

## Quantitative Techniques

Several of the experiments in this course involve quantitative measurements. The student is asked to analyze a solid or a solution for a given substance to the highest degree of accuracy and precision that is possible using the equipment at hand. That equipment, by the way, is of very good quality. One of the main objectives of this course is to teach the student the elementary skills in using quantitative techniques, and the associated attitudes of cleanliness, neatness, orderliness and respect for the equipment.

Each of the following techniques will be used several times during this course. Every time they are required the student will be asked to review this section. The techniques are spelled out in some detail. After a few times, they should become second nature. As with any skill or habit, it is extremely important to learn the **correct** way to do things. It is only after one knows what the correct procedure is and why it is correct, that one can know whether a short cut is permissible or not. In this course, we shall emphasize correct procedures and penalize students who are sloppy or ignore essential aspects of technique. Actually, poor technique is self-penalizing; it results in inaccurate results and therefore, low marks.

### Gross Errors of Technique

Errors from these sources are not, strictly speaking, errors, since erroneous results caused by them are avoidable by careful attention to details. The precision with which an analyst can work depends in high degree upon his/her physical condition. A tired or sleepy person cannot expect to do careful work and to make exact measurements. To obtain best results one must be alert and interested in what is being done.

The beginning student needs to learn to take great care in ordinary laboratory manipulations.

Many a determination has been lost due to failure to guard against:

- a) Spilling a solution of a sample because of a careless collision.
- b) Splashing sample solution out of the container by careless addition of water or reagent.
- c) Recording weights incorrectly.
- d) Neglecting to cover a beaker or flask and allowing impurities to fall into the sample.
- e) Neglecting to label or identify containers and confusing samples.
- f) Neglecting to read a burette when beginning or ending a volume measurement or not allowing the solution in a burette to drain properly before reading the volume.
- g) Weighing an object at a different temperature than that of the analytical balance.
- h) Disregarding precise directions for procedure and taking short cuts not justified by the precision required.

Finally, be sure always to record all data using the maximum number of significant figures justified by the sensitivity of the equipment.