Aalto University
School of Engineering

COE-C2007 Thermodynamics, 2022

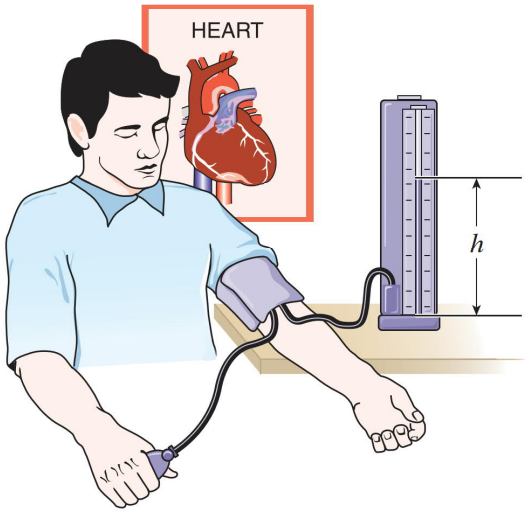
Learning Exercise 1

The exercise is to be completed independently (do not copy paste from other students) and returned as a single pdf report with appropriate use of pictures and charts, as well as presentation of used equations in possible calculations. Name the uploaded pdf-file so that it tells the course, learning exercise number and your name, like Thermodynamics_LE1_Lastname.pdf

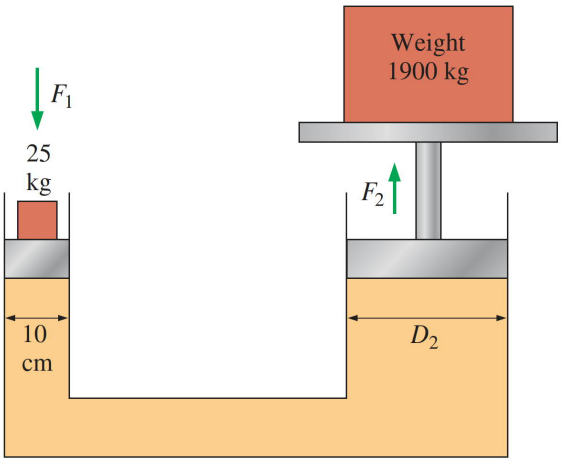
No single question/problem is compulsory, but a minimum of 50 % of points is required in order to pass the exercise. Include also your name and student number on the first page of the report. A proper length of an answer per question would be maximum 1 page. The time for answering this exercise is estimated not to exceed 8 hours, provided that you have attended lectures.

Return DL of LE1: Friday January 21, 2022, 23:55, in MyCourses.

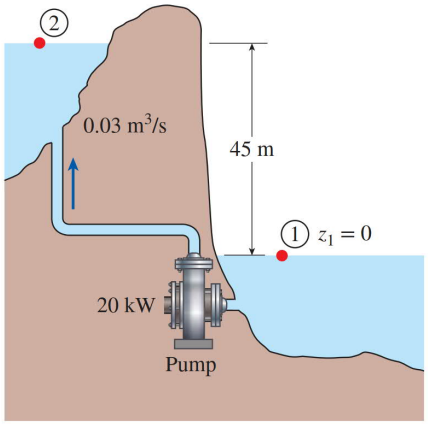
1. The maximum blood pressure in the upper arm of a healthy person is about 120 mmHg. If a vertical tube open to the atmosphere is connected to the vein in the arm of the person, determine how high the blood will rise in the tube. Take the density of the blood to be 1050 kg/m^3. (15 Points)



2. A hydraulic lift is to be used to lift a 1900-kg weight by putting a weight of 25 kg on a piston with a diameter of 10 cm. Determine the diameter of the piston on which the weight is to be placed.? (15 Points)



3. Water is pumped from a lower reservoir to a higher reservoir by a pump that provides 20 kW of shaft power. The free surface of the upper reservoir is 45 m higher than that of the lower reservoir. If the flow rate of water is measured to be 0.03 m3/s, determine mechanical power that is converted to thermal energy during this process due to frictional effects. (Assume that the water levels of the both reservoirs don't change during water delivering). (20 Points)



4. A wind turbine is rotating at 15 rpm under steady winds flowing through the turbine at a rate of 42,000 kg/s. The tip velocity of the turbine blade is measured to be 250 km/h. If 180 kW power is produced by the turbine, determine (a) the average velocity of the air and (b) the conversion efficiency of the turbine. Take the density of air to be 1.31 kg/m3.(15 Points)

5. As a future engineer, you need to find a solution for a clean energy source to replace the current carbon-based energy sources. Please review the advanced clean energy technologies and select one of them for discussion. Write an essay (400-500 words) to explain your solutions. (30 Points)
6. Your free feedback on the first weeks and time spent on this learning exercise. (This does not affect the grading)