

Honors Physics Fluids HW (Homework)

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Physics_Questions_0055

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1.

A **55.0** kg ballet dancer stands on her toes during a performance with four square inches (26.0 cm^2) in contact with the floor. What is the pressure exerted by the floor over the area of contact

(a) if the dancer is stationary, and

(b) if the dancer is leaping upwards with an acceleration of **3.00** m/s^2 ?

2.

The four tires of an automobile are inflated to a gauge pressure of **2.1** $\times 10^5$ Pa. Each tire has an area of **0.020** m^2 in contact with the ground. Determine the weight of the automobile.

3.

Water is to be pumped to the top of a **tall building** which is **650** ft high. What gauge pressure is needed in the water line at the base of the building to raise the water to this height?

4.

Air is trapped above liquid ethanol in a rigid container, as shown in Figure P9.15. If the air pressure above the liquid is **1.15** atm, determine the pressure in the bulb inside a bubble **4.0** m below the surface of the ethanol.

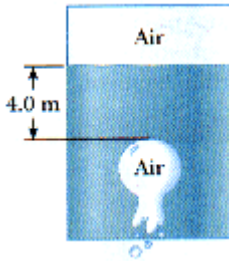


Figure P9.15

5.

A container is filled to a depth of **22.0** cm with water. On top of the water floats a **25.0**-cm-thick layer of oil with specific gravity **0.900**. What is the absolute pressure at the bottom of the container?

6.

A small ferry boat is **4.00** m wide and **6.00** m long. When a loaded truck pulls onto it, the boat sinks an additional **3.80** cm into the water. What is the weight of the truck?

7.

The density of ice is 920 kg/m^3 , and that of seawater is 1030 kg/m^3 . What fraction of the total volume of an iceberg is exposed?

8.

An empty rubber balloon has a mass of 0.0140 kg. The balloon is filled with helium at a density of 0.181 kg/m³. At this density the balloon is spherical with a radius of 0.600 m. If the filled balloon is fastened to a vertical line, what is the tension in the line?

9.

A rectangular air mattress is 1.6 m long, 0.45 m wide, and 0.09 m thick. If it has a mass of 2.0 kg, what additional mass can it support in water?

10.

A 1.00 -kg beaker containing 1.50 kg of oil (density = 916 kg/m³) rests on a scale. A 1.70 kg block of iron is suspended from a spring scale and completely submerged in the oil (Fig. P9.30). Find the equilibrium readings of both scales.

Top Scale:

Bottom Scale:

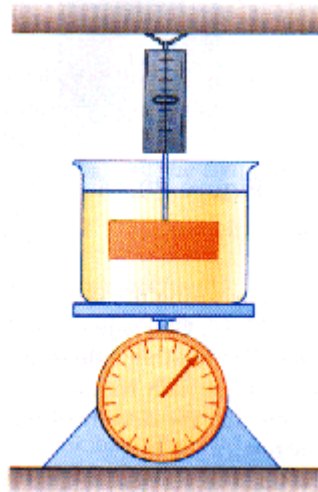


Fig. P9.30.

11.

A block of wood weighs 50.0 N when weighed in air. A sinker is attached to the block, and the weight of the wood-sinker combination is 230 N when the sinker alone is immersed in water. Finally, the wood-sinker combination is completely immersed and the weight is 170 N. Find the density of the block.

12.

A 630 -kg weather balloon is designed to lift a 3600 -kg package. What volume should the balloon have after being inflated with helium at standard temperature and pressure, in order that the total load can be lifted?

13.

A helium-filled balloon at atmospheric pressure is tied to a 2.5 m long, 0.100 kg string. The balloon is spherical with a radius of 0.40 m. When released, it lifts a length (h) of the string and then remains in equilibrium as in Figure P9.65. Determine the value of h . When deflated, the balloon has a mass of 0.25 kg. (*Hint: Only that part of the string above the floor contributes to the weight of the system in equilibrium.*)

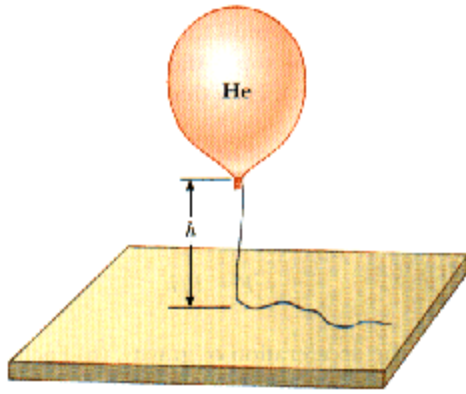


Figure P9.65.

14.

A 1.9-cm-thick bar of soap is floating on a water surface so that 1.7 cm of the bar is underwater. Bath oil of specific gravity 0.60 is poured into the water and floats on top of the water. What is the depth of the oil layer when the top of the soap is just level with the upper surface of the oil?