

Nanotechnology Lesson



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Goal



- Teach students micro-electro-mechanical systems (MEMS) manufacturing concepts without requiring a clean room or expensive equipment.
- Teach students how printed circuit boards (PCB) are manufactured. PCB manufacturing concepts are similar to photolithography, the process used to manufacture MEMS.

“Set the Hook”



- What are Micro-electro-mechanical systems (MEMS)
 - Giving micro and nano some perspective
 - MEMS device with chain
 - Dust mite on MEMS device

PCB Lab



- Two options
 - Basic lab
 - Advanced lab

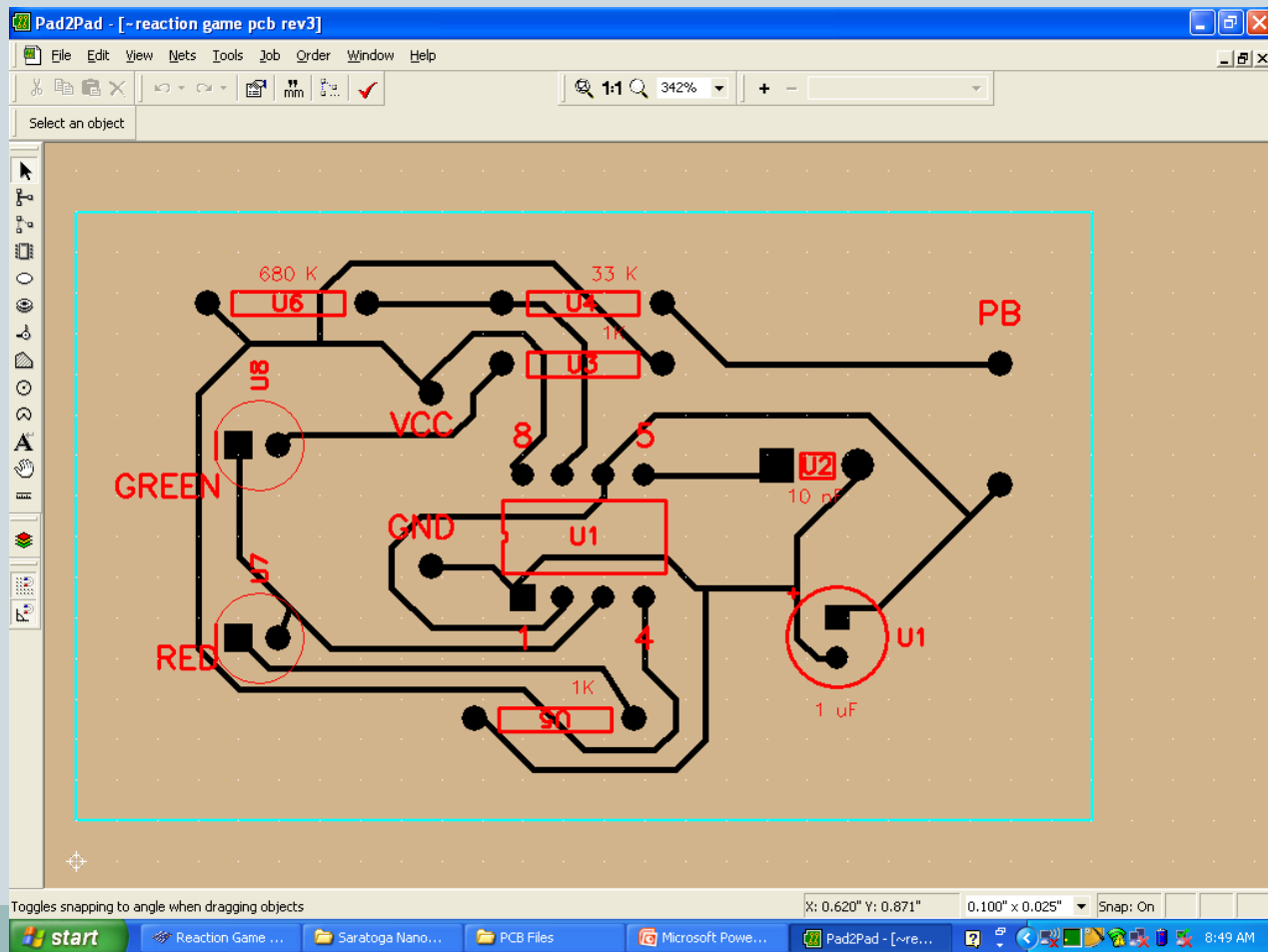
Basic Lab



- Make an LED light using a resistor, battery, and LED
 - Application of covalent bonding and valence electrons
- Show students a PCB, note the lack of wires
- Challenge: Make an equivalent LED circuit without using wires
 - Hand sketch copper trace on paper, then hand out copper board
 - Teach concepts of substrate, mask, and etching
 - Make a mask with a black Sharpie marker, etch using a sponge soaked with ferric chloride, wash in water after unwanted copper is removed
 - Drill holes, solder, and test circuit

Advanced Lab

- Use PCB software to make copper traces



Advanced Lab



- Print mask, transfer onto blank copper substrate
- Etch, drill holes, solder, test

Follow up



- Field trip to a clean room – recreate “micro” version of the student’s circuit using photolithography
- How can the students see their results? Good tie-in to imaging techniques