IB Physics
FA 10.1 - Fluid Statics

Name________________________________

Show your work, round to the correct significant figures, circle your answers, and label them with units.

(1 atm = 1.013×10^5 Pa = 101.3 kPa = 14.7 psi = 760 Torr; 1 m^3 = 1000 liters; $p_{absolute} = p_{gauge}$ + 1 atm;)

When you have finished this, go to the website and check your answers. If you got a problem wrong, cross it off on the front, and do it correctly on the back.

1. A circular porthole in an airplane has a diameter of 37.0 cm. If there is a pressure difference of 31,510 Pa from one side of the window to the other, what is the net force pushing out on the porthole?

2. A cannon ball has a density of 7820 kgm^{-3} and a mass of 23.2 kg. What is its radius if it is perfectly spherical?

3. A hydraulic jack has an input piston diameter of 0.850 cm, and an output piston diameter of 4.50 cm. What force must you exert on the input piston to lift a 1210 kg car?

4a. An empty beaker 8.20 cm in diameter is pushed 10.3 cm into mercury ($\rho = 13.6 \times 10^3$ kg m^{-3}). What is the net upward force on the bottom of the beaker? (Assume the pressure above the mercury is 1 atm)

4b. What is the gauge pressure in PSI at a depth of 8.50 m in fresh water? (ρ = 1000. kg m^{-3})

4c. At what depth in ocean water (ρ = 1025 kgm^{-3}) is the absolute pressure 8320 Torr?

5a. A cylinder has a radius of 0.920 cm and is 25.0 cm long. How far will it sink into a mixture with a density of 865 kg m^{-3} if it has a mass of 37.5 grams assuming it is weighted so it floats vertically?

5b. What upward force would you need to exert on a 11.5 kg piece of Murralite (ρ = 1666 kgm^{-3}) submerged in the dead sea where the water has a density of 1240 kgm^{-3} to keep it from sinking?

5c. A hot air balloon is 9.00 m in radius (assume it is spherical) and contains hot air with a mean density of 0.950 kgm^{-3}. Calculate the lifting capacity (in N) of the hot air if it is surrounded by air with a density of 1.31 kgm^{-3}