Physics 12 - Introductory Worksheet

1. The period of a pendulum (time for one complete vibration back and forth) is expressed by the formula

$$T = 2\pi\sqrt{\frac{l}{g}}$$

where T is the time, l the length of the pendulum, and g the acceleration due to gravity. In what units must g be expressed if T is in sec and l is in m?

2. Which of the following equations cannot be correct because of dimensional inconsistencies? In each case s is distance, v is velocity, a is acceleration (in units of length/time ^{2}), and t is time.

(a) $s = v_i t + 3at^2$ (c) $s + at^2 = vt$

(b) $v = v_i^2 - as^2$ (d) $at^2 + v/t = 2s^2/t^2$

3. There are 31,556,925.9747 seconds in a year. Express this number in scientific notation.

4. Evaluate the following:

(a) $(1.6 \times 10^2)(3 \times 10^6)(2 \times 10^{11})$

(b) $\dfrac{(1.6\times10^2)\times(3\times10^4)}{(2\times10^{11})}$

5. Express in scientific notation:

(a) 0.00336
(b) 4,673,000
(c) 0.0000014
(d) 7.14

6. Express in ordinary notation:

(a) 9.81×10^1
(b) 3.11×10^{-1}
(c) 4.27×10^3
(d) 6.70×10^{-6}

7. Find the sum of 1.6×10^{2}, 2.7×10^{3} and 4.8×10^{4}.

8. Subtract 2.83×10^{-4} from 6.29×10^{-3}.

9. During a laboratory experiment, a student measures a block of wood to be 2.76 cm long, 4.30 cm wide and 1.75 cm high. What volume should she calculate for this block?

10. A circular piece of paper has a measured diameter of 7.4 cm. What is its area?

11. What is the height (in meters) of a person who measures up at 160.6 cm?

12. A tank contains 42.8 liters of water. How much will be left if 3.72 liters are removed?

13. What is the order of magnitude of the number of minutes in a year? (Do *not* make an exact calculation.)

14. Masses are hung on a suspended spring and the corresponding stretch is noted (measured from the original position of the lower end of the spring). The following results were obtained.

Mass (kg)	Stretch (m)
0	0.0
4	0.16
6	0.24
8	0.32
14	0.56
20	0.80

Make a graph of these data.

(a) Does the graph have a constant slope? What is it?
(b) Write the equation that describes the behavior of this spring.
(c) What stretch would you expect if 9.3 kg were placed on the spring?

Assume the original unstretched spring was 1 m long. Can you sketch the graph you would then get if all the stretch measurements were made from the top of the spring? Can you write the equation for this graph?

15. A steel ball was allowed to roll down a long inclined plane and a student recorded the distance traveled at the end of each second as shown below.

Time (sec)	Total distance (cm)
0	0
1	4
2	16
3	36
4	64
5	100
6	144

(a) Use a full sheet of graph paper to graph these data. Put the time on the horizontal axis. If you have done this properly, you see that the graph is not straight, so it makes no sense to talk about a constant slope. However, the curve is smooth, which does suggest that there is some relationship between distance and time , in this experiment.

(b) Add a third column to the table above and head it $(\text{time})^2$. Fill it in by squaring the times in the first column. Now try plotting distance vs. $(\text{time})^2$. Does this graph have a constant slope? What is it?

(c) Write the equation for this motion.

(d) How far does the ball roll in 2.5 sec?