

**Chemical Engineering 201
Fall 2000**

Midterm # 1

Name _____

Problem # 1 _____

Problem # 2 _____

Problem # 3 _____

Problem # 1 (40 points):

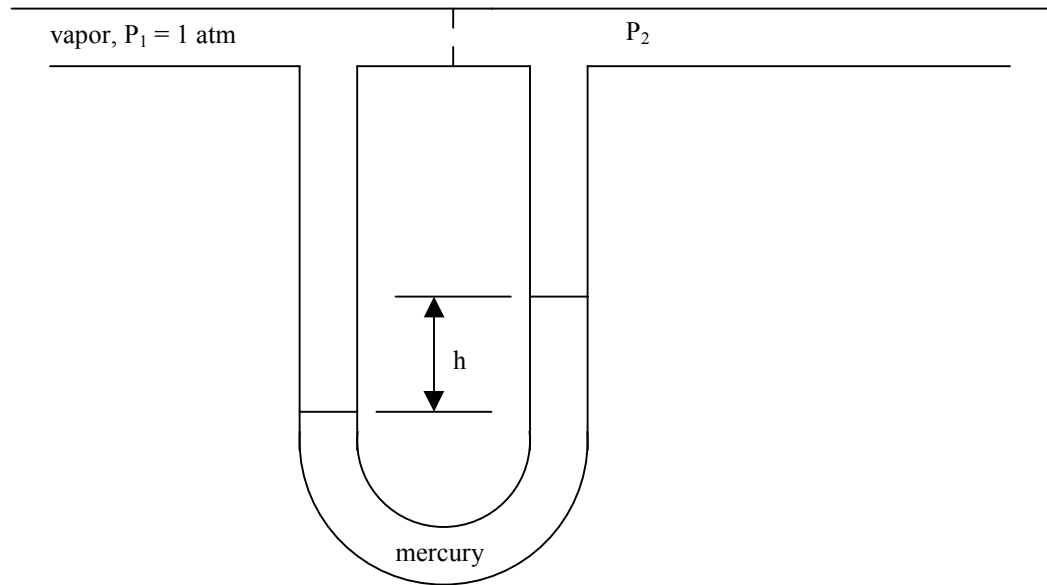
A liquid stream contains 25 vol % ethanol and the rest is water. What would the molar flowrate (mol/hr) be if the mass flowrate is 100 g/hour? In this problem, assume that volumes are additive; i.e., $V_{\text{tot}} = V_{\text{water}} + V_{\text{ethanol}}$

The following data may or may not be useful:

Chemical	Specific Gravity	Molecular Weight (g/mol)
ethane	---	30.07
ethanol	0.789	46.07
methanol	0.792	32.04
water	1.000	18.016

Problem # 2 (30 points):

a) A pipe with a gas in it is connected to a mercury manometer. What is h (in mm) if P_2 is 90 percent of P_1 ?



The following data may or may not be useful:

Chemical	Specific Gravity	Molecular Weight (g/mol)
ethanol	0.789	46.07
mercury	13.546	200.61
water	1.000	18.016

b) Qualitatively, what will happen to h if P_2 decreases further?

Problem # 3 (30 points):

The great Boston molasses flood occurred on January 15, 1919. In it, 2.3 million gallons of molasses flowed from a 30-foot high storage tank that ruptured. Twenty-one people were killed and 150 more were injured. The estimated specific gravity of molasses is 1.4. What was the mass of molasses in the tank in lb_m ? And, what was the pressure at the bottom of the tank in pounds-force per square inch? Assume the tank was open to the atmosphere at the top.