# Introductory and General Chemistry Worksheet

Lab / Section:_______________ Student Group: Manager:___________________________
TA:________________________ Recorder:___________________________
Technician: _________________________
Presenter: __________________________

1. Identification of Equipment:

Consider the items identified on page 2, and answer the following questions:

a. List all the items that you think would be used to measure liquids.

b. What features do all the items in your list have in common?

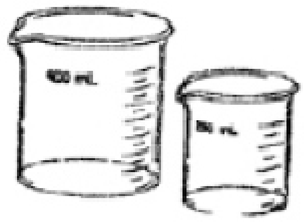
c. Did you include item k (side-arm flask) in your list? Why or why not?

d. Which item(s) would you use to measure out a solid?

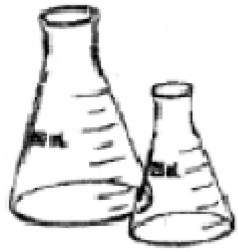
e. Which item(s) would you use to contain a liquid/solution while heating?

f. Which item(s) would you use to contain a solid while heating?

g. Why do you think the tongs would be useful in the chemistry lab?



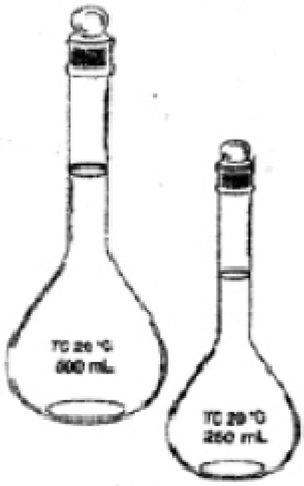
a. beakers



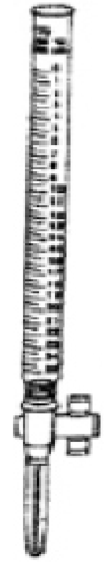
b. Erlenmeyer flasks

c. conical filter

d. crucible

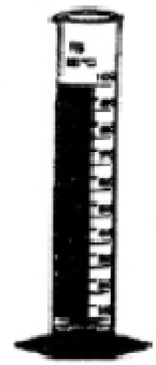


e. volumetric flasks



f. buret

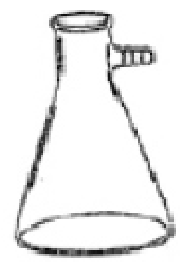
g. transfer pipet



h. graduated cylinder

i. spatula

j. tongs



k. side-arm flask (filtering/drying)

2. Data Treatment/Calculations:

Many scientific investigations require measurements and calculations. All measurements contain a certain amount of error or uncertainty. For example, the mass of an object weighed on a top-loading balance may be recorded as 2.47 grams. The uncertainty in the mass of the object is ± 0.01 grams. In other words, the real mass of the object lies in the range of 2.47 - 2.48 grams. Error in a measurement can be identified as either **determinate error** or **indeterminate error**. Determinate error is an error that can be identified and corrected. An example would be an analytical balance that is not calibrated correctly and always reports the mass as 0.02 grams greater than the real mass. This error can be identified through careful observation and corrected. Indeterminate error typically results from the limitations of your equipment and can not be corrected. An example would be the ± 0.01 grams uncertainty in the top-loading balance. Data obtained by measurement or calculation can be evaluated in terms of its **accuracy** and **precision**. Accuracy refers to the agreement between a measured or calculated value and a known or true value, while precision refers to the agreement between a replicate set of measurements.

Consider two students who were measuring the mass of a solid object using two different analytical balances. Each student weighed the object three times and recorded their results, which are provided below:

| | | | |
|---|---|---|---|
| Student 1: | 2.473 g | 2.462 g | 2.455 g |
| Student 2: | 2.387 g | 2.592 g | 2.668 g |

a. Calculate the average mass obtained from the data of each student.

Student 1: _______________ Student 2:__________________

b. Which set of data is more precise? Explain.

c. If the true mass of the object was 2.547 g, which result is more accurate? Explain.

d. Go back to the items you listed in part 1(a) for measuring liquids. Which item(s) would yield greater precision? Which would yield the least precision?

3. Graphing of Data:

A pictorial diagram or display of data is called a graph. Graphs are useful when exploring the relationships between data and/or experimental variables. When graphing data, the **independent variable** is plotted on the x-axis (or abscissa), while the **dependent variable** is plotted on the y-axis (or ordinate). Consider, for example, a graph which displays average daily temperature over the course of a six month period. The independent variable would be the date (since it is "independent" of temperature), while the dependent variable would be the average daily temperature (because it "depends" on the date).

In a typical experiment, the vapor pressure of a liquid was measured at several temperatures. The data are summarized below.

| | | | | | | |
|---|---|---|---|---|---|---|
| Temperature (K): | 263 | 273 | 283 | 293 | 303 | 313 |
| Vap. Pres. (torr): | 80.1 | 133.6 | 213.3 | 329.3 | 495.4 | 724.4 |

a. If you were to graph this data, which variable would be the independent variable and which the dependent variable?

b. Plot the data appropriately using the graph paper supplied.

c. Fill in the table below by calculating the corresponding value of 1/T for each temperature and the log(P) for each vapor pressure.

| Temperature (K) | 1/T | Vapor pressure (P, in torr) | log (P) |
|---|---|---|---|
| 263 | ______________ | 80.1 | ______________ |
| 273 | ______________ | 133.6 | ______________ |
| 283 | ______________ | 213.3 | ______________ |
| 293 | ______________ | 329.3 | ______________ |
| 303 | ______________ | 495.4 | ______________ |
| 313 | ______________ | 724.4 | ______________ |

d. Using the calculated data from the table, graph log(P) vs 1/T.

e. What is the difference between the two graphs?

f. If you wanted to estimate the vapor pressure of the liquid at a different temperature (e.g., 253 K or 298 K) which graph would provide a more accurate result? Why?

*Name* ______________________ *Section* ______________________ *Date* ______________

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