AP Physics Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Under Pressure

Directions: Go to <http://phet.colorado.edu> Simulation: Under Pressure

Objectives

* To determine how atmospheric pressure affects pressure readings in a tank of liquid.
* To establish a mathematical relationship that allows one to determine the pressure in a liquid.
* To describe the changes which occur in a liquid when pressure is applied to a liquid.

1. Explore the simulation my moving the pressure gauge to find out how pressure changes in air and water. Describe your findings and include specific data from your explorations to support your ideas.
2. Add another gauge to compare the pressure at sea level to the bottom of the pool. Is this consistent with your observations in part 1?

3. How would your values compare if this pool of water was at a higher elevation in Denver? To answer this question, try dropping gravity a bit and notice what happens. Can you explain your results?

4. Restore g to 9.8. Turn the atmosphere off and compare the pressure at sea level to the bottom of the pool. Are the values consistent with your data in part 2? If not, explain why they have changed.

5. How does the shape of the pool affect pressure at the bottom? Try the “slanty” pools. Explain your findings.

6. How does the density of the fluid affect the pressure at the bottom? Explain what you did to answer this question.

7. Now try a quick 3 part experiment. Fill the pool and shut off the atmosphere.

I. Measure the pressure of the water at a depth of 1 meter, 2 meters and 3 meters. Explain any patterns.

II. Put the gauge at a depth of exactly 1 meter (it should read 9.8 kPa). Now change gravity to 4.9 m/s/s and then 19.6. Explain any patterns.

III. Put the gauge at a depth of 1 meter and set gravity back to 9.8. Change the fluid density to 700 kg/m3 and 1400 kg/m3. Explain any patterns.

8. Summarize experiments I,II,III by stating what factors affect pressure and whether the effects are direct or indirect.

9. Convert your written answer in 8 into an equation ( i.e. P = …..). Test your equation to predict the pressure at the bottom of the rectangular tank of seawater of density 1030. Show all of your work including units.

10. Turn air pressure back on. Pick the crazy looking tank with a narrow tube and wide pool. Make sure the water is plain water, on the earth. Put a pressure marker on the bottom of the tank. Drop a 250 kg mass in the hole.

a) Does the water exert a force on the mass? How do you know?

b) Did the pressure change? By how much?

c) Remove the mass. Put a second pressure gauge at a depth of 0.5 meters in the wide pool. Drop the mass in again. Did the pressure change? By how much? Compare this to b.

d) What happens to the gauges if you use the 500kg mass instead?

e) Try dropping the 250 mass again but now observe the water carefully (ruler!) to compare the movement of water in the small tube to the movement of water in the wider pool. Why do you think these amounts are different?

f) Turn off atmospheric pressure. What happened? Explain your results using past observations.

Summary: Write a summary addressing the three objectives.