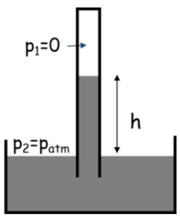
Name: ______________________________ DISC: __________

- Do your own work.
- Answer the questions below in the space provided.
- Make sure you show all your work and any equations that you use.
- Please place a box around your answers.
- Remember to give the correct units with all numerical answers.

Q1	Q2	Q3	Q4
5	5	5	5

1. A barometer can be used to measure atomspheric pressure (P_{atm}). In a barometer an evacuated tube is inserted into a pool of liquid, in this case alcohol. Let's investigate what happens:



ρ Alcohol	P_1	P_{atm}
$697\frac{kg}{m^3}$	$0\ Pa$	$101{,}325\ Pa$

a. Why does the alcohol rise up the tube inside?

Explanation (2 pts):

b. How high does the alcohol rise up the tube inside relative to the level outside? (hint: $P_{atm} = P_1 + \rho g h$)

Pressure (3 pts):

2. Consider an iceberg floating in an ocean as appearing in the movie *Titanic*. The density is 0.917 *g/ml* for ice and 1.025 *g/ml* for the surrounding water. What percentage of the iceberg's volume is above water?

ARCHIMEDES' PRINCIPLE	ρ_{ice}	ρ_{sea}
$F_B = \rho_{fluid} V_{displaced}\, g$	$0.917\ g/ml$	$1.025\ g/ml$

Floating Iceberg (5 pts):

3. Hook's Law, $F_{spring} = -kx$, describes the force exerted on an object by a spring.

Answer (1 pt):

a. A rectangular block is attached to a horizontal spring and rests on a frictionless surface. A lab assistant pulls the block displacing it from its equilibrium position and then releases it. Does the block experience *constant* acceleration just after it is released (**yes/no**)?

b. Draw a free-body diagram describing the situation in part (a). Remember to include a coordinate system and all force labels.

Free-body Diagram (2 pts):

c. Using $U_{spring} = \frac{1}{2}kx^2$ and *energy conservation*, explain why the *speed* of the block depends on its *position* (x). Let the initial displacement of the spring be x_{ini}.

Explanation (2 pts):

4. Foucault's Pendulum can be approximated as a simple harmonic oscillator. It was used to demonstrate the rotation of the earth.

Answer (1 pt):

a. Does Foucault's Pendulum experience constant acceleration (**yes/no**)?

b. If the pendulum length is $5\ m$, use $T = 2\pi\sqrt{\frac{L}{g}}$ to find the period of the pendulum's swing.

Period (2 pts):

c. Now take your Foucault's Pendulum to another planet. You want to measure the acceleration of gravity on that planet. You set up your pendulum and notice that $T = 2T_{Earth}$. What is the acceleration of gravity on the new planet, g_{new}?

g_{new} (2 pts):