Practical Pharmaceutical calculation
1st stage
College of Pharmacy

Lab 2: Pharmaceutical measurement
Weight Measurement

By : Dr. Nizar Awish Jassem
Ph.D in Pharmaceutics

2025 -2026

Semester: 2nd

Weight & Mass

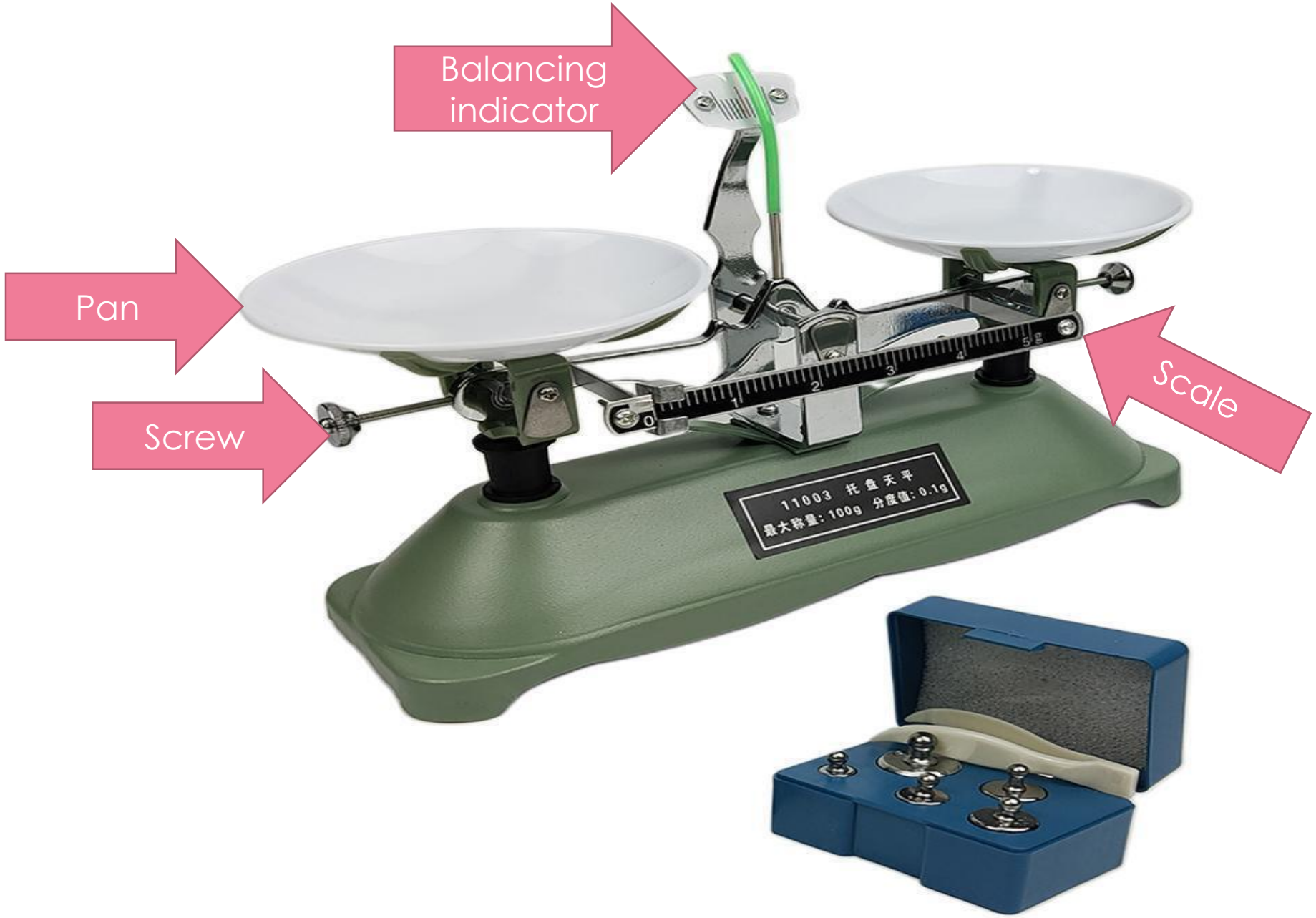
- **Mass** is the amount of matter in an object**,** while **weight** is the force exerted on that mass due to gravity.
- An object **weight depends** on its mass and the strength of the gravitational pull.
- Since Weight depends on **gravity** so it **can change** if you are on a different planet.
- The instrument used for weighing is named a (**Balance) or (Scales**).

Weight is measurement by means of a balance.

- There are **different** types of balance, types for rough weights and others for sensitive weights.
- **The sensitivity of a balance** serves as a basis for **judging the degree of accuracy of weight.**

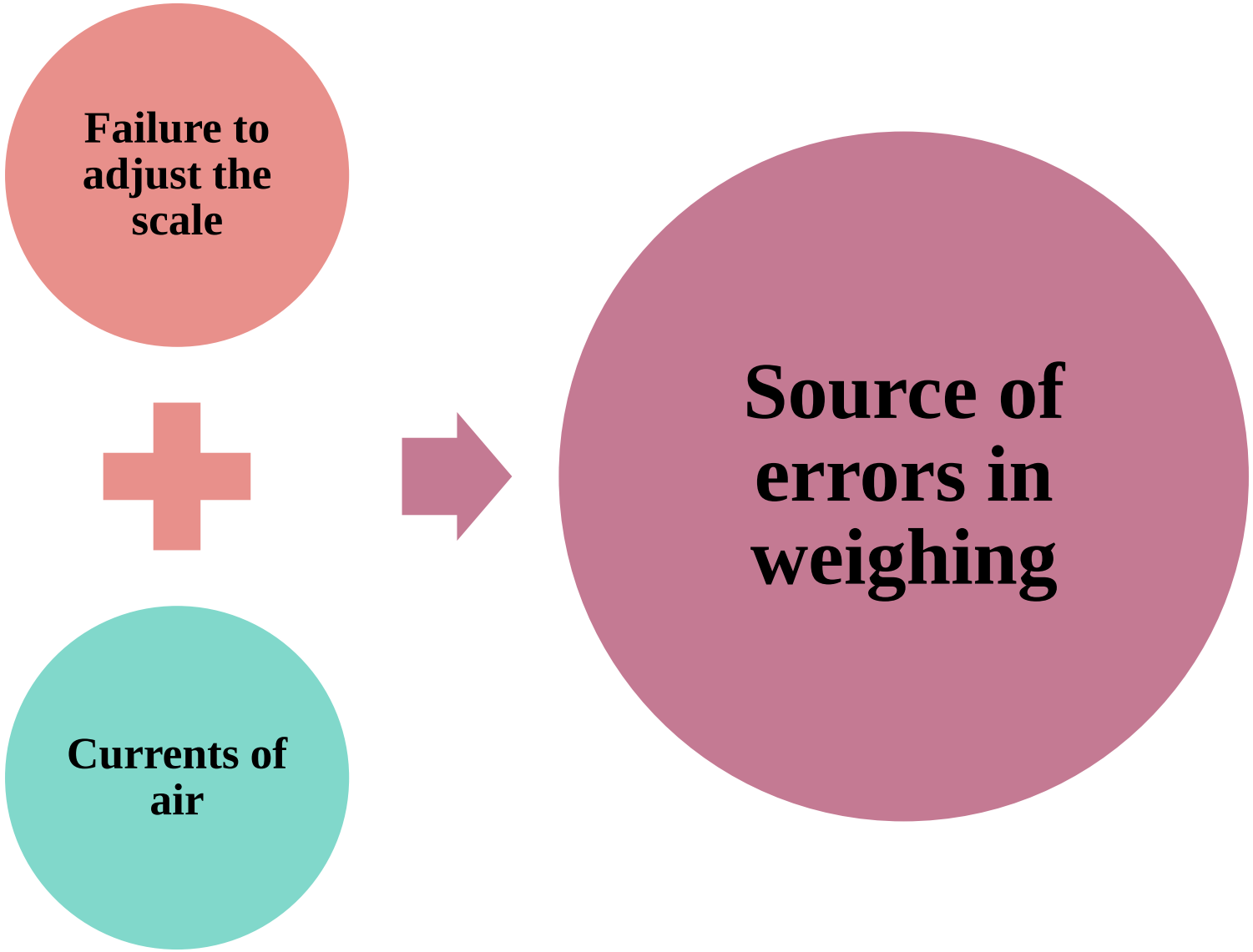





Balancing indicator
Pan
Screw
Scale
11003 托盘天平
最大称量: 100g 分度值: 0.1g

Rules for the use and care of the balance

1. The balance should be located in a well –lightened place ,as far as possible from vibration ,dust, moisture and corrosive vapor.
2. The balance should be kept **clean** at all times.
3. **Watch glass** should be used for weighing of solids, **stoppered bottles** used for corrosive substances and liquids
4. Check to see if the balance is **adjusted** including **zeroing** of it ,also check the adjustment before each weighing


Failure to adjust the scale
Currents of air
Source of errors in weighing

Notes

- *A **clean spatula** may be put into a bottle to remove **solids** for weighing .*
- ***Do not contaminate** reagents by using dirty equipment's or improper techniques.*
- ***Bottle should** be kept clean and stoppered each reagent bottle with it's **own stopper** .*
- ***Never place materials** to be weighed **directly** on the pans*
- *Accuracy requires both **understanding and care** .*
- *Most countries are following the **metric system** of weight and measure.*

Systems of measuring weights

1. **Imperial system** which is mainly used in UK and USA and it include *(grain, ounce, pound, and drachmae)***.**
2. **Metric system** which include (*gram, kilogram, milligram, microgram*)

System of Measuring Weight

- **Metric system**: the unit of weight in this system is the **gram (g)**:
    - *Kilogram (kg) = 1000 g*
    - *Decigram(dg) = 0.1 g*
    - *Centigram (cg) = 0.01 g*
    - *Milligram (mg) = 0.001 g*
    - *Microgram (µg) = 0.001 mg = 0.000001 g*

System of Measuring Weight

- The **Imperial System** (also called the **British Imperial System**) is a system of measurement that originated in United Kingdom and is still partly used there and in some other countries
- It is used units like **grain , ounce , and pound**
- **Ounces (oz)** is the Basic unit of **mass**.
- The **relationship** between **metric and imperial system**:

1 grain(gr) = 0.065 gram

1 gram= 15.432 grain

1 drachm (ʒ) = 4 gram

1 ounce (℥) = 28.35 gram

1Pound (lb) = 454 g

1 kg= 2.2 pound (lb)

Practical Considerations

a. Accuracy: The Metric System is preferred in pharmaceuticals for its **precision and ease of use**. Conversions within the Metric System are simple (multiples of 10).

b. Application: While the Metric System is **standard for most pharmaceutical calculations**, knowledge of the Imperial System is useful in contexts where it is still used or required.

c. Conversions: When converting between systems, **use conversion factors carefully** to avoid errors. Double-check calculations to ensure accuracy.

Examples :

convert 25 lb to kilograms

Convert 10 lb to kilogram

Convert 500 gram to pound

Convert 3.2 kg to pound

Convert 250 g to ounces

Convert 40 oz to gram

Convert 5 lb to ounces

Convert 48 oz to pounds

Convert 3 oz to grains

Percentage of Error

- Because measurements in the community pharmacy are never absolutely accurate, it is important for the pharmacist to recognize the **limitations of the instruments** used and the **magnitude of the errors** that may be incurred.
- When a pharmacist measures a liquid (volume) or weighs a substance (mass), there are always two key quantities to consider:
  1. **Apparent weight or volume**
     - This is the **measured value** you read directly from the instrument.
     - It's called *"apparent"* because it's the **observed value**, not necessarily the exact true amount.
  2. **Possible excess or deficiency (error)**
     - This refers to the **difference between the measured (apparent) value and the true value**.
     - There are always small inaccuracies due to:
       - Instrument limitations (e.g., calibration errors)
       - Human reading errors
       - Environmental factors (temperature)

Percentage of error may be defined as the maximum potential error multiplied by 100 and divided by the quantity desired.

$$\frac{\text{Error} \times 100\%}{\text{Quantity desired}} = \text{Percentage of error}$$

Calculating Percentage of Error in Weighing

- the sensitivity requirement of the balance being used is critical in weighing to a specified degree of accuracy.
- The sensitivity requirement of a balance may be used to determine the percentage of error in a given weighing.

Examples 1: When the maximum potential error is 4 milligrams in a total of 100 milligrams, what is the percentage of error?

$$\frac{4\,\text{mg}}{100\,\text{mg}} \times 100\% = 4\%$$

- Example 2: A prescription calls for 800 milligrams of a substance. After weighing this amount on a balance, the pharmacist decides to check by weighing it again on a more sensitive balance, which registers only 750 milligrams., what was the percentage of error?

maximum potential error = 800 – 750= 50 milligrams

$$\frac{50\ \text{mg}}{800\ \text{mg}} \times 100\% = 6.25\%$$


תודה
Dankie
Gracias
Спасибо
شكراً
Merci
Takk
Köszönjük
Terima kasih
Grazie
Dziękujemy
Dėkojame
Ďakujeme
Vielen Dank
Paldies
Kiitos
Täname teid
谢谢
Thank You
Tak
感謝您
Obrigado
Teşekkür Ederiz
감사합니다
Σας Ευχαριστούμ
ขอบคุณ
Bedankt
Děkujeme vám
ありがとうございます
Tack