8.02 ESG Independent Study

Unit 8: Electromotive Force and Circuits

In order to produce a predictable current, we need to consider elements of a circuit. Different types of circuits, and different arrangements of the same components within a circuit, produce different currents, not always constant. Such circuits represent "electricity" in the everyday sense of flashlight batteries, wall sockets and electric toothbrushes.

(Note: in this revision, study of chemical batteries and electrolysis has been greatly de-emphasized. In fact, it has been eliminated.)

Objectives: After completing this unit, you should be able to relate the concepts of unit 7 along with electromotive force (EMF), charge conservation, and current conservation to explain, both qualitatively and quantitatively, the flow of charges in simple circuits for both steady and time-varying currents.

Suggested Procedure:

1. Finish chapter 25 in UP11 by reading sections 25.4 and 25.5. Also read sections 26.1 through 26.4. Suggested problems from chapter 25 are 35, 47, 65, 75, 82 (optional: involves numerical solution, and gives some hints at how diodes work.) and from chapter 26 are 6, 9, 16, 19, 29, 35, 38, 53, 70, 72 (slightly hard), 76, 92 (involves more thinking than computation), 89 (optional, but recommended for those taking 18.06: set up the equations, perhaps as a matrix, and use MAPLE, Mathematica or some other computational program to solve.). Or,

2. Read chapter 4 in Purcell, sections 7, 9, 10, 11, and review the other sections as necessary. Suggested problems include pp. 164–168, #s 19, 21, 25, 31, 32, 33.

3. Take a unit test.