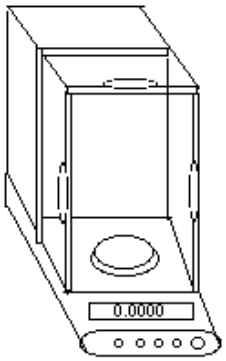
A. Weighing with an Analytical Balance

Purpose: You will learn how to weigh an object using an analytical balance.

Introduction: A balance that could weigh to the nearest gram was first invented in the 18th century. Balances used in this experiment are much more sensitive, weighing to the nearest 1/100th or 1/1000th of a gram. The gram, abbreviated g, is the metric unit of mass. To give you an idea of how much that is, half a dime weighs a little more than a gram.

Apparatus: We will use two different kinds of balances. The top loading balance (top figure) weighs to nearest 0.01 g and the one with sliding doors, weighs to the nearest 0.001 or 0.0001 g. CAUTION: Never overload balances. The maximum load without damaging them is about 300 g.



Procedure:

Part A Weighing your signature and comparing balances

Try this experiment with two balances, the top loader that weighs to the nearest 0.01 g and the more sensitive balance, the one with doors. You can start with either one.

1. Zero the balance by pressing the "TARE" key on the front face. This should give a digital display of either 0.00 g for the top loader and 0.000 g or 0.0000 g for the ones with doors.

2. Place a piece of paper near the center of the balance pan and record the mass directly from the digital display.

3. Remove the paper and write your signature on it.

4. Reweigh the paper with signature. Record result on data page. Find out how much your signature weighs by subtracting the mass of the plain paper from that of the signed paper.

5. Repeat with the other kind of balance.

Part B Composition of pennies

Any of the balances can be used for this part.

1. Find pennies minted in the 60's, 70's, 80's, 90's and 00's.

2. Weigh one from each decade and record date and mass on the data sheet.

3. Weigh additional pennies as needed to find the year when the composition changed.

Data and Results (Using an Analytical Balance)

Name(s) _____

Part A Weighing your signature

	Mass in grams (g) using the top loader*	Mass in grams (g) using the analytical balance*
Paper		
Paper plus signature		
Signature		

* You can record just the number, since the column is already labeled in grams, g.

Part B Composition of pennies

Year	Mass in grams (g)	Year	Mass in grams (g)

Questions:

1. How did the measurement of the mass of your signature depend on the sensitivity of the balance that was used?
2. What is the purpose of the doors on the analytical balance?
3. In what year did the composition of the penny change?
4. There are two metals in all the pennies. One is zinc, Zn. What is the other one?

Instructor's Guide
(Balances)

Time: 30 min. ??

Equipment and Materials: For 5 groups:

Items	**Number**	**Comment**
pennies before 1982 and after 1982	20 of each year	1982?
Top leaders	5	
Analytical balances	5	

Ideas/ Information
1. In addition to learning to use a balance, students will learn to record and interpret data.

2. Before 1982, pennies were 95% copper and 5% zinc.
Pennies minted after 1982 are 90% zinc with a copper coating, 10 % copper.