UCONN ECE Physics Name _____

Summer Assignment

Fall 2020 – Spring 2021

We have read the policies and expectations for UCONN ECE Physics in the attached syllabus. We understand and accept these policies.

Student Signature: _____ Date _____

Parent / Guardian Name (print) _____

Parent / Guardian Signature: _____ Date _____

I. Students taking UCONN ECE Physics are often taking other AP courses as well in their senior year. Students are also involved in clubs, sports and other extracurricular activities, which taken alone are all good things. Please take into consideration the time requirements for each class/club/activity and determine for yourself if the workload is adequate for you or may be overwhelming. Try and pick those courses and activities that you truly desire to take. You cannot do everything.

II. UCONN ECE Physics is a rigorous class that covers A LOT of material. This necessitates a very fast pace. This summer homework will allow us to start on the Physics subject matter immediately when school begins. This packet is a math review to brush up on valuable skills, and perhaps a means to assess whether you are correctly placed in UCONN ECE Physics.

III. Physics, and UCONN ECE Physics in particular, requires an exceptional proficiency in algebra, trigonometry, and geometry. In addition to the science concepts Physics often seems like a course in applied mathematics. The following assignment includes mathematical problems that are considered routine in UCONN ECE Physics. This includes knowing several key metric system conversion factors and how to employ them. Another key area in Physics is understanding vectors.

IV. The attached pages contain a brief review, hints, and example problems. It is hoped that combined with your previous math knowledge this assignment is merely a review and a means to brush up before school begins in the fall. Please read the text and instructions throughout.

V. Cell phones will not be allowed out in class AT ANY TIME. If cell phones are out, they will be placed in a secure box and may be picked up after class.

VI. **Please work on this packet AFTER August 1, 2020, however don't wait until the last weekend of the summer**.

VII. What is due the first day of school, 2020?

A. **Signed Class Policies and Expectations Sheet**
   1. **Read all of the information included in this document.**
   2. **Complete the section at the top of this form and obtain appropriate signatures.**
   3. **Complete the math problems section.**
   4. **Please print out the above assignments and do your work on the print-outs.**

VIII. *There will be a test on the math in this packet the third day of school.*

IX. What if I don't get all the problems or don't understand the instructions?

A. Simply do the best you can, but show some work / effort in order to receive credit.
B. Come to class the first day with your questions, in order to resolve these issues prior to the test/quiz.
C. Contact Mr. Ontko at ontko@csdnb.org

Summer Work

Since physics is the study of relationships in nature, and these relationships are often expressed in the form of mathematical equations, we are requiring you to spend time this summer solving some math problems that we typically see in Physics. The following are ordinary physics problems. Place the answer in scientific notation when appropriate and simplify the units (Scientific notation is used when it takes less time to write than the ordinary number does. As an example, 200 is easier to write than 2.00×10^2, but 2.00×10^8 is easier to write than 200,000,000). Do your best to cancel units, and attempt to show the simplified units in the final answer.

a. $T_s = 2\pi\sqrt{\dfrac{4.5\times10^{-2}\,kg}{2.0\times10^{3}\,kg/s^2}} =$ _____

b. $K = \dfrac{1}{2}\left(6.6\times10^{2}\ kg\right)\left(2.11\times10^{4}\ m/s\right)^2 =$ _____

c. $F = \left(9.0\times10^{9}\,\dfrac{N\cdot m^2}{C^2}\right)\dfrac{\left(3.2\times10^{-9}C\right)\left(9.6\times10^{-9}C\right)}{\left(0.32m\right)^2} =$ _____

d. $\dfrac{1}{R_p} = \dfrac{1}{4.5\times10^{2}\Omega} + \dfrac{1}{9.4\times10^{2}\Omega}$ $R_P =$ _____

e. $e = \dfrac{1.7\times10^{3}\ J - 3.3\times10^{2}\ J}{1.7\times10^{3}\ J} =$ _____

f. $1.33\sin 25.0^\circ = 1.50\sin\theta$ $\theta =$ _____

g. $\gamma = \dfrac{1}{\sqrt{1-\dfrac{2.25\times10^{8}\,m/s}{3.00\times10^{8}\,m/s}}} =$ _____

Often problems in Physics are done with variables only. Solve for the variable indicated. Don't let the different letters confuse you. Manipulate them algebraically as though they were numbers.

h. $v^2 = v_o^{\,2} + 2a\left(s - s_o\right)$ $, a =$ _____

i. $K = \dfrac{1}{2}kx^2$ $, x =$ _____

j. $T_p = 2\pi\sqrt{\dfrac{\ell}{g}}$ $, g =$ _____

k. $F_g = G\dfrac{m_1 m_2}{r^2}$ $, r =$ _____

l. $mgh = \dfrac{1}{2}mv^2$ $, v =$ _____

m. $x = x_o + v_o t + \dfrac{1}{2}at^2$ $, t =$ _____

n. $B = \dfrac{\mu_o}{2\pi}\dfrac{I}{r}$ $, r =$ _____

o. $x_m = \dfrac{m\lambda L}{d}$ $, d =$ _____

p. $pV = nRT$ $, T =$ _____

q. $\sin\theta_c = \dfrac{n_1}{n_2}$ $, \theta_c =$ _____

r. $qV = \dfrac{1}{2}mv^2$ $, v =$ _____

s. $\dfrac{1}{f} = \dfrac{1}{s_o} + \dfrac{1}{s_i}$ $, s_i =$ _____

Physics uses the ***KMS*** system (***SI***: System International). ***KMS*** stands for kilogram, meter, second. These are the units of choice of physics. The equations in physics depend on unit agreement. So you must convert to ***KMS*** in most problems to arrive at the correct answer.

kilometers (*km*) to meters (*m*) and meters to kilometers
centimeters (*cm*) to meters (*m*) and meters to centimeters
millimeters (*mm*) to meters (*m*) and meters to millimeters
nanometers (*nm*) to meters (*m*) and metes to nanometers
micrometers (μm) to meters (*m*)
gram (*g*) to kilogram (*kg*)
Celsius (^oC) to Kelvin (*K*)
atmospheres (*atm*) to Pascals (*Pa*)
liters (*L*) to cubic meters (m^3)
Other conversions will be taught as they become necessary.

What if you don't know the conversion factors? Colleges want students who can find their own information (so do employers). Hint: Try a good dictionary and look under "measure" or "measurement". Or the Internet? Enjoy.

t. 4008 *g* = _____ *kg*
u. 1.2 *km* = _____ *m*
v. 823 *nm* = _____ *m*
w. 298 *K* = _____ ^oC
x. 0.77 *m* = _____ *cm*
y. 8.8×10^{-8} *m* = _____ *mm*
z. 1.2 *atm* = _____ *Pa*

aa. 25.0 μm = _____ *m*
bb. 2.65 *mm* = _____ *m*
cc. 8.23 *m* = _____ *km*
dd. 5.4 *L* = _____ m^3
ee. 40.0 *cm* = _____ *m*
ff. 6.23×10^{-7} *m* = _____ *nm*
gg. 1.5×10^{11} *m* = _____ *km*

Solve the following geometric problems.

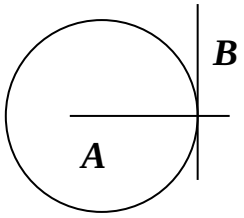
a. Line ***B*** touches the circle at a single point. Line ***A*** extends through the center of the circle.

i. What type of line is line ***B*** in reference to the circle?

_____

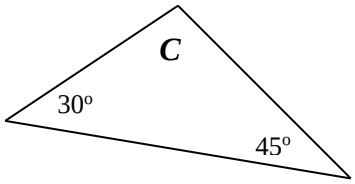
ii. How large is the angle between lines ***A*** and ***B***?

_____



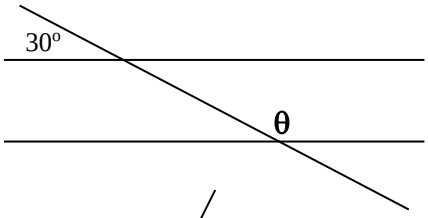
b. What is angle ***C***?

_____



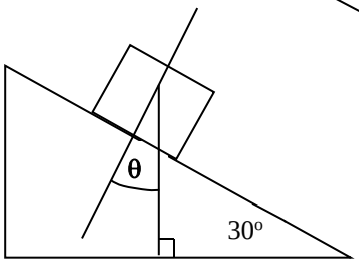
c. What is angle θ ?

_____



d. How large is *θ*?

_____



e. The radius of a circle is 5.5 *cm*,

i. What is the circumference in meters?

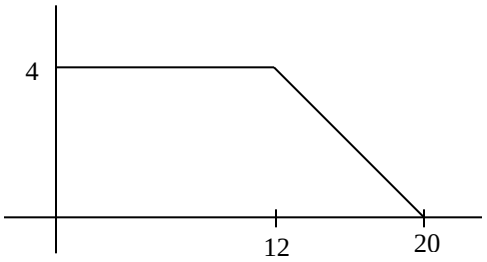
_____

ii. What is its area in square meters?

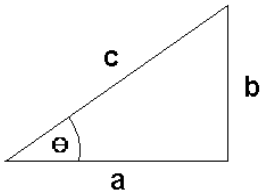
_____

f. What is the area under the curve (function) at the right?

_____



Using the generic triangle to the right, Right Triangle Trigonometry and the Pythagorean Theorem, solve the following. ***Your calculator must be in degree mode.***



g. $\theta = 55^o$ and ***c*** = 32 *m*, solve for ***a*** and ***b***.

_____

h. $\theta = 45^o$ and ***a*** = 15 *m/s*, solve for ***b*** and ***c***.

_____

i. ***b*** = 17.8 *m* and $\theta = 65^o$, solve for ***a*** and ***c***.

_____

j. ***a*** = 250 *m* and ***b*** = 180 *m*, solve for θ and ***c***.

_____

k. ***a*** =25 *cm* and ***c*** = 32 *cm*, solve for ***b*** and θ.

_____