

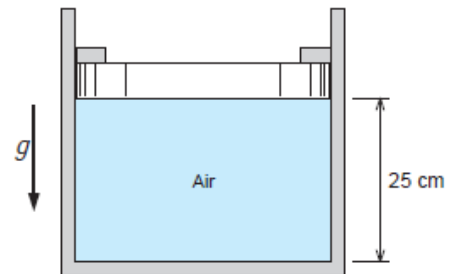


**Midterm Exam # 2**

**Fall 2014**

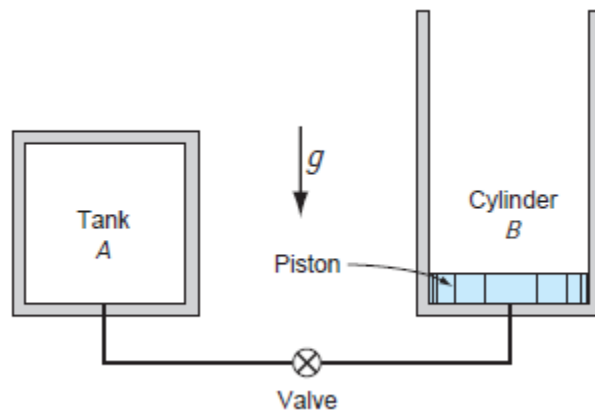
**Round-off all numbers of your answer into reasonable digits**

1. A piston - cylinder arrangement contains air at 250 kPa and 300°C. The 50-kg piston has a diameter of 0.1 m and initially pushes against the stops. The atmosphere is at 100 kPa and 20°C. The cylinder now cools as heat is transferred to the ambient surroundings.



- At what temperature does the piston begin to move down?
- How far has the piston dropped when the temperature reaches the ambient temperature?
- Show the process on the p–v and the T–v diagrams.

2. A 3.5-m<sup>3</sup> rigid tank has air at 15 bar and ambient 300 K connected by a valve to a piston-cylinder. The piston of area 0.1 m<sup>2</sup> requires 3 bar below it to start raising. The valve is opened, the piston moves slowly 2 m up, and the valve is closed. During the process, air temperature remains at 300 K.



- What is the mass of the piston?
- What is the final pressure in the tank?

**Take the molecular weight of air as 29 kg/kmol**