

Practice Exam for Intro TFWO

Write your solution and give it to the Physics Secretary at the Main Physics Office.

If you hand it until 2-28-18 it will count as 100 points towards Activity 2-28-18. Solutions to these problems will be available online on 3-1-18.

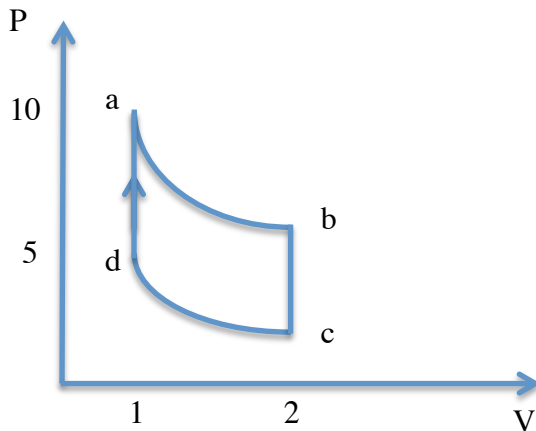
Staple your solutions to this page.

NAME _____ DATE _____ TIME _____

1. The water pressure in a house at the first floor level is 50 psi. We wish to keep the same pressure at the level of the shower in the second floor located 5 m from the first floor level. The water speed at the first floor level is 10 m/s. If the cross-section area of the pipe at the first floor is $4 \times 10^{-4} \text{ m}^2$, what should be the cross-section area of the pipe at the shower level? How much bigger or smaller than at the first floor level?

2. The interior of a freezer is set at 260 K while the temperature in the kitchen is set at 300 K. The freezer uses a Carnot cycle and has a motor that runs at 50 W of power. How long will it take for 1 kg of water to freeze and reach the final 260 K temperature if the initial temperature of the water was 300 K? ($c_{V \text{ water}} = 4181$, $c_{V \text{ ice}} = 2090$, $L_{m \text{ ice}} = 334,000$ all in SI units)

3. The Otto cycle shown in figure consists of two isochoric (d to a and b to c) and two isentropic processes. The pressure at a is 10 and the pressure at d is 5 Pa. The volume at b is 2 and the volume at a is 1 m^3 . Find the efficiency of the engine. The gas is monoatomic ($d = 3$).



4. You want to cool 500 grams of lemonade made of water at room temperature (24 degrees Celsius). You take 4 ice-cubes at -10 degrees Celsius. The mass of each ice-cube is 20 gr. If all the ice melts and the final 580 grams of lemonade reach the same temperature find its value. ($c_{V \text{ ice}} = 2090$, $c_{V \text{ water}} = 4186$, $L_F = 333,550$ in SI units)