha_u\alpha_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_7(a_{1u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

b_{1g}^2

$$\boxed{\Delta E = \langle \gamma_g\gamma_g||\gamma_g\gamma_g\rangle}$$

$$\Psi_8(b_{1g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\gamma_g}\gamma_g|$$

e_u^2

$$\boxed{\Delta E = \langle \mu_u\mu_u||\eta_u\eta_u\rangle + \langle \mu_u\mu_u||\mu_u\mu_u\rangle}$$

$$\Psi_9(e_u^2, {}^1A_{1g}, M=0, \alpha_g) = -\frac{\sqrt{2}|\overline{\eta_u}\eta_u|}{2} - \frac{\sqrt{2}|\overline{\mu_u}\mu_u|}{2}$$

e_g^2

$$\boxed{\Delta E = \langle \mu_g\mu_g||\eta_g\eta_g\rangle + \langle \mu_g\mu_g||\mu_g\mu_g\rangle}$$

$$\Psi_{10}(e_g^2, {}^1A_{1g}, M=0, \alpha_g) = -\frac{\sqrt{2}|\overline{\eta_g}\eta_g|}{2} - \frac{\sqrt{2}|\overline{\mu_g}\mu_g|}{2}$$

2.15.2 $^3A_{2g}$

$a_{1g}a_{2g}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle \alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_{1g}a_{2g}, {}^3A_{2g}, M=-1, \beta_g) = |\overline{\alpha_g}\overline{\beta_g}|$$

$$\Psi_2(a_{1g}a_{2g}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$

$$\Psi_3(a_{1g}a_{2g}, {}^3A_{2g}, M=1, \beta_g) = |\alpha_g\beta_g|$$

$b_{1g}b_{2g}$

$$\boxed{\Delta E = \langle \zeta_g\gamma_g||\zeta_g\gamma_g\rangle - \langle \zeta_g\zeta_g||\gamma_g\gamma_g\rangle}$$

$$\Psi_4(b_{1g}b_{2g}, {}^3A_{2g}, M=-1, \beta_g) = |\overline{\zeta_g}\overline{\gamma_g}|$$

$$\Psi_5(b_{1g}b_{2g}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\zeta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\gamma_g}|}{2}$$

$$\Psi_6(b_{1g}b_{2g}, {}^3A_{2g}, M=1, \beta_g) = |\zeta_g\gamma_g|$$

$a_{1u}a_{2u}$

$$\boxed{\Delta E = \langle \beta_u\alpha_u||\beta_u\alpha_u\rangle - \langle \beta_u\beta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_7(a_{1u}a_{2u}, {}^3A_{2g}, M=-1, \beta_g) = |\overline{\beta_u}\overline{\alpha_u}|$$

$$\Psi_8(a_{1u}a_{2u}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$

$$\Psi_9(a_{1u}a_{2u}, {}^3A_{2g}, M=1, \beta_g) = |\beta_u\alpha_u|$$

$b_{1u}b_{2u}$

$$\boxed{\Delta E = \langle \zeta_u\gamma_u||\zeta_u\gamma_u\rangle - \langle \zeta_u\zeta_u||\gamma_u\gamma_u\rangle}$$

$$\Psi_{10}(b_{1u}b_{2u}, {}^3A_{2g}, M=-1, \beta_g) = |\overline{\zeta_u}\overline{\gamma_u}|$$

$$\Psi_{11}(b_{1u}b_{2u}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\zeta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\gamma_u}|}{2}$$

$$\Psi_{12}(b_{1u}b_{2u}, {}^3A_{2g}, M=1, \beta_g) = |\zeta_u\gamma_u|$$

e_u^2

$$\boxed{\Delta E = \langle \mu_u\eta_u||\mu_u\eta_u\rangle - \langle \mu_u\mu_u||\eta_u\eta_u\rangle}$$

$$\Psi_{13}(e_u^2, {}^3A_{2g}, M=-1, \beta_g) = -|\overline{\eta_u}\overline{\mu_u}|$$

$$\Psi_{14}(e_u^2, {}^3A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\eta_u}\mu_u|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\eta_u|}{2}$$

$$\Psi_{15}(e_u^2, {}^3A_{2g}, M=1, \beta_g) = -|\eta_u\mu_u|$$

e_g^2

$$\boxed{\Delta E = \langle \mu_g\eta_g||\mu_g\eta_g\rangle - \langle \mu_g\mu_g||\eta_g\eta_g\rangle}$$

$$\Psi_{16}(e_g^2, {}^3A_{2g}, M=-1, \beta_g) = -|\overline{\eta_g}\overline{\mu_g}|$$

$$\Psi_{17}(e_g^2, {}^3A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\eta_g}\mu_g|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\eta_g|}{2}$$

$$\Psi_{18}(e_g^2, {}^3A_{2g}, M=1, \beta_g) = -|\eta_g\mu_g|$$

2.15.3 $^1A_{2g}$

$a_{1g}a_{2g}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle \alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_{1g}a_{2g}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$

$b_{1g}b_{2g}$

$$\boxed{\Delta E = \langle \zeta_g\gamma_g||\zeta_g\gamma_g\rangle + \langle \zeta_g\zeta_g||\gamma_g\gamma_g\rangle}$$

$$\Psi_2(b_{1g}b_{2g}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\gamma_g}|}{2}$$

$a_{1u}a_{2u}$

$$\boxed{\Delta E = \langle \beta_u\alpha_u||\beta_u\alpha_u\rangle + \langle \beta_u\beta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_3(a_{1u}a_{2u}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$

$b_{1u}b_{2u}$

$$\boxed{\Delta E = \langle \zeta_u\gamma_u||\zeta_u\gamma_u\rangle + \langle \zeta_u\zeta_u||\gamma_u\gamma_u\rangle}$$

$$\Psi_4(b_{1u}b_{2u}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\gamma_u}|}{2}$$

2.15.4 $^3B_{2g}$

$a_{1g}b_{2g}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\zeta_g\zeta_g\rangle + \langle \alpha_g\zeta_g||\alpha_g\zeta_g\rangle}$$

$$\Psi_1(a_{1g}b_{2g}, {}^3B_{2g}, M=-1, \zeta_g) = |\overline{\alpha_g}\overline{\zeta_g}|$$
$$\Psi_2(a_{1g}b_{2g}, {}^3B_{2g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$
$$\Psi_3(a_{1g}b_{2g}, {}^3B_{2g}, M=1, \zeta_g) = |\alpha_g\zeta_g|$$

$a_{2g}b_{1g}$

$$\boxed{\Delta E = -\langle \beta_g\beta_g||\gamma_g\gamma_g\rangle + \langle \beta_g\gamma_g||\beta_g\gamma_g\rangle}$$

$$\Psi_4(a_{2g}b_{1g}, {}^3B_{2g}, M=-1, \zeta_g) = |\overline{\beta_g}\overline{\gamma_g}|$$
$$\Psi_5(a_{2g}b_{1g}, {}^3B_{2g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\gamma_g}|}{2}$$
$$\Psi_6(a_{2g}b_{1g}, {}^3B_{2g}, M=1, \zeta_g) = |\beta_g\gamma_g|$$

$a_{2u}b_{1u}$

$$\boxed{\Delta E = -\langle \beta_u\beta_u||\gamma_u\gamma_u\rangle + \langle \beta_u\gamma_u||\beta_u\gamma_u\rangle}$$

$$\Psi_7(a_{2u}b_{1u}, {}^3B_{2g}, M=-1, \zeta_g) = |\overline{\beta_u}\overline{\gamma_u}|$$
$$\Psi_8(a_{2u}b_{1u}, {}^3B_{2g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$
$$\Psi_9(a_{2u}b_{1u}, {}^3B_{2g}, M=1, \zeta_g) = |\beta_u\gamma_u|$$

$a_{1u}b_{2u}$

$$\boxed{\Delta E = \langle \zeta_u\alpha_u||\zeta_u\alpha_u\rangle - \langle \zeta_u\zeta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_{10}(a_{1u}b_{2u}, {}^3B_{2g}, M=-1, \zeta_g) = |\overline{\zeta_u}\overline{\alpha_u}|$$
$$\Psi_{11}(a_{1u}b_{2u}, {}^3B_{2g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\zeta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\alpha_u}|}{2}$$
$$\Psi_{12}(a_{1u}b_{2u}, {}^3B_{2g}, M=1, \zeta_g) = |\zeta_u\alpha_u|$$

2.15.5 $^1B_{2g}$

$a_{1g}b_{2g}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\zeta_g\zeta_g\rangle + \langle \alpha_g\zeta_g||\alpha_g\zeta_g\rangle}$$

$$\Psi_1(a_{1g}b_{2g}, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$

$a_{2g}b_{1g}$

$$\boxed{\Delta E = \langle \beta_g\beta_g||\gamma_g\gamma_g\rangle + \langle \beta_g\gamma_g||\beta_g\gamma_g\rangle}$$

$$\Psi_2(a_{2g}b_{1g}, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\gamma_g}|}{2}$$

$a_{2u}b_{1u}$

$$\boxed{\Delta E = \langle \beta_u\beta_u||\gamma_u\gamma_u\rangle + \langle \beta_u\gamma_u||\beta_u\gamma_u\rangle}$$

$$\Psi_3(a_{2u}b_{1u}, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$

$a_{1u}b_{2u}$

$$\boxed{\Delta E = \langle \zeta_u\alpha_u||\zeta_u\alpha_u\rangle + \langle \zeta_u\zeta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_4(a_{1u}b_{2u}, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\alpha_u}|}{2}$$

e_u^2

$$\boxed{\Delta E = \langle \mu_u\eta_u||\mu_u\eta_u\rangle + \langle \mu_u\mu_u||\eta_u\eta_u\rangle}$$

$$\Psi_5(e_u^2, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\eta_u}\mu_u|}{2} - \frac{\sqrt{2}|\overline{\mu_u}\eta_u|}{2}$$

e_g^2

$$\boxed{\Delta E = \langle \mu_g\eta_g||\mu_g\eta_g\rangle + \langle \mu_g\mu_g||\eta_g\eta_g\rangle}$$

$$\Psi_6(e_g^2, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\eta_g}\mu_g|}{2} - \frac{\sqrt{2}|\overline{\mu_g}\eta_g|}{2}$$

2.15.6 $^3A_{2u}$

$a_{1g}a_{2u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle\alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_1(a_{1g}a_{2u}, {}^3A_{2u}, M=-1, \beta_u) = |\overline{\alpha_g}\overline{\beta_u}|$$
$$\Psi_2(a_{1g}a_{2u}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$
$$\Psi_3(a_{1g}a_{2u}, {}^3A_{2u}, M=1, \beta_u) = |\alpha_g\beta_u|$$

$a_{1u}a_{2g}$

$$\boxed{\Delta E = \langle\beta_g\alpha_u||\beta_g\alpha_u\rangle - \langle\beta_g\beta_g||\alpha_u\alpha_u\rangle}$$

$$\Psi_4(a_{1u}a_{2g}, {}^3A_{2u}, M=-1, \beta_u) = |\overline{\beta_g}\overline{\alpha_u}|$$
$$\Psi_5(a_{1u}a_{2g}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\beta_g}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\alpha_u}|}{2}$$
$$\Psi_6(a_{1u}a_{2g}, {}^3A_{2u}, M=1, \beta_u) = |\beta_g\alpha_u|$$

$b_{1u}b_{2g}$

$$\boxed{\Delta E = \langle\zeta_g\gamma_u||\zeta_g\gamma_u\rangle - \langle\zeta_g\zeta_g||\gamma_u\gamma_u\rangle}$$

$$\Psi_7(b_{1u}b_{2g}, {}^3A_{2u}, M=-1, \beta_u) = |\overline{\zeta_g}\overline{\gamma_u}|$$
$$\Psi_8(b_{1u}b_{2g}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\zeta_g}\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\gamma_u}|}{2}$$
$$\Psi_9(b_{1u}b_{2g}, {}^3A_{2u}, M=1, \beta_u) = |\zeta_g\gamma_u|$$

$b_{1g}b_{2u}$

$$\boxed{\Delta E = \langle\zeta_u\gamma_g||\zeta_u\gamma_g\rangle - \langle\zeta_u\zeta_u||\gamma_g\gamma_g\rangle}$$

$$\Psi_{10}(b_{1g}b_{2u}, {}^3A_{2u}, M=-1, \beta_u) = |\overline{\zeta_u}\overline{\gamma_g}|$$
$$\Psi_{11}(b_{1g}b_{2u}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\zeta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\gamma_g}|}{2}$$
$$\Psi_{12}(b_{1g}b_{2u}, {}^3A_{2u}, M=1, \beta_u) = |\zeta_u\gamma_g|$$

e_ge_u

$$\boxed{\begin{array}{c}\Delta E = \langle\mu_u\mu_g||\eta_u\eta_g\rangle + \langle\mu_u\mu_g||\mu_u\mu_g\rangle - \langle\mu_u\mu_u||\mu_g\mu_g\rangle \\ - \langle\mu_u\eta_u||\eta_g\mu_g\rangle\end{array}}$$

$$\Psi_{13}(e_ge_u, {}^3A_{2u}, M=-1, \beta_u) = \frac{\sqrt{2}|\overline{\eta_u}\overline{\eta_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\mu_g}|}{2}$$
$$\Psi_{14}(e_ge_u, {}^3A_{2u}, M=0, \beta_u) = \frac{|\overline{\eta_u}\eta_g|}{2} + \frac{|\overline{\mu_u}\mu_g|}{2} + \frac{|\eta_u\overline{\eta_g}|}{2} + \frac{|\mu_u\overline{\mu_g}|}{2}$$
$$\Psi_{15}(e_ge_u, {}^3A_{2u}, M=1, \beta_u) = \frac{\sqrt{2}|\eta_u\eta_g|}{2} + \frac{\sqrt{2}|\mu_u\mu_g|}{2}$$

2.15.7 $^1A_{2u}$

$a_{1g}a_{2u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle\alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_1(a_{1g}a_{2u}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$a_{1u}a_{2g}$

$$\boxed{\Delta E = \langle\beta_g\alpha_u||\beta_g\alpha_u\rangle + \langle\beta_g\beta_g||\alpha_u\alpha_u\rangle}$$

$$\Psi_2(a_{1u}a_{2g}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\beta_g}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\alpha_u}|}{2}$$

$b_{1u}b_{2g}$

$$\boxed{\Delta E = \langle\zeta_g\gamma_u||\zeta_g\gamma_u\rangle + \langle\zeta_g\zeta_g||\gamma_u\gamma_u\rangle}$$

$$\Psi_3(b_{1u}b_{2g}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\gamma_u}|}{2}$$

$b_{1g}b_{2u}$

$$\boxed{\Delta E = \langle\zeta_u\gamma_g||\zeta_u\gamma_g\rangle + \langle\zeta_u\zeta_u||\gamma_g\gamma_g\rangle}$$

$$\Psi_4(b_{1g}b_{2u}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\gamma_g}|}{2}$$

e_ge_u

$$\boxed{\begin{array}{c}\Delta E = \langle\mu_u\mu_g||\eta_u\eta_g\rangle + \langle\mu_u\mu_g||\mu_u\mu_g\rangle + \langle\mu_u\mu_u||\mu_g\mu_g\rangle \\ + \langle\mu_u\eta_u||\eta_g\mu_g\rangle\end{array}}$$

$$\Psi_5(e_ge_u, {}^1A_{2u}, M=0, \beta_u) = -\frac{|\overline{\eta_u}\eta_g|}{2} - \frac{|\overline{\mu_u}\mu_g|}{2} + \frac{|\eta_u\overline{\eta_g}|}{2} + \frac{|\mu_u\overline{\mu_g}|}{2}$$

2.15.8 $^3B_{2u}$

$a_{1g}b_{2u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\zeta_u\zeta_u\rangle + \langle\alpha_g\zeta_u||\alpha_g\zeta_u\rangle}$$

$$\Psi_1(a_{1g}b_{2u}, {}^3B_{2u}, M=-1, \zeta_u) = |\overline{\alpha_g}\overline{\zeta_u}|$$
$$\Psi_2(a_{1g}b_{2u}, {}^3B_{2u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$
$$\Psi_3(a_{1g}b_{2u}, {}^3B_{2u}, M=1, \zeta_u) = |\alpha_g\zeta_u|$$

$a_{2g}b_{1u}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\gamma_u\gamma_u\rangle + \langle\beta_g\gamma_u||\beta_g\gamma_u\rangle}$$

$$\Psi_4(a_{2g}b_{1u}, {}^3B_{2u}, M=-1, \zeta_u) = |\overline{\beta_g}\overline{\gamma_u}|$$
$$\Psi_5(a_{2g}b_{1u}, {}^3B_{2u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\beta_g}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\gamma_u}|}{2}$$
$$\Psi_6(a_{2g}b_{1u}, {}^3B_{2u}, M=1, \zeta_u) = |\beta_g\gamma_u|$$

$a_{1u}b_{2g}$

$$\boxed{\Delta E = \langle \zeta_g\alpha_u||\zeta_g\alpha_u\rangle - \langle \zeta_g\zeta_g||\alpha_u\alpha_u\rangle}$$

$$\Psi_7(a_{1u}b_{2g}, {}^3B_{2u}, M=-1, \zeta_u) = |\overline{\zeta_g}\overline{\alpha_u}|$$
$$\Psi_8(a_{1u}b_{2g}, {}^3B_{2u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\zeta_g}\alpha_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\alpha_u}|}{2}$$
$$\Psi_9(a_{1u}b_{2g}, {}^3B_{2u}, M=1, \zeta_u) = |\zeta_g\alpha_u|$$

$a_{2u}b_{1g}$

$$\boxed{\Delta E = -\langle \beta_u\beta_u||\gamma_g\gamma_g\rangle + \langle \beta_u\gamma_g||\beta_u\gamma_g\rangle}$$

$$\Psi_{10}(a_{2u}b_{1g}, {}^3B_{2u}, M=-1, \zeta_u) = |\overline{\beta_u}\overline{\gamma_g}|$$
$$\Psi_{11}(a_{2u}b_{1g}, {}^3B_{2u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$
$$\Psi_{12}(a_{2u}b_{1g}, {}^3B_{2u}, M=1, \zeta_u) = |\beta_u\gamma_g|$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = -\langle \mu_u\mu_g||\eta_u\eta_g\rangle + \langle \mu_u\mu_g||\mu_u\mu_g\rangle - \langle \mu_u\mu_u||\mu_g\mu_g\rangle \\ + \langle \mu_u\eta_u||\eta_g\mu_g\rangle\end{gathered}}$$

$$\Psi_{13}(e_ge_u, {}^3B_{2u}, M=-1, \zeta_u) = -\frac{\sqrt{2}|\overline{\eta_u}\overline{\eta_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\mu_g}|}{2}$$
$$\Psi_{14}(e_ge_u, {}^3B_{2u}, M=0, \zeta_u) = -\frac{|\overline{\eta_u}\eta_g|}{2} + \frac{|\overline{\mu_u}\mu_g|}{2} - \frac{|\eta_u\overline{\eta_g}|}{2} + \frac{|\mu_u\overline{\mu_g}|}{2}$$
$$\Psi_{15}(e_ge_u, {}^3B_{2u}, M=1, \zeta_u) = -\frac{\sqrt{2}|\eta_u\eta_g|}{2} + \frac{\sqrt{2}|\mu_u\mu_g|}{2}$$

2.15.9 $^1B_{2u}$

$a_{1g}b_{2u}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\zeta_u\zeta_u\rangle + \langle \alpha_g\zeta_u||\alpha_g\zeta_u\rangle}$$

$$\Psi_1(a_{1g}b_{2u}, {}^1B_{2u}, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$

$a_{2g}b_{1u}$

$$\boxed{\Delta E = \langle \beta_g\beta_g||\gamma_u\gamma_u\rangle + \langle \beta_g\gamma_u||\beta_g\gamma_u\rangle}$$

$$\Psi_2(a_{2g}b_{1u}, {}^1B_{2u}, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_g}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\gamma_u}|}{2}$$

$a_{1u}b_{2g}$

$$\boxed{\Delta E = \langle \zeta_g\alpha_u||\zeta_g\alpha_u\rangle + \langle \zeta_g\zeta_g||\alpha_u\alpha_u\rangle}$$

$$\Psi_3(a_{1u}b_{2g}, {}^1B_{2u}, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\alpha_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\alpha_u}|}{2}$$

$a_{2u}b_{1g}$

$$\boxed{\Delta E = \langle \beta_u\beta_u||\gamma_g\gamma_g\rangle + \langle \beta_u\gamma_g||\beta_u\gamma_g\rangle}$$

$$\Psi_4(a_{2u}b_{1g}, {}^1B_{2u}, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = -\langle \mu_u\mu_g||\eta_u\eta_g\rangle + \langle \mu_u\mu_g||\mu_u\mu_g\rangle + \langle \mu_u\mu_u||\mu_g\mu_g\rangle \\ - \langle \mu_u\eta_u||\eta_g\mu_g\rangle\end{gathered}}$$

$$\Psi_5(e_ge_u, {}^1B_{2u}, M=0, \zeta_u) = \frac{|\overline{\eta_u}\eta_g|}{2} - \frac{|\overline{\mu_u}\mu_g|}{2} - \frac{|\eta_u\overline{\eta_g}|}{2} + \frac{|\mu_u\overline{\mu_g}|}{2}$$

2.15.10 $^3B_{1u}$

$a_{1g}b_{1u}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\gamma_u\gamma_u\rangle + \langle \alpha_g\gamma_u||\alpha_g\gamma_u\rangle}$$

$$\Psi_1(a_{1g}b_{1u}, {}^3B_{1u}, M=-1, \gamma_u) = |\overline{\alpha_g}\overline{\gamma_u}|$$
$$\Psi_2(a_{1g}b_{1u}, {}^3B_{1u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$
$$\Psi_3(a_{1g}b_{1u}, {}^3B_{1u}, M=1, \gamma_u) = |\alpha_g\gamma_u|$$

$a_{2g}b_{2u}$

$$\boxed{\Delta E = -\langle \beta_g\beta_g||\zeta_u\zeta_u\rangle + \langle \beta_g\zeta_u||\beta_g\zeta_u\rangle}$$

$$\Psi_4(a_{2g}b_{2u}, {}^3B_{1u}, M=-1, \gamma_u) = |\overline{\beta_g}\overline{\zeta_u}|$$
$$\Psi_5(a_{2g}b_{2u}, {}^3B_{1u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\beta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_u}|}{2}$$
$$\Psi_6(a_{2g}b_{2u}, {}^3B_{1u}, M=1, \gamma_u) = |\beta_g\zeta_u|$$

$a_{2u}b_{2g}$

$$\boxed{\Delta E = \langle \zeta_g\beta_u||\zeta_g\beta_u\rangle - \langle \zeta_g\zeta_g||\beta_u\beta_u\rangle}$$

$$\Psi_7(a_{2u}b_{2g}, {}^3B_{1u}, M=-1, \gamma_u) = |\overline{\zeta_g}\overline{\beta_u}|$$
$$\Psi_8(a_{2u}b_{2g}, {}^3B_{1u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\zeta_g}\beta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\beta_u}|}{2}$$
$$\Psi_9(a_{2u}b_{2g}, {}^3B_{1u}, M=1, \gamma_u) = |\zeta_g\beta_u|$$

$a_{1u}b_{1g}$

$$\boxed{\Delta E = -\langle \alpha_u\alpha_u||\gamma_g\gamma_g\rangle + \langle \alpha_u\gamma_g||\alpha_u\gamma_g\rangle}$$

$$\Psi_{10}(a_{1u}b_{1g}, {}^3B_{1u}, M=-1, \gamma_u) = |\overline{\alpha_u}\overline{\gamma_g}|$$
$$\Psi_{11}(a_{1u}b_{1g}, {}^3B_{1u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$
$$\Psi_{12}(a_{1u}b_{1g}, {}^3B_{1u}, M=1, \gamma_u) = |\alpha_u\gamma_g|$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = \langle \mu_u\eta_g||\mu_u\eta_g\rangle + \langle \mu_u\mu_g||\eta_u\eta_g\rangle - \langle \mu_u\mu_u||\eta_g\eta_g\rangle \\ - \langle \mu_u\eta_u||\mu_g\eta_g\rangle\end{gathered}}$$

$$\Psi_{13}(e_ge_u, {}^3B_{1u}, M=-1, \gamma_u) = \frac{\sqrt{2}|\overline{\eta_u}\overline{\mu_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\eta_g}|}{2}$$

$\Psi_{14}(e_ge_u, {}^3B_{1u}, M=0, \gamma_u) = \frac{|\overline{\eta_u}\mu_g|}{2} + \frac{|\overline{\mu_u}\eta_g|}{2} + \frac{|\eta_u\overline{\mu_g}|}{2} + \frac{|\mu_u\overline{\eta_g}|}{2}$

$\Psi_{15}(e_ge_u, {}^3B_{1u}, M=1, \gamma_u) = \frac{\sqrt{2}|\eta_u\mu_g|}{2} + \frac{\sqrt{2}|\mu_u\eta_g|}{2}$

2.15.11 $^1B_{1u}$

$a_{1g}b_{1u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\gamma_u\gamma_u\rangle + \langle\alpha_g\gamma_u||\alpha_g\gamma_u\rangle}$$

$\Psi_1(a_{1g}b_{1u}, {}^1B_{1u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$

$a_{2g}b_{2u}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\zeta_u\zeta_u\rangle + \langle\beta_g\zeta_u||\beta_g\zeta_u\rangle}$$

$\Psi_2(a_{2g}b_{2u}, {}^1B_{1u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\beta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_u}|}{2}$

$a_{2u}b_{2g}$

$$\boxed{\Delta E = \langle\zeta_g\beta_u||\zeta_g\beta_u\rangle + \langle\zeta_g\zeta_g||\beta_u\beta_u\rangle}$$

$\Psi_3(a_{2u}b_{2g}, {}^1B_{1u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\beta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\beta_u}|}{2}$

$a_{1u}b_{1g}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\gamma_g\gamma_g\rangle + \langle\alpha_u\gamma_g||\alpha_u\gamma_g\rangle}$$

$\Psi_4(a_{1u}b_{1g}, {}^1B_{1u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$

e_ge_u

$$\boxed{\begin{array}{c}\Delta E = \langle\mu_u\eta_g||\mu_u\eta_g\rangle + \langle\mu_u\mu_g||\eta_u\eta_g\rangle + \langle\mu_u\mu_u||\eta_g\eta_g\rangle \\ + \langle\mu_u\eta_u||\mu_g\eta_g\rangle\end{array}}$$

$\Psi_5(e_ge_u, {}^1B_{1u}, M=0, \gamma_u) = -\frac{|\overline{\eta_u}\mu_g|}{2} - \frac{|\overline{\mu_u}\eta_g|}{2} + \frac{|\eta_u\overline{\mu_g}|}{2} + \frac{|\mu_u\overline{\eta_g}|}{2}$

2.15.12 $^3A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$\Psi_1(a_{1g}a_{1u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\alpha_g}\overline{\alpha_u}|$

$\Psi_2(a_{1g}a_{1u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$

$\Psi_3(a_{1g}a_{1u}, {}^3A_{1u}, M=1, \alpha_u) = |\alpha_g\alpha_u|$

$a_{2g}a_{2u}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\beta_u\beta_u\rangle + \langle\beta_g\beta_u||\beta_g\beta_u\rangle}$$

$\Psi_4(a_{2g}a_{2u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\beta_g}\overline{\beta_u}|$

$\Psi_5(a_{2g}a_{2u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\beta_g}\beta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\beta_u}|}{2}$

$\Psi_6(a_{2g}a_{2u}, {}^3A_{1u}, M=1, \alpha_u) = |\beta_g\beta_u|$

$b_{2g}b_{2u}$

$$\boxed{\Delta E = -\langle\zeta_g\zeta_g||\zeta_u\zeta_u\rangle + \langle\zeta_g\zeta_u||\zeta_g\zeta_u\rangle}$$

$\Psi_7(b_{2g}b_{2u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\zeta_g}\overline{\zeta_u}|$

$\Psi_8(b_{2g}b_{2u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\zeta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\zeta_u}|}{2}$

$\Psi_9(b_{2g}b_{2u}, {}^3A_{1u}, M=1, \alpha_u) = |\zeta_g\zeta_u|$

$b_{1g}b_{1u}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_g||\gamma_u\gamma_g\rangle - \langle\gamma_u\gamma_u||\gamma_g\gamma_g\rangle}$$

$\Psi_{10}(b_{1g}b_{1u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\gamma_u}\overline{\gamma_g}|$

$\Psi_{11}(b_{1g}b_{1u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$

$\Psi_{12}(b_{1g}b_{1u}, {}^3A_{1u}, M=1, \alpha_u) = |\gamma_u\gamma_g|$

e_ge_u

$$\boxed{\begin{array}{c}\Delta E = \langle\mu_u\eta_g||\mu_u\eta_g\rangle - \langle\mu_u\mu_g||\eta_u\eta_g\rangle - \langle\mu_u\mu_u||\eta_g\eta_g\rangle \\ + \langle\mu_u\eta_u||\mu_g\eta_g\rangle\end{array}}$$

$\Psi_{13}(e_ge_u, {}^3A_{1u}, M=-1, \alpha_u) = -\frac{\sqrt{2}|\overline{\eta_u}\overline{\mu_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\eta_g}|}{2}$

$\Psi_{14}(e_ge_u, {}^3A_{1u}, M=0, \alpha_u) = -\frac{|\overline{\eta_u}\mu_g|}{2} + \frac{|\overline{\mu_u}\eta_g|}{2} - \frac{|\eta_u\overline{\mu_g}|}{2} + \frac{|\mu_u\overline{\eta_g}|}{2}$

$\Psi_{15}(e_ge_u, {}^3A_{1u}, M=1, \alpha_u) = -\frac{\sqrt{2}|\eta_u\mu_g|}{2} + \frac{\sqrt{2}|\mu_u\eta_g|}{2}$

2.15.13 $^1A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$\Psi_1(a_{1g}a_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$

$a_{2g}a_{2u}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\beta_u\beta_u\rangle + \langle\beta_g\beta_u||\beta_g\beta_u\rangle}$$

$\Psi_2(a_{2g}a_{2u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\beta_g}\beta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\beta_u}|}{2}$

$b_{2g}b_{2u}$

$$\boxed{\Delta E = \langle\zeta_g\zeta_g||\zeta_u\zeta_u\rangle + \langle\zeta_g\zeta_u||\zeta_g\zeta_u\rangle}$$

$\Psi_3(b_{2g}b_{2u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\zeta_u}|}{2}$

$b_{1g}b_{1u}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_g||\gamma_u\gamma_g\rangle + \langle\gamma_u\gamma_u||\gamma_g\gamma_g\rangle}$$

$$\Psi_4(b_{1g}b_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$$

e_ge_u

$$\boxed{\begin{aligned}\Delta E = \langle\mu_u\eta_g||\mu_u\eta_g\rangle - \langle\mu_u\mu_g||\eta_u\eta_g\rangle + \langle\mu_u\mu_u||\eta_g\eta_g\rangle \\ - \langle\mu_u\eta_u||\mu_g\eta_g\rangle\end{aligned}}$$

$$\Psi_5(e_ge_u, {}^1A_{1u}, M=0, \alpha_u) = \frac{|\overline{\eta_u}\mu_g|}{2} - \frac{|\overline{\mu_u}\eta_g|}{2} - \frac{|\eta_u\overline{\mu_g}|}{2} + \frac{|\mu_u\overline{\eta_g}|}{2}$$

2.15.14 $^3B_{1g}$

$a_{1g}b_{1g}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\gamma_g\gamma_g\rangle + \langle\alpha_g\gamma_g||\alpha_g\gamma_g\rangle}$$

$$\Psi_1(a_{1g}b_{1g}, {}^3B_{1g}, M=-1, \gamma_g) = |\overline{\alpha_g\gamma_g}|$$
$$\Psi_2(a_{1g}b_{1g}, {}^3B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$
$$\Psi_3(a_{1g}b_{1g}, {}^3B_{1g}, M=1, \gamma_g) = |\alpha_g\gamma_g|$$

$a_{2g}b_{2g}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\zeta_g\zeta_g\rangle + \langle\beta_g\zeta_g||\beta_g\zeta_g\rangle}$$

$$\Psi_4(a_{2g}b_{2g}, {}^3B_{1g}, M=-1, \gamma_g) = |\overline{\beta_g\zeta_g}|$$
$$\Psi_5(a_{2g}b_{2g}, {}^3B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\beta_g}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_g}|}{2}$$
$$\Psi_6(a_{2g}b_{2g}, {}^3B_{1g}, M=1, \gamma_g) = |\beta_g\zeta_g|$$

$a_{2u}b_{2u}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\zeta_u\zeta_u\rangle + \langle\beta_u\zeta_u||\beta_u\zeta_u\rangle}$$

$$\Psi_7(a_{2u}b_{2u}, {}^3B_{1g}, M=-1, \gamma_g) = |\overline{\beta_u\zeta_u}|$$
$$\Psi_8(a_{2u}b_{2u}, {}^3B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\beta_u}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_u}|}{2}$$
$$\Psi_9(a_{2u}b_{2u}, {}^3B_{1g}, M=1, \gamma_g) = |\beta_u\zeta_u|$$

$a_{1u}b_{1u}$

$$\boxed{\Delta E = \langle\gamma_u\alpha_u||\gamma_u\alpha_u\rangle - \langle\gamma_u\gamma_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_{10}(a_{1u}b_{1u}, {}^3B_{1g}, M=-1, \gamma_g) = |\overline{\gamma_u\alpha_u}|$$
$$\Psi_{11}(a_{1u}b_{1u}, {}^3B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\gamma_u}\alpha_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\alpha_u}|}{2}$$
$$\Psi_{12}(a_{1u}b_{1u}, {}^3B_{1g}, M=1, \gamma_g) = |\gamma_u\alpha_u|$$

2.15.15 $^1B_{1g}$

$a_{1g}b_{1g}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\gamma_g\gamma_g\rangle + \langle\alpha_g\gamma_g||\alpha_g\gamma_g\rangle}$$

$$\Psi_1(a_{1g}b_{1g}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$

$a_{2g}b_{2g}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\zeta_g\zeta_g\rangle + \langle\beta_g\zeta_g||\beta_g\zeta_g\rangle}$$

$$\Psi_2(a_{2g}b_{2g}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\beta_g}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_g}|}{2}$$

$a_{2u}b_{2u}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\zeta_u\zeta_u\rangle + \langle\beta_u\zeta_u||\beta_u\zeta_u\rangle}$$

$$\Psi_3(a_{2u}b_{2u}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\beta_u}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_u}|}{2}$$

$a_{1u}b_{1u}$

$$\boxed{\Delta E = \langle\gamma_u\alpha_u||\gamma_u\alpha_u\rangle + \langle\gamma_u\gamma_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_4(a_{1u}b_{1u}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\alpha_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\alpha_u}|}{2}$$

e_u^2

$$\boxed{\Delta E = -\langle\mu_u\mu_u||\eta_u\eta_u\rangle + \langle\mu_u\mu_u||\mu_u\mu_u\rangle}$$

$$\Psi_5(e_u^2, {}^1B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\eta_u}\eta_u|}{2} - \frac{\sqrt{2}|\overline{\mu_u}\mu_u|}{2}$$

e_g^2

$$\boxed{\Delta E = -\langle\mu_g\mu_g||\eta_g\eta_g\rangle + \langle\mu_g\mu_g||\mu_g\mu_g\rangle}$$

$$\Psi_6(e_g^2, {}^1B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\eta_g}\eta_g|}{2} - \frac{\sqrt{2}|\overline{\mu_g}\mu_g|}{2}$$

2.15.16 ^3E_u

$a_{1g}e_u$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\mu_u\mu_u\rangle + \langle\alpha_g\mu_u||\alpha_g\mu_u\rangle}$$

$$\Psi_1(a_{1g}e_u, {}^3E_u, M=-1, \eta_u) = |\overline{\alpha_g\eta_u}|$$
$$\Psi_2(a_{1g}e_u, {}^3E_u, M=-1, \mu_u) = |\overline{\alpha_g\mu_u}|$$
$$\Psi_3(a_{1g}e_u, {}^3E_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_u}|}{2}$$
$$\Psi_4(a_{1g}e_u, {}^3E_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\alpha_g}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_u}|}{2}$$
$$\Psi_5(a_{1g}e_u, {}^3E_u, M=1, \eta_u) = |\alpha_g\eta_u|$$
$$\Psi_6(a_{1g}e_u, {}^3E_u, M=1, \mu_u) = |\alpha_g\mu_u|$$

$a_{2g}e_u$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\mu_u\mu_u\rangle + \langle\beta_g\mu_u||\beta_g\mu_u\rangle}$$

$$\Psi_7(a_{2g}e_u, {}^3E_u, M=-1, \mu_u) = -|\overline{\beta_g}\overline{\eta_u}|$$
$$\Psi_8(a_{2g}e_u, {}^3E_u, M=-1, \eta_u) = |\overline{\beta_g}\overline{\mu_u}|$$
$$\Psi_9(a_{2g}e_u, {}^3E_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\beta_g}\eta_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\eta_u}|}{2}$$
$$\Psi_{10}(a_{2g}e_u, {}^3E_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\beta_g}\mu_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_u}|}{2}$$
$$\Psi_{11}(a_{2g}e_u, {}^3E_u, M=1, \mu_u) = -|\beta_g\eta_u|$$
$$\Psi_{12}(a_{2g}e_u, {}^3E_u, M=1, \eta_u) = |\beta_g\mu_u|$$

$b_{2g}e_u$

$$\boxed{\Delta E = \langle\zeta_g\mu_u||\zeta_g\mu_u\rangle - \langle\zeta_g\zeta_g||\mu_u\mu_u\rangle}$$

$$\Psi_{13}(b_{2g}e_u, {}^3E_u, M=-1, \mu_u) = |\overline{\zeta_g}\overline{\eta_u}|$$
$$\Psi_{14}(b_{2g}e_u, {}^3E_u, M=-1, \eta_u) = |\overline{\zeta_g}\overline{\mu_u}|$$
$$\Psi_{15}(b_{2g}e_u, {}^3E_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\zeta_g}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\eta_u}|}{2}$$
$$\Psi_{16}(b_{2g}e_u, {}^3E_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\zeta_g}\mu_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\mu_u}|}{2}$$
$$\Psi_{17}(b_{2g}e_u, {}^3E_u, M=1, \mu_u) = |\zeta_g\eta_u|$$
$$\Psi_{18}(b_{2g}e_u, {}^3E_u, M=1, \eta_u) = |\zeta_g\mu_u|$$

$a_{2u}e_g$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\mu_g\mu_g\rangle + \langle\beta_u\mu_g||\beta_u\mu_g\rangle}$$

$$\Psi_{19}(a_{2u}e_g, {}^3E_u, M=-1, \eta_u) = |\overline{\beta_u}\overline{\eta_g}|$$
$$\Psi_{20}(a_{2u}e_g, {}^3E_u, M=-1, \mu_u) = |\overline{\beta_u}\overline{\mu_g}|$$
$$\Psi_{21}(a_{2u}e_g, {}^3E_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\beta_u}\eta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_g}|}{2}$$
$$\Psi_{22}(a_{2u}e_g, {}^3E_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\beta_u}\mu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_g}|}{2}$$
$$\Psi_{23}(a_{2u}e_g, {}^3E_u, M=1, \eta_u) = |\beta_u\eta_g|$$
$$\Psi_{24}(a_{2u}e_g, {}^3E_u, M=1, \mu_u) = |\beta_u\mu_g|$$

$b_{2u}e_g$

$$\boxed{\Delta E = \langle\zeta_u\mu_g||\zeta_u\mu_g\rangle - \langle\zeta_u\zeta_u||\mu_g\mu_g\rangle}$$

$$\Psi_{25}(b_{2u}e_g, {}^3E_u, M=-1, \eta_u) = |\overline{\zeta_u}\overline{\eta_g}|$$
$$\Psi_{26}(b_{2u}e_g, {}^3E_u, M=-1, \mu_u) = -|\overline{\zeta_u}\overline{\mu_g}|$$
$$\Psi_{27}(b_{2u}e_g, {}^3E_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\zeta_u}\eta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_g}|}{2}$$
$$\Psi_{28}(b_{2u}e_g, {}^3E_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\mu_g|}{2} - \frac{\sqrt{2}|\zeta_u\overline{\mu_g}|}{2}$$
$$\Psi_{29}(b_{2u}e_g, {}^3E_u, M=1, \eta_u) = |\zeta_u\eta_g|$$
$$\Psi_{30}(b_{2u}e_g, {}^3E_u, M=1, \mu_u) = -|\zeta_u\mu_g|$$

$b_{1u}e_g$

$$\boxed{\Delta E = -\langle\gamma_u\gamma_u||\mu_g\mu_g\rangle + \langle\gamma_u\mu_g||\gamma_u\mu_g\rangle}$$

$$\Psi_{31}(b_{1u}e_g, {}^3E_u, M=-1, \mu_u) = |\overline{\gamma_u}\overline{\eta_g}|$$
$$\Psi_{32}(b_{1u}e_g, {}^3E_u, M=-1, \eta_u) = |\overline{\gamma_u}\overline{\mu_g}|$$
$$\Psi_{33}(b_{1u}e_g, {}^3E_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\gamma_u}\eta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_g}|}{2}$$
$$\Psi_{34}(b_{1u}e_g, {}^3E_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\mu_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\mu_g}|}{2}$$
$$\Psi_{35}(b_{1u}e_g, {}^3E_u, M=1, \mu_u) = |\gamma_u\eta_g|$$
$$\Psi_{36}(b_{1u}e_g, {}^3E_u, M=1, \eta_u) = |\gamma_u\mu_g|$$

$a_{1u}e_g$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\mu_g\mu_g\rangle + \langle\alpha_u\mu_g||\alpha_u\mu_g\rangle}$$

$$\Psi_{37}(a_{1u}e_g, {}^3E_u, M=-1, \mu_u) = -|\overline{\alpha_u}\overline{\eta_g}|$$
$$\Psi_{38}(a_{1u}e_g, {}^3E_u, M=-1, \eta_u) = |\overline{\alpha_u}\overline{\mu_g}|$$
$$\Psi_{39}(a_{1u}e_g, {}^3E_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\eta_g|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\eta_g}|}{2}$$
$$\Psi_{40}(a_{1u}e_g, {}^3E_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_g}|}{2}$$
$$\Psi_{41}(a_{1u}e_g, {}^3E_u, M=1, \mu_u) = -|\alpha_u\eta_g|$$
$$\Psi_{42}(a_{1u}e_g, {}^3E_u, M=1, \eta_u) = |\alpha_u\mu_g|$$

$b_{1g}e_u$

$$\boxed{\Delta E = -\langle\gamma_g\gamma_g||\mu_u\mu_u\rangle + \langle\gamma_g\mu_u||\gamma_g\mu_u\rangle}$$

$$\Psi_{43}(b_{1g}e_u, {}^3E_u, M=-1, \eta_u) = |\overline{\gamma_g}\overline{\eta_u}|$$
$$\Psi_{44}(b_{1g}e_u, {}^3E_u, M=-1, \mu_u) = -|\overline{\gamma_g}\overline{\mu_u}|$$
$$\Psi_{45}(b_{1g}e_u, {}^3E_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\gamma_g}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\eta_u}|}{2}$$
$$\Psi_{46}(b_{1g}e_u, {}^3E_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\mu_u|}{2} - \frac{\sqrt{2}|\gamma_g\overline{\mu_u}|}{2}$$
$$\Psi_{47}(b_{1g}e_u, {}^3E_u, M=1, \eta_u) = |\gamma_g\eta_u|$$
$$\Psi_{48}(b_{1g}e_u, {}^3E_u, M=1, \mu_u) = -|\gamma_g\mu_u|$$

2.15.17 ^1E_u

$a_{1g}e_u$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\mu_u\mu_u\rangle + \langle\alpha_g\mu_u||\alpha_g\mu_u\rangle}$$

$$\Psi_1(a_{1g}e_u, {}^1E_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_u}|}{2}$$
$$\Psi_2(a_{1g}e_u, {}^1E_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_u}|}{2}$$

$a_{2g}e_u$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\mu_u\mu_u\rangle + \langle\beta_g\mu_u||\beta_g\mu_u\rangle}$$

$$\Psi_3(a_{2g}e_u, {}^1E_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\beta_g}\eta_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\eta_u}|}{2}$$
$$\Psi_4(a_{2g}e_u, {}^1E_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\beta_g}\mu_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_u}|}{2}$$

$b_{2g}e_u$

$$\boxed{\Delta E = \langle\zeta_g\mu_u||\zeta_g\mu_u\rangle + \langle\zeta_g\zeta_g||\mu_u\mu_u\rangle}$$

$$\Psi_5(b_{2g}e_u, {}^1E_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\eta_u}|}{2}$$
$$\Psi_6(b_{2g}e_u, {}^1E_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\mu_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\mu_u}|}{2}$$

$a_{2u}e_g$

$$\boxed{\Delta E = \langle \beta_u\beta_u || \mu_g\mu_g\rangle + \langle \beta_u\mu_g || \beta_u\mu_g\rangle}$$

$$\Psi_7(a_{2u}e_g, {}^1E_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\eta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_g}|}{2}$$
$$\Psi_8(a_{2u}e_g, {}^1E_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\beta_u}\mu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_g}|}{2}$$

$b_{2u}e_g$

$$\boxed{\Delta E = \langle \zeta_u\mu_g || \zeta_u\mu_g\rangle + \langle \zeta_u\zeta_u || \mu_g\mu_g\rangle}$$

$$\Psi_9(b_{2u}e_g, {}^1E_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\eta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_g}|}{2}$$
$$\Psi_{10}(b_{2u}e_g, {}^1E_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\zeta_u}\mu_g|}{2} - \frac{\sqrt{2}|\zeta_u\overline{\mu_g}|}{2}$$

$b_{1u}e_g$

$$\boxed{\Delta E = \langle \gamma_u\gamma_u || \mu_g\mu_g\rangle + \langle \gamma_u\mu_g || \gamma_u\mu_g\rangle}$$

$$\Psi_{11}(b_{1u}e_g, {}^1E_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\eta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_g}|}{2}$$
$$\Psi_{12}(b_{1u}e_g, {}^1E_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\mu_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\mu_g}|}{2}$$

$a_{1u}e_g$

$$\boxed{\Delta E = \langle \alpha_u\alpha_u || \mu_g\mu_g\rangle + \langle \alpha_u\mu_g || \alpha_u\mu_g\rangle}$$

$$\Psi_{13}(a_{1u}e_g, {}^1E_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\alpha_u}\eta_g|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\eta_g}|}{2}$$
$$\Psi_{14}(a_{1u}e_g, {}^1E_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_g}|}{2}$$

$b_{1g}e_u$

$$\boxed{\Delta E = \langle \gamma_g\gamma_g || \mu_u\mu_u\rangle + \langle \gamma_g\mu_u || \gamma_g\mu_u\rangle}$$

$$\Psi_{15}(b_{1g}e_u, {}^1E_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\eta_u}|}{2}$$
$$\Psi_{16}(b_{1g}e_u, {}^1E_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\gamma_g}\mu_u|}{2} - \frac{\sqrt{2}|\gamma_g\overline{\mu_u}|}{2}$$

2.15.18 ${}^3E_g$

$a_{1g}e_g$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g || \mu_g\mu_g\rangle + \langle \alpha_g\mu_g || \alpha_g\mu_g\rangle}$$

$$\Psi_1(a_{1g}e_g, {}^3E_g, M=-1, \eta_g) = |\overline{\alpha_g}\overline{\eta_g}|$$
$$\Psi_2(a_{1g}e_g, {}^3E_g, M=-1, \mu_g) = |\overline{\alpha_g}\overline{\mu_g}|$$
$$\Psi_3(a_{1g}e_g, {}^3E_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_g}|}{2}$$
$$\Psi_4(a_{1g}e_g, {}^3E_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\alpha_g}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_g}|}{2}$$
$$\Psi_5(a_{1g}e_g, {}^3E_g, M=1, \eta_g) = |\alpha_g\eta_g|$$
$$\Psi_6(a_{1g}e_g, {}^3E_g, M=1, \mu_g) = |\alpha_g\mu_g|$$

$a_{2g}e_g$

$$\boxed{\Delta E = -\langle \beta_g\beta_g || \mu_g\mu_g\rangle + \langle \beta_g\mu_g || \beta_g\mu_g\rangle}$$

$$\Psi_7(a_{2g}e_g, {}^3E_g, M=-1, \mu_g) = -|\overline{\beta_g}\overline{\eta_g}|$$
$$\Psi_8(a_{2g}e_g, {}^3E_g, M=-1, \eta_g) = |\overline{\beta_g}\overline{\mu_g}|$$
$$\Psi_9(a_{2g}e_g, {}^3E_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\beta_g}\eta_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\eta_g}|}{2}$$
$$\Psi_{10}(a_{2g}e_g, {}^3E_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\beta_g}\mu_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_g}|}{2}$$
$$\Psi_{11}(a_{2g}e_g, {}^3E_g, M=1, \mu_g) = -|\beta_g\eta_g|$$
$$\Psi_{12}(a_{2g}e_g, {}^3E_g, M=1, \eta_g) = |\beta_g\mu_g|$$

$b_{2g}e_g$

$$\boxed{\Delta E = \langle \zeta_g\mu_g || \zeta_g\mu_g\rangle - \langle \zeta_g\zeta_g || \mu_g\mu_g\rangle}$$

$$\Psi_{13}(b_{2g}e_g, {}^3E_g, M=-1, \mu_g) = |\overline{\zeta_g}\overline{\eta_g}|$$
$$\Psi_{14}(b_{2g}e_g, {}^3E_g, M=-1, \eta_g) = |\overline{\zeta_g}\overline{\mu_g}|$$
$$\Psi_{15}(b_{2g}e_g, {}^3E_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\zeta_g}\eta_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\eta_g}|}{2}$$
$$\Psi_{16}(b_{2g}e_g, {}^3E_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\zeta_g}\mu_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\mu_g}|}{2}$$
$$\Psi_{17}(b_{2g}e_g, {}^3E_g, M=1, \mu_g) = |\zeta_g\eta_g|$$
$$\Psi_{18}(b_{2g}e_g, {}^3E_g, M=1, \eta_g) = |\zeta_g\mu_g|$$

$a_{2u}e_u$

$$\boxed{\Delta E = -\langle \beta_u\beta_u || \mu_u\mu_u\rangle + \langle \beta_u\mu_u || \beta_u\mu_u\rangle}$$

$$\Psi_{19}(a_{2u}e_u, {}^3E_g, M=-1, \eta_g) = |\overline{\beta_u}\overline{\eta_u}|$$
$$\Psi_{20}(a_{2u}e_u, {}^3E_g, M=-1, \mu_g) = |\overline{\beta_u}\overline{\mu_u}|$$
$$\Psi_{21}(a_{2u}e_u, {}^3E_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\beta_u}\eta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_u}|}{2}$$
$$\Psi_{22}(a_{2u}e_u, {}^3E_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\beta_u}\mu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_u}|}{2}$$
$$\Psi_{23}(a_{2u}e_u, {}^3E_g, M=1, \eta_g) = |\beta_u\eta_u|$$
$$\Psi_{24}(a_{2u}e_u, {}^3E_g, M=1, \mu_g) = |\beta_u\mu_u|$$

$b_{2u}e_u$

$$\boxed{\Delta E = \langle \zeta_u\mu_u || \zeta_u\mu_u\rangle - \langle \zeta_u\zeta_u || \mu_u\mu_u\rangle}$$

$$\Psi_{25}(b_{2u}e_u, {}^3E_g, M=-1, \eta_g) = |\overline{\zeta_u}\overline{\eta_u}|$$
$$\Psi_{26}(b_{2u}e_u, {}^3E_g, M=-1, \mu_g) = -|\overline{\zeta_u}\overline{\mu_u}|$$
$$\Psi_{27}(b_{2u}e_u, {}^3E_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\zeta_u}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_u}|}{2}$$
$$\Psi_{28}(b_{2u}e_u, {}^3E_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\mu_u|}{2} - \frac{\sqrt{2}|\zeta_u\overline{\mu_u}|}{2}$$
$$\Psi_{29}(b_{2u}e_u, {}^3E_g, M=1, \eta_g) = |\zeta_u\eta_u|$$
$$\Psi_{30}(b_{2u}e_u, {}^3E_g, M=1, \mu_g) = -|\zeta_u\mu_u|$$

$b_{1u}e_u$

$$\boxed{\Delta E = -\langle \gamma_u\gamma_u || \mu_u\mu_u\rangle + \langle \gamma_u\mu_u || \gamma_u\mu_u\rangle}$$

$$\Psi_{31}(b_{1u}e_u, {}^3E_g, M=-1, \mu_g) = |\overline{\gamma_u}\overline{\eta_u}|$$
$$\Psi_{32}(b_{1u}e_u, {}^3E_g, M=-1, \eta_g) = |\overline{\gamma_u}\overline{\mu_u}|$$

$$\Psi_{33}(b_{1u}e_u, {}^3E_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\gamma_u}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_u}|}{2}$$
$$\Psi_{34}(b_{1u}e_u, {}^3E_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\gamma_u}\mu_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\mu_u}|}{2}$$
$$\Psi_{35}(b_{1u}e_u, {}^3E_g, M=1, \mu_g) = |\gamma_u\eta_u|$$
$$\Psi_{36}(b_{1u}e_u, {}^3E_g, M=1, \eta_g) = |\gamma_u\mu_u|$$

$a_{1u}e_u$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\mu_u\mu_u\rangle + \langle\alpha_u\mu_u||\alpha_u\mu_u\rangle}$$

$$\Psi_{37}(a_{1u}e_u, {}^3E_g, M=-1, \mu_g) = -|\overline{\alpha_u\eta_u}|$$
$$\Psi_{38}(a_{1u}e_u, {}^3E_g, M=-1, \eta_g) = |\overline{\alpha_u\mu_u}|$$
$$\Psi_{39}(a_{1u}e_u, {}^3E_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\eta_u|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\eta_u}|}{2}$$
$$\Psi_{40}(a_{1u}e_u, {}^3E_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_u}|}{2}$$
$$\Psi_{41}(a_{1u}e_u, {}^3E_g, M=1, \mu_g) = -|\alpha_u\eta_u|$$
$$\Psi_{42}(a_{1u}e_u, {}^3E_g, M=1, \eta_g) = |\alpha_u\mu_u|$$

$b_{1g}e_g$

$$\boxed{\Delta E = -\langle\gamma_g\gamma_g||\mu_g\mu_g\rangle + \langle\gamma_g\mu_g||\gamma_g\mu_g\rangle}$$

$$\Psi_{43}(b_{1g}e_g, {}^3E_g, M=-1, \eta_g) = |\overline{\gamma_g\eta_g}|$$
$$\Psi_{44}(b_{1g}e_g, {}^3E_g, M=-1, \mu_g) = -|\overline{\gamma_g\mu_g}|$$
$$\Psi_{45}(b_{1g}e_g, {}^3E_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\gamma_g}\eta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\eta_g}|}{2}$$
$$\Psi_{46}(b_{1g}e_g, {}^3E_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\mu_g|}{2} - \frac{\sqrt{2}|\gamma_g\overline{\mu_g}|}{2}$$
$$\Psi_{47}(b_{1g}e_g, {}^3E_g, M=1, \eta_g) = |\gamma_g\eta_g|$$
$$\Psi_{48}(b_{1g}e_g, {}^3E_g, M=1, \mu_g) = -|\gamma_g\mu_g|$$

2.15.19 ${}^1E_g$

$a_{1g}e_g$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\mu_g\mu_g\rangle + \langle\alpha_g\mu_g||\alpha_g\mu_g\rangle}$$

$$\Psi_1(a_{1g}e_g, {}^1E_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_g}|}{2}$$
$$\Psi_2(a_{1g}e_g, {}^1E_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_g}|}{2}$$

$a_{2g}e_g$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\mu_g\mu_g\rangle + \langle\beta_g\mu_g||\beta_g\mu_g\rangle}$$

$$\Psi_3(a_{2g}e_g, {}^1E_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\beta_g}\eta_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\eta_g}|}{2}$$
$$\Psi_4(a_{2g}e_g, {}^1E_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\beta_g}\mu_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_g}|}{2}$$

$b_{2g}e_g$

$$\boxed{\Delta E = \langle\zeta_g\mu_g||\zeta_g\mu_g\rangle + \langle\zeta_g\zeta_g||\mu_g\mu_g\rangle}$$

$$\Psi_5(b_{2g}e_g, {}^1E_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\eta_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\eta_g}|}{2}$$
$$\Psi_6(b_{2g}e_g, {}^1E_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\mu_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\mu_g}|}{2}$$

$a_{2u}e_u$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\mu_u\mu_u\rangle + \langle\beta_u\mu_u||\beta_u\mu_u\rangle}$$

$$\Psi_7(a_{2u}e_u, {}^1E_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\eta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_u}|}{2}$$
$$\Psi_8(a_{2u}e_u, {}^1E_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\beta_u}\mu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_u}|}{2}$$

$b_{2u}e_u$

$$\boxed{\Delta E = \langle\zeta_u\mu_u||\zeta_u\mu_u\rangle + \langle\zeta_u\zeta_u||\mu_u\mu_u\rangle}$$

$$\Psi_9(b_{2u}e_u, {}^1E_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_u}|}{2}$$
$$\Psi_{10}(b_{2u}e_u, {}^1E_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\zeta_u}\mu_u|}{2} - \frac{\sqrt{2}|\zeta_u\overline{\mu_u}|}{2}$$

$b_{1u}e_u$

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\mu_u\mu_u\rangle + \langle\gamma_u\mu_u||\gamma_u\mu_u\rangle}$$

$$\Psi_{11}(b_{1u}e_u, {}^1E_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_u}|}{2}$$
$$\Psi_{12}(b_{1u}e_u, {}^1E_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\mu_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\mu_u}|}{2}$$

$a_{1u}e_u$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\mu_u\mu_u\rangle + \langle\alpha_u\mu_u||\alpha_u\mu_u\rangle}$$

$$\Psi_{13}(a_{1u}e_u, {}^1E_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\alpha_u}\eta_u|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\eta_u}|}{2}$$
$$\Psi_{14}(a_{1u}e_u, {}^1E_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_u}|}{2}$$

$b_{1g}e_g$

$$\boxed{\Delta E = \langle\gamma_g\gamma_g||\mu_g\mu_g\rangle + \langle\gamma_g\mu_g||\gamma_g\mu_g\rangle}$$

$$\Psi_{15}(b_{1g}e_g, {}^1E_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\eta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\eta_g}|}{2}$$
$$\Psi_{16}(b_{1g}e_g, {}^1E_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\gamma_g}\mu_g|}{2} - \frac{\sqrt{2}|\gamma_g\overline{\mu_g}|}{2}$$

2.16 Group C_3

Component labels

$A : \{\alpha\}$ —— $E^1 : \{\beta\}$ —— $E^2 : \{\gamma\}$

2.16.1 ^{1}A

a^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a^2, {}^1A, M\!=\!0, \alpha) = -|\overline{\alpha}\alpha|$$

e^1e^2

$$\boxed{\Delta E = 0}$$

$$\Psi_2(e^1e^2, {}^1A, M\!=\!0, \alpha) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$

2.16.2 $^{3}E^{1}$

ae^1

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae^1, {}^3E^1, M\!=\!-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(ae^1, {}^3E^1, M\!=\!0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(ae^1, {}^3E^1, M\!=\!1, \beta) = |\alpha\beta|$$

2.16.3 $^{1}E^{1}$

ae^1

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae^1, {}^1E^1, M\!=\!0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$(e^2)^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_2((e^2)^2, {}^1E^1, M\!=\!0, \beta) = -|\overline{\gamma}\gamma|$$

2.16.4 $^{3}E^{2}$

ae^2

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae^2, {}^3E^2, M\!=\!-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(ae^2, {}^3E^2, M\!=\!0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(ae^2, {}^3E^2, M\!=\!1, \gamma) = |\alpha\gamma|$$

2.16.5 $^{1}E^{2}$

ae^2

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae^2, {}^1E^2, M\!=\!0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

$(e^1)^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_2((e^1)^2, {}^1E^2, M\!=\!0, \gamma) = -|\overline{\beta}\beta|$$

2.16.6 ^{3}A

e^1e^2

$$\boxed{\Delta E = 0}$$

$$\Psi_1(e^1e^2, {}^3A, M\!=\!-1, \alpha) = |\overline{\beta}\overline{\gamma}|$$
$$\Psi_2(e^1e^2, {}^3A, M\!=\!0, \alpha) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_3(e^1e^2, {}^3A, M\!=\!1, \alpha) = |\beta\gamma|$$

2.17 Group S_6

Component labels

$A_g : \{\alpha_g\}$ —— $A_u : \{\alpha_u\}$ —— $E_u^1 : \{\beta_u\}$ —— $E_u^2 : \{\gamma_u\}$ —— $E_g^2 : \{\gamma_g\}$ —— $E_g^1 : \{\beta_g\}$

2.17.1 $^{1}A_g$

a_g^2

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_g\alpha_g\rangle}$$

$$\Psi_1(a_g^2, {}^1A_g, M\!=\!0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

a_u^2

$$\boxed{\Delta E = \langle \alpha_u\alpha_u || \alpha_u\alpha_u \rangle}$$

$$\Psi_2(a_u^2, {}^1A_g, M{=}0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

$e_u^1e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e_u^1e_u^2, {}^1A_g, M{=}0, \alpha_g) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$

$e_g^1e_g^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e_g^1e_g^2, {}^1A_g, M{=}0, \alpha_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\beta_g}|}{2}$$

2.17.2 ^3A_u

a_ga_u

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g || \alpha_u\alpha_u \rangle + \langle \alpha_g\alpha_u || \alpha_g\alpha_u \rangle}$$

$$\Psi_1(a_ga_u, {}^3A_u, M{=}{-1}, \alpha_u) = |\overline{\alpha_g}\overline{\alpha_u}|$$

$$\Psi_2(a_ga_u, {}^3A_u, M{=}0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$$\Psi_3(a_ga_u, {}^3A_u, M{=}1, \alpha_u) = |\alpha_g\alpha_u|$$

$e_g^1e_u^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e_g^1e_u^1, {}^3A_u, M{=}{-1}, \alpha_u) = |\overline{\beta_u}\overline{\beta_g}|$$

$$\Psi_5(e_g^1e_u^1, {}^3A_u, M{=}0, \alpha_u) = \frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

$$\Psi_6(e_g^1e_u^1, {}^3A_u, M{=}1, \alpha_u) = |\beta_u\beta_g|$$

$e_g^2e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e_g^2e_u^2, {}^3A_u, M{=}{-1}, \alpha_u) = |\overline{\gamma_u}\overline{\gamma_g}|$$

$$\Psi_8(e_g^2e_u^2, {}^3A_u, M{=}0, \alpha_u) = \frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$$

$$\Psi_9(e_g^2e_u^2, {}^3A_u, M{=}1, \alpha_u) = |\gamma_u\gamma_g|$$

2.17.3 ^1A_u

a_ga_u

$$\boxed{\Delta E = \langle \alpha_g\alpha_g || \alpha_u\alpha_u \rangle + \langle \alpha_g\alpha_u || \alpha_g\alpha_u \rangle}$$

$$\Psi_1(a_ga_u, {}^1A_u, M{=}0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$e_g^1e_u^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(e_g^1e_u^1, {}^1A_u, M{=}0, \alpha_u) = -\frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

$e_g^2e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e_g^2e_u^2, {}^1A_u, M{=}0, \alpha_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$$

2.17.4 $^3E_u^1$

$a_ge_u^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a_ge_u^1, {}^3E_u^1, M{=}{-1}, \beta_u) = |\overline{\alpha_g}\overline{\beta_u}|$$

$$\Psi_2(a_ge_u^1, {}^3E_u^1, M{=}0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$$\Psi_3(a_ge_u^1, {}^3E_u^1, M{=}1, \beta_u) = |\alpha_g\beta_u|$$

$a_ue_g^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(a_ue_g^2, {}^3E_u^1, M{=}{-1}, \beta_u) = |\overline{\alpha_u}\overline{\gamma_g}|$$

$$\Psi_5(a_ue_g^2, {}^3E_u^1, M{=}0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$

$$\Psi_6(a_ue_g^2, {}^3E_u^1, M{=}1, \beta_u) = |\alpha_u\gamma_g|$$

$e_g^1e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e_g^1e_u^2, {}^3E_u^1, M{=}{-1}, \beta_u) = |\overline{\gamma_u}\overline{\beta_g}|$$

$$\Psi_8(e_g^1e_u^2, {}^3E_u^1, M{=}0, \beta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\beta_g}|}{2}$$

$$\Psi_9(e_g^1e_u^2, {}^3E_u^1, M{=}1, \beta_u) = |\gamma_u\beta_g|$$

2.17.5 $^1E_u^1$

$a_ge_u^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a_ge_u^1, {}^1E_u^1, M{=}0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$a_ue_g^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(a_ue_g^2, {}^1E_u^1, M{=}0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$

$e_g^1e_u^2$

$\boxed{\Delta E = 0}$

$$\Psi_3(e_g^1e_u^2,{}^1E_u^1,M=0,\beta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\beta_g}|}{2}$$

2.17.6 ${}^3E_u^2$

$a_ge_u^2$

$\boxed{\Delta E = 0}$

$$\Psi_1(a_ge_u^2,{}^3E_u^2,M=-1,\gamma_u) = |\overline{\alpha_g}\overline{\gamma_u}|$$

$$\Psi_2(a_ge_u^2,{}^3E_u^2,M=0,\gamma_u) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$

$$\Psi_3(a_ge_u^2,{}^3E_u^2,M=1,\gamma_u) = |\alpha_g\gamma_u|$$

$a_ue_g^1$

$\boxed{\Delta E = 0}$

$$\Psi_4(a_ue_g^1,{}^3E_u^2,M=-1,\gamma_u) = |\overline{\alpha_u}\overline{\beta_g}|$$

$$\Psi_5(a_ue_g^1,{}^3E_u^2,M=0,\gamma_u) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

$$\Psi_6(a_ue_g^1,{}^3E_u^2,M=1,\gamma_u) = |\alpha_u\beta_g|$$

$e_g^2e_u^1$

$\boxed{\Delta E = 0}$

$$\Psi_7(e_g^2e_u^1,{}^3E_u^2,M=-1,\gamma_u) = |\overline{\beta_u}\overline{\gamma_g}|$$

$$\Psi_8(e_g^2e_u^1,{}^3E_u^2,M=0,\gamma_u) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

$$\Psi_9(e_g^2e_u^1,{}^3E_u^2,M=1,\gamma_u) = |\beta_u\gamma_g|$$

2.17.7 ${}^1E_u^2$

$a_ge_u^2$

$\boxed{\Delta E = 0}$

$$\Psi_1(a_ge_u^2,{}^1E_u^2,M=0,\gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$

$a_ue_g^1$

$\boxed{\Delta E = 0}$

$$\Psi_2(a_ue_g^1,{}^1E_u^2,M=0,\gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

$e_g^2e_u^1$

$\boxed{\Delta E = 0}$

$$\Psi_3(e_g^2e_u^1,{}^1E_u^2,M=0,\gamma_u) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

2.17.8 ${}^3E_g^2$

$a_ge_g^2$

$\boxed{\Delta E = 0}$

$$\Psi_1(a_ge_g^2,{}^3E_g^2,M=-1,\gamma_g) = |\overline{\alpha_g}\overline{\gamma_g}|$$

$$\Psi_2(a_ge_g^2,{}^3E_g^2,M=0,\gamma_g) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$

$$\Psi_3(a_ge_g^2,{}^3E_g^2,M=1,\gamma_g) = |\alpha_g\gamma_g|$$

$a_ue_u^1$

$\boxed{\Delta E = 0}$

$$\Psi_4(a_ue_u^1,{}^3E_g^2,M=-1,\gamma_g) = |\overline{\alpha_u}\overline{\beta_u}|$$

$$\Psi_5(a_ue_u^1,{}^3E_g^2,M=0,\gamma_g) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_u}|}{2}$$

$$\Psi_6(a_ue_u^1,{}^3E_g^2,M=1,\gamma_g) = |\alpha_u\beta_u|$$

2.17.9 ${}^1E_g^2$

$a_ge_g^2$

$\boxed{\Delta E = 0}$

$$\Psi_1(a_ge_g^2,{}^1E_g^2,M=0,\gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$

$a_ue_u^1$

$\boxed{\Delta E = 0}$

$$\Psi_2(a_ue_u^1,{}^1E_g^2,M=0,\gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_u}|}{2}$$

$(e_u^2)^2$

$\boxed{\Delta E = 0}$

$$\Psi_3((e_u^2)^2,{}^1E_g^2,M=0,\gamma_g) = -|\overline{\gamma_u}\gamma_u|$$

$(e_g^1)^2$

$\boxed{\Delta E = 0}$

$$\Psi_4((e_g^1)^2,{}^1E_g^2,M=0,\gamma_g) = -|\overline{\beta_g}\beta_g|$$

2.17.10 $^3E_g^1$

$a_g e_g^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a_g e_g^1, {}^3E_g^1, M=-1, \beta_g) = |\overline{\alpha_g}\overline{\beta_g}|$$
$$\Psi_2(a_g e_g^1, {}^3E_g^1, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$
$$\Psi_3(a_g e_g^1, {}^3E_g^1, M=1, \beta_g) = |\alpha_g\beta_g|$$

$a_u e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(a_u e_u^2, {}^3E_g^1, M=-1, \beta_g) = |\overline{\alpha_u}\overline{\gamma_u}|$$
$$\Psi_5(a_u e_u^2, {}^3E_g^1, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$$
$$\Psi_6(a_u e_u^2, {}^3E_g^1, M=1, \beta_g) = |\alpha_u\gamma_u|$$

2.17.11 $^1E_g^1$

$a_g e_g^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a_g e_g^1, {}^1E_g^1, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$

$a_u e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(a_u e_u^2, {}^1E_g^1, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$$

$\left(e_u^1\right)^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(\left(e_u^1\right)^2, {}^1E_g^1, M=0, \beta_g) = -|\overline{\beta_u}\beta_u|$$

$\left(e_g^2\right)^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\left(e_g^2\right)^2, {}^1E_g^1, M=0, \beta_g) = -|\overline{\gamma_g}\gamma_g|$$

2.17.12 ^3A_g

$e_u^1 e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(e_u^1 e_u^2, {}^3A_g, M=-1, \alpha_g) = |\overline{\beta_u}\overline{\gamma_u}|$$
$$\Psi_2(e_u^1 e_u^2, {}^3A_g, M=0, \alpha_g) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$
$$\Psi_3(e_u^1 e_u^2, {}^3A_g, M=1, \alpha_g) = |\beta_u\gamma_u|$$

$e_g^1 e_g^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e_g^1 e_g^2, {}^3A_g, M=-1, \alpha_g) = |\overline{\gamma_g}\overline{\beta_g}|$$
$$\Psi_5(e_g^1 e_g^2, {}^3A_g, M=0, \alpha_g) = \frac{\sqrt{2}|\overline{\gamma_g}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\beta_g}|}{2}$$
$$\Psi_6(e_g^1 e_g^2, {}^3A_g, M=1, \alpha_g) = |\gamma_g\beta_g|$$

2.18 Group D_3

Component labels

$$A_1 : \{\alpha\} \text{ —— } A_2 : \{\beta\} \text{ —— } E : \{\gamma, \zeta\}$$

2.18.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

a_2^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

e^2

$$\boxed{\Delta E = \langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_3(e^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\gamma}\gamma|}{2} - \frac{\sqrt{2}|\overline{\zeta}\zeta|}{2}$$

2.18.2 $^3A_2$

$a_1 a_2$

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1 a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$

$$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

e^2

$$\boxed{\Delta E = -3\,\langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_4(e^2, {}^3A_2, M=-1, \beta) = -|\overline{\gamma}\overline{\zeta}|$$
$$\Psi_5(e^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2}$$
$$\Psi_6(e^2, {}^3A_2, M=1, \beta) = -|\gamma\zeta|$$

2.18.3 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

2.18.4 ^3E

a_1e

$$\boxed{\Delta E = -\,\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1e, {}^3E, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1e, {}^3E, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_3(a_1e, {}^3E, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_4(a_1e, {}^3E, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_5(a_1e, {}^3E, M=1, \gamma) = |\alpha\gamma|$$
$$\Psi_6(a_1e, {}^3E, M=1, \zeta) = |\alpha\zeta|$$

a_2e

$$\boxed{\Delta E = -\,\langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_7(a_2e, {}^3E, M=-1, \zeta) = -|\overline{\beta}\overline{\gamma}|$$
$$\Psi_8(a_2e, {}^3E, M=-1, \gamma) = |\overline{\beta}\overline{\zeta}|$$
$$\Psi_9(a_2e, {}^3E, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} - \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_{10}(a_2e, {}^3E, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_{11}(a_2e, {}^3E, M=1, \zeta) = -|\beta\gamma|$$
$$\Psi_{12}(a_2e, {}^3E, M=1, \gamma) = |\beta\zeta|$$

2.18.5 ^1E

a_1e

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1e, {}^1E, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_2(a_1e, {}^1E, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2e

$$\boxed{\Delta E = \langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_3(a_2e, {}^1E, M=0, \zeta) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} - \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_4(a_2e, {}^1E, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

e^2

$$\boxed{\Delta E = -\,\langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_5(e^2, {}^1E, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\gamma|}{2} + \frac{\sqrt{2}|\overline{\zeta}\zeta|}{2}$$
$$\Psi_6(e^2, {}^1E, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} - \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2}$$

2.19 Group C_{3v}

Component labels

$A_1 : \{\alpha\}$ —— $A_2 : \{\beta\}$ —— $E : \{\gamma, \zeta\}$

2.19.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

a_2^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

e^2

$$\boxed{\Delta E = \langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_3(e^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\gamma}\gamma|}{2} - \frac{\sqrt{2}|\overline{\zeta}\zeta|}{2}$$

2.19.2 $^3A_2$

a_1a_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

e^2

$$\boxed{\Delta E = -3\langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_4(e^2, {}^3A_2, M=-1, \beta) = -|\overline{\gamma}\overline{\zeta}|$$
$$\Psi_5(e^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2}$$
$$\Psi_6(e^2, {}^3A_2, M=1, \beta) = -|\gamma\zeta|$$

2.19.3 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

2.19.4 ^3E

a_1e

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1e, {}^3E, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1e, {}^3E, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_3(a_1e, {}^3E, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_4(a_1e, {}^3E, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_5(a_1e, {}^3E, M=1, \gamma) = |\alpha\gamma|$$
$$\Psi_6(a_1e, {}^3E, M=1, \zeta) = |\alpha\zeta|$$

a_2e

$$\boxed{\Delta E = -\langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_7(a_2e, {}^3E, M=-1, \zeta) = -|\overline{\beta}\overline{\gamma}|$$
$$\Psi_8(a_2e, {}^3E, M=-1, \gamma) = |\overline{\beta}\overline{\zeta}|$$
$$\Psi_9(a_2e, {}^3E, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} - \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_{10}(a_2e, {}^3E, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_{11}(a_2e, {}^3E, M=1, \zeta) = -|\beta\gamma|$$
$$\Psi_{12}(a_2e, {}^3E, M=1, \gamma) = |\beta\zeta|$$

2.19.5 ^1E

a_1e

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1e, {}^1E, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_2(a_1e, {}^1E, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2e

$$\boxed{\Delta E = \langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_3(a_2e, {}^1E, M=0, \zeta) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} - \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_4(a_2e, {}^1E, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

e^2

$$\boxed{\Delta E = -\langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_5(e^2, {}^1E, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\gamma|}{2} + \frac{\sqrt{2}|\overline{\zeta}\zeta|}{2}$$
$$\Psi_6(e^2, {}^1E, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} - \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2}$$

2.20 Group D_{3d}

Component labels

$A_{1g} : \{\alpha_g\}$ —— $A_{1u} : \{\alpha_u\}$ —— $A_{2u} : \{\beta_u\}$ —— $A_{2g} : \{\beta_g\}$ —— $E_g : \{\gamma_g, \zeta_g\}$ —— $E_u : \{\gamma_u, \zeta_u\}$

2.20.1 $^1A_{1g}$

a_{1g}^2

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\alpha_g\alpha_g\rangle}$$

$$\Psi_1(a_{1g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

a_{1u}^2

$$\boxed{\Delta E = \langle \alpha_u\alpha_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_2(a_{1u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

a_{2u}^2

$$\boxed{\Delta E = \langle \beta_u\beta_u||\beta_u\beta_u\rangle}$$

$$\Psi_3(a_{2u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\beta_u}\beta_u|$$

a_{2g}^2

$$\boxed{\Delta E = \langle \beta_g\beta_g||\beta_g\beta_g\rangle}$$

$$\Psi_4(a_{2g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\beta_g}\beta_g|$$

e_g^2

$$\boxed{\Delta E = \langle \zeta_g\zeta_g||\gamma_g\gamma_g\rangle + \langle \zeta_g\zeta_g||\zeta_g\zeta_g\rangle}$$

$$\Psi_5(e_g^2, {}^1A_{1g}, M=0, \alpha_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\gamma_g|}{2} - \frac{\sqrt{2}|\overline{\zeta_g}\zeta_g|}{2}$$

e_u^2

$$\boxed{\Delta E = \langle \zeta_u\zeta_u||\gamma_u\gamma_u\rangle + \langle \zeta_u\zeta_u||\zeta_u\zeta_u\rangle}$$

$$\Psi_6(e_u^2, {}^1A_{1g}, M=0, \alpha_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\gamma_u|}{2} - \frac{\sqrt{2}|\overline{\zeta_u}\zeta_u|}{2}$$

2.20.2 $^3A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle \alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_{1g}a_{1u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\alpha_g\alpha_u}|$$
$$\Psi_2(a_{1g}a_{1u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$
$$\Psi_3(a_{1g}a_{1u}, {}^3A_{1u}, M=1, \alpha_u) = |\alpha_g\alpha_u|$$

$a_{2g}a_{2u}$

$$\boxed{\Delta E = \langle \beta_u\beta_g||\beta_u\beta_g\rangle - \langle \beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_4(a_{2g}a_{2u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\beta_u\beta_g}|$$
$$\Psi_5(a_{2g}a_{2u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$
$$\Psi_6(a_{2g}a_{2u}, {}^3A_{1u}, M=1, \alpha_u) = |\beta_u\beta_g|$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = -\langle \zeta_g\zeta_g||\gamma_u\gamma_u\rangle - 3\langle \zeta_g\zeta_u||\gamma_g\gamma_u\rangle + \langle \zeta_g\zeta_u||\zeta_g\zeta_u\rangle \\ + \langle \zeta_g\gamma_g||\zeta_u\gamma_u\rangle\end{gathered}}$$

$$\Psi_7(e_ge_u, {}^3A_{1u}, M=-1, \alpha_u) = -\frac{\sqrt{2}|\overline{\gamma_g\zeta_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g\gamma_u}|}{2}$$
$$\Psi_8(e_ge_u, {}^3A_{1u}, M=0, \alpha_u) = -\frac{|\overline{\gamma_g}\zeta_u|}{2} + \frac{|\overline{\zeta_g}\gamma_u|}{2} - \frac{|\gamma_g\overline{\zeta_u}|}{2} + \frac{|\zeta_g\overline{\gamma_u}|}{2}$$
$$\Psi_9(e_ge_u, {}^3A_{1u}, M=1, \alpha_u) = -\frac{\sqrt{2}|\gamma_g\zeta_u|}{2} + \frac{\sqrt{2}|\zeta_g\gamma_u|}{2}$$

2.20.3 $^1A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle \alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_{1g}a_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$a_{2g}a_{2u}$

$$\boxed{\Delta E = \langle \beta_u\beta_g||\beta_u\beta_g\rangle + \langle \beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_2(a_{2g}a_{2u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = \langle \zeta_g\zeta_g||\gamma_u\gamma_u\rangle - 3\langle \zeta_g\zeta_u||\gamma_g\gamma_u\rangle + \langle \zeta_g\zeta_u||\zeta_g\zeta_u\rangle \\ - \langle \zeta_g\gamma_g||\zeta_u\gamma_u\rangle\end{gathered}}$$

$$\Psi_3(e_ge_u, {}^1A_{1u}, M=0, \alpha_u) = \frac{|\overline{\gamma_g}\zeta_u|}{2} - \frac{|\overline{\zeta_g}\gamma_u|}{2} - \frac{|\gamma_g\overline{\zeta_u}|}{2} + \frac{|\zeta_g\overline{\gamma_u}|}{2}$$

2.20.4 $^3A_{2u}$

$a_{1g}a_{2u}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle \alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_1(a_{1g}a_{2u}, {}^3A_{2u}, M=-1, \beta_u) = |\overline{\alpha_g}\overline{\beta_u}|$$
$$\Psi_2(a_{1g}a_{2u}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$
$$\Psi_3(a_{1g}a_{2u}, {}^3A_{2u}, M=1, \beta_u) = |\alpha_g\beta_u|$$

$a_{1u}a_{2g}$

$$\boxed{\Delta E = -\langle \alpha_u\alpha_u||\beta_g\beta_g\rangle + \langle \alpha_u\beta_g||\alpha_u\beta_g\rangle}$$

$$\Psi_4(a_{1u}a_{2g}, {}^3A_{2u}, M=-1, \beta_u) = |\overline{\alpha_u}\overline{\beta_g}|$$
$$\Psi_5(a_{1u}a_{2g}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$
$$\Psi_6(a_{1u}a_{2g}, {}^3A_{2u}, M=1, \beta_u) = |\alpha_u\beta_g|$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = -2\langle \zeta_g\zeta_g||\zeta_u\zeta_u\rangle + \langle \zeta_g\zeta_u||\gamma_g\gamma_u\rangle + \langle \zeta_g\zeta_u||\zeta_g\zeta_u\rangle \\ + \langle \zeta_g\gamma_g||\zeta_u\gamma_u\rangle + \langle \zeta_g\zeta_g||\gamma_u\gamma_u\rangle\end{gathered}}$$

$$\Psi_7(e_ge_u, {}^3A_{2u}, M=-1, \beta_u) = \frac{\sqrt{2}|\overline{\gamma_g}\overline{\gamma_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\overline{\zeta_u}|}{2}$$
$$\Psi_8(e_ge_u, {}^3A_{2u}, M=0, \beta_u) =$$
$$\frac{|\overline{\gamma_g}\gamma_u|}{2} + \frac{|\overline{\zeta_g}\zeta_u|}{2} + \frac{|\gamma_g\overline{\gamma_u}|}{2} + \frac{|\zeta_g\overline{\zeta_u}|}{2}$$
$$\Psi_9(e_ge_u, {}^3A_{2u}, M=1, \beta_u) = \frac{\sqrt{2}|\gamma_g\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_g\zeta_u|}{2}$$

2.20.5 $^1A_{2u}$

$a_{1g}a_{2u}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle \alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_1(a_{1g}a_{2u}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$a_{1u}a_{2g}$

$$\boxed{\Delta E = \langle \alpha_u\alpha_u||\beta_g\beta_g\rangle + \langle \alpha_u\beta_g||\alpha_u\beta_g\rangle}$$

$$\Psi_2(a_{1u}a_{2g}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = 2\langle \zeta_g\zeta_g||\zeta_u\zeta_u\rangle + \langle \zeta_g\zeta_u||\gamma_g\gamma_u\rangle + \langle \zeta_g\zeta_u||\zeta_g\zeta_u\rangle \\ - \langle \zeta_g\gamma_g||\zeta_u\gamma_u\rangle - \langle \zeta_g\zeta_g||\gamma_u\gamma_u\rangle\end{gathered}}$$

$$\Psi_3(e_ge_u, {}^1A_{2u}, M=0, \beta_u) =$$
$$-\frac{|\overline{\gamma_g}\gamma_u|}{2} - \frac{|\overline{\zeta_g}\zeta_u|}{2} + \frac{|\gamma_g\overline{\gamma_u}|}{2} + \frac{|\zeta_g\overline{\zeta_u}|}{2}$$

2.20.6 $^3A_{2g}$

$a_{1g}a_{2g}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle \alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_{1g}a_{2g}, {}^3A_{2g}, M=-1, \beta_g) = |\overline{\alpha_g}\overline{\beta_g}|$$
$$\Psi_2(a_{1g}a_{2g}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$
$$\Psi_3(a_{1g}a_{2g}, {}^3A_{2g}, M=1, \beta_g) = |\alpha_g\beta_g|$$

$a_{1u}a_{2u}$

$$\boxed{\Delta E = -\langle \alpha_u\alpha_u||\beta_u\beta_u\rangle + \langle \alpha_u\beta_u||\alpha_u\beta_u\rangle}$$

$$\Psi_4(a_{1u}a_{2u}, {}^3A_{2g}, M=-1, \beta_g) = |\overline{\alpha_u}\overline{\beta_u}|$$
$$\Psi_5(a_{1u}a_{2u}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_u}|}{2}$$
$$\Psi_6(a_{1u}a_{2u}, {}^3A_{2g}, M=1, \beta_g) = |\alpha_u\beta_u|$$

e_g^2

$$\boxed{\Delta E = -3\langle \zeta_g\zeta_g||\gamma_g\gamma_g\rangle + \langle \zeta_g\zeta_g||\zeta_g\zeta_g\rangle}$$

$$\Psi_7(e_g^2, {}^3A_{2g}, M=-1, \beta_g) = -|\overline{\gamma_g}\overline{\zeta_g}|$$
$$\Psi_8(e_g^2, {}^3A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\zeta_g|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\gamma_g|}{2}$$
$$\Psi_9(e_g^2, {}^3A_{2g}, M=1, \beta_g) = -|\gamma_g\zeta_g|$$

e_u^2

$$\boxed{\Delta E = -3\langle \zeta_u\zeta_u||\gamma_u\gamma_u\rangle + \langle \zeta_u\zeta_u||\zeta_u\zeta_u\rangle}$$

$$\Psi_{10}(e_u^2, {}^3A_{2g}, M=-1, \beta_g) = -|\overline{\gamma_u}\overline{\zeta_u}|$$
$$\Psi_{11}(e_u^2, {}^3A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\zeta_u|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\gamma_u|}{2}$$
$$\Psi_{12}(e_u^2, {}^3A_{2g}, M=1, \beta_g) = -|\gamma_u\zeta_u|$$

2.20.7 $^1A_{2g}$

$a_{1g}a_{2g}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle \alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_{1g}a_{2g}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$

$a_{1u}a_{2u}$

$$\boxed{\Delta E = \langle \alpha_u\alpha_u||\beta_u\beta_u\rangle + \langle \alpha_u\beta_u||\alpha_u\beta_u\rangle}$$

$$\Psi_2(a_{1u}a_{2u}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_u}|}{2}$$

2.20.8 ^3E_g

$a_{1g}e_g$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\zeta_g\zeta_g\rangle + \langle\alpha_g\zeta_g||\alpha_g\zeta_g\rangle}$$

$$\Psi_1(a_{1g}e_g, {}^3E_g, M=-1, \gamma_g) = |\overline{\alpha_g}\overline{\gamma_g}|$$
$$\Psi_2(a_{1g}e_g, {}^3E_g, M=-1, \zeta_g) = |\overline{\alpha_g}\overline{\zeta_g}|$$
$$\Psi_3(a_{1g}e_g, {}^3E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$
$$\Psi_4(a_{1g}e_g, {}^3E_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$
$$\Psi_5(a_{1g}e_g, {}^3E_g, M=1, \gamma_g) = |\alpha_g\gamma_g|$$
$$\Psi_6(a_{1g}e_g, {}^3E_g, M=1, \zeta_g) = |\alpha_g\zeta_g|$$

$a_{1u}e_u$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\zeta_u\zeta_u\rangle + \langle\alpha_u\zeta_u||\alpha_u\zeta_u\rangle}$$

$$\Psi_7(a_{1u}e_u, {}^3E_g, M=-1, \zeta_g) = -|\overline{\alpha_u}\overline{\gamma_u}|$$
$$\Psi_8(a_{1u}e_u, {}^3E_g, M=-1, \gamma_g) = |\overline{\alpha_u}\overline{\zeta_u}|$$
$$\Psi_9(a_{1u}e_u, {}^3E_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$$
$$\Psi_{10}(a_{1u}e_u, {}^3E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_u}|}{2}$$
$$\Psi_{11}(a_{1u}e_u, {}^3E_g, M=1, \zeta_g) = -|\alpha_u\gamma_u|$$
$$\Psi_{12}(a_{1u}e_u, {}^3E_g, M=1, \gamma_g) = |\alpha_u\zeta_u|$$

$a_{2u}e_u$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\zeta_u\zeta_u\rangle + \langle\beta_u\zeta_u||\beta_u\zeta_u\rangle}$$

$$\Psi_{13}(a_{2u}e_u, {}^3E_g, M=-1, \gamma_g) = |\overline{\beta_u}\overline{\gamma_u}|$$
$$\Psi_{14}(a_{2u}e_u, {}^3E_g, M=-1, \zeta_g) = |\overline{\beta_u}\overline{\zeta_u}|$$
$$\Psi_{15}(a_{2u}e_u, {}^3E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$
$$\Psi_{16}(a_{2u}e_u, {}^3E_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_u}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_u}|}{2}$$
$$\Psi_{17}(a_{2u}e_u, {}^3E_g, M=1, \gamma_g) = |\beta_u\gamma_u|$$
$$\Psi_{18}(a_{2u}e_u, {}^3E_g, M=1, \zeta_g) = |\beta_u\zeta_u|$$

$a_{2g}e_g$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\zeta_g\zeta_g\rangle + \langle\beta_g\zeta_g||\beta_g\zeta_g\rangle}$$

$$\Psi_{19}(a_{2g}e_g, {}^3E_g, M=-1, \zeta_g) = -|\overline{\beta_g}\overline{\gamma_g}|$$
$$\Psi_{20}(a_{2g}e_g, {}^3E_g, M=-1, \gamma_g) = |\overline{\beta_g}\overline{\zeta_g}|$$
$$\Psi_{21}(a_{2g}e_g, {}^3E_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_g}\gamma_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\gamma_g}|}{2}$$
$$\Psi_{22}(a_{2g}e_g, {}^3E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\beta_g}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_g}|}{2}$$
$$\Psi_{23}(a_{2g}e_g, {}^3E_g, M=1, \zeta_g) = -|\beta_g\gamma_g|$$
$$\Psi_{24}(a_{2g}e_g, {}^3E_g, M=1, \gamma_g) = |\beta_g\zeta_g|$$

2.20.9 ^1E_g

$a_{1g}e_g$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\zeta_g\zeta_g\rangle + \langle\alpha_g\zeta_g||\alpha_g\zeta_g\rangle}$$

$$\Psi_1(a_{1g}e_g, {}^1E_g, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$
$$\Psi_2(a_{1g}e_g, {}^1E_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$

$a_{1u}e_u$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\zeta_u\zeta_u\rangle + \langle\alpha_u\zeta_u||\alpha_u\zeta_u\rangle}$$

$$\Psi_3(a_{1u}e_u, {}^1E_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$$
$$\Psi_4(a_{1u}e_u, {}^1E_g, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_u}|}{2}$$

$a_{2u}e_u$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\zeta_u\zeta_u\rangle + \langle\beta_u\zeta_u||\beta_u\zeta_u\rangle}$$

$$\Psi_5(a_{2u}e_u, {}^1E_g, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$
$$\Psi_6(a_{2u}e_u, {}^1E_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_u}|}{2}$$

$a_{2g}e_g$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\zeta_g\zeta_g\rangle + \langle\beta_g\zeta_g||\beta_g\zeta_g\rangle}$$

$$\Psi_7(a_{2g}e_g, {}^1E_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_g}\gamma_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\gamma_g}|}{2}$$
$$\Psi_8(a_{2g}e_g, {}^1E_g, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\beta_g}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_g}|}{2}$$

e_g^2

$$\boxed{\Delta E = -\langle\zeta_g\zeta_g||\gamma_g\gamma_g\rangle + \langle\zeta_g\zeta_g||\zeta_g\zeta_g\rangle}$$

$$\Psi_9(e_g^2, {}^1E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\gamma_g}\gamma_g|}{2} - \frac{\sqrt{2}|\overline{\zeta_g}\zeta_g|}{2}$$
$$\Psi_{10}(e_g^2, {}^1E_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\zeta_g|}{2} - \frac{\sqrt{2}|\overline{\zeta_g}\gamma_g|}{2}$$

e_u^2

$$\boxed{\Delta E = -\langle\zeta_u\zeta_u||\gamma_u\gamma_u\rangle + \langle\zeta_u\zeta_u||\zeta_u\zeta_u\rangle}$$

$$\Psi_{11}(e_u^2, {}^1E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\gamma_u}\gamma_u|}{2} - \frac{\sqrt{2}|\overline{\zeta_u}\zeta_u|}{2}$$
$$\Psi_{12}(e_u^2, {}^1E_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\zeta_u|}{2} - \frac{\sqrt{2}|\overline{\zeta_u}\gamma_u|}{2}$$

2.20.10 ^3E_u

$a_{1g}e_u$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\zeta_u\zeta_u\rangle + \langle\alpha_g\zeta_u||\alpha_g\zeta_u\rangle}$$

$$\Psi_1(a_{1g}e_u, {}^3E_u, M=-1, \gamma_u) = |\overline{\alpha_g\gamma_u}|$$
$$\Psi_2(a_{1g}e_u, {}^3E_u, M=-1, \zeta_u) = |\overline{\alpha_g}\overline{\zeta_u}|$$
$$\Psi_3(a_{1g}e_u, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$
$$\Psi_4(a_{1g}e_u, {}^3E_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$
$$\Psi_5(a_{1g}e_u, {}^3E_u, M=1, \gamma_u) = |\alpha_g\gamma_u|$$
$$\Psi_6(a_{1g}e_u, {}^3E_u, M=1, \zeta_u) = |\alpha_g\zeta_u|$$

$a_{1u}e_g$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\zeta_g\zeta_g\rangle + \langle\alpha_u\zeta_g||\alpha_u\zeta_g\rangle}$$

$$\Psi_7(a_{1u}e_g, {}^3E_u, M=-1, \zeta_u) = -|\overline{\alpha_u\gamma_g}|$$
$$\Psi_8(a_{1u}e_g, {}^3E_u, M=-1, \gamma_u) = |\overline{\alpha_u}\overline{\zeta_g}|$$
$$\Psi_9(a_{1u}e_g, {}^3E_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$
$$\Psi_{10}(a_{1u}e_g, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$
$$\Psi_{11}(a_{1u}e_g, {}^3E_u, M=1, \zeta_u) = -|\alpha_u\gamma_g|$$
$$\Psi_{12}(a_{1u}e_g, {}^3E_u, M=1, \gamma_u) = |\alpha_u\zeta_g|$$

$a_{2u}e_g$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\zeta_g\zeta_g\rangle + \langle\beta_u\zeta_g||\beta_u\zeta_g\rangle}$$

$$\Psi_{13}(a_{2u}e_g, {}^3E_u, M=-1, \gamma_u) = |\overline{\beta_u}\overline{\gamma_g}|$$
$$\Psi_{14}(a_{2u}e_g, {}^3E_u, M=-1, \zeta_u) = |\overline{\beta_u\zeta_g}|$$
$$\Psi_{15}(a_{2u}e_g, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$
$$\Psi_{16}(a_{2u}e_g, {}^3E_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\beta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_g}|}{2}$$
$$\Psi_{17}(a_{2u}e_g, {}^3E_u, M=1, \gamma_u) = |\beta_u\gamma_g|$$
$$\Psi_{18}(a_{2u}e_g, {}^3E_u, M=1, \zeta_u) = |\beta_u\zeta_g|$$

$a_{2g}e_u$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\zeta_u\zeta_u\rangle + \langle\beta_g\zeta_u||\beta_g\zeta_u\rangle}$$

$$\Psi_{19}(a_{2g}e_u, {}^3E_u, M=-1, \zeta_u) = -|\overline{\beta_g}\overline{\gamma_u}|$$
$$\Psi_{20}(a_{2g}e_u, {}^3E_u, M=-1, \gamma_u) = |\overline{\beta_g\zeta_u}|$$
$$\Psi_{21}(a_{2g}e_u, {}^3E_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_g}\gamma_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\gamma_u}|}{2}$$
$$\Psi_{22}(a_{2g}e_u, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\beta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_u}|}{2}$$
$$\Psi_{23}(a_{2g}e_u, {}^3E_u, M=1, \zeta_u) = -|\beta_g\gamma_u|$$
$$\Psi_{24}(a_{2g}e_u, {}^3E_u, M=1, \gamma_u) = |\beta_g\zeta_u|$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = -\langle\zeta_g\gamma_g||\zeta_u\gamma_u\rangle - \langle\zeta_g\zeta_u||\gamma_g\gamma_u\rangle + \langle\zeta_g\zeta_u||\zeta_g\zeta_u\rangle \\ -\langle\zeta_g\zeta_g||\gamma_u\gamma_u\rangle\end{gathered}}$$

$$\Psi_{25}(e_ge_u, {}^3E_u, M=-1, \gamma_u) = -\frac{\sqrt{2}|\overline{\gamma_g\gamma_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g\zeta_u}|}{2}$$
$$\Psi_{26}(e_ge_u, {}^3E_u, M=-1, \zeta_u) = \frac{\sqrt{2}|\overline{\gamma_g}\overline{\zeta_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\overline{\gamma_u}|}{2}$$
$$\Psi_{27}(e_ge_u, {}^3E_u, M=0, \gamma_u) =$$
$$-\frac{|\overline{\gamma_g}\gamma_u|}{2} + \frac{|\overline{\zeta_g}\zeta_u|}{2} - \frac{|\gamma_g\overline{\gamma_u}|}{2} + \frac{|\zeta_g\overline{\zeta_u}|}{2}$$
$$\Psi_{28}(e_ge_u, {}^3E_u, M=0, \zeta_u) =$$
$$\frac{|\overline{\gamma_g}\zeta_u|}{2} + \frac{|\overline{\zeta_g}\gamma_u|}{2} + \frac{|\gamma_g\overline{\zeta_u}|}{2} + \frac{|\zeta_g\overline{\gamma_u}|}{2}$$
$$\Psi_{29}(e_ge_u, {}^3E_u, M=1, \gamma_u) = -\frac{\sqrt{2}|\gamma_g\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_g\zeta_u|}{2}$$
$$\Psi_{30}(e_ge_u, {}^3E_u, M=1, \zeta_u) = \frac{\sqrt{2}|\gamma_g\zeta_u|}{2} + \frac{\sqrt{2}|\zeta_g\gamma_u|}{2}$$

2.20.11 ^1E_u

$a_{1g}e_u$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\zeta_u\zeta_u\rangle + \langle\alpha_g\zeta_u||\alpha_g\zeta_u\rangle}$$

$$\Psi_1(a_{1g}e_u, {}^1E_u, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$
$$\Psi_2(a_{1g}e_u, {}^1E_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$

$a_{1u}e_g$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\zeta_g\zeta_g\rangle + \langle\alpha_u\zeta_g||\alpha_u\zeta_g\rangle}$$

$$\Psi_3(a_{1u}e_g, {}^1E_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$
$$\Psi_4(a_{1u}e_g, {}^1E_u, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$

$a_{2u}e_g$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\zeta_g\zeta_g\rangle + \langle\beta_u\zeta_g||\beta_u\zeta_g\rangle}$$

$$\Psi_5(a_{2u}e_g, {}^1E_u, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$
$$\Psi_6(a_{2u}e_g, {}^1E_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_g}|}{2}$$

$a_{2g}e_u$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\zeta_u\zeta_u\rangle + \langle\beta_g\zeta_u||\beta_g\zeta_u\rangle}$$

$$\Psi_7(a_{2g}e_u, {}^1E_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\beta_g}\gamma_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\gamma_u}|}{2}$$
$$\Psi_8(a_{2g}e_u, {}^1E_u, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\beta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_u}|}{2}$$

e_ge_u

$$\boxed{\begin{gathered}\Delta E = \langle\zeta_g\gamma_g||\zeta_u\gamma_u\rangle - \langle\zeta_g\zeta_u||\gamma_g\gamma_u\rangle + \langle\zeta_g\zeta_u||\zeta_g\zeta_u\rangle \\ +\langle\zeta_g\zeta_g||\gamma_u\gamma_u\rangle\end{gathered}}$$

$$\Psi_9(e_ge_u, {}^1E_u, M=0, \gamma_u) =$$
$$\frac{|\overline{\gamma_g}\gamma_u|}{2} - \frac{|\overline{\zeta_g}\zeta_u|}{2} - \frac{|\gamma_g\overline{\gamma_u}|}{2} + \frac{|\zeta_g\overline{\zeta_u}|}{2}$$
$$\Psi_{10}(e_ge_u, {}^1E_u, M=0, \zeta_u) =$$
$$-\frac{|\overline{\gamma_g}\zeta_u|}{2} - \frac{|\overline{\zeta_g}\gamma_u|}{2} + \frac{|\gamma_g\overline{\zeta_u}|}{2} + \frac{|\zeta_g\overline{\gamma_u}|}{2}$$

2.21 Group C_6

Component labels

$A:\{\alpha\}$ —— $B:\{\beta\}$ —— $E'^1:\{\eta\}$ —— $E'^2:\{\mu\}$ —— $E''^2:\{\zeta\}$ —— $E''^1:\{\gamma\}$

2.21.1 ^1A

a^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a^2, {}^1A, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

b^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(b^2, {}^1A, M=0, \alpha) = -|\overline{\beta}\beta|$$

$e'^1e'^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e'^1e'^2, {}^1A, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\eta\overline{\mu}|}{2}$$

$e''^1e''^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e''^1e''^2, {}^1A, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$

2.21.2 ^3B

ab

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(ab, {}^3B, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(ab, {}^3B, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(ab, {}^3B, M=1, \beta) = |\alpha\beta|$$

$e''^1e'^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e''^1e'^1, {}^3B, M=-1, \beta) = |\overline{\eta}\overline{\gamma}|$$
$$\Psi_5(e''^1e'^1, {}^3B, M=0, \beta) = \frac{\sqrt{2}|\overline{\eta}\gamma|}{2} + \frac{\sqrt{2}|\eta\overline{\gamma}|}{2}$$
$$\Psi_6(e''^1e'^1, {}^3B, M=1, \beta) = |\eta\gamma|$$

$e''^2e'^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e''^2e'^2, {}^3B, M=-1, \beta) = |\overline{\mu}\overline{\zeta}|$$
$$\Psi_8(e''^2e'^2, {}^3B, M=0, \beta) = \frac{\sqrt{2}|\overline{\mu}\zeta|}{2} + \frac{\sqrt{2}|\mu\overline{\zeta}|}{2}$$
$$\Psi_9(e''^2e'^2, {}^3B, M=1, \beta) = |\mu\zeta|$$

2.21.3 ^1B

ab

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(ab, {}^1B, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$e''^1e'^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(e''^1e'^1, {}^1B, M=0, \beta) = -\frac{\sqrt{2}|\overline{\eta}\gamma|}{2} + \frac{\sqrt{2}|\eta\overline{\gamma}|}{2}$$

$e''^2e'^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e''^2e'^2, {}^1B, M=0, \beta) = -\frac{\sqrt{2}|\overline{\mu}\zeta|}{2} + \frac{\sqrt{2}|\mu\overline{\zeta}|}{2}$$

2.21.4 $^3E'^1$

ae'^1

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae'^1, {}^3E'^1, M=-1, \eta) = |\overline{\alpha}\overline{\eta}|$$
$$\Psi_2(ae'^1, {}^3E'^1, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_3(ae'^1, {}^3E'^1, M=1, \eta) = |\alpha\eta|$$

be''^2

$$\boxed{\Delta E = 0}$$

$$\Psi_4(be''^2, {}^3E'^1, M=-1, \eta) = |\overline{\beta}\overline{\zeta}|$$

$$\Psi_5(be''^2, {}^3E'^1, M\!=\!0, \eta) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_6(be''^2, {}^3E'^1, M\!=\!1, \eta) = |\beta\zeta|$$

$e''^1e'^2$

$\boxed{\Delta E = 0}$

$$\Psi_7(e''^1e'^2, {}^3E'^1, M\!=\!-1, \eta) = |\overline{\mu}\overline{\gamma}|$$
$$\Psi_8(e''^1e'^2, {}^3E'^1, M\!=\!0, \eta) = \frac{\sqrt{2}|\overline{\mu}\gamma|}{2} + \frac{\sqrt{2}|\mu\overline{\gamma}|}{2}$$
$$\Psi_9(e''^1e'^2, {}^3E'^1, M\!=\!1, \eta) = |\mu\gamma|$$

2.21.5 ${}^1E'^1$

ae'^1

$\boxed{\Delta E = 0}$

$$\Psi_1(ae'^1, {}^1E'^1, M\!=\!0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$

be''^2

$\boxed{\Delta E = 0}$

$$\Psi_2(be''^2, {}^1E'^1, M\!=\!0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

$e''^1e'^2$

$\boxed{\Delta E = 0}$

$$\Psi_3(e''^1e'^2, {}^1E'^1, M\!=\!0, \eta) = -\frac{\sqrt{2}|\overline{\mu}\gamma|}{2} + \frac{\sqrt{2}|\mu\overline{\gamma}|}{2}$$

2.21.6 ${}^3E'^2$

ae'^2

$\boxed{\Delta E = 0}$

$$\Psi_1(ae'^2, {}^3E'^2, M\!=\!-1, \mu) = |\overline{\alpha}\overline{\mu}|$$
$$\Psi_2(ae'^2, {}^3E'^2, M\!=\!0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_3(ae'^2, {}^3E'^2, M\!=\!1, \mu) = |\alpha\mu|$$

be''^1

$\boxed{\Delta E = 0}$

$$\Psi_4(be''^1, {}^3E'^2, M\!=\!-1, \mu) = |\overline{\beta}\overline{\gamma}|$$
$$\Psi_5(be''^1, {}^3E'^2, M\!=\!0, \mu) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_6(be''^1, {}^3E'^2, M\!=\!1, \mu) = |\beta\gamma|$$

$e''^2e'^1$

$\boxed{\Delta E = 0}$

$$\Psi_7(e''^2e'^1, {}^3E'^2, M\!=\!-1, \mu) = |\overline{\eta}\overline{\zeta}|$$
$$\Psi_8(e''^2e'^1, {}^3E'^2, M\!=\!0, \mu) = \frac{\sqrt{2}|\overline{\eta}\zeta|}{2} + \frac{\sqrt{2}|\eta\overline{\zeta}|}{2}$$
$$\Psi_9(e''^2e'^1, {}^3E'^2, M\!=\!1, \mu) = |\eta\zeta|$$

2.21.7 ${}^1E'^2$

ae'^2

$\boxed{\Delta E = 0}$

$$\Psi_1(ae'^2, {}^1E'^2, M\!=\!0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$

be''^1

$\boxed{\Delta E = 0}$

$$\Psi_2(be''^1, {}^1E'^2, M\!=\!0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$

$e''^2e'^1$

$\boxed{\Delta E = 0}$

$$\Psi_3(e''^2e'^1, {}^1E'^2, M\!=\!0, \mu) = -\frac{\sqrt{2}|\overline{\eta}\zeta|}{2} + \frac{\sqrt{2}|\eta\overline{\zeta}|}{2}$$

2.21.8 ${}^3E''^2$

ae''^2

$\boxed{\Delta E = 0}$

$$\Psi_1(ae''^2, {}^3E''^2, M\!=\!-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(ae''^2, {}^3E''^2, M\!=\!0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(ae''^2, {}^3E''^2, M\!=\!1, \zeta) = |\alpha\zeta|$$

be'^1

$\boxed{\Delta E = 0}$

$$\Psi_4(be'^1, {}^3E''^2, M\!=\!-1, \zeta) = |\overline{\beta}\overline{\eta}|$$
$$\Psi_5(be'^1, {}^3E''^2, M\!=\!0, \zeta) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} + \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_6(be'^1, {}^3E''^2, M\!=\!1, \zeta) = |\beta\eta|$$

2.21.9 $^1E''^2$

ae''^2

$\boxed{\Delta E = 0}$

$$\Psi_1(ae''^2, {}^1E''^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

be'^1

$\boxed{\Delta E = 0}$

$$\Psi_2(be'^1, {}^1E''^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\eta|}{2} + \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$

$\left(e'^2\right)^2$

$\boxed{\Delta E = 0}$

$$\Psi_3(\left(e'^2\right)^2, {}^1E''^2, M=0, \zeta) = -|\overline{\mu}\mu|$$

$\left(e''^1\right)^2$

$\boxed{\Delta E = 0}$

$$\Psi_4(\left(e''^1\right)^2, {}^1E''^2, M=0, \zeta) = -|\overline{\gamma}\gamma|$$

2.21.10 $^3E''^1$

ae''^1

$\boxed{\Delta E = 0}$

$$\Psi_1(ae''^1, {}^3E''^1, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(ae''^1, {}^3E''^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(ae''^1, {}^3E''^1, M=1, \gamma) = |\alpha\gamma|$$

be'^2

$\boxed{\Delta E = 0}$

$$\Psi_4(be'^2, {}^3E''^1, M=-1, \gamma) = |\overline{\beta}\overline{\mu}|$$
$$\Psi_5(be'^2, {}^3E''^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_6(be'^2, {}^3E''^1, M=1, \gamma) = |\beta\mu|$$

2.21.11 $^1E''^1$

ae''^1

$\boxed{\Delta E = 0}$

$$\Psi_1(ae''^1, {}^1E''^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

be'^2

$\boxed{\Delta E = 0}$

$$\Psi_2(be'^2, {}^1E''^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$

$\left(e'^1\right)^2$

$\boxed{\Delta E = 0}$

$$\Psi_3(\left(e'^1\right)^2, {}^1E''^1, M=0, \gamma) = -|\overline{\eta}\eta|$$

$\left(e''^2\right)^2$

$\boxed{\Delta E = 0}$

$$\Psi_4(\left(e''^2\right)^2, {}^1E''^1, M=0, \gamma) = -|\overline{\zeta}\zeta|$$

2.21.12 ^3A

$e'^1e'^2$

$\boxed{\Delta E = 0}$

$$\Psi_1(e'^1e'^2, {}^3A, M=-1, \alpha) = |\overline{\eta}\overline{\mu}|$$
$$\Psi_2(e'^1e'^2, {}^3A, M=0, \alpha) = \frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\eta\overline{\mu}|}{2}$$
$$\Psi_3(e'^1e'^2, {}^3A, M=1, \alpha) = |\eta\mu|$$

$e''^1e''^2$

$\boxed{\Delta E = 0}$

$$\Psi_4(e''^1e''^2, {}^3A, M=-1, \alpha) = |\overline{\zeta}\overline{\gamma}|$$
$$\Psi_5(e''^1e''^2, {}^3A, M=0, \alpha) = \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$
$$\Psi_6(e''^1e''^2, {}^3A, M=1, \alpha) = |\zeta\gamma|$$

2.22 Group C_{3h}

Component labels

$A' : \{\alpha\}$ —— $A'' : \{\beta\}$ —— $E''^2 : \{\zeta\}$ —— $E''^1 : \{\gamma\}$ —— $E'^2 : \{\mu\}$ —— $E'^1 : \{\eta\}$

2.22.1 $^1A'$

$$\left(a'\right)^2$$

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(\left(a'\right)^2, {}^1A', M=0, \alpha) = -|\overline{\alpha}\alpha|$$

$$\left(a''\right)^2$$

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(\left(a''\right)^2, {}^1A', M=0, \alpha) = -|\overline{\beta}\beta|$$

$$e''^1 e''^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e''^1 e''^2, {}^1A', M=0, \alpha) = -\frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$

$$e'^1 e'^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e'^1 e'^2, {}^1A', M=0, \alpha) = -\frac{\sqrt{2}|\overline{\mu}\eta|}{2} + \frac{\sqrt{2}|\mu\overline{\eta}|}{2}$$

2.22.2 $^3A''$

$$a' a''$$

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a' a'', {}^3A'', M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$

$$\Psi_2(a' a'', {}^3A'', M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$$\Psi_3(a' a'', {}^3A'', M=1, \beta) = |\alpha\beta|$$

$$e''^2 e'^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e''^2 e'^2, {}^3A'', M=-1, \beta) = |\overline{\zeta}\overline{\mu}|$$

$$\Psi_5(e''^2 e'^2, {}^3A'', M=0, \beta) = \frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

$$\Psi_6(e''^2 e'^2, {}^3A'', M=1, \beta) = |\zeta\mu|$$

$$e''^1 e'^1$$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e''^1 e'^1, {}^3A'', M=-1, \beta) = |\overline{\gamma}\overline{\eta}|$$

$$\Psi_8(e''^1 e'^1, {}^3A'', M=0, \beta) = \frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$

$$\Psi_9(e''^1 e'^1, {}^3A'', M=1, \beta) = |\gamma\eta|$$

2.22.3 $^1A''$

$$a' a''$$

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a' a'', {}^1A'', M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$$e''^2 e'^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(e''^2 e'^2, {}^1A'', M=0, \beta) = -\frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

$$e''^1 e'^1$$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e''^1 e'^1, {}^1A'', M=0, \beta) = -\frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$

2.22.4 $^3E''^2$

$$a' e''^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a' e''^2, {}^3E''^2, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$

$$\Psi_2(a' e''^2, {}^3E''^2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

$$\Psi_3(a' e''^2, {}^3E''^2, M=1, \zeta) = |\alpha\zeta|$$

$$a'' e'^1$$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(a'' e'^1, {}^3E''^2, M=-1, \zeta) = |\overline{\beta}\overline{\eta}|$$

$$\Psi_5(a'' e'^1, {}^3E''^2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} + \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$

$$\Psi_6(a'' e'^1, {}^3E''^2, M=1, \zeta) = |\beta\eta|$$

$$e''^1 e'^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e''^1 e'^2, {}^3E''^2, M=-1, \zeta) = |\overline{\gamma}\overline{\mu}|$$

$$\Psi_8(e''^1 e'^2, {}^3E''^2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\mu|}{2} + \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$

$$\Psi_9(e''^1 e'^2, {}^3E''^2, M=1, \zeta) = |\gamma\mu|$$

2.22.5 $^1E''^2$

$a' e''^2$

$\boxed{\Delta E = 0}$

$\Psi_1(a' e''^2, {}^1E''^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$

$a'' e'^1$

$\boxed{\Delta E = 0}$

$\Psi_2(a'' e'^1, {}^1E''^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\eta|}{2} + \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$

$e''^1 e'^2$

$\boxed{\Delta E = 0}$

$\Psi_3(e''^1 e'^2, {}^1E''^2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\mu|}{2} + \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$

2.22.6 $^3E''^1$

$a' e''^1$

$\boxed{\Delta E = 0}$

$\Psi_1(a' e''^1, {}^3E''^1, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$

$\Psi_2(a' e''^1, {}^3E''^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$

$\Psi_3(a' e''^1, {}^3E''^1, M=1, \gamma) = |\alpha\gamma|$

$a'' e'^2$

$\boxed{\Delta E = 0}$

$\Psi_4(a'' e'^2, {}^3E''^1, M=-1, \gamma) = |\overline{\beta}\overline{\mu}|$

$\Psi_5(a'' e'^2, {}^3E''^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$

$\Psi_6(a'' e'^2, {}^3E''^1, M=1, \gamma) = |\beta\mu|$

$e''^2 e'^1$

$\boxed{\Delta E = 0}$

$\Psi_7(e''^2 e'^1, {}^3E''^1, M=-1, \gamma) = |\overline{\zeta}\overline{\eta}|$

$\Psi_8(e''^2 e'^1, {}^3E''^1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$

$\Psi_9(e''^2 e'^1, {}^3E''^1, M=1, \gamma) = |\zeta\eta|$

2.22.7 $^1E''^1$

$a' e''^1$

$\boxed{\Delta E = 0}$

$\Psi_1(a' e''^1, {}^1E''^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$

$a'' e'^2$

$\boxed{\Delta E = 0}$

$\Psi_2(a'' e'^2, {}^1E''^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$

$e''^2 e'^1$

$\boxed{\Delta E = 0}$

$\Psi_3(e''^2 e'^1, {}^1E''^1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$

2.22.8 $^3E'^2$

$a' e'^2$

$\boxed{\Delta E = 0}$

$\Psi_1(a' e'^2, {}^3E'^2, M=-1, \mu) = |\overline{\alpha}\overline{\mu}|$

$\Psi_2(a' e'^2, {}^3E'^2, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$

$\Psi_3(a' e'^2, {}^3E'^2, M=1, \mu) = |\alpha\mu|$

$a'' e''^1$

$\boxed{\Delta E = 0}$

$\Psi_4(a'' e''^1, {}^3E'^2, M=-1, \mu) = |\overline{\beta}\overline{\gamma}|$

$\Psi_5(a'' e''^1, {}^3E'^2, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$

$\Psi_6(a'' e''^1, {}^3E'^2, M=1, \mu) = |\beta\gamma|$

2.22.9 $^1E'^2$

$a' e'^2$

$\boxed{\Delta E = 0}$

$\Psi_1(a' e'^2, {}^1E'^2, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$

$a'' e''^1$

$\boxed{\Delta E = 0}$

$\Psi_2(a'' e''^1, {}^1E'^2, M=0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$

$\left(e''^2\right)^2$

$\boxed{\Delta E = 0}$

$\Psi_3(\left(e''^2\right)^2, {}^1E'^2, M=0, \mu) = -|\overline{\zeta}\zeta|$

$$\left(e'^1\right)^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\left(e'^1\right)^2, {}^1E'^2, M=0, \mu) = -|\overline{\eta}\eta|$$

2.22.10 $^3E'^1$

$$a'e'^1$$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a'e'^1, {}^3E'^1, M=-1, \eta) = |\overline{\alpha\eta}|$$
$$\Psi_2(a'e'^1, {}^3E'^1, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_3(a'e'^1, {}^3E'^1, M=1, \eta) = |\alpha\eta|$$

$$a''e''^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(a''e''^2, {}^3E'^1, M=-1, \eta) = |\overline{\beta\zeta}|$$
$$\Psi_5(a''e''^2, {}^3E'^1, M=0, \eta) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_6(a''e''^2, {}^3E'^1, M=1, \eta) = |\beta\zeta|$$

2.22.11 $^1E'^1$

$$a'e'^1$$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a'e'^1, {}^1E'^1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$

$$a''e''^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(a''e''^2, {}^1E'^1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

$$\left(e''^1\right)^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(\left(e''^1\right)^2, {}^1E'^1, M=0, \eta) = -|\overline{\gamma}\gamma|$$

$$\left(e'^2\right)^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\left(e'^2\right)^2, {}^1E'^1, M=0, \eta) = -|\overline{\mu}\mu|$$

2.22.12 $^3A'$

$$e''^1e''^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(e''^1e''^2, {}^3A', M=-1, \alpha) = |\overline{\zeta\gamma}|$$
$$\Psi_2(e''^1e''^2, {}^3A', M=0, \alpha) = \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$
$$\Psi_3(e''^1e''^2, {}^3A', M=1, \alpha) = |\zeta\gamma|$$

$$e'^1e'^2$$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e'^1e'^2, {}^3A', M=-1, \alpha) = |\overline{\mu\eta}|$$
$$\Psi_5(e'^1e'^2, {}^3A', M=0, \alpha) = \frac{\sqrt{2}|\overline{\mu}\eta|}{2} + \frac{\sqrt{2}|\mu\overline{\eta}|}{2}$$
$$\Psi_6(e'^1e'^2, {}^3A', M=1, \alpha) = |\mu\eta|$$

2.23 Group C_{6h}

Component labels

$\Gamma^1 : \{\gamma_4\}$ —— $\Gamma^2 : \{\gamma_5\}$ —— $\Gamma^3 : \{\gamma_6\}$ —— $\Gamma^4 : \{\gamma_7\}$ —— $\Gamma^5 : \{\gamma_8\}$ —— $\Gamma^6 : \{\gamma_9\}$ —— $\Gamma^7 : \{\gamma_{10}\}$ —— $\Gamma^8 : \{\gamma_{11}\}$ —— $\Gamma^9 : \{\gamma_{12}\}$ —— $\Gamma^{10} : \{\gamma_1\}$ —— $\Gamma^{11} : \{\gamma_2\}$ —— $\Gamma^{12} : \{\gamma_3\}$

2.23.1 $^1\Gamma^1$

$$\left(\gamma^1\right)^2$$

$$\boxed{\Delta E = \langle\gamma_4\gamma_4||\gamma_4\gamma_4\rangle}$$

$$\Psi_1(\left(\gamma^1\right)^2, {}^1\Gamma^1, M=0, \gamma_4) = -|\overline{\gamma_4}\gamma_4|$$

$$\left(\gamma^2\right)^2$$

$$\boxed{\Delta E = \langle\gamma_5\gamma_5||\gamma_5\gamma_5\rangle}$$

$$\Psi_2(\left(\gamma^2\right)^2, {}^1\Gamma^1, M=0, \gamma_4) = -|\overline{\gamma_5}\gamma_5|$$

$\gamma^3\gamma^4$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(\gamma^3\gamma^4, {}^1\Gamma^1, M=0, \gamma_4) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_7}|}{2}$$

$(\gamma^5)^2$

$$\boxed{\Delta E = \langle\gamma_8\gamma_8||\gamma_8\gamma_8\rangle}$$

$$\Psi_4((\gamma^5)^2, {}^1\Gamma^1, M=0, \gamma_4) = -|\overline{\gamma_8}\gamma_8|$$

$\gamma^6\gamma^7$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(\gamma^6\gamma^7, {}^1\Gamma^1, M=0, \gamma_4) = -\frac{\sqrt{2}|\overline{\gamma_9}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_{10}}|}{2}$$

$(\gamma^8)^2$

$$\boxed{\Delta E = \langle\gamma_{11}\gamma_{11}||\gamma_{11}\gamma_{11}\rangle}$$

$$\Psi_6((\gamma^8)^2, {}^1\Gamma^1, M=0, \gamma_4) = -|\overline{\gamma_{11}}\gamma_{11}|$$

$\gamma^9\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(\gamma^9\gamma^{10}, {}^1\Gamma^1, M=0, \gamma_4) = -\frac{\sqrt{2}|\overline{\gamma_{12}}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_{12}\overline{\gamma_1}|}{2}$$

$\gamma^{11}\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_8(\gamma^{11}\gamma^{12}, {}^1\Gamma^1, M=0, \gamma_4) = -\frac{\sqrt{2}|\overline{\gamma_2}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_3}|}{2}$$

2.23.2 ${}^3\Gamma^2$

$\gamma^1\gamma^2$

$$\boxed{\Delta E = -\langle\gamma_4\gamma_4||\gamma_5\gamma_5\rangle + \langle\gamma_4\gamma_5||\gamma_4\gamma_5\rangle}$$

$$\Psi_1(\gamma^1\gamma^2, {}^3\Gamma^2, M=-1, \gamma_5) = |\overline{\gamma_4\gamma_5}|$$
$$\Psi_2(\gamma^1\gamma^2, {}^3\Gamma^2, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_5}|}{2}$$
$$\Psi_3(\gamma^1\gamma^2, {}^3\Gamma^2, M=1, \gamma_5) = |\gamma_4\gamma_5|$$

$\gamma^3\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\gamma^3\gamma^{12}, {}^3\Gamma^2, M=-1, \gamma_5) = |\overline{\gamma_6\gamma_3}|$$
$$\Psi_5(\gamma^3\gamma^{12}, {}^3\Gamma^2, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_3}|}{2}$$
$$\Psi_6(\gamma^3\gamma^{12}, {}^3\Gamma^2, M=1, \gamma_5) = |\gamma_6\gamma_3|$$

$\gamma^4\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(\gamma^4\gamma^{11}, {}^3\Gamma^2, M=-1, \gamma_5) = |\overline{\gamma_7\gamma_2}|$$
$$\Psi_8(\gamma^4\gamma^{11}, {}^3\Gamma^2, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_2}|}{2}$$
$$\Psi_9(\gamma^4\gamma^{11}, {}^3\Gamma^2, M=1, \gamma_5) = |\gamma_7\gamma_2|$$

$\gamma^5\gamma^8$

$$\boxed{\Delta E = \langle\gamma_8\gamma_{11}||\gamma_8\gamma_{11}\rangle - \langle\gamma_8\gamma_8||\gamma_{11}\gamma_{11}\rangle}$$

$$\Psi_{10}(\gamma^5\gamma^8, {}^3\Gamma^2, M=-1, \gamma_5) = |\overline{\gamma_8\gamma_{11}}|$$
$$\Psi_{11}(\gamma^5\gamma^8, {}^3\Gamma^2, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_8}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_{11}}|}{2}$$
$$\Psi_{12}(\gamma^5\gamma^8, {}^3\Gamma^2, M=1, \gamma_5) = |\gamma_8\gamma_{11}|$$

$\gamma^6\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(\gamma^6\gamma^{10}, {}^3\Gamma^2, M=-1, \gamma_5) = |\overline{\gamma_9\gamma_1}|$$
$$\Psi_{14}(\gamma^6\gamma^{10}, {}^3\Gamma^2, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_9}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_1}|}{2}$$
$$\Psi_{15}(\gamma^6\gamma^{10}, {}^3\Gamma^2, M=1, \gamma_5) = |\gamma_9\gamma_1|$$

$\gamma^7\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_{16}(\gamma^7\gamma^9, {}^3\Gamma^2, M=-1, \gamma_5) = |\overline{\gamma_{10}\gamma_{12}}|$$
$$\Psi_{17}(\gamma^7\gamma^9, {}^3\Gamma^2, M=0, \gamma_5) = \frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_{12}}|}{2}$$
$$\Psi_{18}(\gamma^7\gamma^9, {}^3\Gamma^2, M=1, \gamma_5) = |\gamma_{10}\gamma_{12}|$$

2.23.3 ${}^1\Gamma^2$

$\gamma^1\gamma^2$

$$\boxed{\Delta E = \langle\gamma_4\gamma_4||\gamma_5\gamma_5\rangle + \langle\gamma_4\gamma_5||\gamma_4\gamma_5\rangle}$$

$$\Psi_1(\gamma^1\gamma^2, {}^1\Gamma^2, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_5|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_5}|}{2}$$

$\gamma^3\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(\gamma^3\gamma^{12}, {}^1\Gamma^2, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_3}|}{2}$$

$\gamma^4\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(\gamma^4\gamma^{11}, {}^1\Gamma^2, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_2}|}{2}$$

$\gamma^5\gamma^8$

$$\boxed{\Delta E = \langle\gamma_8\gamma_{11}||\gamma_8\gamma_{11}\rangle + \langle\gamma_8\gamma_8||\gamma_{11}\gamma_{11}\rangle}$$

$$\Psi_4(\gamma^5\gamma^8, {}^1\Gamma^2, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_8}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_{11}}|}{2}$$

$\gamma^6\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(\gamma^6\gamma^{10}, {}^1\Gamma^2, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_9}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_1}|}{2}$$

$\gamma^7\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_6(\gamma^7\gamma^9, {}^1\Gamma^2, M=0, \gamma_5) = -\frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_{12}}|}{2}$$

2.23.4 ${}^3\Gamma^3$

$\gamma^1\gamma^3$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(\gamma^1\gamma^3, {}^3\Gamma^3, M=-1, \gamma_6) = |\overline{\gamma_4}\overline{\gamma_6}|$$
$$\Psi_2(\gamma^1\gamma^3, {}^3\Gamma^3, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_6}|}{2}$$
$$\Psi_3(\gamma^1\gamma^3, {}^3\Gamma^3, M=1, \gamma_6) = |\gamma_4\gamma_6|$$

$\gamma^2\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\gamma^2\gamma^{11}, {}^3\Gamma^3, M=-1, \gamma_6) = |\overline{\gamma_5}\overline{\gamma_2}|$$
$$\Psi_5(\gamma^2\gamma^{11}, {}^3\Gamma^3, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_2}|}{2}$$
$$\Psi_6(\gamma^2\gamma^{11}, {}^3\Gamma^3, M=1, \gamma_6) = |\gamma_5\gamma_2|$$

$\gamma^4\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(\gamma^4\gamma^{12}, {}^3\Gamma^3, M=-1, \gamma_6) = |\overline{\gamma_7}\overline{\gamma_3}|$$
$$\Psi_8(\gamma^4\gamma^{12}, {}^3\Gamma^3, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_3}|}{2}$$
$$\Psi_9(\gamma^4\gamma^{12}, {}^3\Gamma^3, M=1, \gamma_6) = |\gamma_7\gamma_3|$$

$\gamma^5\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{10}(\gamma^5\gamma^{10}, {}^3\Gamma^3, M=-1, \gamma_6) = |\overline{\gamma_8}\overline{\gamma_1}|$$
$$\Psi_{11}(\gamma^5\gamma^{10}, {}^3\Gamma^3, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_8}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_1}|}{2}$$
$$\Psi_{12}(\gamma^5\gamma^{10}, {}^3\Gamma^3, M=1, \gamma_6) = |\gamma_8\gamma_1|$$

$\gamma^6\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(\gamma^6\gamma^9, {}^3\Gamma^3, M=-1, \gamma_6) = |\overline{\gamma_9}\overline{\gamma_{12}}|$$
$$\Psi_{14}(\gamma^6\gamma^9, {}^3\Gamma^3, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_9}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_{12}}|}{2}$$
$$\Psi_{15}(\gamma^6\gamma^9, {}^3\Gamma^3, M=1, \gamma_6) = |\gamma_9\gamma_{12}|$$

$\gamma^7\gamma^8$

$$\boxed{\Delta E = 0}$$

$$\Psi_{16}(\gamma^7\gamma^8, {}^3\Gamma^3, M=-1, \gamma_6) = |\overline{\gamma_{10}}\overline{\gamma_{11}}|$$
$$\Psi_{17}(\gamma^7\gamma^8, {}^3\Gamma^3, M=0, \gamma_6) = \frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_{11}}|}{2}$$
$$\Psi_{18}(\gamma^7\gamma^8, {}^3\Gamma^3, M=1, \gamma_6) = |\gamma_{10}\gamma_{11}|$$

2.23.5 ${}^1\Gamma^3$

$\gamma^1\gamma^3$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(\gamma^1\gamma^3, {}^1\Gamma^3, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_6}|}{2}$$

$\gamma^2\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(\gamma^2\gamma^{11}, {}^1\Gamma^3, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_2}|}{2}$$

$\gamma^4\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(\gamma^4\gamma^{12}, {}^1\Gamma^3, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_3}|}{2}$$

$\gamma^5\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\gamma^5\gamma^{10}, {}^1\Gamma^3, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_8}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_1}|}{2}$$

$\gamma^6\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(\gamma^6\gamma^9, {}^1\Gamma^3, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_9}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_{12}}|}{2}$$

$\gamma^7\gamma^8$

$$\boxed{\Delta E = 0}$$

$$\Psi_6(\gamma^7\gamma^8, {}^1\Gamma^3, M=0, \gamma_6) = -\frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_{11}}|}{2}$$

2.23.6 ${}^3\Gamma^4$

$\gamma^1\gamma^4$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(\gamma^1\gamma^4, {}^3\Gamma^4, M=-1, \gamma_7) = |\overline{\gamma_4}\overline{\gamma_7}|$$
$$\Psi_2(\gamma^1\gamma^4, {}^3\Gamma^4, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_7}|}{2}$$
$$\Psi_3(\gamma^1\gamma^4, {}^3\Gamma^4, M=1, \gamma_7) = |\gamma_4\gamma_7|$$

$\gamma^2\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\gamma^2\gamma^{12}, {}^3\Gamma^4, M=-1, \gamma_7) = |\overline{\gamma_5\gamma_3}|$$
$$\Psi_5(\gamma^2\gamma^{12}, {}^3\Gamma^4, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_3}|}{2}$$
$$\Psi_6(\gamma^2\gamma^{12}, {}^3\Gamma^4, M=1, \gamma_7) = |\gamma_5\gamma_3|$$

$\gamma^3\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(\gamma^3\gamma^{11}, {}^3\Gamma^4, M=-1, \gamma_7) = |\overline{\gamma_6\gamma_2}|$$
$$\Psi_8(\gamma^3\gamma^{11}, {}^3\Gamma^4, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_2}|}{2}$$
$$\Psi_9(\gamma^3\gamma^{11}, {}^3\Gamma^4, M=1, \gamma_7) = |\gamma_6\gamma_2|$$

$\gamma^5\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_{10}(\gamma^5\gamma^9, {}^3\Gamma^4, M=-1, \gamma_7) = |\overline{\gamma_8\gamma_{12}}|$$
$$\Psi_{11}(\gamma^5\gamma^9, {}^3\Gamma^4, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_8}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_{12}}|}{2}$$
$$\Psi_{12}(\gamma^5\gamma^9, {}^3\Gamma^4, M=1, \gamma_7) = |\gamma_8\gamma_{12}|$$

$\gamma^6\gamma^8$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(\gamma^6\gamma^8, {}^3\Gamma^4, M=-1, \gamma_7) = |\overline{\gamma_9\gamma_{11}}|$$
$$\Psi_{14}(\gamma^6\gamma^8, {}^3\Gamma^4, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_9}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_{11}}|}{2}$$
$$\Psi_{15}(\gamma^6\gamma^8, {}^3\Gamma^4, M=1, \gamma_7) = |\gamma_9\gamma_{11}|$$

$\gamma^7\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{16}(\gamma^7\gamma^{10}, {}^3\Gamma^4, M=-1, \gamma_7) = |\overline{\gamma_{10}\gamma_1}|$$
$$\Psi_{17}(\gamma^7\gamma^{10}, {}^3\Gamma^4, M=0, \gamma_7) = \frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_1}|}{2}$$
$$\Psi_{18}(\gamma^7\gamma^{10}, {}^3\Gamma^4, M=1, \gamma_7) = |\gamma_{10}\gamma_1|$$

2.23.7 ${}^1\Gamma^4$

$\gamma^1\gamma^4$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(\gamma^1\gamma^4, {}^1\Gamma^4, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_7}|}{2}$$

$\gamma^2\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(\gamma^2\gamma^{12}, {}^1\Gamma^4, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_3}|}{2}$$

$\gamma^3\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(\gamma^3\gamma^{11}, {}^1\Gamma^4, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_2}|}{2}$$

$\gamma^5\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\gamma^5\gamma^9, {}^1\Gamma^4, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_8}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_{12}}|}{2}$$

$\gamma^6\gamma^8$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(\gamma^6\gamma^8, {}^1\Gamma^4, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_9}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_{11}}|}{2}$$

$\gamma^7\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_6(\gamma^7\gamma^{10}, {}^1\Gamma^4, M=0, \gamma_7) = -\frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_1}|}{2}$$

2.23.8 ${}^3\Gamma^5$

$\gamma^1\gamma^5$

$$\boxed{\Delta E = -\langle\gamma_4\gamma_4||\gamma_8\gamma_8\rangle + \langle\gamma_4\gamma_8||\gamma_4\gamma_8\rangle}$$

$$\Psi_1(\gamma^1\gamma^5, {}^3\Gamma^5, M=-1, \gamma_8) = |\overline{\gamma_4\gamma_8}|$$
$$\Psi_2(\gamma^1\gamma^5, {}^3\Gamma^5, M=0, \gamma_8) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_8}|}{2}$$
$$\Psi_3(\gamma^1\gamma^5, {}^3\Gamma^5, M=1, \gamma_8) = |\gamma_4\gamma_8|$$

$\gamma^2\gamma^8$

$$\boxed{\Delta E = \langle\gamma_5\gamma_{11}||\gamma_5\gamma_{11}\rangle - \langle\gamma_5\gamma_5||\gamma_{11}\gamma_{11}\rangle}$$

$$\Psi_4(\gamma^2\gamma^8, {}^3\Gamma^5, M=-1, \gamma_8) = |\overline{\gamma_5\gamma_{11}}|$$
$$\Psi_5(\gamma^2\gamma^8, {}^3\Gamma^5, M=0, \gamma_8) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_{11}}|}{2}$$
$$\Psi_6(\gamma^2\gamma^8, {}^3\Gamma^5, M=1, \gamma_8) = |\gamma_5\gamma_{11}|$$

$\gamma^3\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(\gamma^3\gamma^9, {}^3\Gamma^5, M=-1, \gamma_8) = |\overline{\gamma_6\gamma_{12}}|$$
$$\Psi_8(\gamma^3\gamma^9, {}^3\Gamma^5, M=0, \gamma_8) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_{12}}|}{2}$$
$$\Psi_9(\gamma^3\gamma^9, {}^3\Gamma^5, M=1, \gamma_8) = |\gamma_6\gamma_{12}|$$

$\gamma^4\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{10}(\gamma^4\gamma^{10}, {}^3\Gamma^5, M=-1, \gamma_8) = |\overline{\gamma_7\gamma_1}|$$
$$\Psi_{11}(\gamma^4\gamma^{10}, {}^3\Gamma^5, M=0, \gamma_8) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_1}|}{2}$$
$$\Psi_{12}(\gamma^4\gamma^{10}, {}^3\Gamma^5, M=1, \gamma_8) = |\gamma_7\gamma_1|$$

$\gamma^6\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(\gamma^6\gamma^{11}, {}^3\Gamma^5, M=-1, \gamma_8) = |\overline{\gamma_9}\overline{\gamma_2}|$$
$$\Psi_{14}(\gamma^6\gamma^{11}, {}^3\Gamma^5, M=0, \gamma_8) = \frac{\sqrt{2}|\overline{\gamma_9}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_2}|}{2}$$
$$\Psi_{15}(\gamma^6\gamma^{11}, {}^3\Gamma^5, M=1, \gamma_8) = |\gamma_9\gamma_2|$$

$\gamma^7\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{16}(\gamma^7\gamma^{12}, {}^3\Gamma^5, M=-1, \gamma_8) = |\overline{\gamma_{10}}\overline{\gamma_3}|$$
$$\Psi_{17}(\gamma^7\gamma^{12}, {}^3\Gamma^5, M=0, \gamma_8) = \frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_3}|}{2}$$
$$\Psi_{18}(\gamma^7\gamma^{12}, {}^3\Gamma^5, M=1, \gamma_8) = |\gamma_{10}\gamma_3|$$

2.23.9 ${}^1\Gamma^5$

$\gamma^1\gamma^5$

$$\boxed{\Delta E = \langle\gamma_4\gamma_4||\gamma_8\gamma_8\rangle + \langle\gamma_4\gamma_8||\gamma_4\gamma_8\rangle}$$

$$\Psi_1(\gamma^1\gamma^5, {}^1\Gamma^5, M=0, \gamma_8) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_8}|}{2}$$

$\gamma^2\gamma^8$

$$\boxed{\Delta E = \langle\gamma_5\gamma_{11}||\gamma_5\gamma_{11}\rangle + \langle\gamma_5\gamma_5||\gamma_{11}\gamma_{11}\rangle}$$

$$\Psi_2(\gamma^2\gamma^8, {}^1\Gamma^5, M=0, \gamma_8) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_{11}}|}{2}$$

$\gamma^3\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(\gamma^3\gamma^9, {}^1\Gamma^5, M=0, \gamma_8) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_{12}}|}{2}$$

$\gamma^4\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\gamma^4\gamma^{10}, {}^1\Gamma^5, M=0, \gamma_8) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_1}|}{2}$$

$\gamma^6\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(\gamma^6\gamma^{11}, {}^1\Gamma^5, M=0, \gamma_8) = -\frac{\sqrt{2}|\overline{\gamma_9}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_2}|}{2}$$

$\gamma^7\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_6(\gamma^7\gamma^{12}, {}^1\Gamma^5, M=0, \gamma_8) = -\frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_3}|}{2}$$

2.23.10 ${}^3\Gamma^6$

$\gamma^1\gamma^6$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(\gamma^1\gamma^6, {}^3\Gamma^6, M=-1, \gamma_9) = |\overline{\gamma_4}\overline{\gamma_9}|$$
$$\Psi_2(\gamma^1\gamma^6, {}^3\Gamma^6, M=0, \gamma_9) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_9}|}{2}$$
$$\Psi_3(\gamma^1\gamma^6, {}^3\Gamma^6, M=1, \gamma_9) = |\gamma_4\gamma_9|$$

$\gamma^2\gamma^9$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\gamma^2\gamma^9, {}^3\Gamma^6, M=-1, \gamma_9) = |\overline{\gamma_5}\overline{\gamma_{12}}|$$
$$\Psi_5(\gamma^2\gamma^9, {}^3\Gamma^6, M=0, \gamma_9) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_{12}}|}{2}$$
$$\Psi_6(\gamma^2\gamma^9, {}^3\Gamma^6, M=1, \gamma_9) = |\gamma_5\gamma_{12}|$$

$\gamma^3\gamma^{10}$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(\gamma^3\gamma^{10}, {}^3\Gamma^6, M=-1, \gamma_9) = |\overline{\gamma_6}\overline{\gamma_1}|$$
$$\Psi_8(\gamma^3\gamma^{10}, {}^3\Gamma^6, M=0, \gamma_9) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_1}|}{2}$$
$$\Psi_9(\gamma^3\gamma^{10}, {}^3\Gamma^6, M=1, \gamma_9) = |\gamma_6\gamma_1|$$

$\gamma^4\gamma^8$

$$\boxed{\Delta E = 0}$$

$$\Psi_{10}(\gamma^4\gamma^8, {}^3\Gamma^6, M=-1, \gamma_9) = |\overline{\gamma_7}\overline{\gamma_{11}}|$$
$$\Psi_{11}(\gamma^4\gamma^8, {}^3\Gamma^6, M=0, \gamma_9) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_{11}}|}{2}$$
$$\Psi_{12}(\gamma^4\gamma^8, {}^3\Gamma^6, M=1, \gamma_9) = |\gamma_7\gamma_{11}|$$

$\gamma^5\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(\gamma^5\gamma^{12}, {}^3\Gamma^6, M=-1, \gamma_9) = |\overline{\gamma_8}\overline{\gamma_3}|$$
$$\Psi_{14}(\gamma^5\gamma^{12}, {}^3\Gamma^6, M=0, \gamma_9) = \frac{\sqrt{2}|\overline{\gamma_8}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_3}|}{2}$$
$$\Psi_{15}(\gamma^5\gamma^{12}, {}^3\Gamma^6, M=1, \gamma_9) = |\gamma_8\gamma_3|$$

$\gamma^7\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{16}(\gamma^7\gamma^{11}, {}^3\Gamma^6, M=-1, \gamma_9) = |\overline{\gamma_{10}}\overline{\gamma_2}|$$
$$\Psi_{17}(\gamma^7\gamma^{11}, {}^3\Gamma^6, M=0, \gamma_9) = \frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_2}|}{2}$$
$$\Psi_{18}(\gamma^7\gamma^{11}, {}^3\Gamma^6, M=1, \gamma_9) = |\gamma_{10}\gamma_2|$$

2.23.11 $^1\Gamma^6$

$\gamma^1\gamma^6$

$\boxed{\Delta E = 0}$

$\Psi_1(\gamma^1\gamma^6, {}^1\Gamma^6, M\!=\!0, \gamma_9) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_9}|}{2}$

$\gamma^2\gamma^9$

$\boxed{\Delta E = 0}$

$\Psi_2(\gamma^2\gamma^9, {}^1\Gamma^6, M\!=\!0, \gamma_9) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_{12}}|}{2}$

$\gamma^3\gamma^{10}$

$\boxed{\Delta E = 0}$

$\Psi_3(\gamma^3\gamma^{10}, {}^1\Gamma^6, M\!=\!0, \gamma_9) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_1}|}{2}$

$\gamma^4\gamma^8$

$\boxed{\Delta E = 0}$

$\Psi_4(\gamma^4\gamma^8, {}^1\Gamma^6, M\!=\!0, \gamma_9) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_{11}}|}{2}$

$\gamma^5\gamma^{12}$

$\boxed{\Delta E = 0}$

$\Psi_5(\gamma^5\gamma^{12}, {}^1\Gamma^6, M\!=\!0, \gamma_9) = -\frac{\sqrt{2}|\overline{\gamma_8}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_3}|}{2}$

$\gamma^7\gamma^{11}$

$\boxed{\Delta E = 0}$

$\Psi_6(\gamma^7\gamma^{11}, {}^1\Gamma^6, M\!=\!0, \gamma_9) = -\frac{\sqrt{2}|\overline{\gamma_{10}}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_{10}\overline{\gamma_2}|}{2}$

2.23.12 $^3\Gamma^7$

$\gamma^1\gamma^7$

$\boxed{\Delta E = 0}$

$\Psi_1(\gamma^1\gamma^7, {}^3\Gamma^7, M\!=\!-1, \gamma_{10}) = |\overline{\gamma_4}\overline{\gamma_{10}}|$

$\Psi_2(\gamma^1\gamma^7, {}^3\Gamma^7, M\!=\!0, \gamma_{10}) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_{10}}|}{2}$

$\Psi_3(\gamma^1\gamma^7, {}^3\Gamma^7, M\!=\!1, \gamma_{10}) = |\gamma_4\gamma_{10}|$

$\gamma^2\gamma^{10}$

$\boxed{\Delta E = 0}$

$\Psi_4(\gamma^2\gamma^{10}, {}^3\Gamma^7, M\!=\!-1, \gamma_{10}) = |\overline{\gamma_5}\overline{\gamma_1}|$

$\Psi_5(\gamma^2\gamma^{10}, {}^3\Gamma^7, M\!=\!0, \gamma_{10}) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_1}|}{2}$

$\Psi_6(\gamma^2\gamma^{10}, {}^3\Gamma^7, M\!=\!1, \gamma_{10}) = |\gamma_5\gamma_1|$

$\gamma^3\gamma^8$

$\boxed{\Delta E = 0}$

$\Psi_7(\gamma^3\gamma^8, {}^3\Gamma^7, M\!=\!-1, \gamma_{10}) = |\overline{\gamma_6}\overline{\gamma_{11}}|$

$\Psi_8(\gamma^3\gamma^8, {}^3\Gamma^7, M\!=\!0, \gamma_{10}) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_{11}}|}{2}$

$\Psi_9(\gamma^3\gamma^8, {}^3\Gamma^7, M\!=\!1, \gamma_{10}) = |\gamma_6\gamma_{11}|$

$\gamma^4\gamma^9$

$\boxed{\Delta E = 0}$

$\Psi_{10}(\gamma^4\gamma^9, {}^3\Gamma^7, M\!=\!-1, \gamma_{10}) = |\overline{\gamma_7}\overline{\gamma_{12}}|$

$\Psi_{11}(\gamma^4\gamma^9, {}^3\Gamma^7, M\!=\!0, \gamma_{10}) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_{12}}|}{2}$

$\Psi_{12}(\gamma^4\gamma^9, {}^3\Gamma^7, M\!=\!1, \gamma_{10}) = |\gamma_7\gamma_{12}|$

$\gamma^5\gamma^{11}$

$\boxed{\Delta E = 0}$

$\Psi_{13}(\gamma^5\gamma^{11}, {}^3\Gamma^7, M\!=\!-1, \gamma_{10}) = |\overline{\gamma_8}\overline{\gamma_2}|$

$\Psi_{14}(\gamma^5\gamma^{11}, {}^3\Gamma^7, M\!=\!0, \gamma_{10}) = \frac{\sqrt{2}|\overline{\gamma_8}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_2}|}{2}$

$\Psi_{15}(\gamma^5\gamma^{11}, {}^3\Gamma^7, M\!=\!1, \gamma_{10}) = |\gamma_8\gamma_2|$

$\gamma^6\gamma^{12}$

$\boxed{\Delta E = 0}$

$\Psi_{16}(\gamma^6\gamma^{12}, {}^3\Gamma^7, M\!=\!-1, \gamma_{10}) = |\overline{\gamma_9}\overline{\gamma_3}|$

$\Psi_{17}(\gamma^6\gamma^{12}, {}^3\Gamma^7, M\!=\!0, \gamma_{10}) = \frac{\sqrt{2}|\overline{\gamma_9}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_3}|}{2}$

$\Psi_{18}(\gamma^6\gamma^{12}, {}^3\Gamma^7, M\!=\!1, \gamma_{10}) = |\gamma_9\gamma_3|$

2.23.13 $^1\Gamma^7$

$\gamma^1\gamma^7$

$\boxed{\Delta E = 0}$

$\Psi_1(\gamma^1\gamma^7, {}^1\Gamma^7, M\!=\!0, \gamma_{10}) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_{10}}|}{2}$

$\gamma^2\gamma^{10}$

$\boxed{\Delta E = 0}$

$\Psi_2(\gamma^2\gamma^{10}, {}^1\Gamma^7, M\!=\!0, \gamma_{10}) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_1}|}{2}$

$\gamma^3\gamma^8$

$\boxed{\Delta E = 0}$

$\Psi_3(\gamma^3\gamma^8, {}^1\Gamma^7, M\!=\!0, \gamma_{10}) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_{11}}|}{2}$

$\gamma^4\gamma^9$

$\boxed{\Delta E = 0}$

$\Psi_4(\gamma^4\gamma^9, {}^1\Gamma^7, M\!=\!0, \gamma_{10}) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_{12}}|}{2}$

$\gamma^5\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(\gamma^5\gamma^{11}, {}^1\Gamma^7, M=0, \gamma_{10}) = -\frac{\sqrt{2}|\overline{\gamma_8}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_2}|}{2}$$

$\gamma^6\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_6(\gamma^6\gamma^{12}, {}^1\Gamma^7, M=0, \gamma_{10}) = -\frac{\sqrt{2}|\overline{\gamma_9}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_3}|}{2}$$

2.23.14 ${}^3\Gamma^8$

$\gamma^1\gamma^8$

$$\boxed{\Delta E = \langle\gamma_4\gamma_{11}||\gamma_4\gamma_{11}\rangle - \langle\gamma_4\gamma_4||\gamma_{11}\gamma_{11}\rangle}$$

$$\Psi_1(\gamma^1\gamma^8, {}^3\Gamma^8, M=-1, \gamma_{11}) = |\overline{\gamma_4\gamma_{11}}|$$
$$\Psi_2(\gamma^1\gamma^8, {}^3\Gamma^8, M=0, \gamma_{11}) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_{11}}|}{2}$$
$$\Psi_3(\gamma^1\gamma^8, {}^3\Gamma^8, M=1, \gamma_{11}) = |\gamma_4\gamma_{11}|$$

$\gamma^2\gamma^5$

$$\boxed{\Delta E = -\langle\gamma_5\gamma_5||\gamma_8\gamma_8\rangle + \langle\gamma_5\gamma_8||\gamma_5\gamma_8\rangle}$$

$$\Psi_4(\gamma^2\gamma^5, {}^3\Gamma^8, M=-1, \gamma_{11}) = |\overline{\gamma_5\gamma_8}|$$
$$\Psi_5(\gamma^2\gamma^5, {}^3\Gamma^8, M=0, \gamma_{11}) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_8}|}{2}$$
$$\Psi_6(\gamma^2\gamma^5, {}^3\Gamma^8, M=1, \gamma_{11}) = |\gamma_5\gamma_8|$$

$\gamma^3\gamma^6$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(\gamma^3\gamma^6, {}^3\Gamma^8, M=-1, \gamma_{11}) = |\overline{\gamma_6\gamma_9}|$$
$$\Psi_8(\gamma^3\gamma^6, {}^3\Gamma^8, M=0, \gamma_{11}) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_9}|}{2}$$
$$\Psi_9(\gamma^3\gamma^6, {}^3\Gamma^8, M=1, \gamma_{11}) = |\gamma_6\gamma_9|$$

$\gamma^4\gamma^7$

$$\boxed{\Delta E = 0}$$

$$\Psi_{10}(\gamma^4\gamma^7, {}^3\Gamma^8, M=-1, \gamma_{11}) = |\overline{\gamma_7\gamma_{10}}|$$
$$\Psi_{11}(\gamma^4\gamma^7, {}^3\Gamma^8, M=0, \gamma_{11}) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_{10}}|}{2}$$
$$\Psi_{12}(\gamma^4\gamma^7, {}^3\Gamma^8, M=1, \gamma_{11}) = |\gamma_7\gamma_{10}|$$

$\gamma^9\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(\gamma^9\gamma^{11}, {}^3\Gamma^8, M=-1, \gamma_{11}) = |\overline{\gamma_{12}\gamma_2}|$$
$$\Psi_{14}(\gamma^9\gamma^{11}, {}^3\Gamma^8, M=0, \gamma_{11}) = \frac{\sqrt{2}|\overline{\gamma_{12}}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_{12}\overline{\gamma_2}|}{2}$$
$$\Psi_{15}(\gamma^9\gamma^{11}, {}^3\Gamma^8, M=1, \gamma_{11}) = |\gamma_{12}\gamma_2|$$

$\gamma^{10}\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{16}(\gamma^{10}\gamma^{12}, {}^3\Gamma^8, M=-1, \gamma_{11}) = |\overline{\gamma_1\gamma_3}|$$
$$\Psi_{17}(\gamma^{10}\gamma^{12}, {}^3\Gamma^8, M=0, \gamma_{11}) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_3}|}{2}$$
$$\Psi_{18}(\gamma^{10}\gamma^{12}, {}^3\Gamma^8, M=1, \gamma_{11}) = |\gamma_1\gamma_3|$$

2.23.15 ${}^1\Gamma^8$

$\gamma^1\gamma^8$

$$\boxed{\Delta E = \langle\gamma_4\gamma_{11}||\gamma_4\gamma_{11}\rangle + \langle\gamma_4\gamma_4||\gamma_{11}\gamma_{11}\rangle}$$

$$\Psi_1(\gamma^1\gamma^8, {}^1\Gamma^8, M=0, \gamma_{11}) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_{11}|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_{11}}|}{2}$$

$\gamma^2\gamma^5$

$$\boxed{\Delta E = \langle\gamma_5\gamma_5||\gamma_8\gamma_8\rangle + \langle\gamma_5\gamma_8||\gamma_5\gamma_8\rangle}$$

$$\Psi_2(\gamma^2\gamma^5, {}^1\Gamma^8, M=0, \gamma_{11}) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_8}|}{2}$$

$\gamma^3\gamma^6$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(\gamma^3\gamma^6, {}^1\Gamma^8, M=0, \gamma_{11}) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_9}|}{2}$$

$\gamma^4\gamma^7$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(\gamma^4\gamma^7, {}^1\Gamma^8, M=0, \gamma_{11}) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_{10}}|}{2}$$

$\gamma^9\gamma^{11}$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(\gamma^9\gamma^{11}, {}^1\Gamma^8, M=0, \gamma_{11}) = -\frac{\sqrt{2}|\overline{\gamma_{12}}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_{12}\overline{\gamma_2}|}{2}$$

$\gamma^{10}\gamma^{12}$

$$\boxed{\Delta E = 0}$$

$$\Psi_6(\gamma^{10}\gamma^{12}, {}^1\Gamma^8, M=0, \gamma_{11}) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_3}|}{2}$$

2.23.16 $^3\Gamma^9$

$\gamma^1\gamma^9$

$\boxed{\Delta E = 0}$

$$\Psi_1(\gamma^1\gamma^9, {}^3\Gamma^9, M=-1, \gamma_{12}) = |\overline{\gamma_4}\overline{\gamma_{12}}|$$
$$\Psi_2(\gamma^1\gamma^9, {}^3\Gamma^9, M=0, \gamma_{12}) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_{12}}|}{2}$$
$$\Psi_3(\gamma^1\gamma^9, {}^3\Gamma^9, M=1, \gamma_{12}) = |\gamma_4\gamma_{12}|$$

$\gamma^2\gamma^6$

$\boxed{\Delta E = 0}$

$$\Psi_4(\gamma^2\gamma^6, {}^3\Gamma^9, M=-1, \gamma_{12}) = |\overline{\gamma_5}\overline{\gamma_9}|$$
$$\Psi_5(\gamma^2\gamma^6, {}^3\Gamma^9, M=0, \gamma_{12}) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_9}|}{2}$$
$$\Psi_6(\gamma^2\gamma^6, {}^3\Gamma^9, M=1, \gamma_{12}) = |\gamma_5\gamma_9|$$

$\gamma^3\gamma^7$

$\boxed{\Delta E = 0}$

$$\Psi_7(\gamma^3\gamma^7, {}^3\Gamma^9, M=-1, \gamma_{12}) = |\overline{\gamma_6}\overline{\gamma_{10}}|$$
$$\Psi_8(\gamma^3\gamma^7, {}^3\Gamma^9, M=0, \gamma_{12}) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_{10}}|}{2}$$
$$\Psi_9(\gamma^3\gamma^7, {}^3\Gamma^9, M=1, \gamma_{12}) = |\gamma_6\gamma_{10}|$$

$\gamma^4\gamma^5$

$\boxed{\Delta E = 0}$

$$\Psi_{10}(\gamma^4\gamma^5, {}^3\Gamma^9, M=-1, \gamma_{12}) = |\overline{\gamma_7}\overline{\gamma_8}|$$
$$\Psi_{11}(\gamma^4\gamma^5, {}^3\Gamma^9, M=0, \gamma_{12}) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_8}|}{2}$$
$$\Psi_{12}(\gamma^4\gamma^5, {}^3\Gamma^9, M=1, \gamma_{12}) = |\gamma_7\gamma_8|$$

$\gamma^8\gamma^{12}$

$\boxed{\Delta E = 0}$

$$\Psi_{13}(\gamma^8\gamma^{12}, {}^3\Gamma^9, M=-1, \gamma_{12}) = |\overline{\gamma_{11}}\overline{\gamma_3}|$$
$$\Psi_{14}(\gamma^8\gamma^{12}, {}^3\Gamma^9, M=0, \gamma_{12}) = \frac{\sqrt{2}|\overline{\gamma_{11}}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_{11}\overline{\gamma_3}|}{2}$$
$$\Psi_{15}(\gamma^8\gamma^{12}, {}^3\Gamma^9, M=1, \gamma_{12}) = |\gamma_{11}\gamma_3|$$

$\gamma^{10}\gamma^{11}$

$\boxed{\Delta E = 0}$

$$\Psi_{16}(\gamma^{10}\gamma^{11}, {}^3\Gamma^9, M=-1, \gamma_{12}) = |\overline{\gamma_1}\overline{\gamma_2}|$$
$$\Psi_{17}(\gamma^{10}\gamma^{11}, {}^3\Gamma^9, M=0, \gamma_{12}) = \frac{\sqrt{2}|\overline{\gamma_1}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_2}|}{2}$$
$$\Psi_{18}(\gamma^{10}\gamma^{11}, {}^3\Gamma^9, M=1, \gamma_{12}) = |\gamma_1\gamma_2|$$

2.23.17 $^1\Gamma^9$

$\gamma^1\gamma^9$

$\boxed{\Delta E = 0}$

$$\Psi_1(\gamma^1\gamma^9, {}^1\Gamma^9, M=0, \gamma_{12}) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_{12}}|}{2}$$

$\gamma^2\gamma^6$

$\boxed{\Delta E = 0}$

$$\Psi_2(\gamma^2\gamma^6, {}^1\Gamma^9, M=0, \gamma_{12}) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_9}|}{2}$$

$\gamma^3\gamma^7$

$\boxed{\Delta E = 0}$

$$\Psi_3(\gamma^3\gamma^7, {}^1\Gamma^9, M=0, \gamma_{12}) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_{10}}|}{2}$$

$\gamma^4\gamma^5$

$\boxed{\Delta E = 0}$

$$\Psi_4(\gamma^4\gamma^5, {}^1\Gamma^9, M=0, \gamma_{12}) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_8}|}{2}$$

$\gamma^8\gamma^{12}$

$\boxed{\Delta E = 0}$

$$\Psi_5(\gamma^8\gamma^{12}, {}^1\Gamma^9, M=0, \gamma_{12}) = -\frac{\sqrt{2}|\overline{\gamma_{11}}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_{11}\overline{\gamma_3}|}{2}$$

$\gamma^{10}\gamma^{11}$

$\boxed{\Delta E = 0}$

$$\Psi_6(\gamma^{10}\gamma^{11}, {}^1\Gamma^9, M=0, \gamma_{12}) = -\frac{\sqrt{2}|\overline{\gamma_1}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_1\overline{\gamma_2}|}{2}$$

2.23.18 $^3\Gamma^{10}$

$\gamma^1\gamma^{10}$

$\boxed{\Delta E = 0}$

$$\Psi_1(\gamma^1\gamma^{10}, {}^3\Gamma^{10}, M=-1, \gamma_1) = |\overline{\gamma_4}\overline{\gamma_1}|$$
$$\Psi_2(\gamma^1\gamma^{10}, {}^3\Gamma^{10}, M=0, \gamma_1) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_1}|}{2}$$
$$\Psi_3(\gamma^1\gamma^{10}, {}^3\Gamma^{10}, M=1, \gamma_1) = |\gamma_4\gamma_1|$$

$\gamma^2\gamma^7$

$\boxed{\Delta E = 0}$

$$\Psi_4(\gamma^2\gamma^7, {}^3\Gamma^{10}, M=-1, \gamma_1) = |\overline{\gamma_5}\overline{\gamma_{10}}|$$
$$\Psi_5(\gamma^2\gamma^7, {}^3\Gamma^{10}, M=0, \gamma_1) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_{10}}|}{2}$$
$$\Psi_6(\gamma^2\gamma^7, {}^3\Gamma^{10}, M=1, \gamma_1) = |\gamma_5\gamma_{10}|$$

$\gamma^3\gamma^5$

$\boxed{\Delta E = 0}$

$$\Psi_7(\gamma^3\gamma^5, {}^3\Gamma^{10}, M=-1, \gamma_1) = |\overline{\gamma_6}\overline{\gamma_8}|$$

$$\Psi_8(\gamma^3\gamma^5, {}^3\Gamma^{10}, M=0, \gamma_1) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_8}|}{2}$$
$$\Psi_9(\gamma^3\gamma^5, {}^3\Gamma^{10}, M=1, \gamma_1) = |\gamma_6\gamma_8|$$

$\gamma^4\gamma^6$

$\boxed{\Delta E = 0}$

$$\Psi_{10}(\gamma^4\gamma^6, {}^3\Gamma^{10}, M=-1, \gamma_1) = |\overline{\gamma_7}\overline{\gamma_9}|$$
$$\Psi_{11}(\gamma^4\gamma^6, {}^3\Gamma^{10}, M=0, \gamma_1) = \frac{\sqrt{2}|\overline{\gamma_7}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_9}|}{2}$$
$$\Psi_{12}(\gamma^4\gamma^6, {}^3\Gamma^{10}, M=1, \gamma_1) = |\gamma_7\gamma_9|$$

$\gamma^8\gamma^{11}$

$\boxed{\Delta E = 0}$

$$\Psi_{13}(\gamma^8\gamma^{11}, {}^3\Gamma^{10}, M=-1, \gamma_1) = |\overline{\gamma_{11}}\overline{\gamma_2}|$$
$$\Psi_{14}(\gamma^8\gamma^{11}, {}^3\Gamma^{10}, M=0, \gamma_1) = \frac{\sqrt{2}|\overline{\gamma_{11}}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_{11}\overline{\gamma_2}|}{2}$$
$$\Psi_{15}(\gamma^8\gamma^{11}, {}^3\Gamma^{10}, M=1, \gamma_1) = |\gamma_{11}\gamma_2|$$

$\gamma^9\gamma^{12}$

$\boxed{\Delta E = 0}$

$$\Psi_{16}(\gamma^9\gamma^{12}, {}^3\Gamma^{10}, M=-1, \gamma_1) = |\overline{\gamma_{12}}\overline{\gamma_3}|$$
$$\Psi_{17}(\gamma^9\gamma^{12}, {}^3\Gamma^{10}, M=0, \gamma_1) = \frac{\sqrt{2}|\overline{\gamma_{12}}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_{12}\overline{\gamma_3}|}{2}$$
$$\Psi_{18}(\gamma^9\gamma^{12}, {}^3\Gamma^{10}, M=1, \gamma_1) = |\gamma_{12}\gamma_3|$$

2.23.19 ${}^1\Gamma^{10}$

$\gamma^1\gamma^{10}$

$\boxed{\Delta E = 0}$

$$\Psi_1(\gamma^1\gamma^{10}, {}^1\Gamma^{10}, M=0, \gamma_1) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_1}|}{2}$$

$\gamma^2\gamma^7$

$\boxed{\Delta E = 0}$

$$\Psi_2(\gamma^2\gamma^7, {}^1\Gamma^{10}, M=0, \gamma_1) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_{10}}|}{2}$$

$\gamma^3\gamma^5$

$\boxed{\Delta E = 0}$

$$\Psi_3(\gamma^3\gamma^5, {}^1\Gamma^{10}, M=0, \gamma_1) = -\frac{\sqrt{2}|\overline{\gamma_6}\gamma_8|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_8}|}{2}$$

$\gamma^4\gamma^6$

$\boxed{\Delta E = 0}$

$$\Psi_4(\gamma^4\gamma^6, {}^1\Gamma^{10}, M=0, \gamma_1) = -\frac{\sqrt{2}|\overline{\gamma_7}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_7\overline{\gamma_9}|}{2}$$

$\gamma^8\gamma^{11}$

$\boxed{\Delta E = 0}$

$$\Psi_5(\gamma^8\gamma^{11}, {}^1\Gamma^{10}, M=0, \gamma_1) = -\frac{\sqrt{2}|\overline{\gamma_{11}}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_{11}\overline{\gamma_2}|}{2}$$

$\gamma^9\gamma^{12}$

$\boxed{\Delta E = 0}$

$$\Psi_6(\gamma^9\gamma^{12}, {}^1\Gamma^{10}, M=0, \gamma_1) = -\frac{\sqrt{2}|\overline{\gamma_{12}}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_{12}\overline{\gamma_3}|}{2}$$

2.23.20 ${}^3\Gamma^{11}$

$\gamma^1\gamma^{11}$

$\boxed{\Delta E = 0}$

$$\Psi_1(\gamma^1\gamma^{11}, {}^3\Gamma^{11}, M=-1, \gamma_2) = |\overline{\gamma_4}\overline{\gamma_2}|$$
$$\Psi_2(\gamma^1\gamma^{11}, {}^3\Gamma^{11}, M=0, \gamma_2) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_2}|}{2}$$
$$\Psi_3(\gamma^1\gamma^{11}, {}^3\Gamma^{11}, M=1, \gamma_2) = |\gamma_4\gamma_2|$$

$\gamma^2\gamma^3$

$\boxed{\Delta E = 0}$

$$\Psi_4(\gamma^2\gamma^3, {}^3\Gamma^{11}, M=-1, \gamma_2) = |\overline{\gamma_5}\overline{\gamma_6}|$$
$$\Psi_5(\gamma^2\gamma^3, {}^3\Gamma^{11}, M=0, \gamma_2) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_6}|}{2}$$
$$\Psi_6(\gamma^2\gamma^3, {}^3\Gamma^{11}, M=1, \gamma_2) = |\gamma_5\gamma_6|$$

$\gamma^5\gamma^7$

$\boxed{\Delta E = 0}$

$$\Psi_7(\gamma^5\gamma^7, {}^3\Gamma^{11}, M=-1, \gamma_2) = |\overline{\gamma_8}\overline{\gamma_{10}}|$$
$$\Psi_8(\gamma^5\gamma^7, {}^3\Gamma^{11}, M=0, \gamma_2) = \frac{\sqrt{2}|\overline{\gamma_8}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_{10}}|}{2}$$
$$\Psi_9(\gamma^5\gamma^7, {}^3\Gamma^{11}, M=1, \gamma_2) = |\gamma_8\gamma_{10}|$$

$\gamma^8\gamma^{10}$

$\boxed{\Delta E = 0}$

$$\Psi_{10}(\gamma^8\gamma^{10}, {}^3\Gamma^{11}, M=-1, \gamma_2) = |\overline{\gamma_{11}}\overline{\gamma_1}|$$
$$\Psi_{11}(\gamma^8\gamma^{10}, {}^3\Gamma^{11}, M=0, \gamma_2) = \frac{\sqrt{2}|\overline{\gamma_{11}}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_{11}\overline{\gamma_1}|}{2}$$
$$\Psi_{12}(\gamma^8\gamma^{10}, {}^3\Gamma^{11}, M=1, \gamma_2) = |\gamma_{11}\gamma_1|$$

2.23.21 ${}^1\Gamma^{11}$

$\gamma^1\gamma^{11}$

$\boxed{\Delta E = 0}$

$$\Psi_1(\gamma^1\gamma^{11}, {}^1\Gamma^{11}, M=0, \gamma_2) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_2|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_2}|}{2}$$

$\gamma^2\gamma^3$

$\boxed{\Delta E = 0}$

$$\Psi_2(\gamma^2\gamma^3, {}^1\Gamma^{11}, M{=}0, \gamma_2) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_6|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_6}|}{2}$$

$(\gamma^4)^2$

$\boxed{\Delta E = 0}$

$$\Psi_3((\gamma^4)^2, {}^1\Gamma^{11}, M{=}0, \gamma_2) = -|\overline{\gamma_7}\gamma_7|$$

$\gamma^5\gamma^7$

$\boxed{\Delta E = 0}$

$$\Psi_4(\gamma^5\gamma^7, {}^1\Gamma^{11}, M{=}0, \gamma_2) = -\frac{\sqrt{2}|\overline{\gamma_8}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_{10}}|}{2}$$

$(\gamma^6)^2$

$\boxed{\Delta E = 0}$

$$\Psi_5((\gamma^6)^2, {}^1\Gamma^{11}, M{=}0, \gamma_2) = -|\overline{\gamma_9}\gamma_9|$$

$\gamma^8\gamma^{10}$

$\boxed{\Delta E = 0}$

$$\Psi_6(\gamma^8\gamma^{10}, {}^1\Gamma^{11}, M{=}0, \gamma_2) = -\frac{\sqrt{2}|\overline{\gamma_{11}}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_{11}\overline{\gamma_1}|}{2}$$

$(\gamma^9)^2$

$\boxed{\Delta E = 0}$

$$\Psi_7((\gamma^9)^2, {}^1\Gamma^{11}, M{=}0, \gamma_2) = -|\overline{\gamma_{12}}\gamma_{12}|$$

$(\gamma^{12})^2$

$\boxed{\Delta E = 0}$

$$\Psi_8((\gamma^{12})^2, {}^1\Gamma^{11}, M{=}0, \gamma_2) = -|\overline{\gamma_3}\gamma_3|$$

2.23.22 $^3\Gamma^{12}$

$\gamma^1\gamma^{12}$

$\boxed{\Delta E = 0}$

$$\Psi_1(\gamma^1\gamma^{12}, {}^3\Gamma^{12}, M{=}-1, \gamma_3) = |\overline{\gamma_4}\overline{\gamma_3}|$$
$$\Psi_2(\gamma^1\gamma^{12}, {}^3\Gamma^{12}, M{=}0, \gamma_3) = \frac{\sqrt{2}|\overline{\gamma_4}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_3}|}{2}$$
$$\Psi_3(\gamma^1\gamma^{12}, {}^3\Gamma^{12}, M{=}1, \gamma_3) = |\gamma_4\gamma_3|$$

$\gamma^2\gamma^4$

$\boxed{\Delta E = 0}$

$$\Psi_4(\gamma^2\gamma^4, {}^3\Gamma^{12}, M{=}-1, \gamma_3) = |\overline{\gamma_5}\overline{\gamma_7}|$$
$$\Psi_5(\gamma^2\gamma^4, {}^3\Gamma^{12}, M{=}0, \gamma_3) = \frac{\sqrt{2}|\overline{\gamma_5}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_7}|}{2}$$
$$\Psi_6(\gamma^2\gamma^4, {}^3\Gamma^{12}, M{=}1, \gamma_3) = |\gamma_5\gamma_7|$$

$\gamma^5\gamma^6$

$\boxed{\Delta E = 0}$

$$\Psi_7(\gamma^5\gamma^6, {}^3\Gamma^{12}, M{=}-1, \gamma_3) = |\overline{\gamma_8}\overline{\gamma_9}|$$
$$\Psi_8(\gamma^5\gamma^6, {}^3\Gamma^{12}, M{=}0, \gamma_3) = \frac{\sqrt{2}|\overline{\gamma_8}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_9}|}{2}$$
$$\Psi_9(\gamma^5\gamma^6, {}^3\Gamma^{12}, M{=}1, \gamma_3) = |\gamma_8\gamma_9|$$

$\gamma^8\gamma^9$

$\boxed{\Delta E = 0}$

$$\Psi_{10}(\gamma^8\gamma^9, {}^3\Gamma^{12}, M{=}-1, \gamma_3) = |\overline{\gamma_{11}}\overline{\gamma_{12}}|$$
$$\Psi_{11}(\gamma^8\gamma^9, {}^3\Gamma^{12}, M{=}0, \gamma_3) = \frac{\sqrt{2}|\overline{\gamma_{11}}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_{11}\overline{\gamma_{12}}|}{2}$$
$$\Psi_{12}(\gamma^8\gamma^9, {}^3\Gamma^{12}, M{=}1, \gamma_3) = |\gamma_{11}\gamma_{12}|$$

2.23.23 $^1\Gamma^{12}$

$\gamma^1\gamma^{12}$

$\boxed{\Delta E = 0}$

$$\Psi_1(\gamma^1\gamma^{12}, {}^1\Gamma^{12}, M{=}0, \gamma_3) = -\frac{\sqrt{2}|\overline{\gamma_4}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_4\overline{\gamma_3}|}{2}$$

$\gamma^2\gamma^4$

$\boxed{\Delta E = 0}$

$$\Psi_2(\gamma^2\gamma^4, {}^1\Gamma^{12}, M{=}0, \gamma_3) = -\frac{\sqrt{2}|\overline{\gamma_5}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_5\overline{\gamma_7}|}{2}$$

$(\gamma^3)^2$

$\boxed{\Delta E = 0}$

$$\Psi_3((\gamma^3)^2, {}^1\Gamma^{12}, M{=}0, \gamma_3) = -|\overline{\gamma_6}\gamma_6|$$

$\gamma^5\gamma^6$

$\boxed{\Delta E = 0}$

$$\Psi_4(\gamma^5\gamma^6, {}^1\Gamma^{12}, M{=}0, \gamma_3) = -\frac{\sqrt{2}|\overline{\gamma_8}\gamma_9|}{2} + \frac{\sqrt{2}|\gamma_8\overline{\gamma_9}|}{2}$$

$(\gamma^7)^2$

$\boxed{\Delta E = 0}$

$$\Psi_5((\gamma^7)^2, {}^1\Gamma^{12}, M{=}0, \gamma_3) = -|\overline{\gamma_{10}}\gamma_{10}|$$

$\gamma^8\gamma^9$

$\boxed{\Delta E = 0}$

$$\Psi_6(\gamma^8\gamma^9, {}^1\Gamma^{12}, M{=}0, \gamma_3) = -\frac{\sqrt{2}|\overline{\gamma_{11}}\gamma_{12}|}{2} + \frac{\sqrt{2}|\gamma_{11}\overline{\gamma_{12}}|}{2}$$

$(\gamma^{10})^2$

$\boxed{\Delta E = 0}$

$\Psi_7(\left(\gamma^{10}\right)^2, {}^1\Gamma^{12}, M=0, \gamma_3) = -|\overline{\gamma_1}\gamma_1|$

$\left(\gamma^{11}\right)^2$

$\boxed{\Delta E = 0}$

$\Psi_8(\left(\gamma^{11}\right)^2, {}^1\Gamma^{12}, M=0, \gamma_3) = -|\overline{\gamma_2}\gamma_2|$

2.23.24 $^3\Gamma^1$

$\gamma^3\gamma^4$

$\boxed{\Delta E = 0}$

$\Psi_1(\gamma^3\gamma^4, {}^3\Gamma^1, M=-1, \gamma_4) = |\overline{\gamma_6}\overline{\gamma_7}|$
$\Psi_2(\gamma^3\gamma^4, {}^3\Gamma^1, M=0, \gamma_4) = \frac{\sqrt{2}|\overline{\gamma_6}\gamma_7|}{2} + \frac{\sqrt{2}|\gamma_6\overline{\gamma_7}|}{2}$
$\Psi_3(\gamma^3\gamma^4, {}^3\Gamma^1, M=1, \gamma_4) = |\gamma_6\gamma_7|$

$\gamma^6\gamma^7$

$\boxed{\Delta E = 0}$

$\Psi_4(\gamma^6\gamma^7, {}^3\Gamma^1, M=-1, \gamma_4) = |\overline{\gamma_9}\overline{\gamma_{10}}|$
$\Psi_5(\gamma^6\gamma^7, {}^3\Gamma^1, M=0, \gamma_4) = \frac{\sqrt{2}|\overline{\gamma_9}\gamma_{10}|}{2} + \frac{\sqrt{2}|\gamma_9\overline{\gamma_{10}}|}{2}$
$\Psi_6(\gamma^6\gamma^7, {}^3\Gamma^1, M=1, \gamma_4) = |\gamma_9\gamma_{10}|$

$\gamma^9\gamma^{10}$

$\boxed{\Delta E = 0}$

$\Psi_7(\gamma^9\gamma^{10}, {}^3\Gamma^1, M=-1, \gamma_4) = |\overline{\gamma_{12}}\overline{\gamma_1}|$
$\Psi_8(\gamma^9\gamma^{10}, {}^3\Gamma^1, M=0, \gamma_4) = \frac{\sqrt{2}|\overline{\gamma_{12}}\gamma_1|}{2} + \frac{\sqrt{2}|\gamma_{12}\overline{\gamma_1}|}{2}$
$\Psi_9(\gamma^9\gamma^{10}, {}^3\Gamma^1, M=1, \gamma_4) = |\gamma_{12}\gamma_1|$

$\gamma^{11}\gamma^{12}$

$\boxed{\Delta E = 0}$

$\Psi_{10}(\gamma^{11}\gamma^{12}, {}^3\Gamma^1, M=-1, \gamma_4) = |\overline{\gamma_2}\overline{\gamma_3}|$
$\Psi_{11}(\gamma^{11}\gamma^{12}, {}^3\Gamma^1, M=0, \gamma_4) = \frac{\sqrt{2}|\overline{\gamma_2}\gamma_3|}{2} + \frac{\sqrt{2}|\gamma_2\overline{\gamma_3}|}{2}$
$\Psi_{12}(\gamma^{11}\gamma^{12}, {}^3\Gamma^1, M=1, \gamma_4) = |\gamma_2\gamma_3|$

2.24 Group D_6

Component labels

$A_1 : \{\alpha\}$ —— $B_1 : \{\gamma\}$ —— $B_2 : \{\zeta\}$ —— $A_2 : \{\beta\}$ —— $E_2 : \{\nu, \xi\}$ —— $E_1 : \{\eta, \mu\}$

2.24.1 $^1A_1$

a_1^2

$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$

$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$

b_1^2

$\boxed{\Delta E = \langle\gamma\gamma||\gamma\gamma\rangle}$

$\Psi_2(b_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\gamma}\gamma|$

b_2^2

$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$

$\Psi_3(b_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\zeta}\zeta|$

a_2^2

$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$

$\Psi_4(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$

e_2^2

$\boxed{\Delta E = \langle\xi\xi||\nu\nu\rangle + \langle\xi\xi||\xi\xi\rangle}$

$\Psi_5(e_2^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\nu}\nu|}{2} - \frac{\sqrt{2}|\overline{\xi}\xi|}{2}$

e_1^2

$\boxed{\Delta E = \langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$

$\Psi_6(e_1^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$

2.24.2 $^3B_1$

a_1b_1

$\boxed{\Delta E = -\langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$

$\Psi_1(a_1b_1, {}^3B_1, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$
$\Psi_2(a_1b_1, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$
$\Psi_3(a_1b_1, {}^3B_1, M=1, \gamma) = |\alpha\gamma|$

a_2b_2

$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle - \langle\zeta\zeta||\beta\beta\rangle}$

$$\Psi_4(a_2b_2, {}^3B_1, M=-1, \gamma) = |\overline{\zeta}\overline{\beta}|$$
$$\Psi_5(a_2b_2, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$
$$\Psi_6(a_2b_2, {}^3B_1, M=1, \gamma) = |\zeta\beta|$$

e_1e_2

$$\boxed{\begin{gathered}\Delta E = -\langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle - 2\langle\xi\xi||\mu\mu\rangle \\ -\langle\xi\nu||\mu\eta\rangle + \langle\xi\xi||\eta\eta\rangle\end{gathered}}$$

$$\Psi_7(e_1e_2, {}^3B_1, M=-1, \gamma) = -\frac{\sqrt{2}|\overline{\nu}\overline{\eta}|}{2} + \frac{\sqrt{2}|\overline{\xi}\overline{\mu}|}{2}$$
$$\Psi_8(e_1e_2, {}^3B_1, M=0, \gamma) = -\frac{|\overline{\nu}\eta|}{2} + \frac{|\overline{\xi}\mu|}{2} - \frac{|\nu\overline{\eta}|}{2} + \frac{|\xi\overline{\mu}|}{2}$$
$$\Psi_9(e_1e_2, {}^3B_1, M=1, \gamma) = -\frac{\sqrt{2}|\nu\eta|}{2} + \frac{\sqrt{2}|\xi\mu|}{2}$$

2.24.3 ${}^1B_1$

a_1b_1

$$\boxed{\Delta E = \langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

a_2b_2

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle + \langle\zeta\zeta||\beta\beta\rangle}$$

$$\Psi_2(a_2b_2, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$

e_1e_2

$$\boxed{\begin{gathered}\Delta E = -\langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle + 2\langle\xi\xi||\mu\mu\rangle \\ +\langle\xi\nu||\mu\eta\rangle - \langle\xi\xi||\eta\eta\rangle\end{gathered}}$$

$$\Psi_3(e_1e_2, {}^1B_1, M=0, \gamma) = \frac{|\overline{\nu}\eta|}{2} - \frac{|\overline{\xi}\mu|}{2} - \frac{|\nu\overline{\eta}|}{2} + \frac{|\xi\overline{\mu}|}{2}$$

2.24.4 ${}^3B_2$

a_1b_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^3B_2, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(a_1b_2, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(a_1b_2, {}^3B_2, M=1, \zeta) = |\alpha\zeta|$$

a_2b_1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle - \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_4(a_2b_1, {}^3B_2, M=-1, \zeta) = |\overline{\gamma}\overline{\beta}|$$
$$\Psi_5(a_2b_1, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$
$$\Psi_6(a_2b_1, {}^3B_2, M=1, \zeta) = |\gamma\beta|$$

e_1e_2

$$\boxed{\begin{gathered}\Delta E = 3\langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle - \langle\xi\xi||\eta\eta\rangle \\ -\langle\xi\nu||\mu\eta\rangle\end{gathered}}$$

$$\Psi_7(e_1e_2, {}^3B_2, M=-1, \zeta) = \frac{\sqrt{2}|\overline{\nu}\overline{\mu}|}{2} + \frac{\sqrt{2}|\overline{\xi}\overline{\eta}|}{2}$$
$$\Psi_8(e_1e_2, {}^3B_2, M=0, \zeta) = \frac{|\overline{\nu}\mu|}{2} + \frac{|\overline{\xi}\eta|}{2} + \frac{|\nu\overline{\mu}|}{2} + \frac{|\xi\overline{\eta}|}{2}$$
$$\Psi_9(e_1e_2, {}^3B_2, M=1, \zeta) = \frac{\sqrt{2}|\nu\mu|}{2} + \frac{\sqrt{2}|\xi\eta|}{2}$$

2.24.5 ${}^1B_2$

a_1b_2

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2b_1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle + \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_2(a_2b_1, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$

e_1e_2

$$\boxed{\begin{gathered}\Delta E = 3\langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle + \langle\xi\xi||\eta\eta\rangle \\ +\langle\xi\nu||\mu\eta\rangle\end{gathered}}$$

$$\Psi_3(e_1e_2, {}^1B_2, M=0, \zeta) = -\frac{|\overline{\nu}\mu|}{2} - \frac{|\overline{\xi}\eta|}{2} + \frac{|\nu\overline{\mu}|}{2} + \frac{|\xi\overline{\eta}|}{2}$$

2.24.6 ${}^3A_2$

a_1a_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

b_1b_2

$$\boxed{\Delta E = -\langle\gamma\gamma||\zeta\zeta\rangle + \langle\gamma\zeta||\gamma\zeta\rangle}$$

$$\Psi_4(b_1b_2, {}^3A_2, M=-1, \beta) = |\overline{\gamma}\overline{\zeta}|$$

$$\Psi_5(b_1b_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$
$$\Psi_6(b_1b_2, {}^3A_2, M=1, \beta) = |\gamma\zeta|$$

e_2^2

$$\boxed{\Delta E = -3\,\langle\xi\xi||\nu\nu\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_7(e_2^2, {}^3A_2, M=-1, \beta) = -|\overline{\nu}\overline{\xi}|$$
$$\Psi_8(e_2^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\nu}\xi|}{2} + \frac{\sqrt{2}|\overline{\xi}\nu|}{2}$$
$$\Psi_9(e_2^2, {}^3A_2, M=1, \beta) = -|\nu\xi|$$

e_1^2

$$\boxed{\Delta E = -3\,\langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_{10}(e_1^2, {}^3A_2, M=-1, \beta) = -|\overline{\eta}\overline{\mu}|$$
$$\Psi_{11}(e_1^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$
$$\Psi_{12}(e_1^2, {}^3A_2, M=1, \beta) = -|\eta\mu|$$

2.24.7 ${}^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

b_1b_2

$$\boxed{\Delta E = \langle\gamma\gamma||\zeta\zeta\rangle + \langle\gamma\zeta||\gamma\zeta\rangle}$$

$$\Psi_2(b_1b_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$

2.24.8 ${}^3E_2$

a_1e_2

$$\boxed{\Delta E = -\,\langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1e_2, {}^3E_2, M=-1, \nu) = |\overline{\alpha}\overline{\nu}|$$
$$\Psi_2(a_1e_2, {}^3E_2, M=-1, \xi) = |\overline{\alpha}\overline{\xi}|$$
$$\Psi_3(a_1e_2, {}^3E_2, M=0, \nu) = \frac{\sqrt{2}|\overline{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\overline{\nu}|}{2}$$
$$\Psi_4(a_1e_2, {}^3E_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\overline{\xi}|}{2}$$
$$\Psi_5(a_1e_2, {}^3E_2, M=1, \nu) = |\alpha\nu|$$
$$\Psi_6(a_1e_2, {}^3E_2, M=1, \xi) = |\alpha\xi|$$

b_1e_1

$$\boxed{\Delta E = -\,\langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_7(b_1e_1, {}^3E_2, M=-1, \nu) = |\overline{\gamma}\overline{\eta}|$$
$$\Psi_8(b_1e_1, {}^3E_2, M=-1, \xi) = -|\overline{\gamma}\overline{\mu}|$$
$$\Psi_9(b_1e_1, {}^3E_2, M=0, \nu) = \frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_{10}(b_1e_1, {}^3E_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\gamma}\mu|}{2} - \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$
$$\Psi_{11}(b_1e_1, {}^3E_2, M=1, \nu) = |\gamma\eta|$$
$$\Psi_{12}(b_1e_1, {}^3E_2, M=1, \xi) = -|\gamma\mu|$$

b_2e_1

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle - \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_{13}(b_2e_1, {}^3E_2, M=-1, \xi) = |\overline{\zeta}\overline{\eta}|$$
$$\Psi_{14}(b_2e_1, {}^3E_2, M=-1, \nu) = |\overline{\zeta}\overline{\mu}|$$
$$\Psi_{15}(b_2e_1, {}^3E_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_{16}(b_2e_1, {}^3E_2, M=0, \nu) = \frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{17}(b_2e_1, {}^3E_2, M=1, \xi) = |\zeta\eta|$$
$$\Psi_{18}(b_2e_1, {}^3E_2, M=1, \nu) = |\zeta\mu|$$

a_2e_2

$$\boxed{\Delta E = -\,\langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_{19}(a_2e_2, {}^3E_2, M=-1, \xi) = -|\overline{\beta}\overline{\nu}|$$
$$\Psi_{20}(a_2e_2, {}^3E_2, M=-1, \nu) = |\overline{\beta}\overline{\xi}|$$
$$\Psi_{21}(a_2e_2, {}^3E_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\beta}\nu|}{2} - \frac{\sqrt{2}|\beta\overline{\nu}|}{2}$$
$$\Psi_{22}(a_2e_2, {}^3E_2, M=0, \nu) = \frac{\sqrt{2}|\overline{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\overline{\xi}|}{2}$$
$$\Psi_{23}(a_2e_2, {}^3E_2, M=1, \xi) = -|\beta\nu|$$
$$\Psi_{24}(a_2e_2, {}^3E_2, M=1, \nu) = |\beta\xi|$$

2.24.9 ${}^1E_2$

a_1e_2

$$\boxed{\Delta E = \langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1e_2, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\overline{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\overline{\nu}|}{2}$$
$$\Psi_2(a_1e_2, {}^1E_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\overline{\xi}|}{2}$$

b_1e_1

$$\boxed{\Delta E = \langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_3(b_1e_1, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\overline{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_4(b_1e_1, {}^1E_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\gamma}\mu|}{2} - \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$

b_2e_1

$$\boxed{\Delta E = \langle \zeta\mu || \zeta\mu \rangle + \langle \zeta\zeta || \mu\mu \rangle}$$

$$\Psi_5(b_2e_1, {}^1E_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_6(b_2e_1, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

a_2e_2

$$\boxed{\Delta E = \langle \beta\beta || \xi\xi \rangle + \langle \beta\xi || \beta\xi \rangle}$$

$$\Psi_7(a_2e_2, {}^1E_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\beta}\nu|}{2} - \frac{\sqrt{2}|\beta\overline{\nu}|}{2}$$
$$\Psi_8(a_2e_2, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\overline{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\overline{\xi}|}{2}$$

e_2^2

$$\boxed{\Delta E = -\langle \xi\xi || \nu\nu \rangle + \langle \xi\xi || \xi\xi \rangle}$$

$$\Psi_9(e_2^2, {}^1E_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\nu}\nu|}{2} + \frac{\sqrt{2}|\overline{\xi}\xi|}{2}$$
$$\Psi_{10}(e_2^2, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\overline{\nu}\xi|}{2} - \frac{\sqrt{2}|\overline{\xi}\nu|}{2}$$

e_1^2

$$\boxed{\Delta E = -\langle \mu\mu || \eta\eta \rangle + \langle \mu\mu || \mu\mu \rangle}$$

$$\Psi_{11}(e_1^2, {}^1E_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$
$$\Psi_{12}(e_1^2, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} - \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$

2.24.10 ${}^3E_1$

a_1e_1

$$\boxed{\Delta E = -\langle \alpha\alpha || \mu\mu \rangle + \langle \alpha\mu || \alpha\mu \rangle}$$

$$\Psi_1(a_1e_1, {}^3E_1, M=-1, \eta) = |\overline{\alpha}\overline{\eta}|$$
$$\Psi_2(a_1e_1, {}^3E_1, M=-1, \mu) = |\overline{\alpha}\overline{\mu}|$$
$$\Psi_3(a_1e_1, {}^3E_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_4(a_1e_1, {}^3E_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_5(a_1e_1, {}^3E_1, M=1, \eta) = |\alpha\eta|$$
$$\Psi_6(a_1e_1, {}^3E_1, M=1, \mu) = |\alpha\mu|$$

b_1e_2

$$\boxed{\Delta E = -\langle \gamma\gamma || \xi\xi \rangle + \langle \gamma\xi || \gamma\xi \rangle}$$

$$\Psi_7(b_1e_2, {}^3E_1, M=-1, \eta) = |\overline{\gamma}\overline{\nu}|$$
$$\Psi_8(b_1e_2, {}^3E_1, M=-1, \mu) = -|\overline{\gamma}\overline{\xi}|$$
$$\Psi_9(b_1e_2, {}^3E_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\gamma}\nu|}{2} + \frac{\sqrt{2}|\gamma\overline{\nu}|}{2}$$
$$\Psi_{10}(b_1e_2, {}^3E_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\gamma}\xi|}{2} - \frac{\sqrt{2}|\gamma\overline{\xi}|}{2}$$
$$\Psi_{11}(b_1e_2, {}^3E_1, M=1, \eta) = |\gamma\nu|$$
$$\Psi_{12}(b_1e_2, {}^3E_1, M=1, \mu) = -|\gamma\xi|$$

b_2e_2

$$\boxed{\Delta E = \langle \zeta\xi || \zeta\xi \rangle - \langle \zeta\zeta || \xi\xi \rangle}$$

$$\Psi_{13}(b_2e_2, {}^3E_1, M=-1, \mu) = |\overline{\zeta}\overline{\nu}|$$
$$\Psi_{14}(b_2e_2, {}^3E_1, M=-1, \eta) = |\overline{\zeta}\overline{\xi}|$$
$$\Psi_{15}(b_2e_2, {}^3E_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\zeta}\nu|}{2} + \frac{\sqrt{2}|\zeta\overline{\nu}|}{2}$$
$$\Psi_{16}(b_2e_2, {}^3E_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\zeta}\xi|}{2} + \frac{\sqrt{2}|\zeta\overline{\xi}|}{2}$$
$$\Psi_{17}(b_2e_2, {}^3E_1, M=1, \mu) = |\zeta\nu|$$
$$\Psi_{18}(b_2e_2, {}^3E_1, M=1, \eta) = |\zeta\xi|$$

a_2e_1

$$\boxed{\Delta E = -\langle \beta\beta || \mu\mu \rangle + \langle \beta\mu || \beta\mu \rangle}$$

$$\Psi_{19}(a_2e_1, {}^3E_1, M=-1, \mu) = -|\overline{\beta}\overline{\eta}|$$
$$\Psi_{20}(a_2e_1, {}^3E_1, M=-1, \eta) = |\overline{\beta}\overline{\mu}|$$
$$\Psi_{21}(a_2e_1, {}^3E_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_{22}(a_2e_1, {}^3E_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_{23}(a_2e_1, {}^3E_1, M=1, \mu) = -|\beta\eta|$$
$$\Psi_{24}(a_2e_1, {}^3E_1, M=1, \eta) = |\beta\mu|$$

e_1e_2

$$\boxed{\begin{gathered}\Delta E = \langle \xi\mu || \nu\eta \rangle + \langle \xi\mu || \xi\mu \rangle - \langle \xi\xi || \eta\eta \rangle \\ + \langle \xi\nu || \mu\eta \rangle\end{gathered}}$$

$$\Psi_{25}(e_1e_2, {}^3E_1, M=-1, \mu) = -\frac{\sqrt{2}|\overline{\nu}\overline{\eta}|}{2} - \frac{\sqrt{2}|\overline{\xi}\overline{\mu}|}{2}$$
$$\Psi_{26}(e_1e_2, {}^3E_1, M=-1, \eta) = -\frac{\sqrt{2}|\overline{\nu}\overline{\mu}|}{2} + \frac{\sqrt{2}|\overline{\xi}\overline{\eta}|}{2}$$
$$\Psi_{27}(e_1e_2, {}^3E_1, M=0, \mu) = -\frac{|\overline{\nu}\eta|}{2} - \frac{|\overline{\xi}\mu|}{2} - \frac{|\nu\overline{\eta}|}{2} - \frac{|\xi\overline{\mu}|}{2}$$
$$\Psi_{28}(e_1e_2, {}^3E_1, M=0, \eta) = -\frac{|\overline{\nu}\mu|}{2} + \frac{|\overline{\xi}\eta|}{2} - \frac{|\nu\overline{\mu}|}{2} + \frac{|\xi\overline{\eta}|}{2}$$
$$\Psi_{29}(e_1e_2, {}^3E_1, M=1, \mu) = -\frac{\sqrt{2}|\nu\eta|}{2} - \frac{\sqrt{2}|\xi\mu|}{2}$$
$$\Psi_{30}(e_1e_2, {}^3E_1, M=1, \eta) = -\frac{\sqrt{2}|\nu\mu|}{2} + \frac{\sqrt{2}|\xi\eta|}{2}$$

2.24.11 $^1E_1$

a_1e_1

$$\boxed{\Delta E = \langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e_1, {}^1E_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_2(a_1e_1, {}^1E_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$

b_1e_2

$$\boxed{\Delta E = \langle\gamma\gamma||\xi\xi\rangle + \langle\gamma\xi||\gamma\xi\rangle}$$

$$\Psi_3(b_1e_2, {}^1E_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\gamma}\nu|}{2} + \frac{\sqrt{2}|\gamma\overline{\nu}|}{2}$$
$$\Psi_4(b_1e_2, {}^1E_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\gamma}\xi|}{2} - \frac{\sqrt{2}|\gamma\overline{\xi}|}{2}$$

b_2e_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle + \langle\zeta\zeta||\xi\xi\rangle}$$

$$\Psi_5(b_2e_2, {}^1E_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\zeta}\nu|}{2} + \frac{\sqrt{2}|\zeta\overline{\nu}|}{2}$$
$$\Psi_6(b_2e_2, {}^1E_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\zeta}\xi|}{2} + \frac{\sqrt{2}|\zeta\overline{\xi}|}{2}$$

a_2e_1

$$\boxed{\Delta E = \langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_7(a_2e_1, {}^1E_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_8(a_2e_1, {}^1E_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$

e_1e_2

$$\boxed{\begin{gathered}\Delta E = \langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle + \langle\xi\xi||\eta\eta\rangle \\ - \langle\xi\nu||\mu\eta\rangle\end{gathered}}$$

$$\Psi_9(e_1e_2, {}^1E_1, M=0, \mu) = \frac{|\overline{\nu}\eta|}{2} + \frac{|\overline{\xi}\mu|}{2} - \frac{|\nu\overline{\eta}|}{2} - \frac{|\xi\overline{\mu}|}{2}$$
$$\Psi_{10}(e_1e_2, {}^1E_1, M=0, \eta) = \frac{|\overline{\nu}\mu|}{2} - \frac{|\overline{\xi}\eta|}{2} - \frac{|\nu\overline{\mu}|}{2} + \frac{|\xi\overline{\eta}|}{2}$$

2.25 Group C_{6v}

Component labels

$A_1 : \{\alpha\}$ —— $B_2 : \{\zeta\}$ —— $B_1 : \{\gamma\}$ —— $A_2 : \{\beta\}$ —— $E_2 : \{\nu, \xi\}$ —— $E_1 : \{\eta, \mu\}$

2.25.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

b_2^2

$$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_2(b_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\zeta}\zeta|$$

b_1^2

$$\boxed{\Delta E = \langle\gamma\gamma||\gamma\gamma\rangle}$$

$$\Psi_3(b_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\gamma}\gamma|$$

a_2^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_4(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

e_2^2

$$\boxed{\Delta E = \langle\xi\xi||\nu\nu\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_5(e_2^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\nu}\nu|}{2} - \frac{\sqrt{2}|\overline{\xi}\xi|}{2}$$

e_1^2

$$\boxed{\Delta E = \langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_6(e_1^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$

2.25.2 $^3B_2$

a_1b_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^3B_2, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(a_1b_2, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(a_1b_2, {}^3B_2, M=1, \zeta) = |\alpha\zeta|$$

a_2b_1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle - \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_4(a_2b_1, {}^3B_2, M=-1, \zeta) = |\overline{\gamma}\overline{\beta}|$$
$$\Psi_5(a_2b_1, {}^3B_2, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$
$$\Psi_6(a_2b_1, {}^3B_2, M=1, \zeta) = |\gamma\beta|$$

e_1e_2

$$\boxed{\begin{aligned}\Delta E = &-\langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle - 2\langle\xi\xi||\mu\mu\rangle \\ &-\langle\xi\nu||\mu\eta\rangle + \langle\xi\xi||\eta\eta\rangle\end{aligned}}$$

$$\Psi_7(e_1e_2, {}^3B_2, M=-1, \zeta) = -\frac{\sqrt{2}|\overline{\nu}\overline{\eta}|}{2} + \frac{\sqrt{2}|\overline{\xi}\overline{\mu}|}{2}$$
$$\Psi_8(e_1e_2, {}^3B_2, M=0, \zeta) = -\frac{|\overline{\nu}\eta|}{2} + \frac{|\overline{\xi}\mu|}{2} - \frac{|\nu\overline{\eta}|}{2} + \frac{|\xi\overline{\mu}|}{2}$$
$$\Psi_9(e_1e_2, {}^3B_2, M=1, \zeta) = -\frac{\sqrt{2}|\nu\eta|}{2} + \frac{\sqrt{2}|\xi\mu|}{2}$$

2.25.3 $^1B_2$

a_1b_2

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1b_2, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2b_1

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle + \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_2(a_2b_1, {}^1B_2, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$

e_1e_2

$$\boxed{\begin{aligned}\Delta E = &-\langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle + 2\langle\xi\xi||\mu\mu\rangle \\ &+\langle\xi\nu||\mu\eta\rangle - \langle\xi\xi||\eta\eta\rangle\end{aligned}}$$

$$\Psi_3(e_1e_2, {}^1B_2, M=0, \zeta) = \frac{|\overline{\nu}\eta|}{2} - \frac{|\overline{\xi}\mu|}{2} - \frac{|\nu\overline{\eta}|}{2} + \frac{|\xi\overline{\mu}|}{2}$$

2.25.4 $^3B_1$

a_1b_1

$$\boxed{\Delta E = -\langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^3B_1, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1b_1, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(a_1b_1, {}^3B_1, M=1, \gamma) = |\alpha\gamma|$$

a_2b_2

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle - \langle\zeta\zeta||\beta\beta\rangle}$$

$$\Psi_4(a_2b_2, {}^3B_1, M=-1, \gamma) = |\overline{\zeta}\overline{\beta}|$$
$$\Psi_5(a_2b_2, {}^3B_1, M=0, \gamma) = \frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$
$$\Psi_6(a_2b_2, {}^3B_1, M=1, \gamma) = |\zeta\beta|$$

e_1e_2

$$\boxed{\begin{aligned}\Delta E = &\,3\langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle - \langle\xi\xi||\eta\eta\rangle \\ &-\langle\xi\nu||\mu\eta\rangle\end{aligned}}$$

$$\Psi_7(e_1e_2, {}^3B_1, M=-1, \gamma) = \frac{\sqrt{2}|\overline{\nu}\overline{\mu}|}{2} + \frac{\sqrt{2}|\overline{\xi}\overline{\eta}|}{2}$$
$$\Psi_8(e_1e_2, {}^3B_1, M=0, \gamma) = \frac{|\overline{\nu}\mu|}{2} + \frac{|\overline{\xi}\eta|}{2} + \frac{|\nu\overline{\mu}|}{2} + \frac{|\xi\overline{\eta}|}{2}$$
$$\Psi_9(e_1e_2, {}^3B_1, M=1, \gamma) = \frac{\sqrt{2}|\nu\mu|}{2} + \frac{\sqrt{2}|\xi\eta|}{2}$$

2.25.5 $^1B_1$

a_1b_1

$$\boxed{\Delta E = \langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1b_1, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

a_2b_2

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle + \langle\zeta\zeta||\beta\beta\rangle}$$

$$\Psi_2(a_2b_2, {}^1B_1, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$

e_1e_2

$$\boxed{\begin{aligned}\Delta E = &\,3\langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle + \langle\xi\xi||\eta\eta\rangle \\ &+\langle\xi\nu||\mu\eta\rangle\end{aligned}}$$

$$\Psi_3(e_1e_2, {}^1B_1, M=0, \gamma) = -\frac{|\overline{\nu}\mu|}{2} - \frac{|\overline{\xi}\eta|}{2} + \frac{|\nu\overline{\mu}|}{2} + \frac{|\xi\overline{\eta}|}{2}$$

2.25.6 $^3A_2$

a_1a_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

b_1b_2

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle - \langle\zeta\zeta||\gamma\gamma\rangle}$$

$$\Psi_4(b_1b_2, {}^3A_2, M=-1, \beta) = |\overline{\zeta}\overline{\gamma}|$$

$$\Psi_5(b_1b_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\bar{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\bar{\gamma}|}{2}$$
$$\Psi_6(b_1b_2, {}^3A_2, M=1, \beta) = |\zeta\gamma|$$

e_2^2

$$\boxed{\Delta E = -3\,\langle\xi\xi||\nu\nu\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_7(e_2^2, {}^3A_2, M=-1, \beta) = -|\bar{\nu}\bar{\xi}|$$
$$\Psi_8(e_2^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\bar{\nu}\xi|}{2} + \frac{\sqrt{2}|\bar{\xi}\nu|}{2}$$
$$\Psi_9(e_2^2, {}^3A_2, M=1, \beta) = -|\nu\xi|$$

e_1^2

$$\boxed{\Delta E = -3\,\langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_{10}(e_1^2, {}^3A_2, M=-1, \beta) = -|\bar{\eta}\bar{\mu}|$$
$$\Psi_{11}(e_1^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\bar{\eta}\mu|}{2} + \frac{\sqrt{2}|\bar{\mu}\eta|}{2}$$
$$\Psi_{12}(e_1^2, {}^3A_2, M=1, \beta) = -|\eta\mu|$$

2.25.7 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\bar{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\bar{\beta}|}{2}$$

b_1b_2

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle + \langle\zeta\zeta||\gamma\gamma\rangle}$$

$$\Psi_2(b_1b_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\bar{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\bar{\gamma}|}{2}$$

2.25.8 $^3E_2$

a_1e_2

$$\boxed{\Delta E = -\,\langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1e_2, {}^3E_2, M=-1, \nu) = |\bar{\alpha}\bar{\nu}|$$
$$\Psi_2(a_1e_2, {}^3E_2, M=-1, \xi) = |\bar{\alpha}\bar{\xi}|$$
$$\Psi_3(a_1e_2, {}^3E_2, M=0, \nu) = \frac{\sqrt{2}|\bar{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\bar{\nu}|}{2}$$
$$\Psi_4(a_1e_2, {}^3E_2, M=0, \xi) = \frac{\sqrt{2}|\bar{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\bar{\xi}|}{2}$$
$$\Psi_5(a_1e_2, {}^3E_2, M=1, \nu) = |\alpha\nu|$$
$$\Psi_6(a_1e_2, {}^3E_2, M=1, \xi) = |\alpha\xi|$$

b_2e_1

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle - \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_7(b_2e_1, {}^3E_2, M=-1, \nu) = |\bar{\zeta}\bar{\eta}|$$
$$\Psi_8(b_2e_1, {}^3E_2, M=-1, \xi) = -|\bar{\zeta}\bar{\mu}|$$
$$\Psi_9(b_2e_1, {}^3E_2, M=0, \nu) = \frac{\sqrt{2}|\bar{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\bar{\eta}|}{2}$$
$$\Psi_{10}(b_2e_1, {}^3E_2, M=0, \xi) = -\frac{\sqrt{2}|\bar{\zeta}\mu|}{2} - \frac{\sqrt{2}|\zeta\bar{\mu}|}{2}$$
$$\Psi_{11}(b_2e_1, {}^3E_2, M=1, \nu) = |\zeta\eta|$$
$$\Psi_{12}(b_2e_1, {}^3E_2, M=1, \xi) = -|\zeta\mu|$$

b_1e_1

$$\boxed{\Delta E = -\,\langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_{13}(b_1e_1, {}^3E_2, M=-1, \xi) = |\bar{\gamma}\bar{\eta}|$$
$$\Psi_{14}(b_1e_1, {}^3E_2, M=-1, \nu) = |\bar{\gamma}\bar{\mu}|$$
$$\Psi_{15}(b_1e_1, {}^3E_2, M=0, \xi) = \frac{\sqrt{2}|\bar{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\bar{\eta}|}{2}$$
$$\Psi_{16}(b_1e_1, {}^3E_2, M=0, \nu) = \frac{\sqrt{2}|\bar{\gamma}\mu|}{2} + \frac{\sqrt{2}|\gamma\bar{\mu}|}{2}$$
$$\Psi_{17}(b_1e_1, {}^3E_2, M=1, \xi) = |\gamma\eta|$$
$$\Psi_{18}(b_1e_1, {}^3E_2, M=1, \nu) = |\gamma\mu|$$

a_2e_2

$$\boxed{\Delta E = -\,\langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_{19}(a_2e_2, {}^3E_2, M=-1, \xi) = -|\bar{\beta}\bar{\nu}|$$
$$\Psi_{20}(a_2e_2, {}^3E_2, M=-1, \nu) = |\bar{\beta}\bar{\xi}|$$
$$\Psi_{21}(a_2e_2, {}^3E_2, M=0, \xi) = -\frac{\sqrt{2}|\bar{\beta}\nu|}{2} - \frac{\sqrt{2}|\beta\bar{\nu}|}{2}$$
$$\Psi_{22}(a_2e_2, {}^3E_2, M=0, \nu) = \frac{\sqrt{2}|\bar{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\bar{\xi}|}{2}$$
$$\Psi_{23}(a_2e_2, {}^3E_2, M=1, \xi) = -|\beta\nu|$$
$$\Psi_{24}(a_2e_2, {}^3E_2, M=1, \nu) = |\beta\xi|$$

2.25.9 $^1E_2$

a_1e_2

$$\boxed{\Delta E = \langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1e_2, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\bar{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\bar{\nu}|}{2}$$
$$\Psi_2(a_1e_2, {}^1E_2, M=0, \xi) = -\frac{\sqrt{2}|\bar{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\bar{\xi}|}{2}$$

b_2e_1

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle + \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_3(b_2e_1, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\bar{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\bar{\eta}|}{2}$$
$$\Psi_4(b_2e_1, {}^1E_2, M=0, \xi) = \frac{\sqrt{2}|\bar{\zeta}\mu|}{2} - \frac{\sqrt{2}|\zeta\bar{\mu}|}{2}$$

b_1e_1

$$\boxed{\Delta E = \langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_5(b_1e_1, {}^1E_2, M=0, \xi) = -\frac{\sqrt{2}|\bar{\gamma}\eta|}{2} + \frac{\sqrt{2}|\gamma\bar{\eta}|}{2}$$
$$\Psi_6(b_1e_1, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\bar{\gamma}\mu|}{2} + \frac{\sqrt{2}|\gamma\bar{\mu}|}{2}$$

a_2e_2

$$\boxed{\Delta E = \langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_7(a_2e_2, {}^1E_2, M=0, \xi) = \frac{\sqrt{2}|\bar{\beta}\nu|}{2} - \frac{\sqrt{2}|\beta\bar{\nu}|}{2}$$
$$\Psi_8(a_2e_2, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\bar{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\bar{\xi}|}{2}$$

e_2^2

$$\boxed{\Delta E = -\langle\xi\xi||\nu\nu\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_9(e_2^2, {}^1E_2, M=0, \xi) = -\frac{\sqrt{2}|\bar{\nu}\nu|}{2} + \frac{\sqrt{2}|\bar{\xi}\xi|}{2}$$
$$\Psi_{10}(e_2^2, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\bar{\nu}\xi|}{2} - \frac{\sqrt{2}|\bar{\xi}\nu|}{2}$$

e_1^2

$$\boxed{\Delta E = -\langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_{11}(e_1^2, {}^1E_2, M=0, \xi) = \frac{\sqrt{2}|\bar{\eta}\eta|}{2} - \frac{\sqrt{2}|\bar{\mu}\mu|}{2}$$
$$\Psi_{12}(e_1^2, {}^1E_2, M=0, \nu) = -\frac{\sqrt{2}|\bar{\eta}\mu|}{2} - \frac{\sqrt{2}|\bar{\mu}\eta|}{2}$$

2.25.10 $^3E_1$

a_1e_1

$$\boxed{\Delta E = -\langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e_1, {}^3E_1, M=-1, \eta) = |\bar{\alpha}\bar{\eta}|$$
$$\Psi_2(a_1e_1, {}^3E_1, M=-1, \mu) = |\bar{\alpha}\bar{\mu}|$$
$$\Psi_3(a_1e_1, {}^3E_1, M=0, \eta) = \frac{\sqrt{2}|\bar{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\bar{\eta}|}{2}$$
$$\Psi_4(a_1e_1, {}^3E_1, M=0, \mu) = \frac{\sqrt{2}|\bar{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\bar{\mu}|}{2}$$
$$\Psi_5(a_1e_1, {}^3E_1, M=1, \eta) = |\alpha\eta|$$
$$\Psi_6(a_1e_1, {}^3E_1, M=1, \mu) = |\alpha\mu|$$

b_2e_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle - \langle\zeta\zeta||\xi\xi\rangle}$$

$$\Psi_7(b_2e_2, {}^3E_1, M=-1, \eta) = |\bar{\zeta}\bar{\nu}|$$
$$\Psi_8(b_2e_2, {}^3E_1, M=-1, \mu) = -|\bar{\zeta}\bar{\xi}|$$
$$\Psi_9(b_2e_2, {}^3E_1, M=0, \eta) = \frac{\sqrt{2}|\bar{\zeta}\nu|}{2} + \frac{\sqrt{2}|\zeta\bar{\nu}|}{2}$$
$$\Psi_{10}(b_2e_2, {}^3E_1, M=0, \mu) = -\frac{\sqrt{2}|\bar{\zeta}\xi|}{2} - \frac{\sqrt{2}|\zeta\bar{\xi}|}{2}$$
$$\Psi_{11}(b_2e_2, {}^3E_1, M=1, \eta) = |\zeta\nu|$$
$$\Psi_{12}(b_2e_2, {}^3E_1, M=1, \mu) = -|\zeta\xi|$$

b_1e_2

$$\boxed{\Delta E = -\langle\gamma\gamma||\xi\xi\rangle + \langle\gamma\xi||\gamma\xi\rangle}$$

$$\Psi_{13}(b_1e_2, {}^3E_1, M=-1, \mu) = |\bar{\gamma}\bar{\nu}|$$
$$\Psi_{14}(b_1e_2, {}^3E_1, M=-1, \eta) = |\bar{\gamma}\bar{\xi}|$$
$$\Psi_{15}(b_1e_2, {}^3E_1, M=0, \mu) = \frac{\sqrt{2}|\bar{\gamma}\nu|}{2} + \frac{\sqrt{2}|\gamma\bar{\nu}|}{2}$$
$$\Psi_{16}(b_1e_2, {}^3E_1, M=0, \eta) = \frac{\sqrt{2}|\bar{\gamma}\xi|}{2} + \frac{\sqrt{2}|\gamma\bar{\xi}|}{2}$$
$$\Psi_{17}(b_1e_2, {}^3E_1, M=1, \mu) = |\gamma\nu|$$
$$\Psi_{18}(b_1e_2, {}^3E_1, M=1, \eta) = |\gamma\xi|$$

a_2e_1

$$\boxed{\Delta E = -\langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_{19}(a_2e_1, {}^3E_1, M=-1, \mu) = -|\bar{\beta}\bar{\eta}|$$
$$\Psi_{20}(a_2e_1, {}^3E_1, M=-1, \eta) = |\bar{\beta}\bar{\mu}|$$
$$\Psi_{21}(a_2e_1, {}^3E_1, M=0, \mu) = -\frac{\sqrt{2}|\bar{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\bar{\eta}|}{2}$$
$$\Psi_{22}(a_2e_1, {}^3E_1, M=0, \eta) = \frac{\sqrt{2}|\bar{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\bar{\mu}|}{2}$$
$$\Psi_{23}(a_2e_1, {}^3E_1, M=1, \mu) = -|\beta\eta|$$
$$\Psi_{24}(a_2e_1, {}^3E_1, M=1, \eta) = |\beta\mu|$$

e_1e_2

$$\boxed{\begin{array}{c}\Delta E = \langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle - \langle\xi\xi||\eta\eta\rangle \\ + \langle\xi\nu||\mu\eta\rangle\end{array}}$$

$$\Psi_{25}(e_1e_2, {}^3E_1, M=-1, \mu) = -\frac{\sqrt{2}|\bar{\nu}\bar{\eta}|}{2} - \frac{\sqrt{2}|\bar{\xi}\bar{\mu}|}{2}$$
$$\Psi_{26}(e_1e_2, {}^3E_1, M=-1, \eta) = -\frac{\sqrt{2}|\bar{\nu}\bar{\mu}|}{2} + \frac{\sqrt{2}|\bar{\xi}\bar{\eta}|}{2}$$
$$\Psi_{27}(e_1e_2, {}^3E_1, M=0, \mu) = -\frac{|\bar{\nu}\eta|}{2} - \frac{|\bar{\xi}\mu|}{2} - \frac{|\nu\bar{\eta}|}{2} - \frac{|\xi\bar{\mu}|}{2}$$
$$\Psi_{28}(e_1e_2, {}^3E_1, M=0, \eta) = -\frac{|\bar{\nu}\mu|}{2} + \frac{|\bar{\xi}\eta|}{2} - \frac{|\nu\bar{\mu}|}{2} + \frac{|\xi\bar{\eta}|}{2}$$
$$\Psi_{29}(e_1e_2, {}^3E_1, M=1, \mu) = -\frac{\sqrt{2}|\nu\eta|}{2} - \frac{\sqrt{2}|\xi\mu|}{2}$$
$$\Psi_{30}(e_1e_2, {}^3E_1, M=1, \eta) = -\frac{\sqrt{2}|\nu\mu|}{2} + \frac{\sqrt{2}|\xi\eta|}{2}$$

2.25.11 $^1E_1$

a_1e_1

$$\boxed{\Delta E = \langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1e_1, {}^1E_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_2(a_1e_1, {}^1E_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$

b_2e_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle + \langle\zeta\zeta||\xi\xi\rangle}$$

$$\Psi_3(b_2e_2, {}^1E_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\zeta}\nu|}{2} + \frac{\sqrt{2}|\zeta\overline{\nu}|}{2}$$
$$\Psi_4(b_2e_2, {}^1E_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\zeta}\xi|}{2} - \frac{\sqrt{2}|\zeta\overline{\xi}|}{2}$$

b_1e_2

$$\boxed{\Delta E = \langle\gamma\gamma||\xi\xi\rangle + \langle\gamma\xi||\gamma\xi\rangle}$$

$$\Psi_5(b_1e_2, {}^1E_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\gamma}\nu|}{2} + \frac{\sqrt{2}|\gamma\overline{\nu}|}{2}$$
$$\Psi_6(b_1e_2, {}^1E_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\gamma}\xi|}{2} + \frac{\sqrt{2}|\gamma\overline{\xi}|}{2}$$

a_2e_1

$$\boxed{\Delta E = \langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_7(a_2e_1, {}^1E_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_8(a_2e_1, {}^1E_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$

e_1e_2

$$\boxed{\begin{aligned}\Delta E = \langle\xi\mu||\nu\eta\rangle + \langle\xi\mu||\xi\mu\rangle + \langle\xi\xi||\eta\eta\rangle \\ - \langle\xi\nu||\mu\eta\rangle\end{aligned}}$$

$$\Psi_9(e_1e_2, {}^1E_1, M=0, \mu) = \frac{|\overline{\nu}\eta|}{2} + \frac{|\overline{\xi}\mu|}{2} - \frac{|\nu\overline{\eta}|}{2} - \frac{|\xi\overline{\mu}|}{2}$$
$$\Psi_{10}(e_1e_2, {}^1E_1, M=0, \eta) = \frac{|\overline{\nu}\mu|}{2} - \frac{|\overline{\xi}\eta|}{2} - \frac{|\nu\overline{\mu}|}{2} + \frac{|\xi\overline{\eta}|}{2}$$

2.26 Group D_{3h}

Component labels

$A_1^{'}:\{\alpha\}$ —— $A_2^{''}:\{\zeta\}$ —— $A_1^{''}:\{\gamma\}$ —— $A_2^{'}:\{\beta\}$ —— $E^{'}:\{\eta,\mu\}$ —— $E^{''}:\{\nu,\xi\}$

2.26.1 $^1A_1^{'}$

$\left(a_1^{'}\right)^2$

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(\left(a_1^{'}\right)^2, {}^1A_1^{'}, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

$\left(a_2^{''}\right)^2$

$$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_2(\left(a_2^{''}\right)^2, {}^1A_1^{'}, M=0, \alpha) = -|\overline{\zeta}\zeta|$$

$\left(a_1^{''}\right)^2$

$$\boxed{\Delta E = \langle\gamma\gamma||\gamma\gamma\rangle}$$

$$\Psi_3(\left(a_1^{''}\right)^2, {}^1A_1^{'}, M=0, \alpha) = -|\overline{\gamma}\gamma|$$

$\left(a_2^{'}\right)^2$

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_4(\left(a_2^{'}\right)^2, {}^1A_1^{'}, M=0, \alpha) = -|\overline{\beta}\beta|$$

$\left(e^{'}\right)^2$

$$\boxed{\Delta E = \langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_5(\left(e^{'}\right)^2, {}^1A_1^{'}, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\eta}\eta|}{2} - \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$

$\left(e^{''}\right)^2$

$$\boxed{\Delta E = \langle\xi\xi||\nu\nu\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_6(\left(e^{''}\right)^2, {}^1A_1^{'}, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\nu}\nu|}{2} - \frac{\sqrt{2}|\overline{\xi}\xi|}{2}$$

2.26.2 $^3A_2^{''}$

$a_1^{'}a_2^{''}$

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1^{'}a_2^{''}, {}^3A_2^{''}, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$

$$\Psi_2(a_1^{'}a_2^{''}, {}^3A_2^{''}, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_3(a_1^{'}a_2^{''}, {}^3A_2^{''}, M=1, \zeta) = |\alpha\zeta|$$

$a_1^{''}a_2^{'}$

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle - \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_4(a_1^{''}a_2^{'}, {}^3A_2^{''}, M=-1, \zeta) = |\overline{\gamma}\overline{\beta}|$$
$$\Psi_5(a_1^{''}a_2^{'}, {}^3A_2^{''}, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$
$$\Psi_6(a_1^{''}a_2^{'}, {}^3A_2^{''}, M=1, \zeta) = |\gamma\beta|$$

$e^{'}e^{''}$

$$\boxed{\begin{array}{c}\Delta E = -2\langle\mu\mu||\xi\xi\rangle + \langle\mu\xi||\eta\nu\rangle + \langle\mu\xi||\mu\xi\rangle \\ +\langle\mu\eta||\xi\nu\rangle + \langle\mu\mu||\nu\nu\rangle\end{array}}$$

$$\Psi_7(e^{'}e^{''}, {}^3A_2^{''}, M=-1, \zeta) = \frac{\sqrt{2}|\overline{\eta}\overline{\nu}|}{2} + \frac{\sqrt{2}|\overline{\mu}\overline{\xi}|}{2}$$
$$\Psi_8(e^{'}e^{''}, {}^3A_2^{''}, M=0, \zeta) = \frac{|\overline{\eta}\nu|}{2} + \frac{|\overline{\mu}\xi|}{2} + \frac{|\eta\overline{\nu}|}{2} + \frac{|\mu\overline{\xi}|}{2}$$
$$\Psi_9(e^{'}e^{''}, {}^3A_2^{''}, M=1, \zeta) = \frac{\sqrt{2}|\eta\nu|}{2} + \frac{\sqrt{2}|\mu\xi|}{2}$$

2.26.3 ${}^1A_2^{''}$

$a_1^{'}a_2^{''}$

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1^{'}a_2^{''}, {}^1A_2^{''}, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

$a_1^{''}a_2^{'}$

$$\boxed{\Delta E = \langle\gamma\beta||\gamma\beta\rangle + \langle\gamma\gamma||\beta\beta\rangle}$$

$$\Psi_2(a_1^{''}a_2^{'}, {}^1A_2^{''}, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\beta|}{2} + \frac{\sqrt{2}|\gamma\overline{\beta}|}{2}$$

$e^{'}e^{''}$

$$\boxed{\begin{array}{c}\Delta E = 2\langle\mu\mu||\xi\xi\rangle + \langle\mu\xi||\eta\nu\rangle + \langle\mu\xi||\mu\xi\rangle \\ -\langle\mu\eta||\xi\nu\rangle - \langle\mu\mu||\nu\nu\rangle\end{array}}$$

$$\Psi_3(e^{'}e^{''}, {}^1A_2^{''}, M=0, \zeta) = -\frac{|\overline{\eta}\nu|}{2} - \frac{|\overline{\mu}\xi|}{2} + \frac{|\eta\overline{\nu}|}{2} + \frac{|\mu\overline{\xi}|}{2}$$

2.26.4 ${}^3A_1^{''}$

$a_1^{'}a_1^{''}$

$$\boxed{\Delta E = -\langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1^{'}a_1^{''}, {}^3A_1^{''}, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1^{'}a_1^{''}, {}^3A_1^{''}, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_3(a_1^{'}a_1^{''}, {}^3A_1^{''}, M=1, \gamma) = |\alpha\gamma|$$

$a_2^{'}a_2^{''}$

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle - \langle\zeta\zeta||\beta\beta\rangle}$$

$$\Psi_4(a_2^{'}a_2^{''}, {}^3A_1^{''}, M=-1, \gamma) = |\overline{\zeta}\overline{\beta}|$$
$$\Psi_5(a_2^{'}a_2^{''}, {}^3A_1^{''}, M=0, \gamma) = \frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$
$$\Psi_6(a_2^{'}a_2^{''}, {}^3A_1^{''}, M=1, \gamma) = |\zeta\beta|$$

$e^{'}e^{''}$

$$\boxed{\begin{array}{c}\Delta E = -\langle\mu\mu||\nu\nu\rangle - 3\langle\mu\xi||\eta\nu\rangle + \langle\mu\xi||\mu\xi\rangle \\ +\langle\mu\eta||\xi\nu\rangle\end{array}}$$

$$\Psi_7(e^{'}e^{''}, {}^3A_1^{''}, M=-1, \gamma) = -\frac{\sqrt{2}|\overline{\eta}\overline{\xi}|}{2} + \frac{\sqrt{2}|\overline{\mu}\overline{\nu}|}{2}$$
$$\Psi_8(e^{'}e^{''}, {}^3A_1^{''}, M=0, \gamma) = -\frac{|\overline{\eta}\xi|}{2} + \frac{|\overline{\mu}\nu|}{2} - \frac{|\eta\overline{\xi}|}{2} + \frac{|\mu\overline{\nu}|}{2}$$
$$\Psi_9(e^{'}e^{''}, {}^3A_1^{''}, M=1, \gamma) = -\frac{\sqrt{2}|\eta\xi|}{2} + \frac{\sqrt{2}|\mu\nu|}{2}$$

2.26.5 ${}^1A_1^{''}$

$a_1^{'}a_1^{''}$

$$\boxed{\Delta E = \langle\alpha\alpha||\gamma\gamma\rangle + \langle\alpha\gamma||\alpha\gamma\rangle}$$

$$\Psi_1(a_1^{'}a_1^{''}, {}^1A_1^{''}, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

$a_2^{'}a_2^{''}$

$$\boxed{\Delta E = \langle\zeta\beta||\zeta\beta\rangle + \langle\zeta\zeta||\beta\beta\rangle}$$

$$\Psi_2(a_2^{'}a_2^{''}, {}^1A_1^{''}, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\zeta}\beta|}{2} + \frac{\sqrt{2}|\zeta\overline{\beta}|}{2}$$

$e^{'}e^{''}$

$$\boxed{\begin{array}{c}\Delta E = \langle\mu\mu||\nu\nu\rangle - 3\langle\mu\xi||\eta\nu\rangle + \langle\mu\xi||\mu\xi\rangle \\ -\langle\mu\eta||\xi\nu\rangle\end{array}}$$

$$\Psi_3(e^{'}e^{''}, {}^1A_1^{''}, M=0, \gamma) = \frac{|\overline{\eta}\xi|}{2} - \frac{|\overline{\mu}\nu|}{2} - \frac{|\eta\overline{\xi}|}{2} + \frac{|\mu\overline{\nu}|}{2}$$

2.26.6 $^3A_2^{'}$

$a_1^{'}a_2^{'}$

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1^{'}a_2^{'}, {}^3A_2^{'}, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1^{'}a_2^{'}, {}^3A_2^{'}, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1^{'}a_2^{'}, {}^3A_2^{'}, M=1, \beta) = |\alpha\beta|$$

$a_1^{''}a_2^{''}$

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle - \langle\zeta\zeta||\gamma\gamma\rangle}$$

$$\Psi_4(a_1^{''}a_2^{''}, {}^3A_2^{'}, M=-1, \beta) = |\overline{\zeta}\overline{\gamma}|$$
$$\Psi_5(a_1^{''}a_2^{''}, {}^3A_2^{'}, M=0, \beta) = \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$
$$\Psi_6(a_1^{''}a_2^{''}, {}^3A_2^{'}, M=1, \beta) = |\zeta\gamma|$$

$\left(e^{'}\right)^2$

$$\boxed{\Delta E = -3\langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_7(\left(e^{'}\right)^2, {}^3A_2^{'}, M=-1, \beta) = -|\overline{\eta}\overline{\mu}|$$
$$\Psi_8(\left(e^{'}\right)^2, {}^3A_2^{'}, M=0, \beta) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$
$$\Psi_9(\left(e^{'}\right)^2, {}^3A_2^{'}, M=1, \beta) = -|\eta\mu|$$

$\left(e^{''}\right)^2$

$$\boxed{\Delta E = -3\langle\xi\xi||\nu\nu\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_{10}(\left(e^{''}\right)^2, {}^3A_2^{'}, M=-1, \beta) = -|\overline{\nu}\overline{\xi}|$$
$$\Psi_{11}(\left(e^{''}\right)^2, {}^3A_2^{'}, M=0, \beta) = -\frac{\sqrt{2}|\overline{\nu}\xi|}{2} + \frac{\sqrt{2}|\overline{\xi}\nu|}{2}$$
$$\Psi_{12}(\left(e^{''}\right)^2, {}^3A_2^{'}, M=1, \beta) = -|\nu\xi|$$

2.26.7 $^1A_2^{'}$

$a_1^{'}a_2^{'}$

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1^{'}a_2^{'}, {}^1A_2^{'}, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$a_1^{''}a_2^{''}$

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle + \langle\zeta\zeta||\gamma\gamma\rangle}$$

$$\Psi_2(a_1^{''}a_2^{''}, {}^1A_2^{'}, M=0, \beta) = -\frac{\sqrt{2}|\overline{\zeta}\gamma|}{2} + \frac{\sqrt{2}|\zeta\overline{\gamma}|}{2}$$

2.26.8 $^3E^{'}$

$a_1^{'}e^{'}$

$$\boxed{\Delta E = -\langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1^{'}e^{'}, {}^3E^{'}, M=-1, \eta) = |\overline{\alpha}\overline{\eta}|$$
$$\Psi_2(a_1^{'}e^{'}, {}^3E^{'}, M=-1, \mu) = |\overline{\alpha}\overline{\mu}|$$
$$\Psi_3(a_1^{'}e^{'}, {}^3E^{'}, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_4(a_1^{'}e^{'}, {}^3E^{'}, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_5(a_1^{'}e^{'}, {}^3E^{'}, M=1, \eta) = |\alpha\eta|$$
$$\Psi_6(a_1^{'}e^{'}, {}^3E^{'}, M=1, \mu) = |\alpha\mu|$$

$a_2^{''}e^{''}$

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle - \langle\zeta\zeta||\xi\xi\rangle}$$

$$\Psi_7(a_2^{''}e^{''}, {}^3E^{'}, M=-1, \eta) = |\overline{\zeta}\overline{\nu}|$$
$$\Psi_8(a_2^{''}e^{''}, {}^3E^{'}, M=-1, \mu) = |\overline{\zeta}\overline{\xi}|$$
$$\Psi_9(a_2^{''}e^{''}, {}^3E^{'}, M=0, \eta) = \frac{\sqrt{2}|\overline{\zeta}\nu|}{2} + \frac{\sqrt{2}|\zeta\overline{\nu}|}{2}$$
$$\Psi_{10}(a_2^{''}e^{''}, {}^3E^{'}, M=0, \mu) = \frac{\sqrt{2}|\overline{\zeta}\xi|}{2} + \frac{\sqrt{2}|\zeta\overline{\xi}|}{2}$$
$$\Psi_{11}(a_2^{''}e^{''}, {}^3E^{'}, M=1, \eta) = |\zeta\nu|$$
$$\Psi_{12}(a_2^{''}e^{''}, {}^3E^{'}, M=1, \mu) = |\zeta\xi|$$

$a_1^{''}e^{''}$

$$\boxed{\Delta E = -\langle\gamma\gamma||\xi\xi\rangle + \langle\gamma\xi||\gamma\xi\rangle}$$

$$\Psi_{13}(a_1^{''}e^{''}, {}^3E^{'}, M=-1, \mu) = -|\overline{\gamma}\overline{\nu}|$$
$$\Psi_{14}(a_1^{''}e^{''}, {}^3E^{'}, M=-1, \eta) = |\overline{\gamma}\overline{\xi}|$$
$$\Psi_{15}(a_1^{''}e^{''}, {}^3E^{'}, M=0, \mu) = -\frac{\sqrt{2}|\overline{\gamma}\nu|}{2} - \frac{\sqrt{2}|\gamma\overline{\nu}|}{2}$$
$$\Psi_{16}(a_1^{''}e^{''}, {}^3E^{'}, M=0, \eta) = \frac{\sqrt{2}|\overline{\gamma}\xi|}{2} + \frac{\sqrt{2}|\gamma\overline{\xi}|}{2}$$
$$\Psi_{17}(a_1^{''}e^{''}, {}^3E^{'}, M=1, \mu) = -|\gamma\nu|$$
$$\Psi_{18}(a_1^{''}e^{''}, {}^3E^{'}, M=1, \eta) = |\gamma\xi|$$

$a_2^{'}e^{'}$

$$\boxed{\Delta E = -\langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_{19}(a_2^{'}e^{'}, {}^3E^{'}, M=-1, \mu) = -|\overline{\beta}\overline{\eta}|$$
$$\Psi_{20}(a_2^{'}e^{'}, {}^3E^{'}, M=-1, \eta) = |\overline{\beta}\overline{\mu}|$$
$$\Psi_{21}(a_2^{'}e^{'}, {}^3E^{'}, M=0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_{22}(a_2^{'}e^{'}, {}^3E^{'}, M=0, \eta) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_{23}(a_2^{'}e^{'}, {}^3E^{'}, M=1, \mu) = -|\beta\eta|$$
$$\Psi_{24}(a_2^{'}e^{'}, {}^3E^{'}, M=1, \eta) = |\beta\mu|$$

2.26.9 $^1E^{'}$

$a_1^{'}e^{'}$

$$\boxed{\Delta E = \langle\alpha\alpha||\mu\mu\rangle + \langle\alpha\mu||\alpha\mu\rangle}$$

$$\Psi_1(a_1^{'}e^{'}, {}^1E^{'}, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_2(a_1^{'}e^{'}, {}^1E^{'}, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$

$a_2^{''}e^{''}$

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle + \langle\zeta\zeta||\xi\xi\rangle}$$

$$\Psi_3(a_2^{''}e^{''}, {}^1E^{'}, M=0, \eta) = -\frac{\sqrt{2}|\overline{\zeta}\nu|}{2} + \frac{\sqrt{2}|\zeta\overline{\nu}|}{2}$$
$$\Psi_4(a_2^{''}e^{''}, {}^1E^{'}, M=0, \mu) = -\frac{\sqrt{2}|\overline{\zeta}\xi|}{2} + \frac{\sqrt{2}|\zeta\overline{\xi}|}{2}$$

$a_1^{''}e^{''}$

$$\boxed{\Delta E = \langle\gamma\gamma||\xi\xi\rangle + \langle\gamma\xi||\gamma\xi\rangle}$$

$$\Psi_5(a_1^{''}e^{''}, {}^1E^{'}, M=0, \mu) = \frac{\sqrt{2}|\overline{\gamma}\nu|}{2} - \frac{\sqrt{2}|\gamma\overline{\nu}|}{2}$$
$$\Psi_6(a_1^{''}e^{''}, {}^1E^{'}, M=0, \eta) = -\frac{\sqrt{2}|\overline{\gamma}\xi|}{2} + \frac{\sqrt{2}|\gamma\overline{\xi}|}{2}$$

$a_2^{'}e^{'}$

$$\boxed{\Delta E = \langle\beta\beta||\mu\mu\rangle + \langle\beta\mu||\beta\mu\rangle}$$

$$\Psi_7(a_2^{'}e^{'}, {}^1E^{'}, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} - \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_8(a_2^{'}e^{'}, {}^1E^{'}, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$

$\left(e^{'}\right)^2$

$$\boxed{\Delta E = -\langle\mu\mu||\eta\eta\rangle + \langle\mu\mu||\mu\mu\rangle}$$

$$\Psi_9(\left(e^{'}\right)^2, {}^1E^{'}, M=0, \mu) = -\frac{\sqrt{2}|\overline{\eta}\eta|}{2} + \frac{\sqrt{2}|\overline{\mu}\mu|}{2}$$
$$\Psi_{10}(\left(e^{'}\right)^2, {}^1E^{'}, M=0, \eta) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} - \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$

$\left(e^{''}\right)^2$

$$\boxed{\Delta E = -\langle\xi\xi||\nu\nu\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_{11}(\left(e^{''}\right)^2, {}^1E^{'}, M=0, \mu) = -\frac{\sqrt{2}|\overline{\nu}\nu|}{2} + \frac{\sqrt{2}|\overline{\xi}\xi|}{2}$$
$$\Psi_{12}(\left(e^{''}\right)^2, {}^1E^{'}, M=0, \eta) = -\frac{\sqrt{2}|\overline{\nu}\xi|}{2} - \frac{\sqrt{2}|\overline{\xi}\nu|}{2}$$

2.26.10 $^3E^{''}$

$a_1^{'}e^{''}$

$$\boxed{\Delta E = -\langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1^{'}e^{''}, {}^3E^{''}, M=-1, \nu) = |\overline{\alpha\nu}|$$
$$\Psi_2(a_1^{'}e^{''}, {}^3E^{''}, M=-1, \xi) = |\overline{\alpha}\overline{\xi}|$$
$$\Psi_3(a_1^{'}e^{''}, {}^3E^{''}, M=0, \nu) = \frac{\sqrt{2}|\overline{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\overline{\nu}|}{2}$$
$$\Psi_4(a_1^{'}e^{''}, {}^3E^{''}, M=0, \xi) = \frac{\sqrt{2}|\overline{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\overline{\xi}|}{2}$$
$$\Psi_5(a_1^{'}e^{''}, {}^3E^{''}, M=1, \nu) = |\alpha\nu|$$
$$\Psi_6(a_1^{'}e^{''}, {}^3E^{''}, M=1, \xi) = |\alpha\xi|$$

$a_2^{''}e^{'}$

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle - \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_7(a_2^{''}e^{'}, {}^3E^{''}, M=-1, \nu) = |\overline{\zeta}\overline{\eta}|$$
$$\Psi_8(a_2^{''}e^{'}, {}^3E^{''}, M=-1, \xi) = |\overline{\zeta}\overline{\mu}|$$
$$\Psi_9(a_2^{''}e^{'}, {}^3E^{''}, M=0, \nu) = \frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_{10}(a_2^{''}e^{'}, {}^3E^{''}, M=0, \xi) = \frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{11}(a_2^{''}e^{'}, {}^3E^{''}, M=1, \nu) = |\zeta\eta|$$
$$\Psi_{12}(a_2^{''}e^{'}, {}^3E^{''}, M=1, \xi) = |\zeta\mu|$$

$a_1^{''}e^{'}$

$$\boxed{\Delta E = -\langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_{13}(a_1^{''}e^{'}, {}^3E^{''}, M=-1, \xi) = -|\overline{\gamma\eta}|$$
$$\Psi_{14}(a_1^{''}e^{'}, {}^3E^{''}, M=-1, \nu) = |\overline{\gamma\mu}|$$
$$\Psi_{15}(a_1^{''}e^{'}, {}^3E^{''}, M=0, \xi) = -\frac{\sqrt{2}|\overline{\gamma}\eta|}{2} - \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_{16}(a_1^{''}e^{'}, {}^3E^{''}, M=0, \nu) = \frac{\sqrt{2}|\overline{\gamma}\mu|}{2} + \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$
$$\Psi_{17}(a_1^{''}e^{'}, {}^3E^{''}, M=1, \xi) = -|\gamma\eta|$$
$$\Psi_{18}(a_1^{''}e^{'}, {}^3E^{''}, M=1, \nu) = |\gamma\mu|$$

$a_2^{'}e^{''}$

$$\boxed{\Delta E = -\langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_{19}(a_2^{'}e^{''}, {}^3E^{''}, M=-1, \xi) = -|\overline{\beta}\overline{\nu}|$$
$$\Psi_{20}(a_2^{'}e^{''}, {}^3E^{''}, M=-1, \nu) = |\overline{\beta\xi}|$$
$$\Psi_{21}(a_2^{'}e^{''}, {}^3E^{''}, M=0, \xi) = -\frac{\sqrt{2}|\overline{\beta}\nu|}{2} - \frac{\sqrt{2}|\beta\overline{\nu}|}{2}$$
$$\Psi_{22}(a_2^{'}e^{''}, {}^3E^{''}, M=0, \nu) = \frac{\sqrt{2}|\overline{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\overline{\xi}|}{2}$$
$$\Psi_{23}(a_2^{'}e^{''}, {}^3E^{''}, M=1, \xi) = -|\beta\nu|$$
$$\Psi_{24}(a_2^{'}e^{''}, {}^3E^{''}, M=1, \nu) = |\beta\xi|$$

$e^{'}e^{''}$

$$\boxed{\begin{aligned}\Delta E = &-\langle\mu\mu||\nu\nu\rangle - \langle\mu\xi||\eta\nu\rangle + \langle\mu\xi||\mu\xi\rangle \\ &-\langle\mu\eta||\xi\nu\rangle\end{aligned}}$$

$$\Psi_{25}(e^{'}e^{''}, {}^3E^{''}, M=-1, \xi) = \frac{\sqrt{2}|\overline{\eta\nu}|}{2} - \frac{\sqrt{2}|\overline{\mu\xi}|}{2}$$
$$\Psi_{26}(e^{'}e^{''}, {}^3E^{''}, M=-1, \nu) = \frac{\sqrt{2}|\overline{\eta\xi}|}{2} + \frac{\sqrt{2}|\overline{\mu\nu}|}{2}$$
$$\Psi_{27}(e^{'}e^{''}, {}^3E^{''}, M=0, \xi) = \frac{|\overline{\eta}\nu|}{2} - \frac{|\overline{\mu}\xi|}{2} + \frac{|\eta\overline{\nu}|}{2} - \frac{|\mu\overline{\xi}|}{2}$$
$$\Psi_{28}(e^{'}e^{''}, {}^3E^{''}, M=0, \nu) = \frac{|\overline{\eta}\xi|}{2} + \frac{|\overline{\mu}\nu|}{2} + \frac{|\eta\overline{\xi}|}{2} + \frac{|\mu\overline{\nu}|}{2}$$
$$\Psi_{29}(e^{'}e^{''}, {}^3E^{''}, M=1, \xi) = \frac{\sqrt{2}|\eta\nu|}{2} - \frac{\sqrt{2}|\mu\xi|}{2}$$
$$\Psi_{30}(e^{'}e^{''}, {}^3E^{''}, M=1, \nu) = \frac{\sqrt{2}|\eta\xi|}{2} + \frac{\sqrt{2}|\mu\nu|}{2}$$

2.26.11 ${}^1E^{''}$

$a_1^{'}e^{''}$

$$\boxed{\Delta E = \langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1^{'}e^{''}, {}^1E^{''}, M=0, \nu) = -\frac{\sqrt{2}|\overline{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\overline{\nu}|}{2}$$
$$\Psi_2(a_1^{'}e^{''}, {}^1E^{''}, M=0, \xi) = -\frac{\sqrt{2}|\overline{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\overline{\xi}|}{2}$$

$a_2^{''}e^{'}$

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle + \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_3(a_2^{''}e^{'}, {}^1E^{''}, M=0, \nu) = -\frac{\sqrt{2}|\overline{\zeta}\eta|}{2} + \frac{\sqrt{2}|\zeta\overline{\eta}|}{2}$$
$$\Psi_4(a_2^{''}e^{'}, {}^1E^{''}, M=0, \xi) = -\frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

$a_1^{''}e^{'}$

$$\boxed{\Delta E = \langle\gamma\gamma||\mu\mu\rangle + \langle\gamma\mu||\gamma\mu\rangle}$$

$$\Psi_5(a_1^{''}e^{'}, {}^1E^{''}, M=0, \xi) = \frac{\sqrt{2}|\overline{\gamma}\eta|}{2} - \frac{\sqrt{2}|\gamma\overline{\eta}|}{2}$$
$$\Psi_6(a_1^{''}e^{'}, {}^1E^{''}, M=0, \nu) = -\frac{\sqrt{2}|\overline{\gamma}\mu|}{2} + \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$

$a_2^{'}e^{''}$

$$\boxed{\Delta E = \langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_7(a_2^{'}e^{''}, {}^1E^{''}, M=0, \xi) = \frac{\sqrt{2}|\overline{\beta}\nu|}{2} - \frac{\sqrt{2}|\beta\overline{\nu}|}{2}$$
$$\Psi_8(a_2^{'}e^{''}, {}^1E^{''}, M=0, \nu) = -\frac{\sqrt{2}|\overline{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\overline{\xi}|}{2}$$

$e^{'}e^{''}$

$$\boxed{\begin{gathered}\Delta E = \langle\mu\mu||\nu\nu\rangle - \langle\mu\xi||\eta\nu\rangle + \langle\mu\xi||\mu\xi\rangle \\ + \langle\mu\eta||\xi\nu\rangle\end{gathered}}$$

$$\Psi_9(e^{'}e^{''}, {}^1E^{''}, M=0, \xi) = -\frac{|\overline{\eta}\nu|}{2} + \frac{|\overline{\mu}\xi|}{2} + \frac{|\eta\overline{\nu}|}{2} - \frac{|\mu\overline{\xi}|}{2}$$
$$\Psi_{10}(e^{'}e^{''}, {}^1E^{''}, M=0, \nu) = -\frac{|\overline{\eta}\xi|}{2} - \frac{|\overline{\mu}\nu|}{2} + \frac{|\eta\overline{\xi}|}{2} + \frac{|\mu\overline{\nu}|}{2}$$

2.27 Group D_{6h}

Component labels

$A_{1g} : \{\alpha_g\}$ —— $A_{2u} : \{\beta_u\}$ —— $A_{1u} : \{\alpha_u\}$ —— $B_{1g} : \{\gamma_g\}$ —— $B_{2g} : \{\zeta_g\}$ —— $B_{1u} : \{\gamma_u\}$ —— $B_{2u} : \{\zeta_u\}$ —— $A_{2g} : \{\beta_g\}$ —— $E_{2g} : \{\nu_g, \xi_g\}$ —— $E_{1u} : \{\eta_u, \mu_u\}$ —— $E_{1g} : \{\eta_g, \mu_g\}$ —— $E_{2u} : \{\nu_u, \xi_u\}$

2.27.1 ${}^1A_{1g}$

a_{1g}^2

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_g\alpha_g\rangle}$$

$$\Psi_1(a_{1g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

a_{2u}^2

$$\boxed{\Delta E = \langle\beta_u\beta_u||\beta_u\beta_u\rangle}$$

$$\Psi_2(a_{2u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\beta_u}\beta_u|$$

a_{1u}^2

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_3(a_{1u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

b_{1g}^2

$$\boxed{\Delta E = \langle\gamma_g\gamma_g||\gamma_g\gamma_g\rangle}$$

$$\Psi_4(b_{1g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\gamma_g}\gamma_g|$$

b_{2g}^2

$$\boxed{\Delta E = \langle\zeta_g\zeta_g||\zeta_g\zeta_g\rangle}$$

$$\Psi_5(b_{2g}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\zeta_g}\zeta_g|$$

b_{1u}^2

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\gamma_u\gamma_u\rangle}$$

$$\Psi_6(b_{1u}^2, {}^1A_{1g}, M=0, \alpha_g) = -|\overline{\gamma_u}\gamma_u|$$

b_{2u}^2

$$\boxed{\Delta E = \langle \zeta_u \zeta_u || \zeta_u \zeta_u \rangle}$$

$$\Psi_7(b_{2u}^2, {}^1A_{1g}, M=0, \alpha_g) = -\left|\overline{\zeta_u}\zeta_u\right|$$

a_{2g}^2

$$\boxed{\Delta E = \langle \beta_g \beta_g || \beta_g \beta_g \rangle}$$

$$\Psi_8(a_{2g}^2, {}^1A_{1g}, M=0, \alpha_g) = -\left|\overline{\beta_g}\beta_g\right|$$

e_{2g}^2

$$\boxed{\Delta E = \langle \xi_g \xi_g || \nu_g \nu_g \rangle + \langle \xi_g \xi_g || \xi_g \xi_g \rangle}$$

$$\Psi_9(e_{2g}^2, {}^1A_{1g}, M=0, \alpha_g) = -\frac{\sqrt{2}\left|\overline{\nu_g}\nu_g\right|}{2} - \frac{\sqrt{2}\left|\overline{\xi_g}\xi_g\right|}{2}$$

e_{1u}^2

$$\boxed{\Delta E = \langle \mu_u \mu_u || \eta_u \eta_u \rangle + \langle \mu_u \mu_u || \mu_u \mu_u \rangle}$$

$$\Psi_{10}(e_{1u}^2, {}^1A_{1g}, M=0, \alpha_g) = -\frac{\sqrt{2}\left|\overline{\eta_u}\eta_u\right|}{2} - \frac{\sqrt{2}\left|\overline{\mu_u}\mu_u\right|}{2}$$

e_{1g}^2

$$\boxed{\Delta E = \langle \mu_g \mu_g || \eta_g \eta_g \rangle + \langle \mu_g \mu_g || \mu_g \mu_g \rangle}$$

$$\Psi_{11}(e_{1g}^2, {}^1A_{1g}, M=0, \alpha_g) = -\frac{\sqrt{2}\left|\overline{\eta_g}\eta_g\right|}{2} - \frac{\sqrt{2}\left|\overline{\mu_g}\mu_g\right|}{2}$$

e_{2u}^2

$$\boxed{\Delta E = \langle \xi_u \xi_u || \nu_u \nu_u \rangle + \langle \xi_u \xi_u || \xi_u \xi_u \rangle}$$

$$\Psi_{12}(e_{2u}^2, {}^1A_{1g}, M=0, \alpha_g) = -\frac{\sqrt{2}\left|\overline{\nu_u}\nu_u\right|}{2} - \frac{\sqrt{2}\left|\overline{\xi_u}\xi_u\right|}{2}$$

2.27.2 $^3A_{2u}$

$a_{1g}a_{2u}$

$$\boxed{\Delta E = -\langle \alpha_g \alpha_g || \beta_u \beta_u \rangle + \langle \alpha_g \beta_u || \alpha_g \beta_u \rangle}$$

$$\Psi_1(a_{1g}a_{2u}, {}^3A_{2u}, M=-1, \beta_u) = \left|\overline{\alpha_g}\overline{\beta_u}\right|$$

$$\Psi_2(a_{1g}a_{2u}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}\left|\overline{\alpha_g}\beta_u\right|}{2} + \frac{\sqrt{2}\left|\alpha_g\overline{\beta_u}\right|}{2}$$

$$\Psi_3(a_{1g}a_{2u}, {}^3A_{2u}, M=1, \beta_u) = \left|\alpha_g\beta_u\right|$$

$a_{1u}a_{2g}$

$$\boxed{\Delta E = -\langle \alpha_u \alpha_u || \beta_g \beta_g \rangle + \langle \alpha_u \beta_g || \alpha_u \beta_g \rangle}$$

$$\Psi_4(a_{1u}a_{2g}, {}^3A_{2u}, M=-1, \beta_u) = \left|\overline{\alpha_u}\overline{\beta_g}\right|$$

$$\Psi_5(a_{1u}a_{2g}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}\left|\overline{\alpha_u}\beta_g\right|}{2} + \frac{\sqrt{2}\left|\alpha_u\overline{\beta_g}\right|}{2}$$

$$\Psi_6(a_{1u}a_{2g}, {}^3A_{2u}, M=1, \beta_u) = \left|\alpha_u\beta_g\right|$$

$b_{1g}b_{2u}$

$$\boxed{\Delta E = -\langle \gamma_g \gamma_g || \zeta_u \zeta_u \rangle + \langle \gamma_g \zeta_u || \gamma_g \zeta_u \rangle}$$

$$\Psi_7(b_{1g}b_{2u}, {}^3A_{2u}, M=-1, \beta_u) = \left|\overline{\gamma_g}\overline{\zeta_u}\right|$$

$$\Psi_8(b_{1g}b_{2u}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}\left|\overline{\gamma_g}\zeta_u\right|}{2} + \frac{\sqrt{2}\left|\gamma_g\overline{\zeta_u}\right|}{2}$$

$$\Psi_9(b_{1g}b_{2u}, {}^3A_{2u}, M=1, \beta_u) = \left|\gamma_g\zeta_u\right|$$

$b_{1u}b_{2g}$

$$\boxed{\Delta E = \langle \zeta_g \gamma_u || \zeta_g \gamma_u \rangle - \langle \zeta_g \zeta_g || \gamma_u \gamma_u \rangle}$$

$$\Psi_{10}(b_{1u}b_{2g}, {}^3A_{2u}, M=-1, \beta_u) = \left|\overline{\zeta_g}\overline{\gamma_u}\right|$$

$$\Psi_{11}(b_{1u}b_{2g}, {}^3A_{2u}, M=0, \beta_u) = \frac{\sqrt{2}\left|\overline{\zeta_g}\gamma_u\right|}{2} + \frac{\sqrt{2}\left|\zeta_g\overline{\gamma_u}\right|}{2}$$

$$\Psi_{12}(b_{1u}b_{2g}, {}^3A_{2u}, M=1, \beta_u) = \left|\zeta_g\gamma_u\right|$$

$e_{2g}e_{2u}$

$$\boxed{\begin{aligned}\Delta E = -2\langle \xi_g \xi_g || \xi_u \xi_u \rangle + \langle \xi_g \xi_u || \nu_g \nu_u \rangle + \langle \xi_g \xi_u || \xi_g \xi_u \rangle \\ + \langle \xi_g \nu_g || \xi_u \nu_u \rangle + \langle \xi_g \xi_g || \nu_u \nu_u \rangle\end{aligned}}$$

$$\Psi_{13}(e_{2g}e_{2u}, {}^3A_{2u}, M=-1, \beta_u) = \frac{\sqrt{2}\left|\overline{\nu_g}\overline{\nu_u}\right|}{2} + \frac{\sqrt{2}\left|\overline{\xi_g}\overline{\xi_u}\right|}{2}$$

$$\Psi_{14}(e_{2g}e_{2u}, {}^3A_{2u}, M=0, \beta_u) = \frac{\left|\overline{\nu_g}\nu_u\right|}{2} + \frac{\left|\overline{\xi_g}\xi_u\right|}{2} + \frac{\left|\nu_g\overline{\nu_u}\right|}{2} + \frac{\left|\xi_g\overline{\xi_u}\right|}{2}$$

$$\Psi_{15}(e_{2g}e_{2u}, {}^3A_{2u}, M=1, \beta_u) = \frac{\sqrt{2}\left|\nu_g\nu_u\right|}{2} + \frac{\sqrt{2}\left|\xi_g\xi_u\right|}{2}$$

$e_{1g}e_{1u}$

$$\boxed{\begin{aligned}\Delta E = \langle \mu_u \mu_g || \eta_u \eta_g \rangle + \langle \mu_u \mu_g || \mu_u \mu_g \rangle - 2\langle \mu_u \mu_u || \mu_g \mu_g \rangle \\ + \langle \mu_u \eta_u || \mu_g \eta_g \rangle + \langle \mu_u \mu_u || \eta_g \eta_g \rangle\end{aligned}}$$

$$\Psi_{16}(e_{1g}e_{1u}, {}^3A_{2u}, M=-1, \beta_u) = \frac{\sqrt{2}\left|\overline{\eta_u}\overline{\eta_g}\right|}{2} + \frac{\sqrt{2}\left|\overline{\mu_u}\overline{\mu_g}\right|}{2}$$

$$\Psi_{17}(e_{1g}e_{1u}, {}^3A_{2u}, M=0, \beta_u) = \frac{\left|\overline{\eta_u}\eta_g\right|}{2} + \frac{\left|\overline{\mu_u}\mu_g\right|}{2} + \frac{\left|\eta_u\overline{\eta_g}\right|}{2} + \frac{\left|\mu_u\overline{\mu_g}\right|}{2}$$

$$\Psi_{18}(e_{1g}e_{1u}, {}^3A_{2u}, M=1, \beta_u) = \frac{\sqrt{2}\left|\eta_u\eta_g\right|}{2} + \frac{\sqrt{2}\left|\mu_u\mu_g\right|}{2}$$

2.27.3 $^1A_{2u}$

$a_{1g}a_{2u}$

$$\boxed{\Delta E = \langle \alpha_g \alpha_g || \beta_u \beta_u \rangle + \langle \alpha_g \beta_u || \alpha_g \beta_u \rangle}$$

$$\Psi_1(a_{1g}a_{2u}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$a_{1u}a_{2g}$

$$\boxed{\Delta E = \langle \alpha_u \alpha_u || \beta_g \beta_g \rangle + \langle \alpha_u \beta_g || \alpha_u \beta_g \rangle}$$

$$\Psi_2(a_{1u}a_{2g}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

$b_{1g}b_{2u}$

$$\boxed{\Delta E = \langle \gamma_g \gamma_g || \zeta_u \zeta_u \rangle + \langle \gamma_g \zeta_u || \gamma_g \zeta_u \rangle}$$

$$\Psi_3(b_{1g}b_{2u}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\zeta_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\zeta_u}|}{2}$$

$b_{1u}b_{2g}$

$$\boxed{\Delta E = \langle \zeta_g \gamma_u || \zeta_g \gamma_u \rangle + \langle \zeta_g \zeta_g || \gamma_u \gamma_u \rangle}$$

$$\Psi_4(b_{1u}b_{2g}, {}^1A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\gamma_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\gamma_u}|}{2}$$

$e_{2g}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = 2\langle \xi_g \xi_g || \xi_u \xi_u \rangle + \langle \xi_g \xi_u || \nu_g \nu_u \rangle + \langle \xi_g \xi_u || \xi_g \xi_u \rangle \\ - \langle \xi_g \nu_g || \xi_u \nu_u \rangle - \langle \xi_g \xi_g || \nu_u \nu_u \rangle\end{gathered}}$$

$$\Psi_5(e_{2g}e_{2u}, {}^1A_{2u}, M=0, \beta_u) = \\ -\frac{|\overline{\nu_g}\nu_u|}{2} - \frac{|\overline{\xi_g}\xi_u|}{2} + \frac{|\nu_g\overline{\nu_u}|}{2} + \frac{|\xi_g\overline{\xi_u}|}{2}$$

$e_{1g}e_{1u}$

$$\boxed{\begin{gathered}\Delta E = \langle \mu_u \mu_g || \eta_u \eta_g \rangle + \langle \mu_u \mu_g || \mu_u \mu_g \rangle + 2\langle \mu_u \mu_u || \mu_g \mu_g \rangle \\ - \langle \mu_u \eta_u || \mu_g \eta_g \rangle - \langle \mu_u \mu_u || \eta_g \eta_g \rangle\end{gathered}}$$

$$\Psi_6(e_{1g}e_{1u}, {}^1A_{2u}, M=0, \beta_u) = \\ -\frac{|\overline{\eta_u}\eta_g|}{2} - \frac{|\overline{\mu_u}\mu_g|}{2} + \frac{|\eta_u\overline{\eta_g}|}{2} + \frac{|\mu_u\overline{\mu_g}|}{2}$$

2.27.4 $^3A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = -\langle \alpha_g \alpha_g || \alpha_u \alpha_u \rangle + \langle \alpha_g \alpha_u || \alpha_g \alpha_u \rangle}$$

$$\Psi_1(a_{1g}a_{1u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\alpha_g \alpha_u}|$$

$$\Psi_2(a_{1g}a_{1u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$$\Psi_3(a_{1g}a_{1u}, {}^3A_{1u}, M=1, \alpha_u) = |\alpha_g \alpha_u|$$

$a_{2g}a_{2u}$

$$\boxed{\Delta E = \langle \beta_u \beta_g || \beta_u \beta_g \rangle - \langle \beta_u \beta_u || \beta_g \beta_g \rangle}$$

$$\Psi_4(a_{2g}a_{2u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\beta_u \beta_g}|$$

$$\Psi_5(a_{2g}a_{2u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

$$\Psi_6(a_{2g}a_{2u}, {}^3A_{1u}, M=1, \alpha_u) = |\beta_u \beta_g|$$

$b_{1g}b_{1u}$

$$\boxed{\Delta E = -\langle \gamma_g \gamma_g || \gamma_u \gamma_u \rangle + \langle \gamma_g \gamma_u || \gamma_g \gamma_u \rangle}$$

$$\Psi_7(b_{1g}b_{1u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\gamma_g \gamma_u}|$$

$$\Psi_8(b_{1g}b_{1u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\gamma_g}\gamma_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\gamma_u}|}{2}$$

$$\Psi_9(b_{1g}b_{1u}, {}^3A_{1u}, M=1, \alpha_u) = |\gamma_g \gamma_u|$$

$b_{2g}b_{2u}$

$$\boxed{\Delta E = -\langle \zeta_g \zeta_g || \zeta_u \zeta_u \rangle + \langle \zeta_g \zeta_u || \zeta_g \zeta_u \rangle}$$

$$\Psi_{10}(b_{2g}b_{2u}, {}^3A_{1u}, M=-1, \alpha_u) = |\overline{\zeta_g \zeta_u}|$$

$$\Psi_{11}(b_{2g}b_{2u}, {}^3A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\zeta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\zeta_u}|}{2}$$

$$\Psi_{12}(b_{2g}b_{2u}, {}^3A_{1u}, M=1, \alpha_u) = |\zeta_g \zeta_u|$$

$e_{2g}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = -\langle \xi_g \xi_g || \nu_u \nu_u \rangle - 3\langle \xi_g \xi_u || \nu_g \nu_u \rangle + \langle \xi_g \xi_u || \xi_g \xi_u \rangle \\ + \langle \xi_g \nu_g || \xi_u \nu_u \rangle\end{gathered}}$$

$$\Psi_{13}(e_{2g}e_{2u}, {}^3A_{1u}, M=-1, \alpha_u) = -\frac{\sqrt{2}|\overline{\nu_g}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\nu_u}|}{2}$$

$$\Psi_{14}(e_{2g}e_{2u}, {}^3A_{1u}, M=0, \alpha_u) = \\ -\frac{|\overline{\nu_g}\xi_u|}{2} + \frac{|\overline{\xi_g}\nu_u|}{2} - \frac{|\nu_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\nu_u}|}{2}$$

$$\Psi_{15}(e_{2g}e_{2u}, {}^3A_{1u}, M=1, \alpha_u) = -\frac{\sqrt{2}|\nu_g\xi_u|}{2} + \frac{\sqrt{2}|\xi_g\nu_u|}{2}$$

$e_{1g}e_{1u}$

$$\boxed{\begin{gathered}\Delta E = -3\langle \mu_u \mu_g || \eta_u \eta_g \rangle + \langle \mu_u \mu_g || \mu_u \mu_g \rangle - \langle \mu_u \mu_u || \eta_g \eta_g \rangle \\ + \langle \mu_u \eta_u || \mu_g \eta_g \rangle\end{gathered}}$$

$$\Psi_{16}(e_{1g}e_{1u}, {}^3A_{1u}, M=-1, \alpha_u) = -\frac{\sqrt{2}|\overline{\eta_u \mu_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_u \eta_g}|}{2}$$

$$\Psi_{17}(e_{1g}e_{1u}, {}^3A_{1u}, M=0, \alpha_u) = \\ -\frac{|\overline{\eta_u}\mu_g|}{2} + \frac{|\overline{\mu_u}\eta_g|}{2} - \frac{|\eta_u\overline{\mu_g}|}{2} + \frac{|\mu_u\overline{\eta_g}|}{2}$$

$$\Psi_{18}(e_{1g}e_{1u}, {}^3A_{1u}, M=1, \alpha_u) = -\frac{\sqrt{2}|\eta_u\mu_g|}{2} + \frac{\sqrt{2}|\mu_u\eta_g|}{2}$$

2.27.5 $^1A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_{1g}a_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$a_{2g}a_{2u}$

$$\boxed{\Delta E = \langle\beta_u\beta_g||\beta_u\beta_g\rangle + \langle\beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_2(a_{2g}a_{2u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

$b_{1g}b_{1u}$

$$\boxed{\Delta E = \langle\gamma_g\gamma_g||\gamma_u\gamma_u\rangle + \langle\gamma_g\gamma_u||\gamma_g\gamma_u\rangle}$$

$$\Psi_3(b_{1g}b_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\gamma_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\gamma_u}|}{2}$$

$b_{2g}b_{2u}$

$$\boxed{\Delta E = \langle\zeta_g\zeta_g||\zeta_u\zeta_u\rangle + \langle\zeta_g\zeta_u||\zeta_g\zeta_u\rangle}$$

$$\Psi_4(b_{2g}b_{2u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\zeta_u}|}{2}$$

$e_{2g}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = \langle\xi_g\xi_g||\nu_u\nu_u\rangle - 3\langle\xi_g\xi_u||\nu_g\nu_u\rangle + \langle\xi_g\xi_u||\xi_g\xi_u\rangle \\ - \langle\xi_g\nu_g||\xi_u\nu_u\rangle\end{gathered}}$$

$$\Psi_5(e_{2g}e_{2u}, {}^1A_{1u}, M=0, \alpha_u) = \frac{|\overline{\nu_g}\xi_u|}{2} - \frac{|\overline{\xi_g}\nu_u|}{2} - \frac{|\nu_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\nu_u}|}{2}$$

$e_{1g}e_{1u}$

$$\boxed{\begin{gathered}\Delta E = -3\langle\mu_u\mu_g||\eta_u\eta_g\rangle + \langle\mu_u\mu_g||\mu_u\mu_g\rangle + \langle\mu_u\mu_u||\eta_g\eta_g\rangle \\ - \langle\mu_u\eta_u||\mu_g\eta_g\rangle\end{gathered}}$$

$$\Psi_6(e_{1g}e_{1u}, {}^1A_{1u}, M=0, \alpha_u) = \frac{|\overline{\eta_u}\mu_g|}{2} - \frac{|\overline{\mu_u}\eta_g|}{2} - \frac{|\eta_u\overline{\mu_g}|}{2} + \frac{|\mu_u\overline{\eta_g}|}{2}$$

2.27.6 $^3B_{1g}$

$a_{1g}b_{1g}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\gamma_g\gamma_g\rangle + \langle\alpha_g\gamma_g||\alpha_g\gamma_g\rangle}$$

$$\Psi_1(a_{1g}b_{1g}, {}^3B_{1g}, M=-1, \gamma_g) = |\overline{\alpha_g}\overline{\gamma_g}|$$

$$\Psi_2(a_{1g}b_{1g}, {}^3B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$

$$\Psi_3(a_{1g}b_{1g}, {}^3B_{1g}, M=1, \gamma_g) = |\alpha_g\gamma_g|$$

$a_{2u}b_{2u}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\zeta_u\zeta_u\rangle + \langle\beta_u\zeta_u||\beta_u\zeta_u\rangle}$$

$$\Psi_4(a_{2u}b_{2u}, {}^3B_{1g}, M=-1, \gamma_g) = |\overline{\beta_u}\overline{\zeta_u}|$$

$$\Psi_5(a_{2u}b_{2u}, {}^3B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\beta_u}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_u}|}{2}$$

$$\Psi_6(a_{2u}b_{2u}, {}^3B_{1g}, M=1, \gamma_g) = |\beta_u\zeta_u|$$

$a_{1u}b_{1u}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\gamma_u\gamma_u\rangle + \langle\alpha_u\gamma_u||\alpha_u\gamma_u\rangle}$$

$$\Psi_7(a_{1u}b_{1u}, {}^3B_{1g}, M=-1, \gamma_g) = |\overline{\alpha_u}\overline{\gamma_u}|$$

$$\Psi_8(a_{1u}b_{1u}, {}^3B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$$

$$\Psi_9(a_{1u}b_{1u}, {}^3B_{1g}, M=1, \gamma_g) = |\alpha_u\gamma_u|$$

$a_{2g}b_{2g}$

$$\boxed{\Delta E = \langle\zeta_g\beta_g||\zeta_g\beta_g\rangle - \langle\zeta_g\zeta_g||\beta_g\beta_g\rangle}$$

$$\Psi_{10}(a_{2g}b_{2g}, {}^3B_{1g}, M=-1, \gamma_g) = |\overline{\zeta_g}\overline{\beta_g}|$$

$$\Psi_{11}(a_{2g}b_{2g}, {}^3B_{1g}, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\zeta_g}\beta_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\beta_g}|}{2}$$

$$\Psi_{12}(a_{2g}b_{2g}, {}^3B_{1g}, M=1, \gamma_g) = |\zeta_g\beta_g|$$

$e_{1g}e_{2g}$

$$\boxed{\begin{gathered}\Delta E = 3\langle\xi_g\mu_g||\nu_g\eta_g\rangle + \langle\xi_g\mu_g||\xi_g\mu_g\rangle - \langle\xi_g\xi_g||\eta_g\eta_g\rangle \\ - \langle\xi_g\nu_g||\mu_g\eta_g\rangle\end{gathered}}$$

$$\Psi_{13}(e_{1g}e_{2g}, {}^3B_{1g}, M=-1, \gamma_g) = \frac{\sqrt{2}|\overline{\nu_g}\overline{\mu_g}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\eta_g}|}{2}$$

$$\Psi_{14}(e_{1g}e_{2g}, {}^3B_{1g}, M=0, \gamma_g) = \frac{|\overline{\nu_g}\mu_g|}{2} + \frac{|\overline{\xi_g}\eta_g|}{2} + \frac{|\nu_g\overline{\mu_g}|}{2} + \frac{|\xi_g\overline{\eta_g}|}{2}$$

$$\Psi_{15}(e_{1g}e_{2g}, {}^3B_{1g}, M=1, \gamma_g) = \frac{\sqrt{2}|\nu_g\mu_g|}{2} + \frac{\sqrt{2}|\xi_g\eta_g|}{2}$$

$e_{1u}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = -\langle\mu_u\mu_u||\nu_u\nu_u\rangle + 3\langle\mu_u\xi_u||\eta_u\nu_u\rangle + \langle\mu_u\xi_u||\mu_u\xi_u\rangle \\ - \langle\mu_u\eta_u||\xi_u\nu_u\rangle\end{gathered}}$$

$$\Psi_{16}(e_{1u}e_{2u}, {}^3B_{1g}, M=-1, \gamma_g) = \frac{\sqrt{2}|\overline{\eta_u}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\nu_u}|}{2}$$

$$\Psi_{17}(e_{1u}e_{2u}, {}^3B_{1g}, M=0, \gamma_g) = \frac{|\overline{\eta_u}\xi_u|}{2} + \frac{|\overline{\mu_u}\nu_u|}{2} + \frac{|\eta_u\overline{\xi_u}|}{2} + \frac{|\mu_u\overline{\nu_u}|}{2}$$

$$\Psi_{18}(e_{1u}e_{2u}, {}^3B_{1g}, M=1, \gamma_g) = \frac{\sqrt{2}|\eta_u\xi_u|}{2} + \frac{\sqrt{2}|\mu_u\nu_u|}{2}$$

2.27.7 $^1B_{1g}$

$a_{1g}b_{1g}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\gamma_g\gamma_g\rangle + \langle \alpha_g\gamma_g||\alpha_g\gamma_g\rangle}$$

$$\Psi_1(a_{1g}b_{1g}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$

$a_{2u}b_{2u}$

$$\boxed{\Delta E = \langle \beta_u\beta_u||\zeta_u\zeta_u\rangle + \langle \beta_u\zeta_u||\beta_u\zeta_u\rangle}$$

$$\Psi_2(a_{2u}b_{2u}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\beta_u}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_u}|}{2}$$

$a_{1u}b_{1u}$

$$\boxed{\Delta E = \langle \alpha_u\alpha_u||\gamma_u\gamma_u\rangle + \langle \alpha_u\gamma_u||\alpha_u\gamma_u\rangle}$$

$$\Psi_3(a_{1u}b_{1u}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$$

$a_{2g}b_{2g}$

$$\boxed{\Delta E = \langle \zeta_g\beta_g||\zeta_g\beta_g\rangle + \langle \zeta_g\zeta_g||\beta_g\beta_g\rangle}$$

$$\Psi_4(a_{2g}b_{2g}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\beta_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\beta_g}|}{2}$$

$e_{1g}e_{2g}$

$$\boxed{\begin{array}{c}\Delta E = 3\langle \xi_g\mu_g||\nu_g\eta_g\rangle + \langle \xi_g\mu_g||\xi_g\mu_g\rangle + \langle \xi_g\xi_g||\eta_g\eta_g\rangle \\ + \langle \xi_g\nu_g||\mu_g\eta_g\rangle\end{array}}$$

$$\Psi_5(e_{1g}e_{2g}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{|\overline{\nu_g}\mu_g|}{2} - \frac{|\overline{\xi_g}\eta_g|}{2} + \frac{|\nu_g\overline{\mu_g}|}{2} + \frac{|\xi_g\overline{\eta_g}|}{2}$$

$e_{1u}e_{2u}$

$$\boxed{\begin{array}{c}\Delta E = \langle \mu_u\mu_u||\nu_u\nu_u\rangle + 3\langle \mu_u\xi_u||\eta_u\nu_u\rangle + \langle \mu_u\xi_u||\mu_u\xi_u\rangle \\ + \langle \mu_u\eta_u||\xi_u\nu_u\rangle\end{array}}$$

$$\Psi_6(e_{1u}e_{2u}, {}^1B_{1g}, M=0, \gamma_g) = -\frac{|\overline{\eta_u}\xi_u|}{2} - \frac{|\overline{\mu_u}\nu_u|}{2} + \frac{|\eta_u\overline{\xi_u}|}{2} + \frac{|\mu_u\overline{\nu_u}|}{2}$$

2.27.8 $^3B_{2g}$

$a_{1g}b_{2g}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\zeta_g\zeta_g\rangle + \langle \alpha_g\zeta_g||\alpha_g\zeta_g\rangle}$$

$$\Psi_1(a_{1g}b_{2g}, {}^3B_{2g}, M=-1, \zeta_g) = |\overline{\alpha_g}\overline{\zeta_g}|$$

$$\Psi_2(a_{1g}b_{2g}, {}^3B_{2g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$

$$\Psi_3(a_{1g}b_{2g}, {}^3B_{2g}, M=1, \zeta_g) = |\alpha_g\zeta_g|$$

$a_{2u}b_{1u}$

$$\boxed{\Delta E = -\langle \beta_u\beta_u||\gamma_u\gamma_u\rangle + \langle \beta_u\gamma_u||\beta_u\gamma_u\rangle}$$

$$\Psi_4(a_{2u}b_{1u}, {}^3B_{2g}, M=-1, \zeta_g) = |\overline{\beta_u}\overline{\gamma_u}|$$

$$\Psi_5(a_{2u}b_{1u}, {}^3B_{2g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$

$$\Psi_6(a_{2u}b_{1u}, {}^3B_{2g}, M=1, \zeta_g) = |\beta_u\gamma_u|$$

$a_{1u}b_{2u}$

$$\boxed{\Delta E = -\langle \alpha_u\alpha_u||\zeta_u\zeta_u\rangle + \langle \alpha_u\zeta_u||\alpha_u\zeta_u\rangle}$$

$$\Psi_7(a_{1u}b_{2u}, {}^3B_{2g}, M=-1, \zeta_g) = |\overline{\alpha_u}\overline{\zeta_u}|$$

$$\Psi_8(a_{1u}b_{2u}, {}^3B_{2g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_u}|}{2}$$

$$\Psi_9(a_{1u}b_{2u}, {}^3B_{2g}, M=1, \zeta_g) = |\alpha_u\zeta_u|$$

$a_{2g}b_{1g}$

$$\boxed{\Delta E = \langle \gamma_g\beta_g||\gamma_g\beta_g\rangle - \langle \gamma_g\gamma_g||\beta_g\beta_g\rangle}$$

$$\Psi_{10}(a_{2g}b_{1g}, {}^3B_{2g}, M=-1, \zeta_g) = |\overline{\gamma_g}\overline{\beta_g}|$$

$$\Psi_{11}(a_{2g}b_{1g}, {}^3B_{2g}, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\gamma_g}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\beta_g}|}{2}$$

$$\Psi_{12}(a_{2g}b_{1g}, {}^3B_{2g}, M=1, \zeta_g) = |\gamma_g\beta_g|$$

$e_{1g}e_{2g}$

$$\boxed{\begin{array}{c}\Delta E = -\langle \xi_g\mu_g||\nu_g\eta_g\rangle + \langle \xi_g\mu_g||\xi_g\mu_g\rangle - 2\langle \xi_g\xi_g||\mu_g\mu_g\rangle \\ - \langle \xi_g\nu_g||\mu_g\eta_g\rangle + \langle \xi_g\xi_g||\eta_g\eta_g\rangle\end{array}}$$

$$\Psi_{13}(e_{1g}e_{2g}, {}^3B_{2g}, M=-1, \zeta_g) = -\frac{\sqrt{2}|\overline{\nu_g}\overline{\eta_g}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\mu_g}|}{2}$$

$$\Psi_{14}(e_{1g}e_{2g}, {}^3B_{2g}, M=0, \zeta_g) = -\frac{|\overline{\nu_g}\eta_g|}{2} + \frac{|\overline{\xi_g}\mu_g|}{2} - \frac{|\nu_g\overline{\eta_g}|}{2} + \frac{|\xi_g\overline{\mu_g}|}{2}$$

$$\Psi_{15}(e_{1g}e_{2g}, {}^3B_{2g}, M=1, \zeta_g) = -\frac{\sqrt{2}|\nu_g\eta_g|}{2} + \frac{\sqrt{2}|\xi_g\mu_g|}{2}$$

$e_{1u}e_{2u}$

$$\boxed{\begin{array}{c}\Delta E = -2\langle \mu_u\mu_u||\xi_u\xi_u\rangle - \langle \mu_u\xi_u||\eta_u\nu_u\rangle + \langle \mu_u\xi_u||\mu_u\xi_u\rangle \\ - \langle \mu_u\eta_u||\xi_u\nu_u\rangle + \langle \mu_u\mu_u||\nu_u\nu_u\rangle\end{array}}$$

$$\Psi_{16}(e_{1u}e_{2u}, {}^3B_{2g}, M=-1, \zeta_g) = -\frac{\sqrt{2}|\overline{\eta_u}\overline{\nu_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\xi_u}|}{2}$$

$$\Psi_{17}(e_{1u}e_{2u}, {}^3B_{2g}, M=0, \zeta_g) = -\frac{|\overline{\eta_u}\nu_u|}{2} + \frac{|\overline{\mu_u}\xi_u|}{2} - \frac{|\eta_u\overline{\nu_u}|}{2} + \frac{|\mu_u\overline{\xi_u}|}{2}$$

$$\Psi_{18}(e_{1u}e_{2u}, {}^3B_{2g}, M=1, \zeta_g) = -\frac{\sqrt{2}|\eta_u\nu_u|}{2} + \frac{\sqrt{2}|\mu_u\xi_u|}{2}$$

2.27.9 $^1B_{2g}$

$a_{1g}b_{2g}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g || \zeta_g\zeta_g \rangle + \langle \alpha_g\zeta_g || \alpha_g\zeta_g \rangle}$$

$$\Psi_1(a_{1g}b_{2g}, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$

$a_{2u}b_{1u}$

$$\boxed{\Delta E = \langle \beta_u\beta_u || \gamma_u\gamma_u \rangle + \langle \beta_u\gamma_u || \beta_u\gamma_u \rangle}$$

$$\Psi_2(a_{2u}b_{1u}, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$

$a_{1u}b_{2u}$

$$\boxed{\Delta E = \langle \alpha_u\alpha_u || \zeta_u\zeta_u \rangle + \langle \alpha_u\zeta_u || \alpha_u\zeta_u \rangle}$$

$$\Psi_3(a_{1u}b_{2u}, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_u}|}{2}$$

$a_{2g}b_{1g}$

$$\boxed{\Delta E = \langle \gamma_g\beta_g || \gamma_g\beta_g \rangle + \langle \gamma_g\gamma_g || \beta_g\beta_g \rangle}$$

$$\Psi_4(a_{2g}b_{1g}, {}^1B_{2g}, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\beta_g}|}{2}$$

$e_{1g}e_{2g}$

$$\boxed{\begin{array}{c}\Delta E = -\langle \xi_g\mu_g || \nu_g\eta_g \rangle + \langle \xi_g\mu_g || \xi_g\mu_g \rangle + 2\langle \xi_g\xi_g || \mu_g\mu_g \rangle \\ + \langle \xi_g\nu_g || \mu_g\eta_g \rangle - \langle \xi_g\xi_g || \eta_g\eta_g \rangle\end{array}}$$

$$\Psi_5(e_{1g}e_{2g}, {}^1B_{2g}, M=0, \zeta_g) = \frac{|\overline{\nu_g}\eta_g|}{2} - \frac{|\overline{\xi_g}\mu_g|}{2} - \frac{|\nu_g\overline{\eta_g}|}{2} + \frac{|\xi_g\overline{\mu_g}|}{2}$$

$e_{1u}e_{2u}$

$$\boxed{\begin{array}{c}\Delta E = 2\langle \mu_u\mu_u || \xi_u\xi_u \rangle - \langle \mu_u\xi_u || \eta_u\nu_u \rangle + \langle \mu_u\xi_u || \mu_u\xi_u \rangle \\ + \langle \mu_u\eta_u || \xi_u\nu_u \rangle - \langle \mu_u\mu_u || \nu_u\nu_u \rangle\end{array}}$$

$$\Psi_6(e_{1u}e_{2u}, {}^1B_{2g}, M=0, \zeta_g) = \frac{|\overline{\eta_u}\nu_u|}{2} - \frac{|\overline{\mu_u}\xi_u|}{2} - \frac{|\eta_u\overline{\nu_u}|}{2} + \frac{|\mu_u\overline{\xi_u}|}{2}$$

2.27.10 $^3B_{1u}$

$a_{1g}b_{1u}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g || \gamma_u\gamma_u \rangle + \langle \alpha_g\gamma_u || \alpha_g\gamma_u \rangle}$$

$$\Psi_1(a_{1g}b_{1u}, {}^3B_{1u}, M=-1, \gamma_u) = |\overline{\alpha_g\gamma_u}|$$

$$\Psi_2(a_{1g}b_{1u}, {}^3B_{1u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$

$$\Psi_3(a_{1g}b_{1u}, {}^3B_{1u}, M=1, \gamma_u) = |\alpha_g\gamma_u|$$

$a_{2u}b_{2g}$

$$\boxed{\Delta E = -\langle \beta_u\beta_u || \zeta_g\zeta_g \rangle + \langle \beta_u\zeta_g || \beta_u\zeta_g \rangle}$$

$$\Psi_4(a_{2u}b_{2g}, {}^3B_{1u}, M=-1, \gamma_u) = |\overline{\beta_u\zeta_g}|$$

$$\Psi_5(a_{2u}b_{2g}, {}^3B_{1u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\beta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_g}|}{2}$$

$$\Psi_6(a_{2u}b_{2g}, {}^3B_{1u}, M=1, \gamma_u) = |\beta_u\zeta_g|$$

$a_{1u}b_{1g}$

$$\boxed{\Delta E = -\langle \alpha_u\alpha_u || \gamma_g\gamma_g \rangle + \langle \alpha_u\gamma_g || \alpha_u\gamma_g \rangle}$$

$$\Psi_7(a_{1u}b_{1g}, {}^3B_{1u}, M=-1, \gamma_u) = |\overline{\alpha_u\gamma_g}|$$

$$\Psi_8(a_{1u}b_{1g}, {}^3B_{1u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$

$$\Psi_9(a_{1u}b_{1g}, {}^3B_{1u}, M=1, \gamma_u) = |\alpha_u\gamma_g|$$

$a_{2g}b_{2u}$

$$\boxed{\Delta E = \langle \zeta_u\beta_g || \zeta_u\beta_g \rangle - \langle \zeta_u\zeta_u || \beta_g\beta_g \rangle}$$

$$\Psi_{10}(a_{2g}b_{2u}, {}^3B_{1u}, M=-1, \gamma_u) = |\overline{\zeta_u\beta_g}|$$

$$\Psi_{11}(a_{2g}b_{2u}, {}^3B_{1u}, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\zeta_u}\beta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\beta_g}|}{2}$$

$$\Psi_{12}(a_{2g}b_{2u}, {}^3B_{1u}, M=1, \gamma_u) = |\zeta_u\beta_g|$$

$e_{1u}e_{2g}$

$$\boxed{\begin{array}{c}\Delta E = -\langle \xi_g\mu_u || \nu_g\eta_u \rangle + \langle \xi_g\mu_u || \xi_g\mu_u \rangle - 2\langle \xi_g\xi_g || \mu_u\mu_u \rangle \\ - \langle \xi_g\nu_g || \mu_u\eta_u \rangle + \langle \xi_g\xi_g || \eta_u\eta_u \rangle\end{array}}$$

$$\Psi_{13}(e_{1u}e_{2g}, {}^3B_{1u}, M=-1, \gamma_u) = -\frac{\sqrt{2}|\overline{\nu_g\eta_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g\mu_u}|}{2}$$

$$\Psi_{14}(e_{1u}e_{2g}, {}^3B_{1u}, M=0, \gamma_u) = -\frac{|\overline{\nu_g}\eta_u|}{2} + \frac{|\overline{\xi_g}\mu_u|}{2} - \frac{|\nu_g\overline{\eta_u}|}{2} + \frac{|\xi_g\overline{\mu_u}|}{2}$$

$$\Psi_{15}(e_{1u}e_{2g}, {}^3B_{1u}, M=1, \gamma_u) = -\frac{\sqrt{2}|\nu_g\eta_u|}{2} + \frac{\sqrt{2}|\xi_g\mu_u|}{2}$$

$e_{1g}e_{2u}$

$$\boxed{\begin{array}{c}\Delta E = -2\langle \mu_g\mu_g || \xi_u\xi_u \rangle - \langle \mu_g\xi_u || \eta_g\nu_u \rangle + \langle \mu_g\xi_u || \mu_g\xi_u \rangle \\ - \langle \mu_g\eta_g || \xi_u\nu_u \rangle + \langle \mu_g\mu_g || \nu_u\nu_u \rangle\end{array}}$$

$$\Psi_{16}(e_{1g}e_{2u}, {}^3B_{1u}, M=-1, \gamma_u) = -\frac{\sqrt{2}|\overline{\eta_g\nu_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_g\xi_u}|}{2}$$

$$\Psi_{17}(e_{1g}e_{2u}, {}^3B_{1u}, M=0, \gamma_u) = -\frac{|\overline{\eta_g}\nu_u|}{2} + \frac{|\overline{\mu_g}\xi_u|}{2} - \frac{|\eta_g\overline{\nu_u}|}{2} + \frac{|\mu_g\overline{\xi_u}|}{2}$$

$$\Psi_{18}(e_{1g}e_{2u}, {}^3B_{1u}, M=1, \gamma_u) = -\frac{\sqrt{2}|\eta_g\nu_u|}{2} + \frac{\sqrt{2}|\mu_g\xi_u|}{2}$$

2.27.11 $^1B_{1u}$

$a_{1g}b_{1u}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\gamma_u\gamma_u\rangle + \langle \alpha_g\gamma_u||\alpha_g\gamma_u\rangle}$$

$$\Psi_1(a_{1g}b_{1u}, {}^1B_{1u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$

$a_{2u}b_{2g}$

$$\boxed{\Delta E = \langle \beta_u\beta_u||\zeta_g\zeta_g\rangle + \langle \beta_u\zeta_g||\beta_u\zeta_g\rangle}$$

$$\Psi_2(a_{2u}b_{2g}, {}^1B_{1u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\beta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\zeta_g}|}{2}$$

$a_{1u}b_{1g}$

$$\boxed{\Delta E = \langle \alpha_u\alpha_u||\gamma_g\gamma_g\rangle + \langle \alpha_u\gamma_g||\alpha_u\gamma_g\rangle}$$

$$\Psi_3(a_{1u}b_{1g}, {}^1B_{1u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$

$a_{2g}b_{2u}$

$$\boxed{\Delta E = \langle \zeta_u\beta_g||\zeta_u\beta_g\rangle + \langle \zeta_u\zeta_u||\beta_g\beta_g\rangle}$$

$$\Psi_4(a_{2g}b_{2u}, {}^1B_{1u}, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\beta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\beta_g}|}{2}$$

$e_{1u}e_{2g}$

$$\boxed{\begin{gathered}\Delta E = -\langle \xi_g\mu_u||\nu_g\eta_u\rangle + \langle \xi_g\mu_u||\xi_g\mu_u\rangle + 2\langle \xi_g\xi_g||\mu_u\mu_u\rangle \\ + \langle \xi_g\nu_g||\mu_u\eta_u\rangle - \langle \xi_g\xi_g||\eta_u\eta_u\rangle\end{gathered}}$$

$$\Psi_5(e_{1u}e_{2g}, {}^1B_{1u}, M=0, \gamma_u) = \frac{|\overline{\nu_g}\eta_u|}{2} - \frac{|\overline{\xi_g}\mu_u|}{2} - \frac{|\nu_g\overline{\eta_u}|}{2} + \frac{|\xi_g\overline{\mu_u}|}{2}$$

$e_{1g}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = 2\langle \mu_g\mu_g||\xi_u\xi_u\rangle - \langle \mu_g\xi_u||\eta_g\nu_u\rangle + \langle \mu_g\xi_u||\mu_g\xi_u\rangle \\ + \langle \mu_g\eta_g||\xi_u\nu_u\rangle - \langle \mu_g\mu_g||\nu_u\nu_u\rangle\end{gathered}}$$

$$\Psi_6(e_{1g}e_{2u}, {}^1B_{1u}, M=0, \gamma_u) = \frac{|\overline{\eta_g}\nu_u|}{2} - \frac{|\overline{\mu_g}\xi_u|}{2} - \frac{|\eta_g\overline{\nu_u}|}{2} + \frac{|\mu_g\overline{\xi_u}|}{2}$$

2.27.12 $^3B_{2u}$

$a_{1g}b_{2u}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\zeta_u\zeta_u\rangle + \langle \alpha_g\zeta_u||\alpha_g\zeta_u\rangle}$$

$$\Psi_1(a_{1g}b_{2u}, {}^3B_{2u}, M=-1, \zeta_u) = |\overline{\alpha_g}\overline{\zeta_u}|$$

$$\Psi_2(a_{1g}b_{2u}, {}^3B_{2u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$

$$\Psi_3(a_{1g}b_{2u}, {}^3B_{2u}, M=1, \zeta_u) = |\alpha_g\zeta_u|$$

$a_{2u}b_{1g}$

$$\boxed{\Delta E = -\langle \beta_u\beta_u||\gamma_g\gamma_g\rangle + \langle \beta_u\gamma_g||\beta_u\gamma_g\rangle}$$

$$\Psi_4(a_{2u}b_{1g}, {}^3B_{2u}, M=-1, \zeta_u) = |\overline{\beta_u}\overline{\gamma_g}|$$

$$\Psi_5(a_{2u}b_{1g}, {}^3B_{2u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

$$\Psi_6(a_{2u}b_{1g}, {}^3B_{2u}, M=1, \zeta_u) = |\beta_u\gamma_g|$$

$a_{1u}b_{2g}$

$$\boxed{\Delta E = -\langle \alpha_u\alpha_u||\zeta_g\zeta_g\rangle + \langle \alpha_u\zeta_g||\alpha_u\zeta_g\rangle}$$

$$\Psi_7(a_{1u}b_{2g}, {}^3B_{2u}, M=-1, \zeta_u) = |\overline{\alpha_u}\overline{\zeta_g}|$$

$$\Psi_8(a_{1u}b_{2g}, {}^3B_{2u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$

$$\Psi_9(a_{1u}b_{2g}, {}^3B_{2u}, M=1, \zeta_u) = |\alpha_u\zeta_g|$$

$a_{2g}b_{1u}$

$$\boxed{\Delta E = \langle \gamma_u\beta_g||\gamma_u\beta_g\rangle - \langle \gamma_u\gamma_u||\beta_g\beta_g\rangle}$$

$$\Psi_{10}(a_{2g}b_{1u}, {}^3B_{2u}, M=-1, \zeta_u) = |\overline{\gamma_u}\overline{\beta_g}|$$

$$\Psi_{11}(a_{2g}b_{1u}, {}^3B_{2u}, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\beta_g}|}{2}$$

$$\Psi_{12}(a_{2g}b_{1u}, {}^3B_{2u}, M=1, \zeta_u) = |\gamma_u\beta_g|$$

$e_{1u}e_{2g}$

$$\boxed{\begin{gathered}\Delta E = 3\langle \xi_g\mu_u||\nu_g\eta_u\rangle + \langle \xi_g\mu_u||\xi_g\mu_u\rangle - \langle \xi_g\xi_g||\eta_u\eta_u\rangle \\ - \langle \xi_g\nu_g||\mu_u\eta_u\rangle\end{gathered}}$$

$$\Psi_{13}(e_{1u}e_{2g}, {}^3B_{2u}, M=-1, \zeta_u) = \frac{\sqrt{2}|\overline{\nu_g}\overline{\mu_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\eta_u}|}{2}$$

$$\Psi_{14}(e_{1u}e_{2g}, {}^3B_{2u}, M=0, \zeta_u) = \frac{|\overline{\nu_g}\mu_u|}{2} + \frac{|\overline{\xi_g}\eta_u|}{2} + \frac{|\nu_g\overline{\mu_u}|}{2} + \frac{|\xi_g\overline{\eta_u}|}{2}$$

$$\Psi_{15}(e_{1u}e_{2g}, {}^3B_{2u}, M=1, \zeta_u) = \frac{\sqrt{2}|\nu_g\mu_u|}{2} + \frac{\sqrt{2}|\xi_g\eta_u|}{2}$$

$e_{1g}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = -\langle \mu_g\mu_g||\nu_u\nu_u\rangle + 3\langle \mu_g\xi_u||\eta_g\nu_u\rangle + \langle \mu_g\xi_u||\mu_g\xi_u\rangle \\ - \langle \mu_g\eta_g||\xi_u\nu_u\rangle\end{gathered}}$$

$$\Psi_{16}(e_{1g}e_{2u}, {}^3B_{2u}, M=-1, \zeta_u) = \frac{\sqrt{2}|\overline{\eta_g}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\overline{\nu_u}|}{2}$$

$$\Psi_{17}(e_{1g}e_{2u}, {}^3B_{2u}, M=0, \zeta_u) = \frac{|\overline{\eta_g}\xi_u|}{2} + \frac{|\overline{\mu_g}\nu_u|}{2} + \frac{|\eta_g\overline{\xi_u}|}{2} + \frac{|\mu_g\overline{\nu_u}|}{2}$$

$$\Psi_{18}(e_{1g}e_{2u}, {}^3B_{2u}, M=1, \zeta_u) = \frac{\sqrt{2}|\eta_g\xi_u|}{2} + \frac{\sqrt{2}|\mu_g\nu_u|}{2}$$

2.27.13 $^1B_{2u}$

$a_{1g}b_{2u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\zeta_u\zeta_u\rangle + \langle\alpha_g\zeta_u||\alpha_g\zeta_u\rangle}$$

$$\Psi_1(a_{1g}b_{2u},{}^1B_{2u},M=0,\zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$

$a_{2u}b_{1g}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\gamma_g\gamma_g\rangle + \langle\beta_u\gamma_g||\beta_u\gamma_g\rangle}$$

$$\Psi_2(a_{2u}b_{1g},{}^1B_{2u},M=0,\zeta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

$a_{1u}b_{2g}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\zeta_g\zeta_g\rangle + \langle\alpha_u\zeta_g||\alpha_u\zeta_g\rangle}$$

$$\Psi_3(a_{1u}b_{2g},{}^1B_{2u},M=0,\zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$

$a_{2g}b_{1u}$

$$\boxed{\Delta E = \langle\gamma_u\beta_g||\gamma_u\beta_g\rangle + \langle\gamma_u\gamma_u||\beta_g\beta_g\rangle}$$

$$\Psi_4(a_{2g}b_{1u},{}^1B_{2u},M=0,\zeta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\beta_g}|}{2}$$

$e_{1u}e_{2g}$

$$\boxed{\begin{gathered}\Delta E = 3\langle\xi_g\mu_u||\nu_g\eta_u\rangle + \langle\xi_g\mu_u||\xi_g\mu_u\rangle + \langle\xi_g\xi_g||\eta_u\eta_u\rangle\\ + \langle\xi_g\nu_g||\mu_u\eta_u\rangle\end{gathered}}$$

$$\Psi_5(e_{1u}e_{2g},{}^1B_{2u},M=0,\zeta_u) = \\ -\frac{|\overline{\nu_g}\mu_u|}{2} - \frac{|\overline{\xi_g}\eta_u|}{2} + \frac{|\nu_g\overline{\mu_u}|}{2} + \frac{|\xi_g\overline{\eta_u}|}{2}$$

$e_{1g}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = \langle\mu_g\mu_g||\nu_u\nu_u\rangle + 3\langle\mu_g\xi_u||\eta_g\nu_u\rangle + \langle\mu_g\xi_u||\mu_g\xi_u\rangle\\ + \langle\mu_g\eta_g||\xi_u\nu_u\rangle\end{gathered}}$$

$$\Psi_6(e_{1g}e_{2u},{}^1B_{2u},M=0,\zeta_u) = \\ -\frac{|\overline{\eta_g}\xi_u|}{2} - \frac{|\overline{\mu_g}\nu_u|}{2} + \frac{|\eta_g\overline{\xi_u}|}{2} + \frac{|\mu_g\overline{\nu_u}|}{2}$$

2.27.14 $^3A_{2g}$

$a_{1g}a_{2g}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle\alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_{1g}a_{2g},{}^3A_{2g},M=-1,\beta_g) = |\overline{\alpha_g}\overline{\beta_g}|$$
$$\Psi_2(a_{1g}a_{2g},{}^3A_{2g},M=0,\beta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$
$$\Psi_3(a_{1g}a_{2g},{}^3A_{2g},M=1,\beta_g) = |\alpha_g\beta_g|$$

$a_{1u}a_{2u}$

$$\boxed{\Delta E = \langle\beta_u\alpha_u||\beta_u\alpha_u\rangle - \langle\beta_u\beta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_4(a_{1u}a_{2u},{}^3A_{2g},M=-1,\beta_g) = |\overline{\beta_u}\overline{\alpha_u}|$$
$$\Psi_5(a_{1u}a_{2u},{}^3A_{2g},M=0,\beta_g) = \frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$
$$\Psi_6(a_{1u}a_{2u},{}^3A_{2g},M=1,\beta_g) = |\beta_u\alpha_u|$$

$b_{1g}b_{2g}$

$$\boxed{\Delta E = -\langle\gamma_g\gamma_g||\zeta_g\zeta_g\rangle + \langle\gamma_g\zeta_g||\gamma_g\zeta_g\rangle}$$

$$\Psi_7(b_{1g}b_{2g},{}^3A_{2g},M=-1,\beta_g) = |\overline{\gamma_g}\overline{\zeta_g}|$$
$$\Psi_8(b_{1g}b_{2g},{}^3A_{2g},M=0,\beta_g) = \frac{\sqrt{2}|\overline{\gamma_g}\zeta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\zeta_g}|}{2}$$
$$\Psi_9(b_{1g}b_{2g},{}^3A_{2g},M=1,\beta_g) = |\gamma_g\zeta_g|$$

$b_{1u}b_{2u}$

$$\boxed{\Delta E = -\langle\gamma_u\gamma_u||\zeta_u\zeta_u\rangle + \langle\gamma_u\zeta_u||\gamma_u\zeta_u\rangle}$$

$$\Psi_{10}(b_{1u}b_{2u},{}^3A_{2g},M=-1,\beta_g) = |\overline{\gamma_u}\overline{\zeta_u}|$$
$$\Psi_{11}(b_{1u}b_{2u},{}^3A_{2g},M=0,\beta_g) = \frac{\sqrt{2}|\overline{\gamma_u}\zeta_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\zeta_u}|}{2}$$
$$\Psi_{12}(b_{1u}b_{2u},{}^3A_{2g},M=1,\beta_g) = |\gamma_u\zeta_u|$$

e_{2g}^2

$$\boxed{\Delta E = -3\langle\xi_g\xi_g||\nu_g\nu_g\rangle + \langle\xi_g\xi_g||\xi_g\xi_g\rangle}$$

$$\Psi_{13}(e_{2g}^2,{}^3A_{2g},M=-1,\beta_g) = -|\overline{\nu_g}\overline{\xi_g}|$$
$$\Psi_{14}(e_{2g}^2,{}^3A_{2g},M=0,\beta_g) = -\frac{\sqrt{2}|\overline{\nu_g}\xi_g|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\nu_g|}{2}$$
$$\Psi_{15}(e_{2g}^2,{}^3A_{2g},M=1,\beta_g) = -|\nu_g\xi_g|$$

e_{1u}^2

$$\boxed{\Delta E = -3\langle\mu_u\mu_u||\eta_u\eta_u\rangle + \langle\mu_u\mu_u||\mu_u\mu_u\rangle}$$

$$\Psi_{16}(e_{1u}^2,{}^3A_{2g},M=-1,\beta_g) = -|\overline{\eta_u}\overline{\mu_u}|$$
$$\Psi_{17}(e_{1u}^2,{}^3A_{2g},M=0,\beta_g) = -\frac{\sqrt{2}|\overline{\eta_u}\mu_u|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\eta_u|}{2}$$
$$\Psi_{18}(e_{1u}^2,{}^3A_{2g},M=1,\beta_g) = -|\eta_u\mu_u|$$

e_{1g}^2

$$\boxed{\Delta E = -3\langle\mu_g\mu_g||\eta_g\eta_g\rangle + \langle\mu_g\mu_g||\mu_g\mu_g\rangle}$$

$$\Psi_{19}(e_{1g}^2,{}^3A_{2g},M=-1,\beta_g) = -|\overline{\eta_g}\overline{\mu_g}|$$
$$\Psi_{20}(e_{1g}^2,{}^3A_{2g},M=0,\beta_g) = -\frac{\sqrt{2}|\overline{\eta_g}\mu_g|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\eta_g|}{2}$$
$$\Psi_{21}(e_{1g}^2,{}^3A_{2g},M=1,\beta_g) = -|\eta_g\mu_g|$$

e_{2u}^2

$$\boxed{\Delta E = -3\langle\xi_u\xi_u||\nu_u\nu_u\rangle + \langle\xi_u\xi_u||\xi_u\xi_u\rangle}$$

$$\Psi_{22}(e_{2u}^2, {}^3A_{2g}, M=-1, \beta_g) = -\left|\overline{\nu_u}\overline{\xi_u}\right|$$
$$\Psi_{23}(e_{2u}^2, {}^3A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\nu_u}\xi_u|}{2} + \frac{\sqrt{2}|\overline{\xi_u}\nu_u|}{2}$$
$$\Psi_{24}(e_{2u}^2, {}^3A_{2g}, M=1, \beta_g) = -|\nu_u\xi_u|$$

2.27.15 ${}^1A_{2g}$

$a_{1g}a_{2g}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle\alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_{1g}a_{2g}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$

$a_{1u}a_{2u}$

$$\boxed{\Delta E = \langle\beta_u\alpha_u||\beta_u\alpha_u\rangle + \langle\beta_u\beta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_2(a_{1u}a_{2u}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$

$b_{1g}b_{2g}$

$$\boxed{\Delta E = \langle\gamma_g\gamma_g||\zeta_g\zeta_g\rangle + \langle\gamma_g\zeta_g||\gamma_g\zeta_g\rangle}$$

$$\Psi_3(b_{1g}b_{2g}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\zeta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\zeta_g}|}{2}$$

$b_{1u}b_{2u}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\zeta_u\zeta_u\rangle + \langle\gamma_u\zeta_u||\gamma_u\zeta_u\rangle}$$

$$\Psi_4(b_{1u}b_{2u}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\zeta_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\zeta_u}|}{2}$$

2.27.16 ${}^3E_{2g}$

$a_{1g}e_{2g}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\xi_g\xi_g\rangle + \langle\alpha_g\xi_g||\alpha_g\xi_g\rangle}$$

$$\Psi_1(a_{1g}e_{2g}, {}^3E_{2g}, M=-1, \nu_g) = |\overline{\alpha_g}\overline{\nu_g}|$$
$$\Psi_2(a_{1g}e_{2g}, {}^3E_{2g}, M=-1, \xi_g) = |\overline{\alpha_g}\overline{\xi_g}|$$
$$\Psi_3(a_{1g}e_{2g}, {}^3E_{2g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\alpha_g}\nu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\nu_g}|}{2}$$
$$\Psi_4(a_{1g}e_{2g}, {}^3E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\alpha_g}\xi_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\xi_g}|}{2}$$
$$\Psi_5(a_{1g}e_{2g}, {}^3E_{2g}, M=1, \nu_g) = |\alpha_g\nu_g|$$
$$\Psi_6(a_{1g}e_{2g}, {}^3E_{2g}, M=1, \xi_g) = |\alpha_g\xi_g|$$

$a_{2u}e_{2u}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\xi_u\xi_u\rangle + \langle\beta_u\xi_u||\beta_u\xi_u\rangle}$$

$$\Psi_7(a_{2u}e_{2u}, {}^3E_{2g}, M=-1, \nu_g) = |\overline{\beta_u}\overline{\nu_u}|$$
$$\Psi_8(a_{2u}e_{2u}, {}^3E_{2g}, M=-1, \xi_g) = |\overline{\beta_u}\overline{\xi_u}|$$
$$\Psi_9(a_{2u}e_{2u}, {}^3E_{2g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\beta_u}\nu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\nu_u}|}{2}$$
$$\Psi_{10}(a_{2u}e_{2u}, {}^3E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\beta_u}\xi_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\xi_u}|}{2}$$
$$\Psi_{11}(a_{2u}e_{2u}, {}^3E_{2g}, M=1, \nu_g) = |\beta_u\nu_u|$$
$$\Psi_{12}(a_{2u}e_{2u}, {}^3E_{2g}, M=1, \xi_g) = |\beta_u\xi_u|$$

$a_{1u}e_{2u}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\xi_u\xi_u\rangle + \langle\alpha_u\xi_u||\alpha_u\xi_u\rangle}$$

$$\Psi_{13}(a_{1u}e_{2u}, {}^3E_{2g}, M=-1, \xi_g) = -|\overline{\alpha_u}\overline{\nu_u}|$$
$$\Psi_{14}(a_{1u}e_{2u}, {}^3E_{2g}, M=-1, \nu_g) = |\overline{\alpha_u}\overline{\xi_u}|$$
$$\Psi_{15}(a_{1u}e_{2u}, {}^3E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\nu_u|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\nu_u}|}{2}$$
$$\Psi_{16}(a_{1u}e_{2u}, {}^3E_{2g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\alpha_u}\xi_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\xi_u}|}{2}$$
$$\Psi_{17}(a_{1u}e_{2u}, {}^3E_{2g}, M=1, \xi_g) = -|\alpha_u\nu_u|$$
$$\Psi_{18}(a_{1u}e_{2u}, {}^3E_{2g}, M=1, \nu_g) = |\alpha_u\xi_u|$$

$b_{1g}e_{1g}$

$$\boxed{\Delta E = -\langle\gamma_g\gamma_g||\mu_g\mu_g\rangle + \langle\gamma_g\mu_g||\gamma_g\mu_g\rangle}$$

$$\Psi_{19}(b_{1g}e_{1g}, {}^3E_{2g}, M=-1, \xi_g) = |\overline{\gamma_g}\overline{\eta_g}|$$
$$\Psi_{20}(b_{1g}e_{1g}, {}^3E_{2g}, M=-1, \nu_g) = |\overline{\gamma_g}\overline{\mu_g}|$$
$$\Psi_{21}(b_{1g}e_{1g}, {}^3E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\gamma_g}\eta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\eta_g}|}{2}$$
$$\Psi_{22}(b_{1g}e_{1g}, {}^3E_{2g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\gamma_g}\mu_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\mu_g}|}{2}$$
$$\Psi_{23}(b_{1g}e_{1g}, {}^3E_{2g}, M=1, \xi_g) = |\gamma_g\eta_g|$$
$$\Psi_{24}(b_{1g}e_{1g}, {}^3E_{2g}, M=1, \nu_g) = |\gamma_g\mu_g|$$

$b_{2g}e_{1g}$

$$\boxed{\Delta E = \langle\zeta_g\mu_g||\zeta_g\mu_g\rangle - \langle\zeta_g\zeta_g||\mu_g\mu_g\rangle}$$

$$\Psi_{25}(b_{2g}e_{1g}, {}^3E_{2g}, M=-1, \nu_g) = |\overline{\zeta_g}\overline{\eta_g}|$$
$$\Psi_{26}(b_{2g}e_{1g}, {}^3E_{2g}, M=-1, \xi_g) = -|\overline{\zeta_g}\overline{\mu_g}|$$
$$\Psi_{27}(b_{2g}e_{1g}, {}^3E_{2g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\zeta_g}\eta_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\eta_g}|}{2}$$
$$\Psi_{28}(b_{2g}e_{1g}, {}^3E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\mu_g|}{2} - \frac{\sqrt{2}|\zeta_g\overline{\mu_g}|}{2}$$
$$\Psi_{29}(b_{2g}e_{1g}, {}^3E_{2g}, M=1, \nu_g) = |\zeta_g\eta_g|$$
$$\Psi_{30}(b_{2g}e_{1g}, {}^3E_{2g}, M=1, \xi_g) = -|\zeta_g\mu_g|$$

$b_{1u}e_{1u}$

$$\boxed{\Delta E = -\langle\gamma_u\gamma_u||\mu_u\mu_u\rangle + \langle\gamma_u\mu_u||\gamma_u\mu_u\rangle}$$

$$\Psi_{31}(b_{1u}e_{1u}, {}^3E_{2g}, M=-1, \nu_g) = |\overline{\gamma_u}\overline{\eta_u}|$$
$$\Psi_{32}(b_{1u}e_{1u}, {}^3E_{2g}, M=-1, \xi_g) = -|\overline{\gamma_u}\overline{\mu_u}|$$
$$\Psi_{33}(b_{1u}e_{1u}, {}^3E_{2g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\gamma_u}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_u}|}{2}$$
$$\Psi_{34}(b_{1u}e_{1u}, {}^3E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\mu_u|}{2} - \frac{\sqrt{2}|\gamma_u\overline{\mu_u}|}{2}$$
$$\Psi_{35}(b_{1u}e_{1u}, {}^3E_{2g}, M=1, \nu_g) = |\gamma_u\eta_u|$$

$$\Psi_{36}(b_{1u}e_{1u}, {}^3E_{2g}, M=1, \xi_g) = -|\gamma_u\mu_u|$$

$b_{2u}e_{1u}$

$$\boxed{\Delta E = \langle\zeta_u\mu_u||\zeta_u\mu_u\rangle - \langle\zeta_u\zeta_u||\mu_u\mu_u\rangle}$$

$$\Psi_{37}(b_{2u}e_{1u}, {}^3E_{2g}, M=-1, \xi_g) = |\overline{\zeta_u}\overline{\eta_u}|$$
$$\Psi_{38}(b_{2u}e_{1u}, {}^3E_{2g}, M=-1, \nu_g) = |\overline{\zeta_u}\overline{\mu_u}|$$
$$\Psi_{39}(b_{2u}e_{1u}, {}^3E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\zeta_u}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_u}|}{2}$$
$$\Psi_{40}(b_{2u}e_{1u}, {}^3E_{2g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\zeta_u}\mu_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\mu_u}|}{2}$$
$$\Psi_{41}(b_{2u}e_{1u}, {}^3E_{2g}, M=1, \xi_g) = |\zeta_u\eta_u|$$
$$\Psi_{42}(b_{2u}e_{1u}, {}^3E_{2g}, M=1, \nu_g) = |\zeta_u\mu_u|$$

$a_{2g}e_{2g}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\xi_g\xi_g\rangle + \langle\beta_g\xi_g||\beta_g\xi_g\rangle}$$

$$\Psi_{43}(a_{2g}e_{2g}, {}^3E_{2g}, M=-1, \xi_g) = -|\overline{\beta_g}\overline{\nu_g}|$$
$$\Psi_{44}(a_{2g}e_{2g}, {}^3E_{2g}, M=-1, \nu_g) = |\overline{\beta_g}\overline{\xi_g}|$$
$$\Psi_{45}(a_{2g}e_{2g}, {}^3E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\beta_g}\nu_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\nu_g}|}{2}$$
$$\Psi_{46}(a_{2g}e_{2g}, {}^3E_{2g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\beta_g}\xi_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\xi_g}|}{2}$$
$$\Psi_{47}(a_{2g}e_{2g}, {}^3E_{2g}, M=1, \xi_g) = -|\beta_g\nu_g|$$
$$\Psi_{48}(a_{2g}e_{2g}, {}^3E_{2g}, M=1, \nu_g) = |\beta_g\xi_g|$$

2.27.17 $^1E_{2g}$

$a_{1g}e_{2g}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\xi_g\xi_g\rangle + \langle\alpha_g\xi_g||\alpha_g\xi_g\rangle}$$

$$\Psi_{1}(a_{1g}e_{2g}, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\nu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\nu_g}|}{2}$$
$$\Psi_{2}(a_{1g}e_{2g}, {}^1E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\xi_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\xi_g}|}{2}$$

$a_{2u}e_{2u}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\xi_u\xi_u\rangle + \langle\beta_u\xi_u||\beta_u\xi_u\rangle}$$

$$\Psi_{3}(a_{2u}e_{2u}, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\beta_u}\nu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\nu_u}|}{2}$$
$$\Psi_{4}(a_{2u}e_{2u}, {}^1E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\beta_u}\xi_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\xi_u}|}{2}$$

$a_{1u}e_{2u}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\xi_u\xi_u\rangle + \langle\alpha_u\xi_u||\alpha_u\xi_u\rangle}$$

$$\Psi_{5}(a_{1u}e_{2u}, {}^1E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\alpha_u}\nu_u|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\nu_u}|}{2}$$
$$\Psi_{6}(a_{1u}e_{2u}, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\xi_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\xi_u}|}{2}$$

$b_{1g}e_{1g}$

$$\boxed{\Delta E = \langle\gamma_g\gamma_g||\mu_g\mu_g\rangle + \langle\gamma_g\mu_g||\gamma_g\mu_g\rangle}$$

$$\Psi_{7}(b_{1g}e_{1g}, {}^1E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\eta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\eta_g}|}{2}$$
$$\Psi_{8}(b_{1g}e_{1g}, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\mu_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\mu_g}|}{2}$$

$b_{2g}e_{1g}$

$$\boxed{\Delta E = \langle\zeta_g\mu_g||\zeta_g\mu_g\rangle + \langle\zeta_g\zeta_g||\mu_g\mu_g\rangle}$$

$$\Psi_{9}(b_{2g}e_{1g}, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\eta_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\eta_g}|}{2}$$
$$\Psi_{10}(b_{2g}e_{1g}, {}^1E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\zeta_g}\mu_g|}{2} - \frac{\sqrt{2}|\zeta_g\overline{\mu_g}|}{2}$$

$b_{1u}e_{1u}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\mu_u\mu_u\rangle + \langle\gamma_u\mu_u||\gamma_u\mu_u\rangle}$$

$$\Psi_{11}(b_{1u}e_{1u}, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_u}|}{2}$$
$$\Psi_{12}(b_{1u}e_{1u}, {}^1E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\gamma_u}\mu_u|}{2} - \frac{\sqrt{2}|\gamma_u\overline{\mu_u}|}{2}$$

$b_{2u}e_{1u}$

$$\boxed{\Delta E = \langle\zeta_u\mu_u||\zeta_u\mu_u\rangle + \langle\zeta_u\zeta_u||\mu_u\mu_u\rangle}$$

$$\Psi_{13}(b_{2u}e_{1u}, {}^1E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_u}|}{2}$$
$$\Psi_{14}(b_{2u}e_{1u}, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\mu_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\mu_u}|}{2}$$

$a_{2g}e_{2g}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\xi_g\xi_g\rangle + \langle\beta_g\xi_g||\beta_g\xi_g\rangle}$$

$$\Psi_{15}(a_{2g}e_{2g}, {}^1E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\beta_g}\nu_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\nu_g}|}{2}$$
$$\Psi_{16}(a_{2g}e_{2g}, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\beta_g}\xi_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\xi_g}|}{2}$$

e_{2g}^2

$$\boxed{\Delta E = -\langle\xi_g\xi_g||\nu_g\nu_g\rangle + \langle\xi_g\xi_g||\xi_g\xi_g\rangle}$$

$$\Psi_{17}(e_{2g}^2, {}^1E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\nu_g}\nu_g|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\xi_g|}{2}$$
$$\Psi_{18}(e_{2g}^2, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\nu_g}\xi_g|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\nu_g|}{2}$$

e_{1u}^2

$$\boxed{\Delta E = -\langle\mu_u\mu_u||\eta_u\eta_u\rangle + \langle\mu_u\mu_u||\mu_u\mu_u\rangle}$$

$$\Psi_{19}(e_{1u}^2, {}^1E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\eta_u}\eta_u|}{2} - \frac{\sqrt{2}|\overline{\mu_u}\mu_u|}{2}$$
$$\Psi_{20}(e_{1u}^2, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\eta_u}\mu_u|}{2} - \frac{\sqrt{2}|\overline{\mu_u}\eta_u|}{2}$$

e_{1g}^2

$$\boxed{\Delta E = -\langle\mu_g\mu_g||\eta_g\eta_g\rangle + \langle\mu_g\mu_g||\mu_g\mu_g\rangle}$$

$$\Psi_{21}(e_{1g}^2, {}^1E_{2g}, M=0, \xi_g) = \frac{\sqrt{2}|\overline{\eta_g}\eta_g|}{2} - \frac{\sqrt{2}|\overline{\mu_g}\mu_g|}{2}$$
$$\Psi_{22}(e_{1g}^2, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\eta_g}\mu_g|}{2} - \frac{\sqrt{2}|\overline{\mu_g}\eta_g|}{2}$$

e_{2u}^2

$$\boxed{\Delta E = -\langle\xi_u\xi_u||\nu_u\nu_u\rangle + \langle\xi_u\xi_u||\xi_u\xi_u\rangle}$$

$$\Psi_{23}(e_{2u}^2, {}^1E_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\nu_u}\nu_u|}{2} + \frac{\sqrt{2}|\overline{\xi_u}\xi_u|}{2}$$
$$\Psi_{24}(e_{2u}^2, {}^1E_{2g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\nu_u}\xi_u|}{2} - \frac{\sqrt{2}|\overline{\xi_u}\nu_u|}{2}$$

2.27.18 $^3E_{1u}$

$a_{1g}e_{1u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\mu_u\mu_u\rangle + \langle\alpha_g\mu_u||\alpha_g\mu_u\rangle}$$

$$\Psi_1(a_{1g}e_{1u}, {}^3E_{1u}, M=-1, \eta_u) = |\overline{\alpha_g}\overline{\eta_u}|$$
$$\Psi_2(a_{1g}e_{1u}, {}^3E_{1u}, M=-1, \mu_u) = |\overline{\alpha_g}\overline{\mu_u}|$$
$$\Psi_3(a_{1g}e_{1u}, {}^3E_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_u}|}{2}$$
$$\Psi_4(a_{1g}e_{1u}, {}^3E_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\alpha_g}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_u}|}{2}$$
$$\Psi_5(a_{1g}e_{1u}, {}^3E_{1u}, M=1, \eta_u) = |\alpha_g\eta_u|$$
$$\Psi_6(a_{1g}e_{1u}, {}^3E_{1u}, M=1, \mu_u) = |\alpha_g\mu_u|$$

$a_{2u}e_{1g}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\mu_g\mu_g\rangle + \langle\beta_u\mu_g||\beta_u\mu_g\rangle}$$

$$\Psi_7(a_{2u}e_{1g}, {}^3E_{1u}, M=-1, \eta_u) = |\overline{\beta_u}\overline{\eta_g}|$$
$$\Psi_8(a_{2u}e_{1g}, {}^3E_{1u}, M=-1, \mu_u) = |\overline{\beta_u}\overline{\mu_g}|$$
$$\Psi_9(a_{2u}e_{1g}, {}^3E_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\beta_u}\eta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_g}|}{2}$$
$$\Psi_{10}(a_{2u}e_{1g}, {}^3E_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\beta_u}\mu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_g}|}{2}$$
$$\Psi_{11}(a_{2u}e_{1g}, {}^3E_{1u}, M=1, \eta_u) = |\beta_u\eta_g|$$
$$\Psi_{12}(a_{2u}e_{1g}, {}^3E_{1u}, M=1, \mu_u) = |\beta_u\mu_g|$$

$a_{1u}e_{1g}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\mu_g\mu_g\rangle + \langle\alpha_u\mu_g||\alpha_u\mu_g\rangle}$$

$$\Psi_{13}(a_{1u}e_{1g}, {}^3E_{1u}, M=-1, \mu_u) = -|\overline{\alpha_u}\overline{\eta_g}|$$
$$\Psi_{14}(a_{1u}e_{1g}, {}^3E_{1u}, M=-1, \eta_u) = |\overline{\alpha_u}\overline{\mu_g}|$$
$$\Psi_{15}(a_{1u}e_{1g}, {}^3E_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\eta_g|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\eta_g}|}{2}$$
$$\Psi_{16}(a_{1u}e_{1g}, {}^3E_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_g}|}{2}$$
$$\Psi_{17}(a_{1u}e_{1g}, {}^3E_{1u}, M=1, \mu_u) = -|\alpha_u\eta_g|$$
$$\Psi_{18}(a_{1u}e_{1g}, {}^3E_{1u}, M=1, \eta_u) = |\alpha_u\mu_g|$$

$b_{1g}e_{2u}$

$$\boxed{\Delta E = -\langle\gamma_g\gamma_g||\xi_u\xi_u\rangle + \langle\gamma_g\xi_u||\gamma_g\xi_u\rangle}$$

$$\Psi_{19}(b_{1g}e_{2u}, {}^3E_{1u}, M=-1, \mu_u) = |\overline{\gamma_g}\overline{\nu_u}|$$
$$\Psi_{20}(b_{1g}e_{2u}, {}^3E_{1u}, M=-1, \eta_u) = |\overline{\gamma_g}\overline{\xi_u}|$$
$$\Psi_{21}(b_{1g}e_{2u}, {}^3E_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\gamma_g}\nu_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\nu_u}|}{2}$$
$$\Psi_{22}(b_{1g}e_{2u}, {}^3E_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\gamma_g}\xi_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\xi_u}|}{2}$$
$$\Psi_{23}(b_{1g}e_{2u}, {}^3E_{1u}, M=1, \mu_u) = |\gamma_g\nu_u|$$
$$\Psi_{24}(b_{1g}e_{2u}, {}^3E_{1u}, M=1, \eta_u) = |\gamma_g\xi_u|$$

$b_{2g}e_{2u}$

$$\boxed{\Delta E = \langle\zeta_g\xi_u||\zeta_g\xi_u\rangle - \langle\zeta_g\zeta_g||\xi_u\xi_u\rangle}$$

$$\Psi_{25}(b_{2g}e_{2u}, {}^3E_{1u}, M=-1, \eta_u) = |\overline{\zeta_g}\overline{\nu_u}|$$
$$\Psi_{26}(b_{2g}e_{2u}, {}^3E_{1u}, M=-1, \mu_u) = -|\overline{\zeta_g}\overline{\xi_u}|$$
$$\Psi_{27}(b_{2g}e_{2u}, {}^3E_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\zeta_g}\nu_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\nu_u}|}{2}$$
$$\Psi_{28}(b_{2g}e_{2u}, {}^3E_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\xi_u|}{2} - \frac{\sqrt{2}|\zeta_g\overline{\xi_u}|}{2}$$
$$\Psi_{29}(b_{2g}e_{2u}, {}^3E_{1u}, M=1, \eta_u) = |\zeta_g\nu_u|$$
$$\Psi_{30}(b_{2g}e_{2u}, {}^3E_{1u}, M=1, \mu_u) = -|\zeta_g\xi_u|$$

$b_{1u}e_{2g}$

$$\boxed{\Delta E = -\langle\gamma_u\gamma_u||\xi_g\xi_g\rangle + \langle\gamma_u\xi_g||\gamma_u\xi_g\rangle}$$

$$\Psi_{31}(b_{1u}e_{2g}, {}^3E_{1u}, M=-1, \eta_u) = |\overline{\gamma_u}\overline{\nu_g}|$$
$$\Psi_{32}(b_{1u}e_{2g}, {}^3E_{1u}, M=-1, \mu_u) = -|\overline{\gamma_u}\overline{\xi_g}|$$
$$\Psi_{33}(b_{1u}e_{2g}, {}^3E_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\nu_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\nu_g}|}{2}$$
$$\Psi_{34}(b_{1u}e_{2g}, {}^3E_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\xi_g|}{2} - \frac{\sqrt{2}|\gamma_u\overline{\xi_g}|}{2}$$
$$\Psi_{35}(b_{1u}e_{2g}, {}^3E_{1u}, M=1, \eta_u) = |\gamma_u\nu_g|$$
$$\Psi_{36}(b_{1u}e_{2g}, {}^3E_{1u}, M=1, \mu_u) = -|\gamma_u\xi_g|$$

$b_{2u}e_{2g}$

$$\boxed{\Delta E = \langle\zeta_u\xi_g||\zeta_u\xi_g\rangle - \langle\zeta_u\zeta_u||\xi_g\xi_g\rangle}$$

$$\Psi_{37}(b_{2u}e_{2g}, {}^3E_{1u}, M=-1, \mu_u) = |\overline{\zeta_u}\overline{\nu_g}|$$
$$\Psi_{38}(b_{2u}e_{2g}, {}^3E_{1u}, M=-1, \eta_u) = |\overline{\zeta_u}\overline{\xi_g}|$$
$$\Psi_{39}(b_{2u}e_{2g}, {}^3E_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\zeta_u}\nu_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\nu_g}|}{2}$$
$$\Psi_{40}(b_{2u}e_{2g}, {}^3E_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\zeta_u}\xi_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\xi_g}|}{2}$$
$$\Psi_{41}(b_{2u}e_{2g}, {}^3E_{1u}, M=1, \mu_u) = |\zeta_u\nu_g|$$
$$\Psi_{42}(b_{2u}e_{2g}, {}^3E_{1u}, M=1, \eta_u) = |\zeta_u\xi_g|$$

$a_{2g}e_{1u}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\mu_u\mu_u\rangle + \langle\beta_g\mu_u||\beta_g\mu_u\rangle}$$

$$\Psi_{43}(a_{2g}e_{1u}, {}^3E_{1u}, M=-1, \mu_u) = -|\overline{\beta_g}\overline{\eta_u}|$$
$$\Psi_{44}(a_{2g}e_{1u}, {}^3E_{1u}, M=-1, \eta_u) = |\overline{\beta_g}\overline{\mu_u}|$$

$$\Psi_{45}(a_{2g}e_{1u}, {}^3E_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\beta_g}\eta_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\eta_u}|}{2}$$

$$\Psi_{46}(a_{2g}e_{1u}, {}^3E_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\beta_g}\mu_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_u}|}{2}$$

$$\Psi_{47}(a_{2g}e_{1u}, {}^3E_{1u}, M=1, \mu_u) = -|\beta_g\eta_u|$$

$$\Psi_{48}(a_{2g}e_{1u}, {}^3E_{1u}, M=1, \eta_u) = |\beta_g\mu_u|$$

$e_{1u}e_{2g}$

$$\boxed{\Delta E = \langle\xi_g\mu_u||\nu_g\eta_u\rangle + \langle\xi_g\mu_u||\xi_g\mu_u\rangle - \langle\xi_g\xi_g||\eta_u\eta_u\rangle + \langle\xi_g\nu_g||\mu_u\eta_u\rangle}$$

$$\Psi_{49}(e_{1u}e_{2g}, {}^3E_{1u}, M=-1, \mu_u) = -\frac{\sqrt{2}|\overline{\nu_g\eta_u}|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\overline{\mu_u}|}{2}$$

$$\Psi_{50}(e_{1u}e_{2g}, {}^3E_{1u}, M=-1, \eta_u) = -\frac{\sqrt{2}|\overline{\nu_g\mu_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\eta_u}|}{2}$$

$$\Psi_{51}(e_{1u}e_{2g}, {}^3E_{1u}, M=0, \mu_u) = -\frac{|\overline{\nu_g}\eta_u|}{2} - \frac{|\overline{\xi_g}\mu_u|}{2} - \frac{|\nu_g\overline{\eta_u}|}{2} - \frac{|\xi_g\overline{\mu_u}|}{2}$$

$$\Psi_{52}(e_{1u}e_{2g}, {}^3E_{1u}, M=0, \eta_u) = -\frac{|\overline{\nu_g}\mu_u|}{2} + \frac{|\overline{\xi_g}\eta_u|}{2} - \frac{|\nu_g\overline{\mu_u}|}{2} + \frac{|\xi_g\overline{\eta_u}|}{2}$$

$$\Psi_{53}(e_{1u}e_{2g}, {}^3E_{1u}, M=1, \mu_u) = -\frac{\sqrt{2}|\nu_g\eta_u|}{2} - \frac{\sqrt{2}|\xi_g\mu_u|}{2}$$

$$\Psi_{54}(e_{1u}e_{2g}, {}^3E_{1u}, M=1, \eta_u) = -\frac{\sqrt{2}|\nu_g\mu_u|}{2} + \frac{\sqrt{2}|\xi_g\eta_u|}{2}$$

$e_{1g}e_{2u}$

$$\boxed{\Delta E = -\langle\mu_g\mu_g||\nu_u\nu_u\rangle + \langle\mu_g\xi_u||\eta_g\nu_u\rangle + \langle\mu_g\xi_u||\mu_g\xi_u\rangle + \langle\mu_g\eta_g||\xi_u\nu_u\rangle}$$

$$\Psi_{55}(e_{1g}e_{2u}, {}^3E_{1u}, M=-1, \mu_u) = \frac{\sqrt{2}|\overline{\eta_g\nu_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\overline{\xi_u}|}{2}$$

$$\Psi_{56}(e_{1g}e_{2u}, {}^3E_{1u}, M=-1, \eta_u) = -\frac{\sqrt{2}|\overline{\eta_g}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_g\nu_u}|}{2}$$

$$\Psi_{57}(e_{1g}e_{2u}, {}^3E_{1u}, M=0, \mu_u) = \frac{|\overline{\eta_g}\nu_u|}{2} + \frac{|\overline{\mu_g}\xi_u|}{2} + \frac{|\eta_g\overline{\nu_u}|}{2} + \frac{|\mu_g\overline{\xi_u}|}{2}$$

$$\Psi_{58}(e_{1g}e_{2u}, {}^3E_{1u}, M=0, \eta_u) = -\frac{|\overline{\eta_g}\xi_u|}{2} + \frac{|\overline{\mu_g}\nu_u|}{2} - \frac{|\eta_g\overline{\xi_u}|}{2} + \frac{|\mu_g\overline{\nu_u}|}{2}$$

$$\Psi_{59}(e_{1g}e_{2u}, {}^3E_{1u}, M=1, \mu_u) = \frac{\sqrt{2}|\eta_g\nu_u|}{2} + \frac{\sqrt{2}|\mu_g\xi_u|}{2}$$

$$\Psi_{60}(e_{1g}e_{2u}, {}^3E_{1u}, M=1, \eta_u) = -\frac{\sqrt{2}|\eta_g\xi_u|}{2} + \frac{\sqrt{2}|\mu_g\nu_u|}{2}$$

2.27.19 ${}^1E_{1u}$

$a_{1g}e_{1u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\mu_u\mu_u\rangle + \langle\alpha_g\mu_u||\alpha_g\mu_u\rangle}$$

$$\Psi_1(a_{1g}e_{1u}, {}^1E_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_u}|}{2}$$

$$\Psi_2(a_{1g}e_{1u}, {}^1E_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_u}|}{2}$$

$a_{2u}e_{1g}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\mu_g\mu_g\rangle + \langle\beta_u\mu_g||\beta_u\mu_g\rangle}$$

$$\Psi_3(a_{2u}e_{1g}, {}^1E_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\eta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_g}|}{2}$$

$$\Psi_4(a_{2u}e_{1g}, {}^1E_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\beta_u}\mu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_g}|}{2}$$

$a_{1u}e_{1g}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\mu_g\mu_g\rangle + \langle\alpha_u\mu_g||\alpha_u\mu_g\rangle}$$

$$\Psi_5(a_{1u}e_{1g}, {}^1E_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\alpha_u}\eta_g|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\eta_g}|}{2}$$

$$\Psi_6(a_{1u}e_{1g}, {}^1E_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_g}|}{2}$$

$b_{1g}e_{2u}$

$$\boxed{\Delta E = \langle\gamma_g\gamma_g||\xi_u\xi_u\rangle + \langle\gamma_g\xi_u||\gamma_g\xi_u\rangle}$$

$$\Psi_7(b_{1g}e_{2u}, {}^1E_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\nu_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\nu_u}|}{2}$$

$$\Psi_8(b_{1g}e_{2u}, {}^1E_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\xi_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\xi_u}|}{2}$$

$b_{2g}e_{2u}$

$$\boxed{\Delta E = \langle\zeta_g\xi_u||\zeta_g\xi_u\rangle + \langle\zeta_g\zeta_g||\xi_u\xi_u\rangle}$$

$$\Psi_9(b_{2g}e_{2u}, {}^1E_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\nu_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\nu_u}|}{2}$$

$$\Psi_{10}(b_{2g}e_{2u}, {}^1E_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\zeta_g}\xi_u|}{2} - \frac{\sqrt{2}|\zeta_g\overline{\xi_u}|}{2}$$

$b_{1u}e_{2g}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\xi_g\xi_g\rangle + \langle\gamma_u\xi_g||\gamma_u\xi_g\rangle}$$

$$\Psi_{11}(b_{1u}e_{2g}, {}^1E_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\nu_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\nu_g}|}{2}$$

$$\Psi_{12}(b_{1u}e_{2g}, {}^1E_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\gamma_u}\xi_g|}{2} - \frac{\sqrt{2}|\gamma_u\overline{\xi_g}|}{2}$$

$b_{2u}e_{2g}$

$$\boxed{\Delta E = \langle\zeta_u\xi_g||\zeta_u\xi_g\rangle + \langle\zeta_u\zeta_u||\xi_g\xi_g\rangle}$$

$$\Psi_{13}(b_{2u}e_{2g}, {}^1E_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\nu_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\nu_g}|}{2}$$

$$\Psi_{14}(b_{2u}e_{2g}, {}^1E_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\xi_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\xi_g}|}{2}$$

$a_{2g}e_{1u}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\mu_u\mu_u\rangle + \langle\beta_g\mu_u||\beta_g\mu_u\rangle}$$

$$\Psi_{15}(a_{2g}e_{1u}, {}^1E_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\beta_g}\eta_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\eta_u}|}{2}$$

$$\Psi_{16}(a_{2g}e_{1u}, {}^1E_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\beta_g}\mu_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_u}|}{2}$$

$e_{1u}e_{2g}$

$$\boxed{\Delta E = \langle\xi_g\mu_u||\nu_g\eta_u\rangle + \langle\xi_g\mu_u||\xi_g\mu_u\rangle + \langle\xi_g\xi_g||\eta_u\eta_u\rangle - \langle\xi_g\nu_g||\mu_u\eta_u\rangle}$$

$$\Psi_{17}(e_{1u}e_{2g}, {}^1E_{1u}, M=0, \mu_u) = \frac{|\overline{\nu_g}\eta_u|}{2} + \frac{|\overline{\xi_g}\mu_u|}{2} - \frac{|\nu_g\overline{\eta_u}|}{2} - \frac{|\xi_g\overline{\mu_u}|}{2}$$

$$\Psi_{18}(e_{1u}e_{2g}, {}^1E_{1u}, M=0, \eta_u) = \frac{|\overline{\nu_g}\mu_u|}{2} - \frac{|\overline{\xi_g}\eta_u|}{2} - \frac{|\nu_g\overline{\mu_u}|}{2} + \frac{|\xi_g\overline{\eta_u}|}{2}$$

$e_{1g}e_{2u}$

$$\boxed{\Delta E = \langle\mu_g\mu_g||\nu_u\nu_u\rangle + \langle\mu_g\xi_u||\eta_g\nu_u\rangle + \langle\mu_g\xi_u||\mu_g\xi_u\rangle - \langle\mu_g\eta_g||\xi_u\nu_u\rangle}$$

$$\Psi_{19}(e_{1g}e_{2u}, {}^1E_{1u}, M=0, \mu_u) = -\frac{|\overline{\eta_g}\nu_u|}{2} - \frac{|\overline{\mu_g}\xi_u|}{2} + \frac{|\eta_g\overline{\nu_u}|}{2} + \frac{|\mu_g\overline{\xi_u}|}{2}$$

$$\Psi_{20}(e_{1g}e_{2u}, {}^1E_{1u}, M=0, \eta_u) = \frac{|\overline{\eta_g}\xi_u|}{2} - \frac{|\overline{\mu_g}\nu_u|}{2} - \frac{|\eta_g\overline{\xi_u}|}{2} + \frac{|\mu_g\overline{\nu_u}|}{2}$$

2.27.20 $^3E_{1g}$

$a_{1g}e_{1g}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\mu_g\mu_g\rangle + \langle\alpha_g\mu_g||\alpha_g\mu_g\rangle}$$

$$\Psi_1(a_{1g}e_{1g}, {}^3E_{1g}, M=-1, \eta_g) = |\overline{\alpha_g\eta_g}|$$
$$\Psi_2(a_{1g}e_{1g}, {}^3E_{1g}, M=-1, \mu_g) = |\overline{\alpha_g\mu_g}|$$
$$\Psi_3(a_{1g}e_{1g}, {}^3E_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_g}|}{2}$$
$$\Psi_4(a_{1g}e_{1g}, {}^3E_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\alpha_g}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_g}|}{2}$$
$$\Psi_5(a_{1g}e_{1g}, {}^3E_{1g}, M=1, \eta_g) = |\alpha_g\eta_g|$$
$$\Psi_6(a_{1g}e_{1g}, {}^3E_{1g}, M=1, \mu_g) = |\alpha_g\mu_g|$$

$a_{2u}e_{1u}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\mu_u\mu_u\rangle + \langle\beta_u\mu_u||\beta_u\mu_u\rangle}$$

$$\Psi_7(a_{2u}e_{1u}, {}^3E_{1g}, M=-1, \eta_g) = |\overline{\beta_u}\overline{\eta_u}|$$
$$\Psi_8(a_{2u}e_{1u}, {}^3E_{1g}, M=-1, \mu_g) = |\overline{\beta_u}\overline{\mu_u}|$$
$$\Psi_9(a_{2u}e_{1u}, {}^3E_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\beta_u}\eta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_u}|}{2}$$
$$\Psi_{10}(a_{2u}e_{1u}, {}^3E_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\beta_u}\mu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_u}|}{2}$$
$$\Psi_{11}(a_{2u}e_{1u}, {}^3E_{1g}, M=1, \eta_g) = |\beta_u\eta_u|$$
$$\Psi_{12}(a_{2u}e_{1u}, {}^3E_{1g}, M=1, \mu_g) = |\beta_u\mu_u|$$

$a_{1u}e_{1u}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\mu_u\mu_u\rangle + \langle\alpha_u\mu_u||\alpha_u\mu_u\rangle}$$

$$\Psi_{13}(a_{1u}e_{1u}, {}^3E_{1g}, M=-1, \mu_g) = -|\overline{\alpha_u\eta_u}|$$
$$\Psi_{14}(a_{1u}e_{1u}, {}^3E_{1g}, M=-1, \eta_g) = |\overline{\alpha_u\mu_u}|$$
$$\Psi_{15}(a_{1u}e_{1u}, {}^3E_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\eta_u|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\eta_u}|}{2}$$
$$\Psi_{16}(a_{1u}e_{1u}, {}^3E_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_u}|}{2}$$
$$\Psi_{17}(a_{1u}e_{1u}, {}^3E_{1g}, M=1, \mu_g) = -|\alpha_u\eta_u|$$
$$\Psi_{18}(a_{1u}e_{1u}, {}^3E_{1g}, M=1, \eta_g) = |\alpha_u\mu_u|$$

$b_{1g}e_{2g}$

$$\boxed{\Delta E = -\langle\gamma_g\gamma_g||\xi_g\xi_g\rangle + \langle\gamma_g\xi_g||\gamma_g\xi_g\rangle}$$

$$\Psi_{19}(b_{1g}e_{2g}, {}^3E_{1g}, M=-1, \mu_g) = |\overline{\gamma_g\nu_g}|$$
$$\Psi_{20}(b_{1g}e_{2g}, {}^3E_{1g}, M=-1, \eta_g) = |\overline{\gamma_g}\overline{\xi_g}|$$
$$\Psi_{21}(b_{1g}e_{2g}, {}^3E_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\gamma_g}\nu_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\nu_g}|}{2}$$
$$\Psi_{22}(b_{1g}e_{2g}, {}^3E_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\gamma_g}\xi_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\xi_g}|}{2}$$
$$\Psi_{23}(b_{1g}e_{2g}, {}^3E_{1g}, M=1, \mu_g) = |\gamma_g\nu_g|$$
$$\Psi_{24}(b_{1g}e_{2g}, {}^3E_{1g}, M=1, \eta_g) = |\gamma_g\xi_g|$$

$b_{2g}e_{2g}$

$$\boxed{\Delta E = \langle\zeta_g\xi_g||\zeta_g\xi_g\rangle - \langle\zeta_g\zeta_g||\xi_g\xi_g\rangle}$$

$$\Psi_{25}(b_{2g}e_{2g}, {}^3E_{1g}, M=-1, \eta_g) = |\overline{\zeta_g}\overline{\nu_g}|$$
$$\Psi_{26}(b_{2g}e_{2g}, {}^3E_{1g}, M=-1, \mu_g) = -|\overline{\zeta_g\xi_g}|$$
$$\Psi_{27}(b_{2g}e_{2g}, {}^3E_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\zeta_g}\nu_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\nu_g}|}{2}$$
$$\Psi_{28}(b_{2g}e_{2g}, {}^3E_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\xi_g|}{2} - \frac{\sqrt{2}|\zeta_g\overline{\xi_g}|}{2}$$
$$\Psi_{29}(b_{2g}e_{2g}, {}^3E_{1g}, M=1, \eta_g) = |\zeta_g\nu_g|$$
$$\Psi_{30}(b_{2g}e_{2g}, {}^3E_{1g}, M=1, \mu_g) = -|\zeta_g\xi_g|$$

$b_{1u}e_{2u}$

$$\boxed{\Delta E = -\langle\gamma_u\gamma_u||\xi_u\xi_u\rangle + \langle\gamma_u\xi_u||\gamma_u\xi_u\rangle}$$

$$\Psi_{31}(b_{1u}e_{2u}, {}^3E_{1g}, M=-1, \eta_g) = |\overline{\gamma_u\nu_u}|$$
$$\Psi_{32}(b_{1u}e_{2u}, {}^3E_{1g}, M=-1, \mu_g) = -|\overline{\gamma_u}\overline{\xi_u}|$$
$$\Psi_{33}(b_{1u}e_{2u}, {}^3E_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\gamma_u}\nu_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\nu_u}|}{2}$$
$$\Psi_{34}(b_{1u}e_{2u}, {}^3E_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\xi_u|}{2} - \frac{\sqrt{2}|\gamma_u\overline{\xi_u}|}{2}$$
$$\Psi_{35}(b_{1u}e_{2u}, {}^3E_{1g}, M=1, \eta_g) = |\gamma_u\nu_u|$$
$$\Psi_{36}(b_{1u}e_{2u}, {}^3E_{1g}, M=1, \mu_g) = -|\gamma_u\xi_u|$$

$b_{2u}e_{2u}$

$$\boxed{\Delta E = \langle\zeta_u\xi_u||\zeta_u\xi_u\rangle - \langle\zeta_u\zeta_u||\xi_u\xi_u\rangle}$$

$$\Psi_{37}(b_{2u}e_{2u}, {}^3E_{1g}, M=-1, \mu_g) = |\overline{\zeta_u}\overline{\nu_u}|$$
$$\Psi_{38}(b_{2u}e_{2u}, {}^3E_{1g}, M=-1, \eta_g) = |\overline{\zeta_u\xi_u}|$$
$$\Psi_{39}(b_{2u}e_{2u}, {}^3E_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\zeta_u}\nu_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\nu_u}|}{2}$$
$$\Psi_{40}(b_{2u}e_{2u}, {}^3E_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\zeta_u}\xi_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\xi_u}|}{2}$$
$$\Psi_{41}(b_{2u}e_{2u}, {}^3E_{1g}, M=1, \mu_g) = |\zeta_u\nu_u|$$
$$\Psi_{42}(b_{2u}e_{2u}, {}^3E_{1g}, M=1, \eta_g) = |\zeta_u\xi_u|$$

$a_{2g}e_{1g}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\mu_g\mu_g\rangle + \langle\beta_g\mu_g||\beta_g\mu_g\rangle}$$

$$\Psi_{43}(a_{2g}e_{1g}, {}^3E_{1g}, M=-1, \mu_g) = -|\overline{\beta_g}\overline{\eta_g}|$$
$$\Psi_{44}(a_{2g}e_{1g}, {}^3E_{1g}, M=-1, \eta_g) = |\overline{\beta_g}\overline{\mu_g}|$$
$$\Psi_{45}(a_{2g}e_{1g}, {}^3E_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\beta_g}\eta_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\eta_g}|}{2}$$
$$\Psi_{46}(a_{2g}e_{1g}, {}^3E_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\beta_g}\mu_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_g}|}{2}$$
$$\Psi_{47}(a_{2g}e_{1g}, {}^3E_{1g}, M=1, \mu_g) = -|\beta_g\eta_g|$$
$$\Psi_{48}(a_{2g}e_{1g}, {}^3E_{1g}, M=1, \eta_g) = |\beta_g\mu_g|$$

$e_{1g}e_{2g}$

$$\boxed{\begin{gathered}\Delta E = \langle\xi_g\mu_g||\nu_g\eta_g\rangle + \langle\xi_g\mu_g||\xi_g\mu_g\rangle - \langle\xi_g\xi_g||\eta_g\eta_g\rangle \\ + \langle\xi_g\nu_g||\mu_g\eta_g\rangle\end{gathered}}$$

$$\Psi_{49}(e_{1g}e_{2g}, {}^3E_{1g}, M=-1, \mu_g) = -\frac{\sqrt{2}|\overline{\nu_g}\overline{\eta_g}|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\overline{\mu_g}|}{2}$$
$$\Psi_{50}(e_{1g}e_{2g}, {}^3E_{1g}, M=-1, \eta_g) = -\frac{\sqrt{2}|\overline{\nu_g}\overline{\mu_g}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\eta_g}|}{2}$$
$$\Psi_{51}(e_{1g}e_{2g}, {}^3E_{1g}, M=0, \mu_g) = -\frac{|\overline{\nu_g}\eta_g|}{2} - \frac{|\overline{\xi_g}\mu_g|}{2} - \frac{|\nu_g\overline{\eta_g}|}{2} - \frac{|\xi_g\overline{\mu_g}|}{2}$$
$$\Psi_{52}(e_{1g}e_{2g}, {}^3E_{1g}, M=0, \eta_g) = -\frac{|\overline{\nu_g}\mu_g|}{2} + \frac{|\overline{\xi_g}\eta_g|}{2} - \frac{|\nu_g\overline{\mu_g}|}{2} + \frac{|\xi_g\overline{\eta_g}|}{2}$$
$$\Psi_{53}(e_{1g}e_{2g}, {}^3E_{1g}, M=1, \mu_g) = -\frac{\sqrt{2}|\nu_g\eta_g|}{2} - \frac{\sqrt{2}|\xi_g\mu_g|}{2}$$
$$\Psi_{54}(e_{1g}e_{2g}, {}^3E_{1g}, M=1, \eta_g) = -\frac{\sqrt{2}|\nu_g\mu_g|}{2} + \frac{\sqrt{2}|\xi_g\eta_g|}{2}$$

$e_{1u}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = -\langle\mu_u\mu_u||\nu_u\nu_u\rangle + \langle\mu_u\xi_u||\eta_u\nu_u\rangle + \langle\mu_u\xi_u||\mu_u\xi_u\rangle \\ + \langle\mu_u\eta_u||\xi_u\nu_u\rangle\end{gathered}}$$

$$\Psi_{55}(e_{1u}e_{2u}, {}^3E_{1g}, M=-1, \mu_g) = \frac{\sqrt{2}|\overline{\eta_u}\overline{\nu_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\xi_u}|}{2}$$
$$\Psi_{56}(e_{1u}e_{2u}, {}^3E_{1g}, M=-1, \eta_g) = -\frac{\sqrt{2}|\overline{\eta_u}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\nu_u}|}{2}$$
$$\Psi_{57}(e_{1u}e_{2u}, {}^3E_{1g}, M=0, \mu_g) = \frac{|\overline{\eta_u}\nu_u|}{2} + \frac{|\overline{\mu_u}\xi_u|}{2} + \frac{|\eta_u\overline{\nu_u}|}{2} + \frac{|\mu_u\overline{\xi_u}|}{2}$$
$$\Psi_{58}(e_{1u}e_{2u}, {}^3E_{1g}, M=0, \eta_g) = -\frac{|\overline{\eta_u}\xi_u|}{2} + \frac{|\overline{\mu_u}\nu_u|}{2} - \frac{|\eta_u\overline{\xi_u}|}{2} + \frac{|\mu_u\overline{\nu_u}|}{2}$$
$$\Psi_{59}(e_{1u}e_{2u}, {}^3E_{1g}, M=1, \mu_g) = \frac{\sqrt{2}|\eta_u\nu_u|}{2} + \frac{\sqrt{2}|\mu_u\xi_u|}{2}$$
$$\Psi_{60}(e_{1u}e_{2u}, {}^3E_{1g}, M=1, \eta_g) = -\frac{\sqrt{2}|\eta_u\xi_u|}{2} + \frac{\sqrt{2}|\mu_u\nu_u|}{2}$$

2.27.21 $^1E_{1g}$

$a_{1g}e_{1g}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\mu_g\mu_g\rangle + \langle\alpha_g\mu_g||\alpha_g\mu_g\rangle}$$

$$\Psi_{1}(a_{1g}e_{1g}, {}^1E_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_g}|}{2}$$
$$\Psi_{2}(a_{1g}e_{1g}, {}^1E_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_g}|}{2}$$

$a_{2u}e_{1u}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\mu_u\mu_u\rangle + \langle\beta_u\mu_u||\beta_u\mu_u\rangle}$$

$$\Psi_{3}(a_{2u}e_{1u}, {}^1E_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\eta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_u}|}{2}$$
$$\Psi_{4}(a_{2u}e_{1u}, {}^1E_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\beta_u}\mu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_u}|}{2}$$

$a_{1u}e_{1u}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\mu_u\mu_u\rangle + \langle\alpha_u\mu_u||\alpha_u\mu_u\rangle}$$

$$\Psi_{5}(a_{1u}e_{1u}, {}^1E_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\alpha_u}\eta_u|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\eta_u}|}{2}$$
$$\Psi_{6}(a_{1u}e_{1u}, {}^1E_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_u}|}{2}$$

$b_{1g}e_{2g}$

$$\boxed{\Delta E = \langle\gamma_g\gamma_g||\xi_g\xi_g\rangle + \langle\gamma_g\xi_g||\gamma_g\xi_g\rangle}$$

$$\Psi_{7}(b_{1g}e_{2g}, {}^1E_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\nu_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\nu_g}|}{2}$$
$$\Psi_{8}(b_{1g}e_{2g}, {}^1E_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\xi_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\xi_g}|}{2}$$

$b_{2g}e_{2g}$

$$\boxed{\Delta E = \langle\zeta_g\xi_g||\zeta_g\xi_g\rangle + \langle\zeta_g\zeta_g||\xi_g\xi_g\rangle}$$

$$\Psi_{9}(b_{2g}e_{2g}, {}^1E_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\nu_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\nu_g}|}{2}$$
$$\Psi_{10}(b_{2g}e_{2g}, {}^1E_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\zeta_g}\xi_g|}{2} - \frac{\sqrt{2}|\zeta_g\overline{\xi_g}|}{2}$$

$b_{1u}e_{2u}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\xi_u\xi_u\rangle + \langle\gamma_u\xi_u||\gamma_u\xi_u\rangle}$$

$$\Psi_{11}(b_{1u}e_{2u}, {}^1E_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\nu_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\nu_u}|}{2}$$
$$\Psi_{12}(b_{1u}e_{2u}, {}^1E_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\gamma_u}\xi_u|}{2} - \frac{\sqrt{2}|\gamma_u\overline{\xi_u}|}{2}$$

$b_{2u}e_{2u}$

$$\boxed{\Delta E = \langle\zeta_u\xi_u||\zeta_u\xi_u\rangle + \langle\zeta_u\zeta_u||\xi_u\xi_u\rangle}$$

$$\Psi_{13}(b_{2u}e_{2u}, {}^1E_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\nu_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\nu_u}|}{2}$$
$$\Psi_{14}(b_{2u}e_{2u}, {}^1E_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\xi_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\xi_u}|}{2}$$

$a_{2g}e_{1g}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\mu_g\mu_g\rangle + \langle\beta_g\mu_g||\beta_g\mu_g\rangle}$$

$$\Psi_{15}(a_{2g}e_{1g}, {}^1E_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\beta_g}\eta_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\eta_g}|}{2}$$
$$\Psi_{16}(a_{2g}e_{1g}, {}^1E_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\beta_g}\mu_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_g}|}{2}$$

$e_{1g}e_{2g}$

$$\boxed{\begin{gathered}\Delta E = \langle \xi_g\mu_g||\nu_g\eta_g\rangle + \langle \xi_g\mu_g||\xi_g\mu_g\rangle + \langle \xi_g\xi_g||\eta_g\eta_g\rangle \\ - \langle \xi_g\nu_g||\mu_g\eta_g\rangle\end{gathered}}$$

$$\Psi_{17}(e_{1g}e_{2g}, {}^1E_{1g}, M=0, \mu_g) = \frac{|\overline{\nu_g}\eta_g|}{2} + \frac{|\overline{\xi_g}\mu_g|}{2} - \frac{|\nu_g\overline{\eta_g}|}{2} - \frac{|\xi_g\overline{\mu_g}|}{2}$$
$$\Psi_{18}(e_{1g}e_{2g}, {}^1E_{1g}, M=0, \eta_g) = \frac{|\overline{\nu_g}\mu_g|}{2} - \frac{|\overline{\xi_g}\eta_g|}{2} - \frac{|\nu_g\overline{\mu_g}|}{2} + \frac{|\xi_g\overline{\eta_g}|}{2}$$

$e_{1u}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = \langle \mu_u\mu_u||\nu_u\nu_u\rangle + \langle \mu_u\xi_u||\eta_u\nu_u\rangle + \langle \mu_u\xi_u||\mu_u\xi_u\rangle \\ - \langle \mu_u\eta_u||\xi_u\nu_u\rangle\end{gathered}}$$

$$\Psi_{19}(e_{1u}e_{2u}, {}^1E_{1g}, M=0, \mu_g) = -\frac{|\overline{\eta_u}\nu_u|}{2} - \frac{|\overline{\mu_u}\xi_u|}{2} + \frac{|\eta_u\overline{\nu_u}|}{2} + \frac{|\mu_u\overline{\xi_u}|}{2}$$
$$\Psi_{20}(e_{1u}e_{2u}, {}^1E_{1g}, M=0, \eta_g) = \frac{|\overline{\eta_u}\xi_u|}{2} - \frac{|\overline{\mu_u}\nu_u|}{2} - \frac{|\eta_u\overline{\xi_u}|}{2} + \frac{|\mu_u\overline{\nu_u}|}{2}$$

2.27.22 $^3E_{2u}$

$a_{1g}e_{2u}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\xi_u\xi_u\rangle + \langle \alpha_g\xi_u||\alpha_g\xi_u\rangle}$$

$$\Psi_1(a_{1g}e_{2u}, {}^3E_{2u}, M=-1, \nu_u) = |\overline{\alpha_g}\overline{\nu_u}|$$
$$\Psi_2(a_{1g}e_{2u}, {}^3E_{2u}, M=-1, \xi_u) = |\overline{\alpha_g}\overline{\xi_u}|$$
$$\Psi_3(a_{1g}e_{2u}, {}^3E_{2u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\alpha_g}\nu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\nu_u}|}{2}$$
$$\Psi_4(a_{1g}e_{2u}, {}^3E_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\alpha_g}\xi_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\xi_u}|}{2}$$
$$\Psi_5(a_{1g}e_{2u}, {}^3E_{2u}, M=1, \nu_u) = |\alpha_g\nu_u|$$
$$\Psi_6(a_{1g}e_{2u}, {}^3E_{2u}, M=1, \xi_u) = |\alpha_g\xi_u|$$

$a_{2u}e_{2g}$

$$\boxed{\Delta E = -\langle \beta_u\beta_u||\xi_g\xi_g\rangle + \langle \beta_u\xi_g||\beta_u\xi_g\rangle}$$

$$\Psi_7(a_{2u}e_{2g}, {}^3E_{2u}, M=-1, \nu_u) = |\overline{\beta_u}\overline{\nu_g}|$$
$$\Psi_8(a_{2u}e_{2g}, {}^3E_{2u}, M=-1, \xi_u) = |\overline{\beta_u}\overline{\xi_g}|$$
$$\Psi_9(a_{2u}e_{2g}, {}^3E_{2u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\beta_u}\nu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\nu_g}|}{2}$$
$$\Psi_{10}(a_{2u}e_{2g}, {}^3E_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\beta_u}\xi_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\xi_g}|}{2}$$
$$\Psi_{11}(a_{2u}e_{2g}, {}^3E_{2u}, M=1, \nu_u) = |\beta_u\nu_g|$$
$$\Psi_{12}(a_{2u}e_{2g}, {}^3E_{2u}, M=1, \xi_u) = |\beta_u\xi_g|$$

$a_{1u}e_{2g}$

$$\boxed{\Delta E = -\langle \alpha_u\alpha_u||\xi_g\xi_g\rangle + \langle \alpha_u\xi_g||\alpha_u\xi_g\rangle}$$

$$\Psi_{13}(a_{1u}e_{2g}, {}^3E_{2u}, M=-1, \xi_u) = -|\overline{\alpha_u}\overline{\nu_g}|$$
$$\Psi_{14}(a_{1u}e_{2g}, {}^3E_{2u}, M=-1, \nu_u) = |\overline{\alpha_u}\overline{\xi_g}|$$
$$\Psi_{15}(a_{1u}e_{2g}, {}^3E_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\nu_g|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\nu_g}|}{2}$$
$$\Psi_{16}(a_{1u}e_{2g}, {}^3E_{2u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\alpha_u}\xi_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\xi_g}|}{2}$$
$$\Psi_{17}(a_{1u}e_{2g}, {}^3E_{2u}, M=1, \xi_u) = -|\alpha_u\nu_g|$$
$$\Psi_{18}(a_{1u}e_{2g}, {}^3E_{2u}, M=1, \nu_u) = |\alpha_u\xi_g|$$

$b_{1g}e_{1u}$

$$\boxed{\Delta E = -\langle \gamma_g\gamma_g||\mu_u\mu_u\rangle + \langle \gamma_g\mu_u||\gamma_g\mu_u\rangle}$$

$$\Psi_{19}(b_{1g}e_{1u}, {}^3E_{2u}, M=-1, \xi_u) = |\overline{\gamma_g}\overline{\eta_u}|$$
$$\Psi_{20}(b_{1g}e_{1u}, {}^3E_{2u}, M=-1, \nu_u) = |\overline{\gamma_g}\overline{\mu_u}|$$
$$\Psi_{21}(b_{1g}e_{1u}, {}^3E_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\gamma_g}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\eta_u}|}{2}$$
$$\Psi_{22}(b_{1g}e_{1u}, {}^3E_{2u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\gamma_g}\mu_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\mu_u}|}{2}$$
$$\Psi_{23}(b_{1g}e_{1u}, {}^3E_{2u}, M=1, \xi_u) = |\gamma_g\eta_u|$$
$$\Psi_{24}(b_{1g}e_{1u}, {}^3E_{2u}, M=1, \nu_u) = |\gamma_g\mu_u|$$

$b_{2g}e_{1u}$

$$\boxed{\Delta E = \langle \zeta_g\mu_u||\zeta_g\mu_u\rangle - \langle \zeta_g\zeta_g||\mu_u\mu_u\rangle}$$

$$\Psi_{25}(b_{2g}e_{1u}, {}^3E_{2u}, M=-1, \nu_u) = |\overline{\zeta_g}\overline{\eta_u}|$$
$$\Psi_{26}(b_{2g}e_{1u}, {}^3E_{2u}, M=-1, \xi_u) = -|\overline{\zeta_g}\overline{\mu_u}|$$
$$\Psi_{27}(b_{2g}e_{1u}, {}^3E_{2u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\zeta_g}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\eta_u}|}{2}$$
$$\Psi_{28}(b_{2g}e_{1u}, {}^3E_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\mu_u|}{2} - \frac{\sqrt{2}|\zeta_g\overline{\mu_u}|}{2}$$
$$\Psi_{29}(b_{2g}e_{1u}, {}^3E_{2u}, M=1, \nu_u) = |\zeta_g\eta_u|$$
$$\Psi_{30}(b_{2g}e_{1u}, {}^3E_{2u}, M=1, \xi_u) = -|\zeta_g\mu_u|$$

$b_{1u}e_{1g}$

$$\boxed{\Delta E = -\langle \gamma_u\gamma_u||\mu_g\mu_g\rangle + \langle \gamma_u\mu_g||\gamma_u\mu_g\rangle}$$

$$\Psi_{31}(b_{1u}e_{1g}, {}^3E_{2u}, M=-1, \nu_u) = |\overline{\gamma_u}\overline{\eta_g}|$$
$$\Psi_{32}(b_{1u}e_{1g}, {}^3E_{2u}, M=-1, \xi_u) = -|\overline{\gamma_u}\overline{\mu_g}|$$
$$\Psi_{33}(b_{1u}e_{1g}, {}^3E_{2u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\gamma_u}\eta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_g}|}{2}$$
$$\Psi_{34}(b_{1u}e_{1g}, {}^3E_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\mu_g|}{2} - \frac{\sqrt{2}|\gamma_u\overline{\mu_g}|}{2}$$
$$\Psi_{35}(b_{1u}e_{1g}, {}^3E_{2u}, M=1, \nu_u) = |\gamma_u\eta_g|$$
$$\Psi_{36}(b_{1u}e_{1g}, {}^3E_{2u}, M=1, \xi_u) = -|\gamma_u\mu_g|$$

$b_{2u}e_{1g}$

$$\boxed{\Delta E = \langle \zeta_u\mu_g||\zeta_u\mu_g\rangle - \langle \zeta_u\zeta_u||\mu_g\mu_g\rangle}$$

$$\Psi_{37}(b_{2u}e_{1g}, {}^3E_{2u}, M=-1, \xi_u) = |\overline{\zeta_u}\overline{\eta_g}|$$
$$\Psi_{38}(b_{2u}e_{1g}, {}^3E_{2u}, M=-1, \nu_u) = |\overline{\zeta_u}\overline{\mu_g}|$$
$$\Psi_{39}(b_{2u}e_{1g}, {}^3E_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\zeta_u}\eta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_g}|}{2}$$
$$\Psi_{40}(b_{2u}e_{1g}, {}^3E_{2u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\zeta_u}\mu_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\mu_g}|}{2}$$

$$\Psi_{41}(b_{2u}e_{1g}, {}^3E_{2u}, M=1, \xi_u) = |\zeta_u\eta_g|$$
$$\Psi_{42}(b_{2u}e_{1g}, {}^3E_{2u}, M=1, \nu_u) = |\zeta_u\mu_g|$$

$a_{2g}e_{2u}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\xi_u\xi_u\rangle + \langle\beta_g\xi_u||\beta_g\xi_u\rangle}$$

$$\Psi_{43}(a_{2g}e_{2u}, {}^3E_{2u}, M=-1, \xi_u) = -|\overline{\beta_g}\overline{\nu_u}|$$
$$\Psi_{44}(a_{2g}e_{2u}, {}^3E_{2u}, M=-1, \nu_u) = |\overline{\beta_g}\overline{\xi_u}|$$
$$\Psi_{45}(a_{2g}e_{2u}, {}^3E_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\beta_g}\nu_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\nu_u}|}{2}$$
$$\Psi_{46}(a_{2g}e_{2u}, {}^3E_{2u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\beta_g}\xi_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\xi_u}|}{2}$$
$$\Psi_{47}(a_{2g}e_{2u}, {}^3E_{2u}, M=1, \xi_u) = -|\beta_g\nu_u|$$
$$\Psi_{48}(a_{2g}e_{2u}, {}^3E_{2u}, M=1, \nu_u) = |\beta_g\xi_u|$$

$e_{2g}e_{2u}$

$$\boxed{\begin{gathered}\Delta E = -\langle\xi_g\xi_g||\nu_u\nu_u\rangle - \langle\xi_g\xi_u||\nu_g\nu_u\rangle + \langle\xi_g\xi_u||\xi_g\xi_u\rangle \\ - \langle\xi_g\nu_g||\xi_u\nu_u\rangle\end{gathered}}$$

$$\Psi_{49}(e_{2g}e_{2u}, {}^3E_{2u}, M=-1, \xi_u) = \frac{\sqrt{2}|\overline{\nu_g}\overline{\nu_u}|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\overline{\xi_u}|}{2}$$
$$\Psi_{50}(e_{2g}e_{2u}, {}^3E_{2u}, M=-1, \nu_u) = \frac{\sqrt{2}|\overline{\nu_g}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\nu_u}|}{2}$$
$$\Psi_{51}(e_{2g}e_{2u}, {}^3E_{2u}, M=0, \xi_u) = \frac{|\overline{\nu_g}\nu_u|}{2} - \frac{|\overline{\xi_g}\xi_u|}{2} + \frac{|\nu_g\overline{\nu_u}|}{2} - \frac{|\xi_g\overline{\xi_u}|}{2}$$
$$\Psi_{52}(e_{2g}e_{2u}, {}^3E_{2u}, M=0, \nu_u) = \frac{|\overline{\nu_g}\xi_u|}{2} + \frac{|\overline{\xi_g}\nu_u|}{2} + \frac{|\nu_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\nu_u}|}{2}$$
$$\Psi_{53}(e_{2g}e_{2u}, {}^3E_{2u}, M=1, \xi_u) = \frac{\sqrt{2}|\nu_g\nu_u|}{2} - \frac{\sqrt{2}|\xi_g\xi_u|}{2}$$
$$\Psi_{54}(e_{2g}e_{2u}, {}^3E_{2u}, M=1, \nu_u) = \frac{\sqrt{2}|\nu_g\xi_u|}{2} + \frac{\sqrt{2}|\xi_g\nu_u|}{2}$$

$e_{1g}e_{1u}$

$$\boxed{\begin{gathered}\Delta E = -\langle\mu_u\eta_u||\mu_g\eta_g\rangle - \langle\mu_u\mu_g||\eta_u\eta_g\rangle + \langle\mu_u\mu_g||\mu_u\mu_g\rangle \\ - \langle\mu_u\mu_u||\eta_g\eta_g\rangle\end{gathered}}$$

$$\Psi_{55}(e_{1g}e_{1u}, {}^3E_{2u}, M=-1, \xi_u) = -\frac{\sqrt{2}|\overline{\eta_u}\overline{\eta_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\mu_g}|}{2}$$
$$\Psi_{56}(e_{1g}e_{1u}, {}^3E_{2u}, M=-1, \nu_u) = \frac{\sqrt{2}|\overline{\eta_u}\overline{\mu_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\eta_g}|}{2}$$
$$\Psi_{57}(e_{1g}e_{1u}, {}^3E_{2u}, M=0, \xi_u) = -\frac{|\overline{\eta_u}\eta_g|}{2} + \frac{|\overline{\mu_u}\mu_g|}{2} - \frac{|\eta_u\overline{\eta_g}|}{2} + \frac{|\mu_u\overline{\mu_g}|}{2}$$
$$\Psi_{58}(e_{1g}e_{1u}, {}^3E_{2u}, M=0, \nu_u) = \frac{|\overline{\eta_u}\mu_g|}{2} + \frac{|\overline{\mu_u}\eta_g|}{2} + \frac{|\eta_u\overline{\mu_g}|}{2} + \frac{|\mu_u\overline{\eta_g}|}{2}$$
$$\Psi_{59}(e_{1g}e_{1u}, {}^3E_{2u}, M=1, \xi_u) = -\frac{\sqrt{2}|\eta_u\eta_g|}{2} + \frac{\sqrt{2}|\mu_u\mu_g|}{2}$$
$$\Psi_{60}(e_{1g}e_{1u}, {}^3E_{2u}, M=1, \nu_u) = \frac{\sqrt{2}|\eta_u\mu_g|}{2} + \frac{\sqrt{2}|\mu_u\eta_g|}{2}$$

2.27.23 $^1E_{2u}$

$a_{1g}e_{2u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\xi_u\xi_u\rangle + \langle\alpha_g\xi_u||\alpha_g\xi_u\rangle}$$

$$\Psi_{1}(a_{1g}e_{2u}, {}^1E_{2u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\nu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\nu_u}|}{2}$$
$$\Psi_{2}(a_{1g}e_{2u}, {}^1E_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\xi_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\xi_u}|}{2}$$

$a_{2u}e_{2g}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\xi_g\xi_g\rangle + \langle\beta_u\xi_g||\beta_u\xi_g\rangle}$$

$$\Psi_{3}(a_{2u}e_{2g}, {}^1E_{2u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\beta_u}\nu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\nu_g}|}{2}$$
$$\Psi_{4}(a_{2u}e_{2g}, {}^1E_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\beta_u}\xi_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\xi_g}|}{2}$$

$a_{1u}e_{2g}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\xi_g\xi_g\rangle + \langle\alpha_u\xi_g||\alpha_u\xi_g\rangle}$$

$$\Psi_{5}(a_{1u}e_{2g}, {}^1E_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\alpha_u}\nu_g|}{2} - \frac{\sqrt{2}|\alpha_u\overline{\nu_g}|}{2}$$
$$\Psi_{6}(a_{1u}e_{2g}, {}^1E_{2u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\xi_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\xi_g}|}{2}$$

$b_{1g}e_{1u}$

$$\boxed{\Delta E = \langle\gamma_g\gamma_g||\mu_u\mu_u\rangle + \langle\gamma_g\mu_u||\gamma_g\mu_u\rangle}$$

$$\Psi_{7}(b_{1g}e_{1u}, {}^1E_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\eta_u}|}{2}$$
$$\Psi_{8}(b_{1g}e_{1u}, {}^1E_{2u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\mu_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\mu_u}|}{2}$$

$b_{2g}e_{1u}$

$$\boxed{\Delta E = \langle\zeta_g\mu_u||\zeta_g\mu_u\rangle + \langle\zeta_g\zeta_g||\mu_u\mu_u\rangle}$$

$$\Psi_{9}(b_{2g}e_{1u}, {}^1E_{2u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\eta_u}|}{2}$$
$$\Psi_{10}(b_{2g}e_{1u}, {}^1E_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\zeta_g}\mu_u|}{2} - \frac{\sqrt{2}|\zeta_g\overline{\mu_u}|}{2}$$

$b_{1u}e_{1g}$

$$\boxed{\Delta E = \langle\gamma_u\gamma_u||\mu_g\mu_g\rangle + \langle\gamma_u\mu_g||\gamma_u\mu_g\rangle}$$

$$\Psi_{11}(b_{1u}e_{1g}, {}^1E_{2u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\eta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_g}|}{2}$$
$$\Psi_{12}(b_{1u}e_{1g}, {}^1E_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\gamma_u}\mu_g|}{2} - \frac{\sqrt{2}|\gamma_u\overline{\mu_g}|}{2}$$

$b_{2u}e_{1g}$

$$\boxed{\Delta E = \langle\zeta_u\mu_g||\zeta_u\mu_g\rangle + \langle\zeta_u\zeta_u||\mu_g\mu_g\rangle}$$

$$\Psi_{13}(b_{2u}e_{1g}, {}^1E_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\eta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_g}|}{2}$$
$$\Psi_{14}(b_{2u}e_{1g}, {}^1E_{2u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\zeta_u}\mu_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\mu_g}|}{2}$$

$a_{2g}e_{2u}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\xi_u\xi_u\rangle + \langle\beta_g\xi_u||\beta_g\xi_u\rangle}$$

$$\Psi_{15}(a_{2g}e_{2u}, {}^1E_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\beta_g}\nu_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\nu_u}|}{2}$$

$$\Psi_{16}(a_{2g}e_{2u}, {}^1E_{2u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\beta_g}\xi_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\xi_u}|}{2}$$

$e_{2g}e_{2u}$

$$\boxed{\Delta E = \langle\xi_g\xi_g||\nu_u\nu_u\rangle - \langle\xi_g\xi_u||\nu_g\nu_u\rangle + \langle\xi_g\xi_u||\xi_g\xi_u\rangle + \langle\xi_g\nu_g||\xi_u\nu_u\rangle}$$

$$\Psi_{17}(e_{2g}e_{2u}, {}^1E_{2u}, M=0, \xi_u) = -\frac{|\overline{\nu_g}\nu_u|}{2} + \frac{|\overline{\xi_g}\xi_u|}{2} + \frac{|\nu_g\overline{\nu_u}|}{2} - \frac{|\xi_g\overline{\xi_u}|}{2}$$

$$\Psi_{18}(e_{2g}e_{2u}, {}^1E_{2u}, M=0, \nu_u) = -\frac{|\overline{\nu_g}\xi_u|}{2} - \frac{|\overline{\xi_g}\nu_u|}{2} + \frac{|\nu_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\nu_u}|}{2}$$

$e_{1g}e_{1u}$

$$\boxed{\Delta E = \langle\mu_u\eta_u||\mu_g\eta_g\rangle - \langle\mu_u\mu_g||\eta_u\eta_g\rangle + \langle\mu_u\mu_g||\mu_u\mu_g\rangle + \langle\mu_u\mu_u||\eta_g\eta_g\rangle}$$

$$\Psi_{19}(e_{1g}e_{1u}, {}^1E_{2u}, M=0, \xi_u) = \frac{|\overline{\eta_u}\eta_g|}{2} - \frac{|\overline{\mu_u}\mu_g|}{2} - \frac{|\eta_u\overline{\eta_g}|}{2} + \frac{|\mu_u\overline{\mu_g}|}{2}$$

$$\Psi_{20}(e_{1g}e_{1u}, {}^1E_{2u}, M=0, \nu_u) = -\frac{|\overline{\eta_u}\mu_g|}{2} - \frac{|\overline{\mu_u}\eta_g|}{2} + \frac{|\eta_u\overline{\mu_g}|}{2} + \frac{|\mu_u\overline{\eta_g}|}{2}$$

2.28 Group T

Component labels

$A : \{\alpha\}$ —— $E^1 : \{\beta\}$ —— $E^2 : \{\gamma\}$ —— $T : \{\zeta, \eta, \mu\}$

2.28.1 ${}^1A$

a^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a^2, {}^1A, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

e^1e^2

$$\boxed{\Delta E = 0}$$

$$\Psi_2(e^1e^2, {}^1A, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$

t^2

$$\boxed{\Delta E = 3\,\langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_3(t^2, {}^1A, M=0, \alpha) = -\frac{\sqrt{3}|\overline{\eta}\eta|}{3} - \frac{\sqrt{3}|\overline{\mu}\mu|}{3} - \frac{\sqrt{3}|\overline{\zeta}\zeta|}{3}$$

2.28.2 ${}^3E^1$

ae^1

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae^1, {}^3E^1, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$

$$\Psi_2(ae^1, {}^3E^1, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$$\Psi_3(ae^1, {}^3E^1, M=1, \beta) = |\alpha\beta|$$

2.28.3 ${}^1E^1$

ae^1

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae^1, {}^1E^1, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

$\left(e^2\right)^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(\left(e^2\right)^2, {}^1E^1, M=0, \beta) = -|\overline{\gamma}\gamma|$$

t^2

$$\boxed{\Delta E = 0}$$

$$\Psi_3(t^2, {}^1E^1, M=0, \beta) = \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\eta}\eta| - \frac{\sqrt{3}|\overline{\mu}\mu|}{3} + \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\zeta}\zeta|$$

2.28.4 ${}^3E^2$

ae^2

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae^2, {}^3E^2, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$

$$\Psi_2(ae^2, {}^3E^2, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

$$\Psi_3(ae^2, {}^3E^2, M=1, \gamma) = |\alpha\gamma|$$

2.28.5 $^{1}E^{2}$

ae^2

$$\boxed{\Delta E = 0}$$

$$\Psi_1(ae^2, {}^1E^2, M=0, \gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$

$\left(e^1\right)^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(\left(e^1\right)^2, {}^1E^2, M=0, \gamma) = -|\overline{\beta}\beta|$$

t^2

$$\boxed{\Delta E = 0}$$

$$\Psi_3(t^2, {}^1E^2, M=0, \gamma) = \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\eta}\eta| - \frac{\sqrt{3}|\overline{\mu}\mu|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\zeta}\zeta|$$

2.28.6 ^{3}T

at

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(at, {}^3T, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_2(at, {}^3T, M=-1, \eta) = |\overline{\alpha}\overline{\eta}|$$
$$\Psi_3(at, {}^3T, M=-1, \mu) = |\overline{\alpha}\overline{\mu}|$$
$$\Psi_4(at, {}^3T, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_5(at, {}^3T, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_6(at, {}^3T, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_7(at, {}^3T, M=1, \zeta) = |\alpha\zeta|$$
$$\Psi_8(at, {}^3T, M=1, \eta) = |\alpha\eta|$$
$$\Psi_9(at, {}^3T, M=1, \mu) = |\alpha\mu|$$

e^1t

$$\boxed{\Delta E = \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_{10}(e^1t, {}^3T, M=-1, \zeta) = |\overline{\beta}\overline{\zeta}|$$
$$\Psi_{11}(e^1t, {}^3T, M=-1, \eta) = \frac{i\left(\sqrt{3}+i\right)|\overline{\beta}\overline{\eta}|}{2}$$
$$\Psi_{12}(e^1t, {}^3T, M=-1, \mu) = -\frac{i\left(\sqrt{3}-i\right)|\overline{\beta}\overline{\mu}|}{2}$$
$$\Psi_{13}(e^1t, {}^3T, M=0, \zeta) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_{14}(e^1t, {}^3T, M=0, \eta) = \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\beta}\eta|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\beta\overline{\eta}|}{4}$$
$$\Psi_{15}(e^1t, {}^3T, M=0, \mu) = -\frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\beta}\mu|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\beta\overline{\mu}|}{4}$$
$$\Psi_{16}(e^1t, {}^3T, M=1, \zeta) = |\beta\zeta|$$
$$\Psi_{17}(e^1t, {}^3T, M=1, \eta) = \frac{i\left(\sqrt{3}+i\right)|\beta\eta|}{2}$$
$$\Psi_{18}(e^1t, {}^3T, M=1, \mu) = -\frac{i\left(\sqrt{3}-i\right)|\beta\mu|}{2}$$

e^2t

$$\boxed{\Delta E = \langle\gamma\zeta||\gamma\zeta\rangle}$$

$$\Psi_{19}(e^2t, {}^3T, M=-1, \zeta) = |\overline{\gamma}\overline{\zeta}|$$
$$\Psi_{20}(e^2t, {}^3T, M=-1, \eta) = -\frac{i\left(\sqrt{3}-i\right)|\overline{\gamma}\overline{\eta}|}{2}$$
$$\Psi_{21}(e^2t, {}^3T, M=-1, \mu) = \frac{i\left(\sqrt{3}+i\right)|\overline{\gamma}\overline{\mu}|}{2}$$
$$\Psi_{22}(e^2t, {}^3T, M=0, \zeta) = \frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$
$$\Psi_{23}(e^2t, {}^3T, M=0, \eta) = -\frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\gamma}\eta|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\gamma\overline{\eta}|}{4}$$
$$\Psi_{24}(e^2t, {}^3T, M=0, \mu) = \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\gamma}\mu|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\gamma\overline{\mu}|}{4}$$
$$\Psi_{25}(e^2t, {}^3T, M=1, \zeta) = |\gamma\zeta|$$
$$\Psi_{26}(e^2t, {}^3T, M=1, \eta) = -\frac{i\left(\sqrt{3}-i\right)|\gamma\eta|}{2}$$
$$\Psi_{27}(e^2t, {}^3T, M=1, \mu) = \frac{i\left(\sqrt{3}+i\right)|\gamma\mu|}{2}$$

t^2

$$\boxed{\Delta E = \langle\zeta\mu||\zeta\mu\rangle - \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_{28}(t^2, {}^3T, M=-1, \eta) = |\overline{\zeta}\overline{\mu}|$$
$$\Psi_{29}(t^2, {}^3T, M=-1, \mu) = |\overline{\eta}\overline{\zeta}|$$
$$\Psi_{30}(t^2, {}^3T, M=-1, \zeta) = |\overline{\mu}\overline{\eta}|$$
$$\Psi_{31}(t^2, {}^3T, M=0, \eta) = \frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{32}(t^2, {}^3T, M=0, \mu) = \frac{\sqrt{2}|\overline{\eta}\zeta|}{2} + \frac{\sqrt{2}|\eta\overline{\zeta}|}{2}$$
$$\Psi_{33}(t^2, {}^3T, M=0, \zeta) = \frac{\sqrt{2}|\overline{\mu}\eta|}{2} + \frac{\sqrt{2}|\mu\overline{\eta}|}{2}$$
$$\Psi_{34}(t^2, {}^3T, M=1, \eta) = |\zeta\mu|$$
$$\Psi_{35}(t^2, {}^3T, M=1, \mu) = |\eta\zeta|$$
$$\Psi_{36}(t^2, {}^3T, M=1, \zeta) = |\mu\eta|$$

2.28.7 ^{1}T

at

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(at, {}^1T, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_2(at, {}^1T, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_3(at, {}^1T, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$

e^1t

$$\boxed{\Delta E = \langle \beta\zeta || \beta\zeta \rangle}$$

$$\Psi_4(e^1t, {}^1T, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} + \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

$$\Psi_5(e^1t, {}^1T, M=0, \eta) = -\frac{\sqrt{2}i(\sqrt{3}+i)|\overline{\beta}\eta|}{4} + \frac{\sqrt{2}i(\sqrt{3}+i)|\beta\overline{\eta}|}{4}$$

$$\Psi_6(e^1t, {}^1T, M=0, \mu) = \frac{\sqrt{2}i(\sqrt{3}-i)|\overline{\beta}\mu|}{4} - \frac{\sqrt{2}i(\sqrt{3}-i)|\beta\overline{\mu}|}{4}$$

e^2t

$$\boxed{\Delta E = \langle \gamma\zeta || \gamma\zeta \rangle}$$

$$\Psi_7(e^2t, {}^1T, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\gamma\overline{\zeta}|}{2}$$

$$\Psi_8(e^2t, {}^1T, M=0, \eta) = \frac{\sqrt{2}i(\sqrt{3}-i)|\overline{\gamma}\eta|}{4} - \frac{\sqrt{2}i(\sqrt{3}-i)|\gamma\overline{\eta}|}{4}$$

$$\Psi_9(e^2t, {}^1T, M=0, \mu) = -\frac{\sqrt{2}i(\sqrt{3}+i)|\overline{\gamma}\mu|}{4} + \frac{\sqrt{2}i(\sqrt{3}+i)|\gamma\overline{\mu}|}{4}$$

t^2

$$\boxed{\Delta E = \langle \zeta\mu || \zeta\mu \rangle + \langle \zeta\zeta || \zeta\zeta \rangle}$$

$$\Psi_{10}(t^2, {}^1T, M=0, \eta) = -\frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

$$\Psi_{11}(t^2, {}^1T, M=0, \mu) = -\frac{\sqrt{2}|\overline{\eta}\zeta|}{2} + \frac{\sqrt{2}|\eta\overline{\zeta}|}{2}$$

$$\Psi_{12}(t^2, {}^1T, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\mu}\eta|}{2} + \frac{\sqrt{2}|\mu\overline{\eta}|}{2}$$

2.28.8 ^3A

e^1e^2

$$\boxed{\Delta E = 0}$$

$$\Psi_1(e^1e^2, {}^3A, M=-1, \alpha) = |\overline{\beta}\overline{\gamma}|$$

$$\Psi_2(e^1e^2, {}^3A, M=0, \alpha) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$

$$\Psi_3(e^1e^2, {}^3A, M=1, \alpha) = |\beta\gamma|$$

2.29 Group T_h

Component labels

$A_g : \{\alpha_g\}$ —— $A_u : \{\alpha_u\}$ —— $E_u^1 : \{\beta_u\}$ —— $E_u^2 : \{\gamma_u\}$ —— $E_g^2 : \{\gamma_g\}$ —— $E_g^1 : \{\beta_g\}$ —— $T_g : \{\zeta_g, \eta_g, \mu_g\}$ —— $T_u : \{\zeta_u, \eta_u, \mu_u\}$

2.29.1 ^1A_g

a_g^2

$$\boxed{\Delta E = \langle \alpha_g\alpha_g || \alpha_g\alpha_g \rangle}$$

$$\Psi_1(a_g^2, {}^1A_g, M=0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

a_u^2

$$\boxed{\Delta E = \langle \alpha_u\alpha_u || \alpha_u\alpha_u \rangle}$$

$$\Psi_2(a_u^2, {}^1A_g, M=0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

$e_u^1e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e_u^1e_u^2, {}^1A_g, M=0, \alpha_g) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$

$e_g^1e_g^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e_g^1e_g^2, {}^1A_g, M=0, \alpha_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\beta_g}|}{2}$$

t_g^2

$$\boxed{\Delta E = 3\langle \zeta_g\zeta_g || \zeta_g\zeta_g \rangle}$$

$$\Psi_5(t_g^2, {}^1A_g, M=0, \alpha_g) = -\frac{\sqrt{3}|\overline{\eta_g}\eta_g|}{3} - \frac{\sqrt{3}|\overline{\mu_g}\mu_g|}{3} - \frac{\sqrt{3}|\overline{\zeta_g}\zeta_g|}{3}$$

t_u^2

$$\boxed{\Delta E = 3\langle \zeta_u\zeta_u || \zeta_u\zeta_u \rangle}$$

$$\Psi_6(t_u^2, {}^1A_g, M=0, \alpha_g) = -\frac{\sqrt{3}|\overline{\eta_u}\eta_u|}{3} - \frac{\sqrt{3}|\overline{\mu_u}\mu_u|}{3} - \frac{\sqrt{3}|\overline{\zeta_u}\zeta_u|}{3}$$

2.29.2 ^3A_u

a_ga_u

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g || \alpha_u\alpha_u \rangle + \langle \alpha_g\alpha_u || \alpha_g\alpha_u \rangle}$$

$$\Psi_1(a_ga_u, {}^3A_u, M=-1, \alpha_u) = |\overline{\alpha_g}\overline{\alpha_u}|$$

$$\Psi_2(a_g a_u, {}^3A_u, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$$\Psi_3(a_g a_u, {}^3A_u, M=1, \alpha_u) = |\alpha_g\alpha_u|$$

$e_g^2 e_u^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e_g^2 e_u^1, {}^3A_u, M=-1, \alpha_u) = |\overline{\beta_u}\overline{\gamma_g}|$$

$$\Psi_5(e_g^2 e_u^1, {}^3A_u, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

$$\Psi_6(e_g^2 e_u^1, {}^3A_u, M=1, \alpha_u) = |\beta_u\gamma_g|$$

$e_g^1 e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e_g^1 e_u^2, {}^3A_u, M=-1, \alpha_u) = |\overline{\gamma_u}\overline{\beta_g}|$$

$$\Psi_8(e_g^1 e_u^2, {}^3A_u, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\gamma_u}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\beta_g}|}{2}$$

$$\Psi_9(e_g^1 e_u^2, {}^3A_u, M=1, \alpha_u) = |\gamma_u\beta_g|$$

$t_g t_u$

$$\boxed{\Delta E = 3\langle\zeta_g\eta_u||\zeta_g\eta_u\rangle - 3\langle\zeta_g\zeta_g||\eta_u\eta_u\rangle}$$

$$\Psi_{10}(t_g t_u, {}^3A_u, M=-1, \alpha_u) = \frac{\sqrt{3}|\overline{\eta_g}\overline{\mu_u}|}{3} + \frac{\sqrt{3}|\overline{\mu_g}\overline{\zeta_u}|}{3} + \frac{\sqrt{3}|\overline{\zeta_g}\overline{\eta_u}|}{3}$$

$$\Psi_{11}(t_g t_u, {}^3A_u, M=0, \alpha_u) = \frac{\sqrt{6}|\overline{\eta_g}\mu_u|}{6} + \frac{\sqrt{6}|\overline{\mu_g}\zeta_u|}{6} + \frac{\sqrt{6}|\overline{\zeta_g}\eta_u|}{6} + \frac{\sqrt{6}|\eta_g\overline{\mu_u}|}{6} + \frac{\sqrt{6}|\mu_g\overline{\zeta_u}|}{6} + \frac{\sqrt{6}|\zeta_g\overline{\eta_u}|}{6}$$

$$\Psi_{12}(t_g t_u, {}^3A_u, M=1, \alpha_u) = \frac{\sqrt{3}|\eta_g\mu_u|}{3} + \frac{\sqrt{3}|\mu_g\zeta_u|}{3} + \frac{\sqrt{3}|\zeta_g\eta_u|}{3}$$

2.29.3 ${}^1A_u$

$a_g a_u$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_g a_u, {}^1A_u, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$e_g^2 e_u^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_2(e_g^2 e_u^1, {}^1A_u, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$

$e_g^1 e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e_g^1 e_u^2, {}^1A_u, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\beta_g}|}{2}$$

$t_g t_u$

$$\boxed{\Delta E = 3\langle\zeta_g\eta_u||\zeta_g\eta_u\rangle + 3\langle\zeta_g\zeta_g||\eta_u\eta_u\rangle}$$

$$\Psi_4(t_g t_u, {}^1A_u, M=0, \alpha_u) = -\frac{\sqrt{6}|\overline{\eta_g}\mu_u|}{6} - \frac{\sqrt{6}|\overline{\mu_g}\zeta_u|}{6} - \frac{\sqrt{6}|\overline{\zeta_g}\eta_u|}{6} + \frac{\sqrt{6}|\eta_g\overline{\mu_u}|}{6} + \frac{\sqrt{6}|\mu_g\overline{\zeta_u}|}{6} + \frac{\sqrt{6}|\zeta_g\overline{\eta_u}|}{6}$$

2.29.4 ${}^3E_u^1$

$a_g e_u^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a_g e_u^1, {}^3E_u^1, M=-1, \beta_u) = |\overline{\alpha_g}\overline{\beta_u}|$$

$$\Psi_2(a_g e_u^1, {}^3E_u^1, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$$\Psi_3(a_g e_u^1, {}^3E_u^1, M=1, \beta_u) = |\alpha_g\beta_u|$$

$a_u e_g^1$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(a_u e_g^1, {}^3E_u^1, M=-1, \beta_u) = |\overline{\alpha_u}\overline{\beta_g}|$$

$$\Psi_5(a_u e_g^1, {}^3E_u^1, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

$$\Psi_6(a_u e_g^1, {}^3E_u^1, M=1, \beta_u) = |\alpha_u\beta_g|$$

$e_g^2 e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e_g^2 e_u^2, {}^3E_u^1, M=-1, \beta_u) = |\overline{\gamma_u}\overline{\gamma_g}|$$

$$\Psi_8(e_g^2 e_u^2, {}^3E_u^1, M=0, \beta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$$

$$\Psi_9(e_g^2 e_u^2, {}^3E_u^1, M=1, \beta_u) = |\gamma_u\gamma_g|$$

$t_g t_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_{10}(t_g t_u, {}^3E_u^1, M=-1, \beta_u) = \left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\eta_g}\overline{\mu_u}| + \frac{\sqrt{3}|\overline{\mu_g}\overline{\zeta_u}|}{3} + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\zeta_g}\overline{\eta_u}|$$

$$\Psi_{11}(t_g t_u, {}^3E_u^1, M=0, \beta_u) = \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\eta_g}\mu_u|}{2} + \frac{\sqrt{6}|\overline{\mu_g}\zeta_u|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\zeta_g}\eta_u|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\eta_g\overline{\mu_u}|}{2} + \frac{\sqrt{6}|\mu_g\overline{\zeta_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\zeta_g\overline{\eta_u}|}{2}$$

$$\Psi_{12}(t_g t_u, {}^3E_u^1, M=1, \beta_u) = \left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\eta_g\mu_u| + \frac{\sqrt{3}|\mu_g\zeta_u|}{3} + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\zeta_g\eta_u|$$

2.29.5 $^1E_u^1$

$a_g e_u^1$

$\boxed{\Delta E = 0}$

$$\Psi_1(a_g e_u^1, {}^1E_u^1, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$a_u e_g^1$

$\boxed{\Delta E = 0}$

$$\Psi_2(a_u e_g^1, {}^1E_u^1, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

$e_g^2 e_u^2$

$\boxed{\Delta E = 0}$

$$\Psi_3(e_g^2 e_u^2, {}^1E_u^1, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$$

$t_g t_u$

$\boxed{\Delta E = 0}$

$$\Psi_4(t_g t_u, {}^1E_u^1, M=0, \beta_u) = -\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\eta_g}\mu_u|}{2} - \frac{\sqrt{6}|\overline{\mu_g}\zeta_u|}{6} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\zeta_g}\eta_u|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\eta_g\overline{\mu_u}|}{2} + \frac{\sqrt{6}|\mu_g\overline{\zeta_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\zeta_g\overline{\eta_u}|}{2}$$

2.29.6 $^3E_u^2$

$a_g e_u^2$

$\boxed{\Delta E = 0}$

$$\Psi_1(a_g e_u^2, {}^3E_u^2, M=-1, \gamma_u) = |\overline{\alpha_g\gamma_u}|$$
$$\Psi_2(a_g e_u^2, {}^3E_u^2, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$
$$\Psi_3(a_g e_u^2, {}^3E_u^2, M=1, \gamma_u) = |\alpha_g\gamma_u|$$

$a_u e_g^2$

$\boxed{\Delta E = 0}$

$$\Psi_4(a_u e_g^2, {}^3E_u^2, M=-1, \gamma_u) = |\overline{\alpha_u\gamma_g}|$$
$$\Psi_5(a_u e_g^2, {}^3E_u^2, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$
$$\Psi_6(a_u e_g^2, {}^3E_u^2, M=1, \gamma_u) = |\alpha_u\gamma_g|$$

$e_g^1 e_u^1$

$\boxed{\Delta E = 0}$

$$\Psi_7(e_g^1 e_u^1, {}^3E_u^2, M=-1, \gamma_u) = |\overline{\beta_u\beta_g}|$$
$$\Psi_8(e_g^1 e_u^1, {}^3E_u^2, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$
$$\Psi_9(e_g^1 e_u^1, {}^3E_u^2, M=1, \gamma_u) = |\beta_u\beta_g|$$

$t_g t_u$

$\boxed{\Delta E = 0}$

$$\Psi_{10}(t_g t_u, {}^3E_u^2, M=-1, \gamma_u) = \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\eta_g\mu_u}| + \frac{\sqrt{3}|\overline{\mu_g\zeta_u}|}{3} + \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\zeta_g\eta_u}|$$
$$\Psi_{11}(t_g t_u, {}^3E_u^2, M=0, \gamma_u) = \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\eta_g}\mu_u|}{2} + \frac{\sqrt{6}|\overline{\mu_g}\zeta_u|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\zeta_g}\eta_u|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\eta_g\overline{\mu_u}|}{2} + \frac{\sqrt{6}|\mu_g\overline{\zeta_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\zeta_g\overline{\eta_u}|}{2}$$
$$\Psi_{12}(t_g t_u, {}^3E_u^2, M=1, \gamma_u) = \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\eta_g\mu_u| + \frac{\sqrt{3}|\mu_g\zeta_u|}{3} + \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\zeta_g\eta_u|$$

2.29.7 $^1E_u^2$

$a_g e_u^2$

$\boxed{\Delta E = 0}$

$$\Psi_1(a_g e_u^2, {}^1E_u^2, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$

$a_u e_g^2$

$\boxed{\Delta E = 0}$

$$\Psi_2(a_u e_g^2, {}^1E_u^2, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$

$e_g^1 e_u^1$

$\boxed{\Delta E = 0}$

$$\Psi_3(e_g^1 e_u^1, {}^1E_u^2, M=0, \gamma_u) = -\frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

$t_g t_u$

$\boxed{\Delta E = 0}$

$$\Psi_4(t_g t_u, {}^1E_u^2, M=0, \gamma_u) = -\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\eta_g}\mu_u|}{2} - \frac{\sqrt{6}|\overline{\mu_g}\zeta_u|}{6} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\zeta_g}\eta_u|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\eta_g\overline{\mu_u}|}{2} + \frac{\sqrt{6}|\mu_g\overline{\zeta_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\zeta_g\overline{\eta_u}|}{2}$$

2.29.8 $^3E_g^2$

$a_g e_g^2$

$\boxed{\Delta E = 0}$

$$\Psi_1(a_g e_g^2, {}^3E_g^2, M=-1, \gamma_g) = |\overline{\alpha_g\gamma_g}|$$
$$\Psi_2(a_g e_g^2, {}^3E_g^2, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$
$$\Psi_3(a_g e_g^2, {}^3E_g^2, M=1, \gamma_g) = |\alpha_g\gamma_g|$$

$a_u e_u^2$

$\boxed{\Delta E = 0}$

$\Psi_4(a_u e_u^2, {}^3E_g^2, M=-1, \gamma_g) = |\overline{\alpha_u}\overline{\gamma_u}|$

$\Psi_5(a_u e_u^2, {}^3E_g^2, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$

$\Psi_6(a_u e_u^2, {}^3E_g^2, M=1, \gamma_g) = |\alpha_u\gamma_u|$

2.29.9 ${}^1E_g^2$

$a_g e_g^2$

$\boxed{\Delta E = 0}$

$\Psi_1(a_g e_g^2, {}^1E_g^2, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$

$a_u e_u^2$

$\boxed{\Delta E = 0}$

$\Psi_2(a_u e_u^2, {}^1E_g^2, M=0, \gamma_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$

$\left(e_u^1\right)^2$

$\boxed{\Delta E = 0}$

$\Psi_3(\left(e_u^1\right)^2, {}^1E_g^2, M=0, \gamma_g) = -|\overline{\beta_u}\beta_u|$

$\left(e_g^1\right)^2$

$\boxed{\Delta E = 0}$

$\Psi_4(\left(e_g^1\right)^2, {}^1E_g^2, M=0, \gamma_g) = -|\overline{\beta_g}\beta_g|$

t_g^2

$\boxed{\Delta E = 0}$

$\Psi_5(t_g^2, {}^1E_g^2, M=0, \gamma_g) =$
$\left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\eta_g}\eta_g| - \frac{\sqrt{3}|\overline{\mu_g}\mu_g|}{3} + \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\zeta_g}\zeta_g|$

t_u^2

$\boxed{\Delta E = 0}$

$\Psi_6(t_u^2, {}^1E_g^2, M=0, \gamma_g) =$
$\left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\eta_u}\eta_u| - \frac{\sqrt{3}|\overline{\mu_u}\mu_u|}{3} + \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\zeta_u}\zeta_u|$

2.29.10 ${}^3E_g^1$

$a_g e_g^1$

$\boxed{\Delta E = 0}$

$\Psi_1(a_g e_g^1, {}^3E_g^1, M=-1, \beta_g) = |\overline{\alpha_g}\overline{\beta_g}|$

$\Psi_2(a_g e_g^1, {}^3E_g^1, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$

$\Psi_3(a_g e_g^1, {}^3E_g^1, M=1, \beta_g) = |\alpha_g\beta_g|$

$a_u e_u^1$

$\boxed{\Delta E = 0}$

$\Psi_4(a_u e_u^1, {}^3E_g^1, M=-1, \beta_g) = |\overline{\alpha_u}\overline{\beta_u}|$

$\Psi_5(a_u e_u^1, {}^3E_g^1, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_u}|}{2}$

$\Psi_6(a_u e_u^1, {}^3E_g^1, M=1, \beta_g) = |\alpha_u\beta_u|$

2.29.11 ${}^1E_g^1$

$a_g e_g^1$

$\boxed{\Delta E = 0}$

$\Psi_1(a_g e_g^1, {}^1E_g^1, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$

$a_u e_u^1$

$\boxed{\Delta E = 0}$

$\Psi_2(a_u e_u^1, {}^1E_g^1, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_u}|}{2}$

$\left(e_u^2\right)^2$

$\boxed{\Delta E = 0}$

$\Psi_3(\left(e_u^2\right)^2, {}^1E_g^1, M=0, \beta_g) = -|\overline{\gamma_u}\gamma_u|$

$\left(e_g^2\right)^2$

$\boxed{\Delta E = 0}$

$\Psi_4(\left(e_g^2\right)^2, {}^1E_g^1, M=0, \beta_g) = -|\overline{\gamma_g}\gamma_g|$

t_g^2

$\boxed{\Delta E = 0}$

$\Psi_5(t_g^2, {}^1E_g^1, M=0, \beta_g) =$
$\left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\eta_g}\eta_g| - \frac{\sqrt{3}|\overline{\mu_g}\mu_g|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\zeta_g}\zeta_g|$

t_u^2

$\boxed{\Delta E = 0}$

$\Psi_6(t_u^2, {}^1E_g^1, M=0, \beta_g) =$
$\left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\eta_u}\eta_u| - \frac{\sqrt{3}|\overline{\mu_u}\mu_u|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\zeta_u}\zeta_u|$

2.29.12 ^3T_g

a_gt_g

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\zeta_g\zeta_g\rangle + \langle\alpha_g\zeta_g||\alpha_g\zeta_g\rangle}$$

$$\Psi_1(a_gt_g, {}^3T_g, M=-1, \zeta_g) = |\overline{\alpha_g}\overline{\zeta_g}|$$
$$\Psi_2(a_gt_g, {}^3T_g, M=-1, \eta_g) = |\overline{\alpha_g}\overline{\eta_g}|$$
$$\Psi_3(a_gt_g, {}^3T_g, M=-1, \mu_g) = |\overline{\alpha_g}\overline{\mu_g}|$$
$$\Psi_4(a_gt_g, {}^3T_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$
$$\Psi_5(a_gt_g, {}^3T_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_g}|}{2}$$
$$\Psi_6(a_gt_g, {}^3T_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\alpha_g}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_g}|}{2}$$
$$\Psi_7(a_gt_g, {}^3T_g, M=1, \zeta_g) = |\alpha_g\zeta_g|$$
$$\Psi_8(a_gt_g, {}^3T_g, M=1, \eta_g) = |\alpha_g\eta_g|$$
$$\Psi_9(a_gt_g, {}^3T_g, M=1, \mu_g) = |\alpha_g\mu_g|$$

a_ut_u

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\zeta_u\zeta_u\rangle + \langle\alpha_u\zeta_u||\alpha_u\zeta_u\rangle}$$

$$\Psi_{10}(a_ut_u, {}^3T_g, M=-1, \mu_g) = |\overline{\alpha_u}\overline{\zeta_u}|$$
$$\Psi_{11}(a_ut_u, {}^3T_g, M=-1, \zeta_g) = |\overline{\alpha_u}\overline{\eta_u}|$$
$$\Psi_{12}(a_ut_u, {}^3T_g, M=-1, \eta_g) = |\overline{\alpha_u}\overline{\mu_u}|$$
$$\Psi_{13}(a_ut_u, {}^3T_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_u}|}{2}$$
$$\Psi_{14}(a_ut_u, {}^3T_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\eta_u}|}{2}$$
$$\Psi_{15}(a_ut_u, {}^3T_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_u}|}{2}$$
$$\Psi_{16}(a_ut_u, {}^3T_g, M=1, \mu_g) = |\alpha_u\zeta_u|$$
$$\Psi_{17}(a_ut_u, {}^3T_g, M=1, \zeta_g) = |\alpha_u\eta_u|$$
$$\Psi_{18}(a_ut_u, {}^3T_g, M=1, \eta_g) = |\alpha_u\mu_u|$$

$e_u^1t_u$

$$\boxed{\Delta E = \langle\beta_u\zeta_u||\beta_u\zeta_u\rangle}$$

$$\Psi_{19}(e_u^1t_u, {}^3T_g, M=-1, \mu_g) = \frac{i(\sqrt{3}+i)|\overline{\beta_u}\overline{\zeta_u}|}{2}$$
$$\Psi_{20}(e_u^1t_u, {}^3T_g, M=-1, \zeta_g) = |\overline{\beta_u}\overline{\eta_u}|$$
$$\Psi_{21}(e_u^1t_u, {}^3T_g, M=-1, \eta_g) = -\frac{i(\sqrt{3}-i)|\overline{\beta_u}\overline{\mu_u}|}{2}$$
$$\Psi_{22}(e_u^1t_u, {}^3T_g, M=0, \mu_g) = \frac{\sqrt{2}i(\sqrt{3}+i)|\overline{\beta_u}\zeta_u|}{4} + \frac{\sqrt{2}i(\sqrt{3}+i)|\beta_u\overline{\zeta_u}|}{4}$$
$$\Psi_{23}(e_u^1t_u, {}^3T_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_u}\eta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_u}|}{2}$$
$$\Psi_{24}(e_u^1t_u, {}^3T_g, M=0, \eta_g) = -\frac{\sqrt{2}i(\sqrt{3}-i)|\overline{\beta_u}\mu_u|}{4} - \frac{\sqrt{2}i(\sqrt{3}-i)|\beta_u\overline{\mu_u}|}{4}$$
$$\Psi_{25}(e_u^1t_u, {}^3T_g, M=1, \mu_g) = \frac{i(\sqrt{3}+i)|\beta_u\zeta_u|}{2}$$
$$\Psi_{26}(e_u^1t_u, {}^3T_g, M=1, \zeta_g) = |\beta_u\eta_u|$$
$$\Psi_{27}(e_u^1t_u, {}^3T_g, M=1, \eta_g) = -\frac{i(\sqrt{3}-i)|\beta_u\mu_u|}{2}$$

$e_u^2t_u$

$$\boxed{\Delta E = \langle\gamma_u\zeta_u||\gamma_u\zeta_u\rangle}$$

$$\Psi_{28}(e_u^2t_u, {}^3T_g, M=-1, \mu_g) = -\frac{i(\sqrt{3}-i)|\overline{\gamma_u}\overline{\zeta_u}|}{2}$$
$$\Psi_{29}(e_u^2t_u, {}^3T_g, M=-1, \zeta_g) = |\overline{\gamma_u}\overline{\eta_u}|$$
$$\Psi_{30}(e_u^2t_u, {}^3T_g, M=-1, \eta_g) = \frac{i(\sqrt{3}+i)|\overline{\gamma_u}\overline{\mu_u}|}{2}$$
$$\Psi_{31}(e_u^2t_u, {}^3T_g, M=0, \mu_g) = -\frac{\sqrt{2}i(\sqrt{3}-i)|\overline{\gamma_u}\zeta_u|}{4} - \frac{\sqrt{2}i(\sqrt{3}-i)|\gamma_u\overline{\zeta_u}|}{4}$$
$$\Psi_{32}(e_u^2t_u, {}^3T_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\gamma_u}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_u}|}{2}$$
$$\Psi_{33}(e_u^2t_u, {}^3T_g, M=0, \eta_g) = \frac{\sqrt{2}i(\sqrt{3}+i)|\overline{\gamma_u}\mu_u|}{4} + \frac{\sqrt{2}i(\sqrt{3}+i)|\gamma_u\overline{\mu_u}|}{4}$$
$$\Psi_{34}(e_u^2t_u, {}^3T_g, M=1, \mu_g) = -\frac{i(\sqrt{3}-i)|\gamma_u\zeta_u|}{2}$$
$$\Psi_{35}(e_u^2t_u, {}^3T_g, M=1, \zeta_g) = |\gamma_u\eta_u|$$
$$\Psi_{36}(e_u^2t_u, {}^3T_g, M=1, \eta_g) = \frac{i(\sqrt{3}+i)|\gamma_u\mu_u|}{2}$$

$e_g^2t_g$

$$\boxed{\Delta E = \langle\gamma_g\zeta_g||\gamma_g\zeta_g\rangle}$$

$$\Psi_{37}(e_g^2t_g, {}^3T_g, M=-1, \zeta_g) = |\overline{\gamma_g}\overline{\zeta_g}|$$
$$\Psi_{38}(e_g^2t_g, {}^3T_g, M=-1, \eta_g) = \frac{i(\sqrt{3}+i)|\overline{\gamma_g}\overline{\eta_g}|}{2}$$
$$\Psi_{39}(e_g^2t_g, {}^3T_g, M=-1, \mu_g) = -\frac{i(\sqrt{3}-i)|\overline{\gamma_g}\overline{\mu_g}|}{2}$$
$$\Psi_{40}(e_g^2t_g, {}^3T_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\gamma_g}\zeta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\zeta_g}|}{2}$$
$$\Psi_{41}(e_g^2t_g, {}^3T_g, M=0, \eta_g) = \frac{\sqrt{2}i(\sqrt{3}+i)|\overline{\gamma_g}\eta_g|}{4} + \frac{\sqrt{2}i(\sqrt{3}+i)|\gamma_g\overline{\eta_g}|}{4}$$
$$\Psi_{42}(e_g^2t_g, {}^3T_g, M=0, \mu_g) = -\frac{\sqrt{2}i(\sqrt{3}-i)|\overline{\gamma_g}\mu_g|}{4} - \frac{\sqrt{2}i(\sqrt{3}-i)|\gamma_g\overline{\mu_g}|}{4}$$
$$\Psi_{43}(e_g^2t_g, {}^3T_g, M=1, \zeta_g) = |\gamma_g\zeta_g|$$
$$\Psi_{44}(e_g^2t_g, {}^3T_g, M=1, \eta_g) = \frac{i(\sqrt{3}+i)|\gamma_g\eta_g|}{2}$$
$$\Psi_{45}(e_g^2t_g, {}^3T_g, M=1, \mu_g) = -\frac{i(\sqrt{3}-i)|\gamma_g\mu_g|}{2}$$

$e_g^1t_g$

$$\boxed{\Delta E = \langle\beta_g\zeta_g||\beta_g\zeta_g\rangle}$$

$$\Psi_{46}(e_g^1t_g, {}^3T_g, M=-1, \zeta_g) = |\overline{\beta_g\zeta_g}|$$
$$\Psi_{47}(e_g^1t_g, {}^3T_g, M=-1, \eta_g) = -\frac{i(\sqrt{3}-i)|\overline{\beta_g}\overline{\eta_g}|}{2}$$
$$\Psi_{48}(e_g^1t_g, {}^3T_g, M=-1, \mu_g) = \frac{i(\sqrt{3}+i)|\overline{\beta_g}\overline{\mu_g}|}{2}$$
$$\Psi_{49}(e_g^1t_g, {}^3T_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\beta_g}\zeta_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_g}|}{2}$$
$$\Psi_{50}(e_g^1t_g, {}^3T_g, M=0, \eta_g) = -\frac{\sqrt{2}i(\sqrt{3}-i)|\overline{\beta_g}\eta_g|}{4} - \frac{\sqrt{2}i(\sqrt{3}-i)|\beta_g\overline{\eta_g}|}{4}$$

$$\Psi_{51}(e_g^1t_g, {}^3T_g, M=0, \mu_g) = \frac{\sqrt{2}i\left(\sqrt{3}+i\right)\left|\overline{\beta_g}\mu_g\right|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)\left|\beta_g\overline{\mu_g}\right|}{4}$$

$$\Psi_{52}(e_g^1t_g, {}^3T_g, M=1, \zeta_g) = |\beta_g\zeta_g|$$

$$\Psi_{53}(e_g^1t_g, {}^3T_g, M=1, \eta_g) = -\frac{i\left(\sqrt{3}-i\right)|\beta_g\eta_g|}{2}$$

$$\Psi_{54}(e_g^1t_g, {}^3T_g, M=1, \mu_g) = \frac{i\left(\sqrt{3}+i\right)|\beta_g\mu_g|}{2}$$

t_g^2

$$\boxed{\Delta E = \langle\zeta_g\mu_g||\zeta_g\mu_g\rangle - \langle\zeta_g\zeta_g||\zeta_g\zeta_g\rangle}$$

$$\Psi_{55}(t_g^2, {}^3T_g, M=-1, \eta_g) = |\overline{\zeta_g}\overline{\mu_g}|$$

$$\Psi_{56}(t_g^2, {}^3T_g, M=-1, \mu_g) = |\overline{\eta_g}\overline{\zeta_g}|$$

$$\Psi_{57}(t_g^2, {}^3T_g, M=-1, \zeta_g) = |\overline{\mu_g}\overline{\eta_g}|$$

$$\Psi_{58}(t_g^2, {}^3T_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\zeta_g}\mu_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\mu_g}|}{2}$$

$$\Psi_{59}(t_g^2, {}^3T_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\eta_g}\zeta_g|}{2} + \frac{\sqrt{2}|\eta_g\overline{\zeta_g}|}{2}$$

$$\Psi_{60}(t_g^2, {}^3T_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\mu_g}\eta_g|}{2} + \frac{\sqrt{2}|\mu_g\overline{\eta_g}|}{2}$$

$$\Psi_{61}(t_g^2, {}^3T_g, M=1, \eta_g) = |\zeta_g\mu_g|$$

$$\Psi_{62}(t_g^2, {}^3T_g, M=1, \mu_g) = |\eta_g\zeta_g|$$

$$\Psi_{63}(t_g^2, {}^3T_g, M=1, \zeta_g) = |\mu_g\eta_g|$$

t_u^2

$$\boxed{\Delta E = \langle\zeta_u\eta_u||\zeta_u\eta_u\rangle - \langle\zeta_u\zeta_u||\zeta_u\zeta_u\rangle}$$

$$\Psi_{64}(t_u^2, {}^3T_g, M=-1, \eta_g) = |\overline{\zeta_u}\overline{\eta_u}|$$

$$\Psi_{65}(t_u^2, {}^3T_g, M=-1, \mu_g) = |\overline{\eta_u}\overline{\mu_u}|$$

$$\Psi_{66}(t_u^2, {}^3T_g, M=-1, \zeta_g) = |\overline{\mu_u}\overline{\zeta_u}|$$

$$\Psi_{67}(t_u^2, {}^3T_g, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\zeta_u}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_u}|}{2}$$

$$\Psi_{68}(t_u^2, {}^3T_g, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\eta_u}\mu_u|}{2} + \frac{\sqrt{2}|\eta_u\overline{\mu_u}|}{2}$$

$$\Psi_{69}(t_u^2, {}^3T_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\mu_u}\zeta_u|}{2} + \frac{\sqrt{2}|\mu_u\overline{\zeta_u}|}{2}$$

$$\Psi_{70}(t_u^2, {}^3T_g, M=1, \eta_g) = |\zeta_u\eta_u|$$

$$\Psi_{71}(t_u^2, {}^3T_g, M=1, \mu_g) = |\eta_u\mu_u|$$

$$\Psi_{72}(t_u^2, {}^3T_g, M=1, \zeta_g) = |\mu_u\zeta_u|$$

2.29.13 ${}^1T_g$

a_gt_g

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\zeta_g\zeta_g\rangle + \langle\alpha_g\zeta_g||\alpha_g\zeta_g\rangle}$$

$$\Psi_1(a_gt_g, {}^1T_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$

$$\Psi_2(a_gt_g, {}^1T_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_g}|}{2}$$

$$\Psi_3(a_gt_g, {}^1T_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_g}|}{2}$$

a_ut_u

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\zeta_u\zeta_u\rangle + \langle\alpha_u\zeta_u||\alpha_u\zeta_u\rangle}$$

$$\Psi_4(a_ut_u, {}^1T_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_u}|}{2}$$

$$\Psi_5(a_ut_u, {}^1T_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\eta_u}|}{2}$$

$$\Psi_6(a_ut_u, {}^1T_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_u}|}{2}$$

$e_u^1t_u$

$$\boxed{\Delta E = \langle\beta_u\zeta_u||\beta_u\zeta_u\rangle}$$

$$\Psi_7(e_u^1t_u, {}^1T_g, M=0, \mu_g) = -\frac{\sqrt{2}i\left(\sqrt{3}+i\right)\left|\overline{\beta_u}\zeta_u\right|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)\left|\beta_u\overline{\zeta_u}\right|}{4}$$

$$\Psi_8(e_u^1t_u, {}^1T_g, M=0, \zeta_g) = -\frac{\sqrt{2}\left|\overline{\beta_u}\eta_u\right|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_u}|}{2}$$

$$\Psi_9(e_u^1t_u, {}^1T_g, M=0, \eta_g) = \frac{\sqrt{2}i\left(\sqrt{3}-i\right)\left|\overline{\beta_u}\mu_u\right|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\beta_u\overline{\mu_u}|}{4}$$

$e_u^2t_u$

$$\boxed{\Delta E = \langle\gamma_u\zeta_u||\gamma_u\zeta_u\rangle}$$

$$\Psi_{10}(e_u^2t_u, {}^1T_g, M=0, \mu_g) = \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\gamma_u}\zeta_u|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)\left|\gamma_u\overline{\zeta_u}\right|}{4}$$

$$\Psi_{11}(e_u^2t_u, {}^1T_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\eta_u|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\eta_u}|}{2}$$

$$\Psi_{12}(e_u^2t_u, {}^1T_g, M=0, \eta_g) = -\frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\gamma_u}\mu_u|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\gamma_u\overline{\mu_u}|}{4}$$

$e_g^2t_g$

$$\boxed{\Delta E = \langle\gamma_g\zeta_g||\gamma_g\zeta_g\rangle}$$

$$\Psi_{13}(e_g^2t_g, {}^1T_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\zeta_g|}{2} + \frac{\sqrt{2}\left|\gamma_g\overline{\zeta_g}\right|}{2}$$

$$\Psi_{14}(e_g^2t_g, {}^1T_g, M=0, \eta_g) = -\frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\gamma_g}\eta_g|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\gamma_g\overline{\eta_g}|}{4}$$

$$\Psi_{15}(e_g^2t_g, {}^1T_g, M=0, \mu_g) = \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\gamma_g}\mu_g|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\gamma_g\overline{\mu_g}|}{4}$$

$e_g^1t_g$

$$\boxed{\Delta E = \langle\beta_g\zeta_g||\beta_g\zeta_g\rangle}$$

$$\Psi_{16}(e_g^1t_g, {}^1T_g, M=0, \zeta_g) = -\frac{\sqrt{2}\left|\overline{\beta_g}\zeta_g\right|}{2} + \frac{\sqrt{2}\left|\beta_g\overline{\zeta_g}\right|}{2}$$

$$\Psi_{17}(e_g^1t_g, {}^1T_g, M=0, \eta_g) = \frac{\sqrt{2}i\left(\sqrt{3}-i\right)\left|\overline{\beta_g}\eta_g\right|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\beta_g\overline{\eta_g}|}{4}$$

$$\Psi_{18}(e_g^1t_g, {}^1T_g, M=0, \mu_g) = -\frac{\sqrt{2}i\left(\sqrt{3}+i\right)\left|\overline{\beta_g}\mu_g\right|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\beta_g\overline{\mu_g}|}{4}$$

t_g^2

$$\boxed{\Delta E = \langle\zeta_g\mu_g||\zeta_g\mu_g\rangle + \langle\zeta_g\zeta_g||\zeta_g\zeta_g\rangle}$$

$$\Psi_{19}(t_g^2, {}^1T_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\zeta_g}\mu_g|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\mu_g}|}{2}$$
$$\Psi_{20}(t_g^2, {}^1T_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\eta_g}\zeta_g|}{2} + \frac{\sqrt{2}|\eta_g\overline{\zeta_g}|}{2}$$
$$\Psi_{21}(t_g^2, {}^1T_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\mu_g}\eta_g|}{2} + \frac{\sqrt{2}|\mu_g\overline{\eta_g}|}{2}$$

t_u^2

$$\boxed{\Delta E = \langle\zeta_u\eta_u||\zeta_u\eta_u\rangle + \langle\zeta_u\zeta_u||\zeta_u\zeta_u\rangle}$$

$$\Psi_{22}(t_u^2, {}^1T_g, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\zeta_u}\eta_u|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\eta_u}|}{2}$$
$$\Psi_{23}(t_u^2, {}^1T_g, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\eta_u}\mu_u|}{2} + \frac{\sqrt{2}|\eta_u\overline{\mu_u}|}{2}$$
$$\Psi_{24}(t_u^2, {}^1T_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\mu_u}\zeta_u|}{2} + \frac{\sqrt{2}|\mu_u\overline{\zeta_u}|}{2}$$

2.29.14 ^3T_u

$a_g t_u$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\zeta_u\zeta_u\rangle + \langle\alpha_g\zeta_u||\alpha_g\zeta_u\rangle}$$

$$\Psi_1(a_g t_u, {}^3T_u, M=-1, \zeta_u) = |\overline{\alpha_g}\overline{\zeta_u}|$$
$$\Psi_2(a_g t_u, {}^3T_u, M=-1, \eta_u) = |\overline{\alpha_g}\overline{\eta_u}|$$
$$\Psi_3(a_g t_u, {}^3T_u, M=-1, \mu_u) = |\overline{\alpha_g}\overline{\mu_u}|$$
$$\Psi_4(a_g t_u, {}^3T_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$
$$\Psi_5(a_g t_u, {}^3T_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_u}|}{2}$$
$$\Psi_6(a_g t_u, {}^3T_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\alpha_g}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_u}|}{2}$$
$$\Psi_7(a_g t_u, {}^3T_u, M=1, \zeta_u) = |\alpha_g\zeta_u|$$
$$\Psi_8(a_g t_u, {}^3T_u, M=1, \eta_u) = |\alpha_g\eta_u|$$
$$\Psi_9(a_g t_u, {}^3T_u, M=1, \mu_u) = |\alpha_g\mu_u|$$

$a_u t_g$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\zeta_g\zeta_g\rangle + \langle\alpha_u\zeta_g||\alpha_u\zeta_g\rangle}$$

$$\Psi_{10}(a_u t_g, {}^3T_u, M=-1, \eta_u) = |\overline{\alpha_u}\overline{\zeta_g}|$$
$$\Psi_{11}(a_u t_g, {}^3T_u, M=-1, \mu_u) = |\overline{\alpha_u}\overline{\eta_g}|$$
$$\Psi_{12}(a_u t_g, {}^3T_u, M=-1, \zeta_u) = |\overline{\alpha_u}\overline{\mu_g}|$$
$$\Psi_{13}(a_u t_g, {}^3T_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$
$$\Psi_{14}(a_u t_g, {}^3T_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\alpha_u}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\eta_g}|}{2}$$
$$\Psi_{15}(a_u t_g, {}^3T_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_g}|}{2}$$
$$\Psi_{16}(a_u t_g, {}^3T_u, M=1, \eta_u) = |\alpha_u\zeta_g|$$
$$\Psi_{17}(a_u t_g, {}^3T_u, M=1, \mu_u) = |\alpha_u\eta_g|$$
$$\Psi_{18}(a_u t_g, {}^3T_u, M=1, \zeta_u) = |\alpha_u\mu_g|$$

$e_u^1 t_g$

$$\boxed{\Delta E = \langle\beta_u\zeta_g||\beta_u\zeta_g\rangle}$$

$$\Psi_{19}(e_u^1 t_g, {}^3T_u, M=-1, \eta_u) = -\frac{i\left(\sqrt{3}-i\right)|\overline{\beta_u}\overline{\zeta_g}|}{2}$$
$$\Psi_{20}(e_u^1 t_g, {}^3T_u, M=-1, \mu_u) = \frac{i\left(\sqrt{3}+i\right)|\overline{\beta_u}\overline{\eta_g}|}{2}$$
$$\Psi_{21}(e_u^1 t_g, {}^3T_u, M=-1, \zeta_u) = |\overline{\beta_u}\overline{\mu_g}|$$
$$\Psi_{22}(e_u^1 t_g, {}^3T_u, M=0, \eta_u) = -\frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\beta_u}\zeta_g|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\beta_u\overline{\zeta_g}|}{4}$$
$$\Psi_{23}(e_u^1 t_g, {}^3T_u, M=0, \mu_u) = \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\beta_u}\eta_g|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\beta_u\overline{\eta_g}|}{4}$$
$$\Psi_{24}(e_u^1 t_g, {}^3T_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\beta_u}\mu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_g}|}{2}$$
$$\Psi_{25}(e_u^1 t_g, {}^3T_u, M=1, \eta_u) = -\frac{i\left(\sqrt{3}-i\right)|\beta_u\zeta_g|}{2}$$
$$\Psi_{26}(e_u^1 t_g, {}^3T_u, M=1, \mu_u) = \frac{i\left(\sqrt{3}+i\right)|\beta_u\eta_g|}{2}$$
$$\Psi_{27}(e_u^1 t_g, {}^3T_u, M=1, \zeta_u) = |\beta_u\mu_g|$$

$e_u^2 t_g$

$$\boxed{\Delta E = \langle\gamma_u\zeta_g||\gamma_u\zeta_g\rangle}$$

$$\Psi_{28}(e_u^2 t_g, {}^3T_u, M=-1, \eta_u) = \frac{i\left(\sqrt{3}+i\right)|\overline{\gamma_u}\overline{\zeta_g}|}{2}$$
$$\Psi_{29}(e_u^2 t_g, {}^3T_u, M=-1, \mu_u) = -\frac{i\left(\sqrt{3}-i\right)|\overline{\gamma_u}\overline{\eta_g}|}{2}$$
$$\Psi_{30}(e_u^2 t_g, {}^3T_u, M=-1, \zeta_u) = |\overline{\gamma_u}\overline{\mu_g}|$$
$$\Psi_{31}(e_u^2 t_g, {}^3T_u, M=0, \eta_u) = \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\gamma_u}\zeta_g|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\gamma_u\overline{\zeta_g}|}{4}$$
$$\Psi_{32}(e_u^2 t_g, {}^3T_u, M=0, \mu_u) = -\frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\gamma_u}\eta_g|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\gamma_u\overline{\eta_g}|}{4}$$
$$\Psi_{33}(e_u^2 t_g, {}^3T_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\mu_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\mu_g}|}{2}$$
$$\Psi_{34}(e_u^2 t_g, {}^3T_u, M=1, \eta_u) = \frac{i\left(\sqrt{3}+i\right)|\gamma_u\zeta_g|}{2}$$
$$\Psi_{35}(e_u^2 t_g, {}^3T_u, M=1, \mu_u) = -\frac{i\left(\sqrt{3}-i\right)|\gamma_u\eta_g|}{2}$$
$$\Psi_{36}(e_u^2 t_g, {}^3T_u, M=1, \zeta_u) = |\gamma_u\mu_g|$$

$e_g^2 t_u$

$$\boxed{\Delta E = \langle\gamma_g\zeta_u||\gamma_g\zeta_u\rangle}$$

$$\Psi_{37}(e_g^2 t_u, {}^3T_u, M=-1, \zeta_u) = |\overline{\gamma_g}\overline{\zeta_u}|$$
$$\Psi_{38}(e_g^2 t_u, {}^3T_u, M=-1, \eta_u) = \frac{i\left(\sqrt{3}+i\right)|\overline{\gamma_g}\overline{\eta_u}|}{2}$$
$$\Psi_{39}(e_g^2 t_u, {}^3T_u, M=-1, \mu_u) = -\frac{i\left(\sqrt{3}-i\right)|\overline{\gamma_g}\overline{\mu_u}|}{2}$$
$$\Psi_{40}(e_g^2 t_u, {}^3T_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\gamma_g}\zeta_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\zeta_u}|}{2}$$
$$\Psi_{41}(e_g^2 t_u, {}^3T_u, M=0, \eta_u) = \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\gamma_g}\eta_u|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\gamma_g\overline{\eta_u}|}{4}$$

$$\Psi_{42}(e_g^2 t_u, {}^3T_u, M=0, \mu_u) = -\frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\gamma_g}\mu_u|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\gamma_g\overline{\mu_u}|}{4}$$

$$\Psi_{43}(e_g^2 t_u, {}^3T_u, M=1, \zeta_u) = |\gamma_g\zeta_u|$$

$$\Psi_{44}(e_g^2 t_u, {}^3T_u, M=1, \eta_u) = \frac{i\left(\sqrt{3}+i\right)|\gamma_g\eta_u|}{2}$$

$$\Psi_{45}(e_g^2 t_u, {}^3T_u, M=1, \mu_u) = -\frac{i\left(\sqrt{3}-i\right)|\gamma_g\mu_u|}{2}$$

$e_g^1 t_u$

$$\boxed{\Delta E = \langle\beta_g\zeta_u||\beta_g\zeta_u\rangle}$$

$$\Psi_{46}(e_g^1 t_u, {}^3T_u, M=-1, \zeta_u) = |\overline{\beta_g\zeta_u}|$$

$$\Psi_{47}(e_g^1 t_u, {}^3T_u, M=-1, \eta_u) = -\frac{i\left(\sqrt{3}-i\right)|\overline{\beta_g}\overline{\eta_u}|}{2}$$

$$\Psi_{48}(e_g^1 t_u, {}^3T_u, M=-1, \mu_u) = \frac{i\left(\sqrt{3}+i\right)|\overline{\beta_g}\overline{\mu_u}|}{2}$$

$$\Psi_{49}(e_g^1 t_u, {}^3T_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\beta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_u}|}{2}$$

$$\Psi_{50}(e_g^1 t_u, {}^3T_u, M=0, \eta_u) = -\frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\beta_g}\eta_u|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\beta_g\overline{\eta_u}|}{4}$$

$$\Psi_{51}(e_g^1 t_u, {}^3T_u, M=0, \mu_u) = \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\beta_g}\mu_u|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\beta_g\overline{\mu_u}|}{4}$$

$$\Psi_{52}(e_g^1 t_u, {}^3T_u, M=1, \zeta_u) = |\beta_g\zeta_u|$$

$$\Psi_{53}(e_g^1 t_u, {}^3T_u, M=1, \eta_u) = -\frac{i\left(\sqrt{3}-i\right)|\beta_g\eta_u|}{2}$$

$$\Psi_{54}(e_g^1 t_u, {}^3T_u, M=1, \mu_u) = \frac{i\left(\sqrt{3}+i\right)|\beta_g\mu_u|}{2}$$

$t_g t_u$

$$\boxed{\Delta E = -\langle\zeta_g\zeta_g||\zeta_u\zeta_u\rangle + \langle\zeta_g\zeta_u||\zeta_g\zeta_u\rangle}$$

$$\Psi_{55}(t_g t_u, {}^3T_u, M=-1, \mu_u) = |\overline{\zeta_g\zeta_u}|$$

$$\Psi_{56}(t_g t_u, {}^3T_u, M=-1, \zeta_u) = |\overline{\eta_g\eta_u}|$$

$$\Psi_{57}(t_g t_u, {}^3T_u, M=-1, \eta_u) = |\overline{\mu_g\mu_u}|$$

$$\Psi_{58}(t_g t_u, {}^3T_u, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\zeta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\zeta_u}|}{2}$$

$$\Psi_{59}(t_g t_u, {}^3T_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\eta_g}\eta_u|}{2} + \frac{\sqrt{2}|\eta_g\overline{\eta_u}|}{2}$$

$$\Psi_{60}(t_g t_u, {}^3T_u, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\mu_g}\mu_u|}{2} + \frac{\sqrt{2}|\mu_g\overline{\mu_u}|}{2}$$

$$\Psi_{61}(t_g t_u, {}^3T_u, M=1, \mu_u) = |\zeta_g\zeta_u|$$

$$\Psi_{62}(t_g t_u, {}^3T_u, M=1, \zeta_u) = |\eta_g\eta_u|$$

$$\Psi_{63}(t_g t_u, {}^3T_u, M=1, \eta_u) = |\mu_g\mu_u|$$

2.29.15 ^1T_u

$a_g t_u$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\zeta_u\zeta_u\rangle + \langle\alpha_g\zeta_u||\alpha_g\zeta_u\rangle}$$

$$\Psi_1(a_g t_u, {}^1T_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$

$$\Psi_2(a_g t_u, {}^1T_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_u}|}{2}$$

$$\Psi_3(a_g t_u, {}^1T_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_u}|}{2}$$

$a_u t_g$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\zeta_g\zeta_g\rangle + \langle\alpha_u\zeta_g||\alpha_u\zeta_g\rangle}$$

$$\Psi_4(a_u t_g, {}^1T_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$

$$\Psi_5(a_u t_g, {}^1T_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\eta_g}|}{2}$$

$$\Psi_6(a_u t_g, {}^1T_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_g}|}{2}$$

$e_u^1 t_g$

$$\boxed{\Delta E = \langle\beta_u\zeta_g||\beta_u\zeta_g\rangle}$$

$$\Psi_7(e_u^1 t_g, {}^1T_u, M=0, \eta_u) = \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\beta_u}\zeta_g|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\beta_u\overline{\zeta_g}|}{4}$$

$$\Psi_8(e_u^1 t_g, {}^1T_u, M=0, \mu_u) = -\frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\beta_u}\eta_g|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\beta_u\overline{\eta_g}|}{4}$$

$$\Psi_9(e_u^1 t_g, {}^1T_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\mu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_g}|}{2}$$

$e_u^2 t_g$

$$\boxed{\Delta E = \langle\gamma_u\zeta_g||\gamma_u\zeta_g\rangle}$$

$$\Psi_{10}(e_u^2 t_g, {}^1T_u, M=0, \eta_u) = -\frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\gamma_u}\zeta_g|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\gamma_u\overline{\zeta_g}|}{4}$$

$$\Psi_{11}(e_u^2 t_g, {}^1T_u, M=0, \mu_u) = \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\gamma_u}\eta_g|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\gamma_u\overline{\eta_g}|}{4}$$

$$\Psi_{12}(e_u^2 t_g, {}^1T_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\mu_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\mu_g}|}{2}$$

$e_g^2 t_u$

$$\boxed{\Delta E = \langle\gamma_g\zeta_u||\gamma_g\zeta_u\rangle}$$

$$\Psi_{13}(e_g^2 t_u, {}^1T_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\zeta_u|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\zeta_u}|}{2}$$

$$\Psi_{14}(e_g^2 t_u, {}^1T_u, M=0, \eta_u) = -\frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\gamma_g}\eta_u|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\gamma_g\overline{\eta_u}|}{4}$$

$$\Psi_{15}(e_g^2 t_u, {}^1T_u, M=0, \mu_u) = \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\gamma_g}\mu_u|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\gamma_g\overline{\mu_u}|}{4}$$

$e_g^1 t_u$

$$\boxed{\Delta E = \langle\beta_g\zeta_u||\beta_g\zeta_u\rangle}$$

$$\Psi_{16}(e_g^1 t_u, {}^1T_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\zeta_u}|}{2}$$

$$\Psi_{17}(e_g^1 t_u, {}^1T_u, M=0, \eta_u) = \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\overline{\beta_g}\eta_u|}{4} - \frac{\sqrt{2}i\left(\sqrt{3}-i\right)|\beta_g\overline{\eta_u}|}{4}$$

$$\Psi_{18}(e_g^1 t_u, {}^1T_u, M=0, \mu_u) = -\frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\overline{\beta_g}\mu_u|}{4} + \frac{\sqrt{2}i\left(\sqrt{3}+i\right)|\beta_g\overline{\mu_u}|}{4}$$

$t_g t_u$

$$\boxed{\Delta E = \langle\zeta_g\zeta_g||\zeta_u\zeta_u\rangle + \langle\zeta_g\zeta_u||\zeta_g\zeta_u\rangle}$$

$$\Psi_{19}(t_g t_u, {}^1T_u, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\zeta_g}\zeta_u|}{2} + \frac{\sqrt{2}|\zeta_g\overline{\zeta_u}|}{2}$$
$$\Psi_{20}(t_g t_u, {}^1T_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\eta_g}\eta_u|}{2} + \frac{\sqrt{2}|\eta_g\overline{\eta_u}|}{2}$$
$$\Psi_{21}(t_g t_u, {}^1T_u, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\mu_g}\mu_u|}{2} + \frac{\sqrt{2}|\mu_g\overline{\mu_u}|}{2}$$

2.29.16 ^3A_g

$e_u^1 e_u^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(e_u^1 e_u^2, {}^3A_g, M=-1, \alpha_g) = |\overline{\beta_u}\overline{\gamma_u}|$$
$$\Psi_2(e_u^1 e_u^2, {}^3A_g, M=0, \alpha_g) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$
$$\Psi_3(e_u^1 e_u^2, {}^3A_g, M=1, \alpha_g) = |\beta_u\gamma_u|$$

$e_g^1 e_g^2$

$$\boxed{\Delta E = 0}$$

$$\Psi_4(e_g^1 e_g^2, {}^3A_g, M=-1, \alpha_g) = |\overline{\gamma_g}\overline{\beta_g}|$$
$$\Psi_5(e_g^1 e_g^2, {}^3A_g, M=0, \alpha_g) = \frac{\sqrt{2}|\overline{\gamma_g}\beta_g|}{2} + \frac{\sqrt{2}|\gamma_g\overline{\beta_g}|}{2}$$
$$\Psi_6(e_g^1 e_g^2, {}^3A_g, M=1, \alpha_g) = |\gamma_g\beta_g|$$

2.30 Group O

Component labels

$A_1 : \{\alpha\}$ —— $A_2 : \{\beta\}$ —— $E : \{\gamma, \zeta\}$ —— $T_1 : \{\eta, \mu, \nu\}$ —— $T_2 : \{\xi, \phi, \chi\}$

2.30.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

a_2^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

e^2

$$\boxed{\Delta E = \langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_3(e^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\gamma}\gamma|}{2} - \frac{\sqrt{2}|\overline{\zeta}\zeta|}{2}$$

t_1^2

$$\boxed{\Delta E = 2\langle\nu\nu||\mu\mu\rangle + \langle\nu\nu||\nu\nu\rangle}$$

$$\Psi_4(t_1^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{3}|\overline{\eta}\eta|}{3} - \frac{\sqrt{3}|\overline{\mu}\mu|}{3} - \frac{\sqrt{3}|\overline{\nu}\nu|}{3}$$

t_2^2

$$\boxed{\Delta E = 2\langle\xi\xi||\phi\phi\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_5(t_2^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{3}|\overline{\chi}\chi|}{3} - \frac{\sqrt{3}|\overline{\phi}\phi|}{3} - \frac{\sqrt{3}|\overline{\xi}\xi|}{3}$$

2.30.2 $^3A_2$

$a_1 a_2$

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1 a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1 a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1 a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

e^2

$$\boxed{\Delta E = -3\langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_4(e^2, {}^3A_2, M=-1, \beta) = -|\overline{\gamma}\overline{\zeta}|$$
$$\Psi_5(e^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2}$$
$$\Psi_6(e^2, {}^3A_2, M=1, \beta) = -|\gamma\zeta|$$

$t_1 t_2$

$$\boxed{\begin{array}{c}\Delta E = -\langle\nu\nu||\phi\phi\rangle + \langle\nu\phi||\nu\phi\rangle + 2\langle\nu\xi||\mu\phi\rangle \\ -2\langle\nu\mu||\xi\phi\rangle\end{array}}$$

$$\Psi_7(t_1 t_2, {}^3A_2, M=-1, \beta) = \frac{\sqrt{3}|\overline{\eta}\overline{\chi}|}{3} + \frac{\sqrt{3}|\overline{\mu}\overline{\xi}|}{3} + \frac{\sqrt{3}|\overline{\nu}\overline{\phi}|}{3}$$

$$\Psi_8(t_1t_2,{}^3A_2,M\!=\!0,\beta) = \frac{\sqrt{6}|\overline{\eta}\chi|}{6}+\frac{\sqrt{6}|\overline{\mu}\xi|}{6}+\frac{\sqrt{6}|\overline{\nu}\phi|}{6}+\frac{\sqrt{6}|\eta\overline{\chi}|}{6}+\frac{\sqrt{6}|\mu\overline{\xi}|}{6}+\frac{\sqrt{6}|\nu\overline{\phi}|}{6}$$

$$\Psi_9(t_1t_2,{}^3A_2,M\!=\!1,\beta) = \frac{\sqrt{3}|\eta\chi|}{3}+\frac{\sqrt{3}|\mu\xi|}{3}+\frac{\sqrt{3}|\nu\phi|}{3}$$

2.30.3 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2,{}^1A_2,M\!=\!0,\beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2}+\frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = \langle\nu\nu||\phi\phi\rangle + \langle\nu\phi||\nu\phi\rangle + 2\langle\nu\xi||\mu\phi\rangle \\ +2\langle\nu\mu||\xi\phi\rangle\end{array}}$$

$$\Psi_2(t_1t_2,{}^1A_2,M\!=\!0,\beta) = -\frac{\sqrt{6}|\overline{\eta}\chi|}{6}-\frac{\sqrt{6}|\overline{\mu}\xi|}{6}-\frac{\sqrt{6}|\overline{\nu}\phi|}{6}+\frac{\sqrt{6}|\eta\overline{\chi}|}{6}+\frac{\sqrt{6}|\mu\overline{\xi}|}{6}+\frac{\sqrt{6}|\nu\overline{\phi}|}{6}$$

2.30.4 ^3E

a_1e

$$\boxed{\Delta E = -\langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1e,{}^3E,M\!=\!-1,\gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1e,{}^3E,M\!=\!-1,\zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_3(a_1e,{}^3E,M\!=\!0,\gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2}+\frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_4(a_1e,{}^3E,M\!=\!0,\zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2}+\frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_5(a_1e,{}^3E,M\!=\!1,\gamma) = |\alpha\gamma|$$
$$\Psi_6(a_1e,{}^3E,M\!=\!1,\zeta) = |\alpha\zeta|$$

a_2e

$$\boxed{\Delta E = -\langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_7(a_2e,{}^3E,M\!=\!-1,\zeta) = -|\overline{\beta}\overline{\gamma}|$$
$$\Psi_8(a_2e,{}^3E,M\!=\!-1,\gamma) = |\overline{\beta}\overline{\zeta}|$$
$$\Psi_9(a_2e,{}^3E,M\!=\!0,\zeta) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2}-\frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_{10}(a_2e,{}^3E,M\!=\!0,\gamma) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2}+\frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_{11}(a_2e,{}^3E,M\!=\!1,\zeta) = -|\beta\gamma|$$
$$\Psi_{12}(a_2e,{}^3E,M\!=\!1,\gamma) = |\beta\zeta|$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = -\langle\nu\nu||\phi\phi\rangle + \langle\nu\phi||\nu\phi\rangle - \langle\nu\xi||\mu\phi\rangle \\ +\langle\nu\mu||\xi\phi\rangle\end{array}}$$

$$\Psi_{13}(t_1t_2,{}^3E,M\!=\!-1,\gamma) = -\frac{\sqrt{2}|\overline{\eta}\overline{\chi}|}{2}+\frac{\sqrt{2}|\overline{\nu}\overline{\phi}|}{2}$$
$$\Psi_{14}(t_1t_2,{}^3E,M\!=\!-1,\zeta) = \frac{\sqrt{6}|\overline{\eta}\overline{\chi}|}{6}-\frac{\sqrt{6}|\overline{\mu}\overline{\xi}|}{3}+\frac{\sqrt{6}|\overline{\nu}\overline{\phi}|}{6}$$
$$\Psi_{15}(t_1t_2,{}^3E,M\!=\!0,\gamma) = -\frac{|\overline{\eta}\chi|}{2}+\frac{|\overline{\nu}\phi|}{2}-\frac{|\eta\overline{\chi}|}{2}+\frac{|\nu\overline{\phi}|}{2}$$
$$\Psi_{16}(t_1t_2,{}^3E,M\!=\!0,\zeta) = \frac{\sqrt{3}|\overline{\eta}\chi|}{6}-\frac{\sqrt{3}|\overline{\mu}\xi|}{3}+\frac{\sqrt{3}|\overline{\nu}\phi|}{6}+\frac{\sqrt{3}|\eta\overline{\chi}|}{6}-\frac{\sqrt{3}|\mu\overline{\xi}|}{3}+\frac{\sqrt{3}|\nu\overline{\phi}|}{6}$$
$$\Psi_{17}(t_1t_2,{}^3E,M\!=\!1,\gamma) = -\frac{\sqrt{2}|\eta\chi|}{2}+\frac{\sqrt{2}|\nu\phi|}{2}$$
$$\Psi_{18}(t_1t_2,{}^3E,M\!=\!1,\zeta) = \frac{\sqrt{6}|\eta\chi|}{6}-\frac{\sqrt{6}|\mu\xi|}{3}+\frac{\sqrt{6}|\nu\phi|}{6}$$

2.30.5 ^1E

a_1e

$$\boxed{\Delta E = \langle\alpha\alpha||\zeta\zeta\rangle + \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1e,{}^1E,M\!=\!0,\gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2}+\frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_2(a_1e,{}^1E,M\!=\!0,\zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2}+\frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2e

$$\boxed{\Delta E = \langle\beta\beta||\zeta\zeta\rangle + \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_3(a_2e,{}^1E,M\!=\!0,\zeta) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2}-\frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_4(a_2e,{}^1E,M\!=\!0,\gamma) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2}+\frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

e^2

$$\boxed{\Delta E = -\langle\zeta\zeta||\gamma\gamma\rangle + \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_5(e^2,{}^1E,M\!=\!0,\gamma) = \frac{\sqrt{2}|\overline{\gamma}\gamma|}{2}-\frac{\sqrt{2}|\overline{\zeta}\zeta|}{2}$$
$$\Psi_6(e^2,{}^1E,M\!=\!0,\zeta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2}-\frac{\sqrt{2}|\overline{\zeta}\gamma|}{2}$$

t_1^2

$$\boxed{\Delta E = -\langle\nu\nu||\mu\mu\rangle + \langle\nu\nu||\nu\nu\rangle}$$

$$\Psi_7(t_1^2,{}^1E,M\!=\!0,\gamma) = -\frac{\sqrt{6}|\overline{\eta}\eta|}{6}+\frac{\sqrt{6}|\overline{\mu}\mu|}{3}-\frac{\sqrt{6}|\overline{\nu}\nu|}{6}$$
$$\Psi_8(t_1^2,{}^1E,M\!=\!0,\zeta) = -\frac{\sqrt{2}|\overline{\eta}\eta|}{2}+\frac{\sqrt{2}|\overline{\nu}\nu|}{2}$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = \langle\nu\nu||\phi\phi\rangle + \langle\nu\phi||\nu\phi\rangle - \langle\nu\xi||\mu\phi\rangle \\ -\langle\nu\mu||\xi\phi\rangle\end{array}}$$

$$\Psi_9(t_1t_2,{}^1E,M\!=\!0,\gamma) = \frac{|\overline{\eta}\chi|}{2}-\frac{|\overline{\nu}\phi|}{2}-\frac{|\eta\overline{\chi}|}{2}+\frac{|\nu\overline{\phi}|}{2}$$

$$\Psi_{10}(t_1t_2, {}^1E, M=0, \zeta) =$$
$$-\frac{\sqrt{3}|\overline{\eta}\chi|}{6} + \frac{\sqrt{3}|\overline{\mu}\xi|}{3} - \frac{\sqrt{3}|\overline{\nu}\phi|}{6} + \frac{\sqrt{3}|\eta\overline{\chi}|}{6} - \frac{\sqrt{3}|\mu\overline{\xi}|}{3} + \frac{\sqrt{3}|\nu\overline{\phi}|}{6}$$

t_2^2

$$\boxed{\Delta E = -\langle\xi\xi||\phi\phi\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_{11}(t_2^2, {}^1E, M=0, \gamma) = -\frac{\sqrt{6}|\overline{\chi}\chi|}{6} - \frac{\sqrt{6}|\overline{\phi}\phi|}{6} + \frac{\sqrt{6}|\overline{\xi}\xi|}{3}$$
$$\Psi_{12}(t_2^2, {}^1E, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\chi}\chi|}{2} + \frac{\sqrt{2}|\overline{\phi}\phi|}{2}$$

2.30.6 $^3T_1$

a_1t_1

$$\boxed{\Delta E = -\langle\alpha\alpha||\nu\nu\rangle + \langle\alpha\nu||\alpha\nu\rangle}$$

$$\Psi_1(a_1t_1, {}^3T_1, M=-1, \eta) = |\overline{\alpha\eta}|$$
$$\Psi_2(a_1t_1, {}^3T_1, M=-1, \mu) = |\overline{\alpha\mu}|$$
$$\Psi_3(a_1t_1, {}^3T_1, M=-1, \nu) = |\overline{\alpha\nu}|$$
$$\Psi_4(a_1t_1, {}^3T_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_5(a_1t_1, {}^3T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_6(a_1t_1, {}^3T_1, M=0, \nu) = \frac{\sqrt{2}|\overline{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\overline{\nu}|}{2}$$
$$\Psi_7(a_1t_1, {}^3T_1, M=1, \eta) = |\alpha\eta|$$
$$\Psi_8(a_1t_1, {}^3T_1, M=1, \mu) = |\alpha\mu|$$
$$\Psi_9(a_1t_1, {}^3T_1, M=1, \nu) = |\alpha\nu|$$

a_2t_2

$$\boxed{\Delta E = -\langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_{10}(a_2t_2, {}^3T_1, M=-1, \mu) = |\overline{\beta\xi}|$$
$$\Psi_{11}(a_2t_2, {}^3T_1, M=-1, \nu) = |\overline{\beta\phi}|$$
$$\Psi_{12}(a_2t_2, {}^3T_1, M=-1, \eta) = |\overline{\beta}\overline{\chi}|$$
$$\Psi_{13}(a_2t_2, {}^3T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\overline{\xi}|}{2}$$
$$\Psi_{14}(a_2t_2, {}^3T_1, M=0, \nu) = \frac{\sqrt{2}|\overline{\beta}\phi|}{2} + \frac{\sqrt{2}|\beta\overline{\phi}|}{2}$$
$$\Psi_{15}(a_2t_2, {}^3T_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\beta}\chi|}{2} + \frac{\sqrt{2}|\beta\overline{\chi}|}{2}$$
$$\Psi_{16}(a_2t_2, {}^3T_1, M=1, \mu) = |\beta\xi|$$
$$\Psi_{17}(a_2t_2, {}^3T_1, M=1, \nu) = |\beta\phi|$$
$$\Psi_{18}(a_2t_2, {}^3T_1, M=1, \eta) = |\beta\chi|$$

et_1

$$\boxed{\begin{gathered}\Delta E = -\frac{\sqrt{3}\langle\zeta\nu||\gamma\nu\rangle}{3} + \langle\zeta\nu||\zeta\nu\rangle + \frac{\langle\zeta\zeta||\mu\mu\rangle}{3} \\ -\frac{4\langle\zeta\zeta||\nu\nu\rangle}{3}\end{gathered}}$$

$$\Psi_{19}(et_1, {}^3T_1, M=-1, \eta) = \frac{|\overline{\gamma\eta}|}{2} + \frac{\sqrt{3}|\overline{\zeta}\overline{\eta}|}{2}$$
$$\Psi_{20}(et_1, {}^3T_1, M=-1, \mu) = -|\overline{\gamma\mu}|$$
$$\Psi_{21}(et_1, {}^3T_1, M=-1, \nu) = \frac{|\overline{\gamma\nu}|}{2} - \frac{\sqrt{3}|\overline{\zeta}\overline{\nu}|}{2}$$
$$\Psi_{22}(et_1, {}^3T_1, M=0, \eta) =$$
$$\frac{\sqrt{2}|\overline{\gamma}\eta|}{4} + \frac{\sqrt{6}|\overline{\zeta}\eta|}{4} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{4} + \frac{\sqrt{6}|\zeta\overline{\eta}|}{4}$$
$$\Psi_{23}(et_1, {}^3T_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\gamma}\mu|}{2} - \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$
$$\Psi_{24}(et_1, {}^3T_1, M=0, \nu) =$$
$$\frac{\sqrt{2}|\overline{\gamma}\nu|}{4} - \frac{\sqrt{6}|\overline{\zeta}\nu|}{4} + \frac{\sqrt{2}|\gamma\overline{\nu}|}{4} - \frac{\sqrt{6}|\zeta\overline{\nu}|}{4}$$
$$\Psi_{25}(et_1, {}^3T_1, M=1, \eta) = \frac{|\gamma\eta|}{2} + \frac{\sqrt{3}|\zeta\eta|}{2}$$
$$\Psi_{26}(et_1, {}^3T_1, M=1, \mu) = -|\gamma\mu|$$
$$\Psi_{27}(et_1, {}^3T_1, M=1, \nu) = \frac{|\gamma\nu|}{2} - \frac{\sqrt{3}|\zeta\nu|}{2}$$

et_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle - \langle\zeta\zeta||\xi\xi\rangle}$$

$$\Psi_{28}(et_2, {}^3T_1, M=-1, \nu) = \frac{\sqrt{3}|\overline{\gamma}\overline{\phi}|}{2} + \frac{|\overline{\zeta}\overline{\phi}|}{2}$$
$$\Psi_{29}(et_2, {}^3T_1, M=-1, \eta) = -\frac{\sqrt{3}|\overline{\gamma\chi}|}{2} + \frac{|\overline{\zeta}\overline{\chi}|}{2}$$
$$\Psi_{30}(et_2, {}^3T_1, M=-1, \mu) = -|\overline{\zeta\xi}|$$
$$\Psi_{31}(et_2, {}^3T_1, M=0, \nu) =$$
$$\frac{\sqrt{6}|\overline{\gamma}\phi|}{4} + \frac{\sqrt{2}|\overline{\zeta}\phi|}{4} + \frac{\sqrt{6}|\gamma\overline{\phi}|}{4} + \frac{\sqrt{2}|\zeta\overline{\phi}|}{4}$$
$$\Psi_{32}(et_2, {}^3T_1, M=0, \eta) =$$
$$-\frac{\sqrt{6}|\overline{\gamma}\chi|}{4} + \frac{\sqrt{2}|\overline{\zeta}\chi|}{4} - \frac{\sqrt{6}|\gamma\overline{\chi}|}{4} + \frac{\sqrt{2}|\zeta\overline{\chi}|}{4}$$
$$\Psi_{33}(et_2, {}^3T_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\zeta}\xi|}{2} - \frac{\sqrt{2}|\zeta\overline{\xi}|}{2}$$
$$\Psi_{34}(et_2, {}^3T_1, M=1, \nu) = \frac{\sqrt{3}|\gamma\phi|}{2} + \frac{|\zeta\phi|}{2}$$
$$\Psi_{35}(et_2, {}^3T_1, M=1, \eta) = -\frac{\sqrt{3}|\gamma\chi|}{2} + \frac{|\zeta\chi|}{2}$$
$$\Psi_{36}(et_2, {}^3T_1, M=1, \mu) = -|\zeta\xi|$$

t_1^2

$$\boxed{\Delta E = \langle\nu\mu||\nu\mu\rangle - \langle\nu\nu||\mu\mu\rangle}$$

$$\Psi_{37}(t_1^2, {}^3T_1, M=-1, \nu) = -|\overline{\eta\mu}|$$
$$\Psi_{38}(t_1^2, {}^3T_1, M=-1, \mu) = |\overline{\eta\nu}|$$
$$\Psi_{39}(t_1^2, {}^3T_1, M=-1, \eta) = -|\overline{\mu\nu}|$$
$$\Psi_{40}(t_1^2, {}^3T_1, M=0, \nu) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$
$$\Psi_{41}(t_1^2, {}^3T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\eta}\nu|}{2} - \frac{\sqrt{2}|\overline{\nu}\eta|}{2}$$
$$\Psi_{42}(t_1^2, {}^3T_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\mu}\nu|}{2} + \frac{\sqrt{2}|\overline{\nu}\mu|}{2}$$
$$\Psi_{43}(t_1^2, {}^3T_1, M=1, \nu) = -|\eta\mu|$$
$$\Psi_{44}(t_1^2, {}^3T_1, M=1, \mu) = |\eta\nu|$$
$$\Psi_{45}(t_1^2, {}^3T_1, M=1, \eta) = -|\mu\nu|$$

t_1t_2

$$\boxed{\Delta E = -\langle\nu\nu||\xi\xi\rangle + \langle\nu\xi||\mu\phi\rangle + \langle\nu\xi||\nu\xi\rangle - \langle\nu\mu||\phi\xi\rangle}$$

$$\Psi_{46}(t_1t_2, {}^3T_1, M=-1, \nu) = \frac{\sqrt{2}|\overline{\eta}\overline{\xi}|}{2} + \frac{\sqrt{2}|\overline{\mu}\overline{\chi}|}{2}$$
$$\Psi_{47}(t_1t_2, {}^3T_1, M=-1, \mu) = \frac{\sqrt{2}|\overline{\eta}\overline{\phi}|}{2} + \frac{\sqrt{2}|\overline{\nu}\overline{\chi}|}{2}$$
$$\Psi_{48}(t_1t_2, {}^3T_1, M=-1, \eta) = \frac{\sqrt{2}|\overline{\mu}\overline{\phi}|}{2} + \frac{\sqrt{2}|\overline{\nu}\overline{\xi}|}{2}$$
$$\Psi_{49}(t_1t_2, {}^3T_1, M=0, \nu) = \frac{|\overline{\eta}\xi|}{2} + \frac{|\overline{\mu}\chi|}{2} + \frac{|\eta\overline{\xi}|}{2} + \frac{|\mu\overline{\chi}|}{2}$$
$$\Psi_{50}(t_1t_2, {}^3T_1, M=0, \mu) = \frac{|\overline{\eta}\phi|}{2} + \frac{|\overline{\nu}\chi|}{2} + \frac{|\eta\overline{\phi}|}{2} + \frac{|\nu\overline{\chi}|}{2}$$
$$\Psi_{51}(t_1t_2, {}^3T_1, M=0, \eta) = \frac{|\overline{\mu}\phi|}{2} + \frac{|\overline{\nu}\xi|}{2} + \frac{|\mu\overline{\phi}|}{2} + \frac{|\nu\overline{\xi}|}{2}$$
$$\Psi_{52}(t_1t_2, {}^3T_1, M=1, \nu) = \frac{\sqrt{2}|\eta\xi|}{2} + \frac{\sqrt{2}|\mu\chi|}{2}$$
$$\Psi_{53}(t_1t_2, {}^3T_1, M=1, \mu) = \frac{\sqrt{2}|\eta\phi|}{2} + \frac{\sqrt{2}|\nu\chi|}{2}$$
$$\Psi_{54}(t_1t_2, {}^3T_1, M=1, \eta) = \frac{\sqrt{2}|\mu\phi|}{2} + \frac{\sqrt{2}|\nu\xi|}{2}$$

t_2^2

$$\boxed{\Delta E = \langle\xi\phi||\xi\phi\rangle - \langle\xi\xi||\phi\phi\rangle}$$

$$\Psi_{55}(t_2^2, {}^3T_1, M=-1, \eta) = -|\overline{\xi}\overline{\phi}|$$
$$\Psi_{56}(t_2^2, {}^3T_1, M=-1, \nu) = |\overline{\xi}\overline{\chi}|$$
$$\Psi_{57}(t_2^2, {}^3T_1, M=-1, \mu) = -|\overline{\phi}\overline{\chi}|$$
$$\Psi_{58}(t_2^2, {}^3T_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\phi}\xi|}{2} - \frac{\sqrt{2}|\overline{\xi}\phi|}{2}$$
$$\Psi_{59}(t_2^2, {}^3T_1, M=0, \nu) = -\frac{\sqrt{2}|\overline{\chi}\xi|}{2} + \frac{\sqrt{2}|\overline{\xi}\chi|}{2}$$
$$\Psi_{60}(t_2^2, {}^3T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\chi}\phi|}{2} - \frac{\sqrt{2}|\overline{\phi}\chi|}{2}$$
$$\Psi_{61}(t_2^2, {}^3T_1, M=1, \eta) = -|\xi\phi|$$
$$\Psi_{62}(t_2^2, {}^3T_1, M=1, \nu) = |\xi\chi|$$
$$\Psi_{63}(t_2^2, {}^3T_1, M=1, \mu) = -|\phi\chi|$$

2.30.7 $^1T_1$

a_1t_1

$$\boxed{\Delta E = \langle\alpha\alpha||\nu\nu\rangle + \langle\alpha\nu||\alpha\nu\rangle}$$

$$\Psi_1(a_1t_1, {}^1T_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_2(a_1t_1, {}^1T_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_3(a_1t_1, {}^1T_1, M=0, \nu) = -\frac{\sqrt{2}|\overline{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\overline{\nu}|}{2}$$

a_2t_2

$$\boxed{\Delta E = \langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_4(a_2t_2, {}^1T_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\overline{\xi}|}{2}$$
$$\Psi_5(a_2t_2, {}^1T_1, M=0, \nu) = -\frac{\sqrt{2}|\overline{\beta}\phi|}{2} + \frac{\sqrt{2}|\beta\overline{\phi}|}{2}$$
$$\Psi_6(a_2t_2, {}^1T_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\chi|}{2} + \frac{\sqrt{2}|\beta\overline{\chi}|}{2}$$

et_1

$$\boxed{\Delta E = -\frac{\sqrt{3}\langle\zeta\nu||\gamma\nu\rangle}{3} + \langle\zeta\nu||\zeta\nu\rangle - \frac{\langle\zeta\zeta||\mu\mu\rangle}{3} + \frac{4\langle\zeta\zeta||\nu\nu\rangle}{3}}$$

$$\Psi_7(et_1, {}^1T_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\gamma}\eta|}{4} - \frac{\sqrt{6}|\overline{\zeta}\eta|}{4} + \frac{\sqrt{2}|\gamma\overline{\eta}|}{4} + \frac{\sqrt{6}|\zeta\overline{\eta}|}{4}$$
$$\Psi_8(et_1, {}^1T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\gamma}\mu|}{2} - \frac{\sqrt{2}|\gamma\overline{\mu}|}{2}$$
$$\Psi_9(et_1, {}^1T_1, M=0, \nu) = -\frac{\sqrt{2}|\overline{\gamma}\nu|}{4} + \frac{\sqrt{6}|\overline{\zeta}\nu|}{4} + \frac{\sqrt{2}|\gamma\overline{\nu}|}{4} - \frac{\sqrt{6}|\zeta\overline{\nu}|}{4}$$

et_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle + \langle\zeta\zeta||\xi\xi\rangle}$$

$$\Psi_{10}(et_2, {}^1T_1, M=0, \nu) = -\frac{\sqrt{6}|\overline{\gamma}\phi|}{4} - \frac{\sqrt{2}|\overline{\zeta}\phi|}{4} + \frac{\sqrt{6}|\gamma\overline{\phi}|}{4} + \frac{\sqrt{2}|\zeta\overline{\phi}|}{4}$$
$$\Psi_{11}(et_2, {}^1T_1, M=0, \eta) = \frac{\sqrt{6}|\overline{\gamma}\chi|}{4} - \frac{\sqrt{2}|\overline{\zeta}\chi|}{4} - \frac{\sqrt{6}|\gamma\overline{\chi}|}{4} + \frac{\sqrt{2}|\zeta\overline{\chi}|}{4}$$
$$\Psi_{12}(et_2, {}^1T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\zeta}\xi|}{2} - \frac{\sqrt{2}|\zeta\overline{\xi}|}{2}$$

t_1t_2

$$\boxed{\Delta E = \langle\nu\nu||\xi\xi\rangle + \langle\nu\xi||\mu\phi\rangle + \langle\nu\xi||\nu\xi\rangle + \langle\nu\mu||\phi\xi\rangle}$$

$$\Psi_{13}(t_1t_2, {}^1T_1, M=0, \nu) = -\frac{|\overline{\eta}\xi|}{2} - \frac{|\overline{\mu}\chi|}{2} + \frac{|\eta\overline{\xi}|}{2} + \frac{|\mu\overline{\chi}|}{2}$$
$$\Psi_{14}(t_1t_2, {}^1T_1, M=0, \mu) = -\frac{|\overline{\eta}\phi|}{2} - \frac{|\overline{\nu}\chi|}{2} + \frac{|\eta\overline{\phi}|}{2} + \frac{|\nu\overline{\chi}|}{2}$$
$$\Psi_{15}(t_1t_2, {}^1T_1, M=0, \eta) = -\frac{|\overline{\mu}\phi|}{2} - \frac{|\overline{\nu}\xi|}{2} + \frac{|\mu\overline{\phi}|}{2} + \frac{|\nu\overline{\xi}|}{2}$$

2.30.8 $^3T_2$

a_1t_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1t_2, {}^3T_2, M=-1, \xi) = |\overline{\alpha}\overline{\xi}|$$
$$\Psi_2(a_1t_2, {}^3T_2, M=-1, \phi) = |\overline{\alpha}\overline{\phi}|$$
$$\Psi_3(a_1t_2, {}^3T_2, M=-1, \chi) = |\overline{\alpha}\overline{\chi}|$$
$$\Psi_4(a_1t_2, {}^3T_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\overline{\xi}|}{2}$$
$$\Psi_5(a_1t_2, {}^3T_2, M=0, \phi) = \frac{\sqrt{2}|\overline{\alpha}\phi|}{2} + \frac{\sqrt{2}|\alpha\overline{\phi}|}{2}$$

$$\Psi_6(a_1t_2, {}^3T_2, M=0, \chi) = \frac{\sqrt{2}|\overline{\alpha}\chi|}{2} + \frac{\sqrt{2}|\alpha\overline{\chi}|}{2}$$
$$\Psi_7(a_1t_2, {}^3T_2, M=1, \xi) = |\alpha\xi|$$
$$\Psi_8(a_1t_2, {}^3T_2, M=1, \phi) = |\alpha\phi|$$
$$\Psi_9(a_1t_2, {}^3T_2, M=1, \chi) = |\alpha\chi|$$

a_2t_1

$$\boxed{\Delta E = -\langle\beta\beta||\nu\nu\rangle + \langle\beta\nu||\beta\nu\rangle}$$

$$\Psi_{10}(a_2t_1, {}^3T_2, M=-1, \chi) = |\overline{\beta}\overline{\eta}|$$
$$\Psi_{11}(a_2t_1, {}^3T_2, M=-1, \xi) = |\overline{\beta}\overline{\mu}|$$
$$\Psi_{12}(a_2t_1, {}^3T_2, M=-1, \phi) = |\overline{\beta}\overline{\nu}|$$
$$\Psi_{13}(a_2t_1, {}^3T_2, M=0, \chi) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} + \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_{14}(a_2t_1, {}^3T_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_{15}(a_2t_1, {}^3T_2, M=0, \phi) = \frac{\sqrt{2}|\overline{\beta}\nu|}{2} + \frac{\sqrt{2}|\beta\overline{\nu}|}{2}$$
$$\Psi_{16}(a_2t_1, {}^3T_2, M=1, \chi) = |\beta\eta|$$
$$\Psi_{17}(a_2t_1, {}^3T_2, M=1, \xi) = |\beta\mu|$$
$$\Psi_{18}(a_2t_1, {}^3T_2, M=1, \phi) = |\beta\nu|$$

et_1

$$\boxed{\Delta E = \sqrt{3}\,\langle\zeta\nu||\gamma\nu\rangle + \langle\zeta\nu||\zeta\nu\rangle - \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_{19}(et_1, {}^3T_2, M=-1, \chi) = \frac{\sqrt{3}|\overline{\gamma}\overline{\eta}|}{2} - \frac{|\overline{\zeta}\overline{\eta}|}{2}$$
$$\Psi_{20}(et_1, {}^3T_2, M=-1, \phi) = -\frac{\sqrt{3}|\overline{\gamma}\overline{\nu}|}{2} - \frac{|\overline{\zeta}\overline{\nu}|}{2}$$
$$\Psi_{21}(et_1, {}^3T_2, M=-1, \xi) = |\overline{\zeta}\overline{\mu}|$$
$$\Psi_{22}(et_1, {}^3T_2, M=0, \chi) = \frac{\sqrt{6}|\overline{\gamma}\eta|}{4} - \frac{\sqrt{2}|\overline{\zeta}\eta|}{4} + \frac{\sqrt{6}|\gamma\overline{\eta}|}{4} - \frac{\sqrt{2}|\zeta\overline{\eta}|}{4}$$
$$\Psi_{23}(et_1, {}^3T_2, M=0, \phi) = -\frac{\sqrt{6}|\overline{\gamma}\nu|}{4} - \frac{\sqrt{2}|\overline{\zeta}\nu|}{4} - \frac{\sqrt{6}|\gamma\overline{\nu}|}{4} - \frac{\sqrt{2}|\zeta\overline{\nu}|}{4}$$
$$\Psi_{24}(et_1, {}^3T_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{25}(et_1, {}^3T_2, M=1, \chi) = \frac{\sqrt{3}|\gamma\eta|}{2} - \frac{|\zeta\eta|}{2}$$
$$\Psi_{26}(et_1, {}^3T_2, M=1, \phi) = -\frac{\sqrt{3}|\gamma\nu|}{2} - \frac{|\zeta\nu|}{2}$$
$$\Psi_{27}(et_1, {}^3T_2, M=1, \xi) = |\zeta\mu|$$

et_2

$$\boxed{\Delta E = \frac{4\,\langle\zeta\phi||\zeta\phi\rangle}{3} - \frac{\langle\zeta\xi||\zeta\xi\rangle}{3} - \frac{4\,\langle\zeta\zeta||\phi\phi\rangle}{3} + \frac{\langle\zeta\zeta||\xi\xi\rangle}{3}}$$

$$\Psi_{28}(et_2, {}^3T_2, M=-1, \xi) = |\overline{\gamma}\overline{\xi}|$$
$$\Psi_{29}(et_2, {}^3T_2, M=-1, \phi) = -\frac{|\overline{\gamma}\overline{\phi}|}{2} + \frac{\sqrt{3}|\overline{\zeta}\overline{\phi}|}{2}$$
$$\Psi_{30}(et_2, {}^3T_2, M=-1, \chi) = -\frac{|\overline{\gamma}\overline{\chi}|}{2} - \frac{\sqrt{3}|\overline{\zeta}\overline{\chi}|}{2}$$
$$\Psi_{31}(et_2, {}^3T_2, M=0, \xi) = \frac{\sqrt{2}|\overline{\gamma}\xi|}{2} + \frac{\sqrt{2}|\gamma\overline{\xi}|}{2}$$
$$\Psi_{32}(et_2, {}^3T_2, M=0, \phi) = -\frac{\sqrt{2}|\overline{\gamma}\phi|}{4} + \frac{\sqrt{6}|\overline{\zeta}\phi|}{4} - \frac{\sqrt{2}|\gamma\overline{\phi}|}{4} + \frac{\sqrt{6}|\zeta\overline{\phi}|}{4}$$
$$\Psi_{33}(et_2, {}^3T_2, M=0, \chi) = -\frac{\sqrt{2}|\overline{\gamma}\chi|}{4} - \frac{\sqrt{6}|\overline{\zeta}\chi|}{4} - \frac{\sqrt{2}|\gamma\overline{\chi}|}{4} - \frac{\sqrt{6}|\zeta\overline{\chi}|}{4}$$
$$\Psi_{34}(et_2, {}^3T_2, M=1, \xi) = |\gamma\xi|$$
$$\Psi_{35}(et_2, {}^3T_2, M=1, \phi) = -\frac{|\gamma\phi|}{2} + \frac{\sqrt{3}|\zeta\phi|}{2}$$
$$\Psi_{36}(et_2, {}^3T_2, M=1, \chi) = -\frac{|\gamma\chi|}{2} - \frac{\sqrt{3}|\zeta\chi|}{2}$$

t_1t_2

$$\boxed{\Delta E = -\langle\nu\nu||\xi\xi\rangle - \langle\nu\xi||\mu\phi\rangle + \langle\nu\xi||\nu\xi\rangle + \langle\nu\mu||\phi\xi\rangle}$$

$$\Psi_{37}(t_1t_2, {}^3T_2, M=-1, \phi) = \frac{\sqrt{2}|\overline{\eta}\overline{\xi}|}{2} - \frac{\sqrt{2}|\overline{\mu}\overline{\chi}|}{2}$$
$$\Psi_{38}(t_1t_2, {}^3T_2, M=-1, \xi) = -\frac{\sqrt{2}|\overline{\eta}\overline{\phi}|}{2} + \frac{\sqrt{2}|\overline{\nu}\overline{\chi}|}{2}$$
$$\Psi_{39}(t_1t_2, {}^3T_2, M=-1, \chi) = \frac{\sqrt{2}|\overline{\mu}\overline{\phi}|}{2} - \frac{\sqrt{2}|\overline{\nu}\overline{\xi}|}{2}$$
$$\Psi_{40}(t_1t_2, {}^3T_2, M=0, \phi) = \frac{|\overline{\eta}\xi|}{2} - \frac{|\overline{\mu}\chi|}{2} + \frac{|\eta\overline{\xi}|}{2} - \frac{|\mu\overline{\chi}|}{2}$$
$$\Psi_{41}(t_1t_2, {}^3T_2, M=0, \xi) = -\frac{|\overline{\eta}\phi|}{2} + \frac{|\overline{\nu}\chi|}{2} - \frac{|\eta\overline{\phi}|}{2} + \frac{|\nu\overline{\chi}|}{2}$$
$$\Psi_{42}(t_1t_2, {}^3T_2, M=0, \chi) = \frac{|\overline{\mu}\phi|}{2} - \frac{|\overline{\nu}\xi|}{2} + \frac{|\mu\overline{\phi}|}{2} - \frac{|\nu\overline{\xi}|}{2}$$
$$\Psi_{43}(t_1t_2, {}^3T_2, M=1, \phi) = \frac{\sqrt{2}|\eta\xi|}{2} - \frac{\sqrt{2}|\mu\chi|}{2}$$
$$\Psi_{44}(t_1t_2, {}^3T_2, M=1, \xi) = -\frac{\sqrt{2}|\eta\phi|}{2} + \frac{\sqrt{2}|\nu\chi|}{2}$$
$$\Psi_{45}(t_1t_2, {}^3T_2, M=1, \chi) = \frac{\sqrt{2}|\mu\phi|}{2} - \frac{\sqrt{2}|\nu\xi|}{2}$$

2.30.9 ${}^1T_2$

a_1t_2

$$\boxed{\Delta E = \langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1t_2, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\overline{\xi}|}{2}$$
$$\Psi_2(a_1t_2, {}^1T_2, M=0, \phi) = -\frac{\sqrt{2}|\overline{\alpha}\phi|}{2} + \frac{\sqrt{2}|\alpha\overline{\phi}|}{2}$$
$$\Psi_3(a_1t_2, {}^1T_2, M=0, \chi) = -\frac{\sqrt{2}|\overline{\alpha}\chi|}{2} + \frac{\sqrt{2}|\alpha\overline{\chi}|}{2}$$

a_2t_1

$$\boxed{\Delta E = \langle\beta\beta||\nu\nu\rangle + \langle\beta\nu||\beta\nu\rangle}$$

$$\Psi_4(a_2t_1, {}^1T_2, M=0, \chi) = -\frac{\sqrt{2}|\overline{\beta}\eta|}{2} + \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_5(a_2t_1, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_6(a_2t_1, {}^1T_2, M=0, \phi) = -\frac{\sqrt{2}|\overline{\beta}\nu|}{2} + \frac{\sqrt{2}|\beta\overline{\nu}|}{2}$$

et_1

$$\boxed{\Delta E = \sqrt{3}\,\langle\zeta\nu||\gamma\nu\rangle + \langle\zeta\nu||\zeta\nu\rangle + \langle\zeta\zeta||\mu\mu\rangle}$$

$$\Psi_7(et_1, {}^1T_2, M=0, \chi) = -\frac{\sqrt{6}|\overline{\gamma}\eta|}{4} + \frac{\sqrt{2}|\overline{\zeta}\eta|}{4} + \frac{\sqrt{6}|\gamma\overline{\eta}|}{4} - \frac{\sqrt{2}|\zeta\overline{\eta}|}{4}$$

$$\Psi_8(et_1, {}^1T_2, M=0, \phi) = \frac{\sqrt{6}|\overline{\gamma}\nu|}{4} + \frac{\sqrt{2}|\overline{\zeta}\nu|}{4} - \frac{\sqrt{6}|\gamma\overline{\nu}|}{4} - \frac{\sqrt{2}|\zeta\overline{\nu}|}{4}$$

$$\Psi_9(et_1, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\zeta}\mu|}{2} + \frac{\sqrt{2}|\zeta\overline{\mu}|}{2}$$

et_2

$$\boxed{\Delta E = \frac{4\,\langle\zeta\phi||\zeta\phi\rangle}{3} - \frac{\langle\zeta\xi||\zeta\xi\rangle}{3} + \frac{4\,\langle\zeta\zeta||\phi\phi\rangle}{3} - \frac{\langle\zeta\zeta||\xi\xi\rangle}{3}}$$

$$\Psi_{10}(et_2, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\gamma}\xi|}{2} + \frac{\sqrt{2}|\gamma\overline{\xi}|}{2}$$

$$\Psi_{11}(et_2, {}^1T_2, M=0, \phi) = \frac{\sqrt{2}|\overline{\gamma}\phi|}{4} - \frac{\sqrt{6}|\overline{\zeta}\phi|}{4} - \frac{\sqrt{2}|\gamma\overline{\phi}|}{4} + \frac{\sqrt{6}|\zeta\overline{\phi}|}{4}$$

$$\Psi_{12}(et_2, {}^1T_2, M=0, \chi) = \frac{\sqrt{2}|\overline{\gamma}\chi|}{4} + \frac{\sqrt{6}|\overline{\zeta}\chi|}{4} - \frac{\sqrt{2}|\gamma\overline{\chi}|}{4} - \frac{\sqrt{6}|\zeta\overline{\chi}|}{4}$$

t_1^2

$$\boxed{\Delta E = \langle\nu\mu||\nu\mu\rangle + \langle\nu\nu||\mu\mu\rangle}$$

$$\Psi_{13}(t_1^2, {}^1T_2, M=0, \phi) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} - \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$

$$\Psi_{14}(t_1^2, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\eta}\nu|}{2} - \frac{\sqrt{2}|\overline{\nu}\eta|}{2}$$

$$\Psi_{15}(t_1^2, {}^1T_2, M=0, \chi) = -\frac{\sqrt{2}|\overline{\mu}\nu|}{2} - \frac{\sqrt{2}|\overline{\nu}\mu|}{2}$$

t_1t_2

$$\boxed{\Delta E = \langle\nu\nu||\xi\xi\rangle - \langle\nu\xi||\mu\phi\rangle + \langle\nu\xi||\nu\xi\rangle - \langle\nu\mu||\phi\xi\rangle}$$

$$\Psi_{16}(t_1t_2, {}^1T_2, M=0, \phi) = -\frac{|\overline{\eta}\xi|}{2} + \frac{|\overline{\mu}\chi|}{2} + \frac{|\eta\overline{\xi}|}{2} - \frac{|\mu\overline{\chi}|}{2}$$

$$\Psi_{17}(t_1t_2, {}^1T_2, M=0, \xi) = \frac{|\overline{\eta}\phi|}{2} - \frac{|\overline{\nu}\chi|}{2} - \frac{|\eta\overline{\phi}|}{2} + \frac{|\nu\overline{\chi}|}{2}$$

$$\Psi_{18}(t_1t_2, {}^1T_2, M=0, \chi) = -\frac{|\overline{\mu}\phi|}{2} + \frac{|\overline{\nu}\xi|}{2} + \frac{|\mu\overline{\phi}|}{2} - \frac{|\nu\overline{\xi}|}{2}$$

t_2^2

$$\boxed{\Delta E = \langle\xi\phi||\xi\phi\rangle + \langle\xi\xi||\phi\phi\rangle}$$

$$\Psi_{19}(t_2^2, {}^1T_2, M=0, \chi) = -\frac{\sqrt{2}|\overline{\phi}\xi|}{2} - \frac{\sqrt{2}|\overline{\xi}\phi|}{2}$$

$$\Psi_{20}(t_2^2, {}^1T_2, M=0, \phi) = -\frac{\sqrt{2}|\overline{\chi}\xi|}{2} - \frac{\sqrt{2}|\overline{\xi}\chi|}{2}$$

$$\Psi_{21}(t_2^2, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\chi}\phi|}{2} - \frac{\sqrt{2}|\overline{\phi}\chi|}{2}$$

2.31 Group T_d

Component labels

$A_1 : \{\alpha\}$ —— $A_2 : \{\beta\}$ —— $E : \{\gamma, \zeta\}$ —— $T_2 : \{\xi, \phi, \chi\}$ —— $T_1 : \{\eta, \mu, \nu\}$

2.31.1 $^1A_1$

a_1^2

$$\boxed{\Delta E = \langle\alpha\alpha||\alpha\alpha\rangle}$$

$$\Psi_1(a_1^2, {}^1A_1, M=0, \alpha) = -|\overline{\alpha}\alpha|$$

a_2^2

$$\boxed{\Delta E = \langle\beta\beta||\beta\beta\rangle}$$

$$\Psi_2(a_2^2, {}^1A_1, M=0, \alpha) = -|\overline{\beta}\beta|$$

e^2

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle}$$

$$\Psi_3(e^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} - \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2}$$

t_2^2

$$\boxed{\Delta E = 2\,\langle\xi\xi||\phi\phi\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_4(t_2^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{3}|\overline{\chi}\chi|}{3} - \frac{\sqrt{3}|\overline{\phi}\phi|}{3} - \frac{\sqrt{3}|\overline{\xi}\xi|}{3}$$

t_1^2

$$\boxed{\Delta E = 2\,\langle\nu\nu||\mu\mu\rangle + \langle\nu\nu||\nu\nu\rangle}$$

$$\Psi_5(t_1^2, {}^1A_1, M=0, \alpha) = -\frac{\sqrt{3}|\overline{\eta}\eta|}{3} - \frac{\sqrt{3}|\overline{\mu}\mu|}{3} - \frac{\sqrt{3}|\overline{\nu}\nu|}{3}$$

2.31.2 $^3A_2$

a_1a_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^3A_2, M=-1, \beta) = |\overline{\alpha}\overline{\beta}|$$
$$\Psi_2(a_1a_2, {}^3A_2, M=0, \beta) = \frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$
$$\Psi_3(a_1a_2, {}^3A_2, M=1, \beta) = |\alpha\beta|$$

e^2

$$\boxed{\Delta E = \langle\zeta\gamma||\zeta\gamma\rangle}$$

$$\Psi_4(e^2, {}^3A_2, M=-1, \beta) = -|\overline{\gamma}\overline{\zeta}|$$
$$\Psi_5(e^2, {}^3A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\gamma}\zeta|}{2} + \frac{\sqrt{2}|\overline{\zeta}\gamma|}{2}$$
$$\Psi_6(e^2, {}^3A_2, M=1, \beta) = -|\gamma\zeta|$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = 2\langle\xi\eta||\phi\mu\rangle + \langle\xi\eta||\xi\eta\rangle - \langle\xi\xi||\eta\eta\rangle \\ -2\langle\xi\phi||\mu\eta\rangle\end{array}}$$

$$\Psi_7(t_1t_2, {}^3A_2, M=-1, \beta) = \frac{\sqrt{3}|\overline{\chi}\overline{\nu}|}{3} + \frac{\sqrt{3}|\overline{\phi}\overline{\mu}|}{3} + \frac{\sqrt{3}|\overline{\xi}\overline{\eta}|}{3}$$
$$\Psi_8(t_1t_2, {}^3A_2, M=0, \beta) =$$
$$\frac{\sqrt{6}|\overline{\chi}\nu|}{6} + \frac{\sqrt{6}|\overline{\phi}\mu|}{6} + \frac{\sqrt{6}|\overline{\xi}\eta|}{6} + \frac{\sqrt{6}|\chi\overline{\nu}|}{6} + \frac{\sqrt{6}|\phi\overline{\mu}|}{6} + \frac{\sqrt{6}|\xi\overline{\eta}|}{6}$$
$$\Psi_9(t_1t_2, {}^3A_2, M=1, \beta) = \frac{\sqrt{3}|\chi\nu|}{3} + \frac{\sqrt{3}|\phi\mu|}{3} + \frac{\sqrt{3}|\xi\eta|}{3}$$

2.31.3 $^1A_2$

a_1a_2

$$\boxed{\Delta E = \langle\alpha\alpha||\beta\beta\rangle + \langle\alpha\beta||\alpha\beta\rangle}$$

$$\Psi_1(a_1a_2, {}^1A_2, M=0, \beta) = -\frac{\sqrt{2}|\overline{\alpha}\beta|}{2} + \frac{\sqrt{2}|\alpha\overline{\beta}|}{2}$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = 2\langle\xi\eta||\phi\mu\rangle + \langle\xi\eta||\xi\eta\rangle + \langle\xi\xi||\eta\eta\rangle \\ +2\langle\xi\phi||\mu\eta\rangle\end{array}}$$

$$\Psi_2(t_1t_2, {}^1A_2, M=0, \beta) =$$
$$-\frac{\sqrt{6}|\overline{\chi}\nu|}{6} - \frac{\sqrt{6}|\overline{\phi}\mu|}{6} - \frac{\sqrt{6}|\overline{\xi}\eta|}{6} + \frac{\sqrt{6}|\chi\overline{\nu}|}{6} + \frac{\sqrt{6}|\phi\overline{\mu}|}{6} + \frac{\sqrt{6}|\xi\overline{\eta}|}{6}$$

2.31.4 ^3E

a_1e

$$\boxed{\Delta E = \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1e, {}^3E, M=-1, \gamma) = |\overline{\alpha}\overline{\gamma}|$$
$$\Psi_2(a_1e, {}^3E, M=-1, \zeta) = |\overline{\alpha}\overline{\zeta}|$$
$$\Psi_3(a_1e, {}^3E, M=0, \gamma) = \frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_4(a_1e, {}^3E, M=0, \zeta) = \frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$
$$\Psi_5(a_1e, {}^3E, M=1, \gamma) = |\alpha\gamma|$$
$$\Psi_6(a_1e, {}^3E, M=1, \zeta) = |\alpha\zeta|$$

a_2e

$$\boxed{\Delta E = \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_7(a_2e, {}^3E, M=-1, \gamma) = |\overline{\beta}\overline{\gamma}|$$
$$\Psi_8(a_2e, {}^3E, M=-1, \zeta) = -|\overline{\beta}\overline{\zeta}|$$
$$\Psi_9(a_2e, {}^3E, M=0, \gamma) = \frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_{10}(a_2e, {}^3E, M=0, \zeta) = -\frac{\sqrt{2}|\overline{\beta}\zeta|}{2} - \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$
$$\Psi_{11}(a_2e, {}^3E, M=1, \gamma) = |\beta\gamma|$$
$$\Psi_{12}(a_2e, {}^3E, M=1, \zeta) = -|\beta\zeta|$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = -\langle\xi\eta||\phi\mu\rangle + \langle\xi\eta||\xi\eta\rangle - \langle\xi\xi||\eta\eta\rangle \\ +\langle\xi\phi||\mu\eta\rangle\end{array}}$$

$$\Psi_{13}(t_1t_2, {}^3E, M=-1, \gamma) =$$
$$\frac{\sqrt{3}|\overline{\chi}\overline{\nu}|}{3} + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\phi}\overline{\mu}| + \left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\xi}\overline{\eta}|$$
$$\Psi_{14}(t_1t_2, {}^3E, M=-1, \zeta) =$$
$$\left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\chi}\overline{\nu}| - \frac{\sqrt{3}|\overline{\phi}\overline{\mu}|}{3} + \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\xi}\overline{\eta}|$$
$$\Psi_{15}(t_1t_2, {}^3E, M=0, \gamma) =$$
$$\frac{\sqrt{6}|\overline{\chi}\nu|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\phi}\mu|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\xi}\eta|}{2} +$$
$$\frac{\sqrt{6}|\chi\overline{\nu}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\phi\overline{\mu}|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\xi\overline{\eta}|}{2}$$
$$\Psi_{16}(t_1t_2, {}^3E, M=0, \zeta) = \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\chi}\nu|}{2} - \frac{\sqrt{6}|\overline{\phi}\mu|}{6} +$$
$$\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\xi}\eta|}{2} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\chi\overline{\nu}|}{2} - \frac{\sqrt{6}|\phi\overline{\mu}|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\xi\overline{\eta}|}{2}$$
$$\Psi_{17}(t_1t_2, {}^3E, M=1, \gamma) =$$
$$\frac{\sqrt{3}|\chi\nu|}{3} + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\phi\mu| + \left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\xi\eta|$$
$$\Psi_{18}(t_1t_2, {}^3E, M=1, \zeta) =$$
$$\left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\chi\nu| - \frac{\sqrt{3}|\phi\mu|}{3} + \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\xi\eta|$$

2.31.5 ^1E

a_1e

$$\boxed{\Delta E = \langle\alpha\zeta||\alpha\zeta\rangle}$$

$$\Psi_1(a_1e,{}^1E,M=0,\gamma) = -\frac{\sqrt{2}|\overline{\alpha}\gamma|}{2} + \frac{\sqrt{2}|\alpha\overline{\gamma}|}{2}$$
$$\Psi_2(a_1e,{}^1E,M=0,\zeta) = -\frac{\sqrt{2}|\overline{\alpha}\zeta|}{2} + \frac{\sqrt{2}|\alpha\overline{\zeta}|}{2}$$

a_2e

$$\boxed{\Delta E = \langle\beta\zeta||\beta\zeta\rangle}$$

$$\Psi_3(a_2e,{}^1E,M=0,\gamma) = -\frac{\sqrt{2}|\overline{\beta}\gamma|}{2} + \frac{\sqrt{2}|\beta\overline{\gamma}|}{2}$$
$$\Psi_4(a_2e,{}^1E,M=0,\zeta) = \frac{\sqrt{2}|\overline{\beta}\zeta|}{2} - \frac{\sqrt{2}|\beta\overline{\zeta}|}{2}$$

e^2

$$\boxed{\Delta E = \langle\zeta\zeta||\zeta\zeta\rangle}$$

$$\Psi_5(e^2,{}^1E,M=0,\zeta) = -|\overline{\gamma}\gamma|$$
$$\Psi_6(e^2,{}^1E,M=0,\gamma) = -|\overline{\zeta}\zeta|$$

t_2^2

$$\boxed{\Delta E = -\langle\xi\xi||\phi\phi\rangle + \langle\xi\xi||\xi\xi\rangle}$$

$$\Psi_7(t_2^2,{}^1E,M=0,\gamma) = -\frac{\sqrt{3}|\overline{\chi}\chi|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\phi}\phi| + \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\xi}\xi|$$
$$\Psi_8(t_2^2,{}^1E,M=0,\zeta) = \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\chi}\chi| - \frac{\sqrt{3}|\overline{\phi}\phi|}{3} + \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\xi}\xi|$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = -\langle\xi\eta||\phi\mu\rangle + \langle\xi\eta||\xi\eta\rangle + \langle\xi\xi||\eta\eta\rangle \\ -\langle\xi\phi||\mu\eta\rangle\end{array}}$$

$$\Psi_9(t_1t_2,{}^1E,M=0,\gamma) = -\frac{\sqrt{6}|\overline{\chi}\nu|}{6} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\phi}\mu|}{2} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\xi}\eta|}{2} + \frac{\sqrt{6}|\chi\overline{\nu}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\phi\overline{\mu}|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\xi\overline{\eta}|}{2}$$

$$\Psi_{10}(t_1t_2,{}^1E,M=0,\zeta) = -\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\chi}\nu|}{2} + \frac{\sqrt{6}|\overline{\phi}\mu|}{6} - \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\xi}\eta|}{2} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\chi\overline{\nu}|}{2} - \frac{\sqrt{6}|\phi\overline{\mu}|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\xi\overline{\eta}|}{2}$$

t_1^2

$$\boxed{\Delta E = -\langle\nu\nu||\mu\mu\rangle + \langle\nu\nu||\nu\nu\rangle}$$

$$\Psi_{11}(t_1^2,{}^1E,M=0,\gamma) = \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\eta}\eta| + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\mu}\mu| - \frac{\sqrt{3}|\overline{\nu}\nu|}{3}$$
$$\Psi_{12}(t_1^2,{}^1E,M=0,\zeta) = \left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\eta}\eta| - \frac{\sqrt{3}|\overline{\mu}\mu|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\nu}\nu|$$

2.31.6 $^3T_2$

a_1t_2

$$\boxed{\Delta E = -\langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_1(a_1t_2,{}^3T_2,M=-1,\xi) = |\overline{\alpha}\overline{\xi}|$$
$$\Psi_2(a_1t_2,{}^3T_2,M=-1,\phi) = |\overline{\alpha}\overline{\phi}|$$
$$\Psi_3(a_1t_2,{}^3T_2,M=-1,\chi) = |\overline{\alpha}\overline{\chi}|$$
$$\Psi_4(a_1t_2,{}^3T_2,M=0,\xi) = \frac{\sqrt{2}|\overline{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\overline{\xi}|}{2}$$
$$\Psi_5(a_1t_2,{}^3T_2,M=0,\phi) = \frac{\sqrt{2}|\overline{\alpha}\phi|}{2} + \frac{\sqrt{2}|\alpha\overline{\phi}|}{2}$$
$$\Psi_6(a_1t_2,{}^3T_2,M=0,\chi) = \frac{\sqrt{2}|\overline{\alpha}\chi|}{2} + \frac{\sqrt{2}|\alpha\overline{\chi}|}{2}$$
$$\Psi_7(a_1t_2,{}^3T_2,M=1,\xi) = |\alpha\xi|$$
$$\Psi_8(a_1t_2,{}^3T_2,M=1,\phi) = |\alpha\phi|$$
$$\Psi_9(a_1t_2,{}^3T_2,M=1,\chi) = |\alpha\chi|$$

a_2t_1

$$\boxed{\Delta E = -\langle\beta\beta||\nu\nu\rangle + \langle\beta\nu||\beta\nu\rangle}$$

$$\Psi_{10}(a_2t_1,{}^3T_2,M=-1,\xi) = |\overline{\beta}\overline{\eta}|$$
$$\Psi_{11}(a_2t_1,{}^3T_2,M=-1,\phi) = |\overline{\beta}\overline{\mu}|$$
$$\Psi_{12}(a_2t_1,{}^3T_2,M=-1,\chi) = |\overline{\beta}\overline{\nu}|$$
$$\Psi_{13}(a_2t_1,{}^3T_2,M=0,\xi) = \frac{\sqrt{2}|\overline{\beta}\eta|}{2} + \frac{\sqrt{2}|\beta\overline{\eta}|}{2}$$
$$\Psi_{14}(a_2t_1,{}^3T_2,M=0,\phi) = \frac{\sqrt{2}|\overline{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\overline{\mu}|}{2}$$
$$\Psi_{15}(a_2t_1,{}^3T_2,M=0,\chi) = \frac{\sqrt{2}|\overline{\beta}\nu|}{2} + \frac{\sqrt{2}|\beta\overline{\nu}|}{2}$$
$$\Psi_{16}(a_2t_1,{}^3T_2,M=1,\xi) = |\beta\eta|$$
$$\Psi_{17}(a_2t_1,{}^3T_2,M=1,\phi) = |\beta\mu|$$
$$\Psi_{18}(a_2t_1,{}^3T_2,M=1,\chi) = |\beta\nu|$$

et_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle}$$

$$\Psi_{19}(et_2,{}^3T_2,M=-1,\xi) = \frac{\sqrt{2}|\overline{\gamma}\overline{\xi}|}{2} + \frac{\sqrt{2}|\overline{\zeta}\overline{\xi}|}{2}$$
$$\Psi_{20}(et_2,{}^3T_2,M=-1,\phi) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma}\overline{\phi}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta}\overline{\phi}|}{2}$$
$$\Psi_{21}(et_2,{}^3T_2,M=-1,\chi) = -\frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma}\overline{\chi}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta}\overline{\chi}|}{2}$$
$$\Psi_{22}(et_2,{}^3T_2,M=0,\xi) = \frac{|\overline{\gamma}\xi|}{2} + \frac{|\overline{\zeta}\xi|}{2} + \frac{|\gamma\overline{\xi}|}{2} + \frac{|\zeta\overline{\xi}|}{2}$$
$$\Psi_{23}(et_2,{}^3T_2,M=0,\phi) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma}\phi|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta}\phi|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma\overline{\phi}|}{2} - \frac{\sqrt[3]{-1}|\zeta\overline{\phi}|}{2}$$
$$\Psi_{24}(et_2,{}^3T_2,M=0,\chi) = -\frac{\sqrt[3]{-1}|\overline{\gamma}\chi|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta}\chi|}{2} - \frac{\sqrt[3]{-1}|\gamma\overline{\chi}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta\overline{\chi}|}{2}$$

$$\Psi_{25}(et_2, {}^3T_2, M=1, \xi) = \frac{\sqrt{2}|\gamma\xi|}{2} + \frac{\sqrt{2}|\zeta\xi|}{2}$$
$$\Psi_{26}(et_2, {}^3T_2, M=1, \phi) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma\phi|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta\phi|}{2}$$
$$\Psi_{27}(et_2, {}^3T_2, M=1, \chi) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma\chi|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta\chi|}{2}$$

et_1

$$\boxed{\Delta E = \langle\zeta\nu||\zeta\nu\rangle}$$

$$\Psi_{28}(et_1, {}^3T_2, M=-1, \xi) = -\frac{\sqrt{2}|\bar{\gamma}\bar{\eta}|}{2} + \frac{\sqrt{2}|\bar{\zeta}\bar{\eta}|}{2}$$
$$\Psi_{29}(et_1, {}^3T_2, M=-1, \phi) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\bar{\gamma}\bar{\mu}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\bar{\zeta}\bar{\mu}|}{2}$$
$$\Psi_{30}(et_1, {}^3T_2, M=-1, \chi) = \frac{\sqrt[3]{-1}\sqrt{2}|\bar{\gamma}\bar{\nu}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\bar{\zeta}\bar{\nu}|}{2}$$
$$\Psi_{31}(et_1, {}^3T_2, M=0, \xi) = -\frac{|\bar{\gamma}\eta|}{2} + \frac{|\bar{\zeta}\eta|}{2} - \frac{|\gamma\bar{\eta}|}{2} + \frac{|\zeta\bar{\eta}|}{2}$$
$$\Psi_{32}(et_1, {}^3T_2, M=0, \phi) =$$
$$-\frac{(-1)^{\frac{2}{3}}|\bar{\gamma}\mu|}{2} - \frac{\sqrt[3]{-1}|\bar{\zeta}\mu|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma\bar{\mu}|}{2} - \frac{\sqrt[3]{-1}|\zeta\bar{\mu}|}{2}$$
$$\Psi_{33}(et_1, {}^3T_2, M=0, \chi) =$$
$$\frac{\sqrt[3]{-1}|\bar{\gamma}\nu|}{2} + \frac{(-1)^{\frac{2}{3}}|\bar{\zeta}\nu|}{2} + \frac{\sqrt[3]{-1}|\gamma\bar{\nu}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta\bar{\nu}|}{2}$$
$$\Psi_{34}(et_1, {}^3T_2, M=1, \xi) = -\frac{\sqrt{2}|\gamma\eta|}{2} + \frac{\sqrt{2}|\zeta\eta|}{2}$$
$$\Psi_{35}(et_1, {}^3T_2, M=1, \phi) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma\mu|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta\mu|}{2}$$
$$\Psi_{36}(et_1, {}^3T_2, M=1, \chi) = \frac{\sqrt[3]{-1}\sqrt{2}|\gamma\nu|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta\nu|}{2}$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = -\langle\xi\eta||\phi\mu\rangle + \langle\xi\nu||\xi\nu\rangle - \langle\xi\xi||\nu\nu\rangle \\ + \langle\xi\phi||\eta\mu\rangle\end{array}}$$

$$\Psi_{37}(t_1t_2, {}^3T_2, M=-1, \chi) = \frac{\sqrt{2}|\bar{\phi}\bar{\eta}|}{2} - \frac{\sqrt{2}|\bar{\xi}\bar{\mu}|}{2}$$
$$\Psi_{38}(t_1t_2, {}^3T_2, M=-1, \phi) = -\frac{\sqrt{2}|\bar{\chi}\bar{\eta}|}{2} + \frac{\sqrt{2}|\bar{\xi}\bar{\nu}|}{2}$$
$$\Psi_{39}(t_1t_2, {}^3T_2, M=-1, \xi) = \frac{\sqrt{2}|\bar{\chi}\bar{\mu}|}{2} - \frac{\sqrt{2}|\bar{\phi}\bar{\nu}|}{2}$$
$$\Psi_{40}(t_1t_2, {}^3T_2, M=0, \chi) = \frac{|\bar{\phi}\eta|}{2} - \frac{|\bar{\xi}\mu|}{2} + \frac{|\phi\bar{\eta}|}{2} - \frac{|\xi\bar{\mu}|}{2}$$
$$\Psi_{41}(t_1t_2, {}^3T_2, M=0, \phi) = -\frac{|\bar{\chi}\eta|}{2} + \frac{|\bar{\xi}\nu|}{2} - \frac{|\chi\bar{\eta}|}{2} + \frac{|\xi\bar{\nu}|}{2}$$
$$\Psi_{42}(t_1t_2, {}^3T_2, M=0, \xi) = \frac{|\bar{\chi}\mu|}{2} - \frac{|\bar{\phi}\nu|}{2} + \frac{|\chi\bar{\mu}|}{2} - \frac{|\phi\bar{\nu}|}{2}$$
$$\Psi_{43}(t_1t_2, {}^3T_2, M=1, \chi) = \frac{\sqrt{2}|\phi\eta|}{2} - \frac{\sqrt{2}|\xi\mu|}{2}$$
$$\Psi_{44}(t_1t_2, {}^3T_2, M=1, \phi) = -\frac{\sqrt{2}|\chi\eta|}{2} + \frac{\sqrt{2}|\xi\nu|}{2}$$
$$\Psi_{45}(t_1t_2, {}^3T_2, M=1, \xi) = \frac{\sqrt{2}|\chi\mu|}{2} - \frac{\sqrt{2}|\phi\nu|}{2}$$

2.31.7 ${}^1T_2$

a_1t_2

$$\boxed{\Delta E = \langle\alpha\alpha||\xi\xi\rangle + \langle\alpha\xi||\alpha\xi\rangle}$$

$$\Psi_{1}(a_1t_2, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\bar{\alpha}\xi|}{2} + \frac{\sqrt{2}|\alpha\bar{\xi}|}{2}$$
$$\Psi_{2}(a_1t_2, {}^1T_2, M=0, \phi) = -\frac{\sqrt{2}|\bar{\alpha}\phi|}{2} + \frac{\sqrt{2}|\alpha\bar{\phi}|}{2}$$
$$\Psi_{3}(a_1t_2, {}^1T_2, M=0, \chi) = -\frac{\sqrt{2}|\bar{\alpha}\chi|}{2} + \frac{\sqrt{2}|\alpha\bar{\chi}|}{2}$$

a_2t_1

$$\boxed{\Delta E = \langle\beta\beta||\nu\nu\rangle + \langle\beta\nu||\beta\nu\rangle}$$

$$\Psi_{4}(a_2t_1, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\bar{\beta}\eta|}{2} + \frac{\sqrt{2}|\beta\bar{\eta}|}{2}$$
$$\Psi_{5}(a_2t_1, {}^1T_2, M=0, \phi) = -\frac{\sqrt{2}|\bar{\beta}\mu|}{2} + \frac{\sqrt{2}|\beta\bar{\mu}|}{2}$$
$$\Psi_{6}(a_2t_1, {}^1T_2, M=0, \chi) = -\frac{\sqrt{2}|\bar{\beta}\nu|}{2} + \frac{\sqrt{2}|\beta\bar{\nu}|}{2}$$

et_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle}$$

$$\Psi_{7}(et_2, {}^1T_2, M=0, \xi) = -\frac{|\bar{\gamma}\xi|}{2} - \frac{|\bar{\zeta}\xi|}{2} + \frac{|\gamma\bar{\xi}|}{2} + \frac{|\zeta\bar{\xi}|}{2}$$
$$\Psi_{8}(et_2, {}^1T_2, M=0, \phi) =$$
$$-\frac{(-1)^{\frac{2}{3}}|\bar{\gamma}\phi|}{2} + \frac{\sqrt[3]{-1}|\bar{\zeta}\phi|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma\bar{\phi}|}{2} - \frac{\sqrt[3]{-1}|\zeta\bar{\phi}|}{2}$$
$$\Psi_{9}(et_2, {}^1T_2, M=0, \chi) =$$
$$\frac{\sqrt[3]{-1}|\bar{\gamma}\chi|}{2} - \frac{(-1)^{\frac{2}{3}}|\bar{\zeta}\chi|}{2} - \frac{\sqrt[3]{-1}|\gamma\bar{\chi}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta\bar{\chi}|}{2}$$

et_1

$$\boxed{\Delta E = \langle\zeta\nu||\zeta\nu\rangle}$$

$$\Psi_{10}(et_1, {}^1T_2, M=0, \xi) = \frac{|\bar{\gamma}\eta|}{2} - \frac{|\bar{\zeta}\eta|}{2} - \frac{|\gamma\bar{\eta}|}{2} + \frac{|\zeta\bar{\eta}|}{2}$$
$$\Psi_{11}(et_1, {}^1T_2, M=0, \phi) =$$
$$\frac{(-1)^{\frac{2}{3}}|\bar{\gamma}\mu|}{2} + \frac{\sqrt[3]{-1}|\bar{\zeta}\mu|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma\bar{\mu}|}{2} - \frac{\sqrt[3]{-1}|\zeta\bar{\mu}|}{2}$$
$$\Psi_{12}(et_1, {}^1T_2, M=0, \chi) =$$
$$-\frac{\sqrt[3]{-1}|\bar{\gamma}\nu|}{2} - \frac{(-1)^{\frac{2}{3}}|\bar{\zeta}\nu|}{2} + \frac{\sqrt[3]{-1}|\gamma\bar{\nu}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta\bar{\nu}|}{2}$$

t_2^2

$$\boxed{\Delta E = \langle\xi\phi||\xi\phi\rangle + \langle\xi\xi||\phi\phi\rangle}$$

$$\Psi_{13}(t_2^2, {}^1T_2, M=0, \chi) = -\frac{\sqrt{2}|\bar{\phi}\xi|}{2} - \frac{\sqrt{2}|\bar{\xi}\phi|}{2}$$
$$\Psi_{14}(t_2^2, {}^1T_2, M=0, \phi) = -\frac{\sqrt{2}|\bar{\chi}\xi|}{2} - \frac{\sqrt{2}|\bar{\xi}\chi|}{2}$$
$$\Psi_{15}(t_2^2, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\bar{\chi}\phi|}{2} - \frac{\sqrt{2}|\bar{\phi}\chi|}{2}$$

t_1t_2

$$\boxed{\begin{array}{c}\Delta E = -\langle\xi\eta||\phi\mu\rangle + \langle\xi\nu||\xi\nu\rangle + \langle\xi\xi||\nu\nu\rangle \\ - \langle\xi\phi||\eta\mu\rangle\end{array}}$$

$$\Psi_{16}(t_1t_2, {}^1T_2, M=0, \chi) = -\frac{|\bar{\phi}\eta|}{2} + \frac{|\bar{\xi}\mu|}{2} + \frac{|\phi\bar{\eta}|}{2} - \frac{|\xi\bar{\mu}|}{2}$$
$$\Psi_{17}(t_1t_2, {}^1T_2, M=0, \phi) = \frac{|\bar{\chi}\eta|}{2} - \frac{|\bar{\xi}\nu|}{2} - \frac{|\chi\bar{\eta}|}{2} + \frac{|\xi\bar{\nu}|}{2}$$

$$\Psi_{18}(t_1t_2, {}^1T_2, M=0, \xi) = -\frac{|\overline{\chi}\mu|}{2} + \frac{|\overline{\phi}\nu|}{2} + \frac{|\chi\overline{\mu}|}{2} - \frac{|\phi\overline{\nu}|}{2}$$

t_1^2

$$\boxed{\Delta E = \langle\nu\mu||\nu\mu\rangle + \langle\nu\nu||\mu\mu\rangle}$$

$$\Psi_{19}(t_1^2, {}^1T_2, M=0, \chi) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} - \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$
$$\Psi_{20}(t_1^2, {}^1T_2, M=0, \phi) = -\frac{\sqrt{2}|\overline{\eta}\nu|}{2} - \frac{\sqrt{2}|\overline{\nu}\eta|}{2}$$
$$\Psi_{21}(t_1^2, {}^1T_2, M=0, \xi) = -\frac{\sqrt{2}|\overline{\mu}\nu|}{2} - \frac{\sqrt{2}|\overline{\nu}\mu|}{2}$$

2.31.8 $^3T_1$

a_1t_1

$$\boxed{\Delta E = -\langle\alpha\alpha||\nu\nu\rangle + \langle\alpha\nu||\alpha\nu\rangle}$$

$$\Psi_1(a_1t_1, {}^3T_1, M=-1, \eta) = |\overline{\alpha\eta}|$$
$$\Psi_2(a_1t_1, {}^3T_1, M=-1, \mu) = |\overline{\alpha\mu}|$$
$$\Psi_3(a_1t_1, {}^3T_1, M=-1, \nu) = |\overline{\alpha\nu}|$$
$$\Psi_4(a_1t_1, {}^3T_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_5(a_1t_1, {}^3T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_6(a_1t_1, {}^3T_1, M=0, \nu) = \frac{\sqrt{2}|\overline{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\overline{\nu}|}{2}$$
$$\Psi_7(a_1t_1, {}^3T_1, M=1, \eta) = |\alpha\eta|$$
$$\Psi_8(a_1t_1, {}^3T_1, M=1, \mu) = |\alpha\mu|$$
$$\Psi_9(a_1t_1, {}^3T_1, M=1, \nu) = |\alpha\nu|$$

a_2t_2

$$\boxed{\Delta E = -\langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_{10}(a_2t_2, {}^3T_1, M=-1, \eta) = |\overline{\beta\xi}|$$
$$\Psi_{11}(a_2t_2, {}^3T_1, M=-1, \mu) = |\overline{\beta\phi}|$$
$$\Psi_{12}(a_2t_2, {}^3T_1, M=-1, \nu) = |\overline{\beta}\overline{\chi}|$$
$$\Psi_{13}(a_2t_2, {}^3T_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\overline{\xi}|}{2}$$
$$\Psi_{14}(a_2t_2, {}^3T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\beta}\phi|}{2} + \frac{\sqrt{2}|\beta\overline{\phi}|}{2}$$
$$\Psi_{15}(a_2t_2, {}^3T_1, M=0, \nu) = \frac{\sqrt{2}|\overline{\beta}\chi|}{2} + \frac{\sqrt{2}|\beta\overline{\chi}|}{2}$$
$$\Psi_{16}(a_2t_2, {}^3T_1, M=1, \eta) = |\beta\xi|$$
$$\Psi_{17}(a_2t_2, {}^3T_1, M=1, \mu) = |\beta\phi|$$
$$\Psi_{18}(a_2t_2, {}^3T_1, M=1, \nu) = |\beta\chi|$$

et_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle}$$

$$\Psi_{19}(et_2, {}^3T_1, M=-1, \eta) = -\frac{\sqrt{2}|\overline{\gamma}\overline{\xi}|}{2} + \frac{\sqrt{2}|\overline{\zeta}\overline{\xi}|}{2}$$
$$\Psi_{20}(et_2, {}^3T_1, M=-1, \mu) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma}\overline{\phi}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta}\overline{\phi}|}{2}$$
$$\Psi_{21}(et_2, {}^3T_1, M=-1, \nu) = \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma}\overline{\chi}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta}\overline{\chi}|}{2}$$
$$\Psi_{22}(et_2, {}^3T_1, M=0, \eta) = -\frac{|\overline{\gamma}\xi|}{2} + \frac{|\overline{\zeta}\xi|}{2} - \frac{|\gamma\overline{\xi}|}{2} + \frac{|\zeta\overline{\xi}|}{2}$$
$$\Psi_{23}(et_2, {}^3T_1, M=0, \mu) =$$
$$-\frac{(-1)^{\frac{2}{3}}|\overline{\gamma}\phi|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta}\phi|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma\overline{\phi}|}{2} - \frac{\sqrt[3]{-1}|\zeta\overline{\phi}|}{2}$$
$$\Psi_{24}(et_2, {}^3T_1, M=0, \nu) =$$
$$\frac{\sqrt[3]{-1}|\overline{\gamma}\chi|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta}\chi|}{2} + \frac{\sqrt[3]{-1}|\gamma\overline{\chi}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta\overline{\chi}|}{2}$$
$$\Psi_{25}(et_2, {}^3T_1, M=1, \eta) = -\frac{\sqrt{2}|\gamma\xi|}{2} + \frac{\sqrt{2}|\zeta\xi|}{2}$$
$$\Psi_{26}(et_2, {}^3T_1, M=1, \mu) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma\phi|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta\phi|}{2}$$
$$\Psi_{27}(et_2, {}^3T_1, M=1, \nu) = \frac{\sqrt[3]{-1}\sqrt{2}|\gamma\chi|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta\chi|}{2}$$

et_1

$$\boxed{\Delta E = \langle\zeta\nu||\zeta\nu\rangle}$$

$$\Psi_{28}(et_1, {}^3T_1, M=-1, \eta) = \frac{\sqrt{2}|\overline{\gamma}\overline{\eta}|}{2} + \frac{\sqrt{2}|\overline{\zeta}\overline{\eta}|}{2}$$
$$\Psi_{29}(et_1, {}^3T_1, M=-1, \mu) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma}\overline{\mu}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta}\overline{\mu}|}{2}$$
$$\Psi_{30}(et_1, {}^3T_1, M=-1, \nu) = -\frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma}\overline{\nu}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta}\overline{\nu}|}{2}$$
$$\Psi_{31}(et_1, {}^3T_1, M=0, \eta) = \frac{|\overline{\gamma}\eta|}{2} + \frac{|\overline{\zeta}\eta|}{2} + \frac{|\gamma\overline{\eta}|}{2} + \frac{|\zeta\overline{\eta}|}{2}$$
$$\Psi_{32}(et_1, {}^3T_1, M=0, \mu) =$$
$$\frac{(-1)^{\frac{2}{3}}|\overline{\gamma}\mu|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta}\mu|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma\overline{\mu}|}{2} - \frac{\sqrt[3]{-1}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{33}(et_1, {}^3T_1, M=0, \nu) =$$
$$-\frac{\sqrt[3]{-1}|\overline{\gamma}\nu|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta}\nu|}{2} - \frac{\sqrt[3]{-1}|\gamma\overline{\nu}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta\overline{\nu}|}{2}$$
$$\Psi_{34}(et_1, {}^3T_1, M=1, \eta) = \frac{\sqrt{2}|\gamma\eta|}{2} + \frac{\sqrt{2}|\zeta\eta|}{2}$$
$$\Psi_{35}(et_1, {}^3T_1, M=1, \mu) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma\mu|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta\mu|}{2}$$
$$\Psi_{36}(et_1, {}^3T_1, M=1, \nu) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma\nu|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta\nu|}{2}$$

t_2^2

$$\boxed{\Delta E = \langle\xi\phi||\xi\phi\rangle - \langle\xi\xi||\phi\phi\rangle}$$

$$\Psi_{37}(t_2^2, {}^3T_1, M=-1, \nu) = -|\overline{\xi\phi}|$$
$$\Psi_{38}(t_2^2, {}^3T_1, M=-1, \mu) = |\overline{\xi}\overline{\chi}|$$
$$\Psi_{39}(t_2^2, {}^3T_1, M=-1, \eta) = -|\overline{\phi}\overline{\chi}|$$
$$\Psi_{40}(t_2^2, {}^3T_1, M=0, \nu) = \frac{\sqrt{2}|\overline{\phi}\xi|}{2} - \frac{\sqrt{2}|\overline{\xi}\phi|}{2}$$
$$\Psi_{41}(t_2^2, {}^3T_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\chi}\xi|}{2} + \frac{\sqrt{2}|\overline{\xi}\chi|}{2}$$
$$\Psi_{42}(t_2^2, {}^3T_1, M=0, \eta) = \frac{\sqrt{2}|\overline{\chi}\phi|}{2} - \frac{\sqrt{2}|\overline{\phi}\chi|}{2}$$
$$\Psi_{43}(t_2^2, {}^3T_1, M=1, \nu) = -|\xi\phi|$$
$$\Psi_{44}(t_2^2, {}^3T_1, M=1, \mu) = |\xi\chi|$$
$$\Psi_{45}(t_2^2, {}^3T_1, M=1, \eta) = -|\phi\chi|$$

t_1t_2

$$\boxed{\begin{gathered}\Delta E = \langle\xi\eta||\phi\mu\rangle + \langle\xi\nu||\xi\nu\rangle - \langle\xi\xi||\nu\nu\rangle\\ - \langle\xi\phi||\eta\mu\rangle\end{gathered}}$$

$$\Psi_{46}(t_1t_2, {}^3T_1, M=-1, \nu) = \frac{\sqrt{2}|\overline{\phi}\overline{\eta}|}{2} + \frac{\sqrt{2}|\overline{\xi}\overline{\mu}|}{2}$$
$$\Psi_{47}(t_1t_2, {}^3T_1, M=-1, \mu) = \frac{\sqrt{2}|\overline{\chi}\overline{\eta}|}{2} + \frac{\sqrt{2}|\overline{\xi}\overline{\nu}|}{2}$$
$$\Psi_{48}(t_1t_2, {}^3T_1, M=-1, \eta) = \frac{\sqrt{2}|\overline{\chi}\overline{\mu}|}{2} + \frac{\sqrt{2}|\overline{\phi}\overline{\nu}|}{2}$$
$$\Psi_{49}(t_1t_2, {}^3T_1, M=0, \nu) = \frac{|\overline{\phi}\eta|}{2} + \frac{|\overline{\xi}\mu|}{2} + \frac{|\phi\overline{\eta}|}{2} + \frac{|\xi\overline{\mu}|}{2}$$
$$\Psi_{50}(t_1t_2, {}^3T_1, M=0, \mu) = \frac{|\overline{\chi}\eta|}{2} + \frac{|\overline{\xi}\nu|}{2} + \frac{|\chi\overline{\eta}|}{2} + \frac{|\xi\overline{\nu}|}{2}$$
$$\Psi_{51}(t_1t_2, {}^3T_1, M=0, \eta) = \frac{|\overline{\chi}\mu|}{2} + \frac{|\overline{\phi}\nu|}{2} + \frac{|\chi\overline{\mu}|}{2} + \frac{|\phi\overline{\nu}|}{2}$$
$$\Psi_{52}(t_1t_2, {}^3T_1, M=1, \nu) = \frac{\sqrt{2}|\phi\eta|}{2} + \frac{\sqrt{2}|\xi\mu|}{2}$$
$$\Psi_{53}(t_1t_2, {}^3T_1, M=1, \mu) = \frac{\sqrt{2}|\chi\eta|}{2} + \frac{\sqrt{2}|\xi\nu|}{2}$$
$$\Psi_{54}(t_1t_2, {}^3T_1, M=1, \eta) = \frac{\sqrt{2}|\chi\mu|}{2} + \frac{\sqrt{2}|\phi\nu|}{2}$$

t_1^2

$$\boxed{\Delta E = \langle\nu\mu||\nu\mu\rangle - \langle\nu\nu||\mu\mu\rangle}$$

$$\Psi_{55}(t_1^2, {}^3T_1, M=-1, \nu) = -|\overline{\eta}\overline{\mu}|$$
$$\Psi_{56}(t_1^2, {}^3T_1, M=-1, \mu) = |\overline{\eta}\overline{\nu}|$$
$$\Psi_{57}(t_1^2, {}^3T_1, M=-1, \eta) = -|\overline{\mu}\overline{\nu}|$$
$$\Psi_{58}(t_1^2, {}^3T_1, M=0, \nu) = -\frac{\sqrt{2}|\overline{\eta}\mu|}{2} + \frac{\sqrt{2}|\overline{\mu}\eta|}{2}$$
$$\Psi_{59}(t_1^2, {}^3T_1, M=0, \mu) = \frac{\sqrt{2}|\overline{\eta}\nu|}{2} - \frac{\sqrt{2}|\overline{\nu}\eta|}{2}$$
$$\Psi_{60}(t_1^2, {}^3T_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\mu}\nu|}{2} + \frac{\sqrt{2}|\overline{\nu}\mu|}{2}$$
$$\Psi_{61}(t_1^2, {}^3T_1, M=1, \nu) = -|\eta\mu|$$
$$\Psi_{62}(t_1^2, {}^3T_1, M=1, \mu) = |\eta\nu|$$
$$\Psi_{63}(t_1^2, {}^3T_1, M=1, \eta) = -|\mu\nu|$$

2.31.9 ${}^1T_1$

a_1t_1

$$\boxed{\Delta E = \langle\alpha\alpha||\nu\nu\rangle + \langle\alpha\nu||\alpha\nu\rangle}$$

$$\Psi_1(a_1t_1, {}^1T_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\alpha}\eta|}{2} + \frac{\sqrt{2}|\alpha\overline{\eta}|}{2}$$
$$\Psi_2(a_1t_1, {}^1T_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\alpha}\mu|}{2} + \frac{\sqrt{2}|\alpha\overline{\mu}|}{2}$$
$$\Psi_3(a_1t_1, {}^1T_1, M=0, \nu) = -\frac{\sqrt{2}|\overline{\alpha}\nu|}{2} + \frac{\sqrt{2}|\alpha\overline{\nu}|}{2}$$

a_2t_2

$$\boxed{\Delta E = \langle\beta\beta||\xi\xi\rangle + \langle\beta\xi||\beta\xi\rangle}$$

$$\Psi_4(a_2t_2, {}^1T_1, M=0, \eta) = -\frac{\sqrt{2}|\overline{\beta}\xi|}{2} + \frac{\sqrt{2}|\beta\overline{\xi}|}{2}$$
$$\Psi_5(a_2t_2, {}^1T_1, M=0, \mu) = -\frac{\sqrt{2}|\overline{\beta}\phi|}{2} + \frac{\sqrt{2}|\beta\overline{\phi}|}{2}$$
$$\Psi_6(a_2t_2, {}^1T_1, M=0, \nu) = -\frac{\sqrt{2}|\overline{\beta}\chi|}{2} + \frac{\sqrt{2}|\beta\overline{\chi}|}{2}$$

et_2

$$\boxed{\Delta E = \langle\zeta\xi||\zeta\xi\rangle}$$

$$\Psi_7(et_2, {}^1T_1, M=0, \eta) = \frac{|\overline{\gamma}\xi|}{2} - \frac{|\overline{\zeta}\xi|}{2} - \frac{|\gamma\overline{\xi}|}{2} + \frac{|\zeta\overline{\xi}|}{2}$$
$$\Psi_8(et_2, {}^1T_1, M=0, \mu) =$$
$$\frac{(-1)^{\frac{2}{3}}|\overline{\gamma}\phi|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta}\phi|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma\overline{\phi}|}{2} - \frac{\sqrt[3]{-1}|\zeta\overline{\phi}|}{2}$$
$$\Psi_9(et_2, {}^1T_1, M=0, \nu) =$$
$$-\frac{\sqrt[3]{-1}|\overline{\gamma}\chi|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta}\chi|}{2} + \frac{\sqrt[3]{-1}|\gamma\overline{\chi}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta\overline{\chi}|}{2}$$

et_1

$$\boxed{\Delta E = \langle\zeta\nu||\zeta\nu\rangle}$$

$$\Psi_{10}(et_1, {}^1T_1, M=0, \eta) = -\frac{|\overline{\gamma}\eta|}{2} - \frac{|\overline{\zeta}\eta|}{2} + \frac{|\gamma\overline{\eta}|}{2} + \frac{|\zeta\overline{\eta}|}{2}$$
$$\Psi_{11}(et_1, {}^1T_1, M=0, \mu) =$$
$$-\frac{(-1)^{\frac{2}{3}}|\overline{\gamma}\mu|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta}\mu|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma\overline{\mu}|}{2} - \frac{\sqrt[3]{-1}|\zeta\overline{\mu}|}{2}$$
$$\Psi_{12}(et_1, {}^1T_1, M=0, \nu) =$$
$$\frac{\sqrt[3]{-1}|\overline{\gamma}\nu|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta}\nu|}{2} - \frac{\sqrt[3]{-1}|\gamma\overline{\nu}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta\overline{\nu}|}{2}$$

t_1t_2

$$\boxed{\begin{gathered}\Delta E = \langle\xi\eta||\phi\mu\rangle + \langle\xi\nu||\xi\nu\rangle + \langle\xi\xi||\nu\nu\rangle\\ + \langle\xi\phi||\eta\mu\rangle\end{gathered}}$$

$$\Psi_{13}(t_1t_2, {}^1T_1, M=0, \nu) = -\frac{|\overline{\phi}\eta|}{2} - \frac{|\overline{\xi}\mu|}{2} + \frac{|\phi\overline{\eta}|}{2} + \frac{|\xi\overline{\mu}|}{2}$$
$$\Psi_{14}(t_1t_2, {}^1T_1, M=0, \mu) = -\frac{|\overline{\chi}\eta|}{2} - \frac{|\overline{\xi}\nu|}{2} + \frac{|\chi\overline{\eta}|}{2} + \frac{|\xi\overline{\nu}|}{2}$$
$$\Psi_{15}(t_1t_2, {}^1T_1, M=0, \eta) = -\frac{|\overline{\chi}\mu|}{2} - \frac{|\overline{\phi}\nu|}{2} + \frac{|\chi\overline{\mu}|}{2} + \frac{|\phi\overline{\nu}|}{2}$$

2.32 Group O_h

Component labels

$A_{1g} : \{\alpha_g\}$ —— $A_{2u} : \{\beta_u\}$ —— $A_{1u} : \{\alpha_u\}$ —— $A_{2g} : \{\beta_g\}$ —— $E_u : \{\gamma_u, \zeta_u\}$ —— $E_g : \{\gamma_g, \zeta_g\}$ —— $T_{1g} : \{\eta_g, \mu_g, \nu_g\}$ —— $T_{2g} : \{\xi_g, \phi_g, \chi_g\}$ —— $T_{1u} : \{\eta_u, \mu_u, \nu_u\}$ —— $T_{2u} : \{\xi_u, \phi_u, \chi_u\}$

2.32.1 $^1A_{1g}$

a_{1g}^2

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\alpha_g\alpha_g\rangle}$$

$$\Psi_1(a_{1g}^2, {}^1A_{1g}, M{=}0, \alpha_g) = -|\overline{\alpha_g}\alpha_g|$$

a_{2u}^2

$$\boxed{\Delta E = \langle\beta_u\beta_u||\beta_u\beta_u\rangle}$$

$$\Psi_2(a_{2u}^2, {}^1A_{1g}, M{=}0, \alpha_g) = -|\overline{\beta_u}\beta_u|$$

a_{1u}^2

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_3(a_{1u}^2, {}^1A_{1g}, M{=}0, \alpha_g) = -|\overline{\alpha_u}\alpha_u|$$

a_{2g}^2

$$\boxed{\Delta E = \langle\beta_g\beta_g||\beta_g\beta_g\rangle}$$

$$\Psi_4(a_{2g}^2, {}^1A_{1g}, M{=}0, \alpha_g) = -|\overline{\beta_g}\beta_g|$$

e_u^2

$$\boxed{\Delta E = 0}$$

$$\Psi_5(e_u^2, {}^1A_{1g}, M{=}0, \alpha_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\zeta_u|}{2} - \frac{\sqrt{2}|\overline{\zeta_u}\gamma_u|}{2}$$

e_g^2

$$\boxed{\Delta E = 0}$$

$$\Psi_6(e_g^2, {}^1A_{1g}, M{=}0, \alpha_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\zeta_g|}{2} - \frac{\sqrt{2}|\overline{\zeta_g}\gamma_g|}{2}$$

t_{1g}^2

$$\boxed{\Delta E = 3\langle\nu_g\nu_g||\nu_g\nu_g\rangle}$$

$$\Psi_7(t_{1g}^2, {}^1A_{1g}, M{=}0, \alpha_g) = -\frac{\sqrt{3}|\overline{\eta_g}\eta_g|}{3} - \frac{\sqrt{3}|\overline{\mu_g}\mu_g|}{3} - \frac{\sqrt{3}|\overline{\nu_g}\nu_g|}{3}$$

t_{2g}^2

$$\boxed{\Delta E = 3\langle\xi_g\xi_g||\xi_g\xi_g\rangle}$$

$$\Psi_8(t_{2g}^2, {}^1A_{1g}, M{=}0, \alpha_g) = -\frac{\sqrt{3}|\overline{\chi_g}\chi_g|}{3} - \frac{\sqrt{3}|\overline{\phi_g}\phi_g|}{3} - \frac{\sqrt{3}|\overline{\xi_g}\xi_g|}{3}$$

t_{1u}^2

$$\boxed{\Delta E = 3\langle\nu_u\nu_u||\nu_u\nu_u\rangle}$$

$$\Psi_9(t_{1u}^2, {}^1A_{1g}, M{=}0, \alpha_g) = -\frac{\sqrt{3}|\overline{\eta_u}\eta_u|}{3} - \frac{\sqrt{3}|\overline{\mu_u}\mu_u|}{3} - \frac{\sqrt{3}|\overline{\nu_u}\nu_u|}{3}$$

t_{2u}^2

$$\boxed{\Delta E = 3\langle\xi_u\xi_u||\xi_u\xi_u\rangle}$$

$$\Psi_{10}(t_{2u}^2, {}^1A_{1g}, M{=}0, \alpha_g) = -\frac{\sqrt{3}|\overline{\chi_u}\chi_u|}{3} - \frac{\sqrt{3}|\overline{\phi_u}\phi_u|}{3} - \frac{\sqrt{3}|\overline{\xi_u}\xi_u|}{3}$$

2.32.2 $^3A_{2u}$

$a_{1g}a_{2u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle\alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_1(a_{1g}a_{2u}, {}^3A_{2u}, M{=}{-1}, \beta_u) = |\overline{\alpha_g}\overline{\beta_u}|$$

$$\Psi_2(a_{1g}a_{2u}, {}^3A_{2u}, M{=}0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$$\Psi_3(a_{1g}a_{2u}, {}^3A_{2u}, M{=}1, \beta_u) = |\alpha_g\beta_u|$$

$a_{1u}a_{2g}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\beta_g\beta_g\rangle + \langle\alpha_u\beta_g||\alpha_u\beta_g\rangle}$$

$$\Psi_4(a_{1u}a_{2g}, {}^3A_{2u}, M{=}{-1}, \beta_u) = |\overline{\alpha_u}\overline{\beta_g}|$$

$$\Psi_5(a_{1u}a_{2g}, {}^3A_{2u}, M{=}0, \beta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

$$\Psi_6(a_{1u}a_{2g}, {}^3A_{2u}, M{=}1, \beta_u) = |\alpha_u\beta_g|$$

e_ge_u

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e_ge_u, {}^3A_{2u}, M{=}{-1}, \beta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\overline{\zeta_g}|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\overline{\gamma_g}|}{2}$$

$$\Psi_8(e_ge_u, {}^3A_{2u}, M{=}0, \beta_u) = -\frac{|\overline{\gamma_u}\zeta_g|}{2} + \frac{|\overline{\zeta_u}\gamma_g|}{2} - \frac{|\gamma_u\overline{\zeta_g}|}{2} + \frac{|\zeta_u\overline{\gamma_g}|}{2}$$

$$\Psi_9(e_ge_u, {}^3A_{2u}, M{=}1, \beta_u) = -\frac{\sqrt{2}|\gamma_u\zeta_g|}{2} + \frac{\sqrt{2}|\zeta_u\gamma_g|}{2}$$

$t_{1g}t_{2u}$

$$\boxed{\Delta E = 3\langle\nu_g\chi_u||\nu_g\chi_u\rangle - 3\langle\nu_g\nu_g||\chi_u\chi_u\rangle}$$

$$\Psi_{10}(t_{1g}t_{2u}, {}^3A_{2u}, M{=}{-1}, \beta_u) = \frac{\sqrt{3}|\overline{\eta_g}\overline{\xi_u}|}{3} + \frac{\sqrt{3}|\overline{\mu_g}\overline{\phi_u}|}{3} + \frac{\sqrt{3}|\overline{\nu_g}\overline{\chi_u}|}{3}$$

$$\Psi_{11}(t_{1g}t_{2u}, {}^3A_{2u}, M{=}0, \beta_u) = \frac{\sqrt{6}|\overline{\eta_g}\xi_u|}{6} + \frac{\sqrt{6}|\overline{\mu_g}\phi_u|}{6} + \frac{\sqrt{6}|\overline{\nu_g}\chi_u|}{6} + \frac{\sqrt{6}|\eta_g\overline{\xi_u}|}{6} + \frac{\sqrt{6}|\mu_g\overline{\phi_u}|}{6} + \frac{\sqrt{6}|\nu_g\overline{\chi_u}|}{6}$$

$$\Psi_{12}(t_{1g}t_{2u}, {}^3A_{2u}, M{=}1, \beta_u) = \frac{\sqrt{3}|\eta_g\xi_u|}{3} + \frac{\sqrt{3}|\mu_g\phi_u|}{3} + \frac{\sqrt{3}|\nu_g\chi_u|}{3}$$

$t_{1u}t_{2g}$

$$\boxed{\Delta E = 3\langle\xi_g\eta_u||\xi_g\eta_u\rangle - 3\langle\xi_g\xi_g||\eta_u\eta_u\rangle}$$

$$\Psi_{13}(t_{1u}t_{2g}, {}^{3}A_{2u}, M=-1, \beta_u) = \frac{\sqrt{3}|\overline{\chi_g}\overline{\nu_u}|}{3} + \frac{\sqrt{3}|\overline{\phi_g}\overline{\mu_u}|}{3} + \frac{\sqrt{3}|\overline{\xi_g}\overline{\eta_u}|}{3}$$

$$\Psi_{14}(t_{1u}t_{2g}, {}^{3}A_{2u}, M=0, \beta_u) = \frac{\sqrt{6}|\overline{\chi_g}\nu_u|}{6} + \frac{\sqrt{6}|\overline{\phi_g}\mu_u|}{6} + \frac{\sqrt{6}|\overline{\xi_g}\eta_u|}{6} + \frac{\sqrt{6}|\chi_g\overline{\nu_u}|}{6} + \frac{\sqrt{6}|\phi_g\overline{\mu_u}|}{6} + \frac{\sqrt{6}|\xi_g\overline{\eta_u}|}{6}$$

$$\Psi_{15}(t_{1u}t_{2g}, {}^{3}A_{2u}, M=1, \beta_u) = \frac{\sqrt{3}|\chi_g\nu_u|}{3} + \frac{\sqrt{3}|\phi_g\mu_u|}{3} + \frac{\sqrt{3}|\xi_g\eta_u|}{3}$$

2.32.3 $^{1}A_{2u}$

$a_{1g}a_{2u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\beta_u\beta_u\rangle + \langle\alpha_g\beta_u||\alpha_g\beta_u\rangle}$$

$$\Psi_{1}(a_{1g}a_{2u}, {}^{1}A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_u}|}{2}$$

$a_{1u}a_{2g}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\beta_g\beta_g\rangle + \langle\alpha_u\beta_g||\alpha_u\beta_g\rangle}$$

$$\Psi_{2}(a_{1u}a_{2g}, {}^{1}A_{2u}, M=0, \beta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\beta_g}|}{2}$$

e_ge_u

$$\boxed{\Delta E = 0}$$

$$\Psi_{3}(e_ge_u, {}^{1}A_{2u}, M=0, \beta_u) = \frac{|\overline{\gamma_u}\zeta_g|}{2} - \frac{|\overline{\zeta_u}\gamma_g|}{2} - \frac{|\gamma_u\overline{\zeta_g}|}{2} + \frac{|\zeta_u\overline{\gamma_g}|}{2}$$

$t_{1g}t_{2u}$

$$\boxed{\Delta E = 3\,\langle\nu_g\chi_u||\nu_g\chi_u\rangle + 3\,\langle\nu_g\nu_g||\chi_u\chi_u\rangle}$$

$$\Psi_{4}(t_{1g}t_{2u}, {}^{1}A_{2u}, M=0, \beta_u) = -\frac{\sqrt{6}|\overline{\eta_g}\xi_u|}{6} - \frac{\sqrt{6}|\overline{\mu_g}\phi_u|}{6} - \frac{\sqrt{6}|\overline{\nu_g}\chi_u|}{6} + \frac{\sqrt{6}|\eta_g\overline{\xi_u}|}{6} + \frac{\sqrt{6}|\mu_g\overline{\phi_u}|}{6} + \frac{\sqrt{6}|\nu_g\overline{\chi_u}|}{6}$$

$t_{1u}t_{2g}$

$$\boxed{\Delta E = 3\,\langle\xi_g\eta_u||\xi_g\eta_u\rangle + 3\,\langle\xi_g\xi_g||\eta_u\eta_u\rangle}$$

$$\Psi_{5}(t_{1u}t_{2g}, {}^{1}A_{2u}, M=0, \beta_u) = -\frac{\sqrt{6}|\overline{\chi_g}\nu_u|}{6} - \frac{\sqrt{6}|\overline{\phi_g}\mu_u|}{6} - \frac{\sqrt{6}|\overline{\xi_g}\eta_u|}{6} + \frac{\sqrt{6}|\chi_g\overline{\nu_u}|}{6} + \frac{\sqrt{6}|\phi_g\overline{\mu_u}|}{6} + \frac{\sqrt{6}|\xi_g\overline{\eta_u}|}{6}$$

2.32.4 $^{3}A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = -\,\langle\alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle\alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_{1}(a_{1g}a_{1u}, {}^{3}A_{1u}, M=-1, \alpha_u) = |\overline{\alpha_g}\overline{\alpha_u}|$$

$$\Psi_{2}(a_{1g}a_{1u}, {}^{3}A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$$\Psi_{3}(a_{1g}a_{1u}, {}^{3}A_{1u}, M=1, \alpha_u) = |\alpha_g\alpha_u|$$

$a_{2g}a_{2u}$

$$\boxed{\Delta E = \langle\beta_u\beta_g||\beta_u\beta_g\rangle - \langle\beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_{4}(a_{2g}a_{2u}, {}^{3}A_{1u}, M=-1, \alpha_u) = |\overline{\beta_u}\overline{\beta_g}|$$

$$\Psi_{5}(a_{2g}a_{2u}, {}^{3}A_{1u}, M=0, \alpha_u) = \frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

$$\Psi_{6}(a_{2g}a_{2u}, {}^{3}A_{1u}, M=1, \alpha_u) = |\beta_u\beta_g|$$

e_ge_u

$$\boxed{\Delta E = 0}$$

$$\Psi_{7}(e_ge_u, {}^{3}A_{1u}, M=-1, \alpha_u) = \frac{\sqrt{2}|\overline{\gamma_u}\overline{\zeta_g}|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\overline{\gamma_g}|}{2}$$

$$\Psi_{8}(e_ge_u, {}^{3}A_{1u}, M=0, \alpha_u) = \frac{|\overline{\gamma_u}\zeta_g|}{2} + \frac{|\overline{\zeta_u}\gamma_g|}{2} + \frac{|\gamma_u\overline{\zeta_g}|}{2} + \frac{|\zeta_u\overline{\gamma_g}|}{2}$$

$$\Psi_{9}(e_ge_u, {}^{3}A_{1u}, M=1, \alpha_u) = \frac{\sqrt{2}|\gamma_u\zeta_g|}{2} + \frac{\sqrt{2}|\zeta_u\gamma_g|}{2}$$

$t_{1g}t_{1u}$

$$\boxed{\Delta E = -3\,\langle\nu_g\nu_g||\nu_u\nu_u\rangle + 3\,\langle\nu_g\nu_u||\nu_g\nu_u\rangle}$$

$$\Psi_{10}(t_{1g}t_{1u}, {}^{3}A_{1u}, M=-1, \alpha_u) = \frac{\sqrt{3}|\overline{\eta_g}\overline{\eta_u}|}{3} + \frac{\sqrt{3}|\overline{\mu_g}\overline{\mu_u}|}{3} + \frac{\sqrt{3}|\overline{\nu_g}\overline{\nu_u}|}{3}$$

$$\Psi_{11}(t_{1g}t_{1u}, {}^{3}A_{1u}, M=0, \alpha_u) = \frac{\sqrt{6}|\overline{\eta_g}\eta_u|}{6} + \frac{\sqrt{6}|\overline{\mu_g}\mu_u|}{6} + \frac{\sqrt{6}|\overline{\nu_g}\nu_u|}{6} + \frac{\sqrt{6}|\eta_g\overline{\eta_u}|}{6} + \frac{\sqrt{6}|\mu_g\overline{\mu_u}|}{6} + \frac{\sqrt{6}|\nu_g\overline{\nu_u}|}{6}$$

$$\Psi_{12}(t_{1g}t_{1u}, {}^{3}A_{1u}, M=1, \alpha_u) = \frac{\sqrt{3}|\eta_g\eta_u|}{3} + \frac{\sqrt{3}|\mu_g\mu_u|}{3} + \frac{\sqrt{3}|\nu_g\nu_u|}{3}$$

$t_{2g}t_{2u}$

$$\boxed{\Delta E = -3\,\langle\xi_g\xi_g||\xi_u\xi_u\rangle + 3\,\langle\xi_g\xi_u||\xi_g\xi_u\rangle}$$

$$\Psi_{13}(t_{2g}t_{2u}, {}^{3}A_{1u}, M=-1, \alpha_u) = \frac{\sqrt{3}|\overline{\chi_g}\overline{\chi_u}|}{3} + \frac{\sqrt{3}|\overline{\phi_g}\overline{\phi_u}|}{3} + \frac{\sqrt{3}|\overline{\xi_g}\overline{\xi_u}|}{3}$$

$$\Psi_{14}(t_{2g}t_{2u}, {}^{3}A_{1u}, M=0, \alpha_u) = \frac{\sqrt{6}|\overline{\chi_g}\chi_u|}{6} + \frac{\sqrt{6}|\overline{\phi_g}\phi_u|}{6} + \frac{\sqrt{6}|\overline{\xi_g}\xi_u|}{6} + \frac{\sqrt{6}|\chi_g\overline{\chi_u}|}{6} + \frac{\sqrt{6}|\phi_g\overline{\phi_u}|}{6} + \frac{\sqrt{6}|\xi_g\overline{\xi_u}|}{6}$$

$$\Psi_{15}(t_{2g}t_{2u}, {}^{3}A_{1u}, M=1, \alpha_u) = \frac{\sqrt{3}|\chi_g\chi_u|}{3} + \frac{\sqrt{3}|\phi_g\phi_u|}{3} + \frac{\sqrt{3}|\xi_g\xi_u|}{3}$$

2.32.5 $^1A_{1u}$

$a_{1g}a_{1u}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\alpha_u\alpha_u\rangle + \langle \alpha_g\alpha_u||\alpha_g\alpha_u\rangle}$$

$$\Psi_1(a_{1g}a_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\alpha_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\alpha_u}|}{2}$$

$a_{2g}a_{2u}$

$$\boxed{\Delta E = \langle \beta_u\beta_g||\beta_u\beta_g\rangle + \langle \beta_u\beta_u||\beta_g\beta_g\rangle}$$

$$\Psi_2(a_{2g}a_{2u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{2}|\overline{\beta_u}\beta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\beta_g}|}{2}$$

e_ge_u

$$\boxed{\Delta E = 0}$$

$$\Psi_3(e_ge_u, {}^1A_{1u}, M=0, \alpha_u) = -\frac{|\overline{\gamma_u}\zeta_g|}{2} - \frac{|\overline{\zeta_u}\gamma_g|}{2} + \frac{|\gamma_u\overline{\zeta_g}|}{2} + \frac{|\zeta_u\overline{\gamma_g}|}{2}$$

$t_{1g}t_{1u}$

$$\boxed{\Delta E = 3\langle \nu_g\nu_g||\nu_u\nu_u\rangle + 3\langle \nu_g\nu_u||\nu_g\nu_u\rangle}$$

$$\Psi_4(t_{1g}t_{1u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{6}|\overline{\eta_g}\eta_u|}{6} - \frac{\sqrt{6}|\overline{\mu_g}\mu_u|}{6} - \frac{\sqrt{6}|\overline{\nu_g}\nu_u|}{6} + \frac{\sqrt{6}|\eta_g\overline{\eta_u}|}{6} + \frac{\sqrt{6}|\mu_g\overline{\mu_u}|}{6} + \frac{\sqrt{6}|\nu_g\overline{\nu_u}|}{6}$$

$t_{2g}t_{2u}$

$$\boxed{\Delta E = 3\langle \xi_g\xi_g||\xi_u\xi_u\rangle + 3\langle \xi_g\xi_u||\xi_g\xi_u\rangle}$$

$$\Psi_5(t_{2g}t_{2u}, {}^1A_{1u}, M=0, \alpha_u) = -\frac{\sqrt{6}|\overline{\chi_g}\chi_u|}{6} - \frac{\sqrt{6}|\overline{\phi_g}\phi_u|}{6} - \frac{\sqrt{6}|\overline{\xi_g}\xi_u|}{6} + \frac{\sqrt{6}|\chi_g\overline{\chi_u}|}{6} + \frac{\sqrt{6}|\phi_g\overline{\phi_u}|}{6} + \frac{\sqrt{6}|\xi_g\overline{\xi_u}|}{6}$$

2.32.6 $^3A_{2g}$

$a_{1g}a_{2g}$

$$\boxed{\Delta E = -\langle \alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle \alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_{1g}a_{2g}, {}^3A_{2g}, M=-1, \beta_g) = |\overline{\alpha_g}\overline{\beta_g}|$$
$$\Psi_2(a_{1g}a_{2g}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$
$$\Psi_3(a_{1g}a_{2g}, {}^3A_{2g}, M=1, \beta_g) = |\alpha_g\beta_g|$$

$a_{1u}a_{2u}$

$$\boxed{\Delta E = \langle \beta_u\alpha_u||\beta_u\alpha_u\rangle - \langle \beta_u\beta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_4(a_{1u}a_{2u}, {}^3A_{2g}, M=-1, \beta_g) = |\overline{\beta_u}\overline{\alpha_u}|$$
$$\Psi_5(a_{1u}a_{2u}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$
$$\Psi_6(a_{1u}a_{2u}, {}^3A_{2g}, M=1, \beta_g) = |\beta_u\alpha_u|$$

e_u^2

$$\boxed{\Delta E = 0}$$

$$\Psi_7(e_u^2, {}^3A_{2g}, M=-1, \beta_g) = -|\overline{\gamma_u}\overline{\zeta_u}|$$
$$\Psi_8(e_u^2, {}^3A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\zeta_u|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\gamma_u|}{2}$$
$$\Psi_9(e_u^2, {}^3A_{2g}, M=1, \beta_g) = -|\gamma_u\zeta_u|$$

e_g^2

$$\boxed{\Delta E = 0}$$

$$\Psi_{10}(e_g^2, {}^3A_{2g}, M=-1, \beta_g) = -|\overline{\gamma_g}\overline{\zeta_g}|$$
$$\Psi_{11}(e_g^2, {}^3A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\zeta_g|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\gamma_g|}{2}$$
$$\Psi_{12}(e_g^2, {}^3A_{2g}, M=1, \beta_g) = -|\gamma_g\zeta_g|$$

$t_{1g}t_{2g}$

$$\boxed{\Delta E = 3\langle \nu_g\chi_g||\nu_g\chi_g\rangle - 3\langle \nu_g\nu_g||\chi_g\chi_g\rangle}$$

$$\Psi_{13}(t_{1g}t_{2g}, {}^3A_{2g}, M=-1, \beta_g) = \frac{\sqrt{3}|\overline{\eta_g}\overline{\xi_g}|}{3} + \frac{\sqrt{3}|\overline{\mu_g}\overline{\phi_g}|}{3} + \frac{\sqrt{3}|\overline{\nu_g}\overline{\chi_g}|}{3}$$
$$\Psi_{14}(t_{1g}t_{2g}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{6}|\overline{\eta_g}\xi_g|}{6} + \frac{\sqrt{6}|\overline{\mu_g}\phi_g|}{6} + \frac{\sqrt{6}|\overline{\nu_g}\chi_g|}{6} + \frac{\sqrt{6}|\eta_g\overline{\xi_g}|}{6} + \frac{\sqrt{6}|\mu_g\overline{\phi_g}|}{6} + \frac{\sqrt{6}|\nu_g\overline{\chi_g}|}{6}$$
$$\Psi_{15}(t_{1g}t_{2g}, {}^3A_{2g}, M=1, \beta_g) = \frac{\sqrt{3}|\eta_g\xi_g|}{3} + \frac{\sqrt{3}|\mu_g\phi_g|}{3} + \frac{\sqrt{3}|\nu_g\chi_g|}{3}$$

$t_{1u}t_{2u}$

$$\boxed{\Delta E = 3\langle \nu_u\chi_u||\nu_u\chi_u\rangle - 3\langle \nu_u\nu_u||\chi_u\chi_u\rangle}$$

$$\Psi_{16}(t_{1u}t_{2u}, {}^3A_{2g}, M=-1, \beta_g) = \frac{\sqrt{3}|\overline{\eta_u}\overline{\xi_u}|}{3} + \frac{\sqrt{3}|\overline{\mu_u}\overline{\phi_u}|}{3} + \frac{\sqrt{3}|\overline{\nu_u}\overline{\chi_u}|}{3}$$
$$\Psi_{17}(t_{1u}t_{2u}, {}^3A_{2g}, M=0, \beta_g) = \frac{\sqrt{6}|\overline{\eta_u}\xi_u|}{6} + \frac{\sqrt{6}|\overline{\mu_u}\phi_u|}{6} + \frac{\sqrt{6}|\overline{\nu_u}\chi_u|}{6} + \frac{\sqrt{6}|\eta_u\overline{\xi_u}|}{6} + \frac{\sqrt{6}|\mu_u\overline{\phi_u}|}{6} + \frac{\sqrt{6}|\nu_u\overline{\chi_u}|}{6}$$
$$\Psi_{18}(t_{1u}t_{2u}, {}^3A_{2g}, M=1, \beta_g) = \frac{\sqrt{3}|\eta_u\xi_u|}{3} + \frac{\sqrt{3}|\mu_u\phi_u|}{3} + \frac{\sqrt{3}|\nu_u\chi_u|}{3}$$

2.32.7 $^1A_{2g}$

$a_{1g}a_{2g}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\beta_g\beta_g\rangle + \langle \alpha_g\beta_g||\alpha_g\beta_g\rangle}$$

$$\Psi_1(a_{1g}a_{2g}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\beta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\beta_g}|}{2}$$

$a_{1u}a_{2u}$

$$\boxed{\Delta E = \langle \beta_u\alpha_u||\beta_u\alpha_u\rangle + \langle \beta_u\beta_u||\alpha_u\alpha_u\rangle}$$

$$\Psi_2(a_{1u}a_{2u}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\alpha_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\alpha_u}|}{2}$$

$t_{1g}t_{2g}$

$$\boxed{\Delta E = 3\langle\nu_g\chi_g||\nu_g\chi_g\rangle + 3\langle\nu_g\nu_g||\chi_g\chi_g\rangle}$$

$$\Psi_3(t_{1g}t_{2g}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{6}|\overline{\eta_g}\xi_g|}{6} - \frac{\sqrt{6}|\overline{\mu_g}\phi_g|}{6} - \frac{\sqrt{6}|\overline{\nu_g}\chi_g|}{6} + \frac{\sqrt{6}|\eta_g\overline{\xi_g}|}{6} + \frac{\sqrt{6}|\mu_g\overline{\phi_g}|}{6} + \frac{\sqrt{6}|\nu_g\overline{\chi_g}|}{6}$$

$t_{1u}t_{2u}$

$$\boxed{\Delta E = 3\langle\nu_u\chi_u||\nu_u\chi_u\rangle + 3\langle\nu_u\nu_u||\chi_u\chi_u\rangle}$$

$$\Psi_4(t_{1u}t_{2u}, {}^1A_{2g}, M=0, \beta_g) = -\frac{\sqrt{6}|\overline{\eta_u}\xi_u|}{6} - \frac{\sqrt{6}|\overline{\mu_u}\phi_u|}{6} - \frac{\sqrt{6}|\overline{\nu_u}\chi_u|}{6} + \frac{\sqrt{6}|\eta_u\overline{\xi_u}|}{6} + \frac{\sqrt{6}|\mu_u\overline{\phi_u}|}{6} + \frac{\sqrt{6}|\nu_u\overline{\chi_u}|}{6}$$

2.32.8 ^3E_u

$a_{1g}e_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a_{1g}e_u, {}^3E_u, M=-1, \gamma_u) = |\overline{\alpha_g}\overline{\gamma_u}|$$
$$\Psi_2(a_{1g}e_u, {}^3E_u, M=-1, \zeta_u) = |\overline{\alpha_g}\overline{\zeta_u}|$$
$$\Psi_3(a_{1g}e_u, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_u}|}{2}$$
$$\Psi_4(a_{1g}e_u, {}^3E_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_u}|}{2}$$
$$\Psi_5(a_{1g}e_u, {}^3E_u, M=1, \gamma_u) = |\alpha_g\gamma_u|$$
$$\Psi_6(a_{1g}e_u, {}^3E_u, M=1, \zeta_u) = |\alpha_g\zeta_u|$$

$a_{2u}e_g$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(a_{2u}e_g, {}^3E_u, M=-1, \gamma_u) = |\overline{\beta_u}\overline{\gamma_g}|$$
$$\Psi_8(a_{2u}e_g, {}^3E_u, M=-1, \zeta_u) = -|\overline{\beta_u}\overline{\zeta_g}|$$
$$\Psi_9(a_{2u}e_g, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_g}|}{2}$$
$$\Psi_{10}(a_{2u}e_g, {}^3E_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\zeta_g|}{2} - \frac{\sqrt{2}|\beta_u\overline{\zeta_g}|}{2}$$
$$\Psi_{11}(a_{2u}e_g, {}^3E_u, M=1, \gamma_u) = |\beta_u\gamma_g|$$
$$\Psi_{12}(a_{2u}e_g, {}^3E_u, M=1, \zeta_u) = -|\beta_u\zeta_g|$$

$a_{1u}e_g$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(a_{1u}e_g, {}^3E_u, M=-1, \gamma_u) = |\overline{\alpha_u}\overline{\gamma_g}|$$
$$\Psi_{14}(a_{1u}e_g, {}^3E_u, M=-1, \zeta_u) = |\overline{\alpha_u}\overline{\zeta_g}|$$
$$\Psi_{15}(a_{1u}e_g, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_g}|}{2}$$
$$\Psi_{16}(a_{1u}e_g, {}^3E_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_g}|}{2}$$
$$\Psi_{17}(a_{1u}e_g, {}^3E_u, M=1, \gamma_u) = |\alpha_u\gamma_g|$$
$$\Psi_{18}(a_{1u}e_g, {}^3E_u, M=1, \zeta_u) = |\alpha_u\zeta_g|$$

$a_{2g}e_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_{19}(a_{2g}e_u, {}^3E_u, M=-1, \gamma_u) = |\overline{\beta_g}\overline{\gamma_u}|$$
$$\Psi_{20}(a_{2g}e_u, {}^3E_u, M=-1, \zeta_u) = -|\overline{\beta_g}\overline{\zeta_u}|$$
$$\Psi_{21}(a_{2g}e_u, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\beta_g}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\gamma_u}|}{2}$$
$$\Psi_{22}(a_{2g}e_u, {}^3E_u, M=0, \zeta_u) = -\frac{\sqrt{2}|\overline{\beta_g}\zeta_u|}{2} - \frac{\sqrt{2}|\beta_g\overline{\zeta_u}|}{2}$$
$$\Psi_{23}(a_{2g}e_u, {}^3E_u, M=1, \gamma_u) = |\beta_g\gamma_u|$$
$$\Psi_{24}(a_{2g}e_u, {}^3E_u, M=1, \zeta_u) = -|\beta_g\zeta_u|$$

e_ge_u

$$\boxed{\Delta E = 0}$$

$$\Psi_{25}(e_ge_u, {}^3E_u, M=-1, \zeta_u) = |\overline{\gamma_u}\overline{\gamma_g}|$$
$$\Psi_{26}(e_ge_u, {}^3E_u, M=-1, \gamma_u) = |\overline{\zeta_u}\overline{\zeta_g}|$$
$$\Psi_{27}(e_ge_u, {}^3E_u, M=0, \zeta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\gamma_g|}{2} + \frac{\sqrt{2}|\gamma_u\overline{\gamma_g}|}{2}$$
$$\Psi_{28}(e_ge_u, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}|\overline{\zeta_u}\zeta_g|}{2} + \frac{\sqrt{2}|\zeta_u\overline{\zeta_g}|}{2}$$
$$\Psi_{29}(e_ge_u, {}^3E_u, M=1, \zeta_u) = |\gamma_u\gamma_g|$$
$$\Psi_{30}(e_ge_u, {}^3E_u, M=1, \gamma_u) = |\zeta_u\zeta_g|$$

$t_{1g}t_{1u}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{31}(t_{1g}t_{1u}, {}^3E_u, M=-1, \gamma_u) = \left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\eta_g\eta_u}| + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\mu_g\mu_u}| + \frac{\sqrt{3}|\overline{\nu_g\nu_u}|}{3}$$
$$\Psi_{32}(t_{1g}t_{1u}, {}^3E_u, M=-1, \zeta_u) = \left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\overline{\eta_g\eta_u}| + \frac{\sqrt{3}|\overline{\mu_g\mu_u}|}{3} + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\overline{\nu_g\nu_u}|$$
$$\Psi_{33}(t_{1g}t_{1u}, {}^3E_u, M=0, \gamma_u) = \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\eta_g}\eta_u|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\mu_g}\mu_u|}{2} + \frac{\sqrt{6}|\overline{\nu_g}\nu_u|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\eta_g\overline{\eta_u}|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\mu_g\overline{\mu_u}|}{2} + \frac{\sqrt{6}|\nu_g\overline{\nu_u}|}{6}$$
$$\Psi_{34}(t_{1g}t_{1u}, {}^3E_u, M=0, \zeta_u) = \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\eta_g}\eta_u|}{2} + \frac{\sqrt{6}|\overline{\mu_g}\mu_u|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\nu_g}\nu_u|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\eta_g\overline{\eta_u}|}{2} + \frac{\sqrt{6}|\mu_g\overline{\mu_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\nu_g\overline{\nu_u}|}{2}$$
$$\Psi_{35}(t_{1g}t_{1u}, {}^3E_u, M=1, \gamma_u) = \left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\eta_g\eta_u| + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\mu_g\mu_u| + \frac{\sqrt{3}|\nu_g\nu_u|}{3}$$
$$\Psi_{36}(t_{1g}t_{1u}, {}^3E_u, M=1, \zeta_u) = \left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)|\eta_g\eta_u| + \frac{\sqrt{3}|\mu_g\mu_u|}{3} + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)|\nu_g\nu_u|$$

$t_{1g}t_{2u}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{37}(t_{1g}t_{2u},{}^3E_u,M=-1,\gamma_u) = \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\eta_g}\overline{\xi_u}\right| + \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\mu_g}\overline{\phi_u}\right| + \frac{\sqrt{3}\left|\overline{\nu_g}\overline{\chi_u}\right|}{3}$$

$$\Psi_{38}(t_{1g}t_{2u},{}^3E_u,M=-1,\zeta_u) = \left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\eta_g}\overline{\xi_u}\right| - \frac{\sqrt{3}\left|\overline{\mu_g}\overline{\phi_u}\right|}{3} + \left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\nu_g}\overline{\chi_u}\right|$$

$$\Psi_{39}(t_{1g}t_{2u},{}^3E_u,M=0,\gamma_u) = \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\eta_g}\xi_u\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\mu_g}\phi_u\right|}{2} + \frac{\sqrt{6}\left|\overline{\nu_g}\chi_u\right|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\eta_g\overline{\xi_u}\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\mu_g\overline{\phi_u}\right|}{2} + \frac{\sqrt{6}\left|\nu_g\overline{\chi_u}\right|}{6}$$

$$\Psi_{40}(t_{1g}t_{2u},{}^3E_u,M=0,\zeta_u) = \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\eta_g}\xi_u\right|}{2} - \frac{\sqrt{6}\left|\overline{\mu_g}\phi_u\right|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\nu_g}\chi_u\right|}{2} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\eta_g\overline{\xi_u}\right|}{2} - \frac{\sqrt{6}\left|\mu_g\overline{\phi_u}\right|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\nu_g\overline{\chi_u}\right|}{2}$$

$$\Psi_{41}(t_{1g}t_{2u},{}^3E_u,M=1,\gamma_u) = \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\eta_g\xi_u\right| + \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\mu_g\phi_u\right| + \frac{\sqrt{3}\left|\nu_g\chi_u\right|}{3}$$

$$\Psi_{42}(t_{1g}t_{2u},{}^3E_u,M=1,\zeta_u) = \left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\eta_g\xi_u\right| - \frac{\sqrt{3}\left|\mu_g\phi_u\right|}{3} + \left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\nu_g\chi_u\right|$$

$t_{1u}t_{2g}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{43}(t_{1u}t_{2g},{}^3E_u,M=-1,\gamma_u) = \frac{\sqrt{3}\left|\overline{\chi_g}\overline{\nu_u}\right|}{3} + \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\phi_g}\overline{\mu_u}\right| + \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\xi_g}\overline{\eta_u}\right|$$

$$\Psi_{44}(t_{1u}t_{2g},{}^3E_u,M=-1,\zeta_u) = \left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\chi_g}\overline{\nu_u}\right| - \frac{\sqrt{3}\left|\overline{\phi_g}\overline{\mu_u}\right|}{3} + \left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\xi_g}\overline{\eta_u}\right|$$

$$\Psi_{45}(t_{1u}t_{2g},{}^3E_u,M=0,\gamma_u) = \frac{\sqrt{6}\left|\overline{\chi_g}\nu_u\right|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\phi_g}\mu_u\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\xi_g}\eta_u\right|}{2} + \frac{\sqrt{6}\left|\chi_g\overline{\nu_u}\right|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\phi_g\overline{\mu_u}\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\xi_g\overline{\eta_u}\right|}{2}$$

$$\Psi_{46}(t_{1u}t_{2g},{}^3E_u,M=0,\zeta_u) = \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\chi_g}\nu_u\right|}{2} - \frac{\sqrt{6}\left|\overline{\phi_g}\mu_u\right|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\xi_g}\eta_u\right|}{2} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\chi_g\overline{\nu_u}\right|}{2} - \frac{\sqrt{6}\left|\phi_g\overline{\mu_u}\right|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\xi_g\overline{\eta_u}\right|}{2}$$

$$\Psi_{47}(t_{1u}t_{2g},{}^3E_u,M=1,\gamma_u) = \frac{\sqrt{3}\left|\chi_g\nu_u\right|}{3} + \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\phi_g\mu_u\right| + \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\xi_g\eta_u\right|$$

$$\Psi_{48}(t_{1u}t_{2g},{}^3E_u,M=1,\zeta_u) = \left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\chi_g\nu_u\right| - \frac{\sqrt{3}\left|\phi_g\mu_u\right|}{3} + \left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\xi_g\eta_u\right|$$

$t_{2g}t_{2u}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{49}(t_{2g}t_{2u},{}^3E_u,M=-1,\gamma_u) = \frac{\sqrt{3}\left|\overline{\chi_g}\overline{\chi_u}\right|}{3} + \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\phi_g}\overline{\phi_u}\right| + \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\xi_g}\overline{\xi_u}\right|$$

$$\Psi_{50}(t_{2g}t_{2u},{}^3E_u,M=-1,\zeta_u) = \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\chi_g}\overline{\chi_u}\right| + \frac{\sqrt{3}\left|\overline{\phi_g}\overline{\phi_u}\right|}{3} + \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\xi_g}\overline{\xi_u}\right|$$

$$\Psi_{51}(t_{2g}t_{2u},{}^3E_u,M=0,\gamma_u) = \frac{\sqrt{6}\left|\overline{\chi_g}\chi_u\right|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\phi_g}\phi_u\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\xi_g}\xi_u\right|}{2} + \frac{\sqrt{6}\left|\chi_g\overline{\chi_u}\right|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\phi_g\overline{\phi_u}\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\xi_g\overline{\xi_u}\right|}{2}$$

$$\Psi_{52}(t_{2g}t_{2u},{}^3E_u,M=0,\zeta_u) = \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\chi_g}\chi_u\right|}{2} + \frac{\sqrt{6}\left|\overline{\phi_g}\phi_u\right|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\xi_g}\xi_u\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\chi_g\overline{\chi_u}\right|}{2} + \frac{\sqrt{6}\left|\phi_g\overline{\phi_u}\right|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\xi_g\overline{\xi_u}\right|}{2}$$

$$\Psi_{53}(t_{2g}t_{2u},{}^3E_u,M=1,\gamma_u) = \frac{\sqrt{3}\left|\chi_g\chi_u\right|}{3} + \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\phi_g\phi_u\right| + \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\xi_g\xi_u\right|$$

$$\Psi_{54}(t_{2g}t_{2u},{}^3E_u,M=1,\zeta_u) = \left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\chi_g\chi_u\right| + \frac{\sqrt{3}\left|\phi_g\phi_u\right|}{3} + \left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\xi_g\xi_u\right|$$

2.32.9 ^1E_u

$a_{1g}e_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a_{1g}e_u,{}^1E_u,M=0,\gamma_u) = -\frac{\sqrt{2}\left|\overline{\alpha_g}\gamma_u\right|}{2} + \frac{\sqrt{2}\left|\alpha_g\overline{\gamma_u}\right|}{2}$$

$$\Psi_2(a_{1g}e_u,{}^1E_u,M=0,\zeta_u) = -\frac{\sqrt{2}\left|\overline{\alpha_g}\zeta_u\right|}{2} + \frac{\sqrt{2}\left|\alpha_g\overline{\zeta_u}\right|}{2}$$

$a_{2u}e_g$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(a_{2u}e_g,{}^1E_u,M=0,\gamma_u) = -\frac{\sqrt{2}\left|\overline{\beta_u}\gamma_g\right|}{2} + \frac{\sqrt{2}\left|\beta_u\overline{\gamma_g}\right|}{2}$$

$$\Psi_4(a_{2u}e_g,{}^1E_u,M=0,\zeta_u) = \frac{\sqrt{2}\left|\overline{\beta_u}\zeta_g\right|}{2} - \frac{\sqrt{2}\left|\beta_u\overline{\zeta_g}\right|}{2}$$

$a_{1u}e_g$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(a_{1u}e_g,{}^1E_u,M=0,\gamma_u) = -\frac{\sqrt{2}\left|\overline{\alpha_u}\gamma_g\right|}{2} + \frac{\sqrt{2}\left|\alpha_u\overline{\gamma_g}\right|}{2}$$

$$\Psi_6(a_{1u}e_g,{}^1E_u,M=0,\zeta_u) = -\frac{\sqrt{2}\left|\overline{\alpha_u}\zeta_g\right|}{2} + \frac{\sqrt{2}\left|\alpha_u\overline{\zeta_g}\right|}{2}$$

$a_{2g}e_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(a_{2g}e_u,{}^1E_u,M=0,\gamma_u) = -\frac{\sqrt{2}\left|\overline{\beta_g}\gamma_u\right|}{2} + \frac{\sqrt{2}\left|\beta_g\overline{\gamma_u}\right|}{2}$$

$$\Psi_8(a_{2g}e_u,{}^1E_u,M=0,\zeta_u) = \frac{\sqrt{2}\left|\overline{\beta_g}\zeta_u\right|}{2} - \frac{\sqrt{2}\left|\beta_g\overline{\zeta_u}\right|}{2}$$

e_ge_u

$$\boxed{\Delta E = 0}$$

$$\Psi_9(e_ge_u,{}^1E_u,M=0,\zeta_u) = -\frac{\sqrt{2}\left|\overline{\gamma_u}\gamma_g\right|}{2} + \frac{\sqrt{2}\left|\gamma_u\overline{\gamma_g}\right|}{2}$$

$$\Psi_{10}(e_ge_u,{}^1E_u,M=0,\gamma_u) = -\frac{\sqrt{2}\left|\overline{\zeta_u}\zeta_g\right|}{2} + \frac{\sqrt{2}\left|\zeta_u\overline{\zeta_g}\right|}{2}$$

$t_{1g}t_{1u}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{11}(t_{1g}t_{1u}, {}^{1}E_u, M=0, \gamma_u) = -\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\eta_g}\eta_u|}{2} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\mu_g}\mu_u|}{2} - \frac{\sqrt{6}|\overline{\nu_g}\nu_u|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\eta_g\overline{\eta_u}|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\mu_g\overline{\mu_u}|}{2} + \frac{\sqrt{6}|\nu_g\overline{\nu_u}|}{6}$$

$$\Psi_{12}(t_{1g}t_{1u}, {}^{1}E_u, M=0, \zeta_u) = -\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\eta_g}\eta_u|}{2} - \frac{\sqrt{6}|\overline{\mu_g}\mu_u|}{6} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\nu_g}\nu_u|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\eta_g\overline{\eta_u}|}{2} + \frac{\sqrt{6}|\mu_g\overline{\mu_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\nu_g\overline{\nu_u}|}{2}$$

$t_{1g}t_{2u}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(t_{1g}t_{2u}, {}^{1}E_u, M=0, \gamma_u) = -\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\eta_g}\xi_u|}{2} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\mu_g}\phi_u|}{2} - \frac{\sqrt{6}|\overline{\nu_g}\chi_u|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\eta_g\overline{\xi_u}|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\mu_g\overline{\phi_u}|}{2} + \frac{\sqrt{6}|\nu_g\overline{\chi_u}|}{6}$$

$$\Psi_{14}(t_{1g}t_{2u}, {}^{1}E_u, M=0, \zeta_u) = -\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\eta_g}\xi_u|}{2} + \frac{\sqrt{6}|\overline{\mu_g}\phi_u|}{6} - \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\nu_g}\chi_u|}{2} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\eta_g\overline{\xi_u}|}{2} - \frac{\sqrt{6}|\mu_g\overline{\phi_u}|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\nu_g\overline{\chi_u}|}{2}$$

$t_{1u}t_{2g}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{15}(t_{1u}t_{2g}, {}^{1}E_u, M=0, \gamma_u) = -\frac{\sqrt{6}|\overline{\chi_g}\nu_u|}{6} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\phi_g}\mu_u|}{2} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\xi_g}\eta_u|}{2} + \frac{\sqrt{6}|\chi_g\overline{\nu_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\phi_g\overline{\mu_u}|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\xi_g\overline{\eta_u}|}{2}$$

$$\Psi_{16}(t_{1u}t_{2g}, {}^{1}E_u, M=0, \zeta_u) = -\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\chi_g}\nu_u|}{2} + \frac{\sqrt{6}|\overline{\phi_g}\mu_u|}{6} - \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\xi_g}\eta_u|}{2} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\chi_g\overline{\nu_u}|}{2} - \frac{\sqrt{6}|\phi_g\overline{\mu_u}|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\xi_g\overline{\eta_u}|}{2}$$

$t_{2g}t_{2u}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{17}(t_{2g}t_{2u}, {}^{1}E_u, M=0, \gamma_u) = -\frac{\sqrt{6}|\overline{\chi_g}\chi_u|}{6} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\phi_g}\phi_u|}{2} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\xi_g}\xi_u|}{2} + \frac{\sqrt{6}|\chi_g\overline{\chi_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\phi_g\overline{\phi_u}|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\xi_g\overline{\xi_u}|}{2}$$

$$\Psi_{18}(t_{2g}t_{2u}, {}^{1}E_u, M=0, \zeta_u) = -\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\chi_g}\chi_u|}{2} - \frac{\sqrt{6}|\overline{\phi_g}\phi_u|}{6} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\xi_g}\xi_u|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\chi_g\overline{\chi_u}|}{2} + \frac{\sqrt{6}|\phi_g\overline{\phi_u}|}{6} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\xi_g\overline{\xi_u}|}{2}$$

2.32.10 $^{3}E_g$

$a_{1g}e_g$

$$\boxed{\Delta E = 0}$$

$$\Psi_{1}(a_{1g}e_g, {}^{3}E_g, M=-1, \gamma_g) = |\overline{\alpha_g}\overline{\gamma_g}|$$
$$\Psi_{2}(a_{1g}e_g, {}^{3}E_g, M=-1, \zeta_g) = |\overline{\alpha_g}\overline{\zeta_g}|$$
$$\Psi_{3}(a_{1g}e_g, {}^{3}E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_g}\gamma_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\gamma_g}|}{2}$$
$$\Psi_{4}(a_{1g}e_g, {}^{3}E_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\zeta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\zeta_g}|}{2}$$
$$\Psi_{5}(a_{1g}e_g, {}^{3}E_g, M=1, \gamma_g) = |\alpha_g\gamma_g|$$
$$\Psi_{6}(a_{1g}e_g, {}^{3}E_g, M=1, \zeta_g) = |\alpha_g\zeta_g|$$

$a_{2u}e_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_{7}(a_{2u}e_u, {}^{3}E_g, M=-1, \gamma_g) = |\overline{\beta_u}\overline{\gamma_u}|$$
$$\Psi_{8}(a_{2u}e_u, {}^{3}E_g, M=-1, \zeta_g) = -|\overline{\beta_u}\overline{\zeta_u}|$$
$$\Psi_{9}(a_{2u}e_u, {}^{3}E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\beta_u}\gamma_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\gamma_u}|}{2}$$
$$\Psi_{10}(a_{2u}e_u, {}^{3}E_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\zeta_u|}{2} - \frac{\sqrt{2}|\beta_u\overline{\zeta_u}|}{2}$$
$$\Psi_{11}(a_{2u}e_u, {}^{3}E_g, M=1, \gamma_g) = |\beta_u\gamma_u|$$
$$\Psi_{12}(a_{2u}e_u, {}^{3}E_g, M=1, \zeta_g) = -|\beta_u\zeta_u|$$

$a_{1u}e_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(a_{1u}e_u, {}^{3}E_g, M=-1, \gamma_g) = |\overline{\alpha_u}\overline{\gamma_u}|$$
$$\Psi_{14}(a_{1u}e_u, {}^{3}E_g, M=-1, \zeta_g) = |\overline{\alpha_u}\overline{\zeta_u}|$$
$$\Psi_{15}(a_{1u}e_u, {}^{3}E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\alpha_u}\gamma_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\gamma_u}|}{2}$$
$$\Psi_{16}(a_{1u}e_u, {}^{3}E_g, M=0, \zeta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\zeta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\zeta_u}|}{2}$$
$$\Psi_{17}(a_{1u}e_u, {}^{3}E_g, M=1, \gamma_g) = |\alpha_u\gamma_u|$$
$$\Psi_{18}(a_{1u}e_u, {}^{3}E_g, M=1, \zeta_g) = |\alpha_u\zeta_u|$$

$a_{2g}e_g$

$$\boxed{\Delta E = 0}$$

$$\Psi_{19}(a_{2g}e_g, {}^{3}E_g, M=-1, \gamma_g) = |\overline{\beta_g}\overline{\gamma_g}|$$
$$\Psi_{20}(a_{2g}e_g, {}^{3}E_g, M=-1, \zeta_g) = -|\overline{\beta_g}\overline{\zeta_g}|$$
$$\Psi_{21}(a_{2g}e_g, {}^{3}E_g, M=0, \gamma_g) = \frac{\sqrt{2}|\overline{\beta_g}\gamma_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\gamma_g}|}{2}$$
$$\Psi_{22}(a_{2g}e_g, {}^{3}E_g, M=0, \zeta_g) = -\frac{\sqrt{2}|\overline{\beta_g}\zeta_g|}{2} - \frac{\sqrt{2}|\beta_g\overline{\zeta_g}|}{2}$$
$$\Psi_{23}(a_{2g}e_g, {}^{3}E_g, M=1, \gamma_g) = |\beta_g\gamma_g|$$
$$\Psi_{24}(a_{2g}e_g, {}^{3}E_g, M=1, \zeta_g) = -|\beta_g\zeta_g|$$

$t_{1g}t_{2g}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{25}(t_{1g}t_{2g}, {}^3E_g, M=-1, \gamma_g) =$$
$$\left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\overline{\eta_g}\overline{\xi_g}\right| + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\overline{\mu_g}\overline{\phi_g}\right| + \frac{\sqrt{3}\left|\overline{\nu_g}\overline{\chi_g}\right|}{3}$$

$$\Psi_{26}(t_{1g}t_{2g}, {}^3E_g, M=-1, \zeta_g) =$$
$$\left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\overline{\eta_g}\overline{\xi_g}\right| - \frac{\sqrt{3}\left|\overline{\mu_g}\overline{\phi_g}\right|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\overline{\nu_g}\overline{\chi_g}\right|$$

$$\Psi_{27}(t_{1g}t_{2g}, {}^3E_g, M=0, \gamma_g) =$$
$$\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\eta_g}\xi_g\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\mu_g}\phi_g\right|}{2} + \frac{\sqrt{6}\left|\overline{\nu_g}\chi_g\right|}{6} +$$
$$\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\eta_g\overline{\xi_g}\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\mu_g\overline{\phi_g}\right|}{2} + \frac{\sqrt{6}\left|\nu_g\overline{\chi_g}\right|}{6}$$

$$\Psi_{28}(t_{1g}t_{2g}, {}^3E_g, M=0, \zeta_g) =$$
$$\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\eta_g}\xi_g\right|}{2} - \frac{\sqrt{6}\left|\overline{\mu_g}\phi_g\right|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\nu_g}\chi_g\right|}{2} +$$
$$\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\eta_g\overline{\xi_g}\right|}{2} - \frac{\sqrt{6}\left|\mu_g\overline{\phi_g}\right|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\nu_g\overline{\chi_g}\right|}{2}$$

$$\Psi_{29}(t_{1g}t_{2g}, {}^3E_g, M=1, \gamma_g) =$$
$$\left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\eta_g\xi_g\right| + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\mu_g\phi_g\right| + \frac{\sqrt{3}\left|\nu_g\chi_g\right|}{3}$$

$$\Psi_{30}(t_{1g}t_{2g}, {}^3E_g, M=1, \zeta_g) =$$
$$\left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\eta_g\xi_g\right| - \frac{\sqrt{3}\left|\mu_g\phi_g\right|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\nu_g\chi_g\right|$$

$t_{1u}t_{2u}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{31}(t_{1u}t_{2u}, {}^3E_g, M=-1, \gamma_g) =$$
$$\left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\overline{\eta_u}\overline{\xi_u}\right| + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\overline{\mu_u}\overline{\phi_u}\right| + \frac{\sqrt{3}\left|\overline{\nu_u}\overline{\chi_u}\right|}{3}$$

$$\Psi_{32}(t_{1u}t_{2u}, {}^3E_g, M=-1, \zeta_g) =$$
$$\left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\overline{\eta_u}\overline{\xi_u}\right| - \frac{\sqrt{3}\left|\overline{\mu_u}\overline{\phi_u}\right|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\overline{\nu_u}\overline{\chi_u}\right|$$

$$\Psi_{33}(t_{1u}t_{2u}, {}^3E_g, M=0, \gamma_g) =$$
$$\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\eta_u}\xi_u\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\mu_u}\phi_u\right|}{2} + \frac{\sqrt{6}\left|\overline{\nu_u}\chi_u\right|}{6} +$$
$$\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\eta_u\overline{\xi_u}\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\mu_u\overline{\phi_u}\right|}{2} + \frac{\sqrt{6}\left|\nu_u\overline{\chi_u}\right|}{6}$$

$$\Psi_{34}(t_{1u}t_{2u}, {}^3E_g, M=0, \zeta_g) =$$
$$\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\eta_u}\xi_u\right|}{2} - \frac{\sqrt{6}\left|\overline{\mu_u}\phi_u\right|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\nu_u}\chi_u\right|}{2} +$$
$$\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\eta_u\overline{\xi_u}\right|}{2} - \frac{\sqrt{6}\left|\mu_u\overline{\phi_u}\right|}{6} + \frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\nu_u\overline{\chi_u}\right|}{2}$$

$$\Psi_{35}(t_{1u}t_{2u}, {}^3E_g, M=1, \gamma_g) =$$
$$\left(-\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\eta_u\xi_u\right| + \left(-\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\mu_u\phi_u\right| + \frac{\sqrt{3}\left|\nu_u\chi_u\right|}{3}$$

$$\Psi_{36}(t_{1u}t_{2u}, {}^3E_g, M=1, \zeta_g) =$$
$$\left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\eta_u\xi_u\right| - \frac{\sqrt{3}\left|\mu_u\phi_u\right|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\nu_u\chi_u\right|$$

2.32.11 ${}^1E_g$

$a_{1g}e_g$

$$\boxed{\Delta E = 0}$$

$$\Psi_1(a_{1g}e_g, {}^1E_g, M=0, \gamma_g) = -\frac{\sqrt{2}\left|\overline{\alpha_g}\gamma_g\right|}{2} + \frac{\sqrt{2}\left|\alpha_g\overline{\gamma_g}\right|}{2}$$

$$\Psi_2(a_{1g}e_g, {}^1E_g, M=0, \zeta_g) = -\frac{\sqrt{2}\left|\overline{\alpha_g}\zeta_g\right|}{2} + \frac{\sqrt{2}\left|\alpha_g\overline{\zeta_g}\right|}{2}$$

$a_{2u}e_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_3(a_{2u}e_u, {}^1E_g, M=0, \gamma_g) = -\frac{\sqrt{2}\left|\overline{\beta_u}\gamma_u\right|}{2} + \frac{\sqrt{2}\left|\beta_u\overline{\gamma_u}\right|}{2}$$
$$\Psi_4(a_{2u}e_u, {}^1E_g, M=0, \zeta_g) = \frac{\sqrt{2}\left|\overline{\beta_u}\zeta_u\right|}{2} - \frac{\sqrt{2}\left|\beta_u\overline{\zeta_u}\right|}{2}$$

$a_{1u}e_u$

$$\boxed{\Delta E = 0}$$

$$\Psi_5(a_{1u}e_u, {}^1E_g, M=0, \gamma_g) = -\frac{\sqrt{2}\left|\overline{\alpha_u}\gamma_u\right|}{2} + \frac{\sqrt{2}\left|\alpha_u\overline{\gamma_u}\right|}{2}$$
$$\Psi_6(a_{1u}e_u, {}^1E_g, M=0, \zeta_g) = -\frac{\sqrt{2}\left|\overline{\alpha_u}\zeta_u\right|}{2} + \frac{\sqrt{2}\left|\alpha_u\overline{\zeta_u}\right|}{2}$$

$a_{2g}e_g$

$$\boxed{\Delta E = 0}$$

$$\Psi_7(a_{2g}e_g, {}^1E_g, M=0, \gamma_g) = -\frac{\sqrt{2}\left|\overline{\beta_g}\gamma_g\right|}{2} + \frac{\sqrt{2}\left|\beta_g\overline{\gamma_g}\right|}{2}$$
$$\Psi_8(a_{2g}e_g, {}^1E_g, M=0, \zeta_g) = \frac{\sqrt{2}\left|\overline{\beta_g}\zeta_g\right|}{2} - \frac{\sqrt{2}\left|\beta_g\overline{\zeta_g}\right|}{2}$$

e_u^2

$$\boxed{\Delta E = 0}$$

$$\Psi_9(e_u^2, {}^1E_g, M=0, \zeta_g) = -\left|\overline{\gamma_u}\gamma_u\right|$$
$$\Psi_{10}(e_u^2, {}^1E_g, M=0, \gamma_g) = -\left|\overline{\zeta_u}\zeta_u\right|$$

e_g^2

$$\boxed{\Delta E = 0}$$

$$\Psi_{11}(e_g^2, {}^1E_g, M=0, \zeta_g) = -\left|\overline{\gamma_g}\gamma_g\right|$$
$$\Psi_{12}(e_g^2, {}^1E_g, M=0, \gamma_g) = -\left|\overline{\zeta_g}\zeta_g\right|$$

t_{1g}^2

$$\boxed{\Delta E = 0}$$

$$\Psi_{13}(t_{1g}^2, {}^1E_g, M=0, \gamma_g) =$$
$$\left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\overline{\eta_g}\eta_g\right| + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\overline{\mu_g}\mu_g\right| - \frac{\sqrt{3}\left|\overline{\nu_g}\nu_g\right|}{3}$$

$$\Psi_{14}(t_{1g}^2, {}^1E_g, M=0, \zeta_g) =$$
$$\left(\frac{\sqrt{3}}{6} + \frac{i}{2}\right)\left|\overline{\eta_g}\eta_g\right| - \frac{\sqrt{3}\left|\overline{\mu_g}\mu_g\right|}{3} + \left(\frac{\sqrt{3}}{6} - \frac{i}{2}\right)\left|\overline{\nu_g}\nu_g\right|$$

$t_{1g}t_{2g}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{15}(t_{1g}t_{2g}, {}^1E_g, M=0, \gamma_g) =$$
$$-\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\overline{\eta_g}\xi_g\right|}{2} - \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\overline{\mu_g}\phi_g\right|}{2} - \frac{\sqrt{6}\left|\overline{\nu_g}\chi_g\right|}{6} +$$
$$\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)\left|\eta_g\overline{\xi_g}\right|}{2} + \frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)\left|\mu_g\overline{\phi_g}\right|}{2} + \frac{\sqrt{6}\left|\nu_g\overline{\chi_g}\right|}{6}$$

$$\Psi_{16}(t_{1g}t_{2g},{}^{1}E_g,M=0,\zeta_g) =$$
$$-\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\eta_g}\xi_g|}{2}+\frac{\sqrt{6}|\overline{\mu_g}\phi_g|}{6}-\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\nu_g}\chi_g|}{2}+$$
$$\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\eta_g\overline{\xi_g}|}{2}-\frac{\sqrt{6}|\mu_g\overline{\phi_g}|}{6}+\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\nu_g\overline{\chi_g}|}{2}$$

t_{2g}^2

$$\boxed{\Delta E = 0}$$

$$\Psi_{17}(t_{2g}^2,{}^{1}E_g,M=0,\gamma_g) =$$
$$-\frac{\sqrt{3}|\overline{\chi_g}\chi_g|}{3}+\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\phi_g}\phi_g|+\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\xi_g}\xi_g|$$
$$\Psi_{18}(t_{2g}^2,{}^{1}E_g,M=0,\zeta_g) =$$
$$\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\chi_g}\chi_g|-\frac{\sqrt{3}|\overline{\phi_g}\phi_g|}{3}+\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\xi_g}\xi_g|$$

t_{1u}^2

$$\boxed{\Delta E = 0}$$

$$\Psi_{19}(t_{1u}^2,{}^{1}E_g,M=0,\gamma_g) =$$
$$\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\eta_u}\eta_u|+\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\mu_u}\mu_u|-\frac{\sqrt{3}|\overline{\nu_u}\nu_u|}{3}$$
$$\Psi_{20}(t_{1u}^2,{}^{1}E_g,M=0,\zeta_g) =$$
$$\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\eta_u}\eta_u|-\frac{\sqrt{3}|\overline{\mu_u}\mu_u|}{3}+\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\nu_u}\nu_u|$$

$t_{1u}t_{2u}$

$$\boxed{\Delta E = 0}$$

$$\Psi_{21}(t_{1u}t_{2u},{}^{1}E_g,M=0,\gamma_g) =$$
$$-\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\eta_u}\xi_u|}{2}-\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\mu_u}\phi_u|}{2}-\frac{\sqrt{6}|\overline{\nu_u}\chi_u|}{6}+$$
$$\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\eta_u\overline{\xi_u}|}{2}+\frac{\sqrt{2}\left(-\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\mu_u\overline{\phi_u}|}{2}+\frac{\sqrt{6}|\nu_u\overline{\chi_u}|}{6}$$
$$\Psi_{22}(t_{1u}t_{2u},{}^{1}E_g,M=0,\zeta_g) =$$
$$-\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\eta_u}\xi_u|}{2}+\frac{\sqrt{6}|\overline{\mu_u}\phi_u|}{6}-\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\nu_u}\chi_u|}{2}+$$
$$\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\eta_u\overline{\xi_u}|}{2}-\frac{\sqrt{6}|\mu_u\overline{\phi_u}|}{6}+\frac{\sqrt{2}\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\nu_u\overline{\chi_u}|}{2}$$

t_{2u}^2

$$\boxed{\Delta E = 0}$$

$$\Psi_{23}(t_{2u}^2,{}^{1}E_g,M=0,\gamma_g) =$$
$$-\frac{\sqrt{3}|\overline{\chi_u}\chi_u|}{3}+\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\phi_u}\phi_u|+\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\xi_u}\xi_u|$$
$$\Psi_{24}(t_{2u}^2,{}^{1}E_g,M=0,\zeta_g) =$$
$$\left(\frac{\sqrt{3}}{6}-\frac{i}{2}\right)|\overline{\chi_u}\chi_u|-\frac{\sqrt{3}|\overline{\phi_u}\phi_u|}{3}+\left(\frac{\sqrt{3}}{6}+\frac{i}{2}\right)|\overline{\xi_u}\xi_u|$$

2.32.12 $^{3}T_{1g}$

$a_{1g}t_{1g}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\nu_g\nu_g\rangle+\langle\alpha_g\nu_g||\alpha_g\nu_g\rangle}$$

$$\Psi_{1}(a_{1g}t_{1g},{}^{3}T_{1g},M=-1,\eta_g) = |\overline{\alpha_g\eta_g}|$$
$$\Psi_{2}(a_{1g}t_{1g},{}^{3}T_{1g},M=-1,\mu_g) = |\overline{\alpha_g\mu_g}|$$
$$\Psi_{3}(a_{1g}t_{1g},{}^{3}T_{1g},M=-1,\nu_g) = |\overline{\alpha_g\nu_g}|$$
$$\Psi_{4}(a_{1g}t_{1g},{}^{3}T_{1g},M=0,\eta_g) = \frac{\sqrt{2}|\overline{\alpha_g}\eta_g|}{2}+\frac{\sqrt{2}|\alpha_g\overline{\eta_g}|}{2}$$
$$\Psi_{5}(a_{1g}t_{1g},{}^{3}T_{1g},M=0,\mu_g) = \frac{\sqrt{2}|\overline{\alpha_g}\mu_g|}{2}+\frac{\sqrt{2}|\alpha_g\overline{\mu_g}|}{2}$$
$$\Psi_{6}(a_{1g}t_{1g},{}^{3}T_{1g},M=0,\nu_g) = \frac{\sqrt{2}|\overline{\alpha_g}\nu_g|}{2}+\frac{\sqrt{2}|\alpha_g\overline{\nu_g}|}{2}$$
$$\Psi_{7}(a_{1g}t_{1g},{}^{3}T_{1g},M=1,\eta_g) = |\alpha_g\eta_g|$$
$$\Psi_{8}(a_{1g}t_{1g},{}^{3}T_{1g},M=1,\mu_g) = |\alpha_g\mu_g|$$
$$\Psi_{9}(a_{1g}t_{1g},{}^{3}T_{1g},M=1,\nu_g) = |\alpha_g\nu_g|$$

$a_{2u}t_{2u}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\xi_u\xi_u\rangle+\langle\beta_u\xi_u||\beta_u\xi_u\rangle}$$

$$\Psi_{10}(a_{2u}t_{2u},{}^{3}T_{1g},M=-1,\eta_g) = |\overline{\beta_u\xi_u}|$$
$$\Psi_{11}(a_{2u}t_{2u},{}^{3}T_{1g},M=-1,\mu_g) = |\overline{\beta_u\phi_u}|$$
$$\Psi_{12}(a_{2u}t_{2u},{}^{3}T_{1g},M=-1,\nu_g) = |\overline{\beta_u\chi_u}|$$
$$\Psi_{13}(a_{2u}t_{2u},{}^{3}T_{1g},M=0,\eta_g) = \frac{\sqrt{2}|\overline{\beta_u}\xi_u|}{2}+\frac{\sqrt{2}|\beta_u\overline{\xi_u}|}{2}$$
$$\Psi_{14}(a_{2u}t_{2u},{}^{3}T_{1g},M=0,\mu_g) = \frac{\sqrt{2}|\overline{\beta_u}\phi_u|}{2}+\frac{\sqrt{2}|\beta_u\overline{\phi_u}|}{2}$$
$$\Psi_{15}(a_{2u}t_{2u},{}^{3}T_{1g},M=0,\nu_g) = \frac{\sqrt{2}|\overline{\beta_u}\chi_u|}{2}+\frac{\sqrt{2}|\beta_u\overline{\chi_u}|}{2}$$
$$\Psi_{16}(a_{2u}t_{2u},{}^{3}T_{1g},M=1,\eta_g) = |\beta_u\xi_u|$$
$$\Psi_{17}(a_{2u}t_{2u},{}^{3}T_{1g},M=1,\mu_g) = |\beta_u\phi_u|$$
$$\Psi_{18}(a_{2u}t_{2u},{}^{3}T_{1g},M=1,\nu_g) = |\beta_u\chi_u|$$

$a_{1u}t_{1u}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\nu_u\nu_u\rangle+\langle\alpha_u\nu_u||\alpha_u\nu_u\rangle}$$

$$\Psi_{19}(a_{1u}t_{1u},{}^{3}T_{1g},M=-1,\eta_g) = |\overline{\alpha_u\eta_u}|$$
$$\Psi_{20}(a_{1u}t_{1u},{}^{3}T_{1g},M=-1,\mu_g) = |\overline{\alpha_u\mu_u}|$$
$$\Psi_{21}(a_{1u}t_{1u},{}^{3}T_{1g},M=-1,\nu_g) = |\overline{\alpha_u\nu_u}|$$
$$\Psi_{22}(a_{1u}t_{1u},{}^{3}T_{1g},M=0,\eta_g) = \frac{\sqrt{2}|\overline{\alpha_u}\eta_u|}{2}+\frac{\sqrt{2}|\alpha_u\overline{\eta_u}|}{2}$$
$$\Psi_{23}(a_{1u}t_{1u},{}^{3}T_{1g},M=0,\mu_g) = \frac{\sqrt{2}|\overline{\alpha_u}\mu_u|}{2}+\frac{\sqrt{2}|\alpha_u\overline{\mu_u}|}{2}$$
$$\Psi_{24}(a_{1u}t_{1u},{}^{3}T_{1g},M=0,\nu_g) = \frac{\sqrt{2}|\overline{\alpha_u}\nu_u|}{2}+\frac{\sqrt{2}|\alpha_u\overline{\nu_u}|}{2}$$
$$\Psi_{25}(a_{1u}t_{1u},{}^{3}T_{1g},M=1,\eta_g) = |\alpha_u\eta_u|$$
$$\Psi_{26}(a_{1u}t_{1u},{}^{3}T_{1g},M=1,\mu_g) = |\alpha_u\mu_u|$$
$$\Psi_{27}(a_{1u}t_{1u},{}^{3}T_{1g},M=1,\nu_g) = |\alpha_u\nu_u|$$

$a_{2g}t_{2g}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\xi_g\xi_g\rangle+\langle\beta_g\xi_g||\beta_g\xi_g\rangle}$$

$$\Psi_{28}(a_{2g}t_{2g},{}^{3}T_{1g},M=-1,\eta_g) = |\overline{\beta_g\xi_g}|$$
$$\Psi_{29}(a_{2g}t_{2g},{}^{3}T_{1g},M=-1,\mu_g) = |\overline{\beta_g\phi_g}|$$
$$\Psi_{30}(a_{2g}t_{2g},{}^{3}T_{1g},M=-1,\nu_g) = |\overline{\beta_g\chi_g}|$$

$$\Psi_{31}(a_{2g}t_{2g}, {}^3T_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\beta_g}\xi_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\xi_g}|}{2}$$
$$\Psi_{32}(a_{2g}t_{2g}, {}^3T_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\beta_g}\phi_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\phi_g}|}{2}$$
$$\Psi_{33}(a_{2g}t_{2g}, {}^3T_{1g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\beta_g}\chi_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\chi_g}|}{2}$$
$$\Psi_{34}(a_{2g}t_{2g}, {}^3T_{1g}, M=1, \eta_g) = |\beta_g\xi_g|$$
$$\Psi_{35}(a_{2g}t_{2g}, {}^3T_{1g}, M=1, \mu_g) = |\beta_g\phi_g|$$
$$\Psi_{36}(a_{2g}t_{2g}, {}^3T_{1g}, M=1, \nu_g) = |\beta_g\chi_g|$$

e_ut_{1u}

$$\boxed{\Delta E = \langle\zeta_u\nu_u||\zeta_u\nu_u\rangle}$$

$$\Psi_{37}(e_ut_{1u}, {}^3T_{1g}, M=-1, \eta_g) = \frac{\sqrt{2}|\overline{\gamma_u}\overline{\eta_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\overline{\eta_u}|}{2}$$
$$\Psi_{38}(e_ut_{1u}, {}^3T_{1g}, M=-1, \mu_g) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_u}\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_u}\overline{\mu_u}|}{2}$$
$$\Psi_{39}(e_ut_{1u}, {}^3T_{1g}, M=-1, \nu_g) = -\frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_u}\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_u}\overline{\nu_u}|}{2}$$
$$\Psi_{40}(e_ut_{1u}, {}^3T_{1g}, M=0, \eta_g) = \frac{|\overline{\gamma_u}\eta_u|}{2} + \frac{|\overline{\zeta_u}\eta_u|}{2} + \frac{|\gamma_u\overline{\eta_u}|}{2} + \frac{|\zeta_u\overline{\eta_u}|}{2}$$
$$\Psi_{41}(e_ut_{1u}, {}^3T_{1g}, M=0, \mu_g) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\mu_u|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_u}\mu_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\mu_u}|}{2}$$
$$\Psi_{42}(e_ut_{1u}, {}^3T_{1g}, M=0, \nu_g) = -\frac{\sqrt[3]{-1}|\overline{\gamma_u}\nu_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\nu_u|}{2} - \frac{\sqrt[3]{-1}|\gamma_u\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\nu_u}|}{2}$$
$$\Psi_{43}(e_ut_{1u}, {}^3T_{1g}, M=1, \eta_g) = \frac{\sqrt{2}|\gamma_u\eta_u|}{2} + \frac{\sqrt{2}|\zeta_u\eta_u|}{2}$$
$$\Psi_{44}(e_ut_{1u}, {}^3T_{1g}, M=1, \mu_g) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_u\mu_u|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_u\mu_u|}{2}$$
$$\Psi_{45}(e_ut_{1u}, {}^3T_{1g}, M=1, \nu_g) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma_u\nu_u|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_u\nu_u|}{2}$$

e_ut_{2u}

$$\boxed{\Delta E = \langle\zeta_u\xi_u||\zeta_u\xi_u\rangle}$$

$$\Psi_{46}(e_ut_{2u}, {}^3T_{1g}, M=-1, \eta_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\overline{\xi_u}|}{2}$$
$$\Psi_{47}(e_ut_{2u}, {}^3T_{1g}, M=-1, \mu_g) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_u}\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_u}\overline{\phi_u}|}{2}$$
$$\Psi_{48}(e_ut_{2u}, {}^3T_{1g}, M=-1, \nu_g) = \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_u}\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_u}\overline{\chi_u}|}{2}$$
$$\Psi_{49}(e_ut_{2u}, {}^3T_{1g}, M=0, \eta_g) = -\frac{|\overline{\gamma_u}\xi_u|}{2} + \frac{|\overline{\zeta_u}\xi_u|}{2} - \frac{|\gamma_u\overline{\xi_u}|}{2} + \frac{|\zeta_u\overline{\xi_u}|}{2}$$
$$\Psi_{50}(e_ut_{2u}, {}^3T_{1g}, M=0, \mu_g) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\phi_u|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_u}\phi_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\phi_u}|}{2}$$
$$\Psi_{51}(e_ut_{2u}, {}^3T_{1g}, M=0, \nu_g) = \frac{\sqrt[3]{-1}|\overline{\gamma_u}\chi_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\chi_u|}{2} + \frac{\sqrt[3]{-1}|\gamma_u\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\chi_u}|}{2}$$
$$\Psi_{52}(e_ut_{2u}, {}^3T_{1g}, M=1, \eta_g) = -\frac{\sqrt{2}|\gamma_u\xi_u|}{2} + \frac{\sqrt{2}|\zeta_u\xi_u|}{2}$$
$$\Psi_{53}(e_ut_{2u}, {}^3T_{1g}, M=1, \mu_g) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_u\phi_u|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_u\phi_u|}{2}$$
$$\Psi_{54}(e_ut_{2u}, {}^3T_{1g}, M=1, \nu_g) = \frac{\sqrt[3]{-1}\sqrt{2}|\gamma_u\chi_u|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_u\chi_u|}{2}$$

e_gt_{1g}

$$\boxed{\Delta E = \langle\zeta_g\nu_g||\zeta_g\nu_g\rangle}$$

$$\Psi_{55}(e_gt_{1g}, {}^3T_{1g}, M=-1, \eta_g) = \frac{\sqrt{2}|\overline{\gamma_g}\overline{\eta_g}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\overline{\eta_g}|}{2}$$
$$\Psi_{56}(e_gt_{1g}, {}^3T_{1g}, M=-1, \mu_g) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_g}\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_g}\overline{\mu_g}|}{2}$$
$$\Psi_{57}(e_gt_{1g}, {}^3T_{1g}, M=-1, \nu_g) = -\frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_g}\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_g}\overline{\nu_g}|}{2}$$
$$\Psi_{58}(e_gt_{1g}, {}^3T_{1g}, M=0, \eta_g) = \frac{|\overline{\gamma_g}\eta_g|}{2} + \frac{|\overline{\zeta_g}\eta_g|}{2} + \frac{|\gamma_g\overline{\eta_g}|}{2} + \frac{|\zeta_g\overline{\eta_g}|}{2}$$
$$\Psi_{59}(e_gt_{1g}, {}^3T_{1g}, M=0, \mu_g) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\mu_g|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_g}\mu_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\mu_g}|}{2}$$
$$\Psi_{60}(e_gt_{1g}, {}^3T_{1g}, M=0, \nu_g) = -\frac{\sqrt[3]{-1}|\overline{\gamma_g}\nu_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\nu_g|}{2} - \frac{\sqrt[3]{-1}|\gamma_g\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\nu_g}|}{2}$$
$$\Psi_{61}(e_gt_{1g}, {}^3T_{1g}, M=1, \eta_g) = \frac{\sqrt{2}|\gamma_g\eta_g|}{2} + \frac{\sqrt{2}|\zeta_g\eta_g|}{2}$$
$$\Psi_{62}(e_gt_{1g}, {}^3T_{1g}, M=1, \mu_g) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_g\mu_g|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_g\mu_g|}{2}$$
$$\Psi_{63}(e_gt_{1g}, {}^3T_{1g}, M=1, \nu_g) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma_g\nu_g|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_g\nu_g|}{2}$$

e_gt_{2g}

$$\boxed{\Delta E = \langle\zeta_g\xi_g||\zeta_g\xi_g\rangle}$$

$$\Psi_{64}(e_gt_{2g}, {}^3T_{1g}, M=-1, \eta_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\overline{\xi_g}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\overline{\xi_g}|}{2}$$
$$\Psi_{65}(e_gt_{2g}, {}^3T_{1g}, M=-1, \mu_g) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_g}\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_g}\overline{\phi_g}|}{2}$$
$$\Psi_{66}(e_gt_{2g}, {}^3T_{1g}, M=-1, \nu_g) = \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_g}\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_g}\overline{\chi_g}|}{2}$$
$$\Psi_{67}(e_gt_{2g}, {}^3T_{1g}, M=0, \eta_g) = -\frac{|\overline{\gamma_g}\xi_g|}{2} + \frac{|\overline{\zeta_g}\xi_g|}{2} - \frac{|\gamma_g\overline{\xi_g}|}{2} + \frac{|\zeta_g\overline{\xi_g}|}{2}$$
$$\Psi_{68}(e_gt_{2g}, {}^3T_{1g}, M=0, \mu_g) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\phi_g|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_g}\phi_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\phi_g}|}{2}$$
$$\Psi_{69}(e_gt_{2g}, {}^3T_{1g}, M=0, \nu_g) = \frac{\sqrt[3]{-1}|\overline{\gamma_g}\chi_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\chi_g|}{2} + \frac{\sqrt[3]{-1}|\gamma_g\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\chi_g}|}{2}$$
$$\Psi_{70}(e_gt_{2g}, {}^3T_{1g}, M=1, \eta_g) = -\frac{\sqrt{2}|\gamma_g\xi_g|}{2} + \frac{\sqrt{2}|\zeta_g\xi_g|}{2}$$

$$\Psi_{71}(e_gt_{2g}, {}^3T_{1g}, M=1, \mu_g) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_g\phi_g|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_g\phi_g|}{2}$$

$$\Psi_{72}(e_gt_{2g}, {}^3T_{1g}, M=1, \nu_g) = \frac{\sqrt[3]{-1}\sqrt{2}|\gamma_g\chi_g|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_g\chi_g|}{2}$$

t_{1g}^2

$$\boxed{\Delta E = \langle\nu_g\mu_g||\nu_g\mu_g\rangle - \langle\nu_g\nu_g||\nu_g\nu_g\rangle}$$

$$\Psi_{73}(t_{1g}^2, {}^3T_{1g}, M=-1, \nu_g) = -|\overline{\eta_g\mu_g}|$$
$$\Psi_{74}(t_{1g}^2, {}^3T_{1g}, M=-1, \mu_g) = |\overline{\eta_g\nu_g}|$$
$$\Psi_{75}(t_{1g}^2, {}^3T_{1g}, M=-1, \eta_g) = -|\overline{\mu_g\nu_g}|$$
$$\Psi_{76}(t_{1g}^2, {}^3T_{1g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\eta_g}\mu_g|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\eta_g|}{2}$$
$$\Psi_{77}(t_{1g}^2, {}^3T_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\eta_g}\nu_g|}{2} - \frac{\sqrt{2}|\overline{\nu_g}\eta_g|}{2}$$
$$\Psi_{78}(t_{1g}^2, {}^3T_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\mu_g}\nu_g|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\mu_g|}{2}$$
$$\Psi_{79}(t_{1g}^2, {}^3T_{1g}, M=1, \nu_g) = -|\eta_g\mu_g|$$
$$\Psi_{80}(t_{1g}^2, {}^3T_{1g}, M=1, \mu_g) = |\eta_g\nu_g|$$
$$\Psi_{81}(t_{1g}^2, {}^3T_{1g}, M=1, \eta_g) = -|\mu_g\nu_g|$$

$t_{1g}t_{2g}$

$$\boxed{\begin{gathered}\Delta E = \langle\nu_g\chi_g||\nu_g\chi_g\rangle - \langle\nu_g\nu_g||\xi_g\xi_g\rangle + \langle\nu_g\xi_g||\nu_g\xi_g\rangle \\ - \langle\nu_g\mu_g||\chi_g\phi_g\rangle\end{gathered}}$$

$$\Psi_{82}(t_{1g}t_{2g}, {}^3T_{1g}, M=-1, \nu_g) = \frac{\sqrt{2}|\overline{\eta_g}\,\overline{\phi_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\,\overline{\xi_g}|}{2}$$
$$\Psi_{83}(t_{1g}t_{2g}, {}^3T_{1g}, M=-1, \mu_g) = \frac{\sqrt{2}|\overline{\eta_g\chi_g}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\,\overline{\xi_g}|}{2}$$
$$\Psi_{84}(t_{1g}t_{2g}, {}^3T_{1g}, M=-1, \eta_g) = \frac{\sqrt{2}|\overline{\mu_g\chi_g}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\,\overline{\phi_g}|}{2}$$
$$\Psi_{85}(t_{1g}t_{2g}, {}^3T_{1g}, M=0, \nu_g) = \frac{|\overline{\eta_g}\phi_g|}{2} + \frac{|\overline{\mu_g}\xi_g|}{2} + \frac{|\eta_g\overline{\phi_g}|}{2} + \frac{|\mu_g\overline{\xi_g}|}{2}$$
$$\Psi_{86}(t_{1g}t_{2g}, {}^3T_{1g}, M=0, \mu_g) = \frac{|\overline{\eta_g}\chi_g|}{2} + \frac{|\overline{\nu_g}\xi_g|}{2} + \frac{|\eta_g\overline{\chi_g}|}{2} + \frac{|\nu_g\overline{\xi_g}|}{2}$$
$$\Psi_{87}(t_{1g}t_{2g}, {}^3T_{1g}, M=0, \eta_g) = \frac{|\overline{\mu_g}\chi_g|}{2} + \frac{|\overline{\nu_g}\phi_g|}{2} + \frac{|\mu_g\overline{\chi_g}|}{2} + \frac{|\nu_g\overline{\phi_g}|}{2}$$
$$\Psi_{88}(t_{1g}t_{2g}, {}^3T_{1g}, M=1, \nu_g) = \frac{\sqrt{2}|\eta_g\phi_g|}{2} + \frac{\sqrt{2}|\mu_g\xi_g|}{2}$$
$$\Psi_{89}(t_{1g}t_{2g}, {}^3T_{1g}, M=1, \mu_g) = \frac{\sqrt{2}|\eta_g\chi_g|}{2} + \frac{\sqrt{2}|\nu_g\xi_g|}{2}$$
$$\Psi_{90}(t_{1g}t_{2g}, {}^3T_{1g}, M=1, \eta_g) = \frac{\sqrt{2}|\mu_g\chi_g|}{2} + \frac{\sqrt{2}|\nu_g\phi_g|}{2}$$

t_{2g}^2

$$\boxed{\Delta E = \langle\xi_g\phi_g||\xi_g\phi_g\rangle - \langle\xi_g\xi_g||\xi_g\xi_g\rangle}$$

$$\Psi_{91}(t_{2g}^2, {}^3T_{1g}, M=-1, \nu_g) = -|\overline{\xi_g\phi_g}|$$
$$\Psi_{92}(t_{2g}^2, {}^3T_{1g}, M=-1, \mu_g) = |\overline{\xi_g}\,\overline{\chi_g}|$$
$$\Psi_{93}(t_{2g}^2, {}^3T_{1g}, M=-1, \eta_g) = -|\overline{\phi_g}\,\overline{\chi_g}|$$
$$\Psi_{94}(t_{2g}^2, {}^3T_{1g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\phi_g}\xi_g|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\phi_g|}{2}$$
$$\Psi_{95}(t_{2g}^2, {}^3T_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\chi_g}\xi_g|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\chi_g|}{2}$$
$$\Psi_{96}(t_{2g}^2, {}^3T_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\chi_g}\phi_g|}{2} - \frac{\sqrt{2}|\overline{\phi_g}\chi_g|}{2}$$
$$\Psi_{97}(t_{2g}^2, {}^3T_{1g}, M=1, \nu_g) = -|\xi_g\phi_g|$$
$$\Psi_{98}(t_{2g}^2, {}^3T_{1g}, M=1, \mu_g) = |\xi_g\chi_g|$$
$$\Psi_{99}(t_{2g}^2, {}^3T_{1g}, M=1, \eta_g) = -|\phi_g\chi_g|$$

t_{1u}^2

$$\boxed{\Delta E = \langle\nu_u\mu_u||\nu_u\mu_u\rangle - \langle\nu_u\nu_u||\nu_u\nu_u\rangle}$$

$$\Psi_{100}(t_{1u}^2, {}^3T_{1g}, M=-1, \nu_g) = -|\overline{\eta_u\mu_u}|$$
$$\Psi_{101}(t_{1u}^2, {}^3T_{1g}, M=-1, \mu_g) = |\overline{\eta_u\nu_u}|$$
$$\Psi_{102}(t_{1u}^2, {}^3T_{1g}, M=-1, \eta_g) = -|\overline{\mu_u\nu_u}|$$
$$\Psi_{103}(t_{1u}^2, {}^3T_{1g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\eta_u}\mu_u|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\eta_u|}{2}$$
$$\Psi_{104}(t_{1u}^2, {}^3T_{1g}, M=0, \mu_g) = \frac{\sqrt{2}|\overline{\eta_u}\nu_u|}{2} - \frac{\sqrt{2}|\overline{\nu_u}\eta_u|}{2}$$
$$\Psi_{105}(t_{1u}^2, {}^3T_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\mu_u}\nu_u|}{2} + \frac{\sqrt{2}|\overline{\nu_u}\mu_u|}{2}$$
$$\Psi_{106}(t_{1u}^2, {}^3T_{1g}, M=1, \nu_g) = -|\eta_u\mu_u|$$
$$\Psi_{107}(t_{1u}^2, {}^3T_{1g}, M=1, \mu_g) = |\eta_u\nu_u|$$
$$\Psi_{108}(t_{1u}^2, {}^3T_{1g}, M=1, \eta_g) = -|\mu_u\nu_u|$$

$t_{1u}t_{2u}$

$$\boxed{\begin{gathered}\Delta E = \langle\nu_u\chi_u||\nu_u\chi_u\rangle - \langle\nu_u\nu_u||\xi_u\xi_u\rangle + \langle\nu_u\xi_u||\nu_u\xi_u\rangle \\ - \langle\nu_u\mu_u||\chi_u\phi_u\rangle\end{gathered}}$$

$$\Psi_{109}(t_{1u}t_{2u}, {}^3T_{1g}, M=-1, \nu_g) = \frac{\sqrt{2}|\overline{\eta_u}\,\overline{\phi_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\,\overline{\xi_u}|}{2}$$
$$\Psi_{110}(t_{1u}t_{2u}, {}^3T_{1g}, M=-1, \mu_g) = \frac{\sqrt{2}|\overline{\eta_u\chi_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_u}\,\overline{\xi_u}|}{2}$$
$$\Psi_{111}(t_{1u}t_{2u}, {}^3T_{1g}, M=-1, \eta_g) = \frac{\sqrt{2}|\overline{\mu_u\chi_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_u}\,\overline{\phi_u}|}{2}$$
$$\Psi_{112}(t_{1u}t_{2u}, {}^3T_{1g}, M=0, \nu_g) = \frac{|\overline{\eta_u}\phi_u|}{2} + \frac{|\overline{\mu_u}\xi_u|}{2} + \frac{|\eta_u\overline{\phi_u}|}{2} + \frac{|\mu_u\overline{\xi_u}|}{2}$$
$$\Psi_{113}(t_{1u}t_{2u}, {}^3T_{1g}, M=0, \mu_g) = \frac{|\overline{\eta_u}\chi_u|}{2} + \frac{|\overline{\nu_u}\xi_u|}{2} + \frac{|\eta_u\overline{\chi_u}|}{2} + \frac{|\nu_u\overline{\xi_u}|}{2}$$
$$\Psi_{114}(t_{1u}t_{2u}, {}^3T_{1g}, M=0, \eta_g) = \frac{|\overline{\mu_u}\chi_u|}{2} + \frac{|\overline{\nu_u}\phi_u|}{2} + \frac{|\mu_u\overline{\chi_u}|}{2} + \frac{|\nu_u\overline{\phi_u}|}{2}$$
$$\Psi_{115}(t_{1u}t_{2u}, {}^3T_{1g}, M=1, \nu_g) = \frac{\sqrt{2}|\eta_u\phi_u|}{2} + \frac{\sqrt{2}|\mu_u\xi_u|}{2}$$
$$\Psi_{116}(t_{1u}t_{2u}, {}^3T_{1g}, M=1, \mu_g) = \frac{\sqrt{2}|\eta_u\chi_u|}{2} + \frac{\sqrt{2}|\nu_u\xi_u|}{2}$$
$$\Psi_{117}(t_{1u}t_{2u}, {}^3T_{1g}, M=1, \eta_g) = \frac{\sqrt{2}|\mu_u\chi_u|}{2} + \frac{\sqrt{2}|\nu_u\phi_u|}{2}$$

t_{2u}^2

$$\boxed{\Delta E = \langle\xi_u\phi_u||\xi_u\phi_u\rangle - \langle\xi_u\xi_u||\xi_u\xi_u\rangle}$$

$$\Psi_{118}(t_{2u}^2, {}^3T_{1g}, M=-1, \nu_g) = -|\overline{\xi_u\phi_u}|$$
$$\Psi_{119}(t_{2u}^2, {}^3T_{1g}, M=-1, \mu_g) = |\overline{\xi_u}\,\overline{\chi_u}|$$
$$\Psi_{120}(t_{2u}^2, {}^3T_{1g}, M=-1, \eta_g) = -|\overline{\phi_u}\,\overline{\chi_u}|$$

$$\Psi_{121}(t_{2u}^2, {}^3T_{1g}, M=0, \nu_g) = \frac{\sqrt{2}|\overline{\phi_u}\xi_u|}{2} - \frac{\sqrt{2}|\overline{\xi_u}\phi_u|}{2}$$
$$\Psi_{122}(t_{2u}^2, {}^3T_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\chi_u}\xi_u|}{2} + \frac{\sqrt{2}|\overline{\xi_u}\chi_u|}{2}$$
$$\Psi_{123}(t_{2u}^2, {}^3T_{1g}, M=0, \eta_g) = \frac{\sqrt{2}|\overline{\chi_u}\phi_u|}{2} - \frac{\sqrt{2}|\overline{\phi_u}\chi_u|}{2}$$
$$\Psi_{124}(t_{2u}^2, {}^3T_{1g}, M=1, \nu_g) = -|\xi_u\phi_u|$$
$$\Psi_{125}(t_{2u}^2, {}^3T_{1g}, M=1, \mu_g) = |\xi_u\chi_u|$$
$$\Psi_{126}(t_{2u}^2, {}^3T_{1g}, M=1, \eta_g) = -|\phi_u\chi_u|$$

2.32.13 $^1T_{1g}$

$a_{1g}t_{1g}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\nu_g\nu_g\rangle + \langle\alpha_g\nu_g||\alpha_g\nu_g\rangle}$$

$$\Psi_1(a_{1g}t_{1g}, {}^1T_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_g}|}{2}$$
$$\Psi_2(a_{1g}t_{1g}, {}^1T_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_g}|}{2}$$
$$\Psi_3(a_{1g}t_{1g}, {}^1T_{1g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\nu_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\nu_g}|}{2}$$

$a_{2u}t_{2u}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\xi_u\xi_u\rangle + \langle\beta_u\xi_u||\beta_u\xi_u\rangle}$$

$$\Psi_4(a_{2u}t_{2u}, {}^1T_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\beta_u}\xi_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\xi_u}|}{2}$$
$$\Psi_5(a_{2u}t_{2u}, {}^1T_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\beta_u}\phi_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\phi_u}|}{2}$$
$$\Psi_6(a_{2u}t_{2u}, {}^1T_{1g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\beta_u}\chi_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\chi_u}|}{2}$$

$a_{1u}t_{1u}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\nu_u\nu_u\rangle + \langle\alpha_u\nu_u||\alpha_u\nu_u\rangle}$$

$$\Psi_7(a_{1u}t_{1u}, {}^1T_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\eta_u}|}{2}$$
$$\Psi_8(a_{1u}t_{1u}, {}^1T_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_u}|}{2}$$
$$\Psi_9(a_{1u}t_{1u}, {}^1T_{1g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\nu_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\nu_u}|}{2}$$

$a_{2g}t_{2g}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\xi_g\xi_g\rangle + \langle\beta_g\xi_g||\beta_g\xi_g\rangle}$$

$$\Psi_{10}(a_{2g}t_{2g}, {}^1T_{1g}, M=0, \eta_g) = -\frac{\sqrt{2}|\overline{\beta_g}\xi_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\xi_g}|}{2}$$
$$\Psi_{11}(a_{2g}t_{2g}, {}^1T_{1g}, M=0, \mu_g) = -\frac{\sqrt{2}|\overline{\beta_g}\phi_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\phi_g}|}{2}$$
$$\Psi_{12}(a_{2g}t_{2g}, {}^1T_{1g}, M=0, \nu_g) = -\frac{\sqrt{2}|\overline{\beta_g}\chi_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\chi_g}|}{2}$$

e_ut_{1u}

$$\boxed{\Delta E = \langle\zeta_u\nu_u||\zeta_u\nu_u\rangle}$$

$$\Psi_{13}(e_ut_{1u}, {}^1T_{1g}, M=0, \eta_g) = -\frac{|\overline{\gamma_u}\eta_u|}{2} - \frac{|\overline{\zeta_u}\eta_u|}{2} + \frac{|\gamma_u\overline{\eta_u}|}{2} + \frac{|\zeta_u\overline{\eta_u}|}{2}$$
$$\Psi_{14}(e_ut_{1u}, {}^1T_{1g}, M=0, \mu_g) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\mu_u|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_u}\mu_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\mu_u}|}{2}$$
$$\Psi_{15}(e_ut_{1u}, {}^1T_{1g}, M=0, \nu_g) = \frac{\sqrt[3]{-1}|\overline{\gamma_u}\nu_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\nu_u|}{2} - \frac{\sqrt[3]{-1}|\gamma_u\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\nu_u}|}{2}$$

e_ut_{2u}

$$\boxed{\Delta E = \langle\zeta_u\xi_u||\zeta_u\xi_u\rangle}$$

$$\Psi_{16}(e_ut_{2u}, {}^1T_{1g}, M=0, \eta_g) = \frac{|\overline{\gamma_u}\xi_u|}{2} - \frac{|\overline{\zeta_u}\xi_u|}{2} - \frac{|\gamma_u\overline{\xi_u}|}{2} + \frac{|\zeta_u\overline{\xi_u}|}{2}$$
$$\Psi_{17}(e_ut_{2u}, {}^1T_{1g}, M=0, \mu_g) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\phi_u|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_u}\phi_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\phi_u}|}{2}$$
$$\Psi_{18}(e_ut_{2u}, {}^1T_{1g}, M=0, \nu_g) = -\frac{\sqrt[3]{-1}|\overline{\gamma_u}\chi_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\chi_u|}{2} + \frac{\sqrt[3]{-1}|\gamma_u\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\chi_u}|}{2}$$

e_gt_{1g}

$$\boxed{\Delta E = \langle\zeta_g\nu_g||\zeta_g\nu_g\rangle}$$

$$\Psi_{19}(e_gt_{1g}, {}^1T_{1g}, M=0, \eta_g) = -\frac{|\overline{\gamma_g}\eta_g|}{2} - \frac{|\overline{\zeta_g}\eta_g|}{2} + \frac{|\gamma_g\overline{\eta_g}|}{2} + \frac{|\zeta_g\overline{\eta_g}|}{2}$$
$$\Psi_{20}(e_gt_{1g}, {}^1T_{1g}, M=0, \mu_g) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\mu_g|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_g}\mu_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\mu_g}|}{2}$$
$$\Psi_{21}(e_gt_{1g}, {}^1T_{1g}, M=0, \nu_g) = \frac{\sqrt[3]{-1}|\overline{\gamma_g}\nu_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\nu_g|}{2} - \frac{\sqrt[3]{-1}|\gamma_g\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\nu_g}|}{2}$$

e_gt_{2g}

$$\boxed{\Delta E = \langle\zeta_g\xi_g||\zeta_g\xi_g\rangle}$$

$$\Psi_{22}(e_gt_{2g}, {}^1T_{1g}, M=0, \eta_g) = \frac{|\overline{\gamma_g}\xi_g|}{2} - \frac{|\overline{\zeta_g}\xi_g|}{2} - \frac{|\gamma_g\overline{\xi_g}|}{2} + \frac{|\zeta_g\overline{\xi_g}|}{2}$$
$$\Psi_{23}(e_gt_{2g}, {}^1T_{1g}, M=0, \mu_g) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\phi_g|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_g}\phi_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\phi_g}|}{2}$$
$$\Psi_{24}(e_gt_{2g}, {}^1T_{1g}, M=0, \nu_g) = -\frac{\sqrt[3]{-1}|\overline{\gamma_g}\chi_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\chi_g|}{2} + \frac{\sqrt[3]{-1}|\gamma_g\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\chi_g}|}{2}$$

$t_{1g}t_{2g}$

$$\boxed{\begin{aligned}\Delta E = \langle\nu_g\chi_g||\nu_g\chi_g\rangle + \langle\nu_g\nu_g||\xi_g\xi_g\rangle + \langle\nu_g\xi_g||\nu_g\xi_g\rangle \\ + \langle\nu_g\mu_g||\chi_g\phi_g\rangle\end{aligned}}$$

$$\Psi_{25}(t_{1g}t_{2g}, {}^1T_{1g}, M=0, \nu_g) = -\frac{|\overline{\eta_g}\phi_g|}{2} - \frac{|\overline{\mu_g}\xi_g|}{2} + \frac{|\eta_g\overline{\phi_g}|}{2} + \frac{|\mu_g\overline{\xi_g}|}{2}$$
$$\Psi_{26}(t_{1g}t_{2g}, {}^1T_{1g}, M=0, \mu_g) = -\frac{|\overline{\eta_g}\chi_g|}{2} - \frac{|\overline{\nu_g}\xi_g|}{2} + \frac{|\eta_g\overline{\chi_g}|}{2} + \frac{|\nu_g\overline{\xi_g}|}{2}$$

$$\Psi_{27}(t_{1g}t_{2g},{}^{1}T_{1g},M=0,\eta_g) = -\frac{|\overline{\mu_g}\chi_g|}{2} - \frac{|\overline{\nu_g}\phi_g|}{2} + \frac{|\mu_g\overline{\chi_g}|}{2} + \frac{|\nu_g\overline{\phi_g}|}{2}$$

$t_{1u}t_{2u}$

$$\boxed{\Delta E = \langle\nu_u\chi_u||\nu_u\chi_u\rangle + \langle\nu_u\nu_u||\xi_u\xi_u\rangle + \langle\nu_u\xi_u||\nu_u\xi_u\rangle + \langle\nu_u\mu_u||\chi_u\phi_u\rangle}$$

$$\Psi_{28}(t_{1u}t_{2u},{}^{1}T_{1g},M=0,\nu_g) = -\frac{|\overline{\eta_u}\phi_u|}{2} - \frac{|\overline{\mu_u}\xi_u|}{2} + \frac{|\eta_u\overline{\phi_u}|}{2} + \frac{|\mu_u\overline{\xi_u}|}{2}$$
$$\Psi_{29}(t_{1u}t_{2u},{}^{1}T_{1g},M=0,\mu_g) = -\frac{|\overline{\eta_u}\chi_u|}{2} - \frac{|\overline{\nu_u}\xi_u|}{2} + \frac{|\eta_u\overline{\chi_u}|}{2} + \frac{|\nu_u\overline{\xi_u}|}{2}$$
$$\Psi_{30}(t_{1u}t_{2u},{}^{1}T_{1g},M=0,\eta_g) = -\frac{|\overline{\mu_u}\chi_u|}{2} - \frac{|\overline{\nu_u}\phi_u|}{2} + \frac{|\mu_u\overline{\chi_u}|}{2} + \frac{|\nu_u\overline{\phi_u}|}{2}$$

2.32.14 ${}^{3}T_{2g}$

$a_{1g}t_{2g}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\xi_g\xi_g\rangle + \langle\alpha_g\xi_g||\alpha_g\xi_g\rangle}$$

$$\Psi_{1}(a_{1g}t_{2g},{}^{3}T_{2g},M=-1,\xi_g) = |\overline{\alpha_g}\overline{\xi_g}|$$
$$\Psi_{2}(a_{1g}t_{2g},{}^{3}T_{2g},M=-1,\phi_g) = |\overline{\alpha_g}\overline{\phi_g}|$$
$$\Psi_{3}(a_{1g}t_{2g},{}^{3}T_{2g},M=-1,\chi_g) = |\overline{\alpha_g}\overline{\chi_g}|$$
$$\Psi_{4}(a_{1g}t_{2g},{}^{3}T_{2g},M=0,\xi_g) = \frac{\sqrt{2}|\overline{\alpha_g}\xi_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\xi_g}|}{2}$$
$$\Psi_{5}(a_{1g}t_{2g},{}^{3}T_{2g},M=0,\phi_g) = \frac{\sqrt{2}|\overline{\alpha_g}\phi_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\phi_g}|}{2}$$
$$\Psi_{6}(a_{1g}t_{2g},{}^{3}T_{2g},M=0,\chi_g) = \frac{\sqrt{2}|\overline{\alpha_g}\chi_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\chi_g}|}{2}$$
$$\Psi_{7}(a_{1g}t_{2g},{}^{3}T_{2g},M=1,\xi_g) = |\alpha_g\xi_g|$$
$$\Psi_{8}(a_{1g}t_{2g},{}^{3}T_{2g},M=1,\phi_g) = |\alpha_g\phi_g|$$
$$\Psi_{9}(a_{1g}t_{2g},{}^{3}T_{2g},M=1,\chi_g) = |\alpha_g\chi_g|$$

$a_{2u}t_{1u}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\nu_u\nu_u\rangle + \langle\beta_u\nu_u||\beta_u\nu_u\rangle}$$

$$\Psi_{10}(a_{2u}t_{1u},{}^{3}T_{2g},M=-1,\xi_g) = |\overline{\beta_u}\overline{\eta_u}|$$
$$\Psi_{11}(a_{2u}t_{1u},{}^{3}T_{2g},M=-1,\phi_g) = |\overline{\beta_u}\overline{\mu_u}|$$
$$\Psi_{12}(a_{2u}t_{1u},{}^{3}T_{2g},M=-1,\chi_g) = |\overline{\beta_u}\overline{\nu_u}|$$
$$\Psi_{13}(a_{2u}t_{1u},{}^{3}T_{2g},M=0,\xi_g) = \frac{\sqrt{2}|\overline{\beta_u}\eta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_u}|}{2}$$
$$\Psi_{14}(a_{2u}t_{1u},{}^{3}T_{2g},M=0,\phi_g) = \frac{\sqrt{2}|\overline{\beta_u}\mu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_u}|}{2}$$
$$\Psi_{15}(a_{2u}t_{1u},{}^{3}T_{2g},M=0,\chi_g) = \frac{\sqrt{2}|\overline{\beta_u}\nu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\nu_u}|}{2}$$
$$\Psi_{16}(a_{2u}t_{1u},{}^{3}T_{2g},M=1,\xi_g) = |\beta_u\eta_u|$$
$$\Psi_{17}(a_{2u}t_{1u},{}^{3}T_{2g},M=1,\phi_g) = |\beta_u\mu_u|$$
$$\Psi_{18}(a_{2u}t_{1u},{}^{3}T_{2g},M=1,\chi_g) = |\beta_u\nu_u|$$

$a_{1u}t_{2u}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\xi_u\xi_u\rangle + \langle\alpha_u\xi_u||\alpha_u\xi_u\rangle}$$

$$\Psi_{19}(a_{1u}t_{2u},{}^{3}T_{2g},M=-1,\xi_g) = |\overline{\alpha_u}\overline{\xi_u}|$$
$$\Psi_{20}(a_{1u}t_{2u},{}^{3}T_{2g},M=-1,\phi_g) = |\overline{\alpha_u}\overline{\phi_u}|$$
$$\Psi_{21}(a_{1u}t_{2u},{}^{3}T_{2g},M=-1,\chi_g) = |\overline{\alpha_u}\overline{\chi_u}|$$
$$\Psi_{22}(a_{1u}t_{2u},{}^{3}T_{2g},M=0,\xi_g) = \frac{\sqrt{2}|\overline{\alpha_u}\xi_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\xi_u}|}{2}$$
$$\Psi_{23}(a_{1u}t_{2u},{}^{3}T_{2g},M=0,\phi_g) = \frac{\sqrt{2}|\overline{\alpha_u}\phi_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\phi_u}|}{2}$$
$$\Psi_{24}(a_{1u}t_{2u},{}^{3}T_{2g},M=0,\chi_g) = \frac{\sqrt{2}|\overline{\alpha_u}\chi_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\chi_u}|}{2}$$
$$\Psi_{25}(a_{1u}t_{2u},{}^{3}T_{2g},M=1,\xi_g) = |\alpha_u\xi_u|$$
$$\Psi_{26}(a_{1u}t_{2u},{}^{3}T_{2g},M=1,\phi_g) = |\alpha_u\phi_u|$$
$$\Psi_{27}(a_{1u}t_{2u},{}^{3}T_{2g},M=1,\chi_g) = |\alpha_u\chi_u|$$

$a_{2g}t_{1g}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\nu_g\nu_g\rangle + \langle\beta_g\nu_g||\beta_g\nu_g\rangle}$$

$$\Psi_{28}(a_{2g}t_{1g},{}^{3}T_{2g},M=-1,\xi_g) = |\overline{\beta_g}\overline{\eta_g}|$$
$$\Psi_{29}(a_{2g}t_{1g},{}^{3}T_{2g},M=-1,\phi_g) = |\overline{\beta_g}\overline{\mu_g}|$$
$$\Psi_{30}(a_{2g}t_{1g},{}^{3}T_{2g},M=-1,\chi_g) = |\overline{\beta_g}\overline{\nu_g}|$$
$$\Psi_{31}(a_{2g}t_{1g},{}^{3}T_{2g},M=0,\xi_g) = \frac{\sqrt{2}|\overline{\beta_g}\eta_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\eta_g}|}{2}$$
$$\Psi_{32}(a_{2g}t_{1g},{}^{3}T_{2g},M=0,\phi_g) = \frac{\sqrt{2}|\overline{\beta_g}\mu_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_g}|}{2}$$
$$\Psi_{33}(a_{2g}t_{1g},{}^{3}T_{2g},M=0,\chi_g) = \frac{\sqrt{2}|\overline{\beta_g}\nu_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\nu_g}|}{2}$$
$$\Psi_{34}(a_{2g}t_{1g},{}^{3}T_{2g},M=1,\xi_g) = |\beta_g\eta_g|$$
$$\Psi_{35}(a_{2g}t_{1g},{}^{3}T_{2g},M=1,\phi_g) = |\beta_g\mu_g|$$
$$\Psi_{36}(a_{2g}t_{1g},{}^{3}T_{2g},M=1,\chi_g) = |\beta_g\nu_g|$$

$e_{u}t_{1u}$

$$\boxed{\Delta E = \langle\zeta_u\nu_u||\zeta_u\nu_u\rangle}$$

$$\Psi_{37}(e_ut_{1u},{}^{3}T_{2g},M=-1,\xi_g) = -\frac{\sqrt{2}|\overline{\gamma_u}\overline{\eta_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\overline{\eta_u}|}{2}$$
$$\Psi_{38}(e_ut_{1u},{}^{3}T_{2g},M=-1,\phi_g) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_u}\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_u}\overline{\mu_u}|}{2}$$
$$\Psi_{39}(e_ut_{1u},{}^{3}T_{2g},M=-1,\chi_g) = \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_u}\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_u}\overline{\nu_u}|}{2}$$
$$\Psi_{40}(e_ut_{1u},{}^{3}T_{2g},M=0,\xi_g) = -\frac{|\overline{\gamma_u}\eta_u|}{2} + \frac{|\overline{\zeta_u}\eta_u|}{2} - \frac{|\gamma_u\overline{\eta_u}|}{2} + \frac{|\zeta_u\overline{\eta_u}|}{2}$$
$$\Psi_{41}(e_ut_{1u},{}^{3}T_{2g},M=0,\phi_g) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\mu_u|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_u}\mu_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\mu_u}|}{2}$$
$$\Psi_{42}(e_ut_{1u},{}^{3}T_{2g},M=0,\chi_g) = \frac{\sqrt[3]{-1}|\overline{\gamma_u}\nu_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\nu_u|}{2} + \frac{\sqrt[3]{-1}|\gamma_u\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\nu_u}|}{2}$$
$$\Psi_{43}(e_ut_{1u},{}^{3}T_{2g},M=1,\xi_g) = -\frac{\sqrt{2}|\gamma_u\eta_u|}{2} + \frac{\sqrt{2}|\zeta_u\eta_u|}{2}$$

$$\Psi_{44}(e_ut_{1u}, {}^3T_{2g}, M=1, \phi_g) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_u\mu_u|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_u\mu_u|}{2}$$

$$\Psi_{45}(e_ut_{1u}, {}^3T_{2g}, M=1, \chi_g) = \frac{\sqrt[3]{-1}\sqrt{2}|\gamma_u\nu_u|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_u\nu_u|}{2}$$

e_ut_{2u}

$$\boxed{\Delta E = \langle\zeta_u\xi_u||\zeta_u\xi_u\rangle}$$

$$\Psi_{46}(e_ut_{2u}, {}^3T_{2g}, M=-1, \xi_g) = \frac{\sqrt{2}|\overline{\gamma_u}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\overline{\xi_u}|}{2}$$

$$\Psi_{47}(e_ut_{2u}, {}^3T_{2g}, M=-1, \phi_g) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_u}\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_u}\overline{\phi_u}|}{2}$$

$$\Psi_{48}(e_ut_{2u}, {}^3T_{2g}, M=-1, \chi_g) = -\frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_u}\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_u}\overline{\chi_u}|}{2}$$

$$\Psi_{49}(e_ut_{2u}, {}^3T_{2g}, M=0, \xi_g) = \frac{|\overline{\gamma_u}\xi_u|}{2} + \frac{|\overline{\zeta_u}\xi_u|}{2} + \frac{|\gamma_u\overline{\xi_u}|}{2} + \frac{|\zeta_u\overline{\xi_u}|}{2}$$

$$\Psi_{50}(e_ut_{2u}, {}^3T_{2g}, M=0, \phi_g) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\phi_u|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_u}\phi_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\phi_u}|}{2}$$

$$\Psi_{51}(e_ut_{2u}, {}^3T_{2g}, M=0, \chi_g) = -\frac{\sqrt[3]{-1}|\overline{\gamma_u}\chi_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\chi_u|}{2} - \frac{\sqrt[3]{-1}|\gamma_u\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\chi_u}|}{2}$$

$$\Psi_{52}(e_ut_{2u}, {}^3T_{2g}, M=1, \xi_g) = \frac{\sqrt{2}|\gamma_u\xi_u|}{2} + \frac{\sqrt{2}|\zeta_u\xi_u|}{2}$$

$$\Psi_{53}(e_ut_{2u}, {}^3T_{2g}, M=1, \phi_g) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_u\phi_u|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_u\phi_u|}{2}$$

$$\Psi_{54}(e_ut_{2u}, {}^3T_{2g}, M=1, \chi_g) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma_u\chi_u|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_u\chi_u|}{2}$$

e_gt_{1g}

$$\boxed{\Delta E = \langle\zeta_g\nu_g||\zeta_g\nu_g\rangle}$$

$$\Psi_{55}(e_gt_{1g}, {}^3T_{2g}, M=-1, \xi_g) = -\frac{\sqrt{2}|\overline{\gamma_g}\overline{\eta_g}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\overline{\eta_g}|}{2}$$

$$\Psi_{56}(e_gt_{1g}, {}^3T_{2g}, M=-1, \phi_g) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_g}\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_g}\overline{\mu_g}|}{2}$$

$$\Psi_{57}(e_gt_{1g}, {}^3T_{2g}, M=-1, \chi_g) = \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_g}\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_g}\overline{\nu_g}|}{2}$$

$$\Psi_{58}(e_gt_{1g}, {}^3T_{2g}, M=0, \xi_g) = -\frac{|\overline{\gamma_g}\eta_g|}{2} + \frac{|\overline{\zeta_g}\eta_g|}{2} - \frac{|\gamma_g\overline{\eta_g}|}{2} + \frac{|\zeta_g\overline{\eta_g}|}{2}$$

$$\Psi_{59}(e_gt_{1g}, {}^3T_{2g}, M=0, \phi_g) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\mu_g|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_g}\mu_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\mu_g}|}{2}$$

$$\Psi_{60}(e_gt_{1g}, {}^3T_{2g}, M=0, \chi_g) = \frac{\sqrt[3]{-1}|\overline{\gamma_g}\nu_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\nu_g|}{2} + \frac{\sqrt[3]{-1}|\gamma_g\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\nu_g}|}{2}$$

$$\Psi_{61}(e_gt_{1g}, {}^3T_{2g}, M=1, \xi_g) = -\frac{\sqrt{2}|\gamma_g\eta_g|}{2} + \frac{\sqrt{2}|\zeta_g\eta_g|}{2}$$

$$\Psi_{62}(e_gt_{1g}, {}^3T_{2g}, M=1, \phi_g) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_g\mu_g|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_g\mu_g|}{2}$$

$$\Psi_{63}(e_gt_{1g}, {}^3T_{2g}, M=1, \chi_g) = \frac{\sqrt[3]{-1}\sqrt{2}|\gamma_g\nu_g|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_g\nu_g|}{2}$$

e_gt_{2g}

$$\boxed{\Delta E = \langle\zeta_g\xi_g||\zeta_g\xi_g\rangle}$$

$$\Psi_{64}(e_gt_{2g}, {}^3T_{2g}, M=-1, \xi_g) = \frac{\sqrt{2}|\overline{\gamma_g}\overline{\xi_g}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\overline{\xi_g}|}{2}$$

$$\Psi_{65}(e_gt_{2g}, {}^3T_{2g}, M=-1, \phi_g) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_g}\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_g}\overline{\phi_g}|}{2}$$

$$\Psi_{66}(e_gt_{2g}, {}^3T_{2g}, M=-1, \chi_g) = -\frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_g}\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_g}\overline{\chi_g}|}{2}$$

$$\Psi_{67}(e_gt_{2g}, {}^3T_{2g}, M=0, \xi_g) = \frac{|\overline{\gamma_g}\xi_g|}{2} + \frac{|\overline{\zeta_g}\xi_g|}{2} + \frac{|\gamma_g\overline{\xi_g}|}{2} + \frac{|\zeta_g\overline{\xi_g}|}{2}$$

$$\Psi_{68}(e_gt_{2g}, {}^3T_{2g}, M=0, \phi_g) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\phi_g|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_g}\phi_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\phi_g}|}{2}$$

$$\Psi_{69}(e_gt_{2g}, {}^3T_{2g}, M=0, \chi_g) = -\frac{\sqrt[3]{-1}|\overline{\gamma_g}\chi_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\chi_g|}{2} - \frac{\sqrt[3]{-1}|\gamma_g\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\chi_g}|}{2}$$

$$\Psi_{70}(e_gt_{2g}, {}^3T_{2g}, M=1, \xi_g) = \frac{\sqrt{2}|\gamma_g\xi_g|}{2} + \frac{\sqrt{2}|\zeta_g\xi_g|}{2}$$

$$\Psi_{71}(e_gt_{2g}, {}^3T_{2g}, M=1, \phi_g) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_g\phi_g|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_g\phi_g|}{2}$$

$$\Psi_{72}(e_gt_{2g}, {}^3T_{2g}, M=1, \chi_g) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma_g\chi_g|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_g\chi_g|}{2}$$

$t_{1g}t_{2g}$

$$\boxed{\begin{gathered}\Delta E = -\langle\nu_g\chi_g||\nu_g\chi_g\rangle - \langle\nu_g\nu_g||\xi_g\xi_g\rangle + \langle\nu_g\xi_g||\nu_g\xi_g\rangle \\ + \langle\nu_g\mu_g||\chi_g\phi_g\rangle\end{gathered}}$$

$$\Psi_{73}(t_{1g}t_{2g}, {}^3T_{2g}, M=-1, \chi_g) = -\frac{\sqrt{2}|\overline{\eta_g}\overline{\phi_g}|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\overline{\xi_g}|}{2}$$

$$\Psi_{74}(t_{1g}t_{2g}, {}^3T_{2g}, M=-1, \phi_g) = \frac{\sqrt{2}|\overline{\eta_g}\overline{\chi_g}|}{2} - \frac{\sqrt{2}|\overline{\nu_g}\overline{\xi_g}|}{2}$$

$$\Psi_{75}(t_{1g}t_{2g}, {}^3T_{2g}, M=-1, \xi_g) = -\frac{\sqrt{2}|\overline{\mu_g}\overline{\chi_g}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\overline{\phi_g}|}{2}$$

$$\Psi_{76}(t_{1g}t_{2g}, {}^3T_{2g}, M=0, \chi_g) = -\frac{|\overline{\eta_g}\phi_g|}{2} + \frac{|\overline{\mu_g}\xi_g|}{2} - \frac{|\eta_g\overline{\phi_g}|}{2} + \frac{|\mu_g\overline{\xi_g}|}{2}$$

$$\Psi_{77}(t_{1g}t_{2g}, {}^3T_{2g}, M=0, \phi_g) = \frac{|\overline{\eta_g}\chi_g|}{2} - \frac{|\overline{\nu_g}\xi_g|}{2} + \frac{|\eta_g\overline{\chi_g}|}{2} - \frac{|\nu_g\overline{\xi_g}|}{2}$$

$$\Psi_{78}(t_{1g}t_{2g}, {}^3T_{2g}, M=0, \xi_g) = -\frac{|\overline{\mu_g}\chi_g|}{2} + \frac{|\overline{\nu_g}\phi_g|}{2} - \frac{|\mu_g\overline{\chi_g}|}{2} + \frac{|\nu_g\overline{\phi_g}|}{2}$$

$$\Psi_{79}(t_{1g}t_{2g}, {}^3T_{2g}, M=1, \chi_g) = -\frac{\sqrt{2}|\eta_g\phi_g|}{2} + \frac{\sqrt{2}|\mu_g\xi_g|}{2}$$

$$\Psi_{80}(t_{1g}t_{2g}, {}^3T_{2g}, M=1, \phi_g) = \frac{\sqrt{2}|\eta_g\chi_g|}{2} - \frac{\sqrt{2}|\nu_g\xi_g|}{2}$$

$$\Psi_{81}(t_{1g}t_{2g},{}^{3}T_{2g},M=1,\xi_g) = -\frac{\sqrt{2}|\mu_g\chi_g|}{2} + \frac{\sqrt{2}|\nu_g\phi_g|}{2}$$

$t_{1u}t_{2u}$

$$\boxed{\Delta E = -\langle\nu_u\chi_u||\nu_u\chi_u\rangle - \langle\nu_u\nu_u||\xi_u\xi_u\rangle + \langle\nu_u\xi_u||\nu_u\xi_u\rangle + \langle\nu_u\mu_u||\chi_u\phi_u\rangle}$$

$$\Psi_{82}(t_{1u}t_{2u},{}^{3}T_{2g},M=-1,\chi_g) = -\frac{\sqrt{2}|\overline{\eta_u}\overline{\phi_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_u}\overline{\xi_u}|}{2}$$

$$\Psi_{83}(t_{1u}t_{2u},{}^{3}T_{2g},M=-1,\phi_g) = \frac{\sqrt{2}|\overline{\eta_u}\overline{\chi_u}|}{2} - \frac{\sqrt{2}|\overline{\nu_u}\overline{\xi_u}|}{2}$$

$$\Psi_{84}(t_{1u}t_{2u},{}^{3}T_{2g},M=-1,\xi_g) = -\frac{\sqrt{2}|\overline{\mu_u}\overline{\chi_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_u}\overline{\phi_u}|}{2}$$

$$\Psi_{85}(t_{1u}t_{2u},{}^{3}T_{2g},M=0,\chi_g) = -\frac{|\overline{\eta_u}\phi_u|}{2} + \frac{|\overline{\mu_u}\xi_u|}{2} - \frac{|\eta_u\overline{\phi_u}|}{2} + \frac{|\mu_u\overline{\xi_u}|}{2}$$

$$\Psi_{86}(t_{1u}t_{2u},{}^{3}T_{2g},M=0,\phi_g) = \frac{|\overline{\eta_u}\chi_u|}{2} - \frac{|\overline{\nu_u}\xi_u|}{2} + \frac{|\eta_u\overline{\chi_u}|}{2} - \frac{|\nu_u\overline{\xi_u}|}{2}$$

$$\Psi_{87}(t_{1u}t_{2u},{}^{3}T_{2g},M=0,\xi_g) = -\frac{|\overline{\mu_u}\chi_u|}{2} + \frac{|\overline{\nu_u}\phi_u|}{2} - \frac{|\mu_u\overline{\chi_u}|}{2} + \frac{|\nu_u\overline{\phi_u}|}{2}$$

$$\Psi_{88}(t_{1u}t_{2u},{}^{3}T_{2g},M=1,\chi_g) = -\frac{\sqrt{2}|\eta_u\phi_u|}{2} + \frac{\sqrt{2}|\mu_u\xi_u|}{2}$$

$$\Psi_{89}(t_{1u}t_{2u},{}^{3}T_{2g},M=1,\phi_g) = \frac{\sqrt{2}|\eta_u\chi_u|}{2} - \frac{\sqrt{2}|\nu_u\xi_u|}{2}$$

$$\Psi_{90}(t_{1u}t_{2u},{}^{3}T_{2g},M=1,\xi_g) = -\frac{\sqrt{2}|\mu_u\chi_u|}{2} + \frac{\sqrt{2}|\nu_u\phi_u|}{2}$$

2.32.15 $^{1}T_{2g}$

$a_{1g}t_{2g}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\xi_g\xi_g\rangle + \langle\alpha_g\xi_g||\alpha_g\xi_g\rangle}$$

$$\Psi_{1}(a_{1g}t_{2g},{}^{1}T_{2g},M=0,\xi_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\xi_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\xi_g}|}{2}$$

$$\Psi_{2}(a_{1g}t_{2g},{}^{1}T_{2g},M=0,\phi_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\phi_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\phi_g}|}{2}$$

$$\Psi_{3}(a_{1g}t_{2g},{}^{1}T_{2g},M=0,\chi_g) = -\frac{\sqrt{2}|\overline{\alpha_g}\chi_g|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\chi_g}|}{2}$$

$a_{2u}t_{1u}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\nu_u\nu_u\rangle + \langle\beta_u\nu_u||\beta_u\nu_u\rangle}$$

$$\Psi_{4}(a_{2u}t_{1u},{}^{1}T_{2g},M=0,\xi_g) = -\frac{\sqrt{2}|\overline{\beta_u}\eta_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_u}|}{2}$$

$$\Psi_{5}(a_{2u}t_{1u},{}^{1}T_{2g},M=0,\phi_g) = -\frac{\sqrt{2}|\overline{\beta_u}\mu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_u}|}{2}$$

$$\Psi_{6}(a_{2u}t_{1u},{}^{1}T_{2g},M=0,\chi_g) = -\frac{\sqrt{2}|\overline{\beta_u}\nu_u|}{2} + \frac{\sqrt{2}|\beta_u\overline{\nu_u}|}{2}$$

$a_{1u}t_{2u}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\xi_u\xi_u\rangle + \langle\alpha_u\xi_u||\alpha_u\xi_u\rangle}$$

$$\Psi_{7}(a_{1u}t_{2u},{}^{1}T_{2g},M=0,\xi_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\xi_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\xi_u}|}{2}$$

$$\Psi_{8}(a_{1u}t_{2u},{}^{1}T_{2g},M=0,\phi_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\phi_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\phi_u}|}{2}$$

$$\Psi_{9}(a_{1u}t_{2u},{}^{1}T_{2g},M=0,\chi_g) = -\frac{\sqrt{2}|\overline{\alpha_u}\chi_u|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\chi_u}|}{2}$$

$a_{2g}t_{1g}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\nu_g\nu_g\rangle + \langle\beta_g\nu_g||\beta_g\nu_g\rangle}$$

$$\Psi_{10}(a_{2g}t_{1g},{}^{1}T_{2g},M=0,\xi_g) = -\frac{\sqrt{2}|\overline{\beta_g}\eta_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\eta_g}|}{2}$$

$$\Psi_{11}(a_{2g}t_{1g},{}^{1}T_{2g},M=0,\phi_g) = -\frac{\sqrt{2}|\overline{\beta_g}\mu_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_g}|}{2}$$

$$\Psi_{12}(a_{2g}t_{1g},{}^{1}T_{2g},M=0,\chi_g) = -\frac{\sqrt{2}|\overline{\beta_g}\nu_g|}{2} + \frac{\sqrt{2}|\beta_g\overline{\nu_g}|}{2}$$

e_ut_{1u}

$$\boxed{\Delta E = \langle\zeta_u\nu_u||\zeta_u\nu_u\rangle}$$

$$\Psi_{13}(e_ut_{1u},{}^{1}T_{2g},M=0,\xi_g) = \frac{|\overline{\gamma_u}\eta_u|}{2} - \frac{|\overline{\zeta_u}\eta_u|}{2} - \frac{|\gamma_u\overline{\eta_u}|}{2} + \frac{|\zeta_u\overline{\eta_u}|}{2}$$

$$\Psi_{14}(e_ut_{1u},{}^{1}T_{2g},M=0,\phi_g) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\mu_u|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_u}\mu_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\mu_u}|}{2}$$

$$\Psi_{15}(e_ut_{1u},{}^{1}T_{2g},M=0,\chi_g) = -\frac{\sqrt[3]{-1}|\overline{\gamma_u}\nu_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\nu_u|}{2} + \frac{\sqrt[3]{-1}|\gamma_u\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\nu_u}|}{2}$$

e_ut_{2u}

$$\boxed{\Delta E = \langle\zeta_u\xi_u||\zeta_u\xi_u\rangle}$$

$$\Psi_{16}(e_ut_{2u},{}^{1}T_{2g},M=0,\xi_g) = -\frac{|\overline{\gamma_u}\xi_u|}{2} - \frac{|\overline{\zeta_u}\xi_u|}{2} + \frac{|\gamma_u\overline{\xi_u}|}{2} + \frac{|\zeta_u\overline{\xi_u}|}{2}$$

$$\Psi_{17}(e_ut_{2u},{}^{1}T_{2g},M=0,\phi_g) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\phi_u|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_u}\phi_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\phi_u}|}{2}$$

$$\Psi_{18}(e_ut_{2u},{}^{1}T_{2g},M=0,\chi_g) = \frac{\sqrt[3]{-1}|\overline{\gamma_u}\chi_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\chi_u|}{2} - \frac{\sqrt[3]{-1}|\gamma_u\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\chi_u}|}{2}$$

e_gt_{1g}

$$\boxed{\Delta E = \langle\zeta_g\nu_g||\zeta_g\nu_g\rangle}$$

$$\Psi_{19}(e_gt_{1g},{}^{1}T_{2g},M=0,\xi_g) = \frac{|\overline{\gamma_g}\eta_g|}{2} - \frac{|\overline{\zeta_g}\eta_g|}{2} - \frac{|\gamma_g\overline{\eta_g}|}{2} + \frac{|\zeta_g\overline{\eta_g}|}{2}$$

$$\Psi_{20}(e_gt_{1g},{}^{1}T_{2g},M=0,\phi_g) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\mu_g|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_g}\mu_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\mu_g}|}{2}$$

$$\Psi_{21}(e_gt_{1g},{}^{1}T_{2g},M=0,\chi_g) = -\frac{\sqrt[3]{-1}|\overline{\gamma_g}\nu_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\nu_g|}{2} + \frac{\sqrt[3]{-1}|\gamma_g\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\nu_g}|}{2}$$

e_gt_{2g}

$$\boxed{\Delta E = \langle\zeta_g\xi_g||\zeta_g\xi_g\rangle}$$

$$\Psi_{22}(e_gt_{2g},{}^{1}T_{2g},M=0,\xi_g) = -\frac{|\overline{\gamma_g}\xi_g|}{2} - \frac{|\overline{\zeta_g}\xi_g|}{2} + \frac{|\gamma_g\overline{\xi_g}|}{2} + \frac{|\zeta_g\overline{\xi_g}|}{2}$$

$$\Psi_{23}(e_g t_{2g}, {}^1T_{2g}, M=0, \phi_g) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\phi_g|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_g}\phi_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\phi_g}|}{2}$$

$$\Psi_{24}(e_g t_{2g}, {}^1T_{2g}, M=0, \chi_g) = \frac{\sqrt[3]{-1}|\overline{\gamma_g}\chi_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\chi_g|}{2} - \frac{\sqrt[3]{-1}|\gamma_g\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\chi_g}|}{2}$$

t_{1g}^2

$$\boxed{\Delta E = \langle\nu_g\mu_g||\nu_g\mu_g\rangle + \langle\nu_g\nu_g||\nu_g\nu_g\rangle}$$

$$\Psi_{25}(t_{1g}^2, {}^1T_{2g}, M=0, \chi_g) = -\frac{\sqrt{2}|\overline{\eta_g}\mu_g|}{2} - \frac{\sqrt{2}|\overline{\mu_g}\eta_g|}{2}$$

$$\Psi_{26}(t_{1g}^2, {}^1T_{2g}, M=0, \phi_g) = -\frac{\sqrt{2}|\overline{\eta_g}\nu_g|}{2} - \frac{\sqrt{2}|\overline{\nu_g}\eta_g|}{2}$$

$$\Psi_{27}(t_{1g}^2, {}^1T_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\mu_g}\nu_g|}{2} - \frac{\sqrt{2}|\overline{\nu_g}\mu_g|}{2}$$

$t_{1g}t_{2g}$

$$\boxed{\begin{gathered}\Delta E = -\langle\nu_g\chi_g||\nu_g\chi_g\rangle + \langle\nu_g\nu_g||\xi_g\xi_g\rangle + \langle\nu_g\xi_g||\nu_g\xi_g\rangle \\ -\langle\nu_g\mu_g||\chi_g\phi_g\rangle\end{gathered}}$$

$$\Psi_{28}(t_{1g}t_{2g}, {}^1T_{2g}, M=0, \chi_g) = \frac{|\overline{\eta_g}\phi_g|}{2} - \frac{|\overline{\mu_g}\xi_g|}{2} - \frac{|\eta_g\overline{\phi_g}|}{2} + \frac{|\mu_g\overline{\xi_g}|}{2}$$

$$\Psi_{29}(t_{1g}t_{2g}, {}^1T_{2g}, M=0, \phi_g) = -\frac{|\overline{\eta_g}\chi_g|}{2} + \frac{|\overline{\nu_g}\xi_g|}{2} + \frac{|\eta_g\overline{\chi_g}|}{2} - \frac{|\nu_g\overline{\xi_g}|}{2}$$

$$\Psi_{30}(t_{1g}t_{2g}, {}^1T_{2g}, M=0, \xi_g) = \frac{|\overline{\mu_g}\chi_g|}{2} - \frac{|\overline{\nu_g}\phi_g|}{2} - \frac{|\mu_g\overline{\chi_g}|}{2} + \frac{|\nu_g\overline{\phi_g}|}{2}$$

t_{2g}^2

$$\boxed{\Delta E = \langle\xi_g\phi_g||\xi_g\phi_g\rangle + \langle\xi_g\xi_g||\xi_g\xi_g\rangle}$$

$$\Psi_{31}(t_{2g}^2, {}^1T_{2g}, M=0, \chi_g) = -\frac{\sqrt{2}|\overline{\phi_g}\xi_g|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\phi_g|}{2}$$

$$\Psi_{32}(t_{2g}^2, {}^1T_{2g}, M=0, \phi_g) = -\frac{\sqrt{2}|\overline{\chi_g}\xi_g|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\chi_g|}{2}$$

$$\Psi_{33}(t_{2g}^2, {}^1T_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\chi_g}\phi_g|}{2} - \frac{\sqrt{2}|\overline{\phi_g}\chi_g|}{2}$$

t_{1u}^2

$$\boxed{\Delta E = \langle\nu_u\mu_u||\nu_u\mu_u\rangle + \langle\nu_u\nu_u||\nu_u\nu_u\rangle}$$

$$\Psi_{34}(t_{1u}^2, {}^1T_{2g}, M=0, \chi_g) = -\frac{\sqrt{2}|\overline{\eta_u}\mu_u|}{2} - \frac{\sqrt{2}|\overline{\mu_u}\eta_u|}{2}$$

$$\Psi_{35}(t_{1u}^2, {}^1T_{2g}, M=0, \phi_g) = -\frac{\sqrt{2}|\overline{\eta_u}\nu_u|}{2} - \frac{\sqrt{2}|\overline{\nu_u}\eta_u|}{2}$$

$$\Psi_{36}(t_{1u}^2, {}^1T_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\mu_u}\nu_u|}{2} - \frac{\sqrt{2}|\overline{\nu_u}\mu_u|}{2}$$

$t_{1u}t_{2u}$

$$\boxed{\begin{gathered}\Delta E = -\langle\nu_u\chi_u||\nu_u\chi_u\rangle + \langle\nu_u\nu_u||\xi_u\xi_u\rangle + \langle\nu_u\xi_u||\nu_u\xi_u\rangle \\ -\langle\nu_u\mu_u||\chi_u\phi_u\rangle\end{gathered}}$$

$$\Psi_{37}(t_{1u}t_{2u}, {}^1T_{2g}, M=0, \chi_g) = \frac{|\overline{\eta_u}\phi_u|}{2} - \frac{|\overline{\mu_u}\xi_u|}{2} - \frac{|\eta_u\overline{\phi_u}|}{2} + \frac{|\mu_u\overline{\xi_u}|}{2}$$

$$\Psi_{38}(t_{1u}t_{2u}, {}^1T_{2g}, M=0, \phi_g) = -\frac{|\overline{\eta_u}\chi_u|}{2} + \frac{|\overline{\nu_u}\xi_u|}{2} + \frac{|\eta_u\overline{\chi_u}|}{2} - \frac{|\nu_u\overline{\xi_u}|}{2}$$

$$\Psi_{39}(t_{1u}t_{2u}, {}^1T_{2g}, M=0, \xi_g) = \frac{|\overline{\mu_u}\chi_u|}{2} - \frac{|\overline{\nu_u}\phi_u|}{2} - \frac{|\mu_u\overline{\chi_u}|}{2} + \frac{|\nu_u\overline{\phi_u}|}{2}$$

t_{2u}^2

$$\boxed{\Delta E = \langle\xi_u\phi_u||\xi_u\phi_u\rangle + \langle\xi_u\xi_u||\xi_u\xi_u\rangle}$$

$$\Psi_{40}(t_{2u}^2, {}^1T_{2g}, M=0, \chi_g) = -\frac{\sqrt{2}|\overline{\phi_u}\xi_u|}{2} - \frac{\sqrt{2}|\overline{\xi_u}\phi_u|}{2}$$

$$\Psi_{41}(t_{2u}^2, {}^1T_{2g}, M=0, \phi_g) = -\frac{\sqrt{2}|\overline{\chi_u}\xi_u|}{2} - \frac{\sqrt{2}|\overline{\xi_u}\chi_u|}{2}$$

$$\Psi_{42}(t_{2u}^2, {}^1T_{2g}, M=0, \xi_g) = -\frac{\sqrt{2}|\overline{\chi_u}\phi_u|}{2} - \frac{\sqrt{2}|\overline{\phi_u}\chi_u|}{2}$$

2.32.16 ${}^3T_{1u}$

$a_{1g}t_{1u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\nu_u\nu_u\rangle + \langle\alpha_g\nu_u||\alpha_g\nu_u\rangle}$$

$$\Psi_1(a_{1g}t_{1u}, {}^3T_{1u}, M=-1, \eta_u) = |\overline{\alpha_g}\overline{\eta_u}|$$

$$\Psi_2(a_{1g}t_{1u}, {}^3T_{1u}, M=-1, \mu_u) = |\overline{\alpha_g}\overline{\mu_u}|$$

$$\Psi_3(a_{1g}t_{1u}, {}^3T_{1u}, M=-1, \nu_u) = |\overline{\alpha_g}\overline{\nu_u}|$$

$$\Psi_4(a_{1g}t_{1u}, {}^3T_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\alpha_g}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_u}|}{2}$$

$$\Psi_5(a_{1g}t_{1u}, {}^3T_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\alpha_g}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_u}|}{2}$$

$$\Psi_6(a_{1g}t_{1u}, {}^3T_{1u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\alpha_g}\nu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\nu_u}|}{2}$$

$$\Psi_7(a_{1g}t_{1u}, {}^3T_{1u}, M=1, \eta_u) = |\alpha_g\eta_u|$$

$$\Psi_8(a_{1g}t_{1u}, {}^3T_{1u}, M=1, \mu_u) = |\alpha_g\mu_u|$$

$$\Psi_9(a_{1g}t_{1u}, {}^3T_{1u}, M=1, \nu_u) = |\alpha_g\nu_u|$$

$a_{2u}t_{2g}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\xi_g\xi_g\rangle + \langle\beta_u\xi_g||\beta_u\xi_g\rangle}$$

$$\Psi_{10}(a_{2u}t_{2g}, {}^3T_{1u}, M=-1, \eta_u) = |\overline{\beta_u}\overline{\xi_g}|$$

$$\Psi_{11}(a_{2u}t_{2g}, {}^3T_{1u}, M=-1, \mu_u) = |\overline{\beta_u}\overline{\phi_g}|$$

$$\Psi_{12}(a_{2u}t_{2g}, {}^3T_{1u}, M=-1, \nu_u) = |\overline{\beta_u}\overline{\chi_g}|$$

$$\Psi_{13}(a_{2u}t_{2g}, {}^3T_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\beta_u}\xi_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\xi_g}|}{2}$$

$$\Psi_{14}(a_{2u}t_{2g}, {}^3T_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\beta_u}\phi_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\phi_g}|}{2}$$

$$\Psi_{15}(a_{2u}t_{2g}, {}^3T_{1u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\beta_u}\chi_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\chi_g}|}{2}$$

$$\Psi_{16}(a_{2u}t_{2g}, {}^3T_{1u}, M=1, \eta_u) = |\beta_u\xi_g|$$

$$\Psi_{17}(a_{2u}t_{2g}, {}^3T_{1u}, M=1, \mu_u) = |\beta_u\phi_g|$$

$$\Psi_{18}(a_{2u}t_{2g}, {}^3T_{1u}, M=1, \nu_u) = |\beta_u\chi_g|$$

$a_{1u}t_{1g}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\nu_g\nu_g\rangle + \langle\alpha_u\nu_g||\alpha_u\nu_g\rangle}$$

$$\Psi_{19}(a_{1u}t_{1g}, {}^3T_{1u}, M=-1, \eta_u) = |\overline{\alpha_u}\overline{\eta_g}|$$
$$\Psi_{20}(a_{1u}t_{1g}, {}^3T_{1u}, M=-1, \mu_u) = |\overline{\alpha_u}\overline{\mu_g}|$$
$$\Psi_{21}(a_{1u}t_{1g}, {}^3T_{1u}, M=-1, \nu_u) = |\overline{\alpha_u}\overline{\nu_g}|$$
$$\Psi_{22}(a_{1u}t_{1g}, {}^3T_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\alpha_u}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\eta_g}|}{2}$$
$$\Psi_{23}(a_{1u}t_{1g}, {}^3T_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\alpha_u}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_g}|}{2}$$
$$\Psi_{24}(a_{1u}t_{1g}, {}^3T_{1u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\alpha_u}\nu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\nu_g}|}{2}$$
$$\Psi_{25}(a_{1u}t_{1g}, {}^3T_{1u}, M=1, \eta_u) = |\alpha_u\eta_g|$$
$$\Psi_{26}(a_{1u}t_{1g}, {}^3T_{1u}, M=1, \mu_u) = |\alpha_u\mu_g|$$
$$\Psi_{27}(a_{1u}t_{1g}, {}^3T_{1u}, M=1, \nu_u) = |\alpha_u\nu_g|$$

$a_{2g}t_{2u}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\xi_u\xi_u\rangle + \langle\beta_g\xi_u||\beta_g\xi_u\rangle}$$

$$\Psi_{28}(a_{2g}t_{2u}, {}^3T_{1u}, M=-1, \eta_u) = |\overline{\beta_g}\overline{\xi_u}|$$
$$\Psi_{29}(a_{2g}t_{2u}, {}^3T_{1u}, M=-1, \mu_u) = |\overline{\beta_g}\overline{\phi_u}|$$
$$\Psi_{30}(a_{2g}t_{2u}, {}^3T_{1u}, M=-1, \nu_u) = |\overline{\beta_g}\overline{\chi_u}|$$
$$\Psi_{31}(a_{2g}t_{2u}, {}^3T_{1u}, M=0, \eta_u) = \frac{\sqrt{2}|\overline{\beta_g}\xi_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\xi_u}|}{2}$$
$$\Psi_{32}(a_{2g}t_{2u}, {}^3T_{1u}, M=0, \mu_u) = \frac{\sqrt{2}|\overline{\beta_g}\phi_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\phi_u}|}{2}$$
$$\Psi_{33}(a_{2g}t_{2u}, {}^3T_{1u}, M=0, \nu_u) = \frac{\sqrt{2}|\overline{\beta_g}\chi_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\chi_u}|}{2}$$
$$\Psi_{34}(a_{2g}t_{2u}, {}^3T_{1u}, M=1, \eta_u) = |\beta_g\xi_u|$$
$$\Psi_{35}(a_{2g}t_{2u}, {}^3T_{1u}, M=1, \mu_u) = |\beta_g\phi_u|$$
$$\Psi_{36}(a_{2g}t_{2u}, {}^3T_{1u}, M=1, \nu_u) = |\beta_g\chi_u|$$

e_ut_{1g}

$$\boxed{\Delta E = \langle\zeta_u\nu_g||\zeta_u\nu_g\rangle}$$

$$\Psi_{37}(e_ut_{1g}, {}^3T_{1u}, M=-1, \eta_u) = \frac{\sqrt{2}|\overline{\gamma_u}\overline{\eta_g}|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\overline{\eta_g}|}{2}$$
$$\Psi_{38}(e_ut_{1g}, {}^3T_{1u}, M=-1, \mu_u) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_u}\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_u}\overline{\mu_g}|}{2}$$
$$\Psi_{39}(e_ut_{1g}, {}^3T_{1u}, M=-1, \nu_u) = -\frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_u}\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_u}\overline{\nu_g}|}{2}$$
$$\Psi_{40}(e_ut_{1g}, {}^3T_{1u}, M=0, \eta_u) = \frac{|\overline{\gamma_u}\eta_g|}{2} + \frac{|\overline{\zeta_u}\eta_g|}{2} + \frac{|\gamma_u\overline{\eta_g}|}{2} + \frac{|\zeta_u\overline{\eta_g}|}{2}$$
$$\Psi_{41}(e_ut_{1g}, {}^3T_{1u}, M=0, \mu_u) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\mu_g|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_u}\mu_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\mu_g}|}{2}$$
$$\Psi_{42}(e_ut_{1g}, {}^3T_{1u}, M=0, \nu_u) = -\frac{\sqrt[3]{-1}|\overline{\gamma_u}\nu_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\nu_g|}{2} - \frac{\sqrt[3]{-1}|\gamma_u\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\nu_g}|}{2}$$
$$\Psi_{43}(e_ut_{1g}, {}^3T_{1u}, M=1, \eta_u) = \frac{\sqrt{2}|\gamma_u\eta_g|}{2} + \frac{\sqrt{2}|\zeta_u\eta_g|}{2}$$
$$\Psi_{44}(e_ut_{1g}, {}^3T_{1u}, M=1, \mu_u) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_u\mu_g|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_u\mu_g|}{2}$$
$$\Psi_{45}(e_ut_{1g}, {}^3T_{1u}, M=1, \nu_u) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma_u\nu_g|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_u\nu_g|}{2}$$

e_ut_{2g}

$$\boxed{\Delta E = \langle\zeta_u\xi_g||\zeta_u\xi_g\rangle}$$

$$\Psi_{46}(e_ut_{2g}, {}^3T_{1u}, M=-1, \eta_u) = -\frac{\sqrt{2}|\overline{\gamma_u}\overline{\xi_g}|}{2} + \frac{\sqrt{2}|\overline{\zeta_u}\overline{\xi_g}|}{2}$$
$$\Psi_{47}(e_ut_{2g}, {}^3T_{1u}, M=-1, \mu_u) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_u}\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_u}\overline{\phi_g}|}{2}$$
$$\Psi_{48}(e_ut_{2g}, {}^3T_{1u}, M=-1, \nu_u) = \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_u}\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_u}\overline{\chi_g}|}{2}$$
$$\Psi_{49}(e_ut_{2g}, {}^3T_{1u}, M=0, \eta_u) = -\frac{|\overline{\gamma_u}\xi_g|}{2} + \frac{|\overline{\zeta_u}\xi_g|}{2} - \frac{|\gamma_u\overline{\xi_g}|}{2} + \frac{|\zeta_u\overline{\xi_g}|}{2}$$
$$\Psi_{50}(e_ut_{2g}, {}^3T_{1u}, M=0, \mu_u) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\phi_g|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_u}\phi_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\phi_g}|}{2}$$
$$\Psi_{51}(e_ut_{2g}, {}^3T_{1u}, M=0, \nu_u) = \frac{\sqrt[3]{-1}|\overline{\gamma_u}\chi_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\chi_g|}{2} + \frac{\sqrt[3]{-1}|\gamma_u\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\chi_g}|}{2}$$
$$\Psi_{52}(e_ut_{2g}, {}^3T_{1u}, M=1, \eta_u) = -\frac{\sqrt{2}|\gamma_u\xi_g|}{2} + \frac{\sqrt{2}|\zeta_u\xi_g|}{2}$$
$$\Psi_{53}(e_ut_{2g}, {}^3T_{1u}, M=1, \mu_u) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_u\phi_g|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_u\phi_g|}{2}$$
$$\Psi_{54}(e_ut_{2g}, {}^3T_{1u}, M=1, \nu_u) = \frac{\sqrt[3]{-1}\sqrt{2}|\gamma_u\chi_g|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_u\chi_g|}{2}$$

e_gt_{1u}

$$\boxed{\Delta E = \langle\zeta_g\nu_u||\zeta_g\nu_u\rangle}$$

$$\Psi_{55}(e_gt_{1u}, {}^3T_{1u}, M=-1, \eta_u) = \frac{\sqrt{2}|\overline{\gamma_g}\overline{\eta_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\overline{\eta_u}|}{2}$$
$$\Psi_{56}(e_gt_{1u}, {}^3T_{1u}, M=-1, \mu_u) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_g}\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_g}\overline{\mu_u}|}{2}$$
$$\Psi_{57}(e_gt_{1u}, {}^3T_{1u}, M=-1, \nu_u) = -\frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_g}\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_g}\overline{\nu_u}|}{2}$$
$$\Psi_{58}(e_gt_{1u}, {}^3T_{1u}, M=0, \eta_u) = \frac{|\overline{\gamma_g}\eta_u|}{2} + \frac{|\overline{\zeta_g}\eta_u|}{2} + \frac{|\gamma_g\overline{\eta_u}|}{2} + \frac{|\zeta_g\overline{\eta_u}|}{2}$$
$$\Psi_{59}(e_gt_{1u}, {}^3T_{1u}, M=0, \mu_u) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\mu_u|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_g}\mu_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\mu_u}|}{2}$$
$$\Psi_{60}(e_gt_{1u}, {}^3T_{1u}, M=0, \nu_u) = -\frac{\sqrt[3]{-1}|\overline{\gamma_g}\nu_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\nu_u|}{2} - \frac{\sqrt[3]{-1}|\gamma_g\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\nu_u}|}{2}$$
$$\Psi_{61}(e_gt_{1u}, {}^3T_{1u}, M=1, \eta_u) = \frac{\sqrt{2}|\gamma_g\eta_u|}{2} + \frac{\sqrt{2}|\zeta_g\eta_u|}{2}$$
$$\Psi_{62}(e_gt_{1u}, {}^3T_{1u}, M=1, \mu_u) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_g\mu_u|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_g\mu_u|}{2}$$

$$\Psi_{63}(e_g t_{1u}, {}^3T_{1u}, M=1, \nu_u) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma_g \nu_u|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_g \nu_u|}{2}$$

$e_g t_{2u}$

$$\boxed{\Delta E = \langle \zeta_g \xi_u || \zeta_g \xi_u \rangle}$$

$$\Psi_{64}(e_g t_{2u}, {}^3T_{1u}, M=-1, \eta_u) = -\frac{\sqrt{2}|\overline{\gamma_g}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\zeta_g}\overline{\xi_u}|}{2}$$

$$\Psi_{65}(e_g t_{2u}, {}^3T_{1u}, M=-1, \mu_u) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\gamma_g}\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\zeta_g}\overline{\phi_u}|}{2}$$

$$\Psi_{66}(e_g t_{2u}, {}^3T_{1u}, M=-1, \nu_u) = \frac{\sqrt[3]{-1}\sqrt{2}|\overline{\gamma_g}\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\overline{\zeta_g}\overline{\chi_u}|}{2}$$

$$\Psi_{67}(e_g t_{2u}, {}^3T_{1u}, M=0, \eta_u) = -\frac{|\overline{\gamma_g}\xi_u|}{2} + \frac{|\overline{\zeta_g}\xi_u|}{2} - \frac{|\gamma_g\overline{\xi_u}|}{2} + \frac{|\zeta_g\overline{\xi_u}|}{2}$$

$$\Psi_{68}(e_g t_{2u}, {}^3T_{1u}, M=0, \mu_u) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\phi_u|}{2} - \frac{\sqrt[3]{-1}|\overline{\zeta_g}\phi_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\phi_u}|}{2}$$

$$\Psi_{69}(e_g t_{2u}, {}^3T_{1u}, M=0, \nu_u) = \frac{\sqrt[3]{-1}|\overline{\gamma_g}\chi_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\chi_u|}{2} + \frac{\sqrt[3]{-1}|\gamma_g\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\chi_u}|}{2}$$

$$\Psi_{70}(e_g t_{2u}, {}^3T_{1u}, M=1, \eta_u) = -\frac{\sqrt{2}|\gamma_g\xi_u|}{2} + \frac{\sqrt{2}|\zeta_g\xi_u|}{2}$$

$$\Psi_{71}(e_g t_{2u}, {}^3T_{1u}, M=1, \mu_u) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_g\phi_u|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_g\phi_u|}{2}$$

$$\Psi_{72}(e_g t_{2u}, {}^3T_{1u}, M=1, \nu_u) = \frac{\sqrt[3]{-1}\sqrt{2}|\gamma_g\chi_u|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_g\chi_u|}{2}$$

$t_{1g} t_{1u}$

$$\boxed{\begin{gathered}\Delta E = \langle \nu_g \mu_u || \nu_g \mu_u \rangle - \langle \nu_g \nu_g || \mu_u \mu_u \rangle - \langle \nu_g \nu_u || \nu_g \nu_u \rangle \\ + \langle \nu_g \mu_g || \nu_u \mu_u \rangle\end{gathered}}$$

$$\Psi_{73}(t_{1g} t_{1u}, {}^3T_{1u}, M=-1, \nu_u) = -\frac{\sqrt{2}|\overline{\eta_g}\overline{\mu_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\overline{\eta_u}|}{2}$$

$$\Psi_{74}(t_{1g} t_{1u}, {}^3T_{1u}, M=-1, \mu_u) = \frac{\sqrt{2}|\overline{\eta_g}\overline{\nu_u}|}{2} - \frac{\sqrt{2}|\overline{\nu_g}\overline{\eta_u}|}{2}$$

$$\Psi_{75}(t_{1g} t_{1u}, {}^3T_{1u}, M=-1, \eta_u) = -\frac{\sqrt{2}|\overline{\mu_g}\overline{\nu_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\overline{\mu_u}|}{2}$$

$$\Psi_{76}(t_{1g} t_{1u}, {}^3T_{1u}, M=0, \nu_u) = -\frac{|\overline{\eta_g}\mu_u|}{2} + \frac{|\overline{\mu_g}\eta_u|}{2} - \frac{|\eta_g\overline{\mu_u}|}{2} + \frac{|\mu_g\overline{\eta_u}|}{2}$$

$$\Psi_{77}(t_{1g} t_{1u}, {}^3T_{1u}, M=0, \mu_u) = \frac{|\overline{\eta_g}\nu_u|}{2} - \frac{|\overline{\nu_g}\eta_u|}{2} + \frac{|\eta_g\overline{\nu_u}|}{2} - \frac{|\nu_g\overline{\eta_u}|}{2}$$

$$\Psi_{78}(t_{1g} t_{1u}, {}^3T_{1u}, M=0, \eta_u) = -\frac{|\overline{\mu_g}\nu_u|}{2} + \frac{|\overline{\nu_g}\mu_u|}{2} - \frac{|\mu_g\overline{\nu_u}|}{2} + \frac{|\nu_g\overline{\mu_u}|}{2}$$

$$\Psi_{79}(t_{1g} t_{1u}, {}^3T_{1u}, M=1, \nu_u) = -\frac{\sqrt{2}|\eta_g\mu_u|}{2} + \frac{\sqrt{2}|\mu_g\eta_u|}{2}$$

$$\Psi_{80}(t_{1g} t_{1u}, {}^3T_{1u}, M=1, \mu_u) = \frac{\sqrt{2}|\eta_g\nu_u|}{2} - \frac{\sqrt{2}|\nu_g\eta_u|}{2}$$

$$\Psi_{81}(t_{1g} t_{1u}, {}^3T_{1u}, M=1, \eta_u) = -\frac{\sqrt{2}|\mu_g\nu_u|}{2} + \frac{\sqrt{2}|\nu_g\mu_u|}{2}$$

$t_{1g} t_{2u}$

$$\boxed{\begin{gathered}\Delta E = \langle \nu_g \chi_u || \nu_g \chi_u \rangle - \langle \nu_g \nu_g || \xi_u \xi_u \rangle + \langle \nu_g \xi_u || \nu_g \xi_u \rangle \\ - \langle \nu_g \mu_g || \chi_u \phi_u \rangle\end{gathered}}$$

$$\Psi_{82}(t_{1g} t_{2u}, {}^3T_{1u}, M=-1, \nu_u) = \frac{\sqrt{2}|\overline{\eta_g}\overline{\phi_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\overline{\xi_u}|}{2}$$

$$\Psi_{83}(t_{1g} t_{2u}, {}^3T_{1u}, M=-1, \mu_u) = \frac{\sqrt{2}|\overline{\eta_g}\overline{\chi_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\overline{\xi_u}|}{2}$$

$$\Psi_{84}(t_{1g} t_{2u}, {}^3T_{1u}, M=-1, \eta_u) = \frac{\sqrt{2}|\overline{\mu_g}\overline{\chi_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\overline{\phi_u}|}{2}$$

$$\Psi_{85}(t_{1g} t_{2u}, {}^3T_{1u}, M=0, \nu_u) = \frac{|\overline{\eta_g}\phi_u|}{2} + \frac{|\overline{\mu_g}\xi_u|}{2} + \frac{|\eta_g\overline{\phi_u}|}{2} + \frac{|\mu_g\overline{\xi_u}|}{2}$$

$$\Psi_{86}(t_{1g} t_{2u}, {}^3T_{1u}, M=0, \mu_u) = \frac{|\overline{\eta_g}\chi_u|}{2} + \frac{|\overline{\nu_g}\xi_u|}{2} + \frac{|\eta_g\overline{\chi_u}|}{2} + \frac{|\nu_g\overline{\xi_u}|}{2}$$

$$\Psi_{87}(t_{1g} t_{2u}, {}^3T_{1u}, M=0, \eta_u) = \frac{|\overline{\mu_g}\chi_u|}{2} + \frac{|\overline{\nu_g}\phi_u|}{2} + \frac{|\mu_g\overline{\chi_u}|}{2} + \frac{|\nu_g\overline{\phi_u}|}{2}$$

$$\Psi_{88}(t_{1g} t_{2u}, {}^3T_{1u}, M=1, \nu_u) = \frac{\sqrt{2}|\eta_g\phi_u|}{2} + \frac{\sqrt{2}|\mu_g\xi_u|}{2}$$

$$\Psi_{89}(t_{1g} t_{2u}, {}^3T_{1u}, M=1, \mu_u) = \frac{\sqrt{2}|\eta_g\chi_u|}{2} + \frac{\sqrt{2}|\nu_g\xi_u|}{2}$$

$$\Psi_{90}(t_{1g} t_{2u}, {}^3T_{1u}, M=1, \eta_u) = \frac{\sqrt{2}|\mu_g\chi_u|}{2} + \frac{\sqrt{2}|\nu_g\phi_u|}{2}$$

$t_{1u} t_{2g}$

$$\boxed{\begin{gathered}\Delta E = \langle \xi_g \eta_u || \xi_g \eta_u \rangle + \langle \xi_g \nu_u || \xi_g \nu_u \rangle - \langle \xi_g \xi_g || \nu_u \nu_u \rangle \\ - \langle \xi_g \phi_g || \eta_u \mu_u \rangle\end{gathered}}$$

$$\Psi_{91}(t_{1u} t_{2g}, {}^3T_{1u}, M=-1, \nu_u) = \frac{\sqrt{2}|\overline{\phi_g}\overline{\eta_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\mu_u}|}{2}$$

$$\Psi_{92}(t_{1u} t_{2g}, {}^3T_{1u}, M=-1, \mu_u) = \frac{\sqrt{2}|\overline{\chi_g}\overline{\eta_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\nu_u}|}{2}$$

$$\Psi_{93}(t_{1u} t_{2g}, {}^3T_{1u}, M=-1, \eta_u) = \frac{\sqrt{2}|\overline{\chi_g}\overline{\mu_u}|}{2} + \frac{\sqrt{2}|\overline{\phi_g}\overline{\nu_u}|}{2}$$

$$\Psi_{94}(t_{1u} t_{2g}, {}^3T_{1u}, M=0, \nu_u) = \frac{|\overline{\phi_g}\eta_u|}{2} + \frac{|\overline{\xi_g}\mu_u|}{2} + \frac{|\phi_g\overline{\eta_u}|}{2} + \frac{|\xi_g\overline{\mu_u}|}{2}$$

$$\Psi_{95}(t_{1u} t_{2g}, {}^3T_{1u}, M=0, \mu_u) = \frac{|\overline{\chi_g}\eta_u|}{2} + \frac{|\overline{\xi_g}\nu_u|}{2} + \frac{|\chi_g\overline{\eta_u}|}{2} + \frac{|\xi_g\overline{\nu_u}|}{2}$$

$$\Psi_{96}(t_{1u} t_{2g}, {}^3T_{1u}, M=0, \eta_u) = \frac{|\overline{\chi_g}\mu_u|}{2} + \frac{|\overline{\phi_g}\nu_u|}{2} + \frac{|\chi_g\overline{\mu_u}|}{2} + \frac{|\phi_g\overline{\nu_u}|}{2}$$

$$\Psi_{97}(t_{1u} t_{2g}, {}^3T_{1u}, M=1, \nu_u) = \frac{\sqrt{2}|\phi_g\eta_u|}{2} + \frac{\sqrt{2}|\xi_g\mu_u|}{2}$$

$$\Psi_{98}(t_{1u} t_{2g}, {}^3T_{1u}, M=1, \mu_u) = \frac{\sqrt{2}|\chi_g\eta_u|}{2} + \frac{\sqrt{2}|\xi_g\nu_u|}{2}$$

$$\Psi_{99}(t_{1u} t_{2g}, {}^3T_{1u}, M=1, \eta_u) = \frac{\sqrt{2}|\chi_g\mu_u|}{2} + \frac{\sqrt{2}|\phi_g\nu_u|}{2}$$

$t_{2g} t_{2u}$

$$\boxed{\begin{gathered}\Delta E = \langle \xi_g \phi_u || \xi_g \phi_u \rangle - \langle \xi_g \xi_g || \phi_u \phi_u \rangle - \langle \xi_g \xi_u || \xi_g \xi_u \rangle \\ + \langle \xi_g \phi_g || \xi_u \phi_u \rangle\end{gathered}}$$

$$\Psi_{100}(t_{2g} t_{2u}, {}^3T_{1u}, M=-1, \nu_u) = \frac{\sqrt{2}|\overline{\phi_g}\overline{\xi_u}|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\overline{\phi_u}|}{2}$$

$$\Psi_{101}(t_{2g}t_{2u}, {}^3T_{1u}, M=-1, \mu_u) = -\frac{\sqrt{2}|\overline{\chi_g}\,\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\,\overline{\chi_u}|}{2}$$

$$\Psi_{102}(t_{2g}t_{2u}, {}^3T_{1u}, M=-1, \eta_u) = \frac{\sqrt{2}|\overline{\chi_g}\,\overline{\phi_u}|}{2} - \frac{\sqrt{2}|\overline{\phi_g}\,\overline{\chi_u}|}{2}$$

$$\Psi_{103}(t_{2g}t_{2u}, {}^3T_{1u}, M=0, \nu_u) = \frac{|\overline{\phi_g}\xi_u|}{2} - \frac{|\overline{\xi_g}\phi_u|}{2} + \frac{|\phi_g\overline{\xi_u}|}{2} - \frac{|\xi_g\overline{\phi_u}|}{2}$$

$$\Psi_{104}(t_{2g}t_{2u}, {}^3T_{1u}, M=0, \mu_u) = -\frac{|\overline{\chi_g}\xi_u|}{2} + \frac{|\overline{\xi_g}\chi_u|}{2} - \frac{|\chi_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\chi_u}|}{2}$$

$$\Psi_{105}(t_{2g}t_{2u}, {}^3T_{1u}, M=0, \eta_u) = \frac{|\overline{\chi_g}\phi_u|}{2} - \frac{|\overline{\phi_g}\chi_u|}{2} + \frac{|\chi_g\overline{\phi_u}|}{2} - \frac{|\phi_g\overline{\chi_u}|}{2}$$

$$\Psi_{106}(t_{2g}t_{2u}, {}^3T_{1u}, M=1, \nu_u) = \frac{\sqrt{2}|\phi_g\xi_u|}{2} - \frac{\sqrt{2}|\xi_g\phi_u|}{2}$$

$$\Psi_{107}(t_{2g}t_{2u}, {}^3T_{1u}, M=1, \mu_u) = -\frac{\sqrt{2}|\chi_g\xi_u|}{2} + \frac{\sqrt{2}|\xi_g\chi_u|}{2}$$

$$\Psi_{108}(t_{2g}t_{2u}, {}^3T_{1u}, M=1, \eta_u) = \frac{\sqrt{2}|\chi_g\phi_u|}{2} - \frac{\sqrt{2}|\phi_g\chi_u|}{2}$$

2.32.17 $^1T_{1u}$

$a_{1g}t_{1u}$

$$\boxed{\Delta E = \langle\alpha_g\alpha_g||\nu_u\nu_u\rangle + \langle\alpha_g\nu_u||\alpha_g\nu_u\rangle}$$

$$\Psi_{1}(a_{1g}t_{1u}, {}^1T_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\eta_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\eta_u}|}{2}$$

$$\Psi_{2}(a_{1g}t_{1u}, {}^1T_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\mu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\mu_u}|}{2}$$

$$\Psi_{3}(a_{1g}t_{1u}, {}^1T_{1u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\nu_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\nu_u}|}{2}$$

$a_{2u}t_{2g}$

$$\boxed{\Delta E = \langle\beta_u\beta_u||\xi_g\xi_g\rangle + \langle\beta_u\xi_g||\beta_u\xi_g\rangle}$$

$$\Psi_{4}(a_{2u}t_{2g}, {}^1T_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\beta_u}\xi_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\xi_g}|}{2}$$

$$\Psi_{5}(a_{2u}t_{2g}, {}^1T_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\beta_u}\phi_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\phi_g}|}{2}$$

$$\Psi_{6}(a_{2u}t_{2g}, {}^1T_{1u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\beta_u}\chi_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\chi_g}|}{2}$$

$a_{1u}t_{1g}$

$$\boxed{\Delta E = \langle\alpha_u\alpha_u||\nu_g\nu_g\rangle + \langle\alpha_u\nu_g||\alpha_u\nu_g\rangle}$$

$$\Psi_{7}(a_{1u}t_{1g}, {}^1T_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\eta_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\eta_g}|}{2}$$

$$\Psi_{8}(a_{1u}t_{1g}, {}^1T_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\mu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\mu_g}|}{2}$$

$$\Psi_{9}(a_{1u}t_{1g}, {}^1T_{1u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\nu_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\nu_g}|}{2}$$

$a_{2g}t_{2u}$

$$\boxed{\Delta E = \langle\beta_g\beta_g||\xi_u\xi_u\rangle + \langle\beta_g\xi_u||\beta_g\xi_u\rangle}$$

$$\Psi_{10}(a_{2g}t_{2u}, {}^1T_{1u}, M=0, \eta_u) = -\frac{\sqrt{2}|\overline{\beta_g}\xi_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\xi_u}|}{2}$$

$$\Psi_{11}(a_{2g}t_{2u}, {}^1T_{1u}, M=0, \mu_u) = -\frac{\sqrt{2}|\overline{\beta_g}\phi_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\phi_u}|}{2}$$

$$\Psi_{12}(a_{2g}t_{2u}, {}^1T_{1u}, M=0, \nu_u) = -\frac{\sqrt{2}|\overline{\beta_g}\chi_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\chi_u}|}{2}$$

e_ut_{1g}

$$\boxed{\Delta E = \langle\zeta_u\nu_g||\zeta_u\nu_g\rangle}$$

$$\Psi_{13}(e_ut_{1g}, {}^1T_{1u}, M=0, \eta_u) = -\frac{|\overline{\gamma_u}\eta_g|}{2} - \frac{|\overline{\zeta_u}\eta_g|}{2} + \frac{|\gamma_u\overline{\eta_g}|}{2} + \frac{|\zeta_u\overline{\eta_g}|}{2}$$

$$\Psi_{14}(e_ut_{1g}, {}^1T_{1u}, M=0, \mu_u) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\mu_g|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_u}\mu_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\mu_g}|}{2}$$

$$\Psi_{15}(e_ut_{1g}, {}^1T_{1u}, M=0, \nu_u) = \frac{\sqrt[3]{-1}|\overline{\gamma_u}\nu_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\nu_g|}{2} - \frac{\sqrt[3]{-1}|\gamma_u\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\nu_g}|}{2}$$

e_ut_{2g}

$$\boxed{\Delta E = \langle\zeta_u\xi_g||\zeta_u\xi_g\rangle}$$

$$\Psi_{16}(e_ut_{2g}, {}^1T_{1u}, M=0, \eta_u) = \frac{|\overline{\gamma_u}\xi_g|}{2} - \frac{|\overline{\zeta_u}\xi_g|}{2} - \frac{|\gamma_u\overline{\xi_g}|}{2} + \frac{|\zeta_u\overline{\xi_g}|}{2}$$

$$\Psi_{17}(e_ut_{2g}, {}^1T_{1u}, M=0, \mu_u) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\phi_g|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_u}\phi_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\phi_g}|}{2}$$

$$\Psi_{18}(e_ut_{2g}, {}^1T_{1u}, M=0, \nu_u) = -\frac{\sqrt[3]{-1}|\overline{\gamma_u}\chi_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\chi_g|}{2} + \frac{\sqrt[3]{-1}|\gamma_u\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\chi_g}|}{2}$$

e_gt_{1u}

$$\boxed{\Delta E = \langle\zeta_g\nu_u||\zeta_g\nu_u\rangle}$$

$$\Psi_{19}(e_gt_{1u}, {}^1T_{1u}, M=0, \eta_u) = -\frac{|\overline{\gamma_g}\eta_u|}{2} - \frac{|\overline{\zeta_g}\eta_u|}{2} + \frac{|\gamma_g\overline{\eta_u}|}{2} + \frac{|\zeta_g\overline{\eta_u}|}{2}$$

$$\Psi_{20}(e_gt_{1u}, {}^1T_{1u}, M=0, \mu_u) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\mu_u|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_g}\mu_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\mu_u}|}{2}$$

$$\Psi_{21}(e_gt_{1u}, {}^1T_{1u}, M=0, \nu_u) = \frac{\sqrt[3]{-1}|\overline{\gamma_g}\nu_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\nu_u|}{2} - \frac{\sqrt[3]{-1}|\gamma_g\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\nu_u}|}{2}$$

e_gt_{2u}

$$\boxed{\Delta E = \langle\zeta_g\xi_u||\zeta_g\xi_u\rangle}$$

$$\Psi_{22}(e_gt_{2u}, {}^1T_{1u}, M=0, \eta_u) = \frac{|\overline{\gamma_g}\xi_u|}{2} - \frac{|\overline{\zeta_g}\xi_u|}{2} - \frac{|\gamma_g\overline{\xi_u}|}{2} + \frac{|\zeta_g\overline{\xi_u}|}{2}$$

$$\Psi_{23}(e_gt_{2u}, {}^1T_{1u}, M=0, \mu_u) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\phi_u|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_g}\phi_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\phi_u}|}{2}$$

$$\Psi_{24}(e_gt_{2u}, {}^1T_{1u}, M=0, \nu_u) = -\frac{\sqrt[3]{-1}|\overline{\gamma_g}\chi_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\chi_u|}{2} + \frac{\sqrt[3]{-1}|\gamma_g\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\chi_u}|}{2}$$

$t_{1g}t_{1u}$

$$\boxed{\begin{gathered}\Delta E = \langle\nu_g\mu_u||\nu_g\mu_u\rangle + \langle\nu_g\nu_g||\mu_u\mu_u\rangle - \langle\nu_g\nu_u||\nu_g\nu_u\rangle \\ - \langle\nu_g\mu_g||\nu_u\mu_u\rangle\end{gathered}}$$

$$\Psi_{25}(t_{1g}t_{1u}, {}^1T_{1u}, M=0, \nu_u) = \frac{|\overline{\eta_g}\mu_u|}{2} - \frac{|\overline{\mu_g}\eta_u|}{2} - \frac{|\eta_g\overline{\mu_u}|}{2} + \frac{|\mu_g\overline{\eta_u}|}{2}$$

$$\Psi_{26}(t_{1g}t_{1u}, {}^1T_{1u}, M=0, \mu_u) = -\frac{|\overline{\eta_g}\nu_u|}{2} + \frac{|\overline{\nu_g}\eta_u|}{2} + \frac{|\eta_g\overline{\nu_u}|}{2} - \frac{|\nu_g\overline{\eta_u}|}{2}$$

$$\Psi_{27}(t_{1g}t_{1u}, {}^1T_{1u}, M=0, \eta_u) = \frac{|\overline{\mu_g}\nu_u|}{2} - \frac{|\overline{\nu_g}\mu_u|}{2} - \frac{|\mu_g\overline{\nu_u}|}{2} + \frac{|\nu_g\overline{\mu_u}|}{2}$$

$t_{1g}t_{2u}$

$$\boxed{\begin{gathered}\Delta E = \langle\nu_g\chi_u||\nu_g\chi_u\rangle + \langle\nu_g\nu_g||\xi_u\xi_u\rangle + \langle\nu_g\xi_u||\nu_g\xi_u\rangle \\ + \langle\nu_g\mu_g||\chi_u\phi_u\rangle\end{gathered}}$$

$$\Psi_{28}(t_{1g}t_{2u}, {}^1T_{1u}, M=0, \nu_u) = -\frac{|\overline{\eta_g}\phi_u|}{2} - \frac{|\overline{\mu_g}\xi_u|}{2} + \frac{|\eta_g\overline{\phi_u}|}{2} + \frac{|\mu_g\overline{\xi_u}|}{2}$$

$$\Psi_{29}(t_{1g}t_{2u}, {}^1T_{1u}, M=0, \mu_u) = -\frac{|\overline{\eta_g}\chi_u|}{2} - \frac{|\overline{\nu_g}\xi_u|}{2} + \frac{|\eta_g\overline{\chi_u}|}{2} + \frac{|\nu_g\overline{\xi_u}|}{2}$$

$$\Psi_{30}(t_{1g}t_{2u}, {}^1T_{1u}, M=0, \eta_u) = -\frac{|\overline{\mu_g}\chi_u|}{2} - \frac{|\overline{\nu_g}\phi_u|}{2} + \frac{|\mu_g\overline{\chi_u}|}{2} + \frac{|\nu_g\overline{\phi_u}|}{2}$$

$t_{1u}t_{2g}$

$$\boxed{\begin{gathered}\Delta E = \langle\xi_g\eta_u||\xi_g\eta_u\rangle + \langle\xi_g\nu_u||\xi_g\nu_u\rangle + \langle\xi_g\xi_g||\nu_u\nu_u\rangle \\ + \langle\xi_g\phi_g||\eta_u\mu_u\rangle\end{gathered}}$$

$$\Psi_{31}(t_{1u}t_{2g}, {}^1T_{1u}, M=0, \nu_u) = -\frac{|\overline{\phi_g}\eta_u|}{2} - \frac{|\overline{\xi_g}\mu_u|}{2} + \frac{|\phi_g\overline{\eta_u}|}{2} + \frac{|\xi_g\overline{\mu_u}|}{2}$$

$$\Psi_{32}(t_{1u}t_{2g}, {}^1T_{1u}, M=0, \mu_u) = -\frac{|\overline{\chi_g}\eta_u|}{2} - \frac{|\overline{\xi_g}\nu_u|}{2} + \frac{|\chi_g\overline{\eta_u}|}{2} + \frac{|\xi_g\overline{\nu_u}|}{2}$$

$$\Psi_{33}(t_{1u}t_{2g}, {}^1T_{1u}, M=0, \eta_u) = -\frac{|\overline{\chi_g}\mu_u|}{2} - \frac{|\overline{\phi_g}\nu_u|}{2} + \frac{|\chi_g\overline{\mu_u}|}{2} + \frac{|\phi_g\overline{\nu_u}|}{2}$$

$t_{2g}t_{2u}$

$$\boxed{\begin{gathered}\Delta E = \langle\xi_g\phi_u||\xi_g\phi_u\rangle + \langle\xi_g\xi_g||\phi_u\phi_u\rangle - \langle\xi_g\xi_u||\xi_g\xi_u\rangle \\ - \langle\xi_g\phi_g||\xi_u\phi_u\rangle\end{gathered}}$$

$$\Psi_{34}(t_{2g}t_{2u}, {}^1T_{1u}, M=0, \nu_u) = -\frac{|\overline{\phi_g}\xi_u|}{2} + \frac{|\overline{\xi_g}\phi_u|}{2} + \frac{|\phi_g\overline{\xi_u}|}{2} - \frac{|\xi_g\overline{\phi_u}|}{2}$$

$$\Psi_{35}(t_{2g}t_{2u}, {}^1T_{1u}, M=0, \mu_u) = \frac{|\overline{\chi_g}\xi_u|}{2} - \frac{|\overline{\xi_g}\chi_u|}{2} - \frac{|\chi_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\chi_u}|}{2}$$

$$\Psi_{36}(t_{2g}t_{2u}, {}^1T_{1u}, M=0, \eta_u) = -\frac{|\overline{\chi_g}\phi_u|}{2} + \frac{|\overline{\phi_g}\chi_u|}{2} + \frac{|\chi_g\overline{\phi_u}|}{2} - \frac{|\phi_g\overline{\chi_u}|}{2}$$

2.32.18 $^3T_{2u}$

$a_{1g}t_{2u}$

$$\boxed{\Delta E = -\langle\alpha_g\alpha_g||\xi_u\xi_u\rangle + \langle\alpha_g\xi_u||\alpha_g\xi_u\rangle}$$

$$\Psi_1(a_{1g}t_{2u}, {}^3T_{2u}, M=-1, \xi_u) = |\overline{\alpha_g}\overline{\xi_u}|$$
$$\Psi_2(a_{1g}t_{2u}, {}^3T_{2u}, M=-1, \phi_u) = |\overline{\alpha_g}\overline{\phi_u}|$$
$$\Psi_3(a_{1g}t_{2u}, {}^3T_{2u}, M=-1, \chi_u) = |\overline{\alpha_g}\overline{\chi_u}|$$
$$\Psi_4(a_{1g}t_{2u}, {}^3T_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\alpha_g}\xi_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\xi_u}|}{2}$$
$$\Psi_5(a_{1g}t_{2u}, {}^3T_{2u}, M=0, \phi_u) = \frac{\sqrt{2}|\overline{\alpha_g}\phi_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\phi_u}|}{2}$$
$$\Psi_6(a_{1g}t_{2u}, {}^3T_{2u}, M=0, \chi_u) = \frac{\sqrt{2}|\overline{\alpha_g}\chi_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\chi_u}|}{2}$$
$$\Psi_7(a_{1g}t_{2u}, {}^3T_{2u}, M=1, \xi_u) = |\alpha_g\xi_u|$$
$$\Psi_8(a_{1g}t_{2u}, {}^3T_{2u}, M=1, \phi_u) = |\alpha_g\phi_u|$$
$$\Psi_9(a_{1g}t_{2u}, {}^3T_{2u}, M=1, \chi_u) = |\alpha_g\chi_u|$$

$a_{2u}t_{1g}$

$$\boxed{\Delta E = -\langle\beta_u\beta_u||\nu_g\nu_g\rangle + \langle\beta_u\nu_g||\beta_u\nu_g\rangle}$$

$$\Psi_{10}(a_{2u}t_{1g}, {}^3T_{2u}, M=-1, \xi_u) = |\overline{\beta_u}\overline{\eta_g}|$$
$$\Psi_{11}(a_{2u}t_{1g}, {}^3T_{2u}, M=-1, \phi_u) = |\overline{\beta_u}\overline{\mu_g}|$$
$$\Psi_{12}(a_{2u}t_{1g}, {}^3T_{2u}, M=-1, \chi_u) = |\overline{\beta_u}\overline{\nu_g}|$$
$$\Psi_{13}(a_{2u}t_{1g}, {}^3T_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\beta_u}\eta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_g}|}{2}$$
$$\Psi_{14}(a_{2u}t_{1g}, {}^3T_{2u}, M=0, \phi_u) = \frac{\sqrt{2}|\overline{\beta_u}\mu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_g}|}{2}$$
$$\Psi_{15}(a_{2u}t_{1g}, {}^3T_{2u}, M=0, \chi_u) = \frac{\sqrt{2}|\overline{\beta_u}\nu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\nu_g}|}{2}$$
$$\Psi_{16}(a_{2u}t_{1g}, {}^3T_{2u}, M=1, \xi_u) = |\beta_u\eta_g|$$
$$\Psi_{17}(a_{2u}t_{1g}, {}^3T_{2u}, M=1, \phi_u) = |\beta_u\mu_g|$$
$$\Psi_{18}(a_{2u}t_{1g}, {}^3T_{2u}, M=1, \chi_u) = |\beta_u\nu_g|$$

$a_{1u}t_{2g}$

$$\boxed{\Delta E = -\langle\alpha_u\alpha_u||\xi_g\xi_g\rangle + \langle\alpha_u\xi_g||\alpha_u\xi_g\rangle}$$

$$\Psi_{19}(a_{1u}t_{2g}, {}^3T_{2u}, M=-1, \xi_u) = |\overline{\alpha_u}\overline{\xi_g}|$$
$$\Psi_{20}(a_{1u}t_{2g}, {}^3T_{2u}, M=-1, \phi_u) = |\overline{\alpha_u}\overline{\phi_g}|$$
$$\Psi_{21}(a_{1u}t_{2g}, {}^3T_{2u}, M=-1, \chi_u) = |\overline{\alpha_u}\overline{\chi_g}|$$
$$\Psi_{22}(a_{1u}t_{2g}, {}^3T_{2u}, M=0, \xi_u) = \frac{\sqrt{2}|\overline{\alpha_u}\xi_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\xi_g}|}{2}$$
$$\Psi_{23}(a_{1u}t_{2g}, {}^3T_{2u}, M=0, \phi_u) = \frac{\sqrt{2}|\overline{\alpha_u}\phi_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\phi_g}|}{2}$$
$$\Psi_{24}(a_{1u}t_{2g}, {}^3T_{2u}, M=0, \chi_u) = \frac{\sqrt{2}|\overline{\alpha_u}\chi_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\chi_g}|}{2}$$
$$\Psi_{25}(a_{1u}t_{2g}, {}^3T_{2u}, M=1, \xi_u) = |\alpha_u\xi_g|$$
$$\Psi_{26}(a_{1u}t_{2g}, {}^3T_{2u}, M=1, \phi_u) = |\alpha_u\phi_g|$$
$$\Psi_{27}(a_{1u}t_{2g}, {}^3T_{2u}, M=1, \chi_u) = |\alpha_u\chi_g|$$

$a_{2g}t_{1u}$

$$\boxed{\Delta E = -\langle\beta_g\beta_g||\nu_u\nu_u\rangle + \langle\beta_g\nu_u||\beta_g\nu_u\rangle}$$

$$\Psi_{28}(a_{2g}t_{1u}, {}^3T_{2u}, M=-1, \xi_u) = \left|\overline{\beta_g}\,\overline{\eta_u}\right|$$
$$\Psi_{29}(a_{2g}t_{1u}, {}^3T_{2u}, M=-1, \phi_u) = \left|\overline{\beta_g}\,\overline{\mu_u}\right|$$
$$\Psi_{30}(a_{2g}t_{1u}, {}^3T_{2u}, M=-1, \chi_u) = \left|\overline{\beta_g}\,\overline{\nu_u}\right|$$
$$\Psi_{31}(a_{2g}t_{1u}, {}^3T_{2u}, M=0, \xi_u) = \frac{\sqrt{2}\left|\overline{\beta_g}\eta_u\right|}{2} + \frac{\sqrt{2}\left|\beta_g\overline{\eta_u}\right|}{2}$$
$$\Psi_{32}(a_{2g}t_{1u}, {}^3T_{2u}, M=0, \phi_u) = \frac{\sqrt{2}\left|\overline{\beta_g}\mu_u\right|}{2} + \frac{\sqrt{2}\left|\beta_g\overline{\mu_u}\right|}{2}$$
$$\Psi_{33}(a_{2g}t_{1u}, {}^3T_{2u}, M=0, \chi_u) = \frac{\sqrt{2}\left|\overline{\beta_g}\nu_u\right|}{2} + \frac{\sqrt{2}\left|\beta_g\overline{\nu_u}\right|}{2}$$
$$\Psi_{34}(a_{2g}t_{1u}, {}^3T_{2u}, M=1, \xi_u) = \left|\beta_g\eta_u\right|$$
$$\Psi_{35}(a_{2g}t_{1u}, {}^3T_{2u}, M=1, \phi_u) = \left|\beta_g\mu_u\right|$$
$$\Psi_{36}(a_{2g}t_{1u}, {}^3T_{2u}, M=1, \chi_u) = \left|\beta_g\nu_u\right|$$

$e_u t_{1g}$

$$\boxed{\Delta E = \langle\zeta_u\nu_g||\zeta_u\nu_g\rangle}$$

$$\Psi_{37}(e_u t_{1g}, {}^3T_{2u}, M=-1, \xi_u) = -\frac{\sqrt{2}\left|\overline{\gamma_u}\,\overline{\eta_g}\right|}{2} + \frac{\sqrt{2}\left|\overline{\zeta_u}\,\overline{\eta_g}\right|}{2}$$
$$\Psi_{38}(e_u t_{1g}, {}^3T_{2u}, M=-1, \phi_u) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\overline{\gamma_u}\,\overline{\mu_g}\right|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}\left|\overline{\zeta_u}\,\overline{\mu_g}\right|}{2}$$
$$\Psi_{39}(e_u t_{1g}, {}^3T_{2u}, M=-1, \chi_u) = \frac{\sqrt[3]{-1}\sqrt{2}\left|\overline{\gamma_u}\,\overline{\nu_g}\right|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\overline{\zeta_u}\,\overline{\nu_g}\right|}{2}$$
$$\Psi_{40}(e_u t_{1g}, {}^3T_{2u}, M=0, \xi_u) = -\frac{\left|\overline{\gamma_u}\eta_g\right|}{2} + \frac{\left|\overline{\zeta_u}\eta_g\right|}{2} - \frac{\left|\gamma_u\overline{\eta_g}\right|}{2} + \frac{\left|\zeta_u\overline{\eta_g}\right|}{2}$$
$$\Psi_{41}(e_u t_{1g}, {}^3T_{2u}, M=0, \phi_u) = -\frac{(-1)^{\frac{2}{3}}\left|\overline{\gamma_u}\mu_g\right|}{2} - \frac{\sqrt[3]{-1}\left|\overline{\zeta_u}\mu_g\right|}{2} - \frac{(-1)^{\frac{2}{3}}\left|\gamma_u\overline{\mu_g}\right|}{2} - \frac{\sqrt[3]{-1}\left|\zeta_u\overline{\mu_g}\right|}{2}$$
$$\Psi_{42}(e_u t_{1g}, {}^3T_{2u}, M=0, \chi_u) = \frac{\sqrt[3]{-1}\left|\overline{\gamma_u}\nu_g\right|}{2} + \frac{(-1)^{\frac{2}{3}}\left|\overline{\zeta_u}\nu_g\right|}{2} + \frac{\sqrt[3]{-1}\left|\gamma_u\overline{\nu_g}\right|}{2} + \frac{(-1)^{\frac{2}{3}}\left|\zeta_u\overline{\nu_g}\right|}{2}$$
$$\Psi_{43}(e_u t_{1g}, {}^3T_{2u}, M=1, \xi_u) = -\frac{\sqrt{2}\left|\gamma_u\eta_g\right|}{2} + \frac{\sqrt{2}\left|\zeta_u\eta_g\right|}{2}$$
$$\Psi_{44}(e_u t_{1g}, {}^3T_{2u}, M=1, \phi_u) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\gamma_u\mu_g\right|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}\left|\zeta_u\mu_g\right|}{2}$$
$$\Psi_{45}(e_u t_{1g}, {}^3T_{2u}, M=1, \chi_u) = \frac{\sqrt[3]{-1}\sqrt{2}\left|\gamma_u\nu_g\right|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\zeta_u\nu_g\right|}{2}$$

$e_u t_{2g}$

$$\boxed{\Delta E = \langle\zeta_u\xi_g||\zeta_u\xi_g\rangle}$$

$$\Psi_{46}(e_u t_{2g}, {}^3T_{2u}, M=-1, \xi_u) = \frac{\sqrt{2}\left|\overline{\gamma_u}\,\overline{\xi_g}\right|}{2} + \frac{\sqrt{2}\left|\overline{\zeta_u}\,\overline{\xi_g}\right|}{2}$$
$$\Psi_{47}(e_u t_{2g}, {}^3T_{2u}, M=-1, \phi_u) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\overline{\gamma_u}\,\overline{\phi_g}\right|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}\left|\overline{\zeta_u}\,\overline{\phi_g}\right|}{2}$$
$$\Psi_{48}(e_u t_{2g}, {}^3T_{2u}, M=-1, \chi_u) = -\frac{\sqrt[3]{-1}\sqrt{2}\left|\overline{\gamma_u}\,\overline{\chi_g}\right|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\overline{\zeta_u}\,\overline{\chi_g}\right|}{2}$$
$$\Psi_{49}(e_u t_{2g}, {}^3T_{2u}, M=0, \xi_u) = \frac{\left|\overline{\gamma_u}\xi_g\right|}{2} + \frac{\left|\overline{\zeta_u}\xi_g\right|}{2} + \frac{\left|\gamma_u\overline{\xi_g}\right|}{2} + \frac{\left|\zeta_u\overline{\xi_g}\right|}{2}$$
$$\Psi_{50}(e_u t_{2g}, {}^3T_{2u}, M=0, \phi_u) = \frac{(-1)^{\frac{2}{3}}\left|\overline{\gamma_u}\phi_g\right|}{2} - \frac{\sqrt[3]{-1}\left|\overline{\zeta_u}\phi_g\right|}{2} + \frac{(-1)^{\frac{2}{3}}\left|\gamma_u\overline{\phi_g}\right|}{2} - \frac{\sqrt[3]{-1}\left|\zeta_u\overline{\phi_g}\right|}{2}$$
$$\Psi_{51}(e_u t_{2g}, {}^3T_{2u}, M=0, \chi_u) = -\frac{\sqrt[3]{-1}\left|\overline{\gamma_u}\chi_g\right|}{2} + \frac{(-1)^{\frac{2}{3}}\left|\overline{\zeta_u}\chi_g\right|}{2} - \frac{\sqrt[3]{-1}\left|\gamma_u\overline{\chi_g}\right|}{2} + \frac{(-1)^{\frac{2}{3}}\left|\zeta_u\overline{\chi_g}\right|}{2}$$
$$\Psi_{52}(e_u t_{2g}, {}^3T_{2u}, M=1, \xi_u) = \frac{\sqrt{2}\left|\gamma_u\xi_g\right|}{2} + \frac{\sqrt{2}\left|\zeta_u\xi_g\right|}{2}$$
$$\Psi_{53}(e_u t_{2g}, {}^3T_{2u}, M=1, \phi_u) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\gamma_u\phi_g\right|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}\left|\zeta_u\phi_g\right|}{2}$$
$$\Psi_{54}(e_u t_{2g}, {}^3T_{2u}, M=1, \chi_u) = -\frac{\sqrt[3]{-1}\sqrt{2}\left|\gamma_u\chi_g\right|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\zeta_u\chi_g\right|}{2}$$

$e_g t_{1u}$

$$\boxed{\Delta E = \langle\zeta_g\nu_u||\zeta_g\nu_u\rangle}$$

$$\Psi_{55}(e_g t_{1u}, {}^3T_{2u}, M=-1, \xi_u) = -\frac{\sqrt{2}\left|\overline{\gamma_g}\,\overline{\eta_u}\right|}{2} + \frac{\sqrt{2}\left|\overline{\zeta_g}\,\overline{\eta_u}\right|}{2}$$
$$\Psi_{56}(e_g t_{1u}, {}^3T_{2u}, M=-1, \phi_u) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\overline{\gamma_g}\,\overline{\mu_u}\right|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}\left|\overline{\zeta_g}\,\overline{\mu_u}\right|}{2}$$
$$\Psi_{57}(e_g t_{1u}, {}^3T_{2u}, M=-1, \chi_u) = \frac{\sqrt[3]{-1}\sqrt{2}\left|\overline{\gamma_g}\,\overline{\nu_u}\right|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\overline{\zeta_g}\,\overline{\nu_u}\right|}{2}$$
$$\Psi_{58}(e_g t_{1u}, {}^3T_{2u}, M=0, \xi_u) = -\frac{\left|\overline{\gamma_g}\eta_u\right|}{2} + \frac{\left|\overline{\zeta_g}\eta_u\right|}{2} - \frac{\left|\gamma_g\overline{\eta_u}\right|}{2} + \frac{\left|\zeta_g\overline{\eta_u}\right|}{2}$$
$$\Psi_{59}(e_g t_{1u}, {}^3T_{2u}, M=0, \phi_u) = -\frac{(-1)^{\frac{2}{3}}\left|\overline{\gamma_g}\mu_u\right|}{2} - \frac{\sqrt[3]{-1}\left|\overline{\zeta_g}\mu_u\right|}{2} - \frac{(-1)^{\frac{2}{3}}\left|\gamma_g\overline{\mu_u}\right|}{2} - \frac{\sqrt[3]{-1}\left|\zeta_g\overline{\mu_u}\right|}{2}$$
$$\Psi_{60}(e_g t_{1u}, {}^3T_{2u}, M=0, \chi_u) = \frac{\sqrt[3]{-1}\left|\overline{\gamma_g}\nu_u\right|}{2} + \frac{(-1)^{\frac{2}{3}}\left|\overline{\zeta_g}\nu_u\right|}{2} + \frac{\sqrt[3]{-1}\left|\gamma_g\overline{\nu_u}\right|}{2} + \frac{(-1)^{\frac{2}{3}}\left|\zeta_g\overline{\nu_u}\right|}{2}$$
$$\Psi_{61}(e_g t_{1u}, {}^3T_{2u}, M=1, \xi_u) = -\frac{\sqrt{2}\left|\gamma_g\eta_u\right|}{2} + \frac{\sqrt{2}\left|\zeta_g\eta_u\right|}{2}$$
$$\Psi_{62}(e_g t_{1u}, {}^3T_{2u}, M=1, \phi_u) = -\frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\gamma_g\mu_u\right|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}\left|\zeta_g\mu_u\right|}{2}$$
$$\Psi_{63}(e_g t_{1u}, {}^3T_{2u}, M=1, \chi_u) = \frac{\sqrt[3]{-1}\sqrt{2}\left|\gamma_g\nu_u\right|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\zeta_g\nu_u\right|}{2}$$

$e_g t_{2u}$

$$\boxed{\Delta E = \langle\zeta_g\xi_u||\zeta_g\xi_u\rangle}$$

$$\Psi_{64}(e_g t_{2u}, {}^3T_{2u}, M=-1, \xi_u) = \frac{\sqrt{2}\left|\overline{\gamma_g}\,\overline{\xi_u}\right|}{2} + \frac{\sqrt{2}\left|\overline{\zeta_g}\,\overline{\xi_u}\right|}{2}$$
$$\Psi_{65}(e_g t_{2u}, {}^3T_{2u}, M=-1, \phi_u) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\overline{\gamma_g}\,\overline{\phi_u}\right|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}\left|\overline{\zeta_g}\,\overline{\phi_u}\right|}{2}$$
$$\Psi_{66}(e_g t_{2u}, {}^3T_{2u}, M=-1, \chi_u) = -\frac{\sqrt[3]{-1}\sqrt{2}\left|\overline{\gamma_g}\,\overline{\chi_u}\right|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}\left|\overline{\zeta_g}\,\overline{\chi_u}\right|}{2}$$
$$\Psi_{67}(e_g t_{2u}, {}^3T_{2u}, M=0, \xi_u) = \frac{\left|\overline{\gamma_g}\xi_u\right|}{2} + \frac{\left|\overline{\zeta_g}\xi_u\right|}{2} + \frac{\left|\gamma_g\overline{\xi_u}\right|}{2} + \frac{\left|\zeta_g\overline{\xi_u}\right|}{2}$$
$$\Psi_{68}(e_g t_{2u}, {}^3T_{2u}, M=0, \phi_u) = \frac{(-1)^{\frac{2}{3}}\left|\overline{\gamma_g}\phi_u\right|}{2} - \frac{\sqrt[3]{-1}\left|\overline{\zeta_g}\phi_u\right|}{2} + \frac{(-1)^{\frac{2}{3}}\left|\gamma_g\overline{\phi_u}\right|}{2} - \frac{\sqrt[3]{-1}\left|\zeta_g\overline{\phi_u}\right|}{2}$$

$$\Psi_{69}(e_g t_{2u}, {}^3T_{2u}, M=0, \chi_u) = -\frac{\sqrt[3]{-1}|\overline{\gamma_g}\chi_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\chi_u|}{2} - \frac{\sqrt[3]{-1}|\gamma_g\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\chi_u}|}{2}$$

$$\Psi_{70}(e_g t_{2u}, {}^3T_{2u}, M=1, \xi_u) = \frac{\sqrt{2}|\gamma_g\xi_u|}{2} + \frac{\sqrt{2}|\zeta_g\xi_u|}{2}$$

$$\Psi_{71}(e_g t_{2u}, {}^3T_{2u}, M=1, \phi_u) = \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\gamma_g\phi_u|}{2} - \frac{\sqrt[3]{-1}\sqrt{2}|\zeta_g\phi_u|}{2}$$

$$\Psi_{72}(e_g t_{2u}, {}^3T_{2u}, M=1, \chi_u) = -\frac{\sqrt[3]{-1}\sqrt{2}|\gamma_g\chi_u|}{2} + \frac{(-1)^{\frac{2}{3}}\sqrt{2}|\zeta_g\chi_u|}{2}$$

$t_{1g}t_{1u}$

$$\boxed{\Delta E = \langle\nu_g\mu_u||\nu_g\mu_u\rangle - \langle\nu_g\nu_g||\mu_u\mu_u\rangle + \langle\nu_g\nu_u||\nu_g\nu_u\rangle - \langle\nu_g\mu_g||\nu_u\mu_u\rangle}$$

$$\Psi_{73}(t_{1g}t_{1u}, {}^3T_{2u}, M=-1, \chi_u) = \frac{\sqrt{2}|\overline{\eta_g}\overline{\mu_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\overline{\eta_u}|}{2}$$

$$\Psi_{74}(t_{1g}t_{1u}, {}^3T_{2u}, M=-1, \phi_u) = \frac{\sqrt{2}|\overline{\eta_g}\overline{\nu_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\overline{\eta_u}|}{2}$$

$$\Psi_{75}(t_{1g}t_{1u}, {}^3T_{2u}, M=-1, \xi_u) = \frac{\sqrt{2}|\overline{\mu_g}\overline{\nu_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\overline{\mu_u}|}{2}$$

$$\Psi_{76}(t_{1g}t_{1u}, {}^3T_{2u}, M=0, \chi_u) = \frac{|\overline{\eta_g}\mu_u|}{2} + \frac{|\overline{\mu_g}\eta_u|}{2} + \frac{|\eta_g\overline{\mu_u}|}{2} + \frac{|\mu_g\overline{\eta_u}|}{2}$$

$$\Psi_{77}(t_{1g}t_{1u}, {}^3T_{2u}, M=0, \phi_u) = \frac{|\overline{\eta_g}\nu_u|}{2} + \frac{|\overline{\nu_g}\eta_u|}{2} + \frac{|\eta_g\overline{\nu_u}|}{2} + \frac{|\nu_g\overline{\eta_u}|}{2}$$

$$\Psi_{78}(t_{1g}t_{1u}, {}^3T_{2u}, M=0, \xi_u) = \frac{|\overline{\mu_g}\nu_u|}{2} + \frac{|\overline{\nu_g}\mu_u|}{2} + \frac{|\mu_g\overline{\nu_u}|}{2} + \frac{|\nu_g\overline{\mu_u}|}{2}$$

$$\Psi_{79}(t_{1g}t_{1u}, {}^3T_{2u}, M=1, \chi_u) = \frac{\sqrt{2}|\eta_g\mu_u|}{2} + \frac{\sqrt{2}|\mu_g\eta_u|}{2}$$

$$\Psi_{80}(t_{1g}t_{1u}, {}^3T_{2u}, M=1, \phi_u) = \frac{\sqrt{2}|\eta_g\nu_u|}{2} + \frac{\sqrt{2}|\nu_g\eta_u|}{2}$$

$$\Psi_{81}(t_{1g}t_{1u}, {}^3T_{2u}, M=1, \xi_u) = \frac{\sqrt{2}|\mu_g\nu_u|}{2} + \frac{\sqrt{2}|\nu_g\mu_u|}{2}$$

$t_{1g}t_{2u}$

$$\boxed{\Delta E = -\langle\nu_g\chi_u||\nu_g\chi_u\rangle - \langle\nu_g\nu_g||\xi_u\xi_u\rangle + \langle\nu_g\xi_u||\nu_g\xi_u\rangle + \langle\nu_g\mu_g||\chi_u\phi_u\rangle}$$

$$\Psi_{82}(t_{1g}t_{2u}, {}^3T_{2u}, M=-1, \chi_u) = -\frac{\sqrt{2}|\overline{\eta_g}\overline{\phi_u}|}{2} + \frac{\sqrt{2}|\overline{\mu_g}\overline{\xi_u}|}{2}$$

$$\Psi_{83}(t_{1g}t_{2u}, {}^3T_{2u}, M=-1, \phi_u) = \frac{\sqrt{2}|\overline{\eta_g}\overline{\chi_u}|}{2} - \frac{\sqrt{2}|\overline{\nu_g}\overline{\xi_u}|}{2}$$

$$\Psi_{84}(t_{1g}t_{2u}, {}^3T_{2u}, M=-1, \xi_u) = -\frac{\sqrt{2}|\overline{\mu_g}\overline{\chi_u}|}{2} + \frac{\sqrt{2}|\overline{\nu_g}\overline{\phi_u}|}{2}$$

$$\Psi_{85}(t_{1g}t_{2u}, {}^3T_{2u}, M=0, \chi_u) = -\frac{|\overline{\eta_g}\phi_u|}{2} + \frac{|\overline{\mu_g}\xi_u|}{2} - \frac{|\eta_g\overline{\phi_u}|}{2} + \frac{|\mu_g\overline{\xi_u}|}{2}$$

$$\Psi_{86}(t_{1g}t_{2u}, {}^3T_{2u}, M=0, \phi_u) = \frac{|\overline{\eta_g}\chi_u|}{2} - \frac{|\overline{\nu_g}\xi_u|}{2} + \frac{|\eta_g\overline{\chi_u}|}{2} - \frac{|\nu_g\overline{\xi_u}|}{2}$$

$$\Psi_{87}(t_{1g}t_{2u}, {}^3T_{2u}, M=0, \xi_u) = -\frac{|\overline{\mu_g}\chi_u|}{2} + \frac{|\overline{\nu_g}\phi_u|}{2} - \frac{|\mu_g\overline{\chi_u}|}{2} + \frac{|\nu_g\overline{\phi_u}|}{2}$$

$$\Psi_{88}(t_{1g}t_{2u}, {}^3T_{2u}, M=1, \chi_u) = -\frac{\sqrt{2}|\eta_g\phi_u|}{2} + \frac{\sqrt{2}|\mu_g\xi_u|}{2}$$

$$\Psi_{89}(t_{1g}t_{2u}, {}^3T_{2u}, M=1, \phi_u) = \frac{\sqrt{2}|\eta_g\chi_u|}{2} - \frac{\sqrt{2}|\nu_g\xi_u|}{2}$$

$$\Psi_{90}(t_{1g}t_{2u}, {}^3T_{2u}, M=1, \xi_u) = -\frac{\sqrt{2}|\mu_g\chi_u|}{2} + \frac{\sqrt{2}|\nu_g\phi_u|}{2}$$

$t_{1u}t_{2g}$

$$\boxed{\Delta E = -\langle\xi_g\eta_u||\xi_g\eta_u\rangle + \langle\xi_g\nu_u||\xi_g\nu_u\rangle - \langle\xi_g\xi_g||\nu_u\nu_u\rangle + \langle\xi_g\phi_g||\eta_u\mu_u\rangle}$$

$$\Psi_{91}(t_{1u}t_{2g}, {}^3T_{2u}, M=-1, \chi_u) = \frac{\sqrt{2}|\overline{\phi_g}\overline{\eta_u}|}{2} - \frac{\sqrt{2}|\overline{\xi_g}\overline{\mu_u}|}{2}$$

$$\Psi_{92}(t_{1u}t_{2g}, {}^3T_{2u}, M=-1, \phi_u) = -\frac{\sqrt{2}|\overline{\chi_g}\overline{\eta_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\nu_u}|}{2}$$

$$\Psi_{93}(t_{1u}t_{2g}, {}^3T_{2u}, M=-1, \xi_u) = \frac{\sqrt{2}|\overline{\chi_g}\overline{\mu_u}|}{2} - \frac{\sqrt{2}|\overline{\phi_g}\overline{\nu_u}|}{2}$$

$$\Psi_{94}(t_{1u}t_{2g}, {}^3T_{2u}, M=0, \chi_u) = \frac{|\overline{\phi_g}\eta_u|}{2} - \frac{|\overline{\xi_g}\mu_u|}{2} + \frac{|\phi_g\overline{\eta_u}|}{2} - \frac{|\xi_g\overline{\mu_u}|}{2}$$

$$\Psi_{95}(t_{1u}t_{2g}, {}^3T_{2u}, M=0, \phi_u) = -\frac{|\overline{\chi_g}\eta_u|}{2} + \frac{|\overline{\xi_g}\nu_u|}{2} - \frac{|\chi_g\overline{\eta_u}|}{2} + \frac{|\xi_g\overline{\nu_u}|}{2}$$

$$\Psi_{96}(t_{1u}t_{2g}, {}^3T_{2u}, M=0, \xi_u) = \frac{|\overline{\chi_g}\mu_u|}{2} - \frac{|\overline{\phi_g}\nu_u|}{2} + \frac{|\chi_g\overline{\mu_u}|}{2} - \frac{|\phi_g\overline{\nu_u}|}{2}$$

$$\Psi_{97}(t_{1u}t_{2g}, {}^3T_{2u}, M=1, \chi_u) = \frac{\sqrt{2}|\phi_g\eta_u|}{2} - \frac{\sqrt{2}|\xi_g\mu_u|}{2}$$

$$\Psi_{98}(t_{1u}t_{2g}, {}^3T_{2u}, M=1, \phi_u) = -\frac{\sqrt{2}|\chi_g\eta_u|}{2} + \frac{\sqrt{2}|\xi_g\nu_u|}{2}$$

$$\Psi_{99}(t_{1u}t_{2g}, {}^3T_{2u}, M=1, \xi_u) = \frac{\sqrt{2}|\chi_g\mu_u|}{2} - \frac{\sqrt{2}|\phi_g\nu_u|}{2}$$

$t_{2g}t_{2u}$

$$\boxed{\Delta E = \langle\xi_g\phi_u||\xi_g\phi_u\rangle - \langle\xi_g\xi_g||\phi_u\phi_u\rangle + \langle\xi_g\xi_u||\xi_g\xi_u\rangle - \langle\xi_g\phi_g||\xi_u\phi_u\rangle}$$

$$\Psi_{100}(t_{2g}t_{2u}, {}^3T_{2u}, M=-1, \chi_u) = \frac{\sqrt{2}|\overline{\phi_g}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\phi_u}|}{2}$$

$$\Psi_{101}(t_{2g}t_{2u}, {}^3T_{2u}, M=-1, \phi_u) = \frac{\sqrt{2}|\overline{\chi_g}\overline{\xi_u}|}{2} + \frac{\sqrt{2}|\overline{\xi_g}\overline{\chi_u}|}{2}$$

$$\Psi_{102}(t_{2g}t_{2u}, {}^3T_{2u}, M=-1, \xi_u) = \frac{\sqrt{2}|\overline{\chi_g}\overline{\phi_u}|}{2} + \frac{\sqrt{2}|\overline{\phi_g}\overline{\chi_u}|}{2}$$

$$\Psi_{103}(t_{2g}t_{2u}, {}^3T_{2u}, M=0, \chi_u) = \frac{|\overline{\phi_g}\xi_u|}{2} + \frac{|\overline{\xi_g}\phi_u|}{2} + \frac{|\phi_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\phi_u}|}{2}$$

$$\Psi_{104}(t_{2g}t_{2u}, {}^3T_{2u}, M=0, \phi_u) = \frac{|\overline{\chi_g}\xi_u|}{2} + \frac{|\overline{\xi_g}\chi_u|}{2} + \frac{|\chi_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\chi_u}|}{2}$$

$$\Psi_{105}(t_{2g}t_{2u}, {}^3T_{2u}, M=0, \xi_u) = \frac{|\overline{\chi_g}\phi_u|}{2} + \frac{|\overline{\phi_g}\chi_u|}{2} + \frac{|\chi_g\overline{\phi_u}|}{2} + \frac{|\phi_g\overline{\chi_u}|}{2}$$

$$\Psi_{106}(t_{2g}t_{2u}, {}^3T_{2u}, M=1, \chi_u) = \frac{\sqrt{2}|\phi_g\xi_u|}{2} + \frac{\sqrt{2}|\xi_g\phi_u|}{2}$$

$$\Psi_{107}(t_{2g}t_{2u}, {}^3T_{2u}, M=1, \phi_u) = \frac{\sqrt{2}|\chi_g\xi_u|}{2} + \frac{\sqrt{2}|\xi_g\chi_u|}{2}$$

$$\Psi_{108}(t_{2g}t_{2u}, {}^3T_{2u}, M=1, \xi_u) = \frac{\sqrt{2}|\chi_g\phi_u|}{2} + \frac{\sqrt{2}|\phi_g\chi_u|}{2}$$

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$a_{1g}t_{2u}$

$$\boxed{\Delta E = \langle \alpha_g\alpha_g||\xi_u\xi_u\rangle + \langle \alpha_g\xi_u||\alpha_g\xi_u\rangle}$$

$$\Psi_1(a_{1g}t_{2u}, {}^1T_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\xi_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\xi_u}|}{2}$$
$$\Psi_2(a_{1g}t_{2u}, {}^1T_{2u}, M=0, \phi_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\phi_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\phi_u}|}{2}$$
$$\Psi_3(a_{1g}t_{2u}, {}^1T_{2u}, M=0, \chi_u) = -\frac{\sqrt{2}|\overline{\alpha_g}\chi_u|}{2} + \frac{\sqrt{2}|\alpha_g\overline{\chi_u}|}{2}$$

$a_{2u}t_{1g}$

$$\boxed{\Delta E = \langle \beta_u\beta_u||\nu_g\nu_g\rangle + \langle \beta_u\nu_g||\beta_u\nu_g\rangle}$$

$$\Psi_4(a_{2u}t_{1g}, {}^1T_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\beta_u}\eta_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\eta_g}|}{2}$$
$$\Psi_5(a_{2u}t_{1g}, {}^1T_{2u}, M=0, \phi_u) = -\frac{\sqrt{2}|\overline{\beta_u}\mu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\mu_g}|}{2}$$
$$\Psi_6(a_{2u}t_{1g}, {}^1T_{2u}, M=0, \chi_u) = -\frac{\sqrt{2}|\overline{\beta_u}\nu_g|}{2} + \frac{\sqrt{2}|\beta_u\overline{\nu_g}|}{2}$$

$a_{1u}t_{2g}$

$$\boxed{\Delta E = \langle \alpha_u\alpha_u||\xi_g\xi_g\rangle + \langle \alpha_u\xi_g||\alpha_u\xi_g\rangle}$$

$$\Psi_7(a_{1u}t_{2g}, {}^1T_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\xi_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\xi_g}|}{2}$$
$$\Psi_8(a_{1u}t_{2g}, {}^1T_{2u}, M=0, \phi_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\phi_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\phi_g}|}{2}$$
$$\Psi_9(a_{1u}t_{2g}, {}^1T_{2u}, M=0, \chi_u) = -\frac{\sqrt{2}|\overline{\alpha_u}\chi_g|}{2} + \frac{\sqrt{2}|\alpha_u\overline{\chi_g}|}{2}$$

$a_{2g}t_{1u}$

$$\boxed{\Delta E = \langle \beta_g\beta_g||\nu_u\nu_u\rangle + \langle \beta_g\nu_u||\beta_g\nu_u\rangle}$$

$$\Psi_{10}(a_{2g}t_{1u}, {}^1T_{2u}, M=0, \xi_u) = -\frac{\sqrt{2}|\overline{\beta_g}\eta_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\eta_u}|}{2}$$
$$\Psi_{11}(a_{2g}t_{1u}, {}^1T_{2u}, M=0, \phi_u) = -\frac{\sqrt{2}|\overline{\beta_g}\mu_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\mu_u}|}{2}$$
$$\Psi_{12}(a_{2g}t_{1u}, {}^1T_{2u}, M=0, \chi_u) = -\frac{\sqrt{2}|\overline{\beta_g}\nu_u|}{2} + \frac{\sqrt{2}|\beta_g\overline{\nu_u}|}{2}$$

e_ut_{1g}

$$\boxed{\Delta E = \langle \zeta_u\nu_g||\zeta_u\nu_g\rangle}$$

$$\Psi_{13}(e_ut_{1g}, {}^1T_{2u}, M=0, \xi_u) = \frac{|\overline{\gamma_u}\eta_g|}{2} - \frac{|\overline{\zeta_u}\eta_g|}{2} - \frac{|\gamma_u\overline{\eta_g}|}{2} + \frac{|\zeta_u\overline{\eta_g}|}{2}$$
$$\Psi_{14}(e_ut_{1g}, {}^1T_{2u}, M=0, \phi_u) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\mu_g|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_u}\mu_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\mu_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\mu_g}|}{2}$$
$$\Psi_{15}(e_ut_{1g}, {}^1T_{2u}, M=0, \chi_u) = -\frac{\sqrt[3]{-1}|\overline{\gamma_u}\nu_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\nu_g|}{2} + \frac{\sqrt[3]{-1}|\gamma_u\overline{\nu_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\nu_g}|}{2}$$

e_ut_{2g}

$$\boxed{\Delta E = \langle \zeta_u\xi_g||\zeta_u\xi_g\rangle}$$

$$\Psi_{16}(e_ut_{2g}, {}^1T_{2u}, M=0, \xi_u) = -\frac{|\overline{\gamma_u}\xi_g|}{2} - \frac{|\overline{\zeta_u}\xi_g|}{2} + \frac{|\gamma_u\overline{\xi_g}|}{2} + \frac{|\zeta_u\overline{\xi_g}|}{2}$$
$$\Psi_{17}(e_ut_{2g}, {}^1T_{2u}, M=0, \phi_u) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_u}\phi_g|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_u}\phi_g|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_u\overline{\phi_g}|}{2} - \frac{\sqrt[3]{-1}|\zeta_u\overline{\phi_g}|}{2}$$
$$\Psi_{18}(e_ut_{2g}, {}^1T_{2u}, M=0, \chi_u) = \frac{\sqrt[3]{-1}|\overline{\gamma_u}\chi_g|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_u}\chi_g|}{2} - \frac{\sqrt[3]{-1}|\gamma_u\overline{\chi_g}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_u\overline{\chi_g}|}{2}$$

e_gt_{1u}

$$\boxed{\Delta E = \langle \zeta_g\nu_u||\zeta_g\nu_u\rangle}$$

$$\Psi_{19}(e_gt_{1u}, {}^1T_{2u}, M=0, \xi_u) = \frac{|\overline{\gamma_g}\eta_u|}{2} - \frac{|\overline{\zeta_g}\eta_u|}{2} - \frac{|\gamma_g\overline{\eta_u}|}{2} + \frac{|\zeta_g\overline{\eta_u}|}{2}$$
$$\Psi_{20}(e_gt_{1u}, {}^1T_{2u}, M=0, \phi_u) = \frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\mu_u|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_g}\mu_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\mu_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\mu_u}|}{2}$$
$$\Psi_{21}(e_gt_{1u}, {}^1T_{2u}, M=0, \chi_u) = -\frac{\sqrt[3]{-1}|\overline{\gamma_g}\nu_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\nu_u|}{2} + \frac{\sqrt[3]{-1}|\gamma_g\overline{\nu_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\nu_u}|}{2}$$

e_gt_{2u}

$$\boxed{\Delta E = \langle \zeta_g\xi_u||\zeta_g\xi_u\rangle}$$

$$\Psi_{22}(e_gt_{2u}, {}^1T_{2u}, M=0, \xi_u) = -\frac{|\overline{\gamma_g}\xi_u|}{2} - \frac{|\overline{\zeta_g}\xi_u|}{2} + \frac{|\gamma_g\overline{\xi_u}|}{2} + \frac{|\zeta_g\overline{\xi_u}|}{2}$$
$$\Psi_{23}(e_gt_{2u}, {}^1T_{2u}, M=0, \phi_u) = -\frac{(-1)^{\frac{2}{3}}|\overline{\gamma_g}\phi_u|}{2} + \frac{\sqrt[3]{-1}|\overline{\zeta_g}\phi_u|}{2} + \frac{(-1)^{\frac{2}{3}}|\gamma_g\overline{\phi_u}|}{2} - \frac{\sqrt[3]{-1}|\zeta_g\overline{\phi_u}|}{2}$$
$$\Psi_{24}(e_gt_{2u}, {}^1T_{2u}, M=0, \chi_u) = \frac{\sqrt[3]{-1}|\overline{\gamma_g}\chi_u|}{2} - \frac{(-1)^{\frac{2}{3}}|\overline{\zeta_g}\chi_u|}{2} - \frac{\sqrt[3]{-1}|\gamma_g\overline{\chi_u}|}{2} + \frac{(-1)^{\frac{2}{3}}|\zeta_g\overline{\chi_u}|}{2}$$

$t_{1g}t_{1u}$

$$\boxed{\begin{array}{c}\Delta E = \langle \nu_g\mu_u||\nu_g\mu_u\rangle + \langle \nu_g\nu_g||\mu_u\mu_u\rangle + \langle \nu_g\nu_u||\nu_g\nu_u\rangle \\ + \langle \nu_g\mu_g||\nu_u\mu_u\rangle\end{array}}$$

$$\Psi_{25}(t_{1g}t_{1u}, {}^1T_{2u}, M=0, \chi_u) = -\frac{|\overline{\eta_g}\mu_u|}{2} - \frac{|\overline{\mu_g}\eta_u|}{2} + \frac{|\eta_g\overline{\mu_u}|}{2} + \frac{|\mu_g\overline{\eta_u}|}{2}$$
$$\Psi_{26}(t_{1g}t_{1u}, {}^1T_{2u}, M=0, \phi_u) = -\frac{|\overline{\eta_g}\nu_u|}{2} - \frac{|\overline{\nu_g}\eta_u|}{2} + \frac{|\eta_g\overline{\nu_u}|}{2} + \frac{|\nu_g\overline{\eta_u}|}{2}$$
$$\Psi_{27}(t_{1g}t_{1u}, {}^1T_{2u}, M=0, \xi_u) = -\frac{|\overline{\mu_g}\nu_u|}{2} - \frac{|\overline{\nu_g}\mu_u|}{2} + \frac{|\mu_g\overline{\nu_u}|}{2} + \frac{|\nu_g\overline{\mu_u}|}{2}$$

$t_{1g}t_{2u}$

$$\boxed{\begin{array}{c}\Delta E = -\langle \nu_g\chi_u||\nu_g\chi_u\rangle + \langle \nu_g\nu_g||\xi_u\xi_u\rangle + \langle \nu_g\xi_u||\nu_g\xi_u\rangle \\ - \langle \nu_g\mu_g||\chi_u\phi_u\rangle\end{array}}$$

$$\Psi_{28}(t_{1g}t_{2u}, {}^1T_{2u}, M=0, \chi_u) = \frac{|\overline{\eta_g}\phi_u|}{2} - \frac{|\overline{\mu_g}\xi_u|}{2} - \frac{|\eta_g\overline{\phi_u}|}{2} + \frac{|\mu_g\overline{\xi_u}|}{2}$$

$$\Psi_{29}(t_{1g}t_{2u}, {}^1T_{2u}, M=0, \phi_u) = -\frac{|\overline{\eta_g}\chi_u|}{2} + \frac{|\overline{\nu_g}\xi_u|}{2} + \frac{|\eta_g\overline{\chi_u}|}{2} - \frac{|\nu_g\overline{\xi_u}|}{2}$$

$$\Psi_{30}(t_{1g}t_{2u}, {}^1T_{2u}, M=0, \xi_u) = \frac{|\overline{\mu_g}\chi_u|}{2} - \frac{|\overline{\nu_g}\phi_u|}{2} - \frac{|\mu_g\overline{\chi_u}|}{2} + \frac{|\nu_g\overline{\phi_u}|}{2}$$

$t_{1u}t_{2g}$

$$\boxed{\Delta E = -\langle\xi_g\eta_u||\xi_g\eta_u\rangle + \langle\xi_g\nu_u||\xi_g\nu_u\rangle + \langle\xi_g\xi_g||\nu_u\nu_u\rangle - \langle\xi_g\phi_g||\eta_u\mu_u\rangle}$$

$$\Psi_{31}(t_{1u}t_{2g}, {}^1T_{2u}, M=0, \chi_u) = -\frac{|\overline{\phi_g}\eta_u|}{2} + \frac{|\overline{\xi_g}\mu_u|}{2} + \frac{|\phi_g\overline{\eta_u}|}{2} - \frac{|\xi_g\overline{\mu_u}|}{2}$$

$$\Psi_{32}(t_{1u}t_{2g}, {}^1T_{2u}, M=0, \phi_u) = \frac{|\overline{\chi_g}\eta_u|}{2} - \frac{|\overline{\xi_g}\nu_u|}{2} - \frac{|\chi_g\overline{\eta_u}|}{2} + \frac{|\xi_g\overline{\nu_u}|}{2}$$

$$\Psi_{33}(t_{1u}t_{2g}, {}^1T_{2u}, M=0, \xi_u) = -\frac{|\overline{\chi_g}\mu_u|}{2} + \frac{|\overline{\phi_g}\nu_u|}{2} + \frac{|\chi_g\overline{\mu_u}|}{2} - \frac{|\phi_g\overline{\nu_u}|}{2}$$

$t_{2g}t_{2u}$

$$\boxed{\Delta E = \langle\xi_g\phi_u||\xi_g\phi_u\rangle + \langle\xi_g\xi_g||\phi_u\phi_u\rangle + \langle\xi_g\xi_u||\xi_g\xi_u\rangle + \langle\xi_g\phi_g||\xi_u\phi_u\rangle}$$

$$\Psi_{34}(t_{2g}t_{2u}, {}^1T_{2u}, M=0, \chi_u) = -\frac{|\overline{\phi_g}\xi_u|}{2} - \frac{|\overline{\xi_g}\phi_u|}{2} + \frac{|\phi_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\phi_u}|}{2}$$

$$\Psi_{35}(t_{2g}t_{2u}, {}^1T_{2u}, M=0, \phi_u) = -\frac{|\overline{\chi_g}\xi_u|}{2} - \frac{|\overline{\xi_g}\chi_u|}{2} + \frac{|\chi_g\overline{\xi_u}|}{2} + \frac{|\xi_g\overline{\chi_u}|}{2}$$

$$\Psi_{36}(t_{2g}t_{2u}, {}^1T_{2u}, M=0, \xi_u) = -\frac{|\overline{\chi_g}\phi_u|}{2} - \frac{|\overline{\phi_g}\chi_u|}{2} + \frac{|\chi_g\overline{\phi_u}|}{2} + \frac{|\phi_g\overline{\chi_u}|}{2}$$