

+ WS 1.2 Measurements

1. The 4th largest chemical company in the US is right here in St. Louis! What is it? _____

2. Determine the **English** units and **metric** units for the following measurements:

<u>measurement</u>	<u>English unit</u>	<u>metric unit</u>
length		
mass	()	
weight		()
temperature		
volume		

3. Complete the following table:

prefix	abbrev.	meaning
giga-	G	10^9
mega-		
	k	
		10^{-1}
centi-		
	m	
micro-		
		10^{-9}

Underline the correct response to the following:

4. Which is bigger; 100 centimeters or 100 meters?

5. You have a liter of water. Would you be more likely to drink it or wash your car with it?

6. If Mr. Jones is to travel 4,000 kilometers, should he walk, bike, or take a plane?

7. If you bought 100 milliliters of Pepsi, would you carry it home or haul it by truck?

8. A bullet has a diameter of 125 millimeters. Is it more suitable for a pistol or a cannon?

9. A box weighing 216 grams is more likely to contain feathers or cannonballs?

10. Is the height of the classroom closer to 4 meters or 400 meters?

11. Should the temperature of a warm bath be closer to 35 °C or 85 °C?

12. Is the weight of your textbook closer to 2000 grams or 3 megagrams?

13. Circle which unit would be most appropriate for measuring the length of your book:

millimeter (mm) / kilometer (km) / centimeter (cm) / micrometer (μm)

14. Suppose a pencil weighs 5 g. How many mg is this? _____ How many kg? _____

+ WS 1.5 Significant Figures I

For the following measurements, indicate how many significant figures (sf's) there are:

- 1) 34 g ___ 2) 564 L ___ 3) 19.3 mm ___ 4) 23.45 mg ___ 5) 101 km ___
 6) 3400 g ___ 7) 5040 L ___ 8) 19,000 mm ___ 9) 20 mg ___ 10) 160 km ___
 11) 0.00034 g ___ 12) 0.564 L ___ 13) 0.0019 m ___ 14) 0.5 mg ___ 15) 0.12 km ___
 16) 34.0 g ___ 17) 56.40 L ___ 18) 19.00 m ___ 19) 20.0 mg ___ 20) 8.200 m ___
 21) $34\overline{00}$ g ___ 22) $2\overline{000}$ L ___ 23) $14\overline{0}$ mm ___ 24) $190\overline{00}$ mg ___ 25) $640\overline{0}$ km ___
 26) 800 g ___ 27) 800. L ___ 28) 10,900 mm ___ 29) 10.090 mg ___ 30) 803 km ___
 31) 1,000,000 g ___ 32) 1,000,001 g ___ 33) 0.05060 m ___ 34) 56 mg ___ 35) 0 m ___

Ans #1-35 IRO: 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4 5 7 ?

Indicate the # of sig figs for the following:

- 36) 3.4×10^3 g ___ 37) 5.64×10^8 L ___ 38) 7×10^{-5} mm ___ 39) 2.4×10^4 g ___ 40) 3.61×10^2 m ___
 41) 3.0×10^3 g ___ 42) 5.60×10^8 L ___ 43) 2.04×10^4 g ___ 44) 6.00×10^2 g ___ 45) 2.0×10^0 m ___

Ans #36-45 IRO: 1 2 2 2 2 3 3 3 3 3

Convert between scientific notation and regular notation, without changing the number of sig fig's:

- 46) 5700 g = 5.7×10^3 g 52) 3.6×10^5 m = 360000 m
 47) 14,000,000 m = _____ m 53) 3.6×10^{-5} m = _____ m
 48) 2,000 cm = _____ cm 54) 3.60×10^5 m = _____ m
 49) 2,000. cm = _____ cm 55) 6.00×10^1 kg = _____ kg
 50) 0.000043 kg = _____ kg 56) 6.00×10^2 kg = _____ kg
 51) 0.000230 mg = _____ mg 57) 3.25×10^3 L = _____ L

Ans #46-57 IRO: 4.3×10^{-5} , 0.000036, 2.30×10^{-4} , 60.0, 600., 2×10^3 , 2.000×10^3 , 3250, $36\overline{0000}$, 1.4×10^7

Round each of the following off to the specified number of sig fig's: (some have been done for you...)

- 58) Round 78.241 g to... 4 sf: 78.24 3 sf: _____ 2 sf: _____ 1 sf: _____
 59) Round 4.2983 g to... 4 sf: _____ 3 sf: 4.30 2 sf: _____ 1 sf: _____
 60) Round 373.99 g to... 4 sf: _____ 3 sf: _____ 2 sf: 370 1 sf: _____
 61) Round 50,001 g to... 4 sf: _____ 3 sf: _____ 2 sf: _____ 1 sf: 50,000

Ans #58-61 IRO: 4 4.298 4.3 78 78.2 80 374 374.0 400 $5\overline{0},000$ $50,\overline{000}$ $50,0\overline{00}$

Rounding Worksheet

Round the following numbers as indicated.

To four figures:	To the nearest 0.1:	To nearest 0.01:	To the nearest whole number:
1) 2.16347 x 10 ⁵	13) 3.64	25) 6.675	37) 56.912
2) 4.000574 x 10 ⁶	14) 4.55	26) 0.4203	38) 3.4125
3) 3.682417	15) 7.250	27) 0.03062	39) 251.7817
4) 7.2518	16) 0.0865	28) 4.500	40) 112.511
5) 375.6523	17) 0.5182	29) 2.473	41) 63.541
6) 21.860051	18) 2.473	30) 7.555	42) 7.555
To two figures:	To one decimal place:	To the nearest 0.001:	Round off the farthest right digit
7) 3.512	19) 54.7421	31) 5.687524	43) 2.473
8) 25.631	20) 100.0925	32) 39.861214	44) 5.396
9) 40.523	21) 1.3511	33) 104.97055	45) 8.235
10) 2.751 x 10 ⁸	22) 79.2588	34) 41.86632	46) 3.05
11) 3.9814 x 10 ⁵	23) 0.9114	35) 0.03765	47) 8.25
12) 22.494	24) 0.2056	36) 0.0045	48) 8.65
1) 13)	25)	26)	27)
2) 14)	28)	29)	30)
3) 15)	31)	32)	33)
4) 16)	34)	35)	36)
5) 17)	37)	38)	39)
6) 18)	40)	41)	42)
7) 19)	43)	44)	45)
8) 20)	46)	47)	48)
9) 21)	49)	50)	51)
10) 22)	52)	53)	54)
11) 23)	55)	56)	57)
12) 24)	58)	59)	60)

+ WS 1.7 Density / Archimedes Principle (SHOW ALL WORK)

Substance:	Density:
osmium	22.6 g/mL
gold	19.3 g/mL
mercury	13.6 g/mL
lead	11.4 g/mL
copper	8.96 g/mL
aluminum	2.70 g/mL
water	1.00 g/mL
alcohol	0.781 g/mL
styrofoam	0.145 g/mL
air	1.28 g/L
helium	0.179 g/L

Volume Equations	
block:	$V=lwh$
cylinder:	$V=\pi r^2h$
sphere:	$V=\frac{4\pi r^3}{3}$

1. A 13.2 mL rock weighs 47.6 g. Determine its density.

Ans: _____

2. 138.42 g of salt water has a volume of 117.0 mL. Determine its density.

Ans: _____

3. 0.446 g of hydrogen gas fills a 5.0 L bag. Determine hydrogen's density.

Ans: _____

4. 25.2 mL of water are placed in a graduated cylinder. A 22.6 g stone is dropped in, and the water level rises to 32.4 mL. Find the stone's density.

Ans: _____

5. A 3.0 cm x 4.5 cm x 6.7 cm brick has a mass of 985 g. a> What is its density, and...
b> from what material is it most likely made?

Ans: a> _____ b> _____

6. A cylinder has a mass of 528.6 g, a length of 14.2 cm, and a diameter of 2.30 cm. Of what is the cylinder most likely made of?

Ans: _____

7. A ball has a mass of 753 g and a radius of 5.62 cm. a> Will the ball float or sink in water?
b> Will it float or sink in salt water? (see #2)

Ans: a> _____ b> _____

8. a> How much would a 15.2 mL chunk of styrofoam weigh?
b> How much would the same size chunk of osmium weigh?

Ans: a> _____

Ans: b> _____

9. A piece of gold wire has a diameter of 0.175 cm. How much will precisely 1.00×10^5 cm (about 2/3 mile) of the wire weigh? (hint- think of the wire as a tiny cylinder)

Ans: _____

10. What volume would 62.4 g of mercury have?

Ans: _____

11. How large would a balloon be when filled with: a> 17.8 g of air?
b> With 17.8 g of helium?

Ans: a> _____ b> _____

12. A 187.3 g lead block has dimensions 3.20 cm x 2.95 cm x Z cm.
Find Z (the thickness of the block)

Ans: _____

13. At a cost of \$1600/oz, how much would you have to pay for a solid cubic foot of gold?
useful information: (1 oz = 28.4 g; 1 in = 2.54 cm)

Ans: _____

14. An object has a mass of 57.02 g but appears to weigh 40.85 g when submerged in water.

a) What is the object's volume?

Ans: _____

b) What is the object's density?

Ans: _____

c) What would the object appear to weigh if submerged in alcohol? (see table)

Ans: _____

d) The object appears to weigh 33.17 g submerged in corn syrup.
What is the density of this corn syrup?

Ans: _____

15. A balloon has a total mass of 13.55 g & a volume of 14.82 L.

a) What will the balloon appear to weigh when surrounded by helium gas? (see table)

Ans: _____

b) What will it appear to weigh when surrounded by CO₂ gas? (D = 1.977 g/L)

Ans: _____

ANS (IRO+3): 0 0.089 1.183 1.475 1.74 2.20 3.1 3.526 3.61 4.59 10.90 11 13.9
16.17 44.4 99.4 344 435 46,400 289,000 955,000 31,000,000 lead copper sink float

UNITS (IRO +1): g g g g g g g mL mL mL L L cm cm \$ g/mL g/mL g/mL
g/mL g/mL g/mL g/mL g/L

+WS 1.9 - Review

Fill in the blanks with an appropriate unit: **mm, cm, m, km, g, kg, mL, L, kL**

1. The average textbook is 210 ___ wide and weighs 2000 ___.
2. A tree can grow 0.7 ___ per year and can require 100 ___ of water per month.
3. My TV remote weighs 89 ___ and it has a working range of 1000 ___.

Convert the following:

- 4) 22.2 cm = _____ km 5) $6.1 \times 10^7 \mu\text{L}$ = _____ cL

How many sig fig's?

- 6) 104.01 g _____ 7) 4.10×10^3 g _____
8) 40 g _____ 9) 40. g _____
10) 140.0 g _____ 11) .0140 g _____

Round off to specified # of sig fig's:

- 12) Round 14.989 to... 4 sf: _____ 3 sf: _____ 2 sf _____ 1 sf _____
13) Round 31,011 to... 4 sf: _____ 3 sf: _____ 2 sf _____ 1 sf _____

Calculate the following, using appropriate sig figs:

- 14) What is the volume of a shoebox whose dimensions are 125 cm by 25.5 cm by 30.0 cm?
- 15) A woman has a purse weighing 954.4 g. From it was stolen: a 121.23 g cell phone and a 11.29 g tube of lipstick! How much does the purse weigh now? _____

Density:

- 16) A graduated cylinder is placed on an electronic balance, and the scale reads 81.19 g. 15.5 mL of acetone are added, and the scale reads 95.33 g. What is the density of acetone?

Ans _____

- 17) Mystery object "A" has a density of 3.90 g/mL. If it weighs 450 g, what is its volume?

Ans _____

For the following: Indicate whether it is a **D**eterminate or **I**ndeterminate error (**Use "D" or "I"**):

- 18) _____ There was a rock stuck in the bottom of your graduated cylinder
19) _____ The temperature knob on the hot-plate is off by 10°C
20) _____ Someone dropped some German potato salad into your experiment
21) _____ Misunderstanding the instructions, you used hydrochloric acid instead of water.

Use Dimensional Analysis to convert the following:

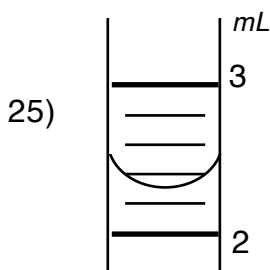
22) 4.11 qt ---> mL

23) 0.709 cm/sec ---> ft/day

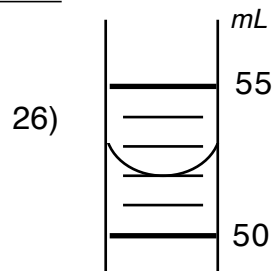
24) 7.5 mi² ---> in²

1 ft = 12 in
1 mi = 5280 ft
1 lb = 16 oz
1 gal = 4 qt
1 in = 2.54 cm
1 mi = 1.61 km
1 lb = 454 g
1 qt = 0.946 L
1 m = 100 cm
1 km = 1000 m
1 kg = 1000 g
1 L = 1000 mL

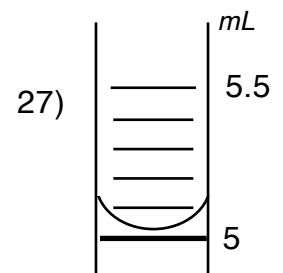
Read the following graduated cylinders:



Ans _____



Ans _____



Ans _____

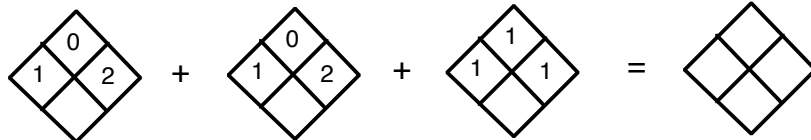
For the following: Indicate whether it is a Determinate or Indeterminate error (Use "D" or "I"):

28) ___ Someone drank some of your experiment

29) ___ Your electronic balance is off by 0.4 grams

30) ___ A fly landed (and dissolved) in your highly acidic experiment

31) Combine these NFPA codes into one:



32) An object has a mass of 60.00 g, but appears to weigh 50.00 g when submerged in water. What is the object's density?