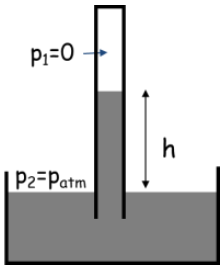
Name: _____ DISC: _____

- 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 olive oil. Let's investigate what happens:



ρ Olive Oil	P_1	P_{ATM}
$800\ kg/m^3$	$0\ Pa$	$101325\ Pa$

Explanation (2pts):

a. Why is the height of the olive oil in the tube related to the atmospheric pressure?

b. How long must the tube be to measure the atmospheric pressure using olive oil? (hint: $P_{ATM} = P_1 + \rho g h$)

Pressure (3 pts):

2. Remarkably steel ships do not sink in the ocean. Employ Archimedes' Principle to explain why.

ARCHIMEDES' PRINCIPLE	ρ_{sea}	ρ_{steel}
$F_B = \rho_{fluid} V_{displaced} g$	$1.025\ g/ml$	$7.9\ g/ml$

Floating Carriers (5 pts):

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

Answer:

a. An object is attached to a horizontal spring and rests on a frictionless surface. The spring is displaced from the equilibrium position.
The object *does <u>not</u> experience constant* acceleration (choose one): **true/false**?

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 (2pts):

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

Explanation (2 pts):

4. Foucault's Pendulum is a simple harmonic oscillator. It was used to demonstrate the rotation of the earth.

Answer:

a. Does Foucault's Pendulum experience constant acceleration? Explain you answer.

b. If the pendulum length is $8\ m$, 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. 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):