

$$\begin{array}{c} \xrightarrow{\alpha} \\ \leftarrow \alpha' \\ \downarrow a \end{array} = T_{\alpha\alpha'}^{(e)a}$$

$$\begin{array}{c} \xrightarrow{\sigma} \\ \leftarrow \alpha' \\ \downarrow a \end{array} = T_{\alpha\alpha'}^{(\sigma)a}$$

T antisymétrique:

$$\begin{array}{c} \xrightarrow{\alpha'} \\ \leftarrow \alpha \\ \downarrow a \end{array} = - \begin{array}{c} \xrightarrow{\alpha} \\ \leftarrow \alpha' \\ \downarrow a \end{array}$$

ainsi le produit s'effectue en reliant les flèches:

$$\begin{array}{c} \xrightarrow{\alpha''} \\ \leftarrow \alpha' \\ \downarrow a \\ \downarrow b \\ \leftarrow \alpha \end{array} = T_{\alpha\alpha'}^{(e)a} T_{\alpha'\alpha''}^{(e)b}$$

$$\begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \alpha \\ \downarrow \delta \end{array} = (db^{(\beta\alpha)})_{\alpha\beta} = \begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \alpha \\ \downarrow \delta \end{array}$$

orthogonalité:

$$\begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \beta' \\ \downarrow \delta \end{array} = \begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \beta' \\ \downarrow \delta \end{array}$$

$$\int_{\beta\beta'} \int_{\delta\delta'} = \sum_{\alpha,\alpha'} (db^{(\beta\alpha)})_{\alpha\beta} (db^{(\beta'\alpha')})_{\alpha'\beta'}$$

complétude:

$$\begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \beta' \\ \downarrow \delta \end{array} = \begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \beta' \\ \downarrow \delta \end{array}$$

$$\int_{\alpha\alpha'} \int_{\beta\beta'} = \sum_{\gamma,\gamma'} (db^{(\beta\gamma)})_{\alpha\beta} (db^{(\beta'\gamma')})_{\alpha'\beta'}$$

question 2:

antisymétrie de  $T^{(\sigma)\alpha}$  et  $T^{(e)\alpha}$       antisymétrie de  $T^{(\sigma)\alpha}$

$$\begin{array}{c} \xrightarrow{\beta'} \\ \leftarrow \beta \\ \downarrow a \end{array} = \begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \beta' \\ \downarrow a \end{array} = - \begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \beta' \\ \downarrow a \end{array} = - \begin{array}{c} \xrightarrow{\beta} \\ \leftarrow \beta' \\ \downarrow a \end{array}$$

$$X_{\alpha\beta; \alpha'\beta'} = T_{\alpha\alpha'}^{(e)a} T_{\beta\beta'}^{(\sigma)a} = - \sum_{\gamma,\gamma'} (db^{(\beta\gamma)})_{\alpha\beta} (T^{(e)a} db^{(\sigma\gamma')} T^{(\sigma)\alpha})_{\alpha'\beta'}$$



question 3

On introduit une notation graphique pour  $T^{(\sigma)a}$ :

$$\begin{array}{c} a \\ \uparrow \\ \text{---} \bigcirc \text{---} \\ \delta' \quad \delta \end{array} = T_{\delta\delta'}^{(\sigma)a}$$

Alors  $\sum_{\delta'} T_{\delta\delta'}^{(\sigma)a} (db^{(\sigma\delta')})_{\alpha\beta} = - \sum_{\alpha'} T_{\alpha\alpha'}^{(\rho)a} (db^{(\rho\alpha')})_{\alpha'\beta} + \sum_{\beta'} (db^{(\rho\beta')})_{\alpha\beta'} (T_{\beta'\beta}^{(\sigma)a})_{\beta\beta}$

s'écrit:

question 4

①  $X_{\alpha\beta; \alpha'\beta'}$

= -

+ c<sub>σ</sub>

= + c<sub>σ</sub>

+

+

- c<sub>σ</sub>

= (c<sub>σ</sub> - c<sub>σ</sub>)

⊕

②  $X_{\alpha\beta; \alpha'\beta'}$

=

- c<sub>e</sub>

donc, en combinant les deux écritures ① et ② :

$$X_{\alpha\beta; \alpha'\beta'} = \frac{1}{2} (c_{\sigma} + c_e - c_{\rho})$$

$$= \frac{1}{2} (c_{\sigma} + c_e - c_{\rho}) (db^{(\sigma\delta)})_{\alpha\beta} (db^{(\rho\delta')})_{\alpha'\beta'}$$