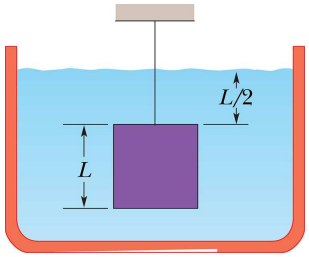
TA: Tomoyuki Nakayama Monday, November 15, 2010

PHY 2048: Physics 1 with Calculus, Fall 2010
Review: Chapter 14.1-14.10

The purpose of this review is to refresh your memory. Physics is a cumulative subject, so make it sure you understand basic concepts and typical problem solving techniques in previous chapters before moving on to a new chapter!

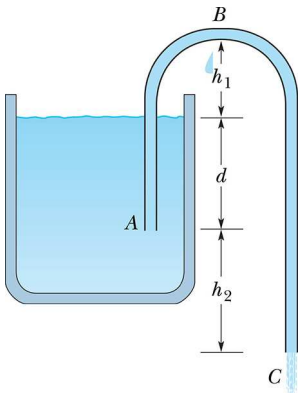
A. Fluid in Equilibrium

A 3-kg container holds 10 kg of water. A cube of edge length 0.1 m and mass 2 kg is suspended by a string and completely submerged in water. If the whole system is put on a spring scale, what is the reading of the scale?



B. Fluid in Motion

A siphon is a device for removing liquid from a container. In the figure below, tube *ABC* must initially be filled, but once this has been done, liquid will flow through the tube until the liquid surface in the container is level with the tube opening at *A*. If the liquid density is 1000 kg/m^3 and the distances in the figures are h_1 = 20 cm, h_2 = 40 cm and d = 30 cm, what is the pressure at the topmost point *B*? The tube has a uniform cross sectional area.



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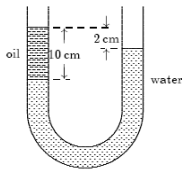
Practice Exam Problems (Chapter 14.1-14.10)

Working on this problem set is optional, but it is strongly recommended. It is quite possible that some of these problems will appear in the exams. Do it on a weekly basis. Cramming is tiring and sometimes it ends up in a disaster.



1. The density of water is 1.0 g/cm^3. The density of the oil in the left column of the U-tube shown on the right is: (Variation of Pressure w/ Height) a. 0.20 g/cm^3 b. 0.80 g/cm^3 c. 1.0 g/cm^3 d. 1.3 g/cm^3 e. 5.0 g/cm^3

2. A closed hemispherical shell of radius R is filled with fluid at uniform pressure p. The net force of the fluid on the curved portion of the shell is given by: (Pressure and Force) a. $2\pi R^2 p$ b. $\pi R^2 p$ c. $4\pi R^2 p$ d. $(4/3)\pi R^2 p$ e. $(4/3)\,\pi R^3 p$

3. One piston in a hydraulic lift has an area that is twice the area of the other. When the pressure at the smaller piston is increased by Δp the pressure at the larger piston: (Pascal's Principle) a. increases by 2 Δp b. increases by $\Delta p/2$ c. increases by Δp d. increases by 4 Δp e. does not change

4. The dimensions of a wooden raft (density = 150 kg/m^3) are 3.0 m×3.0m×1.0 m. What maximum load can it carry in seawater (density = 1020 kg/m^3)? a. 1350 kg b. 7800 kg c. 9200 kg d. 19 500 kg e. 24 300 kg.

5. A 210-g object apparently loses 30 g when suspended in a liquid of density 2.0 g/cm^3. The density of the object is: (Apparent Weight) a. 7.0 g/cm^3 b. 3.5 g/cm^3 c. 1.4 g/cm^3 d. 14 g/cm^3 e. none of these

6. Water flows through a cylindrical pipe of varying cross section. The velocity is 3.0 m/s at a point where the pipe diameter is 1.0 cm. At a point where the pipe diameter is 3.0 cm, the velocity is: (Continuity Equation) a. 9 m/s b. 3 m/s c. 1m/s d. 0.33 m/s e. 0.11 m/s

7. A large water tank, open at the top, has a small hole in the bottom. When the water level is 30 m above the bottom of the tank, the speed of the water leaking from the hole: (Bernoulli's Equation) a. is 2.5 m/s b. is 24 m/s c. is 44 m/s d. cannot be calculated unless the area of the hole is given e. cannot be calculated unless the areas of the hole and tank are given

Answers: 1-b 2-b 3-c 4-b 5-d 6-d 7-b