A First Course on Kinetics and Reaction Engineering

Problem 1.3

Problem Purpose

This problem will help you determine whether you have mastered the learning objectives for this unit.

Problem Statement

In the gasification of cellulosic biomass (here represented using its nominal formula, $C_6H_{10}O_5$), the carbon from the cellulose could be released either as CO, (See Practice Problem 1.1), or as CO_2, reaction (1). In addition, the water-gas shift, reaction (2), can lead to a mixture of CO and CO_2. Suppose a reaction began with 10 moles of H_2O for every one mole of $C_6H_{10}O_5$, and none of the products present. If half of the cellulose is consumed and the products contain 3 moles of CO_2 for every mole of CO, what will the ratio of CO to H_2 equal?

$$C_6H_{10}O_5 + 7\ H_2O \rightarrow 6\ CO_2 + 12\ H_2 \qquad (1)$$

$$CO + H_2O \rightarrow CO_2 + H_2 \qquad (2)$$