

**Chemical Engineering 201
Fall 2000**

Midterm # 3

Name _____

Problem # 1 _____

Problem # 2 _____

Problem # 3 _____

Problem # 4 _____

Problem 1: (25 points)

Describe three limitations of the ideal gas law. (9 points)

Describe two situations where you would use a bypass stream in real-life. Do **not** use the specific examples from the book. (8 points)

Compare and contrast single pass conversion to overall conversion. When are the differences important? (8 points)

Problem 2: (25 points)

1500 L/h of nitrogen at 200°C and 1 atm is in the stack gas from a ethane combustion that used 200 % excess air. The stack gas also contains carbon dioxide, carbon monoxide and water. How much methane was fed?

Problem 3: (25 points)

A fuel mixture that contains only methane and ethane is burned to completion with air to give 0.55 moles of CO_2 per mole of H_2O in the stack gas. What is the ratio of methane to ethane in the fuel?

Problem 4: (25 points)

A relatively new tire has a pressure of 30 psig at 80 °F. However, due to design problems, the tire fails at a critical pressure of 36 psig. Assume the tire has no leaks and does not change volume. If friction with the road surface causes an increase of 0.7 °F per mile per hour driven, what is the maximum speed you should drive when it is 80°F?