1 October 2015

CHE 260 – Thermodynamics and Heat Transfer

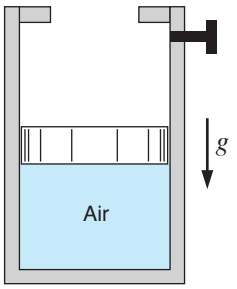
Quiz 1 – 2015

You have 60 minutes to do the following three problems. You may use your textbook and any type of non-communicating calculator.

1) The pressure in a balloon varies as $P = CV^{1/3}$ where $C = 100$ kPa/m and V is the volume. The balloon is blown up with air from a starting volume of 1 m^3 to a volume of 3 m^3. Find the final mass of air, assuming it is at 25°C, and the work done by the air.

(30 Marks)

2) Air in a piston-cylinder assembly, initially at a pressure of 200 kPa and temperature of 600 K (state 1), is heated in a constant-pressure process until it is twice the initial volume (state 2). The piston is then locked with a pin and the air is cooled to a final temperature of 600 K (state 3). Find P and T for states 2 and 3. Using the ideal gas tables for air, find the work and heat transfer per unit mass of air in both processes.



(35 Marks)

3) A diffuser has air entering at 100 kPa and 300 K with a velocity of 200 m/s. The inlet cross-sectional area of the diffuser is 100 mm^2. At the exit the area is 860 mm^2, and the exit velocity is 20 m/s. Determine the exit pressure and temperature of the air.

(35 Marks)