Instructions: This test is divided into two parts. Part A is entitled short answer questions where you are to pick the best word, phrase or choice of answers which best answers or, in some cases, defines the statement. Part B is entitled longer answer questions. Make your answers clear and concise. If you need more room turn over the test paper and continue on the back, but please write "over" on the test. For problems, it is the procedure that will be checked, not only the answer so please try to make it clear. Be sure to include units in answering problems (such as we’ve done in class). Point weighing is indicated in parentheses. So for this, the first test of the summer poets’ course, Good Luck!

A. Short Answer Questions

1. (6) Choose from the physical quantities that we have discussed - length, area, volume, time, mass, speed, acceleration, and force to answer the following:

   **AREA** a) The amount of surface is a 2 dimensional measurement called _?_.

   **VOLUME** b) The amount of space occupied by an object is a three-dimensional measurement called _?_.

   **FORCE** c) A measure of a _push_ or _pull_ is called _?_.

   **MASS** d) A measure of the quantity of matter contained by an object is called _?_.

   **SPEED** e) A measure of _how fast_ an object is moving is given by the _?_.

   **FORCE** f) Weight is a _?_.

2. (12) Choose from the list of physical quantities listed in question 1 to identify the quantities listed below taken from various problems.

   **TIME** a) 6.3 H
   **LENGTH** e) 9.8 ft
   **FORCE** i) 3.9 N

   **MASS** b) 5.2 slug
   **ACCELERATION** f) 2.75 (ft/sec)/sec

   **VOLUME** c) 2.92 ft³
   **AREA** g) 4.7 m²

   **TIME** d) 3.62 sec
   **FORCE** h) 3.63 lb

   **ACCELERATION** j) 2.7 m/sec²
   **MASS** k) 2.77 kg

   **SPEED** l) 2.25 ft/sec

3. (3) Write the following in Scientific Notation.

   **2.7 x 10⁴** a) .0000027 kg
   **2.1 x 10⁶ miles** b) 2,100,000 miles
   **5.2 x 10⁻¹ m** c) .52 m

4. (3) Write the following in ordinary notation.

   **3.00321 m** a) 3.21 x 10⁻³ m
   **5.2100 m** b) 5.21 x 10⁴ m
   **7.002 x 10⁻³ kg** c) .000007002 kg
5. (3) A box measuring 2.3 ft by 1.7 ft by 2.9 ft contains \( \？ \) ft\(^3\) or \( \？ \) in\(^3\).

6. (2) There are \( \？ \) mm in 5 m.

7. (2) There are \( \？ \) km in 1 m.

8. (3) At an average speed of 60 mi/H, what distance will a motorist travel in 8.0 hours?

9. (3) The distance from Hamline to downtown Minneapolis is 7.0 mi. How long will this trip take if you average 35 mi/hr?

10. (3) If 1.6 km = 1 mile, how far away in miles is 3000 m?

11. (2) One gram (or 1 g) is equal to \( \？ \) milligram (mg).

12. (2) There are \( \？ \) cubic cm in one cubic m.

13. (4) If silk cost $5.00 per square ft, the cost of a 40 inches wide by 5.0 ft long piece of silk is \( \？ \).

14. (3) Find the Net Force for the following:

15. (2) "Natural Motion" was an explanation given by \( \？ \) in claiming that more massive objects seek "down" more than less massive objects or that objects tended to come to rest. Choose from: Galileo, Newton, the Greeks, Copernicus.

16. (2) A brilliant scientist, credited with one of the first measurements of the acceleration due to gravity and with the beginning of "experimental science", was named \( \？ \).

17. (2) A brilliant scientist who was credited with discovery of the calculus, the three laws of motion, the Universal Law of Gravitation and who did various optics experiments was named \( \？ \).

B. Longer Answer Questions

1. (5) How does "velocity" differ from "speed"? Provide an example for an object that moves at constant speed but has a changing velocity.
2. (5) What is the significance of Galileo's famous "Tower of Pisa" experiment and how did it contradict the Greek's "common-sense" idea?

Galileo showed that in the absence when air friction is negligible, all objects fall at the same rate \( g = 9.8 \text{ m/s}^2 = 32 \text{ ft/s}^2 \). The Greeks believed that the natural motion of objects is to "seek down" and that more massive objects would seek down and fall faster than less massive objects.

3. (6) Convert 300 mm/s to mi/H. A string of conversion factors or a fraction is quite satisfactory; you need not multiply out the numbers to get full credit.

\[
300 \text{ mm/s} = \left( \frac{300 \text{ mm}}{1 \text{ s}} \right) \left( \frac{1 \text{ m}}{1000 \text{ mm}} \right) \left( \frac{1 \text{ km}}{1000 \text{ m}} \right) \left( \frac{1 \text{ mi}}{1.6 \text{ km}} \right) \left( \frac{60 \text{ s}}{1 \text{ min}} \right) \left( \frac{60 \text{ min}}{1 \text{ H}} \right) = 6.75 \text{ mi/H}
\]

OR

\[
300 \text{ mm/s} = \left( \frac{300 \text{ mm}}{1 \text{ s}} \right) \left( \frac{1 \text{ cm}}{10 \text{ mm}} \right) \left( \frac{1 \text{ in}}{2.54 \text{ cm}} \right) \left( \frac{1 \text{ ft}}{12 \text{ in}} \right) \left( \frac{5280 \text{ ft}}{1 \text{ mi}} \right) \left( \frac{60 \text{ s}}{1 \text{ min}} \right) \left( \frac{60 \text{ min}}{1 \text{ H}} \right) = 6.71 \text{ mi/H}
\]

4. An object is given an initial velocity of 49.0 m per sec straight up into the air at \( t = 0 \) sec. The acceleration due to gravity is 32 ft/sec\(^2\) or 9.8 m/sec\(^2\). Neglect air friction.

(a) Find its velocity at the following times:

- \( t = 1.0 \text{ sec} \)  \( \boxed{39.2 \text{ m/s}} \)
- \( t = 3.0 \text{ sec} \)  \( \boxed{19.6 \text{ m/s}} \)
- \( t = 5.0 \text{ sec} \)  \( \boxed{0} \)
- \( t = 7.0 \text{ sec} \)  \( \boxed{19.6 \text{ m/s}} \)

(b) (2) How long does the object take to return to the thrower's hand?

\[
5 \text{ s \ up \ + \ 5 \ s \ down} = 10 \text{ s}
\]

(c) (2) How high did the object go?

From the Top  \( V = 0 \)

\[
d = \frac{1}{2} a t^2 = \left( 9.8 \text{ m/s}^2 \right) \left( 5 \text{ s} \right)^2 = 122.5 \text{ m}
\]

(d) (1) The acceleration at the top of the path is what?

\( q = 9.8 \text{ m/s}^2 \) AND IS CONSTANT
5. An object moves at constant speed traveling a distance of 90 m in 5.0 seconds.

(a) (2) Find its speed.

\[ v = \frac{d}{t} = \frac{90\text{ m}}{5.0\text{ s}} = 18.0 \text{ m/s} \]

(b) (2.5) Find the distance traveled after \( t \) seconds.

(i) \( t = 1.0 \) sec \[ 18.0 \text{ m} \]

(ii) \( t = 2.0 \) sec \[ 36 \text{ m} \]

(iii) \( t = 3.0 \) sec \[ 54 \text{ m} \]

(iv) \( t = 4.0 \) sec \[ 72 \text{ m} \]

(v) \( t = 5.0 \) sec \[ 90 \text{ m} \]

(c) (1.5) Make a sketch of the approximate position of the object at the above times.

6. An object speeds up at the constant rate of 3.0 ft/s/s starting from rest. Find:

(a) (3) how fast is the object moving

(i) after \( t = 1.0 \) s: \[ \frac{3.0 \text{ ft/s}}{s} \]

(ii) after \( t = 2.0 \) s: \[ 6.0 \text{ ft/s} \]

(iii) after \( t = 3.0 \) s \[ 9.0 \text{ ft/s} \]

(b) (3) the distance that the object has traveled

(i) after \( t = 1.0 \) s: \[ \frac{1.5 \text{ ft}}{s} \]

(ii) after \( t = 2.0 \) s: \[ 6.0 \text{ ft} \]

(iii) after \( t = 3.0 \) s: \[ 13.5 \text{ ft} \]

(c) (2) Make a sketch of the approximate position of the object at the above times.

7. (4) List one advantage and also one disadvantage of the United States adopting the metric system of measurements.

Advantages: Many conversion from one metric unit to another uses prefixes (powers of ten) and is much easier (just move decimal)! Collaboration with other countries easier!

Disadvantages: Many it would be a major expense (costly!) for the US to convert. US citizens are use to the English system so this would be a different "mindset.”