MEMORANDUM

To: Mission Critical Chemistry Team Members
CC:
From: Director of Chemistry Subdivision
Date: October 16, 2003
Re: Fuels

The chemistry team assigned to the Mission Critical Chemistry project has synthesized three powerful oxidants for use in the new fuel system. These have been code named O_a, O_b, and O_c. Solutions of each of these oxidants, with concentrations of 0.1M, are available in the laboratory simulator at the project web site (http://ir.chem.cmu.edu/mars/). We have also put a 0.1M solution of one of our standard reducing agents, R_s, in the laboratory. This reductant has been well characterized over the past few years, and we know the following heats of formation:

$$H_f^o(R_s) = 233.9 \text{ kJ/mol} \qquad H_f^o(R_s^+) = 13.4 \text{ kJ/mol}$$

We have also done some initial physical characterization of the oxidants, and the results are reported in the following table:

Compound	Molecular weight (g/mol)	Density (g/cm^3)	Heat Capacity (cal/g K)
O_a	32.1	1.65	0.68
O_b	64.2	0.51	0.59
O_c	71.5	1.52	0.44

The project web site contains a *User Guide* for the Virtual lab that describes most of the available features. In addition, the lab now includes a thermometer (above the pH meter) and the tools menu includes a Bunsen burner.

Note that you may assume that the thermodynamics of the reactions in water are identical to those that occur in the rocket engines.