# Principles of Physics: Problem Set #11

## Ideal Gas Processes and Fluids

$$PV = nRT \quad ; \quad U = \frac{f}{2}nRT \quad ; \quad v_{rms} = \sqrt{\frac{3k_B T}{m}}$$

$$\Delta U = Q + W \quad ; \quad W = P\Delta V$$

$$F_B = \rho_{\text{fluid}} g V_{\text{displaced}} \quad ; \quad \frac{1}{2}\rho v_1^2 + \rho g y_1 + P_1 = \frac{1}{2}\rho v_2^2 + \rho g y_2 + P_2$$

Due: Friday Nov. 9 in class

Reading assignment:

| | | |
|---|---|---|
| for Mon, | Ch 7 (pp 138-140) | [Fluid Statics: Pressure and Archimedes principle] |
| for Wed, | Ch 7 (pp 140-142) | [Fluid Dynamics: Bernoulli's equation] |
| for Fri, | Ch 7 (pp 145-148) | [Thermodynamic cycles & Degrees of freedom] |

Problem assignment:

(WARNING - The problem naming/numbering scheme in the text is confusing, so ALWAYS double check whether a problem is guided review (**GR**), skill building (**SB**), **Synthesis**, etc.)

CHAPTER 7

**GR-4** (pg 154 ... pressure at the bottom of a lake)

**GR-5** (pg 154 ... pumping water I)

**GR-7** (pg 154 ... blowing on a piece of paper)

**GR-8** (pg 154 ... pumping water II)

**A1**. A hollow glass sphere of mass 0.5 kg and radius 10 cm floats in water.
a. Draw a force diagram and determine what fraction of the sphere is submerged.
b. Compute the force required to push the sphere underwater (draw another force diagram).

**GR-15** (pg 155 ... work and heat for an isothermal gas process)

**SB-6** (pg 155 ... ideal gas in hot and cold water)

**MC-1** (pg 156 ... ideal gas internal energy)

**MC-2** (pg 156 ... ideal gas molecular speed)

**MC-5** (pg 156 ... interpreting an ideal gas PT diagram)