

**Research and Design Homework for recognition of the need for, and an ability to engage in, life-long learning**

1. U.S. Patent 5,298,233 describes a means for converting industrial wastes to carbon dioxide and water vapor. Hydrogen and carbon-containing feed, such as organic or inorganic sludge, low-grade fuel oil, or municipal garbage, is introduced into a molten bath consisting of two immiscible molten metal phases. The carbon and hydrogen of the feed are converted, respectively, to dissolved carbon and dissolved hydrogen. The dissolved carbon is oxidized in the first molten metal phase to carbon dioxide, which is released to the atmosphere. The dissolved hydrogen migrates to the second molten metal phase, where it is oxidized to form water vapor, which is also released from the bath. Critically evaluate this technology for waste disposal. Is the technology promising commercially? Compare with alternative waste management practices such as pyrolysis and incineration.

2. *Stack life* and *installed cost* are two parameters considered critical for fuel cell development. What is meant by stack life and why is it important? What is the projected installed cost, in \$ per kW, of current fuel cell technology for large scale power generation? To be competitive with conventional power systems such as gas turbines, what should be the target installed cost for fuel cells? Discuss.