Gravimetric Determination of Arsenic

Name _____ Date: _____

This homework uses the virtual lab. Using a computer that is running Microsoft windows or Macintosh OS 10.1 or higher, go to http://ir.chem.cmu.edu *and click on* "Virtual Lab" *in the upper left-hand corner. You can then either,*

a) Run the lab as a Java Applet in a web browser by clicking on "Run the applet >>".
b) Download and install the lab on your computer, by clicking on "download" *at the bottom of the page.*

To load the assignment, select "Load Homework..." *from the* "File" *menu, and select* "Molarity **:** Gravimetric Determination of Arsenic".

The toxicity of arsenic has been known since antiquity, but it is still a cause of poisonings today; more than 1300 exposures to arsenic were reported in the United States in 1998, resulting in 4 fatalities. The biggest problem is the presence of arsenic in drinking water, especially in the country of Bangladesh, where most of the wells are contaminated.

In this problem, you are going to use a simple procedure to determine the concentration of arsenic in two samples of contaminated soil. When groundwater flows through soil containing arsenic, some of the arsenic is transferred to the water. Although your real concern is the amount of arsenic in the drinking water, it is better to analyze the soil because the arsenic is more concentrated in the soil than in the water. In the samples you have in your lab, all the arsenic present in a 1.00 kg sample of soil has been converted to arsenate (AsO_4^{-3}).

Design and perform an experiment to determine the amount of arsenate in the solutions, based on the following reaction,

$$AsO_4^{-3} + 3\ Ag^{+} \Rightarrow Ag_3AsO_{4\,(s)}$$

From your measurements, determine the mass percent of As in the soil. [if we can find the amount of As that is considered bad, we can add that here.]

Note to teachers:

You may want to give you students a procedure. This can be done by replacing the text starting with "Design and perform an experiment.." with

The amount of arsenic present in a solution can be determined using the following reaction to convert the arsenate into a solid.

$$AsO_4^{-3} + 3\ Ag^{+} \Rightarrow Ag_3AsO_{4\,(s)}$$

The mass of solid produced can then be used to calculate the amount of As present in the soil.

1). Add 20 ml of 1M Silver nitrate solution to the soil sample.
2). Write down the amount of silver arsenate formed.
3). Calculate the mass of arsenic present in the solution as arsenic metal.

4) From your answer to part 3, determine the mass percent of As in the 1.00kg soil sample.