WS 4.0: Unit Conversions Name:_____ p.___

Prefix	Symbol	Meaning
Mega-	M	10^6, 1000000, 1 million
kilo-	k	10^3, 1000, 1 thousand
deci-	d	10^{-1}, $1/10^{th}$, 1 tenth
centi-	c	10^{-2}, $1/100^{th}$, 1 hundredth
milli-	m	10^{-3}, 1/1000, 1 thousandth
micro-	μ	10^{-6}, 1/1000000, 1 millionth
nano-	n	10^{-9}, $1/1000000000^{th}$, 1 billionth

Other Conversions:
1 inch = 2.54 cm
1 mile = 5280. ft
1 mile = 1.61 kilometers
1 foot = 12 inches (exactly)
1 hour = 60 minutes(exactly)
1 cm^3 = 1 mL (exactly)

(Memorize all prefixes in the above table)

YOU MUST SHOW ALL WORK AND ALL UNIT FACTORS TO RECEIVE CREDIT!

1. Make the following conversions

a. 3.2 feet to centimeters $(3.2\text{ ft})\left(\frac{12\text{ in}}{1\text{ ft}}\right)\left(\frac{2.54\text{ cm}}{1\text{ inch}}\right) = 97.536 \rightarrow$ **98 cm** (a)

b. 0.0567 meters to inches $(0.0567\text{ m})\left(\frac{100\text{ cm}}{1\text{ m}}\right)\left(\frac{1\text{ inch}}{2.54\text{ cm}}\right) = 2.2323 \rightarrow$ **2.23 inches** (b)

c. 27.2 inches to millimeters $(27.2\text{ in})\left(\frac{2.54\text{ cm}}{1\text{ inch}}\right)\left(\frac{10\text{ mm}}{1\text{ cm}}\right) = 690.88 \rightarrow$ **691 mm** (c)

d. 3.00 days to minutes $(3.00\text{ day})\left(\frac{24\text{ hr}}{\text{day}}\right)\left(\frac{60\text{ min}}{1\text{ hr}}\right) =$ **4320 minutes** (d)

e. 0.11 kilometers to feet $(0.11\text{ km})\left(\frac{1\text{ mile}}{1.61\text{ km}}\right)\left(\frac{5280\text{ ft}}{\text{mile}}\right) = 360.745 \rightarrow$ **360 feet** (e)

2a. A spider is moving at a speed of 48 feet per hour. Convert this speed into centimeters per minute.

$\left(\frac{48\text{ feet}}{\text{hour}}\right)\left(\frac{12\text{ in}}{1\text{ foot}}\right)\left(\frac{2.54\text{ cm}}{\text{inch}}\right)\left(\frac{1\text{ hour}}{60\text{ min}}\right) = 24.384 \rightarrow$ **24 $\frac{\text{cm}}{\text{min}}$** (a)

2b. A car is traveling at a speed of 1400 meters per minute. Convert this speed to miles per hour.

$\left(\frac{1400\text{ meters}}{\text{minute}}\right)\left(\frac{1\text{ km}}{1000\text{ m}}\right)\left(\frac{1\text{ mile}}{1.61\text{ km}}\right)\left(\frac{60\text{ min}}{1\text{ hour}}\right) = 52.1739 \rightarrow$ **52 miles/hr** (mph) (b)

2c. A puppy is gaining weight at a rate of 4.2 pounds per week. Convert this rate into grams per day. (Note: 1 kilogram = 2.20 pounds)

$\left(\frac{4.2\text{ lb}}{\text{week}}\right)\left(\frac{1\text{ kg}}{2.20\text{ lb}}\right)\left(\frac{1000\text{ g}}{1\text{ kg}}\right)\left(\frac{1\text{ week}}{7\text{ days}}\right) = 272.73 \rightarrow$ **270 g/day** (c)

3. a. How many square inches are in one square foot? 144
b. How many cubic inches are in one cubic foot? 1728

4. Convert 1.0 ft^3 to cm^3.

$(1.0\text{ ft}^3)\left(\frac{12\text{ in}}{1\text{ ft}}\right)^3\left(\frac{2.54\text{ cm}}{1\text{ inch}}\right)^3 = 28317 \rightarrow$ **28000 cm^3**

or $(1.0\text{ ft}^3)\left(\frac{1728\text{ in}^3}{1\text{ ft}^3}\right)\left(\frac{16.387\text{ cm}^3}{1\text{ in}^3}\right) = 28317 \rightarrow 28000\text{ cm}^3$

5. A piece of gold has a mass of 0.245 kg (kilograms).

a. Convert the mass of gold from kilograms into grams.

$(0.245\ kg)\left(\frac{1000\ g}{1\ kg}\right) = \boxed{245\ g}$

b. Gold has a density of 19.2 g/cm^3. Determine the volume of the piece of gold.

$V = m/D = \frac{245\ g}{19.2\ g/cm^3} = 12.760 \rightarrow \boxed{12.8\ cm^3}$

6. Aluminum has a density of 2.70 g/cm^3. A cubic piece of aluminum has sides with a length of 2.0 inches. or $(2.0)^3 = 8.0\ in^3$ $(8.0\ in^3)\left(\frac{2.54\ cm}{inch}\right)^3 = 131.097\ cm^3$

a. Calculate the volume of the aluminum cube, in cubic centimeters (cm^3).

$(2.0\ in)(2.54\ cm/inch) = 5.08\ cm$

$(5.08\ cm)^3 = 131.097\ cm^3$

$\boxed{130\ cm^3}$

b. Calculate the mass of the piece of alumimum.

$m = V \cdot D = (131.097\ cm^3)(2.70\ g/cm^3) = 353.96 \rightarrow \boxed{350\ g}$

7. Gold has a density of 19.2 g/cm^3. A rectangular piece of gold has a length of 9.0 cm, a width of 7.0 cm, and a mass of 0.16 grams. Calculate the thickness of the gold foil, in centimeters.

~~(Hint: This is just like problem 1 from WS 3.4)~~

$V = m/D = 0.16\ g / (19.2\ g/cm^3) = 0.008333\ cm^3$ .000132275

$V = l \cdot w \cdot t \quad 0.008333\ cm^3 = (9.0\ cm)(7.0\ cm)\ t$ $\boxed{t = 0.00013\ cm}$

8. A cat is moving at a speed of 14000 meters per hour. Convert this speed to feet per minute.

$\left(\frac{14000\ m}{1\ hr}\right)\left(\frac{100\ cm}{1\ m}\right)\left(\frac{1\ inch}{2.54\ cm}\right)\left(\frac{1\ ft}{12\ in}\right)\left(\frac{1\ hr}{60\ min}\right) = 765.5 \rightarrow \boxed{770\ \frac{ft}{min}}$

9. Make the following conversions:

a. 1447 seconds into days

$(1447\ s)\left(\frac{1\ min}{60\ s}\right)\left(\frac{1\ hr}{60\ min}\right)\left(\frac{1\ day}{24\ hr}\right) = 0.0167748 \rightarrow \boxed{0.01675\ days}$ (a)

b. 899 millimeters (mm) into feet.

$(899\ mm)\left(\frac{1\ cm}{10\ mm}\right)\left(\frac{1\ inch}{2.54\ cm}\right)\left(\frac{1\ ft}{12\ in}\right) = 2.9495 \rightarrow \boxed{2.95\ feet}$ (b)

c. 0.25 kilometers (km) into meters

$(0.25\ km)\left(\frac{1000\ m}{1\ km}\right) = \boxed{250\ m}$ (c)

d. 0.0040 kilograms to milligrams

$(.0040\ kg)\left(\frac{1000\ g}{1\ kg}\right)\left(\frac{1000\ mg}{1\ g}\right) = 4000 \rightarrow \boxed{4.0 \times 10^3\ mg}$ (d)

e. 55.5 inches into meters

$(55.5\ in)\left(\frac{2.54\ cm}{1\ inch}\right)\left(\frac{1\ m}{100\ cm}\right) = 1.4097 \rightarrow \boxed{1.41\ m}$ (e)

f. 3.50 miles into meters

$(350\ miles)\left(\frac{1.61\ km}{mile}\right)\left(\frac{1000\ m}{km}\right) = 5635 \rightarrow \boxed{5640\ m}$ (f)

OR $(3.50\ mi)\left(\frac{5280\ ft}{mile}\right)\left(\frac{12\ in}{1\ ft}\right)\left(\frac{2.54\ cm}{inch}\right)\left(\frac{1\ m}{100\ cm}\right) = 5632.7\ldots$? 5630..