

Principles of Physics II (PHY 112)
Spring 2004

Exam 1

Question 1 (4 points) If you insulate an ideal gas and compress it, what happens to the temperature? How do you know?

Question 2 (4 points) If the pressure of an ideal gas increases and the internal energy remains the same, what can you say about the volume of the gas? Does it increase, decrease, or stay the same? How do you know?

Question 3 (4 points) Of the four types of ideal gas processes we studied (isothermal, adiabatic, constant volume, and isobaric), for which two is it easiest to calculate the work done on the system? Explain how you calculate the work done for these two processes.

Question 4 (4 points) What does the second law of thermodynamics say?

Problem 1 (14 points) An ideal gas initially has a temperature of 350 K, a pressure of 200 kPa, and a volume of 2.5 L. The heat capacity at constant volume for the gas is $C_V = \frac{5}{2}nR$, and has this value at all temperatures. The gas undergoes the following cycle.

- (a) Adiabatic expansion to 5 L.
- (b) Isothermal expansion to 8 L.
- (c) Isobaric compression to 2.5 L.
- (d) Constant volume heating back to the initial state.

Complete the following tables. Don't forget to include appropriate units (at least at the top of each column).

State	P	V	T	E_{int}
initial				
after process (a)				
after process (b)				
after process (c)				

Process	ΔE_{int}	Q_{in}	W_{on}
(a)			
(b)			
(c)			
(d)			

Problem 2 (8 points) Robert has 1 kg of ice at 0°C in an insulated bucket. He pours 1 kg of warm water on the ice. The warm water melts the ice and the resulting mixture comes to equilibrium as water at 0°C . What was the temperature of the warm water?