◀ SI Units and Conversion Factors ▶

Length

SI unit: meter (m)

1 meter $\quad$ = 1.0936 yards
1 centimeter = 0.39370 inch
1 inch $\quad$ = 2.54 centimeters
$\qquad$ (exactly)
1 kilometer = 0.62137 mile
1 mile $\quad$ = 5280 feet
$\qquad$ = 1.6093 kilometers
1 angstrom = 10^{-10} meter
$\qquad$ = 100 picometers

Mass

SI unit: kilogram (kg)

1 kilogram $\quad$ = 1000 grams
$\qquad$ = 2.2046 pounds
1 pound $\quad$ = 453.59 grams
$\qquad$ = 0.45359 kilogram
$\qquad$ = 16 ounces
1 ton $\quad$ = 2000 pounds
$\qquad$ = 907.185 kilograms
1 metric ton = 1000 kilograms
$\qquad$ = 2204.6 pounds
1 atomic
mass unit $\quad$ = 1.66056×10^{-27} kilograms

Volume

SI unit: cubic meter (m³)

1 liter $\quad$ = 10^{-3} m^3
$\qquad$ = 1 dm^3
$\qquad$ = 1.0567 quarts
1 gallon $\quad$ = 4 quarts
$\qquad$ = 8 pints
$\qquad$ = 3.7854 liters
1 quart $\quad$ = 32 fluid ounces
$\qquad$ = 0.94633 liter

Temperature

SI unit: kelvin (K)

0 K $\quad$ = $-273.15°C$
$\qquad$ = $-459.67°F$
K $\quad$ = $°C + 273.15$
°C $\quad$ = $\dfrac{5}{9}(°F - 32)$
°F $\quad$ = $\dfrac{9}{5}(°C) + 32$

Energy

SI unit: joule (J)

1 joule $\quad$ = 1 kg · m^2/s^2
$\qquad$ = 0.23901 calorie
$\qquad$ = 9.4781×10^{-4} btu
$\qquad$ (British thermal unit)
1 calorie $\quad$ = 4.184 joules
$\qquad$ = 3.965×10^{-3} btu
1 btu $\quad$ = 1055.06 joules
$\qquad$ = 252.2 calories

Pressure

SI unit: pascal (Pa)

1 pascal $\quad$ = 1 N/m^2
$\qquad$ = 1 kg/m · s^2
1 atmosphere = 101.325 kilopascals
$\qquad$ = 760 torr (mmHg)
$\qquad$ = 14.70 pounds per
$\qquad$ square inch
1 bar $\quad$ = 10^5 pascals

SI UNIT PREFIXES

Multiplication Factor	Prefix	Symbol	Pronunciation (USA) (1)	Term (USA)	Term (Other Countries)
$1\,000\,000\,000\,000\,000\,000 = 10^{18}$	exa	E	as in Texas	one quintillion (2)	one trillion
$1\,000\,000\,000\,000\,000 = 10^{15}$	peta	P	as in petal	one quadrillion (2)	one thousand billion
$1\,000\,000\,000\,000 = 10^{12}$	tera	T	as in terrace	one trillion (2)	one billion
$1\,000\,000\,000 = 10^{9}$	giga	G	jig' a (a as in about)	one billion (2)	one milliard
$1\,000\,000 = 10^{6}$	mega	M	as in megaphone	one million	
$1\,000 = 10^{3}$	kilo	k	as in kilowatt	one thousand	
$100 = 10^{2}$	hecto	h (3)	heck'toe	one hundred	
$10 = 10$	deka	da (3)	deck' a (a as in about)	ten	
$0.1 = 10^{-1}$	deci	d (3)	as in decimal	one tenth	
$0.01 = 10^{-2}$	centi	c (3)	as in sentiment	one hundredth	
$0.001 = 10^{-3}$	milli	m	as in military	one thousandth	
$0.000\,001 = 10^{-6}$	micro	µ (4)	as in microphone	one millionth	
$0.000\,000\,001 = 10^{-9}$	nano	n	nan' oh (nan as in Nancy)	one billionth (2)	one milliardth
$0.000\,000\,000\,001 = 10^{-12}$	pico	p	peek' oh	one trillionth (2)	one billionth
$0.000\,000\,000\,000\,001 = 10^{-15}$	femto	f	fem' toe (fem as in feminine)	one quadrillionth (2)	one thousand billionth
$0.000\,000\,000\,000\,000\,001 = 10^{-18}$	atto	a	as in anatomy	one quintillionth (2)	one trillionth

(1) The first syllable of every prefix is accented to assure that the prefix will retain its identity.

(2) These terms should be avoided in technical writing because the denominations above one million and below one millionth are different in most other countries, as indicated in the last column. Instead, use the prefixes or ten raised to an integral power.

(3) While hecto, deka, deci, and centi are SI prefixes, their use should generally be avoided except for the SI unit-multiples for area and volume and nontechnical use of centimeter, as for body and clothing measurement.

(4) Although Recommendation 1.4 prescribes upright type, the sloping form is sometimes used in the USA for the Greek letter µ (pronounced "mew") because of the scarcity of the upright style.

Dimensional analysis #1

Name_____

Show all set-ups!!

Given the following information:

1 quark = 2.9 whos   1 whos = 5 mabees   1 bug = 3.7 quarks   1 kuz = 3.2 mabees

Change:

1.)   3.0 quark to bug   1._____

2.)   1.3 mabees to quarks   2._____

3.)   7.0 whos to bugs   3._____

4.)   8.75 kuz to quarks   4._____

5.   2.5 bug to kuz   5._____

6.)   2.0 X 10^{-3} quarks to mabees   6._____

7.)   900. quarks to whos   7._____

8.)   4.8 X 10^5 kuz to mabees   8._____

9.)   205 mabees to whos   9._____

10.)   15 bug^2 to $quarks^2$ (see note at bottom)   10._____

11.) 2.5 $mabees^2$ to kuz^2 11._____

12.) 1.50 X 10^3 kuz^2 to bug^2 12._____

For squared conversion factors, write the conversion factor you think you need, put it in parentheses, and then square it. Both the numerical value and the units will end out being squared.

Dimensional Analysis Practice Problems

1) 0.56kg = ? mg

        0.56 kg x   _____g x   _____mg =   _____ mg
                            kg   g

2) 1.2ng = ? g

        1.2 ng x   _____g =   _____ g
                            ng

3) 2.0 in = ? mm (1in = 2.54 cm)

        2.0 in x   _____cm x   _____m x   _____mm =   _____mm
                      in   cm   m

4) 500ft = ? m

        500 ft x   _____in x   _____cm x   _____m =   _____ m
                      ft   in   cm

5) 10μL = ? cc (1mL = 1cm^3 = 1 cc)

        10μL x   _____L x   _____mL x   _____cc =   _____ cc
                      μL   L   mL

6) 3 wk = ? min

        3 wk x   _____ x   _____ x   _____ =   _____ min

7) 50mL = ? cups (1L = 4.226cups)

        50mL x   _____ x   _____ =   _____ cups

8) 5.33km = ? dm

        5.33 km x   _____ x   _____ =   _____ dm

9) 123.0 ng = ? Mg

        123.0ng x   _____ x   _____ =   _____ Mg

10) 3yds = ? in (1 yd = 3ft)

        3 yds x   _____ x   _____ =   _____ in

DIMENSIONAL ANALYSIS

Set up and solve the following problems using dimensional analysis. Be sure to express your results to the proper number of significant figures.

1. How many seconds are there in 1.2 weeks?
2. How many centimeters are there in 4.38 feet?
3. How many meters did you run if the distance run was 6.59×10^5 inches?
4. What is the mass of a suitcase, in pounds, if it weighs 19.5 kilograms?
5. If a recipe calls for 37 grams of sugar, how many pounds does that correspond to?
6. Express a volume of 589 cm^3 in ft^3 and in^3.
7. How many liters are equal to 39 in^3?
8. If a car travels at 4.45×10^4 ft/hr, what would its speed be in meters/min?
9. What is the density of a substance if it has a mass of 59.2 grams and a volume of 17.0 mL?
10. Calculate the density of a liquid, in grams/cm^3, if it has a mass of 23.2 grams and occupies a cube with dimensions of 1.3 cm × 5.6 cm × 2.3 in.
11. If a liquid has a density of 1.04 g/mL, what would its density be in lb/in^3?
12. What volume, in liters, would 88.9 grams of a substance occupy if its density is 2.38 g/mL?
13. What is the mass, in pounds, of 389 mL of a gas that has a density of 1.29 g/L?
14. Convert 37°C to °F and K.
15. Which temperature is the coldest?
    a) −12°C   b) 18°F   c) 248K

Worksheet: Dimensional Analysis

1. The distance from the thumb to the little finger on Erbie Terbium's hand is 9 inches. Convert this to centimeters.

2. According to the Guinness Book of Records the heaviest baby ever born weighed 29 lbs 4 oz. (29.25 lbs). What was the baby's mass in kG? (Historical Note: The birth occurred in Effingham IL in 1939 and due to respiratory problems the baby died two hours later. The heaviest babies to survive weighed 22.5 lbs and were born in 1955 and 1982.)

3. Your cross country skis are 210 cM long. What is their length in inches?

4. A condor has a wing span of 3.05 M. What is the wing span in feet?

5. In Europe gasoline is sold by the liter. Assume that it takes 14 gallons of gasoline to fill the tank of a compact car. How many liters of gasoline will it take?

6. You have just received a French cookbook from the exchange student. You want to make 3 quarts of punch for a party. Will a recipe of 2.5 L be enough?

7. Some owls maintain territories of up to 3 acres. How many owls could live in a large wooded area of 20 hectares? (1 hectare=1 sq. dekameter=100 m^2= 2.47 acres)

8. Ruth Palladium (RuPd) bought 10 acres of land and built a house on 2 acres. RuPd wanted to raise sheep on the remaining 8 acres. If it takes 1/8 (0.125) hectare to raise one sheep, how many sheep can be raised on the 8 acres.

9. One 1.6 oz. of package of cinnamon and spice instant oatmeal contains 34 G of carbohydrates. If you had instant oatmeal 6 days a week, how many ounces of carbohydrate would you consume in a week? (16 oz =1 lb = 454 G =256 Drams = 7000 Grains)

10. Many candybars have 9 G of fat per bar. If during a "chocolate attack" you ate one pack of candy (0.6 dekabars), how many ounces of fat would you have eaten? There are approximately 9 Calories per gram of fat, how many Calories is this?

11. If the RDA for vitamin C is 60 mG per day and there are 70 mG of vitamin C per 100 G of orange, how many 3 oz. oranges would you have to eat each week to meet this requirement?

12. If Gasp cigarettes have 5 mG tar and 0.4 mG nicotine per cigarette and there are 20 cigarettes per pack, how many packs of cigarettes would have to be smoked to coat your lungs with 8 oz (1/4 lb.) of tar? How many packs would you have to smoke to coat your lungs with one gram of nicotine?

13. You are riding home from a party and the driver has been drinking. The car is traveling at 60 mi per hour. Suddenly a child steps into the road ahead. Because the driver has been drinking his reaction time has been slowed by 1 second. How far toward the impending accident will the car travel before the driver begins to stop? (Note: This is equal to the extra distance it will take to stop the car because the driver has been drinking.)