Physics 2305 3 May, 2000
Practice for Exam 4 (modified)

Here's a few sample problems to represent the portion of the exam (approximately 1/3) devoted to new material.

For questions 1 to 3, an ideal polyatomic gas is compressed at constant pressure (p = 25 kPa) from an initial volume of 3.0 m^3 to a final volume of 1.8 m^3. The initial temperature is 300 K.

1. What is the final temperature?

   A) 180 K
   B) 300 K
   C) 500 K
   D) There is insufficient information to solve the problem.
   E) none of the above Answer: _____

2. How much work is done on the gas during the compression?

   A) 0 J
   B) 13 kJ
   C) 30 kJ
   D) 45 kJ
   E) none of the above Answer: _____

3. How much heat is extracted from the gas?

   A) 4 kJ
   B) 90 kJ
   C) 120 kJ
   D) There is insufficient information to solve the problem.
   E) none of the above Answer: _____

4. A steel bar of mass 2.0 kg and temperature 30°C is placed on a much larger steel beam. If the beam remains at a constant temperature of 15°C, what is the net increase in entropy when the bar cools to the beam's temperature? The specific heat of stainless steel is 500 J kg^{-1} K^{-1}.

   A) 0 J/K
   B) 1.3 J/K
   C) 50.8 J/K
   D) 52.1 J/K
   E) none of the above Answer: _____

For questions 5 to 6, an ideal gas undergoes an adiabatic compression from an initial volume of 316 L to 10 L. Its pressure increases from 1 atm to 100 atm. Its initial temperature is 273 K.

5. Which of the following could be the gas in question?

A) argon (Ar)
B) nitrogen (N_2)
C) methane (CH_4)
D) ammonia (NH_3)
E) either methane or ammonia

Answer: _____

6. What is the temperature of the gas after the compression?

A) 273 K
B) 860 K
C) 1090 K
D) 2730 K
E) none of the above

Answer: _____

Sample free-form question:

7. An ideal gas undergoes an isothermal expansion. Derive the expression(s) relating the work and heat in the process to the volume and temperature.

Answers: 1. A; 2. C; 3. C; 4. B; 5. E; 6. B; 7. $Q = W = nRT \ln (V_f/V_i)$.