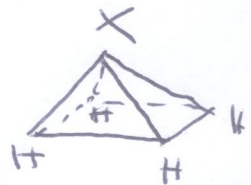


Homework set # 6, due November 12, 2020

1. In class we discussed the 3 dimensional representation matrices $D(g)$ for the symmetry of H_2O
- Write down the explicit form of the 4 matrices
 - Diagonalize these matrices and write down the diagonalized matrix
 - Which matrix entries are related to translations, rotations and vibrations

2. a) What are the symmetries of the molecule XH_3 in the shape of a pyramid! (there are 8)



- What are the conjugacy classes! (there are 5)
- Determine the character table.

3. Do exercise A. 19 of GS

4. For Pauli matrices show the completeness relation

a)
$$\sum_{p=1}^3 \sigma_{p\alpha\beta} \sigma_{p\gamma\delta} = 2\delta_{\alpha\delta} \delta_{\beta\gamma} - \delta_{\alpha\beta} \delta_{\gamma\delta}$$

b) if $u \in SU(2)$ then

$$u \sigma_k u^{-1} = \sum_{e=1}^3 R_{ke} \sigma_e$$

Use a to show that R_{ke} is a rotation i.e. $R^T R = 1$