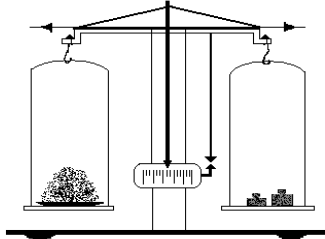


2.2. Balance scale

These scales are the centigrade scales commonly used in the preparation of magistral drugs in pharmacies. Used for weighing weights greater than 10 mg.



Zero point of the scales: When the scales are in the fully horizontal position and open without the effect of the air current, the point is the point at which the display stops after it has been able to move back and forth. Zero point can also be calculated from the oscillations of the display, the average of the farthest points the display shows on the right and left.

Sensitivity of the scale: The indicator is the smallest weight that can be diverted from a zero to one dividing line. Sensitivity in a scale should be at least 10 mg / division when the salvers are empty or both salvers have a weight of 10 g. As the weight increases in the salvers, the sensitivity of the balance decreases practically.

Study 2.1.

Controls with balance scale

Sensitivity control

1. The scale is brought to the full horizontal position, away from the airflow, with a set screw on its feet by the help of plumb or water gauge.
2. With the help of the adjustment screws on both sides of the scale, when the scale is turned on, the display stops at zero point.
3. Place 10 mg on the right salver and slowly lower the handle to make the scale work. At the end of the oscillations, the dividing line that the display stands on its own is determined and written.
4. The scale is turned off, then 20 g's are placed in the center of the two salvers and the scale opens. The divider line of the display is determined and written.
5. Place 20 g's on both salvers and if the display does not stop at zero, it is brought to the balance with additional weights. 10 mg is added to the right side and the scale is opened. The divisor line on which the display stops is determined. If the deviation is not obvious, repeat 20 mg instead of 10 mg.
6. The last two operations are repeated once with 100 g and the three results are displayed in a table. Sensitivity in item 3 is now considered as the sensitivity of the scale.

Example 1. What is the sensitivity of the scale that slides 2 lines with 10 mg?

$$\begin{array}{r} 10 \text{ mg} \quad 2 \text{ slide} \\ X \text{ mg} \quad 1 \text{ slide} \\ \hline \end{array}$$

$$X = 5 \text{ mg/slide}$$

Example 2. On a scale with a sensitivity of 3 mg, at least how many grams of substance can you weigh with 5% error?

$$\begin{aligned} \text{Error (\%)} &= \text{Sensitivity} \times 100 / \text{Weight} \\ 5 &= 3 \times 100 / \text{Weight} \\ \text{Weight} &= 60 \text{ mg} \end{aligned}$$

If weighing less than 60 mg with this scale, an error more than 5% is made.

Questions:

1. How many lines did the display slide with 10 mg? What is the sensitivity of the scale?
2. When there are 20 grams on both salvers and 10 mg is placed on one of the salver, how many lines did the display slide? What is the sensitivity?
3. When there are 100 grams on both salvers and 10 mg is placed on one of the salver, how many lines did the display slide? What is the sensitivity? Compare results with questions 1 and 2.
4. With the assumption that the arms are equal and the weights are reliable, how many milligrams of mistake can you make when weighting a 20 mg item on your scale and how many percent of the error corresponds to that?
5. Under the same conditions, what is the error % when you weigh 1 g of material on your scale?
6. Since the weighing error on the prescriptions will not exceed 5%, how many grams can you weigh accurately with your scale?
7. Which of the scales with the following values is more sensitive?
 - a. 6 mg/slide
 - b. 4 mg/ slide

Study 2.2.

Equalization control of the balance arms

In order for weights to be correct, the scale arms must be equal.

1. The scale is brought to the balance, adjusted by checking the zero point.
2. A weight of 20 grams is placed on the center of both salvers and the scale is opened. If the scale is not balanced, the light plate is brought to the balance with additional weights.
3. The 20 g 's (if any with additional weights) are shifted, and if the display deviates from zero, how many milligrams deviates it (you can also determine this from scale sensitivity). In order for this slip to be within acceptable limits, the weight that compensates for the deflection must not exceed 20 mg.

Example 3. If 2 g is placed on each salver on an equal-arm scale, when the scale is balanced with an additional 20 mg, the scale shows a deviation of 20 mg between the 2 g's. Weighing with one of the two grams will be 20 mg different from the other. What is the percentage of this difference?

2000 mg	20 mg
100 mg	X
$X = \pm \% 1$	

Questions:

1. If there is deviation in the balance control of the scale arms when 20 grams are placed on the salvers, how much weight is placed on which side of the display comes to zero point?
2. Write the results of the above study. According to these results, how did you come up with the equality of the arms of your scale?
3. Using a scale with a sensitivity of 4 mg / division, find the error% made when weighing 50 g and 2.5 g. Explain which weight is closer to the truth.

Study 2.3.

Electronic scales

Setting the scales:

1. Adjust the water level using the adjustment screws on the feet of the scales.
2. Set to zero according to the specifications of the scales.

Weighing:

1. Place the appropriate weighing paper or container on the scale. With the help of the thumbwheel, tare the weighing paper or the container.
2. Add the material until the desired weight reading is reached.

Questions:

1. What is the sensitivity of your electronic scale?
2. How much material can be weighed (minimum and maximum) with the electronic scale you are handling?

Caution: Do not move electronic scales from place to place for any purpose.