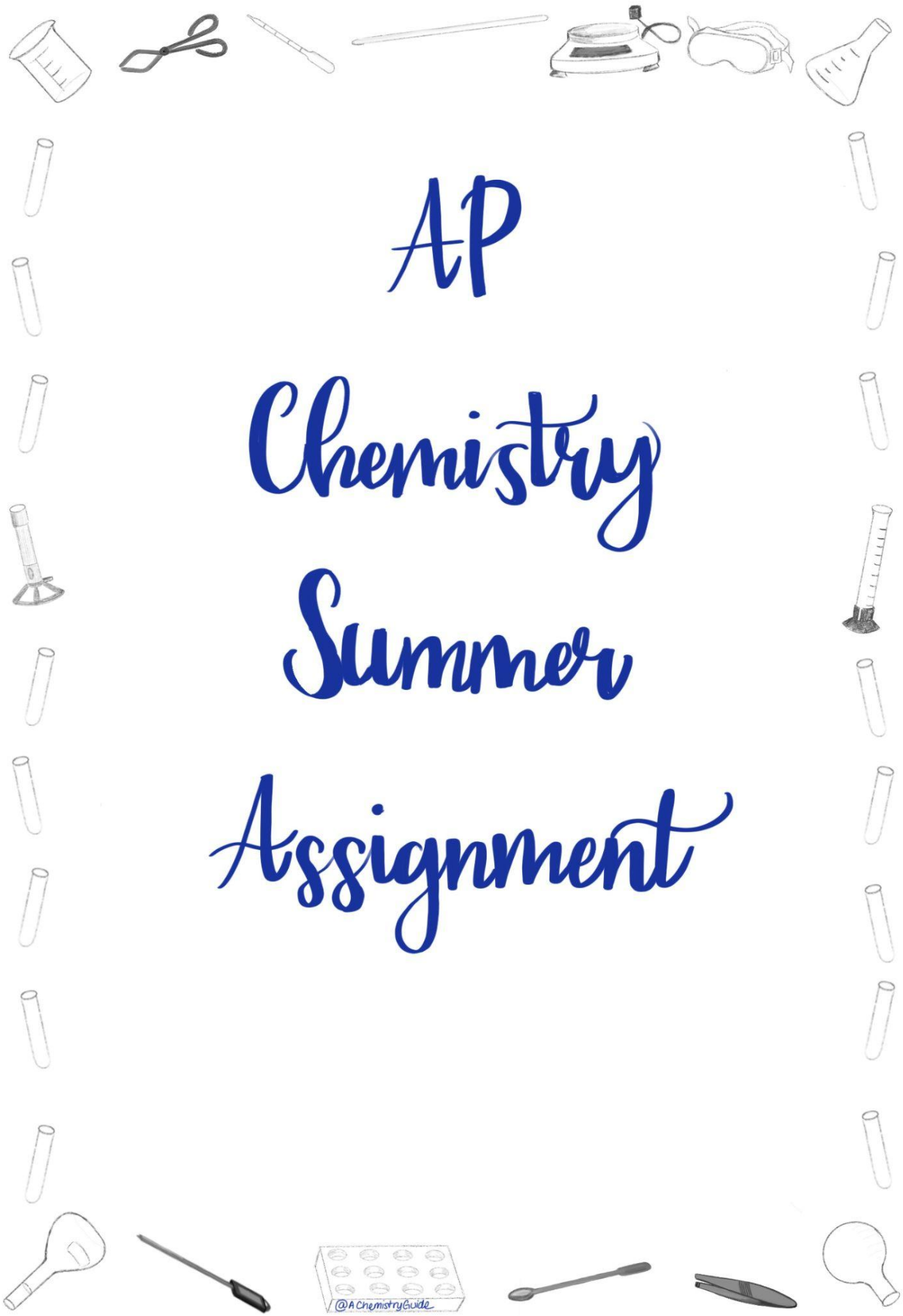
AP Chemistry Summer Assignment



AP Chemistry Summer Assignment

Firstly, I want to welcome you into the AP Chemistry class. We will be spending a lot of time together in the next year; we will feel like family by the end of the year!

The summer assignment for AP chemistry is focused on ensuring your science skills are ready for the year ahead. You should have learned all of the material in your first chemistry experience, so it should all be review material. The only part of the summer assignment that you are going to turn in is the Timeline (1). All of the other skills will be assessed in class. You will also color/label the periodic tables you will use as a reference throughout the year; they will not be checked. You can find the set of periodic tables here: A Chemistry Guide's Periodic Table Collection. Color the periodic tables for group names, monatomic ion charges and the -ate ending (T43 method). We will refer to the others later in the year.

1) Timeline Atomic Discoveries *(**Turn in** - Thursday of first week of school)*
2) Learn Your Ions *Ion Quiz (10 points)*
3) Nomenclature Review *Naming Quiz (6 points)*
4) Sig Figs and Uncertainty *Sig Fig and Uncertainty Quiz (14 points)*
5) Dimensional Analysis *Dimensional Analysis and Stoichiometry Quiz (6 points)*
6) Mental Math *Mental Math Quiz (10 points)*
7) Net Ionic Equations *Net Ionic Quiz (4 points)*

All quizzes will occur in the first 2 weeks of school. All will be short. (≤15 minutes of class) If you receive less than a 70% you will retake them on your own time (before/after school/lunch/study) up to three times. You will receive the average grade.

I have prepared an EdPuzzle to allow all of you to review in a different way. The code to join the EdPuzzle is: pifaofp . This is the link: https://edpuzzle.com/join/pifaofp . The EdPuzzles are optional but encouraged.

If you have any questions, need help, or if you find an extremely funny chemistry joke, please feel free to contact me over the summer by email. It might take me a day or two to respond, but I will see it.
Try to pace yourself over the summer so that the material moves from your short-term memory to your long-term memory. Be sure to have plenty of downtime so that you are well-rested and ready to work hard next year.

Periodically yours,

Ms. Beth Denson
edenson@args.edu

1) Timeline Atomic Discoveries

There is often very little time devoted to the history of chemistry. Construct a timeline with dates for the following scientists. Briefly indicate their contributions to science. You can find all of these scientists in your textbook, or you can research them on the internet. This is not a comprehensive list, you may add additional scientists/discoveries.

	Year(s)	Contribution
Ancient Greeks		
Paracelsus		
Boyle		
Stahl		
Priestley		
Lavoisier		
Proust		
Dalton		
Gay-Lussac		
Avogadro		
Berzelius		
Thomson		
Millikan		
Becquerel Curie		
Rutherford		

2) Learn Your Ions

If you know your ions you will save a lot of time this year because you won't have to look them up. Memorize the following ions, you will have an ion quiz during the first two weeks of school. You will have the Periodic Table when you take the quiz, however, it will not have the names of the elements on it. Try to look for patterns based on the periodic table, it is much easier to learn the patterns than it is to memorize each one individually. Color/label the ions by charge on the periodic table to help you to remember the patterns.

Monatomic Ions					
Group 1 Alkali Metal Ions		Group 2 Alkaline Earth Metal Ions		Group 7 Halogen Ions	
Lithium	Li^+	Beryllium	Be^{2+}	Fluoride	F^-
Sodium	Na^+	Magnesium	Mg^{2+}	Chloride	Cl^-
Potassium	K^+	Calcium	Ca^{2+}	Bromide	Br^-
Rubidium	Rb^+	Strontium	Sr^{2+}	Iodide	I^-
Cesium	Cs^+	Barium	Ba^{2+}	Astatide	At^-
Francium	Fr^+	Radium	Ra^{2+}	Tennesside	Ts^-
Transition Metal Ions		Other Metal Ions		Other Nonmetal Ions	
Zinc	Zn^{2+}	Tin (II)	Sn^{2+}	Hydrogen	H^+
Copper (II)	Cu^{2+}	Tin (IV)	Sn^{4+}	Oxide	O^{2-}
Copper (I)	Cu^+	Lead (II)	Pb^{2+}	Sulfide	S^{2-}
Iron (II)	Fe^{2+}	Lead (IV)	Pb^{4+}	Selenide	Se^{2-}
Iron (III)	Fe^{3+}	Mercury (I)	Hg_2^{2+}	Nitride	N^{3-}
Gold	Au^{3+}	Mercury (II)	Hg^{2+}	Phosphide	P^{3-}
Silver	Ag^+	Aluminum	Al^{3+}		
Chromium(II)	Cr^{2+}	Gallium	Ga^{3+}		
Chromium (III)	Cr^{3+}				
Titanium	Ti^{2+}				

Polyatomic Ions					
Cations		Anions -ate endings *		Other Polyatomic Ions	
Hydronium	H_3O^+	Phosphate	PO_4^{3-}	Hydroxide	OH^-
Ammonium	NH_4^+	Nitrate	NO_3^-	Acetate	CH_3COO^-
		Sulfate	SO_4^{2-}	Dichromate	$Cr_2O_7^{2-}$
		Chlorate	ClO_3^-	Oxalate	$C_2O_4^{2-}$
		Iodate	IO_3^-	Permanganate	MnO_4^-
		Chromate	CrO_4^{2-}	Cyanate	OCN^-

Anion Rule 1		
-ate	Learn these (base ion)	
-ite	Remove one oxygen	No change to charge
Hypo--ite	Remove two oxygens from the (-ate)	No change to charge
Per--ate	Add two oxygens to the (-ate)	No change to charge

Anion Rule 2		
Bi-	Add an H	Charge increases by 1
Monohydrogen or hydrogen	Add an H	Charge increases by 1
Dihydrogen	Add two H	Charge increases by 2

Anion Rule 3		
thio-	Replace an O with an S	No change to charge

3) Nomenclature Review

There are three types of substances that you will need to name, ionic compounds, covalent binary molecules and acids. Each has their own naming system.

<table>
<tr><td>Acids - Start with H</td><td>Ionic - Metal + nonmetals</td><td>Binary Molecular - Two nonmetals</td></tr>
<tr><td>H(s) + Anion</td><td>Cation + Anion</td><td>Two nonmetals</td></tr>
<tr><td>If the anion name ends with -ate
Then the acid is named -ic acid
Example:
HNO_3 contains the nitrate anion.
It would be named nitric acid</td><td rowspan="3">Name the cation first, using a roman numeral if the ion forms multiple charges.
Name the anion second.
Example:
KBr
potassium bromide

KNO_3
potassium nitrate

$CuNO_3$
copper (I) nitrate

$Cu(NO_3)_2$
copper (II) nitrate</td><td>Nonmetals can combine in many different ratios so the name needs to describe the amount of each element that are present in the formula.</td></tr>
<tr><td>If the anion name ends with -ite
Then the acid is named -ous acid
Example:
H_2SO_3 contains the sulfite anion.
It would be named sulfurous acid</td><td>Prefix List<table><tr><td>1</td><td>mono</td><td>6</td><td>hexa</td></tr><tr><td>2</td><td>di</td><td>7</td><td>hepta</td></tr><tr><td>3</td><td>tri</td><td>8</td><td>octa</td></tr><tr><td>4</td><td>tetra</td><td>9</td><td>nona</td></tr><tr><td>5</td><td>penta</td><td>10</td><td>deca</td></tr></table></td></tr>
<tr><td>If the anion name ends with -ide
Then the acid is named hydro - ic acid
Example:
HCl contains the chloride anion.
It would be named hydrochloric acid.</td><td>Use the prefix to indicate the number and then name the first element. (Drop the “o” or “a” if the element starts with a vowel)
Then use the prefix to indicate the number and name the second element, change the suffix of the second element to “-ide”.
Examples:
PCl_3 = Phosphorus trichloride
N_2O_4 = Dinitrogen tetroxide
N_2O = Dinitrogen monoxide</td></tr>
</table>

4) Sig Figs and Uncertainty

SF Rules

1. All non-zero numbers are significant
   - 2.35 mL ← 3 significant figures
   - 1215 g ← 4 significant figures
2. Sandwiched zeros are ALWAYS significant
   - 1.05 mL ← 3 significant figures
   - 8008 kg ← 4 significant figures
3. Leading zeros are NEVER significant
   - 0.00529 cm ← 3 significant figures
   - 0.8091 L ← 4 significant figures
4. Trailing zeros are ONLY significant IF there is a decimal point
   - 1.80 mm ← 3 significant figures
   - 2896000 g ← 4 significant figures
5. Counting numbers and conversion factors have infinite significant figures
   - 15 pencils ← ∞ significant figures
   - 1 L = 1000 mL ← ∞ significant figures

SF Math Rule - Addition and Subtraction

When you add or subtract values, you report the same number of decimal places (or simply places) as the one with the value that is least certain.

Example:

120 mL ← Known to the tens place
\+ **5.52** mL ← Known to the hundredths place
125.52 mL (Unrounded answer)

130 mL ← Known to the tens place

Example:

120.2 mL ← Known to the tenths place
\+ **5.52** mL ← Known to the hundredths place
125.72 mL (Unrounded answer)

125.7 mL ← Known to the tenths place

SF Math Rule - Multiplication and Division

When you multiply or divide values, you report the same number of significant figures as the value with the least significant figures.

Example:

1.56 cm ← Known to three significant figures
x **5.5** cm ← Known to two significant figures
8.58 cm^2 (Unrounded answer)

8.6 cm^2 ← Known to two significant figures

Example:

2.50 g ← Known to three significant figures
0.59 mL ← Known to two significant figures
4.237288136 g/mL (Unrounded answer)

4.2 *g/mL* ← Known to two significant figures

SF Math Rule - Logs (pH etc.)

When you take a log of a number the significant figures are the values after the decimal point. The numbers before the decimal point (the characteristic) are describing the order of magnitude of the value, while the numbers after the decimal point (the mantissa) describe the value.

Example:

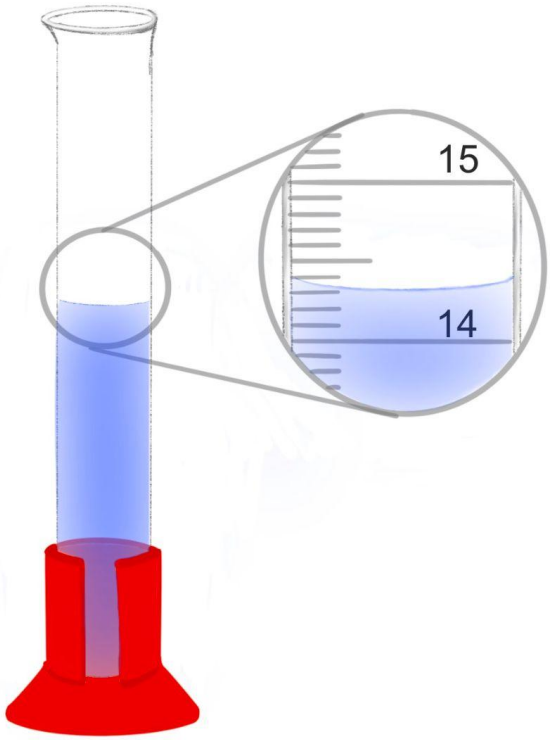
$-\log [2.55 \times 10^{-4} \text{ M}]$ ← Concentration is known to three significant figures
= 3.59345982 (Unrounded answer)

3.593 ← Known to three significant figures

Making Measurements

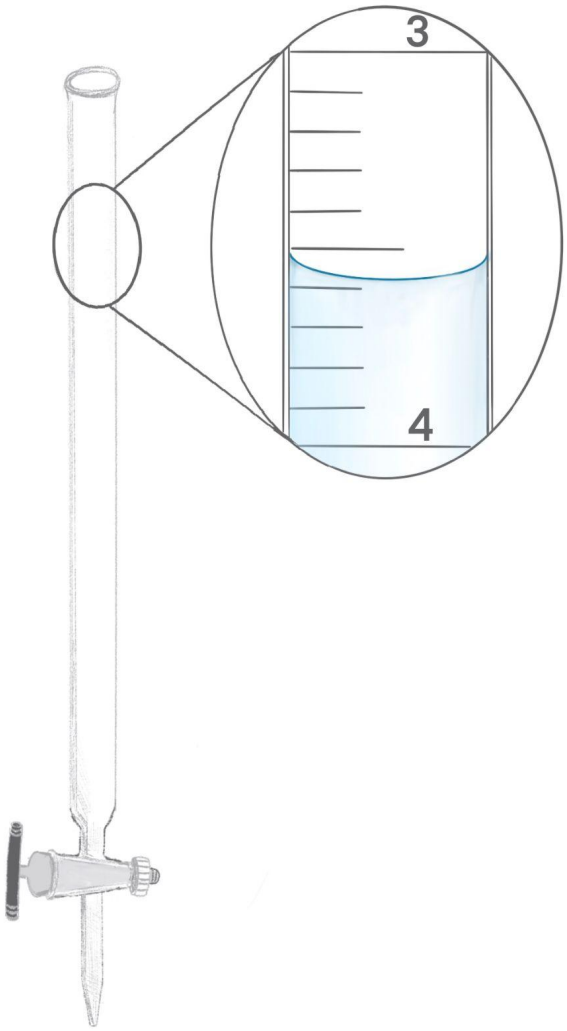
When you are recording a measurement made with an analog device (like a graduated cylinder) you have to record all the values that are known, plus one guess digit. If the device is digital, you do not include the guess digit, simply report all of the given values.

If there is a meniscus, you will read the value from the center of the meniscus, usually the lowest point, unless you are working with mercury, which is unlikely!

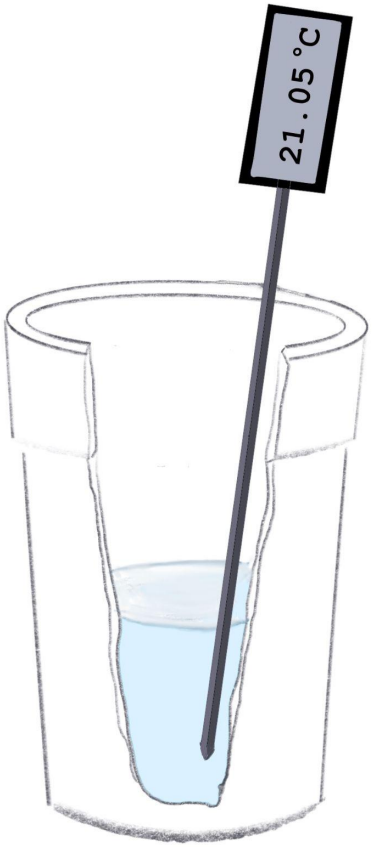


The measurement for this graduated cylinder would be:
14.32 mL
(14.3 are the known digits, while the 2 in the hundredths place is the guess or uncertain digit)

This next example is a 50 mL buret, the measurements run from 0 at the top to 50 mL near the bottom. As such you record the volume of air in the buret to make the calculations easier when the liquid is dispensed.
The measurement for the liquid in this buret would be: 3.58 mL. The 3.5 are certain, while the 8 is a guess or uncertain digit.



The digital thermometer has a measurement of 21.05°C. All digits would be recorded.



Uncertainty is not tested on the AP exam, however you will be using uncertainty when we perform labs this year.

<u>Uncertainty in Measurement</u>

Different courses will use different techniques to determine the uncertainty in a measurement. In this course we will use the following two rules:

- For a digital device the measured uncertainty is the smallest increment on the device.
- For an analog device the measured uncertainty is half of the smallest division.

The uncertainties for the images and measurements above would be:

Graduated Cylinder: 14.32 mL ± 0.05

Buret: 3.58 mL ± 0.05

Digital Thermometer: 21.05°C. ± 0.01

Calculations with Uncertainty

Uncertainty always increases.

Addition and Subtraction

If you perform addition or subtraction, you add the measured uncertainties.

Example:

12.34 mL ± 0.05
\+ 43.21 mL ± 0.05
55.55 mL ± 0.10

Multiplication and Division

If you perform multiplication or division, you add the percent uncertainties. To calculate the percent uncertainty, divide the measured uncertainty by the measurement and then multiply by 100%.

Example:

Mass = 2.50 g ± 0.01 (±0.4 %) ← (0.01/2.50 x100)

Volume = 0.59 mL ± 0.05 (±8 %) ← (0.05/0.59 x100)

2.50 g (±0.4 %) / 0.59 mL (±8 %) = 4.2 g/mL (±8 %)

5) Dimensional Analysis and Stoichiometry

Dimensional analysis (or unit analysis) is a problem solving strategy that allows you to convert between different units of measurement. It is often used in stoichiometry.

Example:

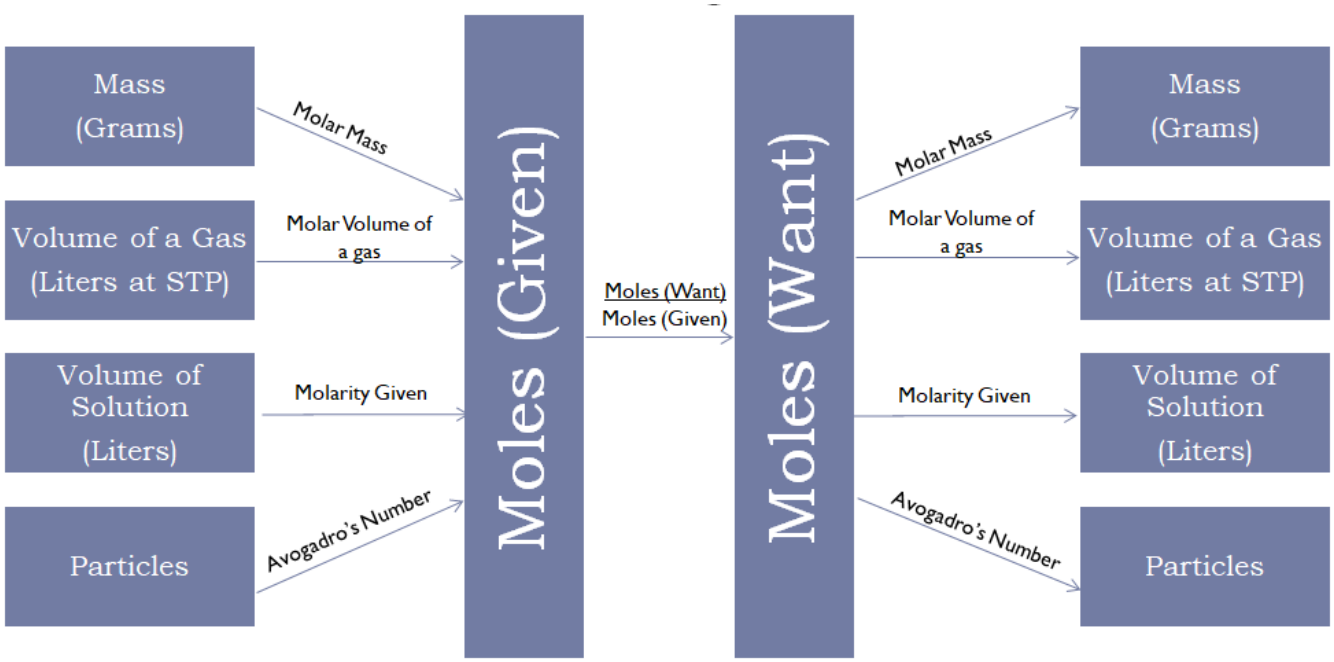
Convert 890. mL into gallons. One gallon contains 4 quarts, 1.06 quarts is 1 liters, and you should know the metric conversions.

$$\frac{890.\ mL}{} \times \frac{1\ L}{1000\ mL} \times \frac{1.06\ quarts}{1\ L} \times \frac{1\ gallon}{4\ quarts} = 0.239\ gallons$$

Example:

If you have 200. mL of 0.123 M hydrochloric acid, HCl, how many liters of hydrogen gas, H_2, at STP would be formed? $2\ HCl_{(aq)} + Mg_{(s)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$

$$\frac{200.\ mL\ HCl}{} \times \frac{1\ L\ HCl}{1000\ mL\ HCl} \times \frac{0.123\ moles\ HCl}{1\ L\ HCl} \times \frac{1\ mole\ H_2}{2\ moles\ HCl} \times \frac{22.4\ L\ H_2}{1\ mole\ H_2} = 0.276\ L\ H_2$$



Useful Conversion Information			
Molar Mass	Molar Volume of a gas	Molarity	Avogadro's Number
Using the formula and periodic table, find the mass for one mole.	For Gases at STP	The molarity is given in the problem.	Number of Particles in one mole
$\frac{\#\ grams}{1\ mole}$	$\frac{22.4\ Liters}{1\ mole}$	$\frac{\#\ moles}{1\ Liter}$	$\frac{6.022 \times 10^{23}\ particles}{1\ mole}$

Note: in a limiting reagent problem, you will perform the stoichiometry twice and choose the smaller result.

6) Mental Math

You are not allowed to use a calculator on the multiple choice section of the AP exam so it will be important to brush up on your mental math skills. Below are a few reminders of the math rules and a few tricks to help you to solve problems without a calculator. You can write these on a piece of paper - mental math just means no calculator.

Scientific notation

We frequently use very large and very small numbers in chemistry so scientific notation is a convenient way to deal with those numbers.

How to convert into scientific notation:

1. Look at the number and decide where to place the decimal point, so that there is only one number (not a zero) in front of the decimal point.
2. Count the places that the decimal point moved.
3. If the original number was less than 1, make sure that the exponent is negative.

How to convert into standard notation:

1. If the exponent is negative, the number will be less than 1.
2. Move the decimal point by the places indicated in the exponent. Add zeroes as needed.

Operations in Scientific Notation

Addition and Subtraction:

1. Convert to the same exponent
2. Perform operation
3. Adjust so that the coefficient is still greater than or equal to 1 and less than 10.

$$\begin{array}{r} 2.0 \times 10^{-2} \\ +\,3.0 \times 10^{-3} \end{array} \quad \text{becomes} \quad \begin{array}{r} 2.0 \times 10^{-2} \\ +\,0.30 \times 10^{-2} \\ \hline 2.3 \times 10^{-2} \end{array}$$

Multiplication:

1. Multiply the coefficients
2. Add the exponents
3. Adjust so that the coefficient is still greater than or equal to 1 and less than 10.

$$(4.1 \times 10^{3})(2.0 \times 10^{10}) = 8.2 \times 10^{13}$$

Division:

1. Divide the coefficients
2. Subtract the exponents
3. Adjust so that the coefficient is still greater than or equal to 1 and less than 10.

$$\frac{6.8 \times 10^{8}}{2.0 \times 10^{5}} = 3.4 \times 10^{3}$$

Multiplying numbers

You learned it in elementary school, now find it in your memory banks! Some multiplication is fairly simple to do in your head, for example 300 x 40.

One technique is to see that 3 x 4 = 12 and 100x10 = 1000, so the answer is 12 x 1000 = 12000

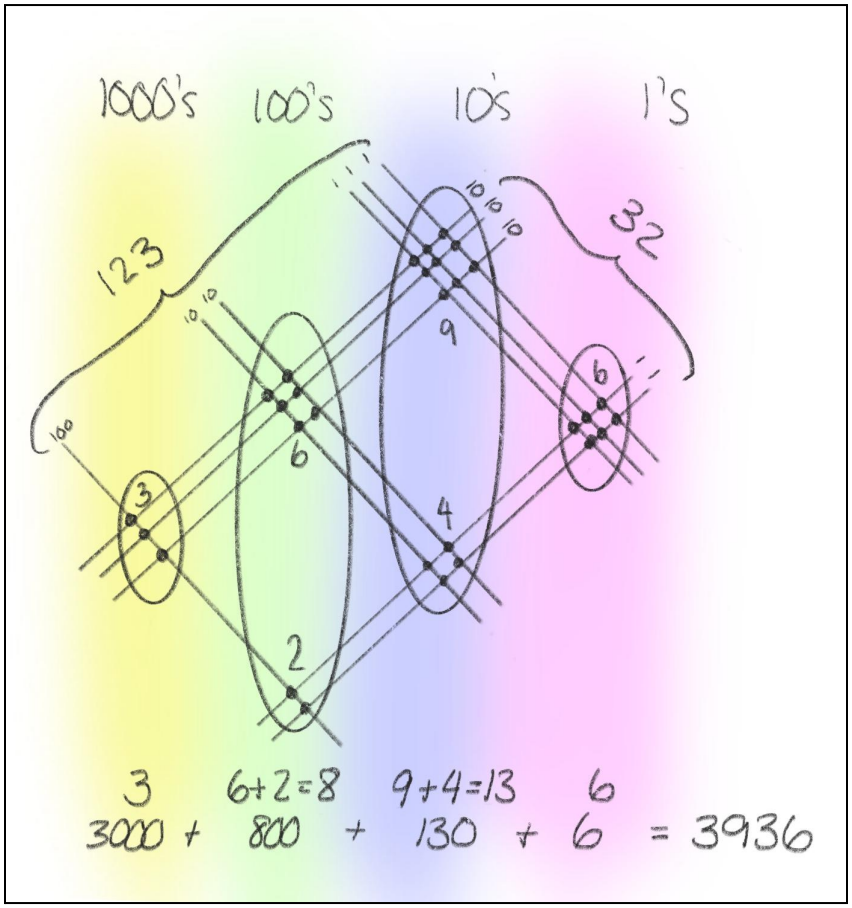
Many calculations in chemistry can be made easier by moving the decimal point. For example:

300 x 0.2 is the same as 30 x 2, which is 60. When multiplying two numbers, you can move the decimal point to the left in one number as long as you move the decimal to the right in the other number.

Alternatively you can resort to long multiplication.

Example:

$$\begin{array}{r} 456 \\ \times \quad 23 \\ \hline 1368 \\ +\,9120 \\ \hline 10488 \end{array}$$



Side note: have you seen "Japanese" or "stick" multiplication?

123 x 32 = 3936

It works as a different approach to looking at an array.

x		32	
		30	2
123	100	3000	200
	20	600	40
	3	90	6
Sum =		3936	

Division

Can you remember how to do long division?

Example:

$$\begin{array}{r} 63 \text{ r } 4 \\ 6\overline{)382} \\ -36\downarrow \\ 22 \\ -18 \\ 4 \end{array}$$

Another way to approach division is to break the division into smaller parts.

50 + 10 + 3 (remainder 4) = 63 and 4/6 remaining or 63.667

6 ⌜300 6 ⌜60 6 ⌜22

Converting Fractions into decimals

You need to know how to convert fractions into decimals to simplify some of the mental math that you will see in the multiple choice section.

What are the decimal equivalents for the following fractions? (Use 3 sig figs) (Do this without a calculator)

1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9
3/2	2/3	3/4	4/5	5/6	2/7	3/8	2/9

You can also calculate different variations of the fractions above, by moving the decimal point. For example:

½ = 0.5	10/2 = 5	1/0.2 = 5
1/20 = 0.05	100/2 = 50	10/0.2 = 50
1/200 = 0.005	1000/2 = 500	10/0.02 = 500

You can also find the decimal equivalent of a fraction by long division. For example, 3/11 = 0.2727

0.2727
11 ⌜3.000
30
- 22↓
80
- 77↓
30
- 22↓
80
- 77↓
30

Cancel and Simplify

Look at the following calculations and estimate the value for the answer. Make the equations easier by cancelling as much as you can. Another technique is to break bigger numbers into smaller multiples, so 42 could be replaced by 6 x 7, or 2 x 3 x 7, in order to make it easier to cancel.

$$\frac{5\ L}{}\times\frac{0.10\ moles\ A}{2\ L}\times\frac{4\ moles\ B}{3\ moles\ A}\times\frac{180\ grams}{1\ mole\ B}\times\frac{20\ \%\ actual\ yield}{100\ \%\ theoretical\ yield}=?$$

$$\frac{5\ L}{}\times\frac{0.10\ moles\ A}{2\ L}\times\frac{4\ moles\ B}{3\ moles\ A}\times\frac{180\ grams}{1\ mole\ B}\times\frac{20\ \%\ actual\ yield}{100\ \%\ theoretical\ yield}=?$$

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① $\frac{20}{100}=\frac{2}{10}$ ② $5\times0.1=0.5$ ③ $0.5\times4=2$

④ $\frac{2}{2}=1$ ⑤ $\frac{180}{3}=60$ ⑥ $\frac{60}{10}=6$ ⑦ $6\times2=12$

$$\frac{0.0010}{}\times\frac{0.010}{100}\times\frac{10}{0.0010}\times\frac{0.10}{1000}\times\frac{10}{0.10}=?$$

$$\frac{0.0010}{}\times\frac{0.010}{100}\times\frac{10}{0.0010}\times\frac{0.10}{1000}\times\frac{10}{0.10}=?$$

① $10\times10=100$ ② $\frac{100}{100}=1$ ③ $\frac{0.10}{0.10}=1$

④ $\frac{0.0010}{0.0010}=1$ ⑤ $\frac{0.010}{1000}\Rightarrow 0.000010$

$$\frac{20}{}\times\frac{60}{0.10}\times\frac{4000}{200}\times\frac{0.50}{10}=?$$

$$\frac{20}{}\times\frac{60}{0.10}\times\frac{4000}{200}\times\frac{0.50}{10}=?$$

① $\frac{20}{200}=0.1$ ② $\frac{0.10}{0.10}=1$ ③ $\frac{4000}{10}=400$

④ $400\times0.50=200$ ⑤ $60\times200=12000$

$$\frac{56 \times 15 \times 4}{7 \times 2 \times 3} = ?$$

$$\frac{\cancel{56} \times \cancel{15} \times 4}{\cancel{7} \times \cancel{2} \times \cancel{3}} = ?$$

① $56 = 8 \times 7$ ② $15 = 3 \times 5$ ③ $\frac{7}{7} = 1$ ④ $\frac{3}{3} = 1$

⑤ $\frac{8}{2} = 4$ ⑥ $4 \times 5 \times 4 = 80$

Estimating

Without using a calculator, estimate the value for the answer to these calculations. The trick to estimating is to round the numbers so that the math is easier.

Example:

$q = (198\ g)(4.184\ J/g°C)(18.0\ °C)$

$q \approx (200)(4)(20) = 16000\ J$

$4x^2 = 398$

$4x^2 \approx 400 \qquad x \approx 10$

$$n = \frac{(2.5\ L)\ (3.1\ atm)}{(0.0821\ L\ atm/mole\ K)\ (275\ K)}$$

$$n \approx \frac{(2.5)(3)}{(0.1)(300)}$$

$$\frac{7.53\ L}{} \times \frac{0.21\ moles}{1\ L} \times \frac{2\ moles\ B}{5\ moles\ A} \times \frac{214\ grams}{1\ mole\ B} \times \frac{48\ \%\ actual\ yield}{100\ \%\ theoretical\ yield} = ?$$

$$\frac{(7.5 \times 0.2 \times 2 \times 200 \times 50)}{(5 \times 100)} \approx ?$$

Estimating pH

As you know from 1st year chemistry, pH is defined as the $-\log[H^+]$. When the coefficient of the concentration of the molarity is 1, then the pH is simply the negative of the exponent.

For example: $[H^+] = 1.00 \times 10^{-4}$ has a pH of 4.000.

The difficulty arises when the coefficient is not 1. For now, you will be expected to provide a range for the pH between two whole values.

For example: $[H^+] = 3.00 \times 10^{-4}$ has a pH between 3 and 4.

We know that 3.00×10^{-4} or 0.000300 lies between 1×10^{-4} (0.0001, pH=4) and 1×10^{-3} (0.001, pH=3).

7) Net Ionic Equations

A net ionic equation is useful to show the reacting species and removes any spectator ions that are not participating in the reaction. Spectator ions are ions that are in aqueous solution on both sides of the equation. You can construct both an overall ionic equation and a net ionic equation from the balanced equation.

You need to memorize that the following ions will always dissociate and be aqueous. Sodium (Na^+), Nitrate (NO_3^-), Ammonium (NH_4^+) and Potassium (K^+). (SNAP ions are always aqueous as solutions)

Over the course of next year we will add the following solubility rules.

- *Strong acids will also dissociate.*
    - *They are H_2SO_4 (only the first H^+, so $H^+ + HSO_4^-$), HI, HBr, HNO_3, HCl, $HClO_4$.*
    - *mnemonic = **SO**, **I Br**ought **NO Cl**ean **ClO**thes*
- *Substances with K_{sp} values that are greater than 1, will dissociate. The larger the Ksp value, the greater the solubility.*
- *The strong bases will also dissociate if they dissolve, they are the group 1 and 2 hydroxides.*

For the net ionic equation quiz in September we will only focus on knowing that the SNAP ions will fully dissociate in solution.

Example:

A reaction occurs between solutions of potassium chloride (KCl) and lead (II) acetate ($Pb(CH_3COO)_2$) forming a white precipitate.

Write the balanced chemical equation.

$$2\ KCl_{(aq)} + Pb(CH_3COO)_{2(aq)} \rightarrow 2\ KCH_3COO_{(aq)} + PbCl_{2(s)}$$

Write the overall ionic equation

$$2\ K^+_{(aq)} + 2\ Cl^-_{(aq)} + Pb^{2+}_{(aq)} + 2\ CH_3COO^-_{(aq)} \rightarrow 2\ K^+_{(aq)} + 2\ CH_3COO^-_{(aq)} + PbCl_{2(s)}$$

Write the net ionic equation

$$2\ Cl^-_{(aq)} + Pb^{2+}_{(aq)} \rightarrow PbCl_{2(s)}$$

Sample Quizzes

The answers to the quizzes are on the subsequent pages.

Sample Ion Quiz

If you are given the formula, provide the name of the ion. If you are given the name, provide the formula.

1. Hydronium

2. Cu^{2+}

3. Acetate

4. Al^{3+}

5. Nitrite

6. OH^-

7. Hydrogen carbonate

8. ClO_2^-

Write the formula for the ionic compound.

9. Tin (II) fluoride

10. Potassium carbonate

The periodic table that you will use can be found on page 243 of this document:

AP Chemistry Course and Exam Description, Effective Fall 2020

Sample Nomenclature Quiz

If you are given the name, write the formula and vice versa.

1) $Fe(ClO_3)_2$

2) Carbon tetrachloride

3) HI

4) Lithium sulfate

5) N_2O_3

6) Acetic Acid

Sample Sig Figs and Uncertainty Quiz

1) How many significant figures are there in the following:

a) 3.080

b) 2.9185

c) 0.000080

d) 2.90×10^{23}

2) Complete these operations without a calculator

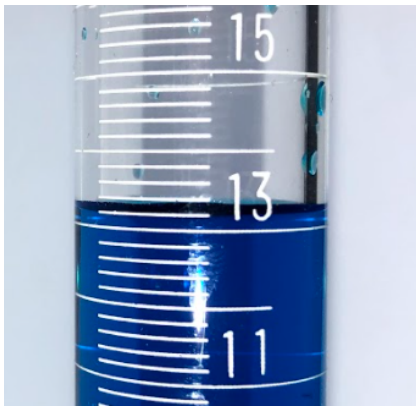
a) 10.0 m * 6.8 m

b) 6.06 g ÷ 2.000 mL

c) 1.05 mL + 15.0 mL + 0.0025 mL

d) $(2.0 \times 10^{10})(3.0 \times 10^{4})$

3) Record the volume in these graduated cylinders with the correct uncertainty. (all are in mL)



Measurement	Uncertainty	Measurement	Uncertainty	Measurement	Uncertainty

4) Add all of the measurements in 3 together. Report with the correct sig figs and uncertainty

Sample Dimensional Analysis and Stoichiometry Quiz

1) Convert 2.41 km into inches using dimensional analysis. (1.61 km = 1 mile, 1 mile = 5280 ft, 1 ft = 12 in)

2) Convert 0.0345 m^2 into $feet^2$ using dimensional analysis. (Use the conversions from #1)

3) 15.0 grams of calcium carbonate, $CaCO_3$, reacts with 250.0 mL of 0.565 M nitric acid, HNO_3, to form carbon dioxide gas, CO_2, water, H_2O and an aqueous solution of calcium nitrate. What is the volume of carbon dioxide (in liters) that is formed?

Sample Mental Math Quiz

Calculate or Estimate the following:

1) Calculate $\frac{81 \times 20 \times 3}{9 \times 2 \times 5} = ?$

2) Calculate $\frac{0.0020}{} \times \frac{10}{0.0050} \times \frac{0.25}{1000} \times \frac{20}{0.20} = ?$

3) What is the pH range of a solution with a hydrogen ion concentration of 0.060 M?

4) Multiply 592 x 45

5) Divide 928 by 23

6) Multiply $(2.50 \times 10^{-6})(6.0 \times 10^{-5})$

7) Divide (4.20×10^{6}) by (2.1×10^{-5})

8) Estimate the answer to: (0.51)(9.95) = x(0.098)(245)

9) Divide 0.060/0.20

10) What is the decimal equivalent of 5/9?

Sample Net Ionic Equations Quiz

A reaction occurs between solutions of sodium carbonate (Na_2CO_3) and calcium nitrate ($Ca(NO_3)_2$) forming a white precipitate.

Write the balanced chemical equation.

Write the overall ionic equation

Write the net ionic equation

Answers to Sample Quizzes

Sample Ion Quiz

If you are given the formula, provide the name of the ion. If you are given the name, provide the formula.

1. Hydronium

   H_3O^+

2. Cu^{2+}

   Copper (II)

3. Acetate

   CH_3COO^-

4. Al^{3+}

   Aluminum

5. Nitrite

   NO_2^-

6. OH^-

   Hydroxide

7. Hydrogen carbonate

   HCO_3^-

8. ClO_2^-

   Chlorite

Write the formula for the ionic compound.

9. Tin (II) fluoride

   SnF_2

10. Potassium carbonate

    K_2CO_3

The periodic table that you will use can be found on page 243 of this document:

AP Chemistry Course and Exam Description, Effective Fall 2020

Sample Nomenclature Quiz

If you are given the name, write the formula and vice versa.

1) $Fe(ClO_3)_2$

Iron (II) chlorate

2) Carbon tetrachloride

CCl_4

3) HI

Hydroiodic acid

4) Lithium sulfate

Li_2SO_4

5) N_2O_3

Dinitrogen trioxide

6) Acetic Acid

HCH_3COO

Sample Sig Figs and Uncertainty Quiz

1) How many significant figures are there in the following:

a) 3.080

4

b) 2.9185

5

c) 0.000080

2

d) 2.90×10^{23}

3

2) Complete these operations without a calculator

a) 10.0 m * 6.8 m

$68\ m^2$

b) 6.06 g ÷ 2.000 mL

3.03 g/mL

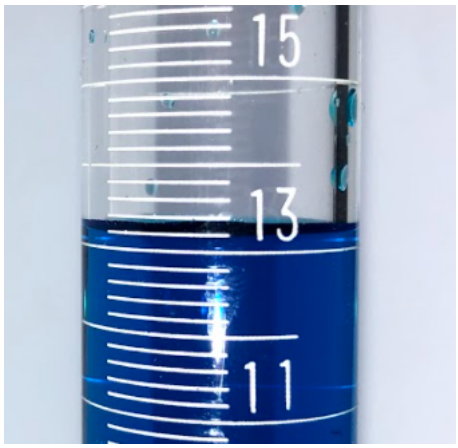
c) 1.05 mL + 15.0 mL + 0.0025 mL

16.1 mL

d) $(2.0 \times 10^{10})(3.0 \times 10^{4})$

6.0×10^{14}

3) Record the volume in these graduated cylinders with the correct uncertainty. (all are in mL)



Measurement	Uncertainty	Measurement	Uncertainty	Measurement	Uncertainty
13.2 mL	± 0.1	7.21 mL	± 0.05	48.5 mL	± 0.5

4) Add all of the measurements in 3 together. Report with the correct sig figs and uncertainty

68.9 mL ± 0.7

Sample Dimensional Analysis and Stoichiometry Quiz

(Set up can differ)

1) Convert 2.41 km into inches using dimensional analysis. (1.61 km = 1 mile, 1 mile = 5280 ft, 1 ft = 12 in)

$$2.41 \text{ km} \times \frac{1 \text{ mile}}{1.61 \text{ km}} \times \frac{5280 \text{ ft}}{1 \text{ mile}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 94800 \text{ in}$$

2) Convert 0.0345 m^2 into $feet^2$ using dimensional analysis. (Use the conversions from #1)

$$0.0345 \text{ m}^2 \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{1 \text{ mile}}{1.61 \text{ km}} \times \frac{1 \text{ mile}}{1.61 \text{ km}} \times \frac{5280 \text{ ft}}{1 \text{ mile}} \times \frac{5280 \text{ ft}}{1 \text{ mile}} = 0.371 \text{ ft}^2$$

3) 15.0 grams of calcium carbonate, $CaCO_3$, reacts with 250.0 mL of 0.565 M nitric acid, HNO_3, to form carbon dioxide gas, CO_2, water, H_2O and an aqueous solution of calcium nitrate. What is the volume of carbon dioxide (in liters) that is formed?

$$CaCO_3 + 2\ HNO_3 \rightarrow CO_2 + H_2O + Ca(NO_3)_2$$

$$15.0 \text{ g } CaCO_3 \times \frac{1 \text{ mole } CaCO_3}{100.01 \text{ grams } CaCO_3} \times \frac{1 \text{ mole } CO_2}{1 \text{ mole } CaCO_3} \times \frac{22.4 \text{ L } CO_2}{} = 3.36 \text{ L } CO_2$$

$$250.0 \text{ mL } HNO_3 \times \frac{1 \text{ L } HNO_3}{1000 \text{ mL } HNO_3} \times \frac{0.565 \text{ moles } HNO_3}{1 \text{ L } HNO_3} \times \frac{1 \text{ mole } CO_2}{2 \text{ mole } HNO_3} \times \frac{22.4 \text{ L } CO_2}{1 \text{ mole } CO_2} = 1.58 \text{ L } CO_2$$

HNO_3 produced less CO_2 so it is the limiting reagent and 1.58 L of CO_2 are produced.

Sample Mental Math Quiz

Calculate or Estimate the following:

1) Calculate $\frac{81 \times 20 \times 3}{9 \times 2 \times 5} = ?$

54

2) Calculate $\frac{0.0020}{} \times \frac{10}{0.0050} \times \frac{0.25}{1000} \times \frac{20}{0.20} = ?$

0.1

3) What is the pH range of a solution with a hydrogen ion concentration of 0.060 M?

1-2

4) Multiply 592 x 45

26640

5) Divide 928 by 23

40 remainder 8

6) Multiply $(2.50 \times 10^{-6})(6.0 \times 10^{-5})$

1.5×10^{-10}

7) Divide $(4.20 \times 10^{6})/(2.1 \times 10^{-5})$

2.0×10^{11}

8) Estimate the answer to: (0.51)(9.95) = x(0.098)(245)

~0.2

9) Divide 0.060/0.20

0.3

10) What is the decimal equivalent of 5/9?

0.556

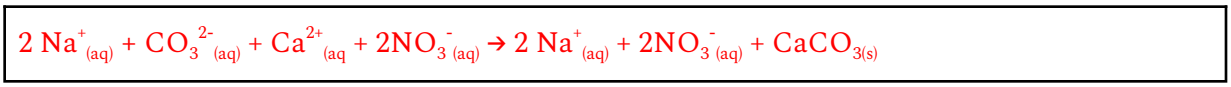
Sample Net Ionic Equations Quiz

A reaction occurs between solutions of sodium carbonate (Na_2CO_3) and calcium nitrate ($Ca(NO_3)_2$) forming a white precipitate.

1) Write the balanced chemical equation.

$$Na_2CO_{3(aq)} + Ca(NO_3)_2 \rightarrow 2\ NaNO_{3(aq)} + CaCO_{3(s)}$$

2) Write the overall ionic equation



$$2\ Na^+_{(aq)} + CO_3^{2-}{}_{(aq)} + Ca^{2+}{}_{(aq} + 2NO_3^-{}_{(aq)} \rightarrow 2\ Na^+_{(aq)} + 2NO_3^-{}_{(aq)} + CaCO_{3(s)}$$

3) Write the net ionic equation

$$CO_3^{2-}{}_{(aq)} + Ca^{2+}{}_{(aq} \rightarrow CaCO_{3(s)}$$