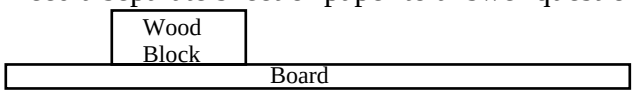
AP Physics 2 Summer Assignment Name: _____

*Due First Full Day of Class
*Contact Mr. Babich at ababich@mchs.net with any questions.

Part 1: Know Your AP Physics 2 Exam – Complete each task in bold on a separate sheet of paper.

- Go to: the AP Physics 2 student site: https://apstudent.collegeboard.org/apcourse/ap-physics-2 and download the 5 pdf files.
- In the AP Physics 2 Course and Exam Description pdf:
  - Read pg 9-10 on the description of the course and the "Big Ideas" of the course
  - Read pg 11-15 on the 7 science practices. **After reading, write a paragraph or more on the specific expectations of each scientific practice that you feel you need to work on throughout this course and how you plan to address those expectations.**
  - Read pg 79-83 on the exam format. Pay attention to the meaning of the specific words listed in "Terms Defined". **Which terms are the most confusing or challenging?**
- **Print out the AP Physics 2 Equation Tables pdf (to use and discuss in class)**
- Read the Paragraph Length Response pdf. **Comment on the differences from AP Physics 1.**
- **Make a list of any questions you have about the test and/or format and bring it to class.**

Part 2: Experimental Design – You may need a separate sheet of paper to answer questions #1 and #2 in detail



1. Design an experiment to determine the coefficient of friction between a wood block and a board. You have access to common lab equipment. Describe your experimental procedure in enough detail so that another student could duplicate your process. Include what measurements you will take and how you will take them.

2. Describe one assumption you made about the design of the experiment and explain how it might affect the value obtained for the coefficient of friction.

Part 3: Variable Manipulation

Solve the following equations for the selected variable. Then, determine by what factor the solved variable would change given the specific change in another variable.

Ex. $v_f = v_i + at$	solve for a	$a = (v_f - v_i)/t$ _____	if t is doubled, a is halved
1. $PV = nRT$	solve for T	T = _____	if n is tripled, T _____
2. $F_g = Gm_1m_2/r^2$	solve for r	r = _____	if m_1 is doubled, r _____
3. $\tau = rF \sin\theta$	solve for θ	θ = _____	if r is halved, θ _____
4. $F_e = kq_1q_2/r^2$	solve for r	r = _____	if q_2 is tripled, r _____
5. $F_c = mv_t^2/r$	solve for v_t	v_t = _____	if m is halved, v_t _____
6. $KE = \frac{1}{2} mv^2$	solve for m	m = _____	if v is doubled, m _____

Part 4: Physics in Our World

1. Physics is happening around us all the time, even on YouTube.
    a. Find a school appropriate video clip on YouTube related to one or more physics concepts.
    b. Type a paragraph-length response, following AP Physics 2 guidelines, describing how the video is related to concepts in physics. Be specific and accurate in your explanation. Include diagrams and equations if necessary.
    c. Email ababich@mchs.net with the paragraph and the link to the YouTube video no later than the first day of school.
    d. Prepare a presentation of the physics concepts in the video.

Part 5: Preparation for Unit 1 – Fluid Statics/Dynamics

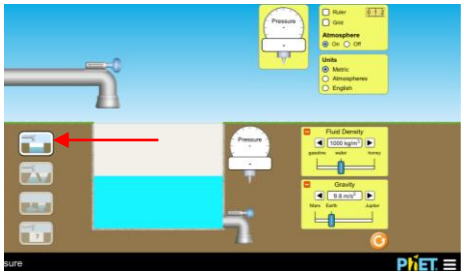
- Research definitions, equations and the importance of each the topics listed below related to fluid statics. Type 2-3 paragraphs including definitions, units of measure and the relationship. Include a works cited. Be prepared to share a video or website that was useful in finding information on these topics.
    - What is a 'fluid'?
    - Density
    - Pressure (including atmospheric pressure, gauge pressure, absolute pressure)
    - Depth of a fluid
    - Pascal's Principle and Hydraulics
    - Buoyancy / Buoyant Force
    - Archimedes' Principle

Part 6: Under Pressure**:** https://phet.colorado.edu/sims/html/under-pressure/latest/under-pressure_en.html

Learning Goals: Students will be able to qualitatively discover which variables affect pressure.

1. Download, open and explore the simulation to find out how pressure changes in air and water. Describe your findings below and include specific data from your explorations to support your ideas.

2. Select the first screen shown in the diagram. Lower the pressure gauge from the top of the screen down to just above the water (about 3 meters). Record your observations. Explain why this happens.



3. Fill the tank. Now lower the pressure gauge from the top of the water to the bottom of the screen (about 3 meters). Record your observations. Explain why this result differs from your previous answer:

4. Calculate the pressure 3 m underwater if the pressure at sea level is 101325 Pa.
   From the equation sheet: $P = P_0 + pgh$.
   - P = unknown pressure at 3 m underwater
   - P_0 = pressure at top of water
   - p = density of water (1000 kg/m^3)
   - g = acceleration due to gravity
   - h = height of fluid (distance below surface of water)

5. Select the second screen in the diagram with the triangular tanks. Slide the pressure gauge along the bottom of the tank.
   a. What happens as the gauge moves across the bottom? Explain:

   b. How does the shape of the pool affect the values?

6. Select the third screen in the diagram and put a pressure gauge at the bottom of each side of the tank. What happens to the pressures as the weights are added on the left tank? What conclusion can you make? (Hydraulics and Pascal's Principle)

7. Remove the weights. This is a hydraulic system like the brake system on your car. The left piston is small like your brake pedal piston and the right piston is large like the piston at your brake pads. Get a ruler and measure the heights of the fluid in each tank. Now add a total of 1000 kg to the left and re-measure the heights. Describe your observations and explain:

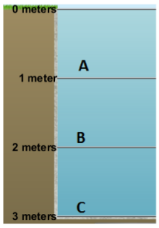
8. How much work is done on the left piston? (Hint: the change in height is important) ($\Delta E = W = Fd$)

9. Ideally, all the work is transmitted from the left piston to the right piston. What force does this piston exert? ($\Delta E = W = Fd$)

10. Explain, using the hydraulic principle (Pascal's Principle), how a small force can be applied on a brake pedal to bring a car to a stop.

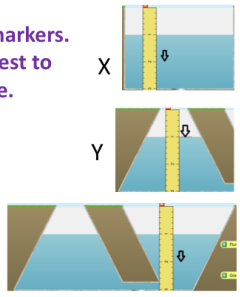
11. Test a variety of situations to answer the following questions. List your answers below each question with an explanation for your answer.

1. Order from lowest to highest pressure.



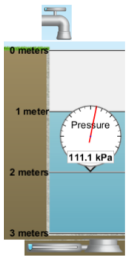
A. A<B<C
B. C<B<A
C. all are equal

2. Look at the markers. Order from lowest to highest pressure.



A. Y<Z<X
B. Y<X<Z
C. Z<X<Y
D. X<Z<Y
E. two are equal

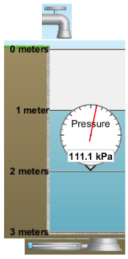
3. What will happen to the pressure if more water is added?



A. increase
B. decrease
C. stay the same

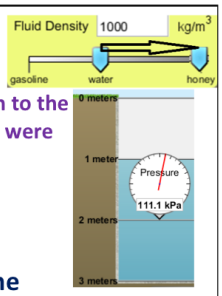
Question 1: _____ Question 2: _____ Question 3: _____

4. What will happen to the pressure if more water is added while the same amount is removed?

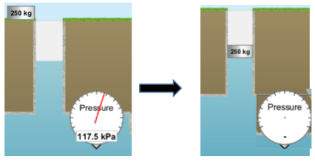


A. increase
B. decrease
C. stay the same

5. What will happen to the pressure if the fluid were changed to honey?



A. increase
B. decrease
C. stay the same

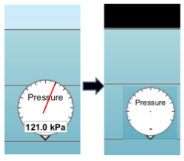


6. If the 250 kg mass was put on the water column, what will happen to the pressure?

A. increase
B. decrease
C. stay the same

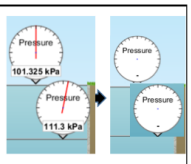
Question 4: _____ Question 5: _____ Question 6: _____

7. If the only change was to remove the air pressure , what will happen to the pressure?

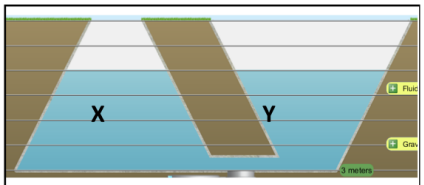


A. increase by 101.3 kPa
B. decrease by 101.3 kPa
C. stay the same
D. Something else

8. If the only change was to go to a place where the gravity was doubled, what will happen to the pressure?



A. Both pressures would double
B. Only the air pressure would double
C. The air pressure would double, and the water pressure would increase some
D. Something else



9. How do the pressures at the two locations compare?

A. X>Y
B. Y>X
C. They are the same

Question 7: _____ Question 8: _____ Question 9: _____