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

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

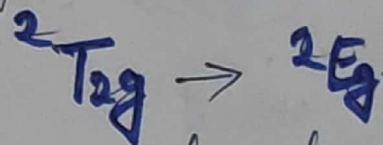| ↑				
2	1	0	-1	-2
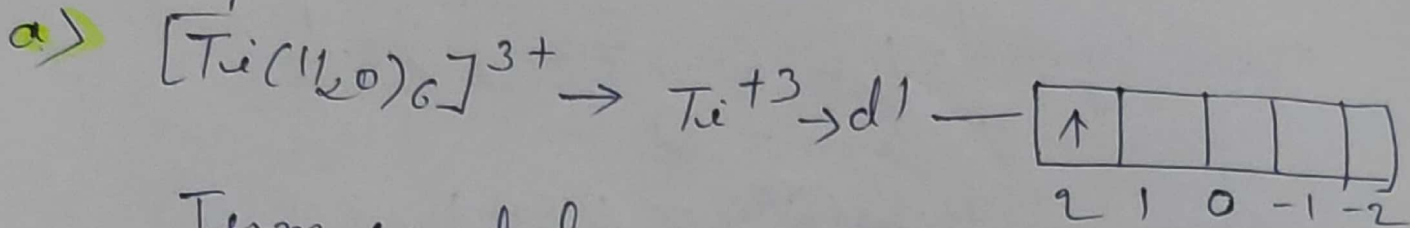
Term symbol — $L = 2$ ∴ Term $= D$

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

$= {}^2D$

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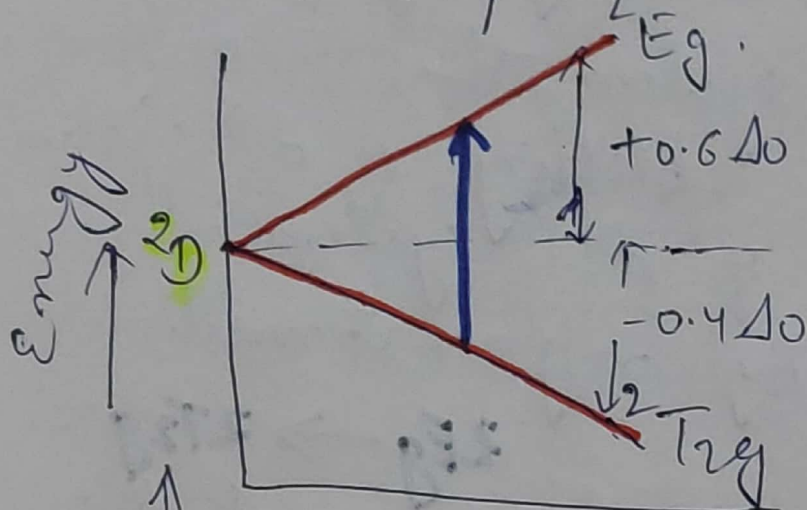
only one Transition

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

∴ we get only one Peak in spectra.

+0.6 Δ_0

-0.4 Δ_0

^2E_g

$^2T_{2g}$

^2D

Energy →

$Dq \longrightarrow$

Molar absorbance →

wave number (cm^{-1})
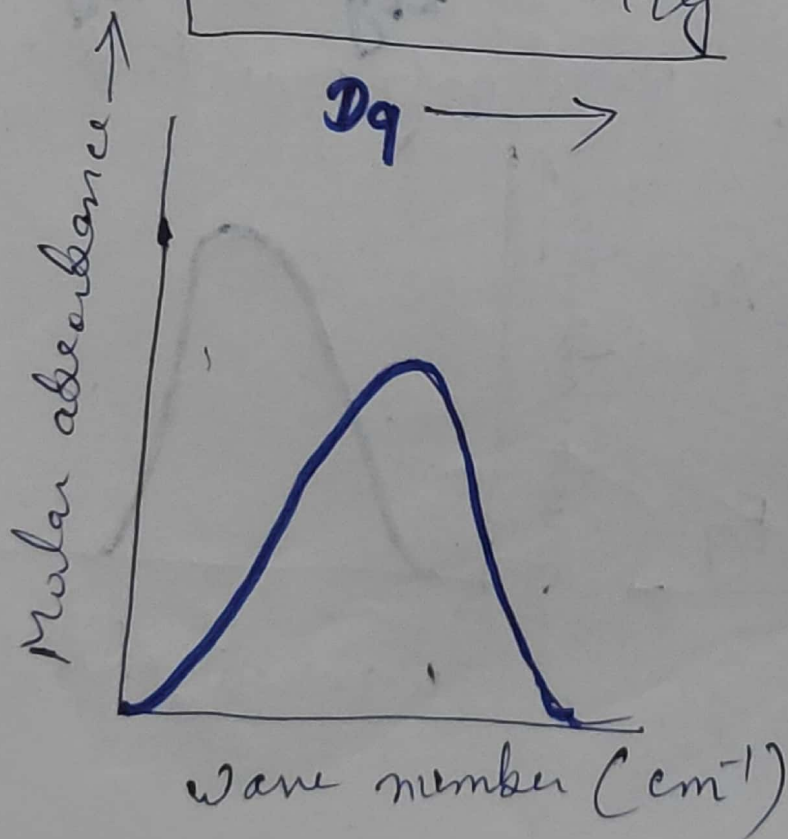
$[Cu(H_2O)_6]^{2+} \rightarrow Cu^{+2} \rightarrow d^9$ configuration

↑↓	↑↓	↑↓	↑↓	↑

$$2 \quad 1 \quad 0 \quad -1 \quad -2$$

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

$\therefore$ Term $= D$

Spin multiplicity $= 2S+1$

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

Term symbol ^2D

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

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

$^2E_g \longrightarrow {}^2T_{2g}$ $\therefore$

we get only one Peak.

$^2T_{2g}$

$+0.4\Delta_0$

$-0.6\Delta_0$

^2D

^2E_g

molar absorbance $\longrightarrow$

$Dq \longrightarrow$

wave number (cm^{-1})