AP CHEMISTRY.

Labs on Paper.

Analysis.

There are two varieties, qualitative and quantitative. We give you a white powder. What’s in it? You test it and find sugar and flour. You’ve done a qualitative analysis.

We give you a white powder, and we tell you that it contains silver ions. “What % of the mass of this substance is silver?? Now you need to do a quantitative analysis. There are several ways to do “quant.” One, titration, you have already learned. You will do more titration in acid-base chemistry later. Another method is called gravimetric analysis. As the name suggests, it is by mass.

Your first step is to weigh the powder. It has a mass of 5.000 grams. Now if you can find the mass of the silver in the powder, just divide by 5.000, multiply by 100%, and PRESTO - % silver by mass. But how can we find the mass of just the silver ions? The usual method is “selective precipitation.” You dissolve the 5.000 g sample in water. You then add a reagent ( a solution used in chemical analysis) that will form a precipitate ONLY with silver ions. Let’s say we use a solution of sodium chromate, Na2CrO4.

You place your solution of the powder in a beaker, and you add some of the sodium chromate solution. As you do, you see a red precipitate (insoluble solid) forming in the beaker. The precipitate is Ag2CrO4. You need to make sure that ALL of the Ag+ has precipitated, so you continue to add the reagent until no more precipitate forms. (It doesn’t matter if you add a lot of extra Na2CrO4. You’ll see why not.)

Now you need to find the mass of the precipitate. Not so easy! You need to separate the precipitate from the soluble material in the solution. You use filtration!

A filter removes only the insoluble material; the sodium and nitrate ions, along with the water, pass right through.

The filter paper is folded into a funnel shape, and then inserted into a funnel. All of the contents of the beaker are poured into the funnel, and the soluble material drips out, while the precipitate stays on the paper. You then WASH the precipitate with pure water, and allow it to drip out. (What is the purpose of the washing? Revealed later…)

Now all of your precipitate is on the filter paper, so you can weigh it. OOPS! You forgot the weigh the filter paper before you wet it! What do you do? You have to start over!!! (This does happen. Even to teachers sometimes!)

OK, you DID get the mass of the filter paper, and it is 6.500 grams. So now, if you weigh the filter paper with the precipitate, you get the mass of the precipitate, right? WRONG! The filter is wet! If you find the mass now, it will include water, and be higher than actual! You need to dry the filter paper and precipitate. In our lab, we place it in a warm, dry place overnight.

OK, the dry filter paper and precipitate have a mass of 10.500 grams. That’s all the data we need. Let’s see how to use it.

Mass of dry filter paper 6.500 grams

Mass of unknown powder 5.000 grams

Mass of dry precipitate 10.500 grams

and filter .

Mass of precipitate \_\_\_\_\_\_\_\_\_\_\_\_\_

MOLES of precipitate

of Ag2CrO4 ( molar mass=332) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mass of silver ion \_\_\_\_\_\_\_\_\_\_\_\_

Did you get 2.60 grams of silver ion? If not, try again!

% of silver in the powder \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What was the purpose of “washing” the precipitate?

Explain whether each of the following errors would produce too high, or too low a % of silver.

1. Not completely drying the filter paper and precipitate

2. Not washing the precipitate.

3. Not pouring ALL of the contents of the beaker through the filter.

4. Pouring too fast, so that some of the solution goes AROUND, rather than through the filter.

5. Suppose that the white solid was actually AgNO3. What is the % of Ag in AgNO3?

6. What would be the % error in the experiment if the solid was AgNO3 ?