

Homework 1

Student's name:

Instructions: Submit in canvas a copy of your solution by the due date.

PART 1: MULTIPLE CHOICE QUESTIONS (5 points each)

Choose only one choice in the following questions:

1. Which of the following is NOT a SI unit of the property it measures?
 - a. length—meter
 - b. volume—liter
 - c. time—second
 - d. mass—kilogram
 - e. amount of substance—mole

2. The SI standard of time is based on:
 - a. the daily rotation of the earth
 - b. the frequency of light emitted by Kr86
 - c. the yearly revolution of the earth about the sun
 - d. a precision pendulum clock
 - e. none of these

3. Light takes about a nanosecond to travel one foot. A nanosecond is:
 - a. 10^9 s
 - b. 10^{-9} s
 - c. 10^{-10} s
 - d. 10^{-10} s
 - e. 10^{-12} s

4. The SI standard of length is based on:
 - a. the distance from the north pole to the equator along a meridian passing through Paris
 - b. wavelength of light emitted by Hg-198
 - c. wavelength of light emitted by Kr-86
 - d. a precision meter stick in Paris
 - e. the speed of light

5. A sprint race track is 100 meters long. This length in yards expressed with three significant figures in scientific notation is:

Note: $1\text{m} = 1.0936\text{yd}$ and

- a. $10.936 \times 10^3\text{cm}$
- b. $1.09 \times 10^2\text{cm}$
- c. $1.09 \times 10^3\text{cm}$
- d. $10.93 \times 10^2\text{cm}$
- e. 1.0936 cm

6. Which is an incorrect rule about significant figures

- a. All trailing zeroes are significant.
- b. digits different from zero are significant.
- c. leading zeroes are not significant.
- d. captive zeroes are significant.
- e. none of these

7. Scientific notation is useful to express physical quantities that are very small or large. What is correct expression of the number $1602.17662 \times 10^{-22}$ with three significant figures in scientific notation

- a. 1.61×10^{-25}
- b. 1.61×10^{-19}
- c. 1.61×10^{-19}
- d. $1602. \times 10^{-19}$
- e. 1.60×10^{-19}

8. The symbol of the prefix for one one-millionth is:

- a. m
- b. M
- c. k
- d. c
- e. μ

PART 2: EXERCISES (15 points each)

Show your work for each of the following exercises. Answer without solution will be given zero points.

1. Using the rules for addition and multiplication given in the lecture notes perform the following operations

a. $1.437 + 3.0 + 4.586$

$$\begin{array}{r} 1.437 \\ 3.000 \\ 4.586 \quad + \\ \hline 9.023 \end{array}$$

b. $1.437 - 4.006 - 4.1$

$$\begin{array}{r} 1.437 \\ 4.006 \quad - \\ \hline -3.431 \\ 4.100 \quad - \\ \hline -7.331 \end{array}$$

c. $(0.342 \times 10^4) \times (2.7 \times 10^{-8})$

$$(342 \times 27) \times 10^{-4} \times 10^{(-4-8)}$$

$$\begin{array}{r} 342 \\ 27 \quad \times \\ \hline 2394 \\ 6840 \quad + \\ \hline \end{array}$$

$$9234$$

$$9234 \times 10^{(-4-4)}$$

$$9234 \times 10^{-8}$$

$$9.234 \times 10^{-5} \text{ or } 0.00009234$$

d.

$$\frac{2.009 \times 10^{-2}}{0.0127 \times 10^8} = \frac{2009 \times 10^{-2} \times 10^{-3}}{127 \times 10^8 \times 10^{-3}} = \frac{2009 \times 10^{-5}}{127 \times 10^5} = \frac{2009 \times 10^{(-5-5)}}{127} = \frac{2009 \times 10^{-10}}{127} = 15.82 \times 10^{-10}$$
$$= 1.582 \times 10^{-9}$$

2. A car is travelling at 85 mph. How much is this speed in m/s and in km/h

$$1 \text{ hr} = 3600 \text{ s}$$

$$85 \text{ m} = 3600 \text{ s}$$

$$1 \text{ s} = \frac{85}{3600} \text{ m}$$

$$\text{speed} = \frac{17}{720} \text{ m/s or } 0.0236 \text{ m/s}$$

$$\frac{17}{720} \times \frac{18}{5} = \frac{306}{200} = \frac{153}{100} \text{ km/hr or } 1.53 \text{ km/hr}$$

3. What is the volume of a 2.00 kg pile of iron cans that are melted, then cooled into a solid cube? The density of iron is 7.874 g/cm³

$$Volume(V) = \frac{Mass(m)}{Density(\rho)} = \frac{7.874g/cm^3}{2.0 \times 1000g} = 0.003937cm^3 \text{ or } (3.937 \times 10^{-3})cm^3$$

4. A **cubic** storage container contains 2081kg of water. What is the length of one side of the container in meters?

Note: density is defined as $\rho = m/V$ and the volume of a cube is $V = l^3$. The density of water is $\rho = 1000kg/m^3$.

$$Volume(V) = \frac{Mass(m)}{Density(\rho)} = \frac{1000kg/m^3}{2081kg} = 0.4805m^3$$

$$V = l^3$$

$$0.4805 = l^3$$

$$l = \sqrt[3]{0.4805} = 0.7833m \text{ or } 78.33cm$$

