

**Chemical Engineering 201
Fall 2004**

Midterm # 4

Name _____

Problem # 1 _____

Problem # 2 _____

Problem # 3 _____

Problem One (35 points):

Acetic acid vapor at 327°C and 30 atm is fed into a pipe that has a diameter of 5 inches with a velocity of 1 m/s. What is the mass flowrate of the acetic acid into the pipe?

Problem 2: (35 points)

Ethane is heated up in a catalytic reactor to produce hydrogen gas and ethylene. The conversion in the reactor is 20%. The product stream is sent to a condenser where 98% of the ethane and 90% of the ethylene is removed as a liquid, while none of the hydrogen is condensed. The liquid stream passes to a distillation column where the overhead stream contains 96 mole percent ethylene while the bottoms contains 89 mole percent ethane. What is the total molar flowrate of the final ethylene stream if 100 kg/hr of ethane is fed to the reactor. How much ethane (moles/hr) is coming out in the bottoms stream? What should you do with this stream?

Problem 3 (30 points) - **This problem is for today's testing only and you will not have the opportunity to redo this problem on Tuesday/Wednesday.**

Describe four different criteria you would use to decide whether you could use the ideal gas law or not.

Find one root of the following equation by either the Newton Raphson method, the bisection method, or the false position method:

$$e^{2x} - 4x^2 = 9$$