

1. The heaviest pig ever raised had a mass of 1158 kg. Suppose you placed this pig on a raft made of dry wood. The raft completely submerged in water so that the raft's top surface was just level with the surface of the lake. If the raft's volume was 3.40 m^3 , what was the mass of the raft's dry wood? The density of fresh water is $1.00 \times 10^3 \text{ kg/m}^3$.
2. The largest iceberg ever observed had an area of $3.10 \times 10^4 \text{ km}^2$, which is larger than the area of Belgium. If the top and bottom surfaces of the iceberg were flat and the thickness of the submerged part was 0.84 km, how large was the buoyant force acting on the iceberg? The density of sea water equals $1.025 \times 10^3 \text{ kg/m}^3$.
3. A cannon built in 1868 in Russia could fire a cannonball with a mass of $4.80 \times 10^2 \text{ kg}$ and a radius of 0.250 m. When suspended from a scale and submerged in water, a cannonball of this type has an apparent weight of $4.07 \times 10^3 \text{ N}$. How large is the buoyant force acting on the cannonball? The density of fresh water is $1.00 \times 10^3 \text{ kg/m}^3$.
4. The tallest iceberg ever measured stood 167 m above the water. Suppose that both the top and the bottom of this iceberg were flat and the thickness of the submerged part was estimated to be 1.50 km. Calculate the density of the ice. The density of sea water equals $1.025 \times 10^3 \text{ kg/m}^3$.
5. One of the rarest non-radioactive elements is rhenium, which is part of the same chemical group as manganese. The pure metal also has the third highest melting point of any solid element and the fourth greatest density of any element. Imagine a cube of rhenium, which has a density of $2.053 \times 10^4 \text{ kg/m}^3$, that is 10.0 cm long on each side. Suppose this cube is partially submerged in fresh water. If the apparent weight of the rhenium cube is 192 N, what is the buoyant force acting on the cube?
6. The element osmium has the greatest density of any element. Suppose a cube of osmium with a volume of 166 cm^3 is submerged in fresh water. The apparent weight of the cube is 35.0 N. Given that fresh water has a density of $1.00 \times 10^3 \text{ kg/m}^3$, what is the density of osmium?
7. A ball strikes the pavement with a force of 5.0 N. If the pressure exerted on the pavement is $9.6 \times 10^3 \text{ Pa}$, what is the area of contact between the ball and the pavement?

8. A hydraulic lift consists of a piston, on which is placed an automobile with a mass of 1.40×10^3 kg. The other piston consists of a block of ice with a uniform thickness of 0.076 m. Given that the density of ice is 917 kg/m^3 , what is the area of the piston holding the automobile? Assume that the weight of the automobile is uniformly distributed over the piston's surface. Assume the piston to be massless.
9. An engineer devises an elevator for tall buildings that does not rely on cables suspending a car. The elevator consists of a piston that is raised by a non-compressible fluid, which is pushed upward by another, larger piston. Suppose the elevator piston is designed to rise 448 m above street level and that the maximum load that can be lifted is 4.45×10^4 N. What force must be exerted on the larger piston if its maximum displacement is 8.00 m? Assume the pistons to be massless.
10. One of the lowest atmospheric pressures ever measured at sea level was 8.88×10^4 Pa, which existed in hurricane Gilbert in 1988. This same pressure can be found at a height 950 m above sea level. Use this information to estimate the density of air.
11. In 1993, Francisco Ferreras of Cuba held his breath and took a dive that lasted more than 2 minutes. The maximum pressure Ferreras experienced was 13.6 times greater than atmospheric pressure. To what depth did Ferreras dive? The density of sea water is $1.025 \times 10^3 \text{ kg/m}^3$.
12. A penguin can endure pressures as great as 4.90×10^6 Pa. What is the maximum depth to which a penguin can dive in sea water?
13. In 1942, the British ship Edinburgh, which was carrying a load of 460 gold ingots, sank off the coast of Norway. In 1981, all of the gold was recovered from a depth of 245 m by a team of 12 divers. What was the pressure exerted by the ocean's water at that depth?
14. In 1960, a bathyscaph descended 10 916 m below the ocean's surface. What was the pressure exerted on the bathyscaph at that depth?

