Balances

Definitions

Accuracy: the agreement between the measured weight and the calibrated weight of an object. It depends on the calibration of weight and the scale divisions of the balance.

Precision: the degree of agreement between repeated weighing of the same mass expressed as one standard deviation in mass unit.

Sensitivity: the ratio of the change in scale division to a specific weight change

Balances are essential laboratory instruments that are widely used for weighing of various substances (powders, crystals and others) in the laboratory. For instance, to prepare reagents, stains and culture media, balances are required to weigh accurately and precisely within the needed range.

They should be kept clean and located in an area away from heavy traffic, large pieces of electrical equipment, and open windows. To minimize any vibration, as interference that may happen, a slab of marble is placed under the balance. Balances in medical laboratory may be:

A. Rough balances (mechanical balances)

B. Analytical balances

Rough balances

Rough balances are several types. Some of them use sliding scale, some have a single or double pan (s) .

They are used for weighing substances, **which do not call for extreme accuracy**. While operating, they do not require mains electricity or battery power and **are currently less expensive** than analytical balances of the similar sensitivity.

Some rough balances weigh **accurately to 0.1 gm** of a substance.

Two - pan balance is a rough balance, which has two copper pans supported by shafts.

It is used:

• To weigh large amounts (up to several kilo grams)

• When a high degree of accuracy is not required.

Example: 20.5 gm, 36. 5 gm, etc. The sensitivity of a two pan balance is 0.5 gm.

The sensitivity of a balance is the smallest weigh that moves the pointer over one division of the scale. For instance, if the sensitivity of balance is 1 mg, this means that a weight of at least 1.0 mg is needed to move the pointer over one scale. For routine laboratory purposes the sensitivity of a balance can be considered to be the smallest weigh that it will measure accurately. Usually the larger the amount of substance to use in a reagent, the least accuracy is required.

Analytical balances

An **analytical balance** is a class of balance designed to measure small mass in the sub-milligram range. The measuring pan of an analytical balance is inside a **transparent enclosure with doors** so

that dust does not collect and so any air currents in the room do not affect the balance's operation.

This enclosure is often **called a draft shield**. The use of balance safety enclosure, allows a smooth turbulence-free airflow that prevents balance fluctuation and the measure of mass down to 1 µg without fluctuations or loss of product. Also, the sample must be at room temperature to prevent natural convection from forming air currents inside the enclosure from causing an error in reading.

Nowadays analytical and electronic balances are the most popularly used balances in medical laboratories to provide a **precision and accuracy** for reagent and standard preparation.

These balances are used:

1. To weigh small quantities usually in **mili gram**(mg) range
2. When **great accuracy** is required

Example, 2.750mg, 0.330 mg, 5.860mg, etc. Its sensitivity is 0.5 mg to 1 mg depending on the model.

Note : **The accuracy of a balance should be checked regularly**.

Use and care of balances

The following should be applied when using a balance:

1. Read carefully the manufacturer's instructions.

2. Always handle a balance with care.

3. Put the balance on a firm bench away from vibration, draughts and direct sunlight.

4. Before starting to weigh, zero the balance as directed by the manufacturer. If using a beam balance, check the position of the beam.

5. Weigh the chemicals at room temperature in a weighing scoop or small beaker. Never put the chemicals directly on the balance pan.

6. When adding or removing a chemical, remove the container to avoid spilling any chemical on the balance.

7. When using an analytical double pan balance, bring the pans to rest before adding or removing a chemical.

8. Protect the weights from dust, moisture and fungal growth.

9. Use small brush to remove any chemical, which may have been spilt on the balance.

10. A container of self - indicating **silica gel** should be kept inside the analytical balance case to remove any moisture present in the atmosphere.

11. Keep the balance clean.

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