

§2.1.2 Errors and the correction approaches

I. Determinate errors (Systematic errors).

1. Characteristics:

(1) may be unidirectional and affect the analytical result constantly.

(2) at the same conditions, measure again, appear again.

(3) affect accuracy, instead of precision.

(4) can be detected and corrected.

2. Reasons of occurrence:

(1) *Methods*—— the method chosen is imperfect
e.g.: slight solubility of a precipitate, unsuitable indicator in titrations.

(2) *Equipment* ---- the equipment has limitations
e.g.: uncalibrated weights, glassware, faulty equipment;

(3) *Reagents*-----reagents used contain impurities
e.g.: the disqualification of ionic water, the purity of reagent is poor
(containing the test component or interference ions)

(4) *Personal judgments*
e.g.: Number biases, colorblind or have a decreased sensitivity to one of the colors.

3. correction:

1). *Methods*—— apply standard methods (selection of the method, controlling the variables of the method).

2). *Equipment*—— calibrating equipment.

3). *Reagents*----- running a blank or contrast experiment.

4) *Personal judgments*—— careful operation

II. Indeterminate errors (Random errors).

1.Characteristics:

- (1) indeterminate, may be positive or negative
- (2) difficult to eliminated or reduced
- (3) following a normal distribution

2. Reasons of occurrence:

accidental factors (e.g., T, P, humidity).

3. Correction:

Adding replicate measurement times.

III.Mistakes

This kind of error is caused by the operation mistakes (unconsciousness).

e.g., the sample is spilled as weighing; the titrant is added out of the volume flask as the titration is processed.

One should judge the systematic error or random error correctly according to the corresponding characteristics.