Problem 19.1

The conversion of A to B takes place in an aqueous solution in an adiabatic batch reactor. The reactor is charged with 1200 L of a 2 M solution of A at 300 K. The heat capacity of the solution of a whole can be taken to equal 1.0 cal mL^{-1} K^{-1}. The heats of formation of A and B may be taken to equal -75 and -82 kcal mol^{-1}, respectively, and the heat of reaction may be assumed to be independent of temperature. Calculate the time required to reach 80% conversion and the final temperature. The reaction is first order in A and the rate coefficient obeys the Arrhenius expression with a pre-exponential term equal to 2.4×10^{8} s^{-1} and an activation energy of 15.3 kcal mol^{-1}.