AP Chemistry 2019-2020

Next year will be a busy year for us. We have lots to do. To help make a smooth start at the beginning of the term I am giving you a reading assignment and problem set. This material should be a review of what you covered in regular or honors chemistry. The problem sets and notes on chapters 1-3 will be collected on the first block of class and we will have a test scheduled for the third block of school on chapters 1-3.
Enjoy your summer and see you in August!
Ms. Ombelli (m.ombelli@laschools.net)

1) You will need to check out the text from the book depository **Chang and Goldsby "Chemistry" (11th edition)**
2) Reading assignment notes: **Chapters 1-3**
You should know by now how you best remember and retain information that you read. **Take notes**, define vocabulary, and/or do what is best for you.
3) (re)Memorize the names, symbols, and charges of the monatomic and polyatomic ions. (See attached document)
4) (re)Memorize the types of reactions and products formed in the reactions. (See attached document) Remember not to include spectator ions in your balanced reactions.
5) (re)Memorize the solubility rules. (See attached document)
6) (re)Memorize the common lab equipment. (See attached document)
7) Complete Problem Set #1 (Chapters 1-3)

- Work should be done on loose leaf paper or graph paper. Work should be done in pencil or black ink.
- Your full name should be written at the top of each paper
- Each problem should be labeled clearly
- One space should be skipped between each problem
- Show work, supporting reasoning, and answer with correct number of significant figures and proper unit. Work must be organized and legible.
- Make sure your answers include enough of the question to make sense.
- If the question is simply a recall one, show the problem and write what is asked

(Example: Name the following: $Ca_3(PO_4)_2$? On your paper you should show: $Ca_3(PO_4)_2$ calcium phosphate)

Chapter 1: 12, 16, 31, 33, 36, 38, 39, 48, 51, 54, 56, 57, 58, 61, 62 71, 73, 77, 81, 90, 92, 94, 98, 100, 103 on pages 30-35 (25 problems)

Chapter 2: 16, 31, 32, 38, 41, 50, 57, 58, 59, 60, 68, 70, 73, 76, 77, 78, 82, 83, 89, 98, 99, 101, 102, 106, 108 (25 problems)

Chapter 3: 5, 22, 28, 44, 54, 60, 84, 94, 96, 100, 102, 108, 114, 118,130, 134, 136, 142, 144, 146, 148, 152, 154, 156, 164 (25 problems)

8) Obtain a carbonless duplicate lab notebook or you can purchase one from Ms. Mitchell now or in the fall for $20.

ION SHEET

1 PLUS

Hydrogen	H^+
Lithium	Li^+
Sodium	Na^+
Potassium	K^+
Rubidium	Rb^+
Cesium	Cs^+
Silver	Ag^+
Copper (I)	Cu^+
Ammonium	NH_4^+

2 PLUS

Beryllium	Be^{2+}
Magnesium	Mg^{2+}
Calcium	Ca^{2+}
Strontium	Sr^{2+}
Barium	Ba^{2+}
Zinc	Zn^{2+}
Copper (II)	Cu^{2+}
Iron (II)	Fe^{2+}
Mercury (I)	Hg_2^{2+}
Mercury (II)	Hg^{2+}
Tin (II)	Sn^{2+}
Chromium (II)	Cr^{2+}
Manganese (II)	Mn^{2+}
Cobalt (II)	Co^{2+}
Lead (II)	Pb^{2+}
Nickel (II)	Ni^{2+}
Cadmium (II)	Cd^{2+}

3 PLUS

Boron	B^{3+}
Aluminum	Al^{3+}
Cobalt (III)	Co^{3+}
Iron (III)	Fe^{3+}
Chromium (III)	Cr^{3+}
Manganese (III)	Mn^{3+}
Nickel (III)	Ni^{3+}

4 PLUS

Lead (IV)	Pb^{4+}
Tin (IV)	Sn^{4+}

1 MINUS

Hydride	H^{-1}
Bromide	Br^{-1}
Chloride	Cl^{-1}
Fluoride	F^{-1}
Iodide	I^{-1}
Hydroxide	OH^{-1}
Dihydrogen phosophate	$H_2PO_4^{-1}$
Hydrogen sulfite [-or- Bisulfite]	HSO_3^{-1}
Hydrogen sulfate [-or- Bisulfate]	HSO_4^{-1}
Hydrogen carbonate [-or- Bicarbonate]	HCO_3^{-1}
Nitrite	NO_2^{-1}
Nitrate	NO_3^{-1}
Cyanide	CN^{-1}
Permanganate	MnO_4^{-1}
Hypochlorite	ClO^{-1}
Chlorite	ClO_2^{-1}
Chlorate	ClO_3^{-1}
Perchlorate	ClO_4^{-1}
Acetate	CH_3COO^{-1}
Acetate	$C_2H_3O_2^{-1}$
Thiocyante	SCN^{-1}
Formate	$CHOO^{-1}$

2 MINUS

Oxide	O^{-2}
Sulfide	S^{-2}
Selenide	Se^{-2}
Telluride	Te^{-2}
Peroxide	O_2^{-2}
Hydrogen phosophate	HPO_4^{-2}
Sulfite	SO_3^{-2}
Sulfate	SO_4^{-2}
Carbonate	CO_3^{-2}
Chromate	CrO_4^{-2}
Dichromate	$Cr_2O_7^{-2}$
Oxalate	$C_2O_4^{-2}$

3 MINUS

Nitride	N^{-3}
Phosphide	P^{-3}
Arsenide	As^{-3}
Antimonide	Sb^{-3}
Phosphate	PO_4^{-3}
Phosphite	PO_3^{-3}

Bromine and iodine have the same ions, the stems are replaced with “brom” and “iod”.

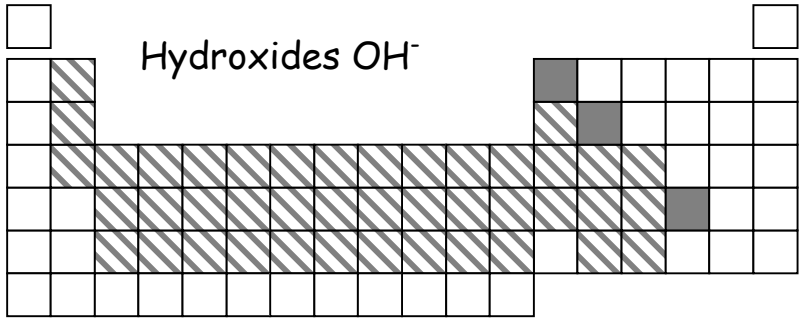
Example: bromate BrO_3^{-1}
Example: iodate IO_3^{-1}

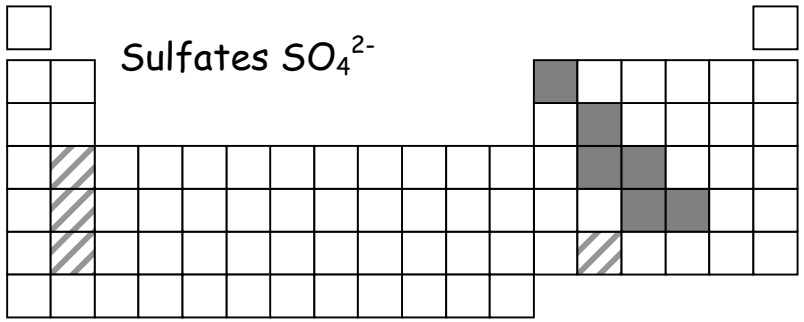
(Re)Memorize the following solubility and ionic charges:

Soluble Compounds
All Group 1 salts (Li^+, Na^+, K^+, Cs^+, Rb^+)
All salts of NH_4^+
All salts of NO_3^-, ClO_3^-, ClO_4^-, and CH_3COO^-

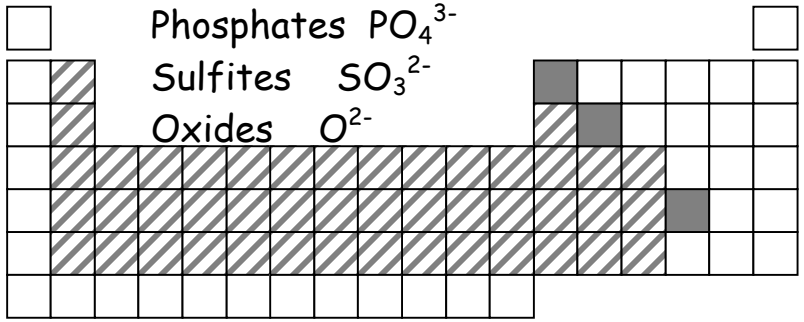
The following figures visually show the salts that are insoluble in water.

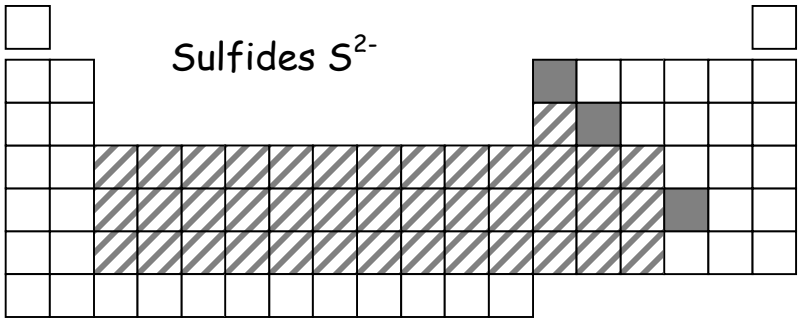
Shows location of metalloids Shows insoluble salts

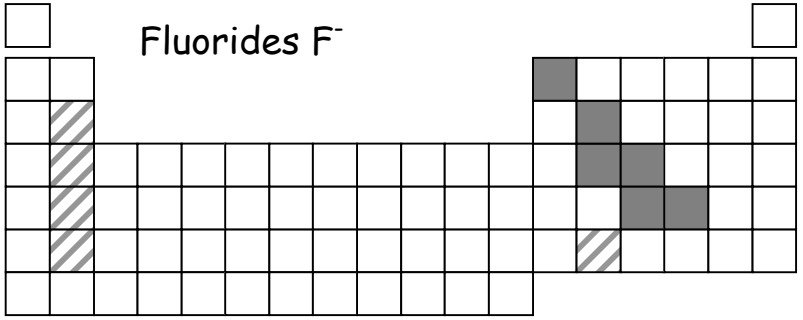


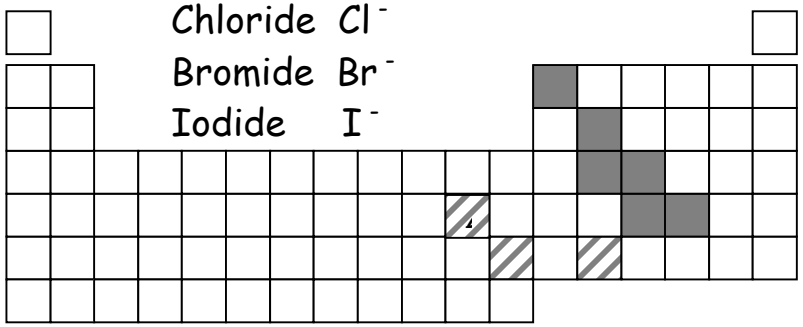


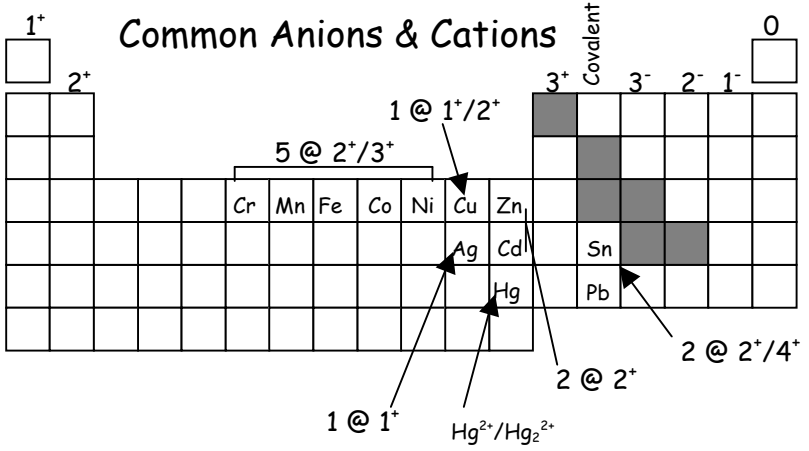
Carbonates CO_3^{2-}
Phosphates PO_4^{3-}
Sulfites SO_3^{2-}
Oxides O^{2-}











TYPES OF REACTIONS – OVERVIEW

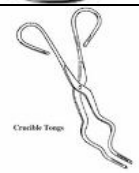
Students are expected to be able to predict and write a balance equation when given the reactants for an experiment. To prepare for this one should MEMORIZE the following standard reactions. When writing the equations one should remember to only include the net ionic equation (drop spectator ions). Use the oxidation-reduction chart on the back to write complex redox equations.

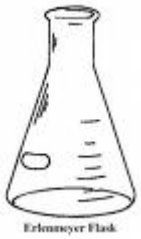
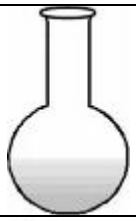
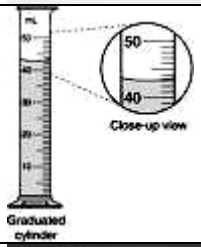
Standard Reaction	Example (not balanced)
1. Nonmetal oxide + $H_2O \rightarrow$ acid	$N_2O_5 + H_2O \rightarrow H^+ + NO_3^-$
2. Metal oxide + $H_2O \rightarrow$ base	$Na_2O + H_2O \rightarrow Na^+ + OH^-$
3. Metal oxide + nonmetal oxide $\rightarrow$ salt (of an oxyanion)	$CaO + SO_3 \rightarrow CaSO_4$
4. Acid + base $\rightarrow$ salt + H_2O (salt usually is not include in net eqn)	$H(Cl) + (Na)OH \rightarrow (NaCl) + H_2O$
5. Salt (with oxyanion) $\xrightarrow{\text{heat}}$ metal oxide + nonmetal oxide	$KClO_3 \rightarrow KCl + O_2$
6. Metal carbonate + acid $\rightarrow$ salt + $H_2O + CO_{2(g)}$	$CaCO_3 + H(Cl) \rightarrow Ca^{2+} + (Cl^-) + H_2O + CO_2$
7. Metal sulfate + acid $\rightarrow$ salt + $H_2O + SO_{2(g)}$	$BaSO_4 + H(Cl) \rightarrow Ba^{2+} + (Cl^-) + H_2O + SO_2$
8. Positive ion + negative ion $\rightarrow$ insoluble salt	$Pb^{2+} + Cl^- \rightarrow PbCl_2$
9. Metal + nonmetal $\rightarrow$ binary compound (remember ionic charges)	$Li + N_2 \rightarrow Li_3N$
10. Active metal + acid $\rightarrow$ salt + $H_{2(g)}$	$Zn + H(Br) \rightarrow Zn^{2+} + (Br^-) + H_2$
11. Active $\left\{\frac{\text{metal}}{\text{nonmetal}}\right\}$ + less active $\left\{\frac{\text{metal}}{\text{nonmetal}}\right\}$ compound $\rightarrow$ less active $\left\{\frac{\text{metal}}{\text{nonmetal}}\right\}$ + Active $\left\{\frac{\text{metal}}{\text{nonmetal}}\right\}$ compound	$Cl_2 + I^- \rightarrow I_2 + Cl^-$
12. H_2 + less active metal compound $\rightarrow$ metal + hydrogen compound	$H_2 + FeO \rightarrow H_2O + Fe$
13. Hydrocarbon + excess oxygen $\rightarrow H_2O + CO_{2(g)}$	$CH_4 + O_2 \rightarrow H_2O + CO_2$
14. Hydrocarbon + limited oxygen $\rightarrow H_2O + CO_{(g)}$	$CH_4 + O_2 \rightarrow H_2O + CO$
15. Group I & II nitrides + $H_2O \rightarrow$ metallic hydroxide + NH_3	$Li_3N + H_2O \rightarrow Li^+ + OH^- + NH_3$
16. Transition metal compound + ligand $\rightarrow$ complex ion	$AgCl + NH_3 \rightarrow Ag(NH_3)_2^+ + Cl^-$
17. Alkali metal + $H_2O \rightarrow$ metal$^+$ + OH^- + $H_{2(g)}$	$Na + H_2O \rightarrow Na^+ + OH^- + H_2$
18. Lewis acid + Lewis base $\rightarrow$ compound	$BF_3 + :NH_3 \rightarrow F_3B:NH_3$
19. Bronsted-Lowry acid + base $\rightarrow$ conjugate base + conjugate acid	$NH_3 + HC_2H_3O_2 \rightarrow NH_4^+ + C_2H_3O_2^-$
20. Metal hydride + $H_2O \rightarrow H_2$ + metal hydroxide	$LiH + H_2O \rightarrow H_2 + Li^+ + OH^-$

To use this table to solve a Redox problem, one reduction half-reaction (read left to right) and one oxidation half-reaction (read right to left).

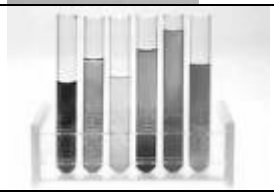
THIS TABLE WILL NEED TO BE MEMORIZED

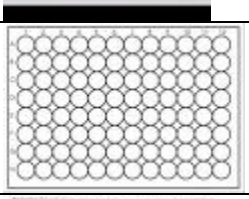
COMMON LABORATORY EQUIPMENT

NAME	Description and/or use	Picture
BEAKER	Glass container, most are pyrex; common sizes are 100 ml, 25 ml, 400 ml; it can be used as a container, shows approximate volume, and may be heated	
BUNSEN BURNER	A metal heating device connected to a gas outlet with rubber tubing; used to heat chemicals in beakers or test tubes; has adjustable air-hole allowing some control of temperature	
BURETTE	It is marked with a milliliter scale and fitted with a stopcock; can be used to withdraw and measure accurate volumes of solutions in titrations	
BEAKER TONGS	Metal with rubber ends; used to handle hot beakers	
CHEMICAL APRON	Chemical resistant rubberized apron used to protect clothing	
CRUCIBLE & COVER	Made of porcelain; used to heat small amounts of solid substances that are being heated strongly at high temperatures	
CRUCIBLE TONGS	Metal utility tongs used for hot crucibles; spring-like jaws with a jaw opening	
DROPPER	Glass tip with a rubber bulb; used to transfer small amounts of liquids	
ELECTRONIC BALANCE	Used for quick, accurate massing	

ERLENMEYER FLASK	Container; common sizes are 125 ml, 250 ml, 500 ml; may be heated; it has a thin neck and a wide base; used to hold liquids when carrying out reactions and preparing solutions	
EVAPORATING DISH	Porcelain dish; used to hold a solution whose solvent is being separated from the solvent by evaporation (often using heat)	
FLORENCE FLASK	Used to hold liquids when carrying out reactions (no heat use flat-bottomed; even heating required use round-bottomed)	
FORCEPS	Metal or plastic, straight-tipped instrument used to isolate and remove small particles	
FUNNEL	Made of glass or plastic; used to hold a filter paper and can be used in pouring (to avoid spills)	
GOGGLES	Used to protect eyes	
GRADUATED CYLINDER	Marked with milliliter (ml) scale and is used to measure volume	
HEAT RESISTANT GLOVES	Used to handle hot glassware or other hot lab equipment	

MORTAR & PESTLE	Heavy porcelain dish with grinder; used to grind chemicals to a powder	
PIPESTEM TRIANGLE (CLAY TRIANGLE)	Triangular wire frame with clay material coverings; used to support a crucible	
PIPETTE	Used to transfer small amounts of liquid	
PLASTIC WASH BOTTLE	Squeezable plastic bottle; used to dispense distilled water	
RING CLAMP (IRON RING)	Iron ring with screw fastener; comes in several sizes; used to fasten to the ring stand as a support for an apparatus	
RING STAND (SUPPORT STAND)	Metal rod that is upright and sits on a heavy base; used as a support and has many uses	
RUBBER STOPPER	Used to cap the openings of glassware such as test tubes or Erlenmeyer flasks	
SCOOPULA	Made of metal; used to transfer solid chemicals	
SPATULA	Made of metal; has a flat rounded end and a rectangular end; used to transfer solid chemicals	
SPOT PLATES	Plastic or ceramic reaction surfaces with slight “dips” for containing small amounts of chemicals	
STIRRING ROD	Made of glass; used to stir combinations of materials	

STRIKER	Made of metal and has a flint; used to ignite the Bunsen burner	
TEST TUBE	Glassware that comes in many sizes; it has many uses and can be heated	
TEST TUBE BRUSH	Brush with wire handle; used to scrub thin glassware	
TEST TUBE CLAMP	Metal clamp with a screw fastener, a swivel and lock nut, an adjusting screw, and a curved clamp; used to hold an apparatus (test tube or burette) to the ring stand	
TEST TUBE HOLDER	Made of metal; has a clamp with a spring handle; used to hold a test tube	
TEST TUBE RACK	May be made of wood, metal, or plastic; used to hold test tubes in an upright position	
THERMOMETER	Made of glass and filled with a red or blue liquid (usually alcohol); used to determine temperature	
TRIPLE BEAM BALANCE	Used for determining the mass, in grams, of a chemical or object	
VOLUMETRIC FLASK	Used when mixing accurate concentrations of solutions. Each flask has a volume marking which is very exact and can be stoppered.	

WATCH GLASS	Curved glass; may be used as a beaker cover or for evaporating very small amounts of liquid	
WELL PLATE	Small plate with several wells; used for reacting small amounts of chemicals	
WIRE GAUZE	Wire screen with ceramic fibered center; used to spread the heat of a flame