SAMPLE PROBLEMS FOR CHAPTER 4-AP CHEMISTRY

Sample problem 1

Calculate the molarity of a solutions prepared by dissolving 11.5 g of solid NaOH in enough water to make 1.50 L of solution.

Sample problem 2

Calculate the molarity of a solutions prepared by dissolving 1.56 g of gaseous HCl in enough water to make 26.8 mL of solution.

Sample problem 3

Give the concentration of each type of ion in the following solutions:

a. 0.50 M Co(NO3)2 b. 1 M Fe(ClO4)3

Sample problem 4

Calculate the number of moles of Cl- ions in 1.75 L of 1.0 x 10-3M ZnCl2

Sample problem 5

Typical blood serum is about 0.14 M NaCl. What volume of blood contains 1.0 mg of NaCl?

Sample problem 6

To analyze the alcohol content of a certain wine, a chemist needs 1.00 L of an aqueous 0.200 M K2Cr2O7 solution. How much solid potassium dichromate must be weighed to make this solution?

Sample problem 7

What volume of 16 M sulfuric acid must be used to prepared 1.5 L of a 0.10 M solution? How would you prepare this solution?

Sample problem 8

Using the solubility rules, predict what will happen when the following pairs of solutions are mixed.

1. KNO3(aq) + BaCl2(aq) →
2. Na2SO4(aq) + Pb(NO3)2(aq) →
3. KOH(aq)  + Fe(NO3)3(aq) →

Sample problem 9

For each of the following reactions, write molecular equation, the complete ionic equation, and the net ionic equation.

1. Aqueous potassium chloride is added to aqueous silver nitrate
2. Aqueous potassium hydroxide in mixed with aqueous iron(III) nitrate

Sample problem 10

Calculate the mass of solid NaCl that must be added to 1.50 L of a 0.100 M AgNO3 solution to precipitate all the Ag+ ions in the form of AgCl

Sample problem 11

When aqueous solution of sodium sulfate and lead (II) nitrate are mixed, lead (II) sulfate precipitates. Calculate the mass of lead (II) sulfate when 1.25 L of 0.0500 M Pb(NO3)2 and 2.00 L of 0.0250 M Na2SO4 are mixed.

Sample problem12

What volume of a 0.100 M HCl solution is needed to neutralize 25.0 mL of 0.350 M NaOH?

Sample problem 13

In a certain experiment, 28.0 mL of 0.250 M HNO3 and 53.0 mL of 0.320 M KOH are mixed. Calculate the amount of water formed in the resulting reaction. What is the concentration of H+ and OH- in excess after the reaction goes to completions?

Sample problem 14

A student carried out an experiment to standardize a sodium hydroxide solution. To do this, the student weighs out a 1.3009 g sample of potassium hydrogen phthalate (KHC8H4O4, often abbreviated KHP). KHP (molar mass 204.22 g/mol) has one acidic hydrogen. The student dissolves the KHP in distilled water, adds phenolphthalein as an indicator, and titrates the resulting solution with sodium hydroxide solution to the phenolphthalein endpoint. The difference between the final and initial buret reading indicates that 41.20 mL of the sodium hydroxide is required to react with the 1.3009 g KHP. Calculate the concentration of the sodium hydroxide

Sample problem 15

An environmental chemist analyzed the effluent (the released waste material) from an industrial process known to produce the compounds carbon tetrachloride and benzoic acid (CCl4 and HC7H5O2 respectively), a weak acid that has one acidic hydrogen atom per molecule. A sample of this effluent weighing 0.3518 g was shaken with water, and the resulting aqueous solution required 10.59 mL of 0.1546 M NaOH for neutralization. Calculate the mass percent of benzoic acid in the original sample

Sample problem 16

Assign oxidation states to all atoms in the following

1. CO2
2. SF6
3. NO3-

Sample problem 17

Metallurgy, the process of producing a metal from its ore, always involves oxidation-reduction reactions. In the metallurgy of galena (PbS), the principal lead-containing ore, the first step is the conversion of lead sulfide to its oxide (a process called roasting):

2PbS(s) + 3O2(g) → 2PbO(s) + 2SO2(g)

The oxide is then treated with carbon monoxide to produce the free metal:

PbO(s) + CO(g) → Pb(s) + CO2(g)

For each reaction, identify the atoms that are oxidized and reduces, and specify the oxidizing and reducing agents.

Sample problem 18

PbO(s) + NH3(g) → N2(g) + H2O(l) + Pb(s)