SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

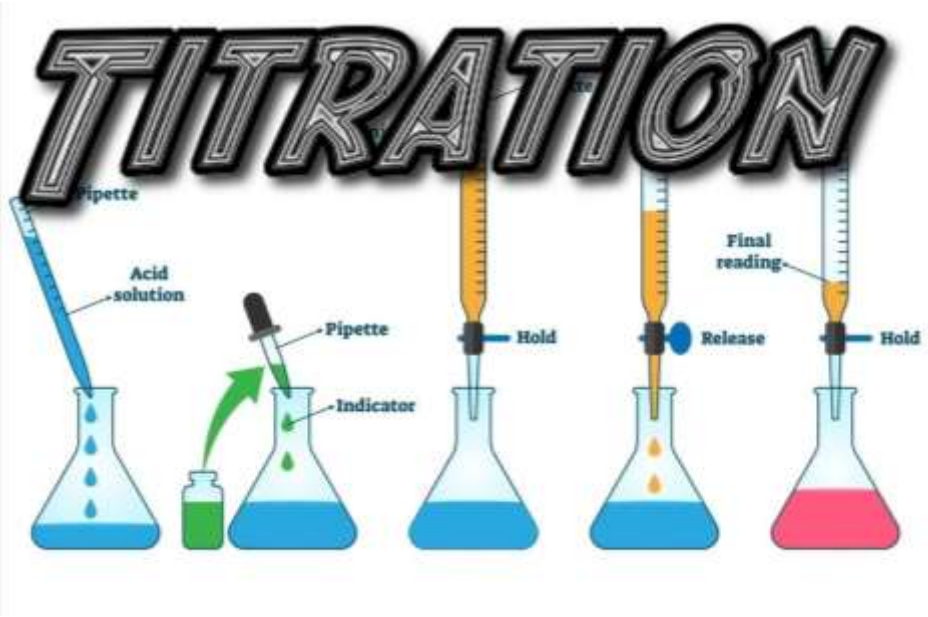
Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai
Approved by Pharmacy Council of India, New Delhi.
Coimbatore -641035

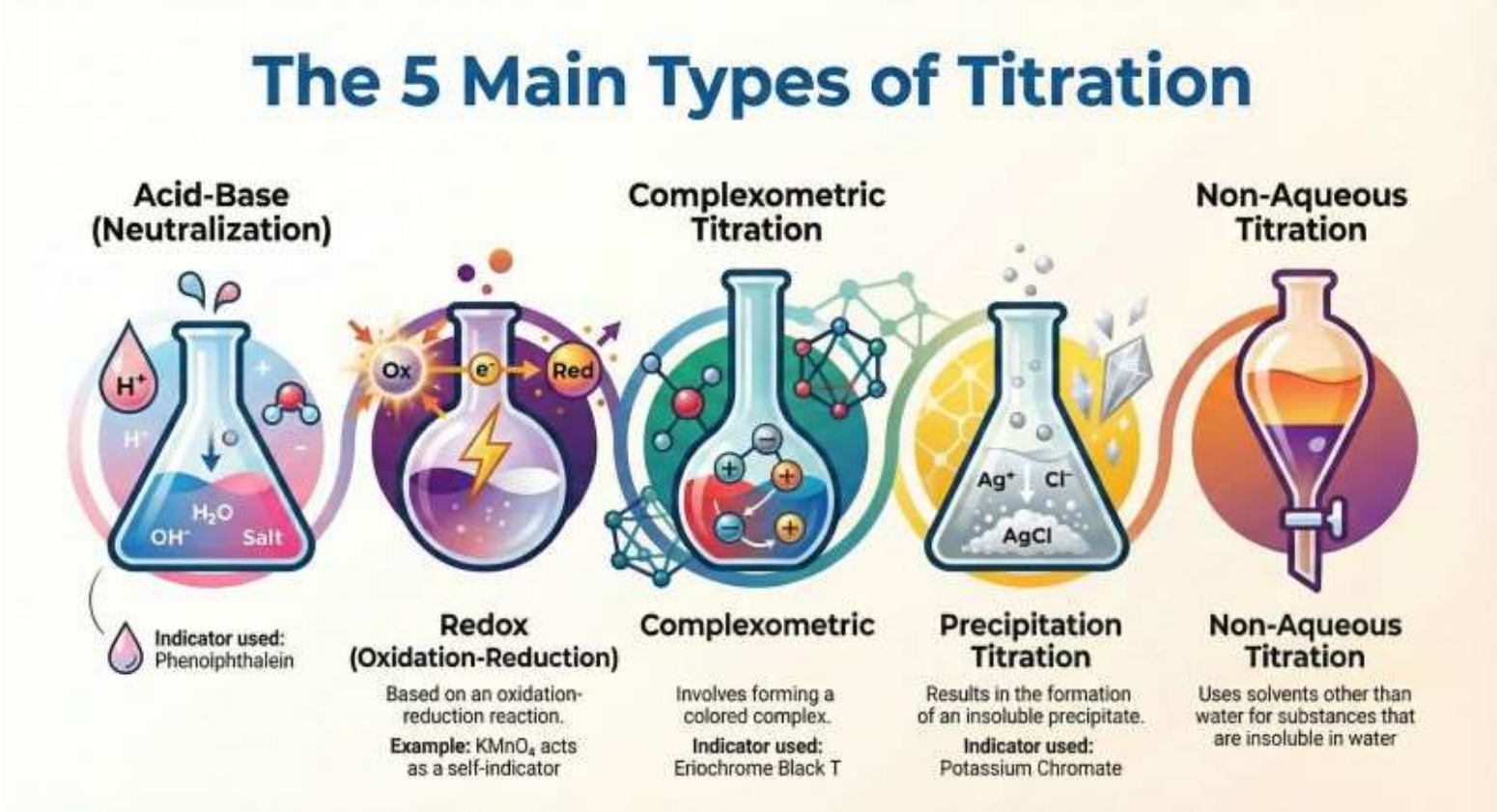
COURSE NAME: PHARMACEUTICAL CHEMISTRY

I YEAR D PHARM

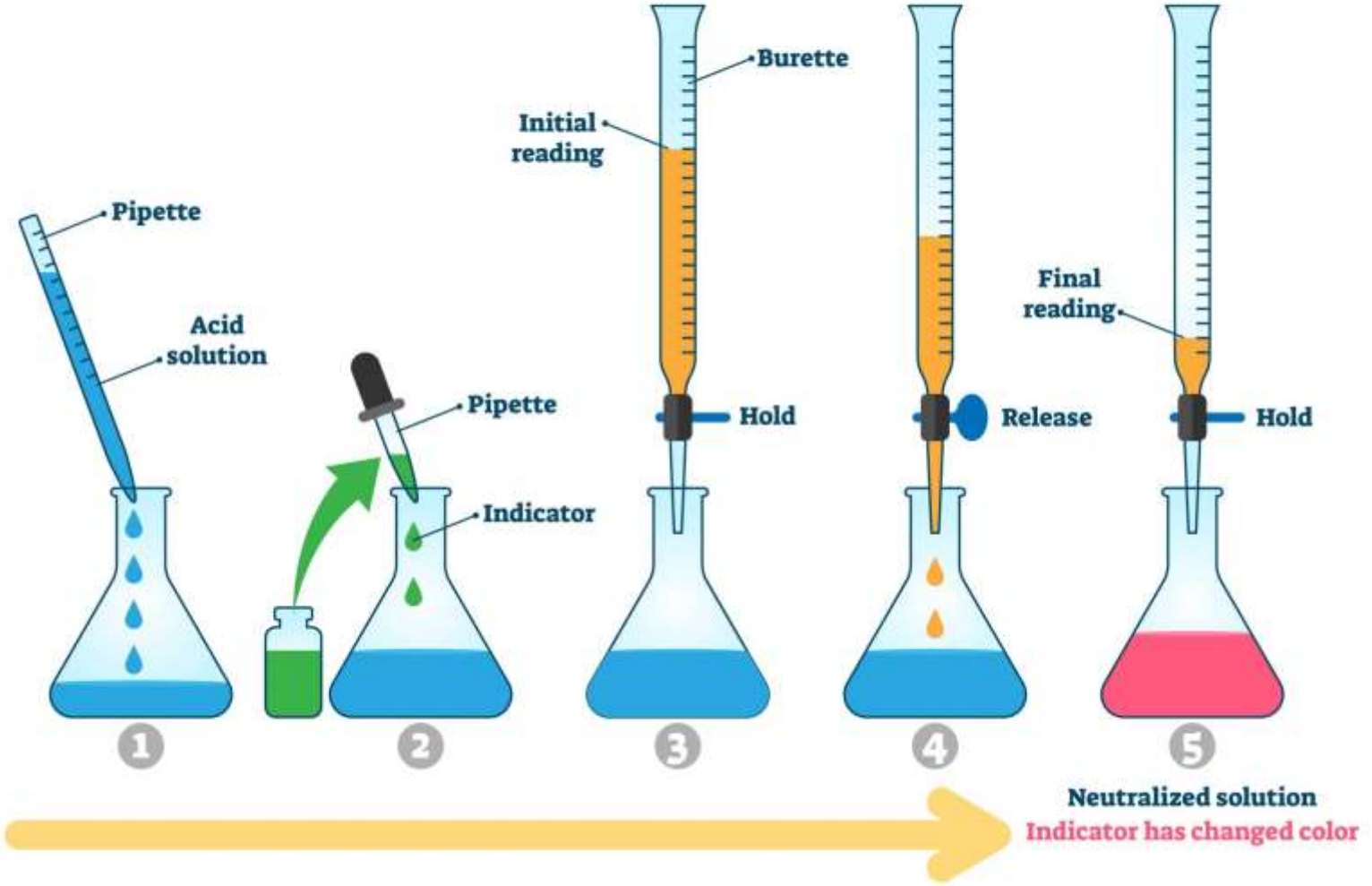
TOPIC 8 : TITRATION AND ITS TYPES

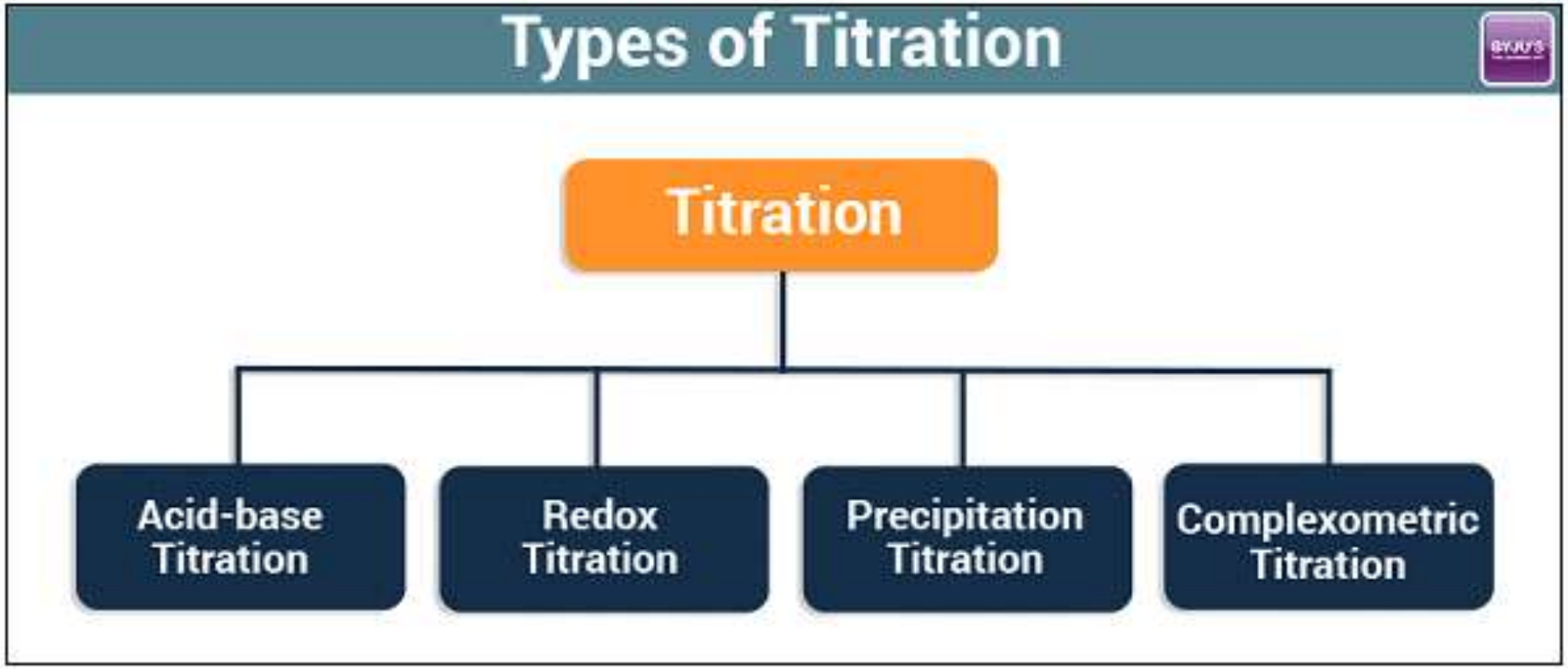
Mind Map


TITRATION
Pipette
Acid solution
Pipette
Indicator
Hold
Release
Final reading
Hold


The 5 Main Types of Titration
Acid-Base (Neutralization)
Complexometric Titration
Non-Aqueous Titration
H+
H2O
OH-
Salt
Indicator used: Phenoiphthalein
Ox
e-
Red
Ag+
Cl-
AgCl
Redox (Oxidation-Reduction)
Based on an oxidation-reduction reaction.
Example: KMnO4 acts as a self-indicator
Complexometric
Involves forming a colored complex.
Indicator used: Eriochrome Black T
Precipitation Titration
Results in the formation of an insoluble precipitate.
Indicator used: Potassium Chromate
Non-Aqueous Titration
Uses solvents other than water for substances that are insoluble in water

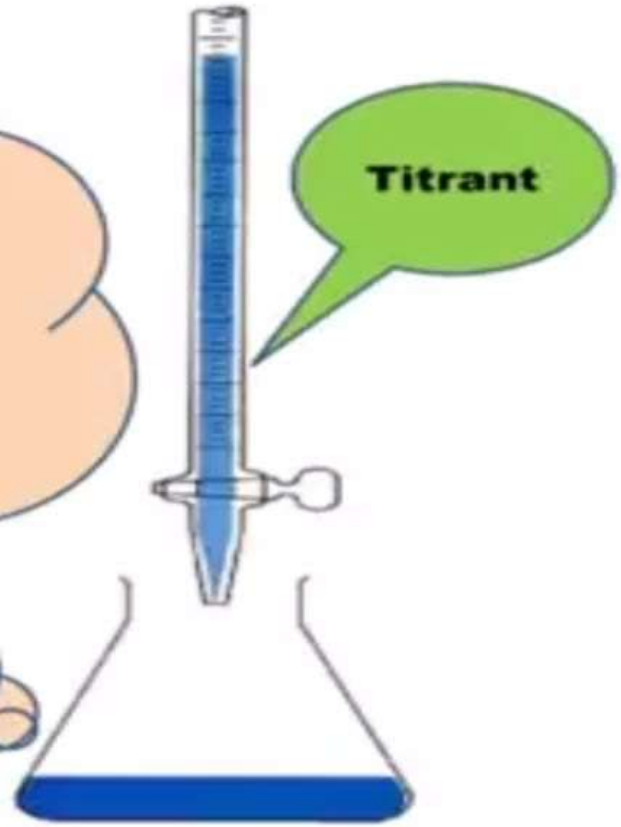
TITRATION

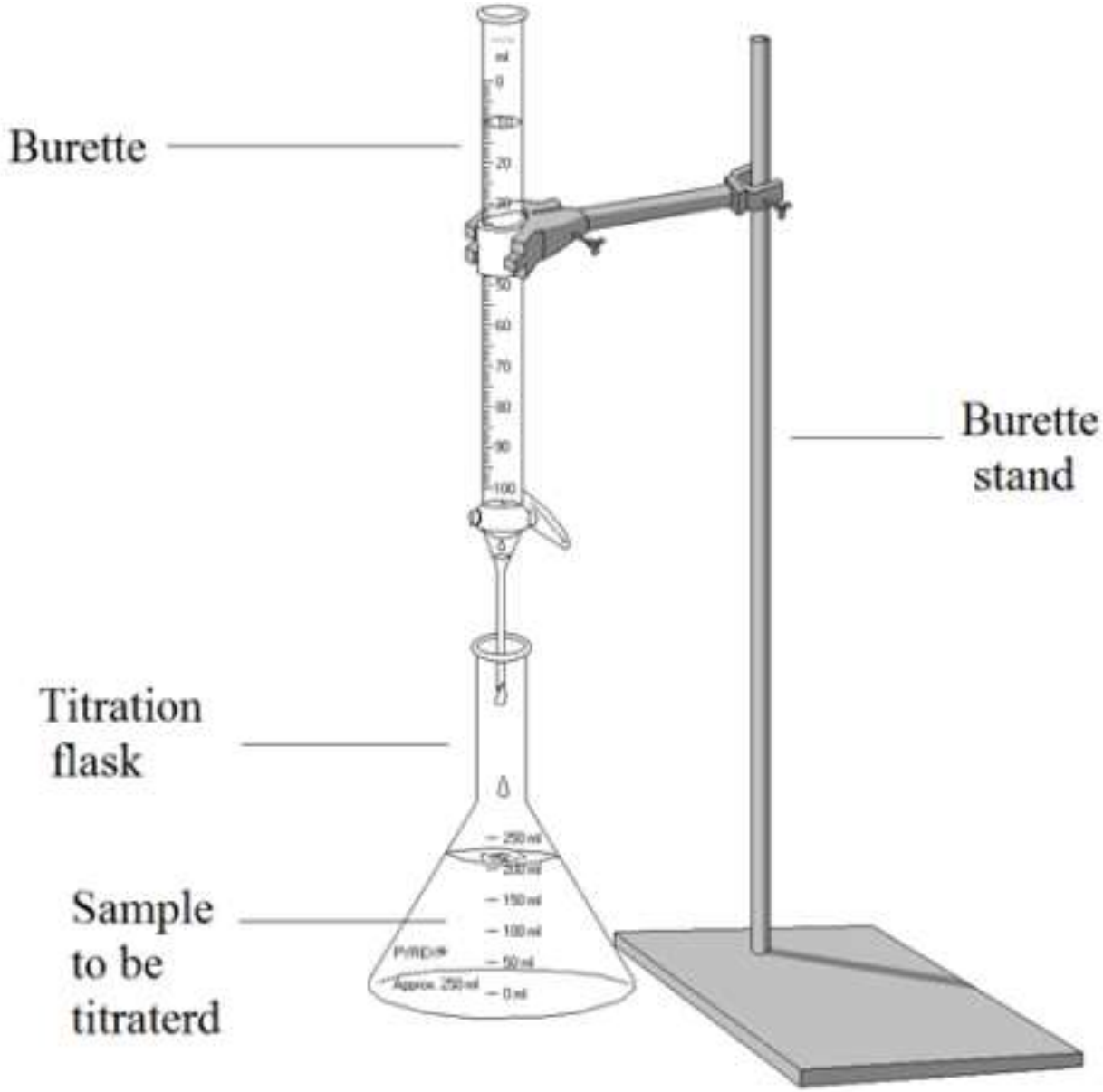

Burette
Initial reading
Pipette
Acid solution
Pipette
Indicator
Hold
Release
Final reading
Hold
1
2
3
4
5
Neutralized solution
Indicator has changed color


Types of Titration
Titration
Acid-base Titration
Redox Titration
Precipitation Titration
Complexometric Titration

TITRANT

The solution of known concentration used in titration (added from burette) are known as titrant

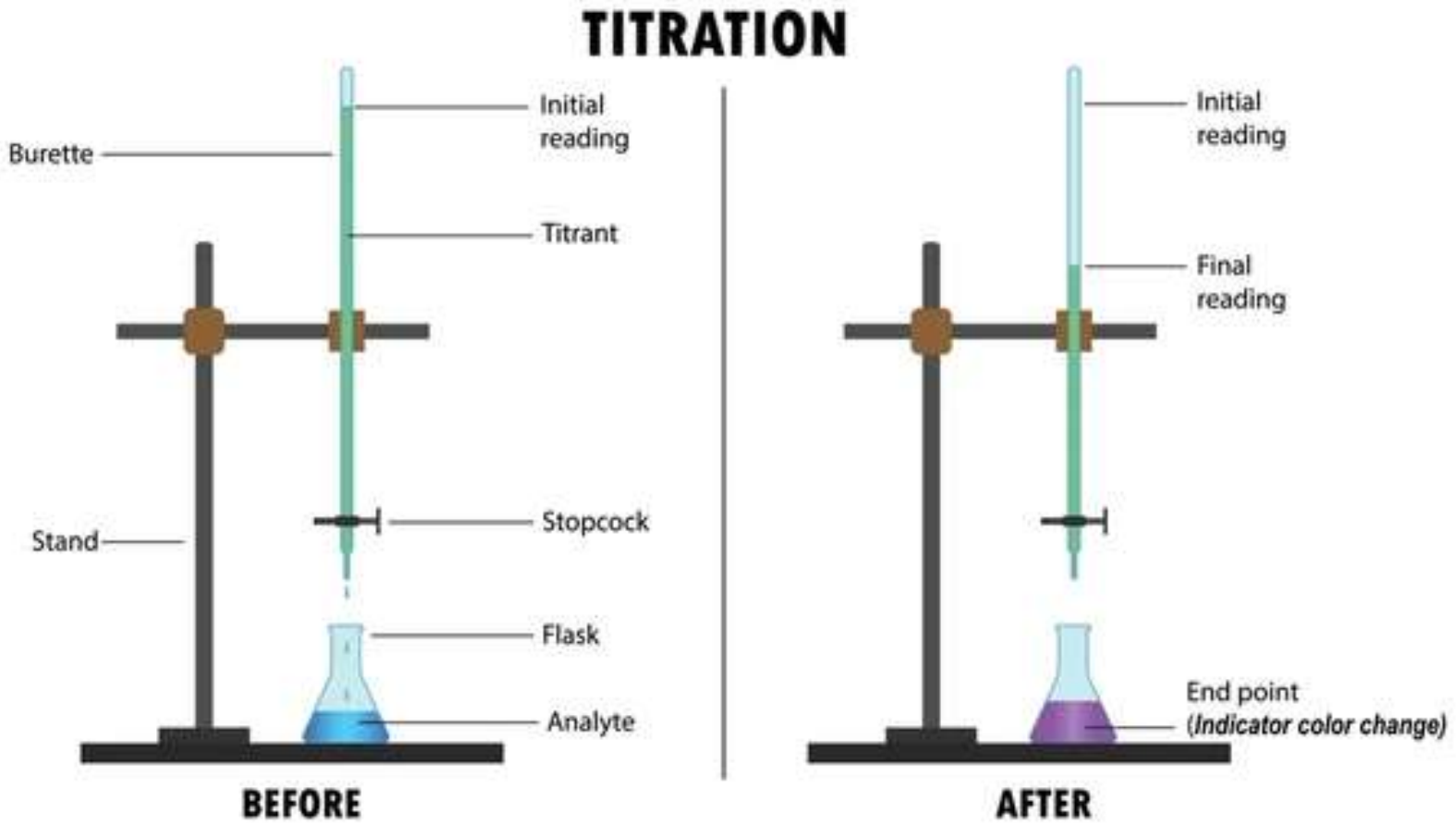



Burette
Burette stand
Titration flask
Sample to be titraterd

STANDARDIZATION VERSUS TITRATION

Standardization is the technique used to find the exact concentration of a solution	Titration is the technique used to measure the concentration of a certain chemical component in a given solution
Used to find the exact concentration of a solution which is prepared for another analysis	Used to find the unknown concentration of a chemical component in a given sample
Burette is filled with a primary standard solution	Burette is filled with a primary standard solution or any other standardized solution
Solution that has to be standardized is taken into the titration flask	Solution with an unknown concentration is taken into the titration flask

Visit www.pediaa.com


TITRATION
Burette
Initial reading
Titrant
Stand
Stopcock
Flask
Analyte
BEFORE
Initial reading
Final reading
End point
(Indicator color change)
AFTER

Titration in Chemistry — More than Just a Lab Technique!

Here are the 4 major types of titration every chemist (and curious mind!) should know in detail:

1 Acid–Base Titration

- Based on neutralization between an acid and a base.
- Uses indicators like phenolphthalein or methyl orange.
- Applications: Determining the purity of drugs, testing acidity/alkalinity in beverages, and quality checks in water treatment

2 Redox Titration

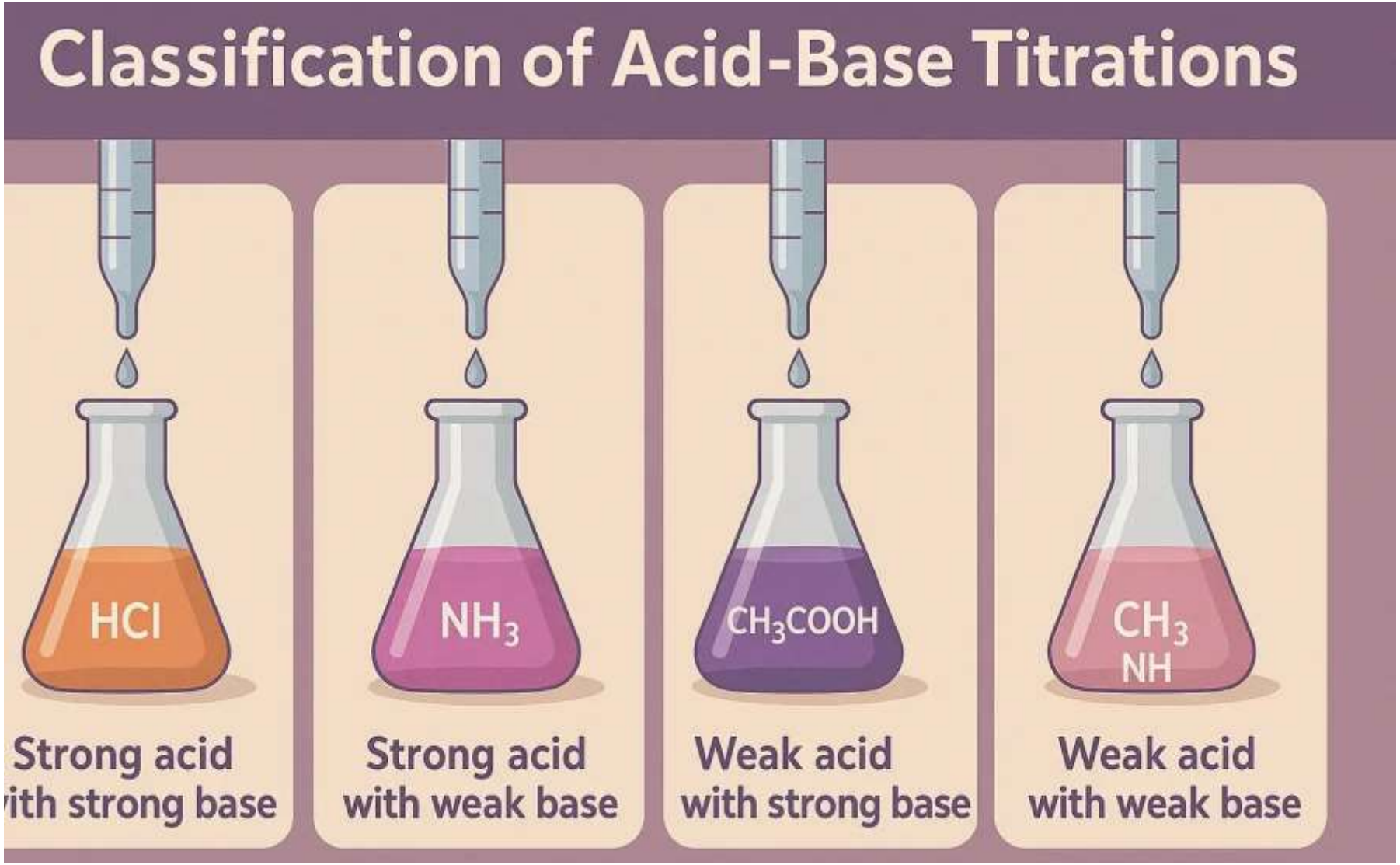
- Involves oxidation-reduction reactions (electron transfer),
- Common reagents: $KMnO_4$ (permanganate), $k_2Cr_2O_7$ (dichromate)
- Applications: Estimating iron content in ores, analyzing hydrogen peroxide, and testing bleaching agents

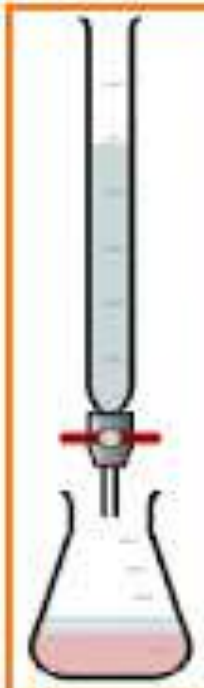
3 Complexometric Titration

- Relies on formation of stable complexes between metal ions and a chelating agent.
- EDTA (Ethylenediaminetetraacetic acid) is the most widely used reagent,
- Applications: Water hardness testing, metal ion analysis in industries, and pharmaceutical formulations

4 Precipitation Titration

- Endpoint reached when an insoluble precipitate forms,
- Example: Using $AgNO_3$ to determine chloride content,
- Applications: Food quality control (e.g., salt analysis), pharmaceutical raw material testing, and halide ion determination


Classification of Acid-Base Titrations
HCl
NH3
CH3COOH
CH3
NH
Strong acid
ith strong base
Strong acid
with weak base
Weak acid
with strong base
Weak acid
with weak base



Precipitation titrations

The basic principle of precipitation titrations is that the amount of precipitating reagent or precipitant added is equivalent to the substance being precipitated.

Amount of added precipitating agent

=

The amount of a compound that is precipitated

Precipitation titration is classified as

- Mohr method
- Volhard method
- Fajan method

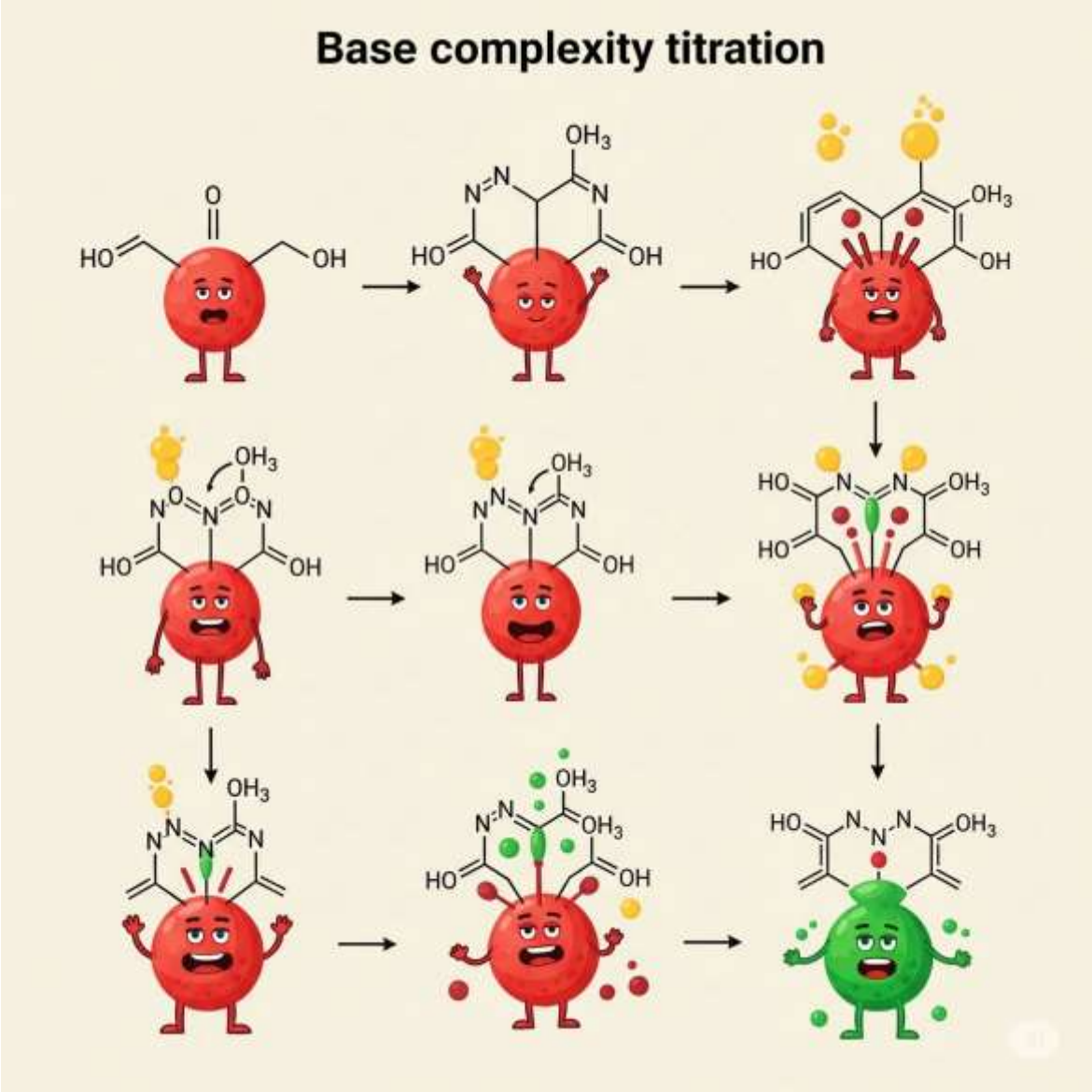
REDOX TITRATIONS

Oxidation – reduction titration –based on the redox reaction between analyte solution and titrant .

Eg; Permagnometric titration

we can estimate the H_2O_2 / ferrous iron by titrating with potassium permaganate which a powerful oxidizing agent , especially in acidic solution(sulphuric acid)

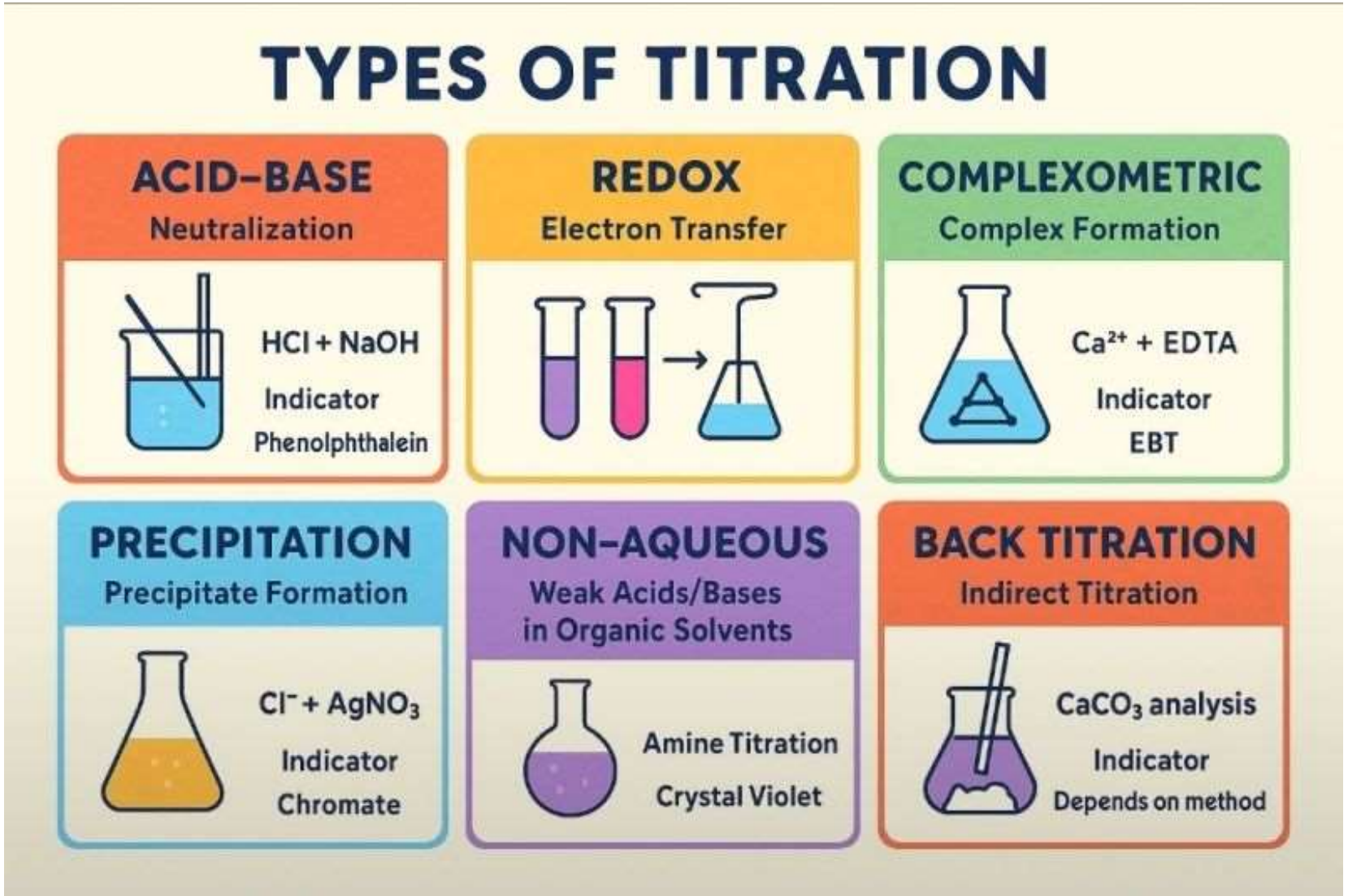
Species titrated	Species formed
H_2O_2	O_2
Fe^{+2}	Fe^{+3}
$H_2C_2O_4$	CO_2


Base complexity titration


DIRECT
BACK
REPLACEMENT
INDIRECT

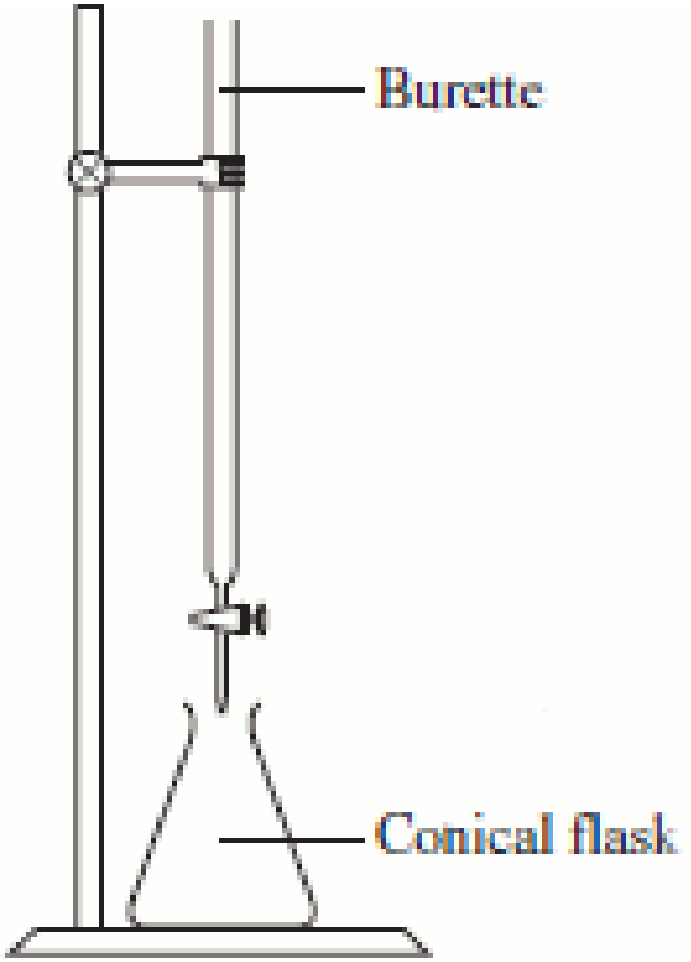

13
00
10
10
COH
HO
OH
OH
O

SUMMARY

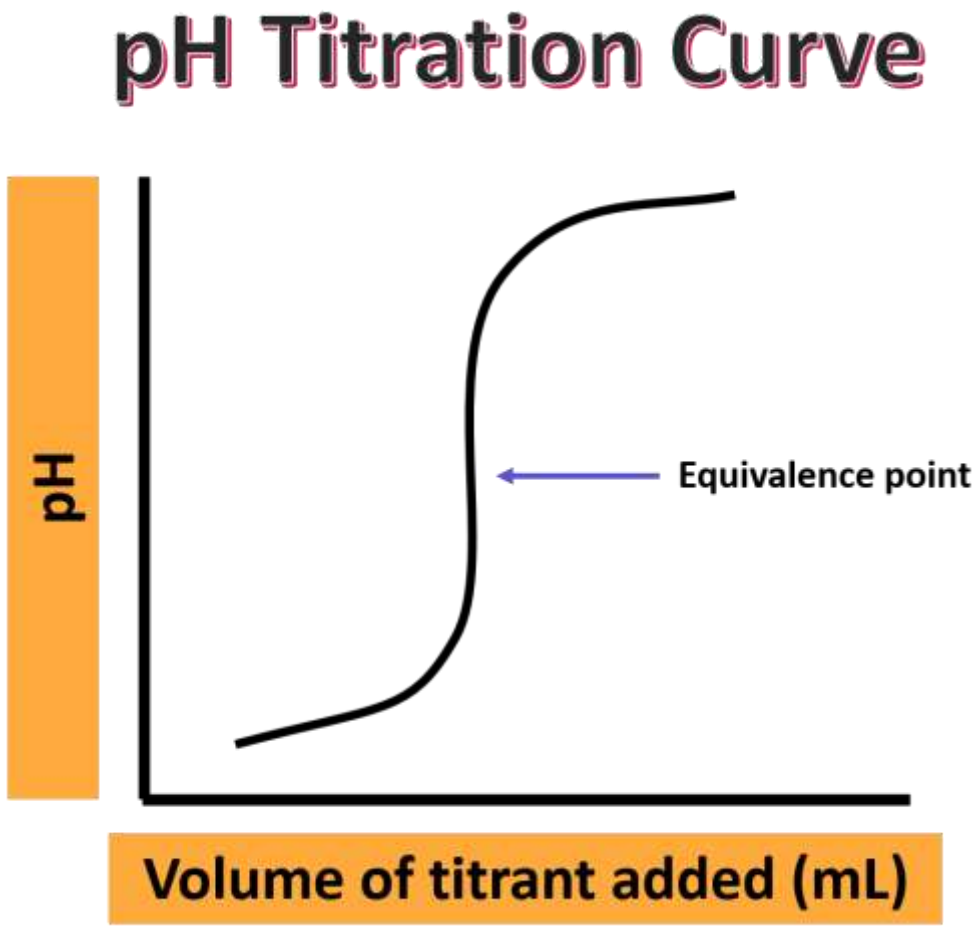

TYPES OF TITRATION
ACID–BASE
Neutralization
HCl + NaOH
Indicator
Phenolphthalein
REDOX
Electron Transfer
COMPLEXOMETRIC
Complex Formation
Ca^{2+} + EDTA
Indicator
EBT
PRECIPITATION
Precipitate Formation
Cl^- + $AgNO_3$
Indicator
Chromate
NON–AQUEOUS
Weak Acids/Bases
in Organic Solvents
Amine Titration
Crystal Violet
BACK TITRATION
Indirect Titration
$CaCO_3$ analysis
Indicator
Depends on method

ASSESMENTS

1. Give a note on instruments used in titration ?



2. Explain the below given picture?



3. Give end point of any two titration?

REFERENCES

Dr. Desh Deepak Pandey, Dr. Arpit Katiyar, Neeraj Kumar (Thakur Pub.), and books by **Dr. Abhishek Tiwari, Dr. Biswa Mohan Sahoo, Dr. Rajesh Shukla (Nirali**

•***Pharmaceutical Chemistry*** ***(D. Pharm 1st Year)*****Authors:** Dr. Abhishek Tiwari

•***Pharmaceutical Chemistry for Diploma in Pharmacy*****Authors:** Dr. Atul R. Bendale, Harshali R. Ahire, Vaishali D. Naphade, Dr. Anil G. Jadhav


Thank You