# Medical Equipment II - 2011
# Exercise 2

1. Prove that if the surface tension within an alveolus is inversely proportional to the surface area of this alveolus then large alveoli tend to empty into smaller alveoli. What would that implicate for the whole lung?
2. If the pressure-volume relationship of the respiration cycle is given by the shown plot, how can you compute the work needed for each breath? Would that work be positive or negative? Explain the meaning of positive and negative work.
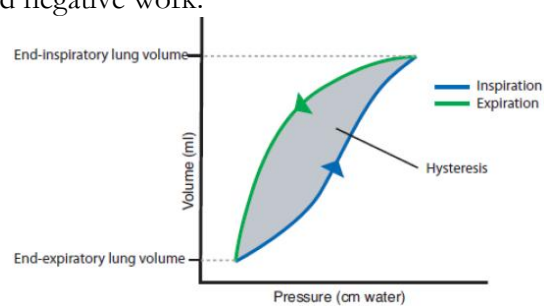


3. Explain the cause of the difference between the Peak Inspiratory Pressure and the Plateau Pressure in the ventilator waveform.
4. Explain why a running athlete may need to stop to catch his breath after a while. Would running at a higher altitude help make it easier for him to run longer?
5. Illustrate on the volume-pressure plot of CPAP how this treatment can be beneficial to the patient.
6. Determine the trigger, limit, cycle, and baseline variables of 10 different ventilator modes including mandatory, triggered and assisted types.
7. Assuming spontaneous breathing happens at a rate of 15 breaths/min. Draw a diagram showing the pressure vs. time for the following cases:
    a. Spontaneous breathing
    b. Mandatory breathing at a rate of 30 breaths/min
    c. Mandatory breathing at a rate of 10 breaths/min
    d. CPAP treatment
    e. Triggered breathing
    f. Mandatory breathing at a rate of 10 breaths/min + Triggered breathing
    g. Synchronized Mandatory breathing at a rate of 10 breaths/min + Triggered breathing
8. If an electrosurgical unit is designed to generate a cutting waveform at a frequency of 1 MHz and a 5V peak voltage from a waveform generate, provide the following:
    a. Specifications of the power amplifier needed if a 3000V/300W output is required
    b. Change to (a) if the frequency is changed to 1.5 MHz
    c. Changes to (a) if the output power needed is 400W.
    d. Changes to (a) if output voltage needed is 4000V.