

PHYS 1020 Final Exam

Monday, December 17, 6 - 9 pm

The whole course, **including ch. 14, sections 1 and 2**
30 multiple choice questions
Formula sheet provided

Seating for Final Exam

A - SIM: Brown Gym

SIN - Z: Gold Gym

Friday, November 30, 2007

15

Welcome to Physics 1020!

Instructors	Required Materials	Schedule	Policies/Evaluation	Suggested Problems	Formula Sheet
Answers to Even-Numbered Problems			Answers for tutorial test problems		
Answers for midterm test			Answers for final exam		
Marks files					

→ [Mastering Physics Assignment #5](#) ←
[Due Monday, December 3 at 11 pm](#)

[Information on "Mastering Physics"](#)

→ [Mastering Physics Survey](#) ←

Monday and Wednesday
Review - send questions!

Friday, November 30, 2007

16

Ideal Gas Law

The behaviour of an ideal gas is described by the ideal gas law:

$$PV = nRT$$

n = number of moles of gas

R = universal gas constant = 8.314 J/(mol.K)

T in Kelvin

In terms of the number, N , of atoms or molecules of the gas:

$$PV = NkT$$

k = Boltzmann's constant = 1.38×10^{-23} J/K

$N = nN_A$, and $nRT = NkT$, so

$$k = \frac{R}{N_A}$$

Q 15, 2005 Final: A sample of a monatomic gas is originally at 20°C. What is the final temperature of the gas if both the pressure and the volume are doubled?

14.10/46: It takes 0.16 g of helium to fill a balloon. How many grams of nitrogen would be required to fill the balloon to the same pressure, volume and temperature?

Friday, November 30, 2007

19

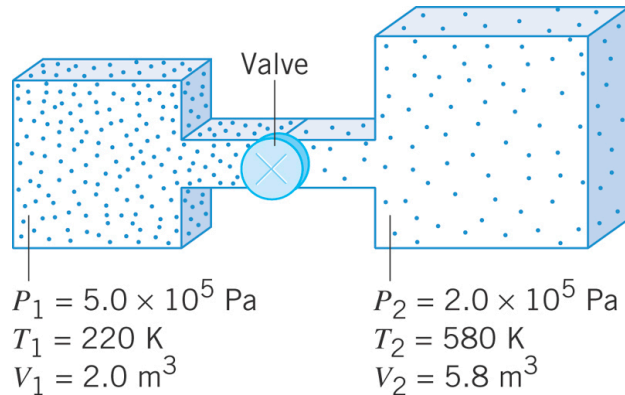
14.12/14: Oxygen for hospital patients is kept in tanks in which the oxygen has a pressure of 65 atmospheres at a temperature of 288 K. The oxygen is administered at a pressure of 1 atmosphere at 297 K. What volume does 1 m³ of oxygen in the tanks occupy in the patient's room?

Friday, November 30, 2007

20

14.19/24: The tanks are connected by a valve, which is initially closed. Each tank contains neon gas at the pressure, volume and temperature indicated. When the valve is opened, the contents of the two tanks mix, and the pressure becomes constant throughout.

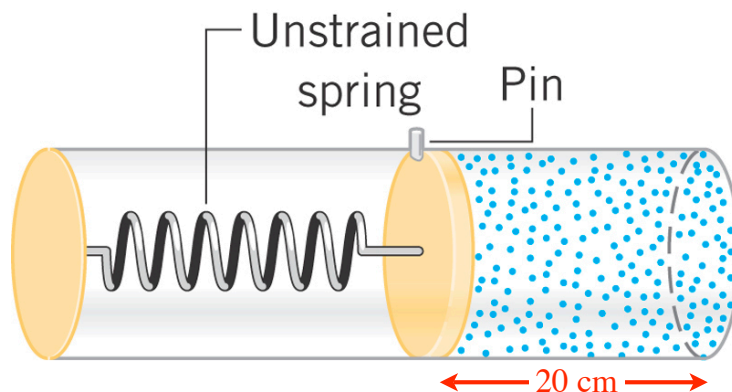
- a) What is the final temperature? (the heat gained by the gas in one tank is equal to the heat lost by the other).
 b) What is the final pressure?



Friday, November 30, 2007

21

14.26: A gas fills the right-hand portion of a horizontal cylinder whose radius is 5 cm. The initial pressure of the gas is 101 kPa. A frictionless movable piston separates the gas from the left portion of the cylinder, which is evacuated and contains a spring. The piston is initially held in place by a pin and the spring is unstrained. The length of the gas-filled region is 20 cm. When the pin is removed and gas is allowed to expand, the length of the gas-filled chamber doubles. The temperature of the gas does not change. Find the spring constant of the spring.



Friday, November 30, 2007

22

14.20/23: A diving bell consists of a cylindrical tank with one open end and one end closed. The tank is lowered into a lake with the open end downward. Water rises into the tank, compressing the trapped air, whose temperature remains constant. The tank is brought to a halt when the distance between the surface of the lake and the surface of the water in the tank is 40 m. Find the fraction of the tank's volume that is filled with air.

14.27: A cylindrical glass beaker of height 1.52 m rests on a table. The bottom half of the beaker is filled with a gas, the top half with liquid mercury exposed to the atmosphere. A frictionless piston separates the gas from the mercury.

The initial temperature is 273 K. The temperature is increased until half of the mercury has spilled out of the beaker. Find this temperature. Ignore thermal expansion of the glass and the mercury.