

Chemical Engineering 201
Fall 2000
Final Exam

Name _____

Problem # 1 _____

Problem # 2 _____

Problem # 3 _____

Problem # 4 _____

Problem # 5 _____

Problem # 6 _____

Total _____

Problem 1 (25 points)

How much energy would need to be added to saturated air at 25°C to drop the relative humidity to 40 percent? Choose a reasonable basis for the flowrate of air.

After heating the air, you desire to cool it adiabatically to saturation again. What will the final temperature be? Describe how you got this final temperature.

Problem 2 (30 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 3 (15 points)

a) make 5 statements about Raoult's law that are true

b) How many times larger is the volume of gaseous water at 0°C and 1.01325 bar compared to its liquid volume?

Problem 4 (40 points)

How much energy is released when 100 moles of methane at 400°C are burned in the theoretical amount of air to completion. The product gases are at 550°C.

Problem 5 (25 points)

A gas containing nitrogen, benzene, and toluene is in equilibrium with a liquid consisting of 30 mass% benzene and 70 mass% toluene at 85°C and 10 atm. What is the composition of the gas?

Problem 6 (20 points)

How much energy must you add to heat 1 pound-mole of liquid water at 40°F to turn it into saturated vapor at 300°F ? Describe another way to find this energy other than the way you solved it the first time (but do not solve it this way).