

ChE 4400, Spring 2001
Quiz #2
Closed Book, Closed Notes
Allowed Time: 15 minutes

1. Consider a liquid flow system consisting of a sealed tank with noncondensable gas above the liquid as shown in the drawing. Derive an unsteady-state model relating the liquid level h to the input flow rate q_i . Is operation of this system independent of the ambient pressure P_a ? What about for a system open to the atmosphere?

You may make the following assumptions:

- The gas obeys the idea gas law. A constant amount of m_g/M moles of gas are present in the tank.
- The operation is isothermal.
- A square root relation holds for flow through the valve.