AP Physics Test

Unit 1**:** Physics Toolkit

\_\_\_ 1. A nanometer (nm) is

 A. 10-6 m B. 10-9 m C. 10-12 m D. 10-15 m E. 10-18 m

\_\_\_ 2. There is no SI base unit for “area” because

 A. an area has no thickness hence no physical standard can be built

 B. we live in a three dimensional world not a two dimensional world

 C. it is impossible to express square feet (ft2) in terms of square meters (m2)

 D. it is derived unit and can be expressed in terms of the fundamental unit of length.

 E. area is not an important physical quantity

\_\_\_ 3. Which one of the following is the longest length?

 A. 100 m B. 102 cm C. 104 mm D. 105 μm E. 107 nm

\_\_\_ 4. A graph plotting two variables is titled as **Period (T) *versus* Length (L)**. This generally means that the length values are the \_\_\_\_ variable and are plotted along the \_\_\_\_.

 A. dependent; ***x***-axis

 B. independent; ***x***-axis

 C. dependent; ***y***-axis

 D. independent; ***y***-axis

\_\_\_ 5. A day has approximately

 A. 8.6 x 102 s B. 8640 s C. 8.6 x 104 s D. 1.44 x 103 s

\_\_\_ 6. Of the following sets of units, which one has only SI units?

 A. cm, s, kg, lb, μm B. mm, μg, g, s, in C. fm, ns, kg, mm, μs D. km, k , kg, μs, ft

\_\_\_ 7. Which one of the following pairs of units may NOT be added together, even after the appropriate unit conversions have been made?

 A. grams and milligrams

 B. days and hours

 C. miles and kilometers

 D. centimeters and yards

E. kilograms and kilometers

\_\_\_ 8. The position  of a particle moving along the -axis depends on the time  according to the following equation:  The dimensions of the quantities  and  (where L represents units of length, and T represents units of time) are respectively,

 A. L2/T; L3/T2 B. L/T2; L2/T C. L/T; L/T2 D. L3/T; T2/L E. none of these

\_\_\_ 9. For the graph on the right, the graphical representation between speed and mass could best be described as:

 A. The speed of fall is directly proportional to the mass.

 B. The speed of fall is proportional to the square root of the mass.

 C. The speed of fall is inversely proportional to the mass.

 D. The speed of fall is proportional to the square of the mass.

 E. There is no relationship between the speed of fall and mass.

In questions 10-14, match a letter from each of the following graphs with its corresponding graphical analysis statement.



10. \_\_\_\_\_ y = kx 11. \_\_\_\_\_ y is independent of x

12. \_\_\_\_\_ y vs. x2 13. \_\_\_\_\_ y vs. 1/x 13. \_\_\_\_\_ y2 vs. x

A student noticed that thicker strings on a guitar produce lower notes. She measured the thickness of the strings and the vibration frequency (pitch) of the string when plucked. She tightened each string to the same tension, then plucked each string while measuring its pitch with a computer.



15. \_\_\_\_\_ What is the relationship being studied?

 A. How the string thickness affects the string tension.

 B. How the vibration frequency affects the pitch.

 C. How the string thickness affects the vibration frequency.

 D. How the string tension affects the vibration frequency.

16. \_\_\_\_\_ What is the dependent variable?

 A. the string tension

 B. the the vibration frequency

 C. the length of the string

 D. the string thickness

 E. the pluck technique

17. \_\_\_\_\_ What is the independent variable?

 A. the string tension

 B. the the vibration frequency

 C. the length of the string

 D. the string thickness

 E. the pluck technique

18. \_\_\_\_\_\_\_\_\_\_ What variables need to be kept constant during the investigation? (list all that apply)

 A. the string tension

 B. the the vibration frequency

 C. the length of the string that is free to vibrate

 D. the string thickness

 E. the pluck technique

**Part II – Problems and Applications**

To receive full credit, you must...

* Show ***complete*** problem set-up and solving (basic equation, equation rearrangement, numeric substitution, etc.)
* Report all numerical answers with correct ***units*** and in proper scientific notation.

19. Express the following using metric prefixes:

A) 0.003 grams B) 5,000 flies C) 0.07 meters

The radius of the moon is approximately 1 350 000 m.

A) What is the radius of the moon in kilometers?

B) What is the radius of the moon in centimeters?

C) What is the radius of the moon in miles? (1 mile = 1.61 km)

20. Assume an average American family of four consumes two 6-packs of soda per week, or 12 cans total and in the United States the number of families is approximately 60 million families. The mass of one empty 12 oz aluminum can is 5.00 g.

A) How many “metric tons” of aluminum is tossed in one year (use 52 weeks/year)? A “metric ton” is an unofficial SI unit equal to 1000 kg.

B) Given that 1 kg of mass has a weight of 2.2 lbs on Earth, what is the weight in pounds for the tossed aluminum cans?

21. The graph below shows the amount of water remaining in a graduated cylinder as time passes and the water is left in the sun.



A) Explain the meaning of the slope value "-0.500" as it pertains to this problem.

B) Write an equation for the graph, inserting variables and constants as appropriate.

C) Determine how much water will be left at time = 15 hours. Explain how you arrived at your answer.

