

**Chemical Engineering 201
Fall 2002**

Midterm # 1

Name _____

Problem # 1 _____

Problem # 2 _____

Problem # 3 _____

Problem One (15 points):

In lecture, we discussed what a mass balance was and how it could be applied to different examples. Describe the specific terms you would include in a population balance on the United States, but do not estimate the size of those terms.

Problem Two (35 points):

The Toyota Prius is one of the best cars for environmental performance that you can buy in the U.S. The car generally gets 40.6 miles per gallon when driving with the air conditioner on, but gets 59.2 miles per gallon when the air conditioner is off. How much gas (in gallons) would you use if you drove 457 miles and only had the air conditioner on for 65% of the miles that you drove?

Problem Three (50 points):

You have measured the flowrate of a liquid stream leaving a cylindrical pipe and have found that it is 50 kg/min. You have also measured the velocity and it is 2 meters/sec. An experimental analysis of the fluid's composition using a gas chromatograph shows that it is 45 mole percent ethanol and the rest is water. What is the diameter of the pipe in inches?