

**Final Exam
ChEE 2001
Fall 2004**

Name

Problem # 1

Problem # 2

Problem # 3

Problem # 4

Problem # 5

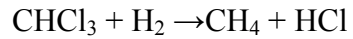
Problem # 6

Problem One (10 points):

A chloroform stream is being fed into a pipe with a 2 inch diameter at 3 m/s, 1 atm, and 80°F.
What is its molar flowrate in mol/sec?

Problem Two (12 points):

Chloroform is a fairly toxic substance so you decide that you will react the chloroform from the first problem with hydrogen to break it into less harmful substances with the following reaction:



Only 90% of the chloroform will react with hydrogen in your reactor and you are feeding in 100% excess hydrogen. What are the molar flowrates of the substances leaving the reactor using the flowrate from problem 1? (If you did not get an answer to part 1, assume an inlet flowrate of 100 mol/s of chloroform)

Problem Three (30 points):

You wish to remove the chloroform from the gases so you cool it down in a condenser while pressurizing it. What is the flowrate (mol/s) of chloroform you can remove as a liquid if the final pressure of the condenser is 10 atm and the final temperature is -20°C ? If you were not able to solve problem 2, assume that the inlet to the condenser is 100 mol/s and has 1.5 mole percent CHCl_3 , 12 % methane, 39.5 % HCl and 47 % hydrogen. Assume chloroform is the only substance to condense.

Problem Four (20 points):

The gases leaving the condenser are at 10 atm and -20°C . If they are flowing through a pipe with an inside diameter of 2 inch, what is the velocity of the stream? If you were unable to finish problem three, assume the gases leaving the condenser have a flowrate of 100 mol/s and has 0.26 mole percent chloroform 13 mole percent methane, 39 mole percent HCl, and 47.7 mole percent hydrogen.

Problem Five (20 points)

You throttle the gases through a valve to drop the pressure to 1 atm. What is the overall change in enthalpy of the gas stream (in watts)? Assume the expansion happens isothermally and that the diameter of the pipe after the valve is still 2 inches. If you were unable to finish problem three, assume the gases leaving the condenser have a flowrate of 100 mol/s and has 0.26 mole percent chloroform 13 mole percent methane, 39 mole percent HCl, and 47.7mole percent hydrogen. Assume the velocity of the entering stream is 1 m/s if you did not get the answer to part four.

Problem Six (8 points)

Describe how gaussian elimination fits with the material from this course.

Name two techniques of finding roots we covered in this class. Also, describe one place where this material was appropriate for use in the course (which chapter and concept).

What would be the result of the following function in VisualBasic (from CC Handout 1)?

```
i = 3
prod = 1
  For j = 1 To (2 * i + 1)
    prod = prod * j
  Next j
```