AP Chemistry Summer Work

Welcome to the Wonderful World of AP Chemistry! Your class begins now but don't worry. This first part is just about making sure you have all your basic Chemistry foundations. It is very important that you complete this work and are prepared for the start of AP Chemistry in the fall.

TO COMPLETE IN MAY (**immediately** when you receive this packet):

1. Email me at robert.scavetta@dvusd.org
   In the email include the following:
   a) Tell me a little about yourself (what year you are going to be, what you like to do with your free time, etc)
   b) Did you take Honors Chemistry or Regular Chemistry?
   c) Who was your teacher and what grade did you receive (both semesters)?
   d) What math did you just complete and what grade did you receive?
   e) How many other AP classes are you taking? What are they?

2. You are going to sign up for a website called Edpuzzle. Edpuzzle is a way for me to post video lessons throughout the summer and school year. From this website I can see when you watched the video, how many times you watched the video and the answers you posted. Sign up by following the directions on the next page.

3. Over the summer, you'll need to read this packet and watch the videos posted on Edpuzzle. These videos are mandatory and there to support the attached information. It is important that you take notes and actively participate in the videos. If you need "extra practice," there are additional practice problems on my website.

If you have questions about any of this work, please email me at robert.scavetta@dvusd.org. I will be checking my email all summer. I usually respond within 24 hours but please realize that I will be going on vacation a few times during the summer so it may take me longer during the months of June and July.

AP Chemistry is divided into discrete units that build upon each other. One of the most important units are the ones you completed in chemistry. These foundational chemistry units are important for your success in AP Chemistry so your task over the summer is to review the vital information you learned in chemistry or honors chemistry. When we return in August we will spend a few days reviewing some of the information from your prior chemistry course and we'll be having our first unit test a few days after we return in August. It is important that you complete the information over the summer because this will be the first major grade in the gradebook.

You will have a test over this material on **Friday, August 11th**.This packet has 6 sections that will be on the test and there are 6 videos to watch. I recommend you watch the videos FIRST, then complete the practice problems. There are also a number of sections that are denoted "For Your Information Only" that will review some other topics that you must have a full understanding of coming into AP Chem. For example, scientific notation is something that we use every day and you should be able to use scientific notation. I will not be testing over it specifically but I do expect that you can use it (along with a review of density, the metric system, and dimensional analysis). One of the additional requirements of AP Chemistry is that you earn at least an 80% on all tests. If you do not earn a minimum score of 80% on one or more of the sections, you will be required to attend one or more review sessions AFTER SCHOOL to cover the material, and you will begin the class at a disadvantage. It is very important to do well on this exam the first time.

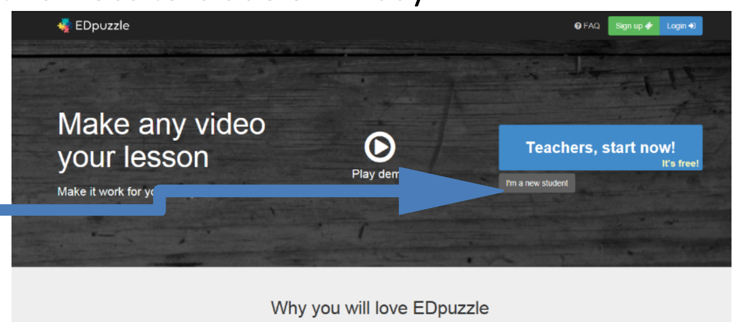
This packet is also available on my website under the AP Chemistry tab.

Please note that superficial understanding of these concepts is not acceptable. This is an intense course and, without these basics, you will be lost.

Edpuzzle.com

With the pace of this course it is sometimes difficult to cover all of the needed curriculum in the allot time. Periodically throughout the year you'll be required to watch a video lesson online. This year you'll be using a website called edpuzzle.com. **This program logs your participation, allows me to ask you questions during your viewing, and allows me to turn off the ability to skip ahead (when we are watching brand new content, no one should be skipping ahead). You can rewind and rewatch any parts necessary.**

Please follow the directions below to sign up for your account. This needs to be completed by 7:00am on Friday, May 24th . Your first video on this website is due on Friday.



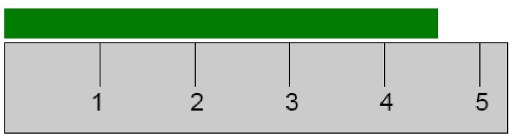
- Go to the website edpuzzle.com
- Click on the "I'm a new student" button
- Fill out the necessary fields. For the Username, use your first name and last name with no spaces. Add a number if needed (if your username has been taken). For example, I would be richstein or richstein445. MAKE SURE TO WRITE DOWN YOUR USERNAME AND PASSWORD!!
- Click on the "Join a Class" button.
- Enter the code `navezla` or
- **Once you have joined the class, the video assignments will show up.**
- **WARNING: The misuse or abuse of this software program will result in disciplinary actions. Conduct yourself like you were in the classroom.**

Again, you must sign up for the site ASAP and these videos are required for entrance into AP Chemistry!

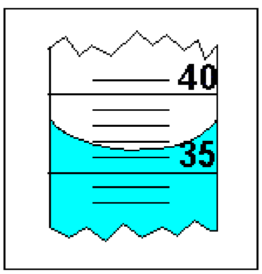
Section 1 - Significant Figures

Measuring Significant Figures from Instruments (Rulers, Graduated Cylinders, etc.)

Significant Figures (sig figs) – the certain digits and the one estimated digit of a measurement



Example: For this measurement, the number 4 can be read off the ruler directly. There are only markings for the one's place. The first decimal (the tenths place) needs to be estimated since there are no markings for it. Therefore a correct measurement would be 4.5 cm. Answers of 4.4 or 4.6 would also be acceptable since the last digit was an estimate. The certain digits, however, do not change from reader to reader, only the last digit.



This is a diagram of a graduated cylinder. Try to determine what volume of water is in this graduated cylinder using the correct number of significant figures. The answer is written below. Remember, record the certain digits first. The estimate just ***ONE LAST DIGIT***. Don't forget the unit!

Answer: The answer is 36.5 mL in my opinion but if you had 36.4 mL or 36.6 mL, your answer is also correct because the last digit was an estimate by the reader.

Determining the Number of Significant Figures When Given a Number

RULES FOR SIG FIGS:

Rule #1 – All non-zero digits are significant
Example: 3695.4 cm has 5 sig figs

Rule #2 – All zeros located anywhere between significant digits are significant (also called the "Sandwich Rule")
Example: 3001grams has 4 sig figs. The three and the one are significant because they are non-zero numbers (rule #1). Then both zeros are significant because they fall somewhere between two significant digits (rule #2).

Rule #3 – If there is a significant digit before the decimal, any zero after the decimal will be significant
Example: 85.0 m has 3 sig figs
92.30 has 4 sig figs
0.0045 sec has 2 sig figs. *The zeros in this one are not significant because there is not a significant figure before them.*

Rule #4 – Any zero appearing after the decimal and after another significant figure is significant

Example: 0.004670 mm has 4 sig figs. *The three zeros at the beginning of the number are not significant because there is not a significant figure before them. The last zero is significant because it is after the decimal place and is after another significant figure.*

Rule #5 – Zeros at the end of a number that does not contain a decimal are NOT significant

Example: 5000 mm has 1 sig fig

1350 cm has 3 sig figs. *In both cases, the zero(s) are at the end of the number and there are no decimal places*

RULES FOR CALCULATING WITH SIG FIGS:

Rule #1 – *Exact Number Rule*

If an exact number is being used, that number does not affect the number of significant figures in the final answer.

Example: Conversion factors are exact numbers because they do not ever change. An example would be 1 ft = 12 in.

Rule #2 – *Multiplication/Division Rule*

*The measurement with the smallest number of **sig figs** determines how many sig figs will be in the final answer.*

Example: 4.3 x 1.23 = 5.289 but this answer has 4 sig figs and that is not correct. According to the rule, 4.3 has 2 sig must have 2 sig figs. Therefore the answer is 5.3. We had to round the 2 to a 3 since the second decimal place was higher than 5.

Rule #3 – *Addition/Subtraction Rule*

*The measurement with the smallest number of **decimal places** determines the number of decimal places in the final answer.*

Example: 67.0/4.35534 = 71.35534 ← This is an unrounded answer. The answer should have one decimal place so it should be 71.4. Remember to look at the number past the last digit to determine if you need to round.

Remember, only the ***final answer*** is rounded to the correct sig figs/decimal places. If a problem has multiple steps, only determine the number of sig figs at the end of the problem. If you round along the way, the number will be very different from the actual value.

Complete practice problems on my website!

Section 2 – Polyatomic ions

You need to have the following polyatomic ions memorized. These are very important when it comes to naming. I suggest you make notecards to study them and WORK ON THEM ALL SUMMER!!! You need to know the name, the formula, and the charge. Starred ones can be more easily memorized using the modifications shown below the polyatomic ion list.

Acetate	$C_2H_3O_2^{-1}$	Iodate	IO_3^{-1}
Ammonium	NH_4^{+1}	Iodite*	IO_2^{-1}
Bicarbonate*	HCO_3^{-1}	Hypoiodite*	IO^{-1}
Perbromate*	BrO_4^{-1}	Nitrate	NO_3^{-1}
Bromate	BrO_3^{-1}	Nitrite*	NO_2^{-1}
Bromite*	BrO_2^{-1}	Oxalate	$C_2O_4^{-2}$
Hypobromite*	BrO^{-1}	Permanganate	MnO_4^{-1}
Carbonate	CO_3^{-2}	Manganate	MnO_4^{-2}
Perchlorate*	ClO_4^{-1}	Phosphate	PO_4^{-3}
Chlorate	ClO_3^{-1}	Phosphite*	PO_3^{-3}

Chlorite*	ClO_2^{-1}	Sulfate	SO_4^{-2}
Hypochlorite*	ClO^{-1}	Sulfite*	SO_3^{-2}
Chromate	CrO_4^{-2}	Thiocyanate	SCN^{-1}
Dichromate	$Cr_2O_7^{-2}$	Cyanate	OCN^{-1}
Hydroxide	OH^{-1}	Peroxide	O_2^{-2}
Periodate*	IO_4^{-1}		

Below are two ways to reduce the amount of memorization needed:

Modification #1 to oxyanions:
Oxyanions are polyatomic ions that contain oxygen

The prefixes and suffixes of oxyanions can be changed to reflect a change in the number of oxygens in the polyatomic ion. The charge on the polyatomic ion DOES NOT CHANGE!!

Prefix	**Suffix**	**Meaning**
	-ate	Standard form of the polyatomic ion
	-ite	One **less** oxygen than standard form
hypo-	-ite	Two **less** oxygens than standard form
per-	-ate	One **more** oxygen than standard form

Example:

ClO_3^{-1} is chlorate
ClO_2^{-1} is chlorite
ClO^{-1} is hypochlorite
ClO_4^{-1} is perchlorate

Modification #2 to oxyanions:
We can also add a hydrogen to the front of oxyanions and slightly modify their names. The charge on the polyatomic ion **does change** is this case. To name these, simply place the word "hydrogen" in front of the polyatomic ion or add the prefix "bi" to the polyatomic ion.

Examples:

CO_3^{-2} is carbonate
HCO_3^{-1} is hydrogen carbonate
or bicarbonate

PO_4^{-3} is phosphate
HPO_4^{-2} is hydrogen phosphate
or biphosphate

Complete practice problems on my website!

Section 3 – naming ionic, covalent, and acidic compounds

Naming compounds is one of the most important skills in AP Chemistry. Without this knowledge, you will have a difficult time in EVERY unit of the course because nomenclature is a part of each of every unit!

Nomenclature is the process of naming chemical compounds. There are three systems of naming compounds depending on the type of compound (ionic, covalent, or acidic).

First, you must know whether your compound is ionic, covalent, or acidic:

IONIC - consists of a metal and a nonmetel(s)
COVALENT - consists of all nonmetals
ACIDIC - first element listed in the compound is H (except for H_2O, which is just water)

How to name IONIC compounds

Binary ionic compounds are compounds that consist of only one type of metal and one type of nonmetal.

When given the formula for a binary ionic compound, the name will consist of two parts:

1. Write the name of the cation in the formula (the cation is the one that appears first).
2. Write the name of the anion but change the ending to –ide.

Examples:

a. NaCl is sodium chloride
b. BaI_2 is barium iodide
c. MgO is magnesium oxide

How to write the formula of an Ionic compound when given its name:

1. Write the symbol for the cation showing its charge.
2. Write the symbol for the anion (could be an element or a polyatomic ion) showing its charge.
3. Use the criss-cross method to balance the charges. Divide by their largest common factor to give the smallest whole-number ratio of ions.

Examples:

aluminum oxide Al^{+3} O^{-2} → Al_2O_3
sodium nitrate Na^{+1} NO_3^{-1} → $NaNO_3$

<u>How to name COVALENT compounds</u>

The system we use to name molecular compounds is different from ionic since we cannot predict the formulas of most molecular substance since they do not form ions. This system for naming covalent molecules (nonmetal and nonmetal compounds). The exception to this rule is compounds containing hydrogen (when it is listed first). Hydrogen is a nonmetal that takes the charge of +1. You will name those compounds according to the acid rules explained later.

1	mono
2	di
3	tri
4	tetra
5	penta
6	hexa
7	hepta
8	octa
9	nona
10	deca

When naming molecular substances, we will use the following prefixes →

Steps for Naming Molecular Compounds:

1. Name the element that appears first. Attach the prefix based on the subscript of that element (exception - do not use mono if there is just one atom of the first element).
2. Name the second element, changing the ending to –ide. Attach the prefix that corresponds with the subscript.

<u>Naming Ternary Ionic Compounds</u>

Ternary ionic compounds are compounds that consist of one type of metal and a polyatomic ion. It is important for you to know all your polyatomic ions.

When given the formula for a ternary ionic compound, the name will consist of two parts:

1. Write the name of the cation in the formula (the cation is the one that appears first).
2. Write the name of the polyatomic ion (DO NOT CHANGE THE ENDING!!!)

   Examples:

   a. $CaCO_3$ is calcium carbonate
   b. K_2SO_4 is potassium sulfate
   c. $Be(ClO_3)_2$ is beryllium chlorate
3. If the cation is ammonium (NH_4^{+1}), the first part of the name is ammonium then change the ending of the anion to –ide.

   Examples:

   a. NH_4Cl is ammonium chloride
   b. NH_4F is ammonium fluoride

Cations with Variable Charges

If a metal can form cations of different charges, the positive charge is given by a roman numeral in parentheses following the name of the metal (this happens mostly with transition meals and metal below the imaginary stair case in the p-block).

List of common metals with variable charges (you must memorize these five metal as being the ones that need roman numerals):

Element	Cation	Name
Copper	Cu^{+1} Cu^{+2}	Copper(I) Copper(II)
Chromium	Cr^{+2} Cr^{+3}	Chromium(II) Chromium(III)
Iron	Fe^{+2} Fe^{+3}	Iron(II) Iron(III)
Lead	Pb^{+2} Pb^{+4}	Lead(II) Lead(IV)
Tin	Sn^{+2} Sn^{+4}	Tin(II) Tin(IV)

Writing Formulas from Names

Conversely, we can also write formulas of an ionic compound when given its name.
Examples:

Cl_2O - dichlorine monoxide
NF_3 - nitrogen trifluoride

How to name ACIDIC compounds

There are two types of acids:

1. Binary Acids - acid containing two elements; one is hydrogen and the other is a different element
2. Oxyacids - acids that contain hydrogen, oxygen, and a third element

The name of each acid is based on the name of its anion (the cation is always hydrogen):

1. Binary acids are named by adding the prefix ***hydro-*** and changing the suffix fo ***-ide*** to ***-ic*** and adding the word **acid** to the end.
2. Oxyacids are named based on the ending of the polyatomic ion it contains. If the ending is ***-ate***, change the ending to ***-ic acid***. If the ending is **-ite**, change it to **–ous acid**.

Examples:

- HCl (binary) Hydrochloric acid
- HF (binary) Hydrofluoric acid
- $HClO_3$ (oxyacid) Chloric acid
- HClO (oxyacid) Hypochlorous acid

Complete practice problems on my website!

Section 4 – DIatomics

There are 7 elements on the periodic table that cannot exist as single neutral atoms so their neutral state is shown as diatomic. You should know all 7:

Hydrogen (H_2), Oxygen (O_2), Fluorine (F_2), Chlorine (Cl_2), Bromine (Br_2), Iodine (I_2), and Nitrogen (N_2)

Section 5 – matter

Terms you should already know:

Element – substances that are composed of only one type of atom and can all be found on the periodic table
Atom – smallest particle of an element that retains the characteristics of that element
Compound – two or more different elements chemically combined
Pure Substance (or simply ***Substances***) – any element or compounds (NOT a mixture)
Mixture – two or more substances in a mixture that do not chemically combine
Homogeneous Mixture – two or more substances that are uniformly combined (example: sugar in water)
Solution – a homogeneous mixture
Heterogeneous Mixture – two or more substances that are unevenly mixed (example: chicken noodle soup)

Units of Temperature

Temperature – a measurement of the movement (kinetic energy) of the molecules in a substance

There are three units of temperature:

1. Celsius (°C)
2. Fahrenheit (°F)
3. Kelvin (K)

The size of a Kelvin and a Celsius degree are the same but the size of a Fahrenheit degree is smaller. It is easy for us to convert from K → °C or from °C → K but not between the two and Fahrenheit because of this.

$$K = {}^{\circ}C + 273$$

In science, the Kelvin scale is the preferred scale because it is based on absolute zero and never has a negative value.

Absolute zero – the temperature at which all molecular movement stops. This is the lowest possible temperature.

Properties of Matter

Physical Properties – properties that can be observed without changing what the substance is

Examples: color, state, melting point, boiling point, density, solubility, conductivity, malleability, and ductility

Chemical Properties – properties that can only be observed by a change in the chemical make-up of the substance

Examples: reactivity, combustability and flammability

Changes of Matter

Physical Change – a change in the physical properties of a substance that does not result in a substance that is chemically different from the original

Examples:

A phase change – when ice melts into liquid water, only the phase is changed…it is still H_2O

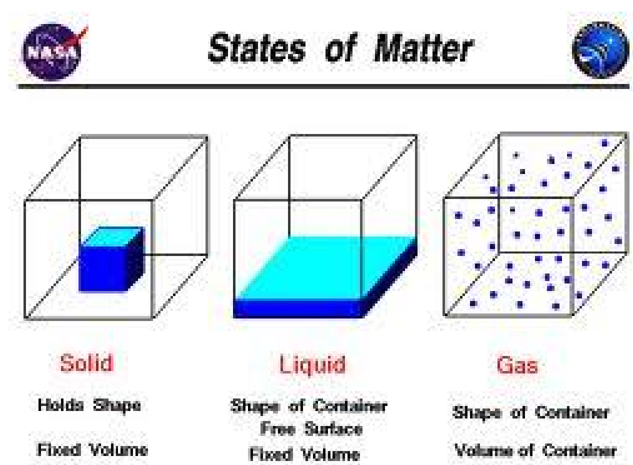
Tearing – if you rip a piece of magnesium ribbon, it is still magnesium…just two pieces

Chemical Change – a change in the chemical properties of a substance that results in a chemically change substance

Example: Burning – if you light a piece of paper on fire, the paper changes to ash (chemically different)

States of Matter

- Gas moelcules move around very rapidly and have almost no attraction for each other.
- Liquid molecules move slower than gas particles and have some attraction to each other (this is why liquids "flow")
- Solid molecules barely move at all. They actually vibrate in a fixed position.
- Gas molecules take the shape and volume of their container because they move so freely.
- Liquid molecules conform to the shape of their container but have a specific volume.
- Solid particles have a specific shape and volume.



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Section 6 – Atomic Structure

Subatomic Particles

There are three types of subatomic particles:

1. Protons – positively charged; located in the nucleus
2. Neutrons – neutrally charged; located in the nucleus
3. Electrons – negatively charged; located outside the nucleus

By definition, an atom has to be neutral in charge. Therefore it must have the same number of protons and electrons in order for the positive and negative charges to balance out.

Most of the mass of an atom resides in the nucleus where the protons and neutrons are. This is because protons and neutrons have a far greater mass than electrons. Electrons are over 10,000 times smaller (in mass) than protons and neutrons. The masses of each particle are shown below but do not need to be memorized.

Subatomic Particle	Mass (g)	Relative Charge

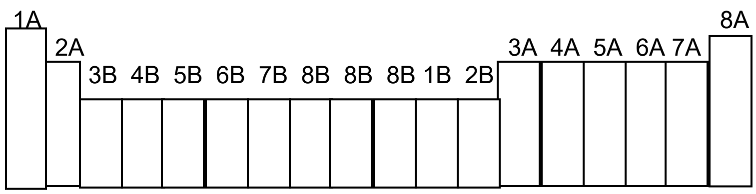
Proton	1.67×10^{-24}	+1
Neutron	1.67×10^{-24}	0
Electron	9.11×10^{-28}	-1

The Periodic Table

Groups (also called families) – vertical columns on the periodic table

Periods – horizontal rows on the periodic table (there are seven rows)

You should be familiar with the group numbers show in the diagram below:



Other common names for the groups on the periodic table:

1A – alkali metal
2A – alkaline earth metals
7A - halogens
8A – noble gases

Main Group Elements – elements in the "A" groups

Transition Elements – elements in the "B" groups

Metals, Nonmetals, and Metalloids

Properties of ***Metals***:
- Solids at room temperature (except for Hg)
- Conduct electricity
- Are ductile
- Are malleable

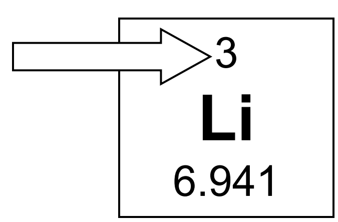
Properties of ***Nonmetals***:
- Do not conduct electricity
- Are not ductile
- Are not malleable

Metalloids have some characteristics of metals and some characteristics of nonmetals. It varies from metalloid to metalloid.

The Numbers

Each box on the periodic table contains a plethora of information. You must be able to extract as much information as possible from the periodic table.

Atomic Number – the number of protons in the nucleus of an atom of an element



Mass Number – the number of protons and neutrons in the nucleus of an atom of an element (to determine the number of neutrons, subtract the atomic number from the mass number). This is this number but rounded to a whole number.

Molar Mass – the number of grams per mole at atoms of an element
(round this number to 1 decimal place)

By simply looking at the periodic table, you can determine the number of protons, electrons, and neutrons in an atom. Here is how:

1. Look at the atomic number. That is the number of protons.
2. Since it is an atom, the charge has to be neutral so the number of electrons has to be the same as the number of protons.
3. To get the number of neutrons, subtract the atomic number from the mass number (remember to use the rounded version of the decimal).

Sometimes it will be important to be able to not only write the symbol for an element but to represent its atomic number and mass number, as well. You will need to use the following to do so:

$$37Li$$

Isotopes

Most elements on the periodic table occur in nature in various forms having various mass numbers.

Isotopes – atoms with the same atomic number but different mass numbers (therefore having a different number of neutrons)

Example: There are two different forms of boron (B):

$511B$ and $510B$

It has been tested that 19.91% of the boron on Earth is boron-10 and 80.09% of the boron on Earth is boron-11.

This is the reason why the mass number on the periodic table is not a whole number even though it represents the number of protons and neutrons in an atom and you cannot have part of a proton or neutron.

The mass number (decimal number) on the periodic table is a decimal because it is an average of the isotopes and abundances of those isotopes on Earth. This gives us a more realistic number to work with when we use it as molar mass.

Back to our example:

Look at boron's mass number…10.811

Do you see how it is closer to 11 than to 10? That tells you that there is more boron-11 on Earth than boron-10. Just as our percentage above shows.

The Mole

Mole – 6.02 x 10^{23} of anything (but in Chemistry it is usually atoms, molecules, particles, etc)

We use the mole as a way to make our calculations reasonable on the scale we are used to. Atoms and molecules are soooooo small that it would be silly to speak of them individually. Instead, we group in a large group called a mole. It is similar to how donuts are sold. You usually do not buy just one donut…you buy a dozen!

Molar Mass – the mass (in grams) of one mole of atoms of any element
- the mass (in grams) of 6.02×10^{23} atoms of any element

Some examples of molar mass:

Molar mass of sodium (Na) = mass of 1 mole of Na atoms
= 23.0 g/mol
= mass of 6.02×10^{23} Na atoms

Note: When rounding the mass number on the periodic table to use for **molar masses**, always round to ONE DECIMAL PLACE!!!!

Mass ⇔ Moles Conversions

To convert from mass to moles or moles to mass of a substance, use dimensional analysis (other forms of work will not be accepted)!!

Moles of substance ⟷ (Use molar mass in g/mol) ⟷ Mass of substance

Example Problem #1:
How many moles of Zn are in 5.87 grams of Zn?

5.87 grams Zn x $\frac{1\ mol\ Zn}{65.4\ g\ Zn}$ = 0.0898 mol Zn

Example Problem #2:
How many grams of Fe are in 1.92 moles of Fe?

1.92 grams Fe x $\frac{1\ mol\ Fe}{55.8\ g}$ = 0.0344 mol Fe

Complete practice problems on my website!

For Your Information Only: Scientific notation

Science can deal with very large and very small numbers. Remember, there are 602,000,000,000,000,000,000,000 molecules in a mole. We use scientific notation to simplify these large (and also small) numbers.

Scientific Notation contains three parts:

1. a number greater than or equal to 1 but less than 10. The number usually contains a decimal
2. a multiplication sign
3. a power of 10 (Ex: 10^4)

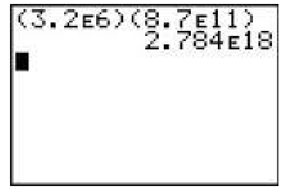
Instead of writing 602,000,000,000,000,000,000,000 we can write 6.02×10^{23} . . . making the number MUCH easier to deal with.

To determine how to write the number in scientific notation, follow these steps:

1. To determine what digits should appear in Part 1, write all the digits from the number that are significant, placing a decimal immediately after the first number. For the above number, that would be the 6.02 without any of the zeros (they are at the end of a number with no decimal place so they are not significant).
2. Then place a multiplication sign after the number … 6.02 x

3. To determine the power of ten, see how many times you needed to move the decimal so it would fall immediately after the first number from Part 1. For the above example, we had to move the decimal place 23 times to left.
    i. Moving the decimal to the <u>right</u> makes the exponent <u>negative</u>.
    ii. Moving the decimal to the <u>left</u> makes the exponent <u>positive</u>.

   This example has the decimal moving to the left therefore making it a positive exponent. The final answer is 6.02×10^{23}



Quick Calculator Lesson (for any of the TI calculators):

1. Type in part 1 of the number
2. Press the "second" key and hit the comma key. A small upper case "E" will appear.
3. Then type in the power of the 10 (do not type the 10, just the number of its superscript)

For Your Information Only: Density

Density – how closely packed together molecules are in a substance

$$\text{Density} = \frac{mass}{volume} = \frac{m}{V}$$

The unit for density depends on the units being used for mass and for volume. The unit will be the mass's unit over the volume's unit. Some examples, g/mL or kg/L or cg/mm^3.

Sample Density Problem:
Determine the density of a piece of metal that has a mass of 340 g and a volume of 5.6 L

D = m/V = 340g/5.6L = 64.1500943 … with the correct sig figs … **64 g/L** is the density

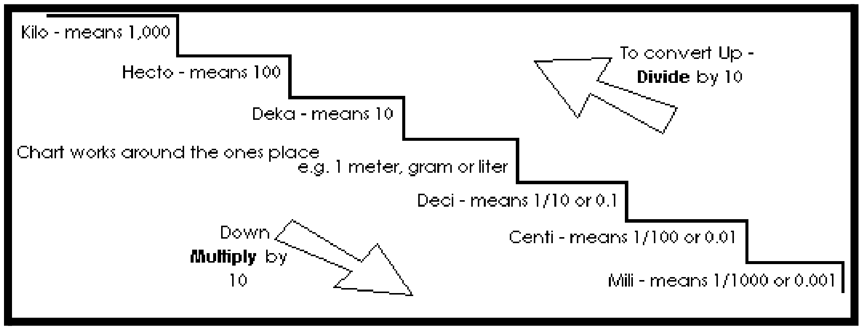
For Your Information Only: The metric system

The United State is the only country in the world that does not use the Metric System. In order for American scientists to be able to communicate with other scientists, we must all use the same system so we use the Metric System in science.

There are seven SI Base Units (with the unit and symbol):

<u>Base Unit</u>	<u>Unit</u>	<u>Symbol</u>
Mass	Kilogram	kg
Length	Meter	m
Time	Second	s
Quantity	Mole	mol
Temperature	Kelvin	K
Electric Current	Amphere	Å
Luminous Intensity	Candela	cd

These are the base units. Each of these units can be made larger or smaller with the use of prefixes.



How do I read this chart?
When using this chart to convert between two units, simply find where your original unit is and where the unit you are trying to find is. Each step represents one move of the decimal place, either to the right (down) or two the left (up).

The following are the prefix conversions we use most often:

1 m = 100 cm	1 g = 100 cg
1 m = 1000 mm	1 g = 1000 mg
1000 m = 1 km	1000 g = 1 kg

This is a way to remember the prefixes:

King **H**enry **D**ied **D**rinking **C**hocolate **M**ilk

For Your Information Only: dimensional analysis

Dimensional analysis is a method used to solve problems that helps to organize information in a logical manner.

The key to dimensional analysis is to take the problem one step at a time!

The best way to demonstrate dimensional analysis is through an example so …

Sample Problem:
How many days are in 4.2 years?

Step 1: Write down the given number and unit from the problem

4.2 years

Step 2: We know the conversion from years to days is 1 yr = 365 days. Now multiply the conversion factor by the original number. Set up the conversion factor so the unit that is the original problem is on the bottom. This will cancel the unit out and you will be left with the unit on the top.

4.2 years **x** $\frac{365\ days}{1\ year}$ = 1533 days = **1500 days** (with correct sig figs)

You can use as many conversion factors as you need to in a row.

Another Sample Problem:
How many hours are in 4.2 years?

4.2 years x $\frac{365\ days}{1\ year}$ x $\frac{24\ hours}{1\ day}$ = 36792 hours = **37000 hours** (with correct sig figs)

AP Chemistry Practice: *It is in your best interest to go back to your Honors Chemistry notebook and try more problems than just these here. This is just a SHORT worksheet.*

Section 1 – Sig Figs:

How many significant figures does each of the following contain?

1. 50.9 ___________
2. 5009 ___________
3. 0.0028 ___________
4. 95.00 ___________
5. 6050 ___________

Perform the following operations. Make sure all your final answers are in scientific notation and contain the correct number of significant figures.

6. (32500) + (7900) _____________
7. (564000) – (4256.89) __________
8. $(3.3 \times 10^{-3}) \times (6.6 \times 10^{-6})$ _____________
9. $(5.9 \times 10^{-4}) / (3.333 \times 10^{2})$ ____________

Section 3 – Naming and Formula Writing:

Name each of the following compounds.

1. $AgCl$ ____________
2. ZnO _____________
3. $CaBr_2$ ____________
4. SnF_4 ___________
5. $Ba(NO_3)_2$ ________
6. $CuCl_2$ ___________
7. K_3N _____________
8. CdO ____________
9. $AlBr_3$ ____________

Write the formula for each of the following.

1. potassium iodide _________
2. magnesium chloride _______
3. sodium sulfide __________
4. copper(II) chloride _________
5. tin(II) fluoride __________
6. calcium nitride _________
7. cesium sulfate _________
8. sodium phosphate _________
9. sodium sulfite _________
10. aluminum chloride _________

Name each of the following molecular compounds.

1. S_2O_3 ___________
2. ICl_3 ___________
3. PBr_5 ___________
4. PF_5 ___________
5. XeF_4 ___________
6. CCl_4 ___________

Write the formula of each of the following molecular compounds.

1. dioxygen difluoride ___________
2. carbon tetraiodide ___________
3. carbon dioxide ___________
4. dinitrogen pentoxide ___________

Name each of the following acids.

1. HNO_3 ___________
2. H_2SO_4 ___________
3. HI ___________
4. H_2SO_3 ___________

Write the formula for each of the following acids.

1. perchloric acid ___________
2. phosphoric acid ___________
4. hydrosulfuric acid ___________
5. carbonic acid ___________

Section 5 – Matter

Convert the following:

1. 25.0°C = ___________ K
2. 123°C = ___________ K
3. 453 K = __________°C
4. 235 K = __________°C

AP Chemistry Practice: *It is in your best interest to go back to your Honors Chemistry notebook and try more problems than just these here. This is just a SHORT worksheet.*

Section 1 – Sig Figs:

How many significant figures does each of the following contain?

1. 50.9 __3________ 3. 0.0028 __2________ 5. 6050 __3________ 2. 5009 __4________ 4. 95.00 __4________

Perform the following operations. Make sure all your final answers contain the correct number of significant figures.

6. (32500) + (7900) ___40400___ 8. $(3.3 \times 10^{-3}) \times (6.6 \times 10^{-6})$ __2.2×10^{-8}____
7. (564000) – (4256.89) ___559743_______ 9. $(5.9 \times 10^{-4}) / (3.333 \times 10^{2})$ __1.8×10^{-6}__

Section 3 – Naming and Formula Writing:

Name each of the following compounds.

1. $AgCl$ _silver chloride_ 4. SnF_4 _tin(IV) fluoride_ 7. K_3N potassium nitride
2. ZnO _zinc oxide______ 5. $Ba(NO_3)_2$ barium nitrate 8. CdO cadmium oxide
3. $CaBr_2$ calcium bromide 6. $CuCl_2$ copper(II) chloride 9. $AlBr_3$ aluminum bromide

Write the formula for each of the following.

1. potassium iodide KI
2. magnesium chloride $MgCl_2$
3. sodium sulfide Na_2S
4. copper(II) chloride $CuCl_2$
5. tin(II) fluoride SnF_2
6. calcium nitride Ca_3N_2
7. cesium sulfate Cs_2SO_4
8. sodium phosphate Na_3PO_4
9. sodium sulfite Na_2SO_3
10. aluminum chloride $AlCl_3$

Name each of the following molecular compounds.

1. S_2O_3 disulfur trioxide 3. PBr_5 phosphorus pentabromide 5. XeF_4 xenon tetrafluoride
2. ICl_3 iodine trichloride 4. PF_5 phosphorus pentafluoride 6. CCl_4 carbon tetrachloride

Write the formula of each of the following molecular compounds.

1. dioxygen difluoride O_2F_2
2. carbon tetraiodide CI_4
3. carbon dioxide CO_2
4. dinitrogen pentoxide N_2O_5

Name each of the following acids.

1. HNO_3 **<u>nitric acid</u>**
2. H_2SO_4 **<u>sulfuric acid</u>**
3. HI **<u>hydroiodic acid</u>**
4. H_2SO_3 **<u>sulfurous acid</u>**

Write the formula for each of the following acids.

1. perchloric acid **<u>$HClO_4$</u>**
2. phosphoric acid **<u>H_3PO_4</u>**
4. hydrosulfuric acid **<u>H_2S</u>**
5. carbonic acid **<u>H_2CO_3</u>**

Section 5 – Matter

Convert the following:

1. 25.0°C = **<u>298.0</u>** K
2. 123°C = **<u>396</u>** K
3. 453 K = **<u>180</u>**°C
4. 235 K = **<u>-38</u>**°C