AP Chemistry Reference

Memorize the following:
(1) **Names** and **Symbols** for elements

(2) **Polyatomic Ions:**

–1 Charge		**–2 Charge**		**+1 Charge**	
dihydrogen phosphate	$H_2PO_4^-$	hydrogen phosphate	HPO_4^{2-}	ammonium	NH_4^+
dihydrogen phosphite	$H_2PO_3^-$	hydrogen phosphite	HPO_3^{2-}		
hydrogen carbonate (bicarbonate)	HCO_3^-	carbonate	CO_3^{2-}		
hydrogen carbonite	HCO_2^-	carbonite	CO_2^{2-}		
hydrogen sulphate	HSO_4^-	sulphate	SO_4^{2-}		
hydrogen sulphite	HSO_3^-	sulphite	SO_3^{2-}		
nitrate	NO_3^-	chromate	CrO_4^{2-}		
nitrite	NO_2^-	dichromate	$Cr_2O_7^{2-}$		
hydroxide	OH^-	oxalate	$C_2O_4^{2-}$		
cyanide	CN^-	thiosulphate	$S_2O_3^{2-}$		
cyanate	OCN^-	silicate	SiO_3^{2-}		
thiocyanate	SCN^-				
permanganate	MnO_4^-	**–3 Charge**			
chlorate	ClO_3^-	phosphate	PO_4^{3-}		
chlorite	ClO_2^-	phosphite	PO_3^{3-}		
hypochlorite	ClO^-	arsenate	AsO_4^{3-}		
perchlorate	ClO_4^-	arsenite	AsO_3^{3-}		
bromate	BrO_3^-	borate	BO_3^{3-}		
bromite	BrO_2^-				
hypobromite	BrO^-				
perbromate	BrO_4^-				
iodate	IO_3^-				
iodite	IO_2^-				
hypoiodite	IO^-				
periodate	IO_4^-				
acetate	$C_2H_3O_2^-$ or CH_3COO^-				

(3) **Solubility Rules:**
All sodium (Na^+), potassium (K^+), ammonium (NH_4^+), and nitrate (NO_3^-) compounds are soluble in water.

Students are expected to be proficient with each of the following:
- unit conversions and metric prefixes (mega: 10^6, kilo: 10^3, centi: 10^{-2}, milli: 10^{-3}, micro: 10^{-6}, nano: 10^{-9}, pico: 10^{-12})
- density calculations (Density = mass/volume)
- naming/writing formulas for any compound (including ionic, covalent, acids and bases, and organic compounds)
- mole calculations (including percent composition, empirical, and molecular formulas)
- balancing chemical equations, classifying reactions (synthesis, decomposition, single replacement, double replacement, neutralization, and combustion), and predicting products
- stoichiometry (including mass, gases, solutions, and acid/base)
- gas calculations (Boyle's Law, Charles' Law, Gay-Lussac's Law, combined gas law, Avogadro's Law, and ideal gas law)
- solution calculations (molarity and dilution)
- pH calculations
- writing orbital notation, electron configuration, and noble gas notation for any element/ion

Students should review the following topics as they will be further developed in AP Chemistry.
- drawing Lewis structures and classifying VSEPR shapes for molecules
- explaining periodic trends (including atomic radius, ionization energy, and electronegativity)
- thermochemistry calculations (phase changes, heating and cooling, and heat of reaction)
- Le Châtelier's Principle (changing concentration, temperature, pressure/volume)
- Keq expressions and calculations

AP Chemistry Preparedness Assignment

Complete the following questions on a separate piece of paper. Show all work and answer with appropriate units and significant figures. This assignment will be collected by your AP chemistry teacher on the Friday of the first week of school and will be worth 20 points.

(1) Zirconium has a density of 6.52 g/cm^3.

(a) Calculate the mass (in kg) of a block of zirconium that measures 8.00 cm by 2.40 cm by 1.50 cm.

(b) Determine the volume (in mL) of 80.0 g of zirconium.

(c) Convert the density of zirconium to kg/L.

(2) Give the number of **protons**, **electrons**, and **neutrons** of each of the following elements/ions. Give the **electron configuration** notation.

(a) $^{13}_{6}C$ (b) $^{86}_{38}Sr^{2+}$

(3) (a) Name each compound:

(i) $CaCl_2$ (ii) $FeBr_3$ (iii) $BaSO_4$ (iv) $Ni(NO_3)_2$

(v) HBr (vi) $HC_2H_3O_2$ (vii) CCl_4 (viii) N_2O_5

(b) Write each chemical formula:

(i) sodium iodide (ii) lithium hydroxide (iii) cobalt (II) phosphate (iv) chromium (III) chloride

(v) nitric acid (vi) chlorous acid (vii) selenium hexafluoride (viii) nitrogen trichloride

(4) (a) Calculate the number of molecules present in 13.8 g of nitrogen dioxide. How many atoms of *each* element are present?
(b) Calculate the mass of $9.03x10^{23}$ molecules of aluminum chloride.

(5) A compound has the following composition: 44.9 % K, 18.4% S, and 36.7% O. Determine the empirical formula.

(6) A 5.000 g sample of an organic compound contains only carbon, hydrogen, and oxygen. The sample contains 2.726 g of carbon, 0.458 g of hydrogen, and the remainder is oxygen. The molecular weight is 88.104 g/mol. Determine the molecular formula.

(7) Balance each of the following equations:

(a) $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$ (b) $NH_3 + O_2 \rightarrow NO + H_2O$

(8) Zinc reacts with silver nitrate to produce zinc nitrate and silver. If 52.3 g of zinc are present, what mass of silver nitrate is required? What is the mass of each of the products?

(9) Lithium reacts with nitrogen to produce lithium nitride according to the following balanced equation: $6Li + N_2 \rightarrow 2Li_3N$
16.0 g of lithium are combined with 12.0 g of nitrogen. If the reaction actually produces 20.0 g of lithium nitride, calculate the percent yield.

(10) A sample of carbon dioxide has a volume of 125 mL at 20 °C and 1.20 atm. Determine the moles, mass, and molecules of carbon dioxide present.

(11) Calculate the molarity if 500 mL of a solution contains 20.2 g of potassium nitrate. Calculate the resulting molarity if 300 mL of water are ***added*** to the solution.

(12) Write a dissociation equation for the compound sodium carbonate. Determine the molarity of each ion in a 0.100 M solution.

(13) Magnesium reacts with hydrochloric acid to produce magnesium chloride and hydrogen gas. Write a balanced chemical equation for the reaction. If 0.510 g of magnesium reacts with 0.500 L of hydrochloric acid, determine the molarity and pH of the hydrochloric acid solution. Determine the volume of hydrogen gas that will be produced if the reaction takes place at 25 °C and 1.00 atm.