AP 1 & C

HONORS PHYSICS SUMMER PACKET

Welcome in advance to Honors Physics. In order to be successful in your Honors Physics class next year, we have provided you with a summer packet. It is to your benefit to take time each day to complete this packet. This packet is set into different sections and will be collected on the first day of school.

This packet should be completed during the summer. Students will have an opportunity to ask questions on the packet when school starts, however the teacher will NOT directly address every single topic. It is expected that this packet will be completed in a timely manner, and not at the last minute. It is recommended that this packet should be looked through for an understanding of what will be expected of you when you begin Honors Physics. If the material seems overwhelming or exceptionally difficult that may be a sign that you should not be taking Honors Physics due to its rigorous coursework. Information is provided in the packet, but information should also be sought from other resources, books or reliable websites on the internet. Many colleges, educational institutions, and YouTube have relevant information on the topics discussed in this packet. Please use them. Internet access is not required to complete this packet, but it will help. You can find some sources listed below.

Packet Contents:

1. **Significant Figures**- digits that carry meaning contributing to its measurement resolution.
2. **Scientific Notation**- way that scientists easily handle very large numbers or very small numbers.
3. **Dimensional Analysis-** problem-solving method that uses the fact that any number or expression can be multiplied by one without changing its value.
4. **Graphing-** a diagram representing a system of connections or interrelations among two or more variables
5. **Standard International Units-** a system of physical units (*SI Units*) based on the meter, kilogram, second, ampere, kelvin, candela, and mole, together with a set of prefixes to indicate multiplication or division by a power of ten.
6. **Rearranging formulas-** to isolate the a variable in a formula by using algebraic rules.

Other Sources:

http://www.purplemath.com/
https://www.khanacademy.org/science/physics
http://www.physicsclassroom.com/
http://phyz.org/hewittdrewit/

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Name: _____

SIGNIFICANT FIGURES

General Rules for Significant Figures

1. All nonzero digits are significant.
2. All zeroes between significant digits are significant.
3. All zeroes which are both to the right of the decimal point and to the right of all non-zero significant digits are themselves significant.

Addition and Subtraction:

Add (or subtract) the numbers as usual, but then round the answer to the same decimal place as the least-accurate number. (Least number of decimal places)

13.214 + **234.6** + 7.0350 + 6.38 = 261.229

13.214 + **234.6** + 7.0350 + 6.38 = **261.2**

Multiplication and Division:

Multiply (or divide) the numbers as usual, but then round the answer to the same number of significant digits as the least-accurate number. (Least number of significant figures)

16.235 × 0.217 × **5** = 17.614975

16.235 × 0.217 × **5** = 20

How many significant figures are in each of the following numbers?

1. 5.40 _____
2. 1.2×10^3 _____
3. 210 _____
4. 0.00120 _____
5. 801.5 _____
6. 0.0102 _____
7. 1,000 _____
8. 9.010×10^{-6} _____
9. 101.0100 _____
10. 2,370.0 _____
11. 23.04 _____
12. .00345 _____

Round these numbers to 3 significant digits.

13. 1,566,311 _____
14. 2.7651×10^{-3} _____
15. 84,592 _____
16. 0.0011672 _____
17. 0.07799 _____

Perform the following calculations. Report your answer to the correct number of significant figures.

18. 144.3854 + 8.04 – 165.32 + 30.0 = _____
19. 1 x 0.074 ÷ 2.014 = _____
20. 73.8967 x 9.03 ÷ 875.34 = _____
21. (410 x 63.91) ÷ (17.9 ÷ 0.002) = _____
22. $\frac{50.31 + 70.408}{13.38 \times 0.018}$ _____

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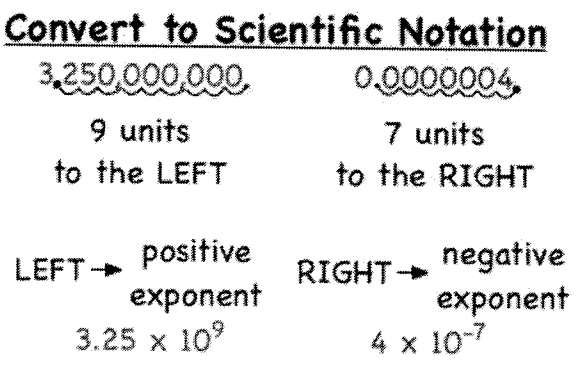
SCIENTIFIC NOTATION:

Scientific notation is the way that scientists easily handle very large numbers or very small numbers. For example, instead of writing 0.0000000056, we write 5.6×10^{-9}. So, how does this work?

We can think of 5.6×10^{-9} as the product of two numbers: 5.6 (the digit term) and 10^{-9} (the exponential term).



Put the following numbers in correct scientific notation.

1. 93,000,000 mi. = _____ distance to the sun
2. 130,000,000 km = _____ distance to the sun
3. 58,666,000,000,000 mi = _____ distance to the nearest star
4. 300,000,000 m/sec = _____ speed of light
5. 600,000,000,000,000,000,000,000 = _____ molecules in 2g hydrogen
6. 0.000000027 m = _____ diameter of an atom
7. 0.0000010 km = _____ length of one mm
8. 350,000,000 = _____ number of people in USA
9. 0.000000010001 = _____ a single dollars part of national debt
10. 365 = _____ days in a year

Expand the following numbers.

11. 5.2×10^{3} _____
12. 3.6×10^{12} _____
13. 9.65×10^{-4} _____
14. 6.452×10^{2} _____
15. 8.5×10^{-2} _____
16. 8.77×10^{-5} _____
17. 2.71×10^{4} _____
18. 6.4×10^{-3} _____

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DIMENSIONAL ANALYSIS

1 hr = 60 min	1 min = 60 sec	24 hrs = 1 day	1 kg = 2.2 lbs	1 mi = 5,280 ft
1 kg = 1000 g	365 days = 1 yr	52 weeks = 1 yr	0.621 mi = 1.00 km	1 yd = 36 inches
1 ton = 2000 lbs	7 days = 1 week	1 gal = 3.79 L	1 lb = 16 oz	264.2 gal = 1 cubic meter
20 drops = 1 mL	2.54 cm = 1 in	1 L = 1000 Ml	1 cc is 1 cm^3	1 mL = 1 cm^3

Solve each problem using dimensional analysis. Every nuer must have a unit. Work must be shown. Conversion factors are given below

Example 1: How many miles will a person run during a 10 kilometer race?

$$\frac{10\ km}{}\left(\frac{0.621\ mi}{1 km}\right) = 6.21\ miles$$

Example 2: The moon is 250,000 miles away. How many inches is the moon from the Earth?

$$\frac{250{,}000\ miles}{}\left(\frac{5{,}280\ ft}{1 mile}\right)\left(\frac{12\ in}{1\ ft}\right) = 1{,}584{,}000{,}000\ miles$$

1. The moon is 250,000 miles away. How many feet is it from earth?

2. A family pool holds 10,000 gallons of water. How many cubic meters is this?

3. The average American student is in class 330 minutes/day. How many hours/day is this?

4. How many seconds are there in 1 year?

5. Lake Michigan holds 1.3×10^{15} gallons of water. How many liters is this?

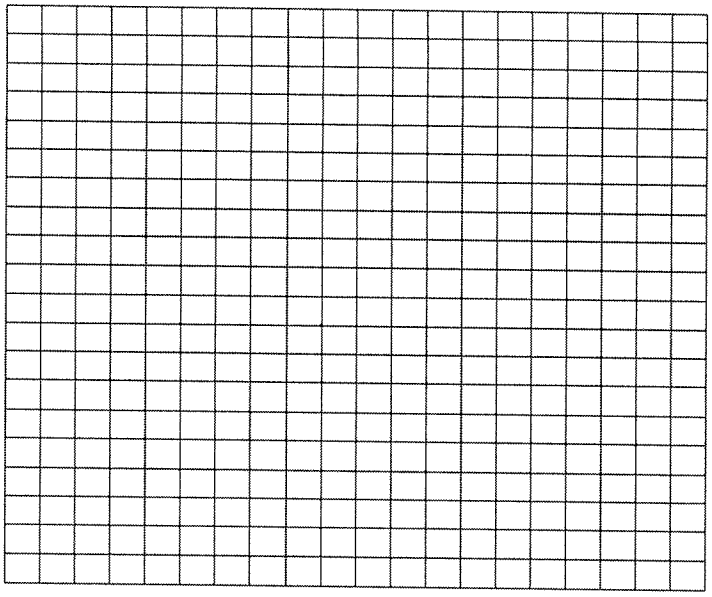
6. Lake Michigan holds 1.3×10^{15} gallons of water. If just Chicago removed water from the lake and it never rained again, how many days would the water last? Chicago uses 1.2×10^{9} gallons of water / day

Name: _____

GRAPHING

Graph the following information in a LINE graph. Label and number the x and y-axis appropriately.

# of Hours of Study	Grade
0	20
2	60
4	70
6	80
8	90
10	100



1. What is the independent variable?
2. What is the dependent variable?
3. What is an appropriate title?
4. What is the slope of the line?
5. What is the equation of the line?
6. What is the grade if someone studies for 6 hours? 8 hours?
7. What is the relationship between number of hours studied and the grade?

STANDARD INTERNATIONAL UNITS

Match the SI unit with the correct quantity of measures.

1. _____ Kilogram (kg)
2. _____ Meter (m)
3. _____ Second (s)
4. _____ Newton (N)

a. distance
b. temperature
c. mass
d. volume
e. weight

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ALGEBRAICALLY SOLVING FOR VARIABLES

Listed are several of the physics formulas that we will be learning throughout the year. Simply do the algebra to solve for the variable listed.

Example- Solve for v: $D=\frac{m}{v} \rightarrow v=\frac{m}{D}$

1. Solve for m: $F = mg$

2. Solve for m_2: $F = \frac{Gm_1m_2}{d^2}$

3. Solve for v_i: $d= \frac{1}{2}(v_f + v_i)\, t$

4. Solve for v_i^2: $v_f^2 = v_i^2 + 2ad$

5. Solve for t: $d = \frac{1}{2}at^2$

6. Solve for v: $F_c = \frac{mv^2}{r}$

7. Solve for a: : $v_f^2 = v_i^2 + 2ad$

8. Solve for l: $T = 2\pi\sqrt{\frac{l}{g}}$

9. Solve for T: $F = \frac{m4\pi^2 r}{T^2}$

10. Solve for r_B : $\left(\frac{T_a}{T_b}\right)^2 = \left(\frac{r_a}{r_b}\right)^3$

11. Solve for θ : $\cos\theta = \frac{x}{H}$

12. Solve for a: F=ma

13. Combine the equations to solve for a: $m_1g - F_t = m_1a$ & $m_2a = F_t - \mu m_2 g$