

1) Solve for the variables using the expression below.

$$\frac{ab}{xyz} = 1$$

a =

b =

x =

y =

z =

Solve.

2) $3E^6 \times 2E^2 =$

3) $6.4E^{15} \times 7.3E^{23} =$

4) $9.1E^{-2} \times 4.4E^{-6} =$

5) $\frac{4.8E^{-19}}{2.1E^{-5}} =$

6) $\frac{5E^{11}}{6E^3} =$

7) $\frac{1E^{20}}{1E^{10}} =$

8) $1.01E^2 + 2.00E^7 =$

11) $7.6E^4 - 3.6E^3 =$

9) $3.27E^9 + 6.12E^{-7} =$

12) $8.0E^5 - 6.4E^1 =$

10) $2E^{-31} + 4E^{-60} =$

13) $2.1E^{-23} - 2.1E^{-11} =$

Convert units then put the answer in scientific notation.

14) 75 mL = _____ L _____ L

15) 82 m = _____ cm _____ cm

16) 0.1298 km _____ mm _____ mm

17) Complete the equation to solve for the physical property of DENSITY.

Density =

18) Calculate the mass for an object with a density of 2 g/mL and a volume of 6 mL.

Directions: Perform the following conversion as indicated. Use a separate sheet of paper.

Length:

1. 70 cm to m	2. 49 cm to mm
3. 8 m to mm	4. 14.76 m to cm
5. 8500 cm to m	6. 20 mm to m

Volume and Mass:

7. 6 L to cl	8. 4.1 L to ml
9. 8.7 L to ml	10. 12.5 cl to L
11. 925 mg to Kg	12. 412.6 Kg to g

13. $8\text{ cm} \times 7\text{ cm} \times 6\text{ m} = ?\text{ cm}^3$ also = ? ml
14. $4\text{ cm} \times 9\text{ cm} \times 12\text{ cm} = ?\text{ cm}^3$ also = ? ml
15. $15\text{ m} \times 12\text{ cm} \times 5\text{ cm} = ?\text{ cm}^3$ also = ? ml

Convert: using Dimensional Analysis method (show your work)

16. 8000 g to Kg 17. 25,000 g to Kg 18. 2 mm to Km
19. 12.42 Kg to g 20. 4.2 g to mg
21. One nickel weighs 5 grams. How many nickels are in 1 Kg of nickels?
22. What is the total mass of the following?

Potatoes	5 Kg
Flour	11Kg
Turkey	8000 g
Cereal	250 g
Candy	340 g
Medicine	550 mg
Total:	_____ kg _____ mg _____ g

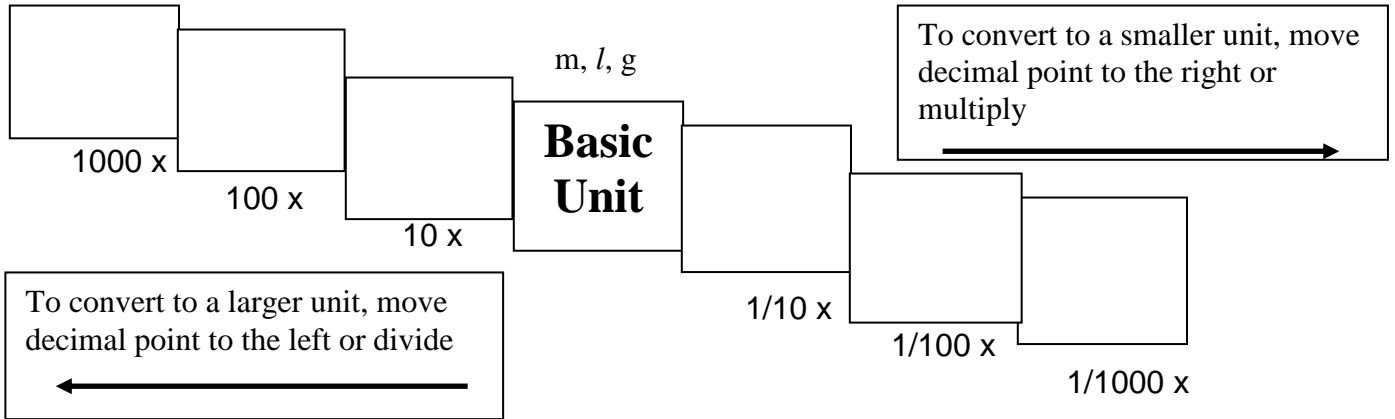
$1\text{cm}^3 = 1\text{ml}$

23. The fundamental unit used to measure mass is _____.
24. What does the prefix "centi" mean? _____.
25. What does the prefix kilo mean? _____.

On the back of this sheet complete the following: **37 in/sec to miles/year**

Dougherty Valley HS Chemistry
Metric Mania
Conversion Practice

**WORKSHEET
#3**



Try these conversions, using the ladder method:

1000 mg = _____ g

1 L = _____ ml

160 cm = _____ mm

14 km = _____ m

109 g = _____ kg

250 m = _____ km

Compare using <, >, or =

56 cm ○ 6 m

7 g ○ 698 mg

Conversion Challenge

Write the correct abbreviation for each metric unit. Answer on a separate sheet of paper

- | | | |
|-------------------|---------------------|---------------------|
| 1. Kilogram _____ | 4. Milliliter _____ | 7. Kilometer _____ |
| 2. Meter _____ | 5. Millimeter _____ | 8. Centimeter _____ |
| 3. Gram _____ | 6. Liter _____ | 9. Milligram _____ |

Try these conversions, using the ladder method of conventional method

- | | | |
|----------------------|----------------------|-----------------------|
| 1. 2000 mg = _____ g | 6. 5 L = _____ mL | 11. 16 cm = _____ mm |
| 2. 104 km = _____ m | 7. 198 g = _____ kg | 12. 2500 m = _____ km |
| 3. 480 cm = _____ m | 8. 75 mL = _____ L | 13. 65 g = _____ mg |
| 4. 5.6 kg = _____ g | 9. 50 cm = _____ m | 14. 6.3 cm = _____ mm |
| 5. 8 mm = _____ cm | 10. 5.6 m = _____ cm | 15. 120 mg = _____ g |

Compare using <, >, or =

- | | | |
|---|-------------------------------------|---|
| 16. 63 cm <input type="text"/> 6 m | 17. 5 g <input type="text"/> 508 mg | 18. 1,500 mL <input type="text"/> 1.5 L |
| 19. 536 cm <input type="text"/> 53.6 dm | 20. 43 mg <input type="text"/> 5 g | 21. 3.6 m <input type="text"/> 36 cm |

Complete all work on a separate sheet of paper.

[1] Give the number of significant figures in each of the following:

_____ 402 m _____ 34.20 lbs _____ 0.03 sec
_____ 0.00420 g _____ 3 200 liters _____ 0.0300 ft.

_____ 5.1×10^4 kg _____ 0.48 m _____ 1 400.0 m
_____ 78 323.01 g _____ 1.10 torr _____ 760 mm Hg

[2] Multiply each of the following, observing significant figure rules:

17 m x 324 m = _____ 1.7 mm x 4 294 mm = _____
0.005 in x 8 888 in = _____ 0.050 m x 102 m = _____
0.424 in x .090 in = _____ 324 000 cm x 12.00 cm = _____

[3] Divide each of the following, observing significant figure rules:

23.4 m ÷ 0.50 sec = _____ 12 miles ÷ 3.20 hours = _____
0.960 g ÷ 1.51 moles = _____ 1 200 m ÷ 12.12 sec = _____

[4] Add each of the following, observing significant figure rules:

3.40 m 102.45 g 102. cm
0.022 m 2.44 g 3.14 cm
0.5 m 1.9999 g 5.9 cm

[5] Subtract each of the following, observing significant figure rules:

42.306 m 14.33 g 234.1 cm
1.22 m 3.468 g 62.04 cm

[6] Work each of the following problems, observing significant figure rules:

Three determinations were made of the percentage of oxygen in mercuric oxide. The results were 7.40%, 7.43%, and 7.35%. What was the average percentage?

A rectangular solid measures 13.4 cm x 11.0 cm x 2.2 cm. Calculate the volume of the solid.

If the density of mercury is 13.6 g/ml, what is the mass in grams of 3426 ml of the liquid?

A copper cylinder, 12.0 cm in radius, is 44.0 cm long. If the density of copper is 8.90 g/cm³, calculate the mass in grams of the cylinder. (assume pi = 3.14)

Dougherty Valley High School
Measurement Practice
Chemistry

WORKSHEET
#5

SIGNIFICANT DIGITS

Significant figures are the digits in any measurement that are known with certainty plus one digit that is uncertain.

Rule 1: All non-zero digits are significant

3.1425	[5]
3.14	[3]
469	[3]

Rule 2: All zeros between significant digits are significant

7.503	[4]
7053	[4]
302	[3]

Rule 3: In a number with digits to the right of a decimal place, zeros to the right of the last non-zero digit are significant

43	[2]
43.0	[3]
43.00	[4]
0.00200	[3]
0.40050	[5]

Rule 4: Zeros to the left of the first non-zero digit that act, as placeholders are NOT significant.

0.0056	[2]
0.0789	[3]
0.000001	[1]

Rule 5: In a number that has no decimal point, and that ends in zeros (such as 3600), the zeros at the end may or may not be significant (it is ambiguous). To avoid ambiguity express the number in scientific notation showing in the coefficient the number of significant digits.

3.6×10^3 contains two significant digits

A. How many significant digits are in each of the following numbers?

1837	1)	205.8	2)
$3.14145E^4$	3)	1900.5	4)
6005	5)	1200.43	6)
0.08206	7)	6000.00	8)
0.000014	9)	632.0000	10)
149356.1	11)	14.163000	12)
8.7300	13)	14	14)
0.00743	15)	302400.00	16)
302400	17)	0.0019872	18)
8.732	19)	20000	20)
14.000	21)	426.1	22)
19.7342	23)	60	24)

B. Convert the following number into or out of scientific notation:

142.63	1)
1,500,000.00	2)
0.00336	3)
$1.63E^7$	4)
$3.11E^{-4}$	5)
0.00125	6)
86,400.00	7)
$1.01E^6$	8)
$9.81E^1$	9)
0.0000000000000144	10)
4,633,310.56	11)

ROUNDING

GENERAL RULES FOR ROUNDING:

$XY \rightarrow X$
 When $Y \geq 5$, increase X by 1
 When $Y < 5$, don't change X

C. Round each of the following numbers to four significant digits:

6.16782	1)
6.19648	2)
0.0019872	3)
$3.14145E^4$	4)
213.25	5)
14.163000	6)
90210	7)
234.4	8)
1200.43	9)
0.0022475	10)
14.16300	11)
0.02315	12)
13.462	13)
135.69	14)
152.00	15)
395.55	16)

SIGNIFICANT DIGITS IN OPERATIONS

D. Add or subtract as indicated and state the answer with the correct number of significant digits

$85.26 \text{ cm} + 4.6 \text{ cm}$	1)
$1.07 \text{ m} + 0.607 \text{ m}$	2)
$186.4 \text{ g} - 57.83 \text{ g}$	3)
$60.08 \text{ s} - 12.2 \text{ s}$	4)
$4,285.75 - 520.1 - 386.255$	5)
$72.60 \text{ m} + 0.0950 \text{ m}$	6)

E. Multiply or divide as indicated and state that answer with the correct number of significant digits

$(5.5 \text{ m})(4.22 \text{ m})$	1)
$(0.0167 \text{ km})(8.525 \text{ km})$	2)
$2.6 \text{ kg} \div 9.42 \text{ m}^3$	3)
$0.632 \text{ m} \div 3.8 \text{ s}$	4)
$(8.95)(9.162) / (4.25)(6.3)$	5)
$0.0045 \text{ mm}^2 \div 0.90 \text{ mm}$	6)

F. Evaluate the following with answers expressed to proper number of significant digits.

$4.22\text{E}^5 + 3.11\text{E}^7 + 6.003\text{E}^6$	1)
$(9.11\text{E}^{-28})(6.02\text{E}^{23})$	2)
$2.160\text{E}^3 + 6.2000\text{E}^4 + 5.2\text{E}^1$	3)
$\frac{8.4\text{E}^7}{2.1\text{E}^4}$	4)
$\frac{8.4\text{E}^{-7}}{2.1\text{E}^4}$	5)
$\frac{8.4\text{E}^7}{2.1\text{E}^{-4}}$	6)
$\frac{8.4\text{E}^{-7}}{2.1\text{E}^{-4}}$	7)
$\frac{6.02\text{E}^{23}}{9.11\text{E}^{28}}$	8)

G. Given the following numbers (a-e), solve the following problems, expressing the answer to the proper number of significant digits.

- (a) 1.72 cm
- (b) 0.15 cm
- (c) 627.1 cm
- (d) 0.007 cm
- (e) 704.050 cm

$a + b + c + d + e$	1)
$a + c + e$	2)
$c - a$	3)
$e - b$	4)
$(a + c) - (b + d)$	5)
(a) (e)	6)
(c) (d)	7)
$(a + b)(b + e)$	8)
$c \div b$	9)
$e \div d$	10)
$(b + c) \div (e - c)$	11)
$(b)^3$	12)

Instructions: Show your work on a separate sheet of paper and attach it to this page. Put a box around your final answer so that it can be found easily. You must use Dimensional Analysis to solve.

1. Evaluate the following:

$$(6.02 \times 10^{23})(5.15 \times 10^{-4})(3.82 \times 10^3) =$$

$$(3.92 \times 10^8)(4.96 \times 10^{-9})(1.99 \times 10^{11}) =$$

2. Jules Verne wrote a book called Twenty Thousand Leagues Under the Sea. Using the conversion factors given, convert 20,000 leagues into inches:

$$12 \text{ in} = 1 \text{ ft}$$

$$3 \text{ ft} = 1 \text{ yd}$$

$$1 \text{ fathom} = 2 \text{ yds}$$

$$1 \text{ statute mile} = 5280 \text{ ft}$$

$$1 \text{ nautical mile} = 6080 \text{ ft}$$

$$1 \text{ league} = 3 \text{ nautical miles}$$

3. Convert 73 mi/hr into in/min.

4. Some owls maintain a territory of up to 3 acres. How many owls could live in a large wooded area of 20 hectares?

$$1 \text{ hectare} = 1 \text{ square decameter} = 100 \text{ square meters} = 2.47 \text{ acres}$$

5. One 1.6 oz. 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 carbohydrates would you consume in one week? 16 oz = 1 lb = 454 g = 256 Drams = 7000 grains

6. Many candy gazelle's have 9 grams of fat per bar. If during a "chocolate attack" you ate one 6-pack of bars (0.6 Decabars), how many ounces of fat would you have eaten? If there are approximately 9 calories per gram of fat, how many Calories is this?

7. You are riding home from a party and the driver has been drinking. The car is traveling 60 mi/hr. Suddenly a child steps out into the road ahead. Because the driver has been drinking, his reaction time has been slowed by one second. How many feet toward the impending accident will the car travel before the drive begins to stop? (This is equal to the extra distance it will take to stop the car because the driver has been drinking)

8. In an old episode of the TV program McGyver; a planeload of gold was being transported from the Soviet Union to the United States during WWII. The plane crashed in the Arctic region. To prevent the "bad guys" from getting the gold, the pilot and copilot transferred the gold in to a cave by stacking it on a door of the crashed plane and dragging the "sled" into the cave. You were led to believe in the episode that they accomplished the move in one trip. The gold was stacked neatly in the shape of a cube, measuring about 1 meter on a side. Calculate the weight, in tons, of one cubic meter of gold. The density of gold is 19.4 g/cc. Would it have been possible for the two pilots to accomplish this feat? Would a plane of WWII vintage be able to carry this much gold?

WORKSHEET

#7

Practice Problems on Unit Conversion Using Dimensional Analysis (Factor Label Method)

These are practice problems. It is assumed that you have already been introduced to the method of "dimensional analysis." Answers are provided at the end of this document. You should look at the question, work it out on paper (not in your head), before checking the answers at the end. The purpose of these problems is not merely to get the right answer, but to practice writing out the dimensional analysis setup. We will be using this method all semester and I will be asking for your setups, so don't just work out an answer on your calculator without writing out a setup.

In these practice problems, I am going to ask you to stick to ONLY the following conversions between the English and metric system (these are the only conversions that I will give you on exams). In some cases you can look up conversions elsewhere, but I would rather you didn't. I want you to learn how to make conversions that take more than one single step.

1 inch = 2.54 cm exactly 1 lb = 454 g 1 qt = 0.946 L 1 mi = 5280 ft 1 qt = 2 pt 4qt = 1 gal

You should also remember that $1 \text{ cc} = 1 \text{ cm}^3 = 1 \text{ mL}$ exactly. (This is a conversion you need to know.)

For all problems, please show your dimensional analysis setup and give your answer to the correct significant figures. Remember you can use any of the conversions shown above.

- [1] Convert 3598 grams into pounds.
- [2] Convert 231 grams into ounces.
- [3] A beaker contains 578 mL of water. What is the volume in quarts?
- [4] How many ng are there in 5.27×10^{-13} kg?
- [5] What is 7.86×10^{-2} kL in dL?
- [6] What is 0.0032 gallons in cL?
- [7] A box measures 3.12 ft in length, 0.0455 yd in width and 7.87 inches in height. What is its volume in cubic centimeters?
- [8] A block occupies 0.2587 ft^3 . What is its volume in mm^3 ?
- [9] If you are going 55 mph, what is your speed in nm per second?
- [10] If the density of an object is 2.87×10^{-4} lbs/cubic inch, what is its density in g/mL?