

Supplemental Problems 5

1. Nitrogen at 30 deg. C. and 200 kPa is contained in a 0.3 cubic meter piston-cylinder device. The Nitrogen is heated at constant pressure until the volume triples. Provide appropriate assumptions and construct a P-V diagram and then determine:
 - a. the moving boundary work, kJ
 - b. the change in internal energy, kJ
 - c. the heat transfer, kJ
 - d. the final temperature, K.
2. Air at 20 deg. C. and 150 kPa is contained in a 0.4 cubic meter piston-cylinder device. The air is heated at constant pressure until the final temperature is 100 deg. C. Provide appropriate assumptions and construct a P-V diagram and then determine:
 - a. the moving boundary work, kJ
 - b. the change in internal energy, kJ
 - c. the heat transfer, kJ
 - d. the final volume, cubic meters.
3. A golf ball has a mass of 0.046 kg. A typical drive may have a peak elevation of 55 ft and a velocity of 80 mph. Apply appropriate unit conversions and determine:
 - a. the potential energy at the peak elevation, kJ
 - b. the kinetic energy at the specified velocity, kJ
4. A piston-cylinder device contains 0.25 kg of R-134A. The initial state is 750 kPa and saturated liquid. Heat is applied while the pressure remains constant until the final volume is twenty times the initial volume. Provide appropriate assumptions and construct a P-V diagram and then determine:
 - a. the moving boundary work, kJ
 - b. the change in internal energy, kJ
 - c. the heat transfer, kJ
 - d. the final temperature, K.