

ave. = 7.1  
 $\sigma = 2.6$

Name Answer Key

Lab: early late (please circle one)

**Quiz #8: Fluids**

**Problem 1 (2 points)**

A solid lead sphere and a solid aluminum sphere of the same diameter are both completely submerged in water. Lead is denser than aluminum. Is the buoyant force on the lead sphere greater than, less than, or the same as the buoyant force on the aluminum sphere.

C

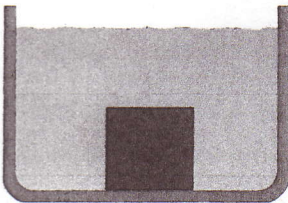
- a) buoyant force on lead sphere > buoyant force on aluminum sphere
- b) buoyant force on lead sphere < buoyant force on aluminum sphere
- c) buoyant force on lead sphere = buoyant force on aluminum sphere
- d) more information is needed

since  $V_{sub}$  is same,  
 $F_B$  is same

$$F_B = \rho_{fluid} V_{sub} g$$

**Problem 2 (4 points)**

A lead cube with a mass of 12.5 kg and a density of 11,340 kg/m<sup>3</sup> is at rest at the bottom of a pool of water as shown in the figure below. What is the normal force acting on the cube?



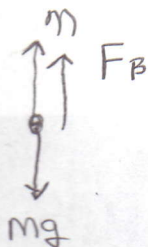
$$m = 12.5 \text{ kg}$$

$$\rho = 11,340 \text{ kg/m}^3$$

$$\rho = m/v \rightarrow v = m/\rho = \frac{12.5 \text{ kg}}{11,340 \text{ kg/m}^3}$$

$$V_{lead} = \underline{1.10 \times 10^{-3} \text{ m}^3}$$

$$F_B = \rho_{fluid} V_{sub} g = (1000 \text{ kg/m}^3)(1.10 \times 10^{-3} \text{ m}^3)(9.80 \text{ m/s}^2) = \underline{10.8 \text{ N}}$$



$$\sum F_y = ma_y = 0$$

$$n + F_B - mg = 0 \rightarrow n = mg - F_B$$

$$n = (12.5 \text{ kg})(9.80 \text{ m/s}^2) - 10.8 \text{ N}$$

$n = 112 \text{ N}$

**Problem 3 (4 points)**

A submarine is operating at 35.0 m below the surface of the ocean. The density of seawater is  $1025 \text{ kg/m}^3$ . How much force does the water exert on a circular window of radius 0.45 m?

$$P = P_0 + \rho g d$$

$$P_0 = P_{\text{atm}} = 1.013 \times 10^5 \text{ Pa}$$

$$d = 35.0 \text{ m}$$

$$\rho = 1025 \text{ kg/m}^3$$

$$P = 1.013 \times 10^5 \text{ Pa} + (1025 \text{ kg/m}^3)(9.80 \text{ m/s}^2)(35.0 \text{ m})$$

$$P = \underline{4.53 \times 10^5 \text{ Pa}}$$

$$P = F/A \rightarrow F = PA$$

$$A = \pi r^2$$

$$F = (4.53 \times 10^5 \text{ Pa}) \pi (0.45 \text{ m})^2$$

$$F = \underline{2.88 \times 10^5 \text{ N}}$$

# 1 PHYSICS

## 1.1 History

Aristotle said a bunch of stuff that was wrong. Galileo and Newton fixed things up. Then Einstein broke everything again. Now, we've basically got it all worked out, except for small stuff, big stuff, hot stuff, cold stuff, fast stuff, heavy stuff, dark stuff, turbulence, and the concept of time.