

Name: _____

Physics 202 Quiz 1

Apr 8, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. One end of a piano wire is wrapped around a cylindrical tuning peg and the other end is fixed in place. The tuning peg is turned so as to stretch the wire. The piano wire is made from steel ($Y = 2.0 \times 10^{11} \text{ N/m}^2$). It has a radius of 0.80 mm, and an unstrained length of 0.76 meters. The radius of the tuning peg is 1.8 mm. Initially, there is no tension in the wire. Find the tension in the wire when the tuning peg is turned through two revolutions.

2. An 86.0-kilogram climber is scaling the vertical wall of a mountain. His safety rope is made of nylon that, when stretched, behaves like a spring with a spring constant of 1200 N/m. He accidentally slips and falls freely for 0.750 meters before the rope runs out of slack. How much is the rope stretched when it breaks his fall and momentarily brings him to rest?

Name: _____

Physics 202 Quiz 2

Apr 15, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. A submersible pump is put under the water at the bottom of a well and is used to push water up through a pipe. What minimum output gauge pressure must the pump generate to make the water reach the nozzle at ground level, 71 meters above the pump?

2. A blood transfusion is being set up in an emergency room for an accident victim. Blood has a density of 1060 kg/m^3 and a viscosity of η is $4.0 \times 10^{-3} \text{ Pa}\cdot\text{s}$. The needle being used has a length of 3.0 cm and an inner radius of 0.25 mm . The doctor wishes to use a volume flow rate through the needle of $4.5 \times 10^{-8} \text{ m}^3/\text{s}$. What is the distance h above the victim's arm where the level of the blood in the transfusion bottle should be located? As an approximation, assume that the level of the blood in the transfusion bottle and the point where the needle enters the vein in the arm have the same pressure of one atmosphere. (In reality, the pressure in the vein is slightly above atmospheric pressure.)

Name: _____

Physics 202 Quiz 3

Apr 22, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. A wall in a house contains a single window. The window consists of a single pane of glass whose area is 0.16 m^2 and whose thickness is 2.0 mm . Treat the wall as a slab of the insulating material Styrofoam whose area and thickness are 18 m^2 and 0.10 meters , respectively. Heat is lost via conduction through the window and the wall. The temperature difference between the inside and outside is the same for the window and the wall. Of the total heat lost by the wall and the window, what is the percentage lost by the window?

2. In an aluminum pot, 0.15 kilograms of water at $100\text{ }^{\circ}\text{C}$ boils away in four minutes. The bottom of the pot is 3.1 mm thick and has a surface area of 0.015 m^2 . To prevent the water from boiling too rapidly, a stainless steel plate has been placed between the pot and the heating element. The plate is 1.4 mm thick, and its area matches that of the pot. Assuming that heat is conducted into the water only through the bottom of the pot, find the temperature at (a) the aluminum-steel interface and (b) the steel surface in contact with the heating element.

Name: _____

Physics 202 Quiz 4

May 6, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. The pressure and volume of an ideal monatomic gas change from A to B to C , as Figure 1 shows. The curved line between A and C is an isotherm. (a) Determine the total heat for the process and (b) state whether the flow of heat is into or out of the gas.

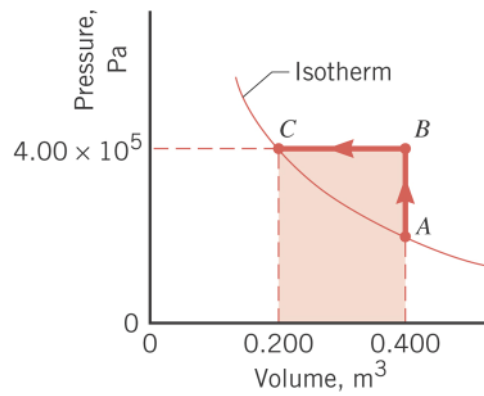


Figure 1: Problem 15.31

2. A Carnot engine operates between temperatures of 650 and 350 K. To improve the efficiency of the engine, it is decided either to raise the temperature of the hot reservoir by 40 K or to lower the temperature of the cold reservoir by 40 K. Which change gives the greatest improvement? Justify your answer by calculating the efficiency in each case.

Name: _____

Physics 202 Quiz 5

May 13, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. The middle C string on a piano is under a tension of 944 newtons. The period and wavelength of a wave on this string are 3.82 milliseconds and 1.26 meters, respectively. Find the linear density of the string.

- 2.** The mass of a string is 5.0 grams, and it is stretched so that the tension in it is 180 newtons. A transverse wave traveling on this string has a frequency of 260 Hz and a wavelength of 0.60 meters. What is the length of the string?

Name: _____

Physics 202 Quiz 6

May 20, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. One method for measuring the speed of sound uses standing waves. A cylindrical tube is open at both ends, and one end admits sound from a tuning fork. A movable plunger is inserted into the other end at a distance L from the end of the tube where the tuning fork is. For a fixed frequency, the plunger is moved until the smallest value of L is measured that allows a standing wave to be formed. Suppose that the tuning fork produces a 485-Hz tone, and that the smallest value observed for L is 0.264 m. What is the speed of the sound in the gas in the tube?

2. The range of human hearing is roughly from 20 Hz to 20 kHz. Based on these limits and a value of 343 m/s for the speed of sound, what are the lengths of the longest and shortest pipes (open at both ends and producing sound at their fundamental frequencies) that you expect to find in a pipe organ?

Name: _____

Physics 202 Quiz 7

May 27, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. The outside mirror on the passenger side of a car is convex and has a focal length of -7.0 meters. Relative to this mirror, a truck traveling in the rear has an object distance of 11 meters. Find (a) the image distance of the truck and (b) the magnification of the mirror.

2. A spotlight on a boat is 2.5 meters above the water, and the light strikes the water at a point that is 8.0 meters horizontally displaced from the spotlight (see Figure 2). The depth of the water is 4.0 meters. Determine the distance d , which locates the point where the light strikes the bottom.

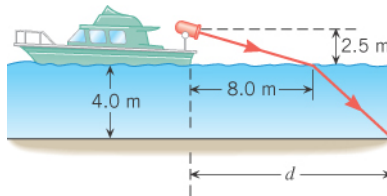


Figure 2: Problem 26.12

Name: _____

Physics 202 Quiz 8

Jun 5, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. A flat screen is located 0.60 meters away from a single slit. Light with a wavelength of 510 nm (in vacuum) shines through the slit and produces a diffraction pattern. The width of the central bright fringe on the screen is 0.050 meters. What is the width of the slit?

2. A spotlight sends red light (wavelength of 694.3 nm) to the moon. At the surface of the moon, which is 3.77×10^8 meters away, the light strikes a reflector left there by astronauts. The reflected light returns to the earth, where it is detected. When it leaves the spotlight, the circular beam of light has a diameter of about 0.20 meters, and diffraction causes the beam to spread as the light travels to the moon. In effect, the first circular dark fringe in the diffraction pattern defines the size of the central bright spot on the moon. Determine the diameter (not the radius) of the central bright spot on the moon.