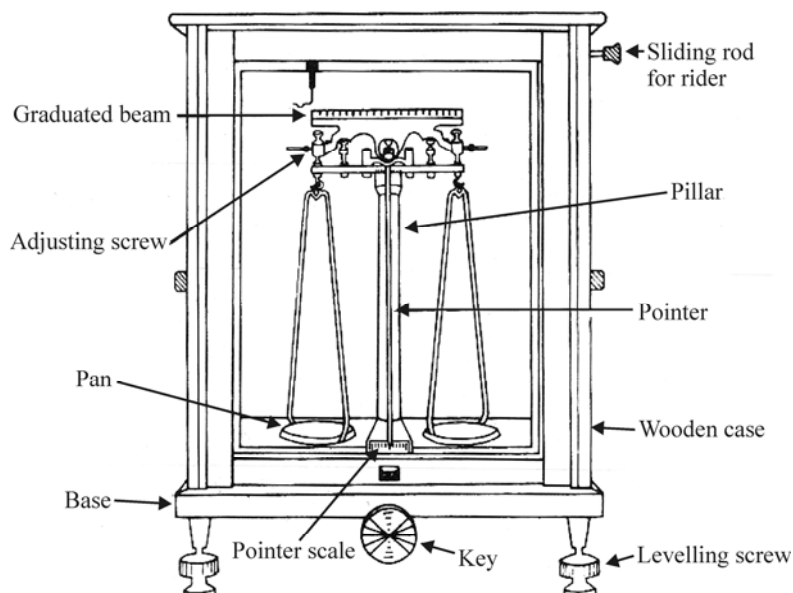


EXPERIMENT 1

Aim: To understand the working of an Analytical Balance.



Sketch of an Analytical Balance

Reference

1. Beckett, A.H. and Stenlake, J.B. *Practical Pharmaceutical Chemistry*. Edition 4th. Part 1. PP 114-123. CBS Publishers & Distributors, New Delhi.
2. Singh, H. and Kapoor, V.K. *Practical Pharmaceutical Chemistry*. Edition 1st. PP 96-97. Vallabh Prakashan, Delhi.

Requirement

Analytical Balance, weight box, fractional weights, proper sized spatula, forceps, weighing bottle, receiving container.

Theory

Weighing is an important operation in the experiments involving quantitative analysis. In spite of that weighing is a common source of

error that can be difficult to detect in the final analytical results. The tool employed for weighing is an analytical balance. For most analytical purpose an analytical balance is used which has maximum load capacity of 100-200 g and sensitivity of 0.1 mg.

Features of an Analytical Balance

1. Beam supported on a pillar
2. Pans

The beam is a rigid piece of metal which rests through a knife edge of agate on a plate of agate attached to the pillar top. On each end of the beam, at equal distance from the central knife edge, are two terminal knife edges of agate facing upwards. Each terminal edge supports a suspension from which a pan is hung. To the centre of the beam a long pointer is attached which moves over a scale at the foot of the pillar. The top of the beam is divided accurately for the use of a rider. The two adjusting screws at each end of the beam are used for adjusting the equilibrium position. The balance is fixed with leveling screws at the bottom, and a plumb line suspension.

Use of a Rider: Weights smaller than 10 mg are inconvenient to handle on the conventional analytical balance, therefore a rider is used. The right hand side of the balance is normally used. The rider is placed at division 0 before adjusting the balance. If the rider is placed at marking 10 on the right hand section of the scale then its effect is equal to 0.01 g weight placed on the right hand pan of the balance. If it is hung at marking 4 the effective weight is equal to 0.004 g. The distance between two smaller divisions is 0.0002 g. Thus if the rider is placed on the second smaller division between the markings 6 and 7, the weight is 0.0064 g.

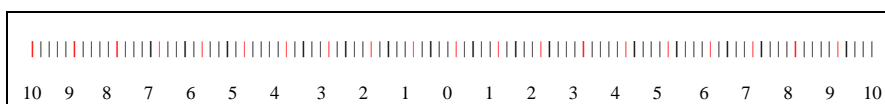


Fig. 1

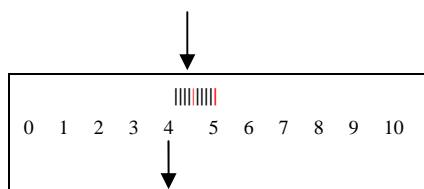


Fig. 2

Some of the balances have beam scale as shown in Fig. 2. With such balances 5 mg rider is used. The rider is placed at division 0 before adjusting balance. The distance between two small divisions represents effective weight of 0.0001 g. Thus if rider is placed at marking 4, the effective weight is 0.004 g; and if it is placed on the 5th small division between markings 4 and 5, the effective weight is 0.0045 g.

Procedure

Weighing on the Balance

- (i) **Weighing by Difference:** Take a thoroughly clean and dry stoppered weighing bottle. Place the sample to be weighed in it and weigh accurately (w_1 g). Take out the bottle from the balance. Remove the stopper and pour out the required amount of sample into the flask by rotating and gently tapping the weighing bottle. Replace back the stopper on the weighing bottle. Weigh the bottle and its remaining content again (w_2 g). The difference between the weights represents the weight of the sample transferred.
- (ii) **Weighing by Addition:** Weigh the clean and dry weighing bottle. Introduce the sample in the bottle in small portions until the correct weight has been added. Weigh the container and the contents. Take out the container and pour the contents carefully into the receiving vessel. Wash the container thoroughly with a jet of water, washings being collected in the receiving vessel.

Care and use of an analytical balance

1. The balance should be placed on a firm platform.
2. Materials spilled on the balance pan must be cleaned immediately.
3. Balance should swing freely.
4. Sample must not be weighed directly on the balance pans. A stopper container should be used.
5. Hot objects must be cooled to room temperature before weighing.
6. The balance door must be closed when the weighing is made.
7. The object to be weighed is usually placed on the left hand side pan and the weights on the right hand side pan.
8. Handle the weights with forceps.
9. Note the readings as soon as weighing is complete.

Observations**(i) Weight by difference**Wt. of weighing bottle + substance (Na_2CO_3) =Wt. of weighing bottle after 1st transfer =Wt. of weighing bottle after 2nd transfer =Wt. of weighing bottle after 3rd transfer =

Sr. No.	Wt. of bottle before transfer (w_1)g	Wt. of bottle after transfer (w_2)g	Wt. of the substance transferred ($w_1 - w_2$) = (a)g
1.			
2.			
3.			

(ii) Weight by addition

Wt. of weighing bottle =

Wt. of weighing bottle after 1st addition =Wt. of weighing bottle after 2nd addition =Wt. of weighing bottle after 3rd addition =

Sr. No.	Wt. of bottle before addition (w_1)g	Wt. of bottle after addition (w_2)g	Wt. of the substance added ($w_2 - w_1$) = (a)g
1.			
2.			
3.			