Pharmacopoeia

Pharmacopoeia is derived from two Greek words:

Pharmakon → 'drug'

Poeia → 'to make'

It is the legal and official book of standards of drugs issued by recognized authorities, usually appointed by the government of each country.

Pharmacopoeia contains:

- List of drugs and related substances
- Sources
- Prescription
- Tests
- Formulas
- Uses
- Doses
- Storage conditions

Importance of Pharmacopoeia:

- To maintain uniformity and control standards of drugs available in the market.
- Avoid adulterated drugs.
- Complete information of drugs and dosage form.
- Reference for laboratory, industry, and academic institutions.

Pharmacopoeia of Different Countries:

Pharmacopoeia of Different Countries:

- Indian Pharmacopoeia
- British Pharmacopoeia
- US Pharmacopoeia
- European Pharmacopoeia
- French Pharmacopoeia

Indian Pharmacopoeia Commission

The Indian Pharmacopoeia Commission is an autonomous institution of the Ministry of Health & Family Welfare which sets standards for all the drugs that are manufactured, sold, and consumed in India.

Indian Pharmacopoeia:

It is the official book of standards for drugs to define identity, purity, and strength for the drugs imported, manufactured for sale, stocked, or distributed in India.

Indian Pharmacopoeia is published by IPC.

Its head office is in Ghaziabad (UP).

Indian Pharmacopoeia is published by NISCAIR.

Full Form of NISCAIR:

National Institute Of Science Communication And Information Resources

History of Indian Pharmacopoeia:

History of Indian Pharmacopoeia:

- In pre-independence days, British Pharmacopoeia was used in India.
- In 1946, the Government of India issued "The Indian Pharmacopoeial List."
- The committee, under the chairmanship of Sir R.N. Chopra along with other nine members, prepared "The Indian Pharmacopoeial List."
- It was prepared by the Department of Health, Government of India, Delhi, in 1946.
- In 1948, the Government of India appointed an Indian Pharmacopoeia committee for preparing "Pharmacopoeia of India."
- Indian Pharmacopoeia, under the chairmanship of Dr. B.N. Ghosh, published the first edition of IP in 1955.

Father of Indian Pharmacopoeia:

Professor Mahadeva Lal Schroff

Editions	Year	Addendum / Supplement	No of Volumes	Monographs
1st Edition	1955	Supplement 1960	2	386
2nd Edition	1966	Supplement 1975	3	830
3rd Edition	1985	Addendum 1989, Addendum 1991	2	261
4th Edition	1996	Addendum 2000, Addendum 2000, Addendum 2002, Addendum 2005	3	1149, 208, 19
5th Edition	2007	Addendum 2008	3	271
6th Edition	2010	Addendum 2012	3	52
7th Edition	2014	Addendum 2016, Addendum 2018	4	577
8th Edition	2018	Addendum 2019	4	290

Impurity: Impurity is the undesirable foreign materials which may be toxic or may not be toxic, present in the pharmaceutical substances. Impurity is the substance or a matter which does not form the part of medicinal or pharmaceuticals drugs.

Sources of Impurities:

1. Raw materials used in the manufacture.

2. Reagents used in the manufacturing process.

3. Method used in manufacture.

4. Intermediate products in the manufacturing process.

5. Solvents.

6. Action of solvents and reagents on reaction vessels.

7. Atmospheric contamination during the manufacturing process.

8. Storage condition.

9. Adulteration.

Effects of Impurities:

1. Impurities having a toxic effect can be injurious when present above certain limits.

2. Impurities may sometimes be harmless. However, if these are present in large proportions, such that the active strength of the substance gets lowered, its therapeutic effect decreases.

3. Impurities may cause a change in the physical and chemical properties of the substance, thereby making it medically useless.

4. Impurities may cause an incompatibility with other substances.

5. Impurities may decrease the shelf life of the substance.

Limit Test:

Limit tests are the quantitative or semi-quantitative tests designed to identify and control small quantities of impurities that are likely to be present in the substance.

Examples:

a. Limit test of sulfates.

b. Limit test for iron.

c. Limit test for arsenic, etc.

Limit tests are generally carried out in apparatus known as Nessler cylinder, which is made up of colorless glass.

Factors responsible for designing limit test:

1. Specificity of the tests

2. Sensitivity

3. Control of personal errors

Factors considered while fixing the limit test:

1. Incompatibilities

2. Practicability of getting the particular limit or particular standard of purity.

3. Harmful effect - Limit of some impurities is fixed on basis of their toxic effect. They must not be present in amounts likely to be harmful.

Example - Lead & arsenic are highly toxic.

4. Use of the substance for which the limit of impurities is to be fixed.

Importance of Limit Test:

a) They are used for quantitative determination of impurity.

b) They provide visible appearance to test the appearance.

c) To test moisture, volatile matter, and residual solvents.

d) For the specificity of the test and to control the sensitivity of the test.

e) To test and detect various insoluble and soluble matter.

Limit Test for Chloride

Principle:

The principle of the limit test of chloride is based on the reaction of soluble chlorides with silver nitrate in the presence of dilute nitric acid to form silver chloride, which appears as turbidity/opalescence.

$$Cl^- + AgNO_3 \rightarrow AgCl\downarrow + NO_3^-$$

Why Nitric Acid?

Nitric acid is added to the solution to make the solution acidic.

Dissolves other impurities.

Provides a common ion effect and helps silver chloride precipitate to make the solution turbid at the end of the process.

Apparatus Required:

Nessler's Cylinder

Glass Rod

Stand

Chemical Required:

Dilute Nitric Acid (10%)

Silver Nitrate (5%)

Sodium Chloride

Procedure:

Test	Standard
Specific amount of substance dissolved in Nessler's cylinder as directed in pharmacopeia	Take 1 ml of 0.05845% w/v solution of NaCl in a Nessler's cylinder
Add 10 ml dilute HNO_3	Add 10 ml dilute HNO_3
Dilute the solution to 50 ml with water	Dilute the solution to 50 ml with water
Add 1 ml silver nitrate solution	Add 1 ml silver nitrate solution
Observe the opalescence/turbidity	Observe the opalescence/turbidity

Observation:

If the turbidity of the test solution is less than the turbidity of the standard solution, the sample will pass the limit test.
If the turbidity of the test solution is greater than the turbidity of the standard solution, the limit test fails.

Limit Test for Sulphate

Principle:

The principle of the limit test of sulphate is based on the reaction of soluble sulphate with barium chloride to form barium sulphate in the presence of dilute hydrochloric acid, which appears as turbidity/opalescence.

Apparatus Required:

Nessler Cylinders

Glass Rod

Stand

Chemicals Required:

Dilute Hydrochloric Acid

Standard potassium sulphate solution

Barium sulphate reagent

(Prepared by mixing 15 ml of 0.5 M $BaCl_2$ + 55 ml of water + 20 ml alcohol + 5 ml of 0.0181% w/v K_2SO_4, then diluted to 100 ml)

Role of HCl:

Provides acidic medium

Prevents precipitation of other radicals

Chemical Reaction

$$SO_4^{2-} + BaCl_2 \xrightarrow{HCl} BaSO_4 + 2Cl^-$$

Procedure:

Test	Standard
Dissolve specific amount of substance in Nessler cylinder as directed in pharmacopeia	1 ml of 0.1089% w/v solution of K_2SO_4 in Nessler cylinder
Add 2 ml dilute HCl	Add 2 ml dilute HCl
Dilute the solution to 45 ml with water	Dilute the solution to 45 ml with water
Add 5 ml barium sulphate reagent	Add 5 ml barium sulphate reagent
Observe the opalescence	Observe the opalescence

Observation:

If the turbidity of the test solution is less than the turbidity of the standard solution, then the sample will pass the limit test.

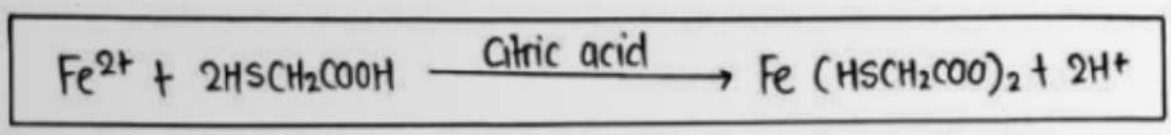
If the turbidity of the test solution is greater than the turbidity of the standard solution, the limit test fails.

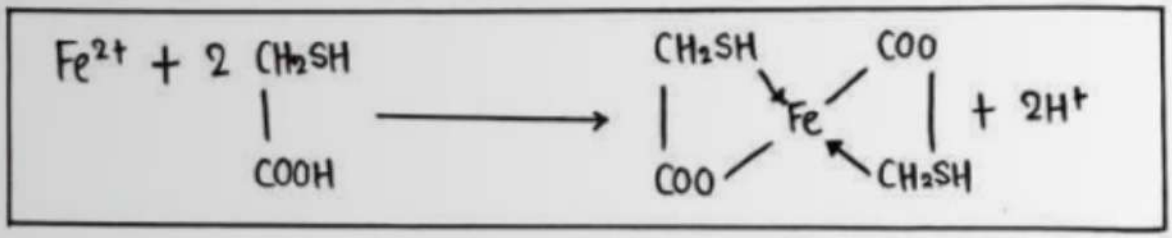
Limit Test for Iron

Principle:

The principle of the limit test of iron is based on the reaction between ferrous ions and thioglycolic acid in the presence of ammonia and citric acid to form a ferrous thioglycolate complex, which appears as a pale pink to deep reddish-purple color.

Chemical Reactions:





Apparatus Required:

Nessler Cylinders

Glass Rod

Stand

Chemicals Required:

Standard Iron Solution (Ferric ammonium sulphate)

Iron-free citric acid

Thioglycolic acid

Iron-free ammonia solution

Role of Reagents:

Thioglycolic acid: Converts ferric (Fe^{3+}) ions into ferrous (Fe^{2+}) ions.

Ammonia: Provides an alkaline medium.

Citric acid: Prevents precipitation of iron with ammonia.

Procedure:

TEST	STANDARD
• Dissolve specific amount of sample in nessler cylinder as directed in pharmacopoeia	• Dissolve 2 ml standard iron solution in nessler cylinder
• Dilute with 20 ml water	• Dilute with 20 ml water
• Add 2 ml iron free citric acid	• Add 2 ml iron free citric acid
• Add 0.1 ml thioglycolic acid	• Add 0.1 ml thioglycolic acid
• Make solution alkaline with ammonia	• Make solution alkaline with ammonia
• Dilute the solution ~~with~~ 50 ml with water & observe.	• Dilute the solution to 20 ml with water

Observation:

If the intensity of color of the test solution is less than the intensity of the color of the standard solution, then the sample passes the limit test.

If the intensity of color of the test solution is greater than the intensity of the color of the standard solution, the sample fails the limit test.

Limit Test for Arsenic

Principle:

The principle of the limit test for arsenic is based on the fact that arsenic in the arsenious state is easily reduced into Arsine gas, which on reaction with mercuric chloride gives a yellow stain.

Chemical Reaction:

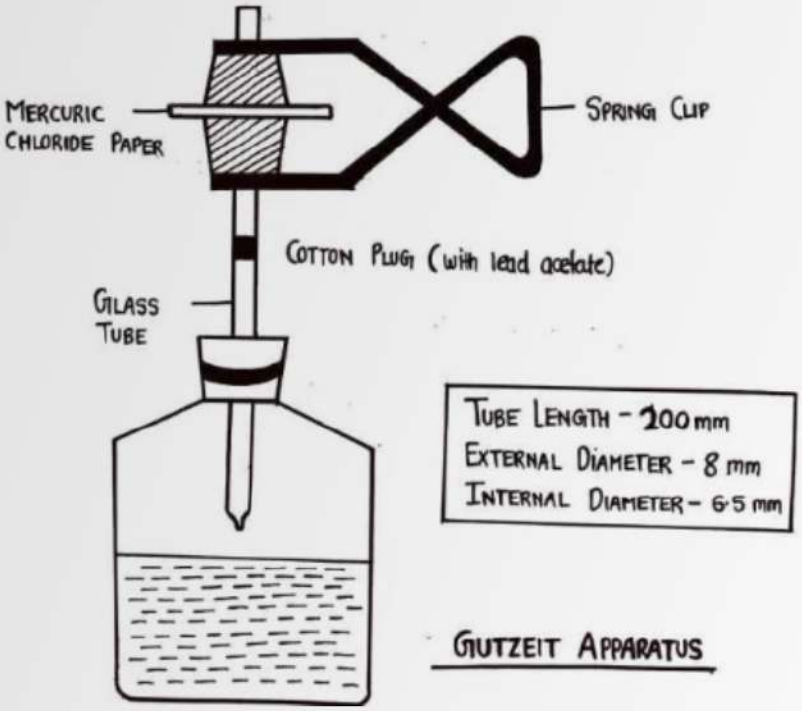
$$2AsH_3 + HgCl_2 \rightarrow Hg(AsH_2)_2 + 2HCl$$

Apparatus Required:

Gutzeit Apparatus

Glass Rod

Stand



GUTZEIT APPARATUS

Chemicals Required:

Standard Arsenic Solution

Potassium Iodide

Zinc

Stannous Chloride

Stannated HCl (with Lead Acetate)

Role of Reagents:

Zn/KI/$SnCl_2$: Acts as reducing agents.

HCl: To make the solution acidic.

Lead Acetate: To trap any hydrogen sulphide (if present).

Procedure:

TEST	STANDARD
• Add specific amount of test sample along with stannated HCl in gutzeit apparatus	• Dissolve known quantity of standard arsenic solution with HCl in gutzeit apparatus
• Add 1 gm of potassium Iodide	• Add 1 gm potassium Iodide
• To this add 5 ml $SnCl_2$	• Add 5 ml stannous chloride
• Now add 10g granulated zinc	• Add 10g granulated zinc
• keep the solution aside for 40 minutes	• keep the solution aside for 40 minutes.

Observation:

If the stain produced by the test is lighter than the stain

produced by the standard, the sample passes the limit test.

If the stain produced by the test is more than the stain produced by the standard, the sample fails the limit test.

----------End of Chapter----------