Q. Define orgel diagram and electronic spectra in $[Ti(H_2O)_6]^{3+}$ and $[Cu(H_2O)_6]^{2+}$ complexes.

a) $[Ti(H_2O)_6]^{3+} \rightarrow Ti^{+3} \rightarrow d^1$ ——

↑				
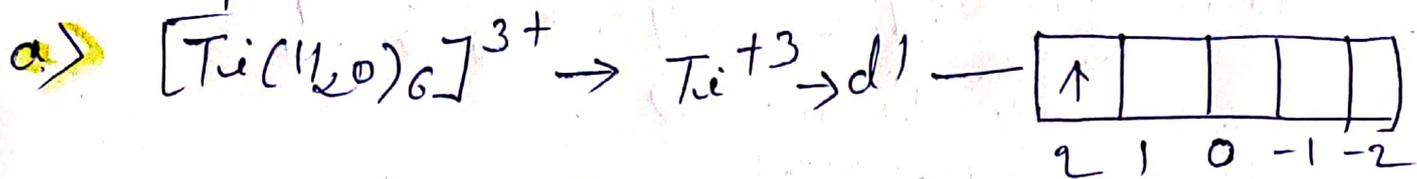
2 1 0 -1 -2

Term symbol — $L = 2 \therefore$ Term $= D$

Spin multiplicity $2S+1 = 2 \times \frac{1}{2} + 1 = 2$

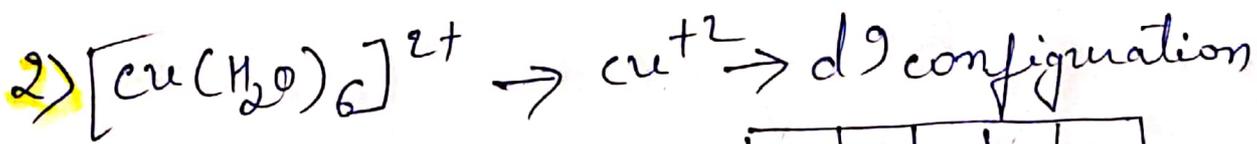$$= {}^2D$$

${}^2D$ Term split in to T_{2g} & E_g.
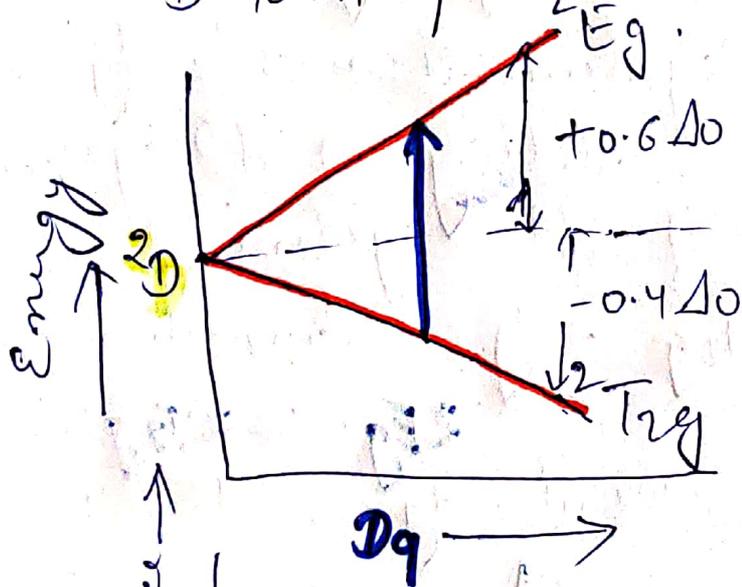
only one Transition

$${}^2T_{2g} \rightarrow {}^2E_g$$

$\therefore$ we get only one Peak in spectra.

2) $[Cu(H_2O)_6]^{2+} \rightarrow Cu^{+2} \rightarrow d^9$ configuration

↑L	↑L	↑↓	↑↓	↑
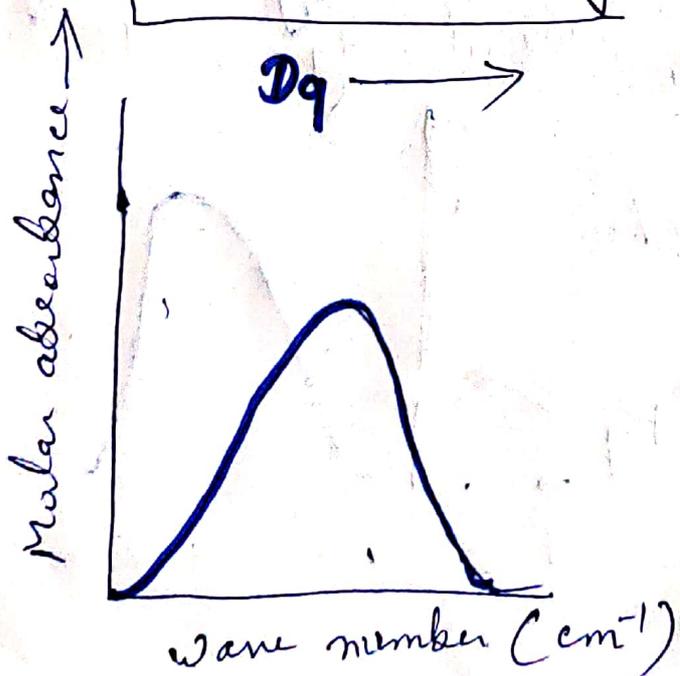
$\qquad$ 2 $\quad$ 1 $\quad$ 0 $\quad$ -1 $\quad$ -2

Term symbol- $L = 6-4 = 2$, $S = \frac{1}{2}$

$\therefore$ Term $= D$

Spin multiplicity $= 2S+1$

$\qquad = 2 \times \frac{1}{2} + 1 = 2$

Term symbol ^2D

Splitting of $^2D \rightarrow {}^2T_{2g} + {}^2E_g$.

Since in d^9 system there is only one whole therefore splitting of d^9 system is just inverse of d^1 system. only one transition

$^2E_g \rightarrow {}^2T_{2g}$ $\therefore$ we get only one Peak.

$^2T_{2g}$

$+0.4\Delta_0$

$-0.6\Delta_0$

^2E_g

^2D

Energy $\rightarrow$

$Dq \rightarrow$

molar absorbance $\rightarrow$

wave number (cm^{-1})