Name Alexkoh

PHY 1110 - Summer 2020 - Study Guide #1 - Introduction/Kinematics

1. The fundamental units of the SI system of units are the meter, the kilogram, and the second.

2. Write the following numbers in proper scientific notation.

a) 32100.0 = $3.21 \cdot 10^4$

b) 0.07213 = $7.213 \cdot 10^{-2}$

c) 523.97 = $5.2397 \cdot 10^2$

3. Write the following numbers in decimal notation.

a) 5.13276 X 10^{-3} = 0.00513276

b) 9.101 X 10^4 = 91010

c) 1.23 X 10^0 = 1.23

4. Write the following physical quantities using prefixes. (More than one answers possible)

a) 3273 feet = 327.3 dfeet

b) 0.00001 gallons = 0.000001 dgallons

c) 7 X 10^5 m = $7 \cdot 10^4$ dm

d) 0.03 X 10^{-4} kg = $0.03 \cdot 10^{-3}$ hg

5. Write the following physical quantities without prefixes. (More than one answers possible.)

a) 0.05 $\cdot 10^{-9}$ nm = $5 \cdot 10^{-11}$ m

b) 123.45 $\cdot 10^3$ km = 123450 m

c) 0.000002 M ft = 6 ft

6. Simplify the following expressions.

a) $(5x^2y)(3zy^2)/(2zxy) = \frac{15x^2y^3z}{2xyz} = \frac{15xy^2}{2}$

b) $(xy^{-2})(x^2y)/(x^{-1}y) = \frac{x^4y}{y^3} \div \frac{x^4}{y^2}$

$\frac{x}{y^2} \quad \frac{x^2yx}{y} = \frac{x^4y}{y^3}$

7. Solve for x. Whenever possible find numerical value(s) rather than symbolic values.

a) $17 + 3x = 5$ $3x = -12$

$x = -4$

b) $5x + 3 = 4xy$ $5x - 4xy = -3$

$x(5-4y) = -3$

$x = \frac{-3}{5-4y}$ when $y \neq 0$

c) $x + 7xy - 3xy = 2x$ $7xy - 3xy = 2x - x$

$x = 4xy$

$1 = 4y$

$\frac{1}{4} = y$

$x + 7xy - 3xy - 2x = 0$

$x(4y - 1) = 0$

$x = \frac{0}{4y-1}$

$x = 0$ when $(4y-1) \neq 0$

d) $2x^2 + 3x = 4$ (Hint: Use the quadratic formula)

$2x^2 + 3x - 4 = 0$

$\frac{-3 \pm \sqrt{3^2 - 4(2)(-4)}}{2(2)} = \frac{-3 \pm \sqrt{9+32}}{4} = \frac{-3 \pm \sqrt{41}}{4} =$

e) $3x - y = 7$ and $x - y = 1$ (Hint: Simultaneous equations)

$3x - 7 = y$ $x - 1 = y$

$3x - 7 = x - 1$

$2x = 6$

$x = 3$

8. Conversion of units. Some useful facts are:

1 gallon = 4 quarts
1 quart = 2 pints
1 pint = 2 cups
1 cup = 16 tablespoons
1 tablespoon = 3 teaspoons

a) 3 quarts = 3/4 gallons = 576 teaspoons

$\frac{3\text{ quart}}{}\left|\frac{1\text{ gallon}}{4\text{ quart}}\right. = \frac{3}{4}\text{ gallon}$

$\frac{3\text{ qrt}}{}\left|\frac{2\text{ pnt}}{1\text{ qrt}}\right|\frac{2\text{ cup}}{1\text{ pnt}}\left|\frac{16\text{ tbs}}{1\text{ cup}}\right|\frac{3\text{ tsp}}{1\text{ tbs}} = 576\text{ tsp}$

b) 5 gallons/sec = 2400 pints/min = 288000 cups/hour

$\frac{5\text{ gal}}{\text{sec}}\left|\frac{4\text{ qrt}}{1\text{ gal}}\right|\frac{2\text{ pnt}}{1\text{ qrt}}\left|\frac{60\text{ sec}}{1\text{ min}}\right. = 2400\frac{\text{pnt}}{\text{min}}$

$\frac{2400\text{ pnt}}{\text{min}}\left|\frac{60\text{ min}}{1\text{ hr}}\right|\frac{2\text{ cup}}{1\text{ pnt}} = 288000\frac{\text{cup}}{\text{hr}}$

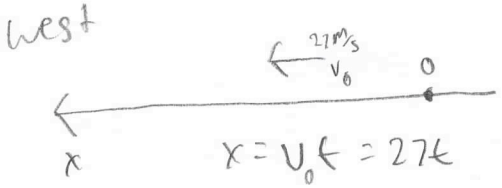
c) 7 hours/cup = 105/4 min/tablespoon

$\frac{7\text{ hr}}{\text{cup}}\left|\frac{60\text{ min}}{1\text{ hr}}\right|\frac{1\text{ cup}}{16\text{ tbs}} = \frac{105\text{ min}}{4\text{ tbs}}$

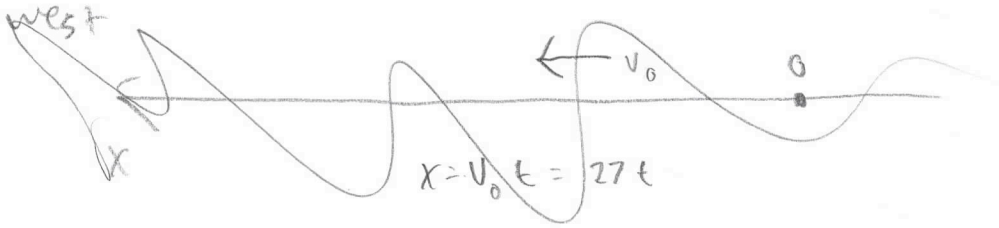
9. Give the SI unit(s) for the following physical quantities:

a) position ~~meter~~ m
b) displacement ~~meter~~ m
c) time ~~second~~ s
d) velocity m/s
e) acceleration m/s^2.

10. A Corvette traveled down a long straight road in a westerly direction with a <u>constant velocity</u> of 27 m/s. As it passed a large apple tree along the side of the road, an observant traffic policeman started a timer. Sketch the situation, set up a coordinate system, and list the information known about the Corvette in proper mathematical notation.



11. The velocity of the Corvette after 1 s was 27 m/s, and the distance it traveled was 27 m. Its velocity after 5 s was 27 m/s, and the distance it traveled was 135 m. Its acceleration during this time interval was 0 m/s².



12. Make graphs of the:
a) position of the Corvette vs. time,
b) instantaneous velocity of the Corvette vs. time, and
c) acceleration of the Corvette vs. time.