# Physics 10154 – Exam #11B

Answer the following two questions. Be sure to clearly indicate your answer with a circle or box. <u>Show all work</u>. If I cannot see how you arrived at an answer, I will deduct points!

1. When a gas goes from state A --> B --> C on the PV diagram below, 1300 J of heat is added to the gas.

a) What is the change in internal energy of the gas?

b) If the gas goes from A --> D --> C on the PV diagram, how much heat is added to the gas?

c) What is the work done by the gas when it goes in the cycle A --> B --> C --> D? --> A

P (atm)

4.0 — A .... B

1.0 — D C

V (L)

2.0 11
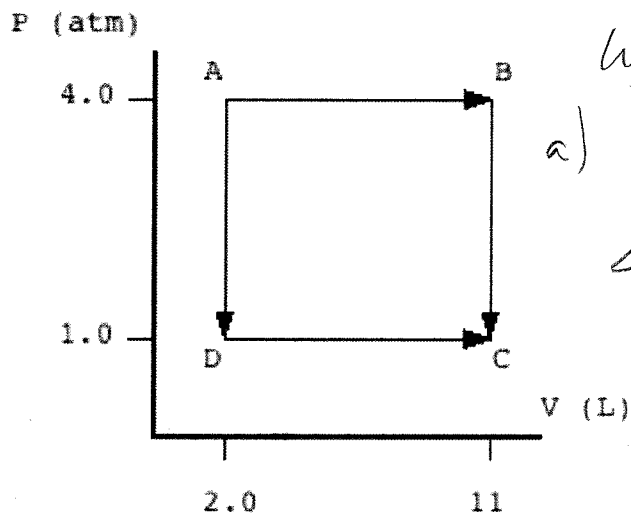
$W_{by\,gas}\,(A \to B) \to C$ → 0

a) $= (4 \times 10^5)(9 \times 10^{-3}) = 3600\,J$

$\Delta U_{ABC} = -3600 + 1300$

$= \boxed{2300\,J}$

b) $W_{by\,gas}\,(A \to D \to C) = 0 + (1 \times 10^5)(9 \times 10^{-3}) = 900\,J$

$\Delta U_{AC} = -W_{by\,gas} + Q$

$2300 = -900 + Q$ $\boxed{Q = 3200\,J}$

c) $W_{TOT} = W_{ABC} - W_{ADC} = \boxed{2700\,J}$

2. A 2.5 kg block is attached to a horizontally-oriented spring on a frictionless table with a spring constant of 2200 N/m. The spring is stretched to a distance of L and the block is released from rest to oscillate back and forth.

a) What is the maximum speed of the block as it oscillates back and forth? Answer in terms of L (i.e. 5.6L or 0.35L).

b) At what distance from the equilibrium point is the block"s speed 25% of its maximum possible value? Answer in terms of L.

c) How many oscillations does the spring complete per minute?

a) $V_{max} = \sqrt{\frac{k}{m}} L = \boxed{30 L}$

b) $V = \sqrt{\frac{k}{m}} \frac{L}{4} = \sqrt{\frac{k}{m}(L^2 - x^2)}$

$$\frac{k}{m} \frac{L^2}{16} = \frac{k}{m} L^2 - x^2$$

$$.0625 L^2 - L^2 = -x^2$$

$$0.9375 L^2 = x^2$$

$$\boxed{x = 0.97 L}$$

c) $T = 2\pi \sqrt{\frac{m}{k}} = 0.212 \text{ s}$

$$N = \frac{60 \text{ s}}{0.212 \text{ s}} = \boxed{280}$$