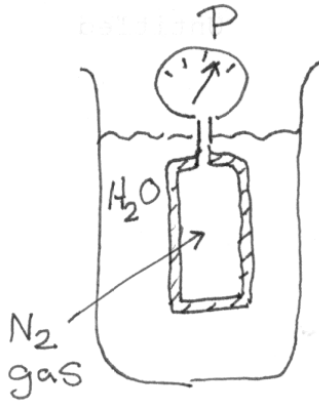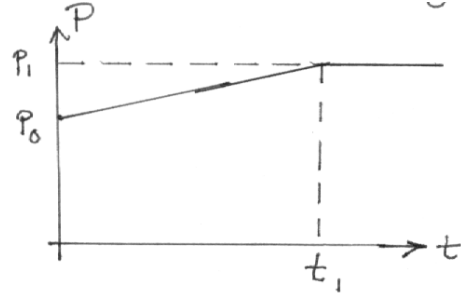Physics 131 Lecture quiz # 12 (17 April 2006)

NAME:_____

To measure temperature T of water using a constant volume gas thermometer, you immerse the small rigid gas tank in the water and wait until the needle indicating pressure P is stationary. Suppose the water is heated slowly on a stove, until it boils at a time t_1. The gas pressure, recorded over time, looks like this.

1. Now the experiment is repeated, but the water is heated more rapidly until it boils at at time t_1'. The pressure versus time might look like what is shown below. Choose all answers that could reasonably be correct.

(a)   (b)   (c)   (d)
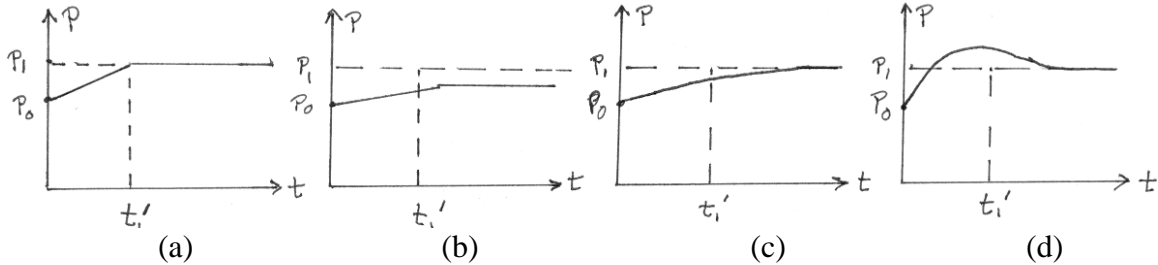
Answer (b) is impossible because it is an incomplete equilibration. (d) is impossible, although the rigorous proof requires knowing the second law of thermodynamics. (a) and (c) represent cases where equilibration is fast and slow. Both are correct.

2. .During the heating process, the work W done on the gas is:
    (a) $W < 0$
    (b) $W = 0$ **Correct.** *Since nothing is moving (neglecting motion of the needle), there can be no work done.*
    (c) $W > 0$.
3. Suppose the pressure gauge is the best money can buy, and the tank is as rigid as possible. To improve the accuracy of the thermometer, you could
    (a) use He instead of N_2 **Yes**. *He is a better ideal gas than N_2.*
    (b) use less N_2 gas in the tank **Yes**. *Less gas makes a better ideal gas.*
    (c) use more N_2 gas in the tank **No.**
    (d) use a smaller tank. **Maybe.** *It will respond faster and alter the properties of the water less than a big tank.*