Buoyancy – Practice

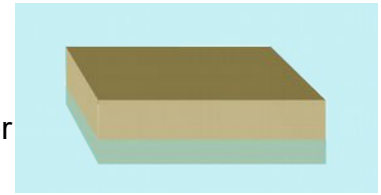
density of air = 1.29kg/m^3 density of water = 1000kg/m^3 g = 9.81N/kg

1. A piece of wood, volume 300cm^3 and density 400kg/m^3, floats on water. Calculate the volume immersed in the water. *(120cm^3)*
   (hint: use the principle of the iceberg: ratio of volume immersed to total volume)

2. A cube, made of oak, of side 1.50m, floats in water with 1.05m of its depth below the surface and with its sides vertical. Calculate the density of the oak. *(700kg/m^3)*

3. A hot air balloon has a mass of 300kg, including the basket. The hot air inside the balloon weighs 17kN. Calculate the maximum load that the balloon is able to lift, if it displaces 25kN of cold air. *(5.1kN)*

4. A boat weighing 120kN is floating on a lake. The boat is like a box, 7m long, 3m wide, and 2m tall. Calculate:
   (a) the buoyant force acting on the boat, *(120kN)*
   (b) the volume of water that must be displaced in order to hold the boat up. *(12.2m^3)*
   (c) how much (in meters) of the 2-meter height of the boat is below the surface of the lake. *(0.58m)*



5. A balloon, mass 80kg, has a capacity of 120m^3. If it is filled with helium, density 0.18 kg/m^3, calculate the load that it can support. *(521N)*

6. A spherical balloon 5.0 meters in diameter contains helium, density 0.18 kg/m^3. Calculate:
   (a) the volume of the balloon, *(65.4m^3)*
   (b) the upthrust on the balloon from the air, *(827N)*
   (c) the weight of the helium in the balloon, *(115N)*
   (d) the net upward force, assuming that the weight of the balloon itself is insignificant, *(712N)*
   (e) the mass that could be lifted by the balloon. *(73kg)*