

## **Physics 10154 - Exam #5a**

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. (35 pts) 3.5 moles of an ideal gas are held in a container at a pressure of 2.0 atmospheres and a temperature of 25° C.
  - a) What is the volume of the container, in Liters?
  - b) Keeping the number of moles constant, the volume of the container is doubled, and the temperature is increased to 75°C. How much work is done by the gas during this expansion, in Joules?

2. (35 pts) 35 grams of ice ( $c = 2090 \text{ J/kg}\cdot\text{C}$ ) at an initial temperature of  $-81\text{C}$  is placed into a 640 gram aluminum container ( $c = 900 \text{ J/kg}\cdot\text{C}$ ) at an initial temperature of  $45\text{C}$ . The latent heat of fusion for water is  $333,000 \text{ J/kg}$ . Also, the specific heat of water is  $4186 \text{ J/kg}\cdot\text{C}$ .

Calculate the final temperature of the system. If the final temperature is zero, calculate how much ice melts.

3. (30 pts) A spring ( $k = 320 \text{ N/m}$ ) has a  $2.5 \text{ kg}$  mass attached. The spring is stretched by  $15 \text{ cm}$  and released from rest, free to oscillate back and forth on a frictionless, horizontal surface.

- a) What maximum velocity does the mass reach while oscillating on the spring?
- b) What is the mechanical energy of the system?
- c) If the coefficient of kinetic friction between the mass and the surface is  $0.33$ , what is the velocity of the mass when it passes through equilibrium for the first time after being released?