JABLONKI DIAGRAM

PREREQUISITE

- Types of excitation
- Ground state and excited state

LEARNING OUTCOMES

- Knowledge of Jablonski diagram
- Electronic energy state
- Absorbance and photochemical phenomenon

- **Jablonski diagram** is a diagram that illustrates the electronic states of a molecule and the transitions between them.

- A Jablonski diagram is basically an energy diagram, arranged with energy on a vertical axis

- The energy levels can be quantitatively denoted, but most of these diagrams use energy levels schematically.

- The rest of the diagram is arranged into columns. Every column usually represents a specific spin multiplicity for a particular species.

- some diagrams divide energy levels within the same spin multiplicity into different columns. Within each column, horizontal lines represent eigenstates for that particular molecule. Bold horizontal lines are representations of the limits of electronic energy states.

- Within each electronic energy state are multiple vibronic energy states that may be coupled with the electronic state.

- As electronic energy states increase, the difference in energy becomes continually less, eventually becoming a continuum that can be approach with classical mechanics.

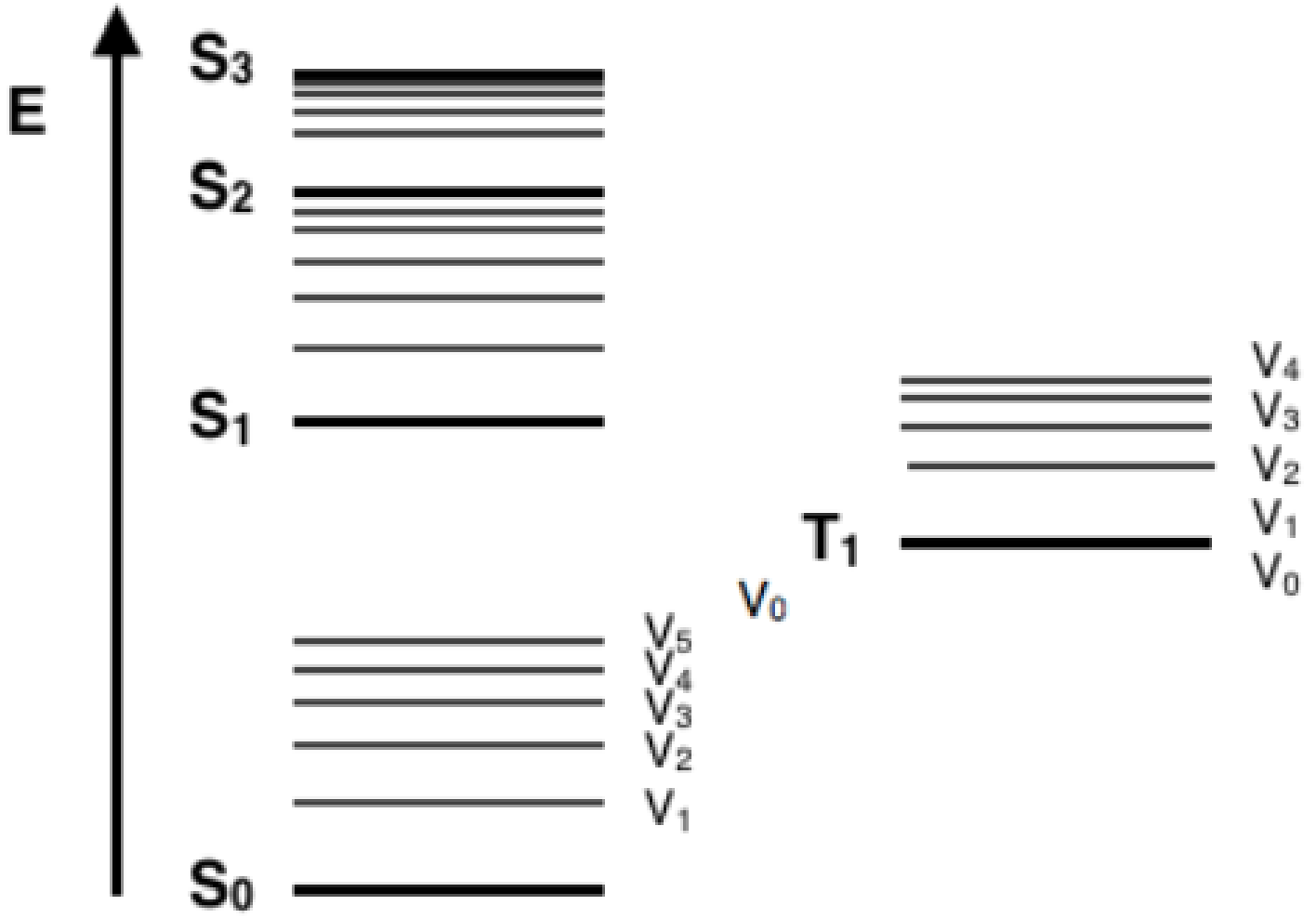

Figure 1: The Foundation of a typical Jablonski Diagram

PHOTOPHYSICAL PHENOMENON

Table 23.2 Common photophysical processes†

Primary absorption	$S + h\nu \rightarrow S^*$
Excited-state absorption	$S^* + h\nu \rightarrow S^{**}$
	$T^* + h\nu \rightarrow T^{**}$
Fluorescence	$S^* \rightarrow S + h\nu$
Stimulated emission	$S^* + h\nu \rightarrow S + 2h\nu$
Intersystem crossing (ISC)	$S^* \rightarrow T^*$
Phosphorescence	$T^* \rightarrow S + h\nu$
Internal conversion (IC)	$S^* \rightarrow S$
Collision-induced emission	$S^* + M \rightarrow S + M + h\nu$
Collisional deactivation	$S^* + M \rightarrow S + M$
	$T^* + M \rightarrow S + M$
Electronic energy transfer:	
Singlet–singlet	$S^* + S \rightarrow S + S^*$
Triple–triplet	$T^* + T \rightarrow T + T^*$
Excimer formation	$S^* + S \rightarrow (SS)^*$
Energy pooling	
Singlet–singlet	$S^* + S^* \rightarrow S^{**} + S$
Triple–triplet	$T^* + T^* \rightarrow S^* + S$

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