SAMPLE LESSON PLAN

PREFACE

This unit should be used after students have completed units covering the quantum mechanical model of the atom, including electron configurations. It is also intended that the unit be used in conjunction with one covering the periodic table and periodic trends. The lesson plan below should therefore be considered as a framework from which an overall lesson plan may be constructed. Other demonstrations, experiments, and class activities can be inserted where appropriate. The material in this unit should complement as well as extend the typical coverage of these topics.

DAY 1 Discuss the effect of having many atoms in the solid phase in close proximity on the energy levels of the atoms in the structure (band theory).
50 minutes

Use Demonstration 1 to illustrate electrical conductivity within the framework of band theory.

DAY 2 Have the students do Investigation 1.
50 minutes

DAY 3 Discuss Investigation 1.
10 minutes

Do Demonstration 2.
40 minutes

DAY 4 Have students do Investigation 2.

DAY 5 Discuss Investigation 2.
10 minutes

Discuss diamond and zinc blende structures (See background information for this unit) and solid solutions in conjunction with an introduction to
40 minutes periodicity. Topics should include trends in atomic size, electronegativity, ionization energy and metallic behavior. The relationship of each trend to electron configuration should also be established.

DAY 6 Continue the discussion from Day 5.
50 minutes

DAY 7 Extend the discussion by emphasizing semiconducting properties. Remind students that they did an activity from the
50 minutes "Exploring the Nanoworld" Kit some time ago in which they learned that semiconductors are used in the construction of LEDs. Discuss the differences between n-type and p-type semiconductors and the construction of a p-n junction. Also discuss what it means to bias a junction in either a forward or reverse manner.

DAY 8 Do Demonstration 3 as a reinforcement of the previous day's lesson. The
25-30 minutes follow-up questions should be presented as in-class discussion questions.

20-25 minutes Begin a discussion of LEDs.

DAY 9 Continue the discussion of LEDs and how they operate. Include the relationship between band gap energies and atomic size and
20-25 minutes electronegativity. Discuss, in turn, how the light produced depends on the size of the band-gap.

25-30 minutes Use demonstration 4 to relate the compositions of solid solutions to band gap energies. Assign the follow-up questions as homework.

DAY 10 Have students do Experiment 1.

DAY 11 Discuss the follow-up questions from Demonstration 4 and the results of
30 minutes Experiment 1. Emphasize that the solid solution series used for the LEDs is isovalent and essentially isostructural with the Group IV elements in the periodic table.

20 minutes Discuss the capabilities and uses of LEDs, showing examples. Examples are available at http://mrsec.wisc.edu/edetc/LED/index.html.

DAY 12 Use the questions provided at the end of the unit to review.

DAY 13 Unit exam.