

AP Problem Set = 2

BONDING AND MOLECULAR STRUCTURE:

- 1) The values of the first three ionization energies (I_1 , I_2 , I_3) for magnesium and argon are as follows:

	I_1	I_2	I_3 (KJ/mol)
Mg	735	1443	7730
Ar	1525	2665	3945

- Give the electronic configuration of Mg and Ar
- In terms of these configurations, explain why the values of the first and second ionization energies of Mg are significantly lower than the values for Ar, whereas the third ionization energy of Mg is much larger than the third ionization energy of Ar.
- If a sample of Ar in one container and a sample of Mg in another container are each heated and chlorine is passed into each container, what compounds, if any, will be formed? Explain in terms of the electronic configurations given in part (a)

Element Q has the following first three ionization energies:

	I_1	I_2	I_3 (KJ/mol)
Mg	496	4568	6920

- What is the formula for the most likely compound of element Q with chlorine? Explain the choice of formula on the basis of the ionization energies.

REACTIONS: WRITE THE NET IONIC REACTIONS FOR THE FOLLOWING, ASSUME ALL REACTIONS TAKE PLACE:

- Solid sodium oxide is added to distilled water
- Ethane gas is burned in air
- Solutions of cobalt(II) nitrate and sodium hydroxide are mixed
- A solution of copper(II) chloride is added to a solution of sodium sulfide
- A small piece of sodium metal is added to distilled water

SOLIDS LIQUIDS AND SOLUTIONS

Concentrated sulfuric acid (18.4 M H_2SO_4) has a density of 1.84grams per milliliter. After dilution with water to 5.20M, the solution has a density of 1.38 grams per milliliter and can be used as an electrolyte in lead storage batteries for automobiles.

- a) Calculate the volume of concentrated acid required to prepare 1.00 Liter of 5.20M H_2SO_4
- b) Determine the mass % of H_2SO_4 in the original concentrated solution
- c) Calculate the volume of 5.20M H_2SO_4 that can be completely neutralized with 10.5grams of sodium bicarbonate. (NaHCO_3)

LAB PROCEDURES AND THERMODYNAMICS

An experiment is to be performed to determine the standard molar enthalpy of neutralization of a strong acid by a strong base. Standard school laboratory equipment and a supply of standardized 1.00M HCl and standardized 1.00M NaOH are available.

- a) What equipment would be needed?
- b) What measurements should be taken?
- c) Without performing calculations, describe how the resulting data should be used to obtain the standard molar enthalpy of neutralization
- d) When a class of students performed this experiment, the average of the results was -55.0kilojoules per mole. The accepted value for the standard molar enthalpy of neutralization of a stron acid by a strong base is -57.7 kilojoules per mole. Propose two likely sources of experimental error that could account for the result obtained by the class.