Utilizing the in-class game Jablinko

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**Jablinko Guidelines**

The in-class game Jablinko was designed to make learning excited state transitions fun. To play, a student chooses an excited state by placing a game chip at the top of the board, then the chip can “vibrationally cool” by bouncing through the pegs, and finally “transition” to a lower energy state in the bottom row. The students then compete to be the first to name the transition (e.g. S1🡪T1 is called intersystem crossing).

Jablinko is intended to be used following an in-class discussion on photochemistry, using the lecture slides provided with these facilitator notes.

**Learning Goals**

* Explain excited state processes through the use of a Jablonski diagram
* Describe how transitions occur between electronic states
* Learn how to draw a transition provided from the game on a blank Jablonski diagram

**Useful Materials**

1. Instructor’s version of “Photochemistry” power point slides
2. Students’ version of “Photochemistry” slides to use for note-taking
3. Jablinko board (one version is pictured to the right) with five wells in the bottom. We found that the game works well with two wells labeled T1, two labeled S0, and one labeled S1. See below for additional details about the construction of the board.
4. Four Jablinko chips (the caps of poster tubes work nicely). We found that labeling the caps S1, S2, T1, and T2 gives all significant transition permutations.

**Names of States**

S0 = ground state; S1 (pronounced S 1) = singlet excited state 1; S2 = singlet excited state 2

T1 (pronounced T 1) = triplet excited state 1; T2 = triplet excited state 2

**Types of Transitions**

S1🡪S0 is internal conversion (IC) or fluorescence

S2🡪S1 is internal conversion (IC)

S1🡪T1 is intersystem crossing (ISC)

T2🡪T1 is internal conversion (IC)

T1🡪S0 is intersystem crossing (ISC) or phosphorescence

T2🡪S0 this is tricky! It’s really broken into two steeps, T2🡪T1 followed by T1🡪S0. Since internal conversion happens very quickly and phosphorescence is much slower, it is unlikely that a molecule transitions from T2 directly back to the ground state without proceeding through T1.

S1🡪S1 Students are quick to answer “nothing” to this result. Although this is not a transition between two states, this transition is termed vibrational cooling.

**Construction of the Board**

A ­­­2’ × 4’, 1/8” thick, holes 3/16” width, standard white pegboard was purchased from a home improvement store for under $20. The board was used as purchased, thus not cutting was required. The holes are 1” apart in all directions. 1-1/4” length, 3/16” width dowel pegs were purchased for less than $2 and used on the board to guide the Jablinko chip. Pegs were inserted leaving three empty holes between sets of pegs, and two empty rows between filled rows in a staggered fashion (see photo). Wells were created at the bottom using peg placement: columns 5 pegs high with a 5-peg-wide gap between. These can be arranged to suit your chip size and it is recommended that you identify your Jablinko chip before placing pegs onto board. Jablinko chips were crafted from the plastic covers used on cardboard poster tubes. Cardstock was used to label the board and paper inserts were created to fit in the caps of the poster tubes. Additional pegs were inserted where needed around the edges of the board to keep the chip from falling off of the board. This entire board was crafted in less than 2 hours.

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