Unit 1 Interactive Notebook 2013-2014

Chemistry Conversions Scientific Method

Grant Union High School
8/15/2013

Interactive Notebook Table of Contents

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	8/30/13		Unit 1 Test		

Five Point Scoring Rubric

5 Points—(a WOW product)
- all of the requirements are evident and EXCEEDED
- the product is VERY neatly done and EXTREMELY well organized
- the product shows LOTS of creativity and is colorfully illustrated
- completed on time

4 Points—(What is EXPECTED)
- all the requirements are evident
- the product is neatly done and well organized
- the product shows creativity and is colorfully illustrated
- completed on time

3 Points—(Almost What is EXPECTED)
- the requirements are evident (maybe 1 or 2 are missing)
- the product is neatly done and organized
- the product shows some creativity and is illustrated
- completed on time

2 Points—(Sort of What is EXPECTED)
- the requirements are evident (maybe 3 or 4 are missing)
- the product is done and sort of organized
- the product is done and sort of organized
- the product shows little creativity and is illustrated
- completed on time

1 Points—(Two or More parts is missing)
- MANY of the requirements are NOT PRESENT
- The product is VERY POORLY done and POORLY organized
- The product shows little TO NO creativity and THE illustrations

0 Points—(Does not meet Standards)
- Unscorable or no product

Chemistry Scale of Mastery

5 I am ready to move on

4 I get this

3 I can do most of the problem

2 With help I can do it

1 No understanding

Level of Effort

5 I did my best

4 I tried pretty hard

3 I tried some

2 I tried a little

1 I did not try at all

Cognitive Skill: Problem Solving Using Conversions and Mathematical Relationships (formulas)

Evaluative Criteria Steps (to be completed in order):

1. Identify the given information. Both unknown and given.
2. Organize: Use an acceptable conversion set-up, or formula to solve the problem. You may need to rearrange the equation to solve appropriately
3. Units and Numbers are properly placed in the conversion or formula. When possible units must be the same type- for example when canceling if volume is in liter in one place, volume should be in liters in another place.
4. Answer the problem. Unit cancellation and calculations.

Level	Descriptions
Advanced	In addition to the description for proficient the student applies the skill to a new type of problem.
Proficient	You have clearly identified the given and unknown information, organizing this information in a conversion format, or formula. Units and numbers are properly placed in the conversion/formula, and the answer has the correct number and units.
Basic	You have clearly identified the given and unknown information, organizing this information in a conversion format, or formula. Units and numbers are properly placed in the conversion/formula. The answer is incorrect either because the units/numbers are incorrect, or missing.
Below Basic	You have clearly identified the given and unknown information, organizing this information in a conversion format, or formula. Misplaced or incorrect units and/or numbers. The answer is incorrect either because the units/numbers are incorrect, or missing.
Incomplete	You have clearly identified the given and/or unknown information. The information is not organized into a conversion format, or formula. Misplaced, incorrect, or missing units and/or numbers. The answer is incorrect either because the units/numbers are incorrect, or missing.

Unit 1 Single Step Conversions and Density Study Guide

Chemistry Standard Set 3 Students must be able to manipulate very large and very small numbers using exponents expressed in scientific notation, and to write equations numerically with correct units using dimensional analysis

Learning Goals

Students will be able to convert units using dimensional analysis and equalities.
Students will read a word problem and identify important information to solve the problem.
Students will be able to interpret scientific experiments using experimental vocabulary

Key Conversion Vocabulary Terms

Atoms
Compound
Conversion Factor
cc
Mole
Dimensional
Density
Element
Metric System

Key Experimental Vocabulary Terms

Hypothesis
Experiment
Independent Variable
Constants
Control
Dependent Variable

Concepts

Conversions: Grams ↔ Moles, Atoms ↔ Moles, Vol @STP ↔ moles, C° ↔ K, mL ↔ L, and between Pressure Units
Solving density formula for density, mass or volume
How volume displacement is used to determine the volume of an object

Items for Memorization

1000 milliliter (mL) = 1 liter (L)

1 mL = 1cc = 1 cubic centimeter = $1cm^3$

1 mole = 6.02×10^{23} particles (counting moles)

$$Density = \frac{mass}{volume}$$

Skills

- Identify known and unknowns Units and numbers to organize information for problem solving
- Using periodic table calculate molar mass (weighing moles), calculate molar volume for gases at STP (volume mole), convert temperature and pressure units

Lab

Dry density of various metals using error analysis and liquid densities of various

Le Systeme Internationale d'Unites (SI System)

The metric system is a system of units of measurement established from its beginnings in 1874 by diplomatic treaty (***Conférérence Générale des Poids et Measures***). The modern system is actually called the International System of Units or SI. SI is abbreviated from the French Le ***Système Internationale d'Unités*** and grew from the original metric system. Today, most people use the name metric and SI interchangeably with SI being the more correct title.

SI Base Units

length	meter	m
mass	kilogram	kg
temperature	Kelvin	K
amount of substance	mole	mol
electric current	ampere	amp
time	second	s
luminous intensity	candela	cd

DIMENSIONAL ANALYSIS or FACTOR LABEL METHOD

Measurement is finding out how many times a unit is contained in a quantity. [illegible] unit. Quantities can be converted from one unit to another by using the relationship of one unit to another. For example: 12 inches = 1 foot. Since these two measurements represent the same quantity, the fractions $\frac{12\text{ in}}{1\text{ ft}}$ and $\frac{1\text{ ft}}{12\text{ in}}$ are both equal to one. When you multiply another number by the number one, you do not change the value. However, you may change its unit.

$$\text{Known quantity}\left[\frac{\text{required unit}}{\text{given unit}}\right] \qquad 2.5\text{ ft}\left[\frac{12\text{ in}}{1\text{ ft}}\right] = 30\text{ ft}$$

Interactive Notebook Score Sheet

Quizzes/Formatives	Date	Score/Max Score	Retake Needed (yes or no)	Peer Initial	Parent Initial
Formative 1 Conversions Volume, Pressure, Temperature					
Formative 2 Moles Mass, Particle, Volume					
Formative 3 Density					
Unit 1 Test					

Name of Scored Assignment	Date Due	Score/Max	Peer Initials	Level of Effort

Histogram – graphic representation of grouped data. Histograms are also called bar graphs. To monitor progress we are going to track how well problems are solved on a daily basis. Each column will represent a day (x axis) and the row progress solving problems with 5 advanced, 4 proficient, 3 basic, 2 below basis, and 1 incomplete (y axis)

Scientific Notation – expresses number as multiple of two factors: 1) a number between 1 and 9; and 2) a ten raised to a power or exponent. The exponent tells how many times the first factor must be multiplied by 10. When expressed in scientific notation, numbers greater than 1 have positive exponents while number less than 1 have negative exponents.

Express the following numbers in scientific notation:

a. 1 392 000 km _____
b. 0.000 000 028 g/cm^3 _____
c. 700 m _____
d. 38 000 m _____
e. 0.000 000 000 8 kg _____
f. 685 000 000 000 m _____
g. 0.000 005 40 s _____
h. 0.000 000 000 000 20 km _____
i. 5060 s _____
j. 0.000 006 87 kg _____

Adding or subtracting using scientific notation: The exponents **must be the same** before doing the arithmetic.

a. 5.3×10^5 + 3.6×10^5

b. 7.35×10^{-6} – 4.20×10^{-6}

c. 1.12×10^4 - 9.7×10^3

e. 2.89×10^{-5} + 6.5×10^{-4}

Multiplying or dividing using scientific notation: Multiply the first factors then add the exponents. Divide the first factors then subtract the exponents.

a. 3×10^4 cm x 2×10^3 cm

b. 2×10^{-4} cm x 4×10^2 cm

c. $\frac{6 \times 10^2 \text{ g}}{3 \times 10^5 \text{ cm}^3}$

d. $\frac{8 \times 10^{-3} \text{ g}}{2 \times 10^{-1} \text{ cm}^3}$

Significant figures- include all digits that are certain and one estimated digit. Always start counting from the first nonzero.

Rules for recognizing significant figures

Rule	Example
All nonzero numbers are significant.	72.3 has 3 sigfigs
Zeros between nonzeros are significant	60.5 has 3 sigfigs
Trailing zeros are significant only if there is a decimal point.	6.20 has 3 sigfigs 620 has only 2 sigfigs
Leading zeroes are not significant. They are only placeholders.	0.000 028 has 2 sigfigs
Counting numbers and defined constants have an infinite number of sigfigs.	6 computers 60 s = 1 min

Determine the number of sigfigs in the following:

a. 0.000 402 30 g _____ d. 405 000 kg _____ g. 508.0 L _____

b. 820 400.0 L _____ e. 1.0200×10^5 kg _____ h. 35 people _____

c. 3.1587×10^{-8} g _____ f. 0.000 482 mL _____ i. 0.049 450 s _____

Rules for Rounding

Rule	**Example**
If the digit immediately to the right of the last significant digit you want to retain is	
➢ Greater than 5, round up the last digit.	56.87 g ⟶ 56.9 g
➢ Less than 5, retain the last digit.	12.02 L ⟶ 12.0 L
➢ 5, followed by a nonzero digit, round up the last digit.	3.7851 ⟶ 3.79
➢ 5, not followed by a nonzero and preceded by odd digit, round up the last digit.	2.835 s ⟶ 2.84 s
➢ 5, not followed by nonzero digit, and the preceding significant digit is even, retain the last digit.	2.65 mL ⟶ 2.6 mL

Round all numbers to 4 sigfigs then to three sigfigs. **Then write the numbers in scientific notation.**

	4 sigfigs	3 sigfigs
a. 84,791 kg		
b. 38.5432 g		
c. 256.75 cm		
d. 4.9356		
e. 0.000 548 18 g		
f. 136,758 kg		
g. 808,659,000 mm		
h. 2.0145 mL		
i. 0.002000 m		

Addition and Subtraction: When you add or subtract the final answer must be rounded to the same number of digits to the right of the decimal point as the value with the fewest number to the right of the decimal point.

a. add
28.0 cm
23.538 cm
5.68 cm
57.218 cm

b. add
258.3 kg
257.11 kg
253 kg
768.41 kg

c. subtract
93.626 cm
81.14 cm
12.486 cm

d. subtract
4.32×10^3 cm
1.6×10^3 cm
2.72×10^3 cm

Multiplication and Division: When you multiply or divide, the answer must have the same number of significant figures as the measurement with the fewest sigfigs.

a. Calculate the volume of a rectangular solid with the following dimensions: V=l x h x w

length = 3.65 cm width = 3.20 cm height = 2.05 cm

Rewrite the answers using the correct number of significant figures

b. 24 cm x 3.26 cm = 78.24

c. 120 m x 0.10 m = 12.00

d. 1.23 x 2.0 m = 2.460

e. 53.0 m x 1.53 m = 81.090

f. 4.84 m/1.4 s = 3.457143

g. 60.2 m/20.1 s = 2.99502

h. 102.4 m/51.2 s = 2

i. 168 m/58 s = 2.89655

Scientific Notation – the Powers of Tens

A. Convert each of the following into scientific notation.

a) 3427 _____

b) 0.0000455 _____

c) 525 000 _____

d) 250.0 _____

e) 70700 _____

f) 0.00009820 _____

g) 107.20 _____

h) 0.0473 _____

B. Determine the number of significant figures in each underlined measurement:

a. 508.0 L _____

b. 807 000 g _____

c. $3.158\ 7 \times 10^{-8}$ g _____

d. 1 km = 1 000 m _____

e. 50.00 g _____

f. 820 400.0 L _____

g. 0.049 450 km _____

h. 60 s = 1 min _____

i. 25 computers ___

j. 0.000 000 875 m _____

k. $1.020\ 0 \times 10^{5}$ kg _____

l. 0.000 482 L _____

m. 57.048 m _____

n. 0.000 300 40 mg _____

o. 4.678×10^{22} atoms _____

Quick Write: Explain how to determine the number of significant figures

_____

_____

_____

Quick Write: Explain how to write a number in scientific notation.

_____

_____

C. The following operations have been worked out with answers indicated. Express the final answers to the correct number of significant figures. Affix the proper units. For answers written in scientific notations, write the correct exponent.

a) 123.67 cm + 31.6 cm + 48 cm = 203.27 _____

b) $\frac{3.45\ \text{g}}{0.91\ \text{mL}}$ = 3.7912088 _____

c) 0.000 217 8 m x 23.4 m x 76.347 m = 0.3891040 _____

d) 456 m x 21 m = 9576 _____

e) 48.57 L - 32.8 L = 15.77 _____

f) $\frac{56.78\ \text{mol}}{9.4\ \text{L}}$ = 6.0404255 _____

g) 3.40 mg + 7.34 mg - 5.6 mg = 5.14 _____

h) $\frac{5.42\ \text{cm}^2\ \text{x}\ 2.8\ \text{cm}}{1.226\ \text{cm}}$ = 12.378466 _____

i) $(6.23 \times 10^6\ \text{kL}) + (5.34 \times 10^6\ \text{kL}) = 11.57 \times 10^?$ _____

j) $(4.36 \times 10^5)(3.4 \times 10^{-9}) = 14.824 \times 10^?$ _____

k) $\frac{7.46\ x\ 10^8}{3.2\ x\ 10^3} = 2.33125 \times 10^?$ _____

l) 5.6 cm x 8.56cm x 0.75 cm = 35.952 _____

m) $3.9 \times 10^4 + 4.76 \times 10^4 = 8.66 \times 10^?$ _____

n) $(7.8 \times 10^6)(2.4 \times 10^5) = 18.72 \times 10^?$ _____

o) $8.4 \times 10^{-4} + 6.89 \times 10^{-4} = 15.29 \times 10^?$ _____

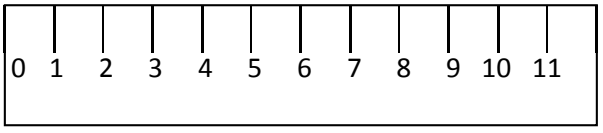
p) $(2.7 \times 10^{-4})(3.67 \times 10^{-5}) = 9.909 \times 10^?$ _____

D. Which of these rulers could have been used to measure the following distances?

_____ A. 2.7 cm
_____ B. 3 cm
_____ C. 2.72 cm
_____ D. 10.1 cm
_____ E. 11.2 cm
_____ F. 6.72 cm
_____ G. 10.74 cm

I.

II.



III.

Equalities: 1 liter (L) = 1000 milliliter (mL) = 10^3 mL 1 cm^3 = 1mL = 1cc = 1 cubic centimeter

Sample problem

a. How many mL are 1.5 L?

b. How many L are 50 mL?

Practice converting volume units

1. 2500 mL to L

2. 0.5 L to mL

3. 850 mL to L

4. 1.20 L to mL

5. 385 cm^3 to L

6. 0.025 L to mL

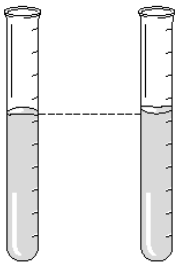
Practice 2 Using the mL obtained from pg 13 practice reading a graduated cylinder convert to L

a. **b.** **c.**

d. **e.** **f.**

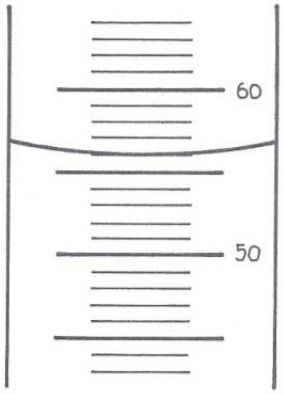
g. **h.** **i.**

Using a Graduated Cylinder: (Source: Life Science, Holt, Rinehart & Winston, Austin. 2001.)

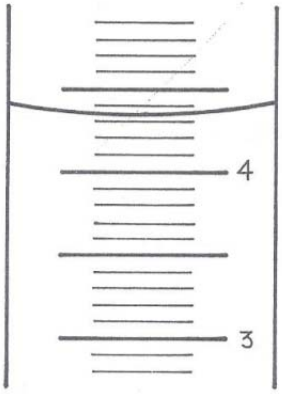


1. Make sure the cylinder is on a flat, level surface.
2. Move your head so that your eye is level with the surface of the liquid.
3. Read the mark closest to the liquid level, at the center of the curve or **meniscus**.
4. When measuring make sure that you know what each graduation represents and mark how much each graduation represents with the practice work.

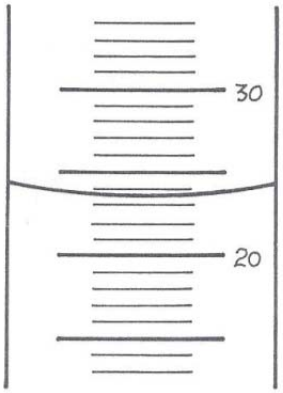
What volume is indicated on each of the graduated cylinders below? The unit of volume is mL.



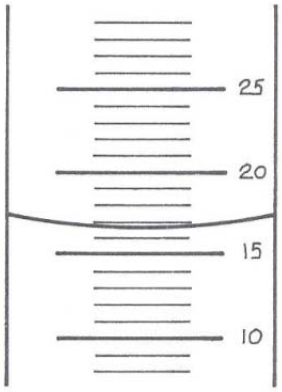
a) _____



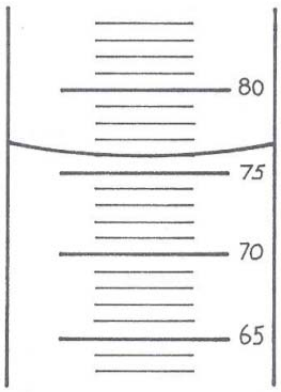
b) _____



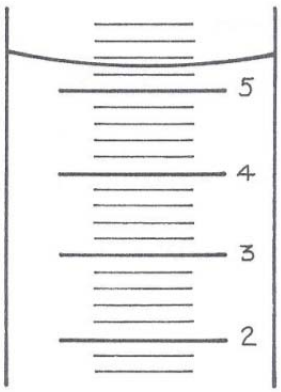
c) _____



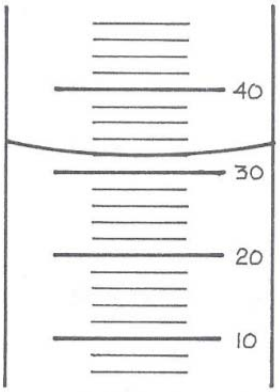
d) _____



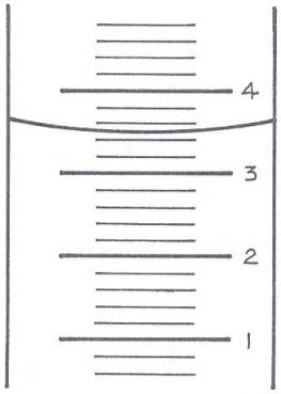
e) _____



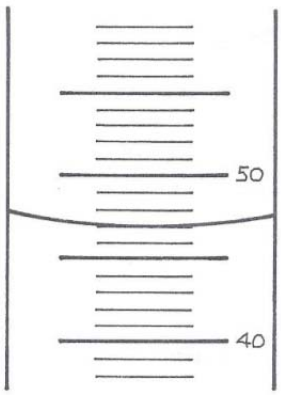
f) _____



g) _____



h) _____



i) _____

Pressure Conversions

Notice on the Periodic Table Reference Sheet all of the pressure measures at the bottom. All are equalities.

The unit abbreviations are written and spoken as:

atm is _____

mm Hg is _____

Torr is _____

kPa is _____

lbs/in^2 is _____

in. Hg is _____

Equalities. Notice how the unit always goes after the numerical value

1 atm equals

_____mm Hg

_____ Torr

_____ kPa

_____lbs/in^2

_____in. Hg

Sample Pressure Conversions

a. 2 atm are how many kPa?

b. 15 in Hg is how many psi?

c. Convert 151 kPa toTorr?

Pressure Conversion Practice

1. How many atm in 380 Torr

2. 2 atm is how many mmHg

3. 1520 Torr is equal to how many kPa?

4. 29.4 psi (lbs/in^2) equals how many inches mercury?

5. 405.2 kPa equals how many atm?

6. Convert 380 mmHg into atmospheres.

7. 671 mmHg is equivalent to how many Torrs?

8. Convert 570 Torr to atm

9. Convert 1.5 atm to kPa

10. Convert 1140 Torr to kPa

11. Convert today's barometric pressure to atmospheres.
http://www.myforecast.com/bin/conditions.m?city=12139&metric=false

Quick Write: Explain how to convert from one pressure unit to another pressure unit

_____

_____

_____

Temperature Conversion Practice Worksheet – SHOW ALL WORK

K= °C + 273 °F = 9/5 °C +32 °C = 5/9 (°F-32)

Convert the following to Fahrenheit

1) 100 °C = 212°F

2) 37 °C =98.6°F

3) 0 °C =32°F

Convert the following to Kelvin

12) 0° C =273K

13) -50° C =223K

14) 90 ° C =363K

15) -20 °C =253K

Convert the following to Celsius

16) 100 K = -173 °C

17) 200 K = -73 °C

18) 273 K =0 °C

19) 350 K = 77 °C

Practice

20) -15 °C to K

21) 600 K to °C

22) 25 °C to K

23) 0 K to °C

Explain which are the easiest conversions?

_____

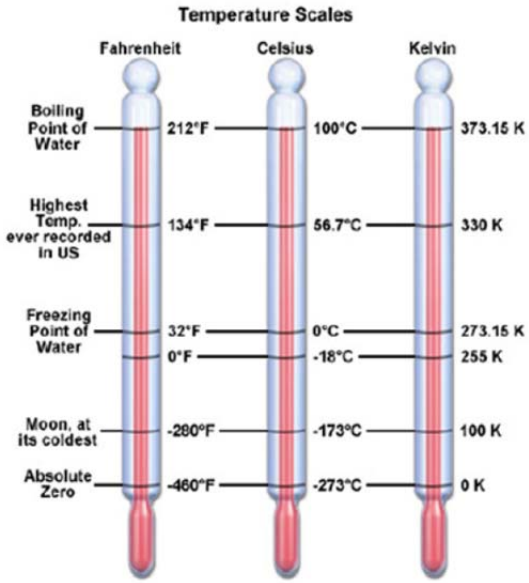
_____

Temperature Conversions

In your everyday life and in your study of Chemistry, you are likely to encounter three different temperature scales. When you watch the weather report on the news, they will report the temperature on one scale, yet you measure temperature in the laboratory on a different scale. Many Chemistry equations must be done using yet another temperature scale, the Kelvin scale. As student of science, you must to be able to convert temperatures from one scale to another. Temperature is an indicator of important physical properties like kinetic energy. The hotter the more movement affecting physical states of matter with gases having the most movement and solids the least. There is a standard temperature and pressure (STP) which is 0ºC and 1 atm.

The Fahrenheit Scale - The Fahrenheit scale is the scale that is used when they report the weather on the news each night. It is probably the temperature scale that you are most familiar with, if you live in the United States. The thermometers that you have in your house, for uses such as; swimming pools, cooking, bath tubs, or reading body temperature, are all likely to be in Fahrenheit. In Canada and most other countries, the news will report the temperature on the Celsius scale.

The Celsius Scale - The Celsius scale, is commonly used for scientific work. The thermometers that we use in our laboratory are marked with the Celsius scale. The Celsius scale is also called the Centigrade scale because it was designed in such a way that there are 100 units or degrees between the freezing point and boiling point of water. One of the limitations of the Celsius scale is that negative temperatures are very common. Since we know that temperature is a measure of the kinetic energy of molecules, this would almost suggest that it is possible to have less than zero energy. This is why the Kelvin scale was necessary.



The Kelvin Scale - The International System of Measurements (SI) uses the Kelvin scale for measuring temperature. This scale makes more sense in light of the way that temperature is defined. The Kelvin scale is based on the concept of **absolute zero**, the theoretical temperature at which molecules would have zero kinetic energy. Absolute zero, which is about -273^{o}C, is set at zero on the Kelvin scale. This means that there is no temperature lower than zero Kelvin, so there are no negative numbers on the Kelvin scale. For certain calculations, like the gas laws, which you will be learning soon, the Kelvin scale must be used.

Set Points	Fahrenheit	Celsius	Kelvin
body temperature	98.6°F		
water freezes	32°F		
water boils	212 °F		
absolute zero	-460°F		

What does STP mean?

Molar Conversions

Mass Mole

Molar mass is the weight of one mole (or 6.02×10^{23} particles) of any chemical compounds. The quantity one mole is set by defining one mole of carbon-12 atom to have a mass of exactly 12 grams. Molar mass is the sum of the atomic masses of the constituent atoms of each element in the molecule. Molar mass is expressed in units of grams per mole and usually includes a weighted average of all the isotopes of each element. **1 mole = sum of the masses of the atoms of each element**

Particle Mole

One mole equals 6.02×10^{23} particles, atoms, or molecules, or ionic formula units. This number is called Avogadro's number because it was named after Amedeo Carlo Avogadro the developer of a law of proportions. The number of particles in the sample is determined by multiplying the number of moles by Avogadro's number. **1 mole = 6.02×10^{23} particles**

Volume Mole

One mole of gas at standard temperature and pressure (0°C and 1 atmosphere) occupies a volume of 22.4 liters. STP stands for standard temperature and pressure. **At STP 1 mole = 22.4 L**

Molar Mass Practice Elements – List the molar mass and element name for the following elements

C	Na
Cr	Fe
Ag	Au
Kr	Si
F	Sb
Mg	Mn
N	Ne
As	H

Calculating Elemental Molar Mass

The easiest molar mass to find is for an element which you can read directly off the periodic table Example: the molar mass of 1mole of carbon, C, is 12.01 g. To find the molar mass of more than one mole use dimensional analysis t-chart:

What is the mass of 1.5 moles C

Known 1.5 moles C $\quad \dfrac{1.5 \text{ moles C}}{} \quad \dfrac{12.01 \text{ g C}}{} = 18.015$ grams (Rounded to 18 g)

Unknown mass g C 1mole C

Guided Practice

How many moles is 13.88 g of Li

Explain how to determine the number of moles of a sample of known mass

_____

_____

_____

_____

_____

_____

Practice Problems Elemental Molar Mass- Show all work

1. Calculate the mass of 1.5 moles of Chromium

2. Convert 48 g O to mol O

3. Calculate how many moles of Cl constitute 70.9 g of Cl

4. How many g are in 1.5 moles of F

5. Convert 12.15 g Mg to mol Mg

Calculating Molecular/Formula Unit Molar Mass[1]

For any chemical compound that's not an element, we need to find the molar mass from the chemical formula. The chemical formula tells us the number of each kind of element so that we can create an inventory which then will total up.

To do this, we need to remember a few rules to determine the mass of 1 mole of a compound:

1. Molar masses of chemical compounds are equal to the sums of the molar masses of all the atoms in one molecule of that compound.

If we have a chemical compound like NaCl, the molar mass will be equal to the molar mass of one atom of sodium plus the molar mass of one atom of chlorine. If we write this as a calculation, it looks like this:

1 Na = 22.99 g/mol so 1 mole of NaCl = 58.5 g rounded to 3 sig figs
1 Cl = 35.45 g/mol
1NaCl = 58.54 g/mol

2. If you have a subscript in a chemical formula, then you multiply the number of atoms of anything next to that subscript by the number of the subscript. The subscript tells you how many atoms of each element, but you must remember if there is no subscript you have only one atom of that element. For most compounds, this is easy.

For Barium chloride, or $BaCl_2$, you have one atom of barium and two atoms of chlorine. If we write this as a calculation, it looks like this:

1 Ba = 1 x 137.33 g = 137.33 g/mole so 1 mol of $BaCl_2$ = 208.23 g
2 Cl = 2 x 35.45g = 70.9 g/mole
$BaCl_2$ = 208.23 g/mole

3. For other compounds, this might get a little bit more complicated. For example, take the example of zinc nitrate, or $Zn(NO_3)_2$. In this compound, we have one atom of zinc and two polyatomic ions of nitrate which includes two atoms of nitrogen (one atom inside the brackets multiplied by the subscript two) and six atoms of oxygen (three atoms in the brackets multiplied by the subscript two). If we write this as a calculation, it looks like this:

1 Zn = 1 x 65.4 g = 65.4 g/mol so 1 mole of $Zn(NO_3)_2$ = 189.4 g
2 N = 2 x 14 g = 28 g/mol
6 O = 6 x 16 g = 96 g/mol
$Zn(NO_3)_2$ = 189.4 g/mol

Molecular/Formula Unit Practice

	Inventory	Molar Mass
C_2H_6	2 C 6 H	2x12.01 = 24.02 g 6 x 1.01 = 6.06 g 30.08 g = 1 mole C_2H_6
$MgCl_2$		
P_4O_{10}		
HCl		
$Fe(NO_3)_2$		

[1] Adapted by M.Elizabeth 4/25/12 from http://misterguch.brinkster.net/molarmass.html . Thank you Mr Guch.

Atomic Counts

Name	Use	Formula	Atoms in Formula
Sucrose	Table sugar - sweetener	$C_{12}H_{22}O_{11}$	
Pyrite	Fool's gold - mineral	FeS_2	
Octane	One of several components in gasoline	C_8H_{18}	
Sulfuric Acid	Used in car batteries	H_2SO_4	
Butane	Lighter Fluid	C_4H_{10}	
Asbestos	Insulator derived from serpentine (the state rock)	$H_4Mg_3Si_2O_9$	
Iron oxide	Rust	Fe_2O_3	
Dichlorodiphenyl-trichloroethane	Banned pesticide	$C_{14}H_2C_{l5}$	
Calcium dihydrogen phosphate	Fertilizer	$Ca(H_2PO_4)_2$	
Cellulose	Plant cell walls found in wood products such as your wooden pencil or paper	$C_6H_7O_2(OH)_3$	

Practice Problems Molecular/Formula Unit Molar Mass – Using an atomic inventory determine molar mass for the following compounds and solve the associated problem. SHOW ALL WORK

*Sample Problem***:** *How many moles is 64 g of O_2, oxygen gas?*

Known: 64 g O_2
Unknown moles of O_2
Molar Mass O_2 : 1 mole O_2 = 2x16g = 32g

$$\frac{64 \text{ g } O_2}{} \left| \frac{1 \text{mole } O_2}{32 \text{ g } O_2} = 2 \text{ moles } O_2 \right.$$

1. 3 moles of N_2 nitrogen gas is how many grams

2. 10 g of H_2 hydrogen gas is how many moles

3. How many grams is 2 moles of H_2O water

5. How many moles is 11 grams of CO_2 carbon dioxide

6. Convert 8 grams of CH_4 methane to moles

8. Convert 80 g of NaOH sodium hydroxide to moles

7. 1.5 moles of NH_4Br ammonia bromide weighs how many grams?

Avagadro's Number aka Particle Mole Practice Equality: 1 mole = 6.02×10^{23} particles

Sample Problem: *How many atoms in 0.5 moles of C?*

Known: 0.5 moles C

Unknown: number of atoms

Equality: 1 mole = 6.02×10^{23}

$$\frac{0.5 \text{ mol } C}{} \left| \frac{6.02 \times 10^{23}}{1 \text{ mole } C} \right. = 3.01 \times 10^{23} \text{ atoms } C$$

1. Convert 1.5 moles H_20 to number of molecules of H_2O

2. How many formula units in 0.25 moles of KBr

3. How many moles are 3.01×10^{23} Fe atoms

4. Convert 2 mol $CaCl_2$ to formula units $CaCl_2$

Volume Moles of a Gas at STP Practice Equality: 1 mole = 22.4 Liters

Sample Problem: *What is the volume of 0.5 mole N2 at STP?*

Known: 0.5 moles N_2

Unknown: Liters

Equality: 1 mole = 22.4 L

$$\frac{0.5 \text{ mol } N_2}{} \left| \frac{22.4 \text{ L } N_2}{1 \text{ mole } N_2} \right. = 11.5 \text{ L}$$

1. Convert 1.5 moles CH4 gas at STP to liters

2. How many moles is 44.8 L moles of Ne at STP

3. How many moles are 5.6 L of O_2 at STP

4. Find the volume of 2 mol F_2 at STP

Identify the type of mole problem and what equality would be used to solve

1. 5.00 mole Zn has how many atoms Zn?

2. 20.0x1046 molecules H_2O = ___ mole H_2O

3. 1.50 mole Ca is how many grams Ca?

4. 1.75 x 10^{15} atoms K constitute how many moles K

5. 45.9 g of lead represents how many moles of Pb?

6. 3.01 x 10^{23} molecules Barium chloride is how many moles $BaCl_2$?

7. 44.8 L of CO_2 gas at STP is how many moles?

8. 0.250 mole Si has how many atoms Si in it?

9. Most of the atmosphere in a 0.10 liter balloon is N_2 at STP this is how many moles?

10. 2.30 mole Mg weighs how many grams Mg

11. 2.30 mole Mg has a mass of ?

12. 25.0 x 10^{24} atoms Au is how many moles Au?

13. 105 g Be is ___ mole Be?

14. What is the volume of 3 moles of O_2 gas at STP?

15. Challenge: 75.0 g S is how many atoms S

Practice Polyatomic Compound Molar Mass SHOW ALL WORK when determining the molar mass

1. $Mg(OH)_2$ Magnesium hydroxide

2. $Zn(NO_3)_2$ Zinc Nitrate

3. $Ca_3(PO_4)_2$ Calcium Phosphate

Comparative Analysis: Answer the question and provide the reasons for your answer

1. Which contains a greater number of atoms, 2.0 mole of Zn or 2.0 mole Cu?

_____

2. Which has a greater mass, 2.0 mole of Zn or 2.0 mole Cu?

_____

3. A mole of moles digs a mole of holes. How many holes does each mole dig?

_____

DENSITY Practice Problems SHOW ALL WORK

1. What is the formula for density?

2. What is the volume of an irregular shaped object if the following data is reported:
   A graduated cylinder is filled with an initial 2.55 mL of water. Then, an irregular shaped object is added to the graduated cylinder and a total final volume of 30.2 mL of water is reported. (Hint: the final volume is equal to the amount of initial water in the graduated cylinder + the volume of the irregular shaped object.)

3. The density of table salt is 2.164 g/cm^3 at 25 degrees Celsius. What is the volume of 20.0 grams of salt?

4. A 2.0 mL sample of liquid has a mass of 3.0 g. What is the density of the liquid?

5. A 100.0 g solid sample has a volume of 25 cm^3. What is the density of the solid?

6. Aluminum (Al) has a density of 2.7 g/mL. What is the mass of a 3 mL sample of Al?

7. What is the volume of 21.0 g sample of silver (Ag)? The density of silver is 10.49 g/cm^3.

Density Notes

Summary	

Solve the following density problems. Show all work. Calculator okay for these problems only

You take the mass of the empty detergent container and find that it is 390g. Its volume is 300ml.

You find part of an empty margarine container. It has an irregular shape, so you use the water displacement method to find its volume. You add 20ml of water to a graduated cylinder, put the piece of plastic in, and note that the water level goes up to 26ml. You also use a balance and find that the mass of the piece is 5.76g.

A plastic ball that you own has this label. It has a mass of 10g and a radius of 1.19cm.

Most plastic grocery bags aren't labeled, but if they were they would have this one. You find the mass of a bag to be 5.06g. When it is placed in to a graduated cylinder containing 92ml of water the level raises to 97.5ml.

A rectangular chunk of plastic has the dimensions 3cm by 7cm by 6.5cm and a mass of 122.85g.

Your plastic take-out container has a volume of 120ml and a mass of 124.8g.

Partitioning Plastics

Different types of plastics have different densities. The plastics recycling industry makes use of this fact to separate mixed batches of used plastics that consumers haven't sorted themselves. Mixed plastics can be recycled, but they are not as valuable as sorted plastics because the recycled plastic's physical properties, such as strength, may vary with each batch. In order to help consumers sort their plastic recyclables, the American Plastics Council has developed a set of codes that can be found on the bottoms of plastic containers. These codes correspond to the type of plastic that the item is composed. Recall that plastics are organic polymers made of repeating carbon based subunits.

Plastic	Density (g/cm^3)	Full Name
HDPE	0.96	High Density Polyethylene
LDPE	0.92	Low Density Polyethylene
PET	1.3	Polyethylene terephthalate
PP	0.9	Polypropylene
PS	1.04	Polystyrene
PVC	1.4	Polyvinyl chloride

Directions. Using the table of known densities given below, find out what type of plastic each numerical code corresponds to by calculating the density in each problem.

<u>You will need to recall the following</u>

Volume of a rectangle is length x width x height. Volume of a sphere is $V = 4/3\ \pi r3$

Density Challenge Problems

A graduated cylinder is filled with 50 cc of water. A glass stopper is dropped into the graduated cylinder. The volume now reads 65.4 cc. If we know glass has a density of 2.5 g/cm^3, what we would we expect the mass of the stopper to be?

A volume of 50 cu. cm. of dry sand is added to 30 cu. cm of water for a total volume of 60 cu. cm. What is the volume of water that goes into the air spaces between the sand particles?

Why Does Matter Matter? by Kelly Hashway

Solids	gases	liquids
Volume	mass	shape
Container	atoms	space
Matter	chair	milk
Ice	air	clouds
Juice	melting	

Choose a word from the box to complete each sentence.

1. The three basic properties of matter are _____, _____, and _____.

2. All matter is made up of tiny particles called _____.

3. Volume is the amount of _____ that matter takes up.

4. Mass is the amount of _____ an object has.

5. Liquids take the shape of their _____.

6. _____ do not have a definite shape or volume.

7. _____ do not have a definite shape, but they do have a definite volume.

8. _____ have a definite shape and volume.

9. A _____ and _____ are examples of solids,

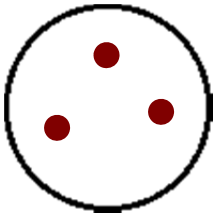
10. _____ and _____ are examples of liquids.

11. _____ and _____ are examples of gas.

12. Solid ice is _____ when it is changing into a liquid.

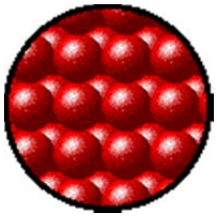
Solids, Liquids, and Gases: States of Matter

Gases, liquids and solids are all made up of microscopic particles, but the behaviors of these particles differ in the three phases. The following figure illustrates the microscopic differences.



Microscopic view of a gas.

Microscopic view of a liquid.



Microscopic view of a solid.

- Particles in a:
  - gas are well separated with no regular arrangement.
  - liquid are close together with no regular arrangement.
  - solid are tightly packed, usually in a regular pattern.
- Particles in a:
  - gas vibrate and move freely at high speeds.
  - liquid vibrate, move about, and slide past each other.
  - solid vibrate (jiggle) but generally do not move from place to place.

Liquids and solids are often referred to as ***condensed phases*** because the particles are very close together. The following table summarizes properties of gases, liquids, and solids and identifies the microscopic behavior responsible for each property.

Some Characteristics of Gases, Liquids and Solids and the Microscopic Explanation for the Behavior

gas	liquid	solid
assumes the shape and volume of its container particles can move past one another	assumes the shape of the part of the container which it occupies particles can move/slide past one another	retains a fixed volume and shape rigid - particles locked into place
compressible lots of free space between particles	not easily compressible little free space between particles	not easily compressible little free space between particles
flows easily particles can move past one another	flows easily particles can move/slide past one another	does not flow easily rigid - particles cannot move/slide past one another

From: http://www.chem.purdue.edu/gchelp/atoms/states.html

Conversion Review I

Instructions: Complete the below conversions making sure to include: (1) the unknown and given, (2) conversion factor, and (3) correct answer with the units. So that you can check your work I have included the answers to the problems at the bottom of the second page of the page.

Remember that you will have a formative tomorrow morning that will have five conversions, worth 10 points.

Example: unknown (no #) Known

How many atm are in 1520 mmHg?

$$? \text{ atm} = 1520 \text{ mmHg} \left| \frac{1 \text{ atm}}{760 \text{ mmHg}} \right. = 2 \text{ atm}$$

1. How many liters (L) are in 125 milliters (mL)?

2. How many Kelvin (K) are in 327 degrees Celsius (°C)?

3. How many mmHg are in 888 Torr?

4. How many milliliters (mL) are in 22.4 Liters (L)?

5. How many degrees Celsius (°C) are in 377 Kelvin (K)?

6. How many atmospheres (atm) are in 7.35 pounds per square inch (lbs./in^2)?

7. How many liters (L) are in 10,000 milliliters (mL)?

8. How many Kelvin (K) are in -50 degrees Celsius (^oC)?

9. How many kilopascals (kPa) are in 60 inches of mercury (in. Hg)?

10. How many milliliters (mL) are in 0.003 Liters (L)?

11. How many degrees Celsius (^oC) are in 200 Kelvin (K)?

12. How many atmospheres (atm) are in 202.6 kilopascals (kPa)?

Answers: (1) 0.125 L, (2) 600 K, (3) 888 mmHg, (4) 22,400 mL,(5) 104 ^oC, (6) 0.5 atm,(7) 10 L, (8)223 K, (9) 202.6 kPa, (10) 3 mL, (11) -73 ^oC, and (12) 2 atm.

Conversion Practice 2

1. 250 mL → L

2. 35°C → K

3. 25.8 g Zn → mol Zn

4. 2.75 mol Na → atoms Na

5. 1.5 atm → mm Hg

6. 120 kPa → atm

7. 7.25 L → mL

8. 0.025 mol NaCl → g NaCl

9. 29.4 lb/in^2 → atm

10. 18.7 g KOH → mol KOH

11. 2,500 mL → L

12. 850 torr → atm

13. 9.03×10^{23} atoms → mol

14. 350K → °C

15. 5.0 mol → molecules

16. -50°C → K

17. 120 kPa → atm

18. 1.50 L → mL

19. 11.2L (at STP) → mol

Practice for Unit test

1) 2 moles sodium (Na) has a mass of?

2) 540 mmHg to torr

3) 125 mL to L

4) 0.5 moles silver (Ag) contains how many atoms silver (Ag)

5) 33.6 L is how many moles

6) What is the mass of 5.0 mL of a sample of zinc (Zn)? The density of zinc is 7.13 g/mL

7) Lead (Pb) has a density of 11.36 g/ cm^3. What is the volume of 5.68 g of Pb?

8) How many cubic centimeters (cm^3) of copper (Cu) are in 47.94 g of Cu? The density of copper is 8.96 g/mL.

9) The density of water is 1.00 g/mL. What is the mass of one gallon of water? There are 3,785.4 mL in one gallon.

10) An 8.24g aluminum (Al) sample is added to a graduated cylinder containing 20.2 mL of water. The water level rises to the 23.25 mL mark. From this information, calculate the density of aluminum.

11)A 15.56 g iron (Fe) sample is added to a graduated cylinder containing 41.2mL of water. The water level rises to the 43.2 mL mark. From this information, calculate the density of iron.

12)A 5.68 g lead (Pb) sample is added to a graduated cylinder containing 32.1 mL of water. The water level rises to the 32.6 mL mark. From this information, calculate the density of lead.

13)A 10.7 g zinc (Zn) sample is added to a graduated cylinder containing 15.3 mL of water. The water level rises to the 16.8 mL mark. From this information, calculate the density of zinc.

Bell Ringers

8/15/13 – Welcome new Chemistry students to a great year of learning.

Solve $\frac{1250}{25}$ without a calculator

8/16/13 – Circle the unit of measure which is the smallest of the pair and write their relationship beneath Example second and hour

60 seconds = 1 hour

feet and inches cup and ounces gallon and quart

8/19/13 - Solve the following conversion problems Show all work

250 mL to L 0.4 L to mL

8/20/13 – What are the decimal fractions for the following fractions?

$\frac{1}{2}$ =	$\frac{1}{3}$ =	$\frac{1}{4}$=	$\frac{1}{5}$=	$\frac{3}{2}$=
$\frac{2}{3}$=	$\frac{3}{4}$=	$\frac{2}{5}$=	$\frac{6}{4}$=	$\frac{4}{5}$=

8/21/13 Solve the following problems with the correct number of significant figures

32.67 x 4.60 =

$$\frac{124.02}{5.2} =$$

$$\frac{9.00000 \times 10^{5}}{4.500 \times 10^{-3}} =$$

8/22/13 Solve the following problems with the correct number of significant figures

$\frac{34.1 \text{ grams}}{1.11 \text{ mL}}$ =

8/23/13

Convert 4500 mL to L

Convert 0.0010 L to mL

Convert 33.8 kPa to in. Hg

Convert 600 mm Hg to Torr

8/26/13 Express 0.0000007 in scientific notation?

8/27/13

Convert 59.5 g KBr to mol KBr

Convert 3 mol LiBr to g LiBr

8/28/13

Convert 2.5 moles K to atoms K

Convert 33.6 L Cl_2 to mol Cl_2

Calculate the molar masses of the following compounds

1. sodium fluoride, NaF

4. manganese (IV) oxide MnO_2

2. potassium hydroxide, KOH

5. calcium sulfate $CaSO_4$

8/29/13 - The running group is training for a 10-k run (10 kilometers). How many miles are the running club training to run if 1 kilometer (km) = 0.62 miles?

Known

Unknown