Pre-AP Chemistry 2016-17

I am excited that you decided to take on the challenge that Pre-AP Chemistry has to offer. You are in for an experience that will prepare you for advanced work in your high school career and in your college career. This class is intended to take you to the next level in critical thinking and stamina.
This packet contains materials that are necessary for your success in this course. It covers basic memorized material that we will be using all year long starting with the first day of class. If you have difficulty with memorizing this information, you are more than welcome to email either Pre-AP Chemistry teacher at any point during the summer for assistance: Mrs. Sternitzke at sternits@frisocisd.org or Ms. Reynolds at ReynoldM@friscoisd.org . We will be checking our email once or twice a week and will get back to you when we can, so be patient.

MEMORIZE ELEMENT NAMES & SYMBOLS

First letter of the symbol must be uppercase. If a second letter is present, it must be lower case. It is best to learn 5 – 10 elements with their symbols at a time. Each time you work on learning an element make sure to find its position on the Periodic Table so that you can do so when needed during class. Also, spelling counts so write the element names as you study to make sure you can spell the names correctly.

Actinium	Ac
Aluminum	Al
Antimony	Sb
Argon	Ar
Arsenic	As
Astatine	At
Barium	Ba
Beryllium	Be
Bismuth	Bi
Boron	B
Bromine	Br
Cadmium	Cd
Calcium	Ca
Carbon	C
Cesium	Cs
Chlorine	Cl
Chromium	Cr
Cobalt	Co
Copper	Cu
Fluorine	F
Francium	Fr
Gallium	Ga
Germanium	Ge
Gold	Au
Helium	He
Hydrogen	H
Iodine	I
Iron	Fe
Krypton	Kr
Lanthanum	La
Lead	Pb
Lithium	Li
Magnesium	Mg
Manganese	Mn
Mercury	Hg
Neon	Ne
Nickel	Ni
Nitrogen	N
Oxygen	O
Phosphorus	P
Platinum	Pt
Plutonium	Pu
Potassium	K
Radium	Ra
Radon	Rn
Rubidium	Rb
Scandium	Sc
Seaborgium	Sg
Selenium	Se
Silicon	Si
Silver	Ag
Sodium	Na
Strontium	Sr
Sulfur	S
Tellurium	Te
Thallium	Tl
Thorium	Th
Tin	Sn
Titanium	Ti
Tungsten	W
Uranium	U
Vanadium	V
Xenon	Xe
Yttrium	Y
Zinc	Zn
Zirconium	Zr

Periodic Table of the Elements

1 IA 1A	2 IIA 2A	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8	9 VIII 8	10	11 IB 1B	12 IIB 2B	13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A
1 H Hydrogen 1.008																	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305											13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.066	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.88	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.631	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 84.798
37 Rb Rubidium 84.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.711	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.249
55 Cs Cesium 132.905	56 Ba Barium 137.328	57-71	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.085	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [208.982]	85 At Astatine 209.987	86 Rn Radon 222.018
87 Fr Francium 223.020	88 Ra Radium 226.025	89-103	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [269]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium unknown	114 Fl Flerovium [289]	115 Uup Ununpentium unknown	116 Lv Livermorium [298]	117 Uus Ununseptium unknown	118 Uuo Ununoctium unknown

Lanthanide Series	57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.243	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.055	71 Lu Lutetium 174.967
Actinide Series	89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium 257.095	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]

Alkali Metal | Alkaline Earth | Transition Metal | Basic Metal | Semimetal | Nonmetal | Halogen | Noble Gas | Lanthanide | Actinide

MEMORIZE POLYATOMIC ION NAMES & SYMBOLS

Polyatomic Cations (+)

Ammonium	NH_4^{1+}
Hydronium	H_3O^{1+}

Polyatomic Anions (–)

Acetate	$C_2H_3O_2^{1-}$
Hypobromite	BrO^{1-}
Bromite	BrO_2^{1-}
Bromate	BrO_3^{1-}
Perbromate	BrO_4^{1-}
Carbonate	CO_3^{2-}
Hydrogen carbonate	HCO_3^{1-}
Hypochlorite	ClO^{1-}
Chlorite	ClO_2^{1-}
Chlorate	ClO_3^{1-}
Perchlorate	ClO_4^{1-}
Chromate	CrO_4^{2-}
Cyanide	CN^{1-}
Hypofluorite	BrO^{1-}
Fluorite	BrO_2^{1-}
Fluorate	BrO_3^{1-}
Perfluorate	BrO_4^{1-}
Hydroxide	OH^{1-}
Hypoiodite	IO^{1-}
Iodite	IO_2^{1-}
Iodate	IO_3^{1-}
Periodate	IO_4^{1-}
Permanganate	MnO_4^{1-}
Manganate	MnO_3^{1-}
Phosphate	PO_4^{3-}
Hydrogen phosphate	HPO_4^{2-}
Dihydrogen phosphate	$H_2PO_4^{1-}$
Nitrate	NO_3^{1-}
Nitrite	NO_2^{1-}
Sulfite	SO_3^{2-}
Sulfate	SO_4^{2-}
Hydrogen sulfite	HSO_3^{1-}
Hydrogen sulfate	HSO_4^{1-}

Memorization Tips for Polyatomic Ions

THE MOST IMPORTANT THING IS TO LEARN THE PATTERNS INVOLVED IN THESE IONS.

1) Sometimes the old ways are the best ways: Make flash cards for all of the polyatomic ions your teacher requires you to remember.

Ammonium	NH_4^{1+}

2) Divide the cards into groups by pattern. Different students will see different patterns. As you pick up a card, make sure to say the polyatomic ion name out-loud (not in your head --- OUT-LOUD). Shuffle the cards and do it again. You can use the same pattern as before or use another one. Don't forget to say the ion's name out-loud.

3) Now separate all the cards that end with *-ate* suffix. Notice they all have oxygen in the formula and negative oxidation numbers (superscripts).

NO_3^{1-} CO_3^{2-} ClO_3^{1-} CrO_4^{2-} MnO_3^{1-} PO_4^{3-}

4) There is a memory trick for most of these *-ate* suffix ions. Remember this saying:

"Nick the Camel ate a Clam and a Crayon and a Mint for Supper in Phoenix"

Now this saying gives you the clues on how many oxygens are in the polyatomic ion and the oxidation number. The word Nick stands for nitrate which is nitrogen (N) and oxygen (O). Count the vowels in the word Nick. There's 1 vowel. That indicates the superscript for nitrate (-1). Now count the consonants in the word Nick. There are 3 consonants. That indicates the number of oxygens (subscript) and that is 3. The symbol (or formula) for nitrate is NO_3^{-1}.

Next, Camel is for carbonate which contains carbon and oxygen. Count vowels (2) and consonants (3). The vowels indicate the superscript and consonants indicate the subscripts. Thus the formula for carbonate is CO_3^{-2}.

Clam is for chlorate containing chlorine and oxygen. Count vowels and consonants in the word clam, 1 and 3 respectively. Thus the formula for chlorate is ClO_3^{-2}.

Crayon is for chromate, Mint is for manganate, Supper is for sulfate, and Phoenix for phosphate.

At this point, you should know nitrate, carbonate, chlorate, chromate, manganate, sulfate, and phosphate. Practice these *-ate* ions using your flash cards. You must write when you practice. Write the symbols and write the names (spelling counts).

5) Learn ammonium and hydronium (the two positively charged ions). Learn it like you learned to spell a new word when you were in elementary school.

NH_4^{1+} H_3O^{1+}

6) After you have *-ate* ions down, learn ions ending in *-ite*. The difference between the *-ate* and *-ite* is just the number for oxygens. **"Nitrate *ate* 1 more oxygen than Nitrite"**. This works for all the ions: the *-ate* ion will always have 1 oxygen more than its *-ite* ion.

NO_2^{1-} CO_2^{2-} ClO_2^{1-} CrO_3^{2-} MnO_2^{1-} PO_3^{3-}

At this point, you should know nitrite, carbonite, chlorite, chromite, manganite, sulfite, and phosphite. Practice the *-ite* ions using your flash cards. You must write when you practice. Write the symbols and write the names.

7) At sometime in middle school, you would have learned that elements in the same group (column) on the periodic table have similar properties. This is partially true for polyatomic ions. Look at group 17 (the halogens) on the table which includes: F, Cl, Br, and I.

ClO_3^{1-} FO_3^{1-} BrO_3^{1-} IO_3^{1-}

Since you already know chlorate, you'll see the same pattern in fluorate, bromate, and iodate. At this point, you should know chlorate, chlorite, fluorate, fluorite, bromate, bromite, iodate, and iodite. Make flash cards for these.

ClO_2^{1-} FO_2^{1-} BrO_2^{1-} IO_2^{1-}

8) Look at the polyatomic ions that have chlorine in their formulas: hypochlorite, chlorite, chlorate, and perchlorate. All of these differ from each other only by the number of oxygens. Hypochlorite will always have 1 oxygen less than chlorite; and chlorate has 1 oxygen less than perchlorate. The other ions will follow the same pattern.

ClO^{1-} ClO_2^{1-} ClO_3^{1-} ClO_4^{1-}

Make flash cards for hypomanganite, manganite, manganate, and permanganate. Permanganate is the only one you are likely to encounter.

MnO^{1-}	MnO_2^{1-}	MnO_3^{1-}	MnO_4^{1-}
FO^{1-}	FO_2^{1-}	FO_3^{1-}	FO_4^{1-}
BrO^{1-}	BrO_2^{1-}	BrO_3^{1-}	BrO_4^{1-}
IO^{1-}	IO_2^{1-}	IO_3^{1-}	IO_4^{1-}

9) Now separate out all the polyatomic ions that have hydrogen as the first element in the formula. Compare the hydrogen containing polyatomic ion with the ion that doesn't have the hydrogen. Example: compare hydrogen carbonate with carbonate; the difference is in the charge; for every hydrogen added to the formula the charge is change by +1.

Instead of using hydrogen as the first part of the name, you can use bi- as a prefix. In other words, hydrogen carbonate and bicarbonate are exactly same.

Using this pattern, you should practice hydrogen sulfite, hydrogen sulfate, hydrogen phosphate, and dihydrogen phosphate. You should be able to make other "hydrogen" polyatomic ions that are not on your list.

HCO_3^{1-}	HSO_3^{1-}	HSO_4^{1-}	HPO_4^{1-}

10) Learn acetate. I remember it as "CHO 2,3,2". (pronounce it with a long o sound).

$C_2H_3O_2^{1-}$

11) Learn hydroxide. For hydroxide, think about the Jolly Green Giant saying "OH OH OH". Or remember "There are no HO's in chemistry". Since oxygen and sulfur are in the same group, they will have similar properties and thus hydrogen sulfide (HS^{1-}) is similar to hydroxide.

OH^{1-}

12) Now just memorize cyanide. CN^{1-}

Pre-AP Chemistry 2016-17
Mrs. Sternitzke

SAFETY RULES AND PRACTICES FOR THE AP CHEMISTRY LAB

Good lab practice requires mandatory safety rules and procedures which must be strictly enforced. Performing lab work properly will reduce accidents.

GENERAL SAFETY RULES

1. Eye protection is required at all times in the laboratory. You will NEVER conduct a lab procedure without wearing goggles. It is recommended (but not required) that you remove contact lenses before working in the lab area.
2. No food or drink is allowed anywhere in the lab area.
3. Horseplay or pranks are especially dangerous and are prohibited.
4. The hazards of a chemical used should be known (e.g., toxicity, corrosiveness, flammability, stability) and the precautions concerning that chemical are to be followed.
5. Unauthorized experiments are prohibited.
6. You should wear a lab apron to protect your clothing while working. Loose clothing (such as hoodies) and jewelry are not permitted. Exposed legs and feet are not permitted.
7. Closed toe shoes must be worn during all labs.
8. Long hair is always to be tied back.
9. Know the location and proper use of all safety equipment: goggles, aprons, eye wash, safety shower, fire blanket, and fire extinguisher.
10. Sweep up broken glass using sweeper and dustpan and dispose of in the glass break box.

EMERGENCY PROCEDURES

1. **Chemical Spills:** If any chemical gets on your skin or clothing, flush with lots of cold water and notify the teacher immediately. Use the safety shower (while removing clothing) if the spill is extensive. If the chemical gets into the eyes, immediately irrigate the eyes for 15 minutes at the eye-wash station. You will be sent to the nurse.
2. **Burns:** Immerse the burned area in cold water (15 minutes). You will be sent to the nurse.
3. **Cuts and abrasions:** Immediately clean the wound with water, hold a sterile pad firmly over the wound until the bleeding stops, then bandage. If the cut is severe, elevate the wound above the heart. You will be sent to the nurse.
4. **Fires:** Small fires at your station can usually be put out by smothering with a nonflammable material such as a fire blanket, sand, or an inverted beaker. If your clothing catches fire, try to use your lab apron to put it out or wrap in a fire blanket. If necessary, stop, drop, and roll on the floor or use the safety shower. Do not put yourself in danger just to extinguish a fire. Do not use an extinguisher on a person.

Notify your instructor of any accident, no matter how minor !!!!!!!

PROCEDURES FOR HEATING

1. Never reach across a flame.
2. Before heating glass containers, examine them to see that they contain no cracks. Cracked glassware should be given to your teacher.
3. When heating any solid or liquid in a test tube, keep the tube in constant motion and do not point the mouth of the tube at another person.
4. Always hold the test tube that is being heated at an angle, and heat the sides of the tube as well as the bottom.
5. Never look down into a tube containing a reagent or hot water, especially if it is being heated.
6. Never apply a direct flame to a container of volatile or flammable materials, and never place an open flame near containers of volatile or flammable materials.
7. Hot glass looks just like cold glass, so always place hot objects on wire gauze to cool. Hot glass can inflict severe burns. To determine if an item is cool enough to handle, draw the back of the hand close to the object to sense its temperature.
8. Never immerse hot glassware in cold water or on a cold surface. It could shatter.

PROCEDURES FOR WORKING WITH CHEMICALS

All chemicals are potentially harmful to some degree. Avoid direct contact with any chemical. It is especially important to keep chemicals from hands, face and clothing. Many substances are readily absorbed through the skin and through inhalation. Chemicals can also enter the body through the mouth by contamination of the hands or food/drink that was in the lab area, and chemicals can be transferred to the eyes from the hands.

1. Never taste any chemical. Do not taste anything that was in contact with lab equipment.
2. Carefully read the label twice on any bottle prior to using it. Use chemicals only from containers that are clearly labeled.
3. Do not carry large supply bottles to your desk as other students will need them. Chemicals will be provided in small containers for you to take to your lab station. In the instance where you must obtain chemicals from a larger supply bottle, bring an appropriate container to the supply table and take only what you need.
4. Do not return unused portions of chemicals to their containers as you could contaminate the entire bottle. See if other students in your area need the chemical or dispose of the excess as directed by the instructor.
5. Mass chemicals in a weigh container placed on top of weigh paper rather than directly on the balance pan.
6. Never smell an unknown substance directly to determine its odor. Carefully waft the fumes towards your nose.
7. Pour substances from the reagent bottles holding the label side of the bottle in your hand. This prevents dripping on the label and provides a clean side for holding the bottle.
8. When diluting acid always add acid into the water slowly with stirring. The water will absorb the heat produced and also prevent the acid from splashing onto your skin.
9. During mixing, place a vessel in cool water or ice water if the mixing is a very exothermic process (e.g., sodium hydroxide pellets in water, concentrated sulfuric acid in water).

10. If solutions of acids or bases spill onto the table, neutralize the spill and use paper towels to soak up the spill or push it into the sink. Dispose of the towels in the solid waste container. Acids are neutralized with a weak base like sodium bicarbonate (baking soda). Bases are neutralized with a weak acid like acetic acid (vinegar).
11. Disposal of waste chemicals:
    (a) Solid wastes and broken glass are to be placed in the waste jars provided. Do not put any solids, paper, or broken glass into the sink.
    (b) Acids, bases, and water solutions may be washed down the sink (after neutralizing) with large amounts of water, unless your instructor gives you other disposal instructions.
    (c) Volatile or flammable liquids should not be poured down the drain, but should be placed in specially marked containers and kept sealed and away from flames.

CONCLUSION OF THE LAB EXERCISE

1. Clean and dry all of your glassware and your lab counter. Return all equipment to its proper place.
2. Wash your hands thoroughly; alcohol gel is not sufficient to remove chemicals from hands.
3. Check to see that the gas and water are turned off before you leave your working area.
4. Place your goggles in the sterilizer and your apron in its proper place.

CAUSES FOR REMOVAL FROM THE LABORATORY AREA

1. Behaving in such a manner that you can cause injury to yourself or to another person.
2. Not following the prescribed safety rules for the science activity area or the particular science activity being conducted.
3. Performing unauthorized experiments (get teacher permission before deviating from instructions).
4. Not having completed the pre-experiment activities that will allow you to work safely and knowledgeably in the laboratory situation. This is a matter of coming to lab prepared.

Write an Essay on "Staying Safe in the Lab". Make sure to list personal safety equipment, precautions for dealing with heating, how to prevent and put-out a fire, and what to do when an accident occurs. Be specific.

Practice QUIZ for Element Symbols and Polyatomic Ions

Give the name or symbol for each of the following (spelling counts):

Zr		Fe		U	
Si		N		P	
Ni		Bi		Sn	
O		Se		Te	
Cs		V		Cd	
As		Cl		Ar	
S		Co		Be	
Ga		Pt		Hg	
Pb		Au		Ca	
At		Pt		Mg	
Fr		Te		Xe	

Copper		Zinc		Barium	
Seaborgium		Rubidium		Potassium	
Hydrogen		Uranium		Sn	
Cadmium		Manganese		Ytterium	
Astatine		Lithium		Plutonium	
Radium		Fluorine		Lanthanum	
Sodium		Tungsten		Scandium	
Strontium		Radon		Actinium	
Silver		Tin		Arsenic	
Thallium		Chromium		Boron	
Krypton		Thorium		Germanium	

SO_4^{2-}	
NH_4^{1+}	
IO_2^{1-}	
CN^{1-}	
$C_2H_3O_2^{1-}$	
NO_3^{1-}	
CO_3^{2-}	
OH^{1-}	
ClO_4^{1-}	
CrO_4^{2-}	
PO_4^{3-}	

	Periodate
	Hydrogen carbonate
	Sulfite
	Ammonium
	Nitrite
	Dihydrogen phosphate
	Bisulfate
	Hypochlorite
	Fluorate
	Permanganate
	Bromate