

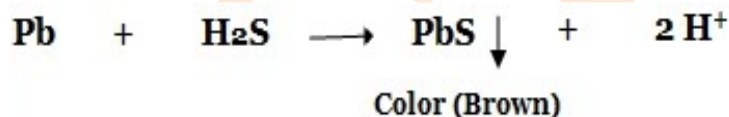
## PHARMACEUTICAL INORGANIC CHEMISTRY- BP104T

UNIT: 1 (IMPURITIES IN PHARMACEUTICAL SUBSTANCES)

CLASS: 8

### TOPIC: LIMIT TEST FOR HEAVY METALS

**Principle:** Limit test of heavy metals is based on the reaction of metallic impurities with hydrogen sulfide in acidic medium to form brownish color solution. Metals that response to this test are lead, mercury, bismuth, arsenic, antimony, tin, cadmium, silver, copper, and molybdenum. The metallic impurities in substances are expressed as parts of lead per million parts of the substance. The usual limit as per Indian Pharmacopoeia is 20 ppm



#### Procedure:

The Indian Pharmacopoeia has adopted four methods for the limit test of heavy metals.

#### Method A:

Use for the substance which gives clear colorless solution under the specific condition

| Test                                                                                     | Standard                                                                             |
|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Solution is prepared as per the monograph and 25 ml is transferred in Nessler's cylinder | Take 2 ml of standard lead solution and dilute to 25 ml with water                   |
| Adjust the pH between 3 to 4 by adding dilute acetic acid or dilute ammonia solution     | Adjust the pH between 3 to 4 by adding dilute acetic acid or dilute ammonia solution |
| Dilute with water to 35 ml                                                               | Dilute with water to 35 ml                                                           |
| Add freshly prepared 10 ml of hydrogen sulphide solution                                 | Add freshly prepared 10 ml of hydrogen sulphide solution                             |
| Dilute with water to 50 ml                                                               | Dilute with water to 50 ml                                                           |
| Allow to stand for five minutes                                                          | Allow to stand for five minutes                                                      |
| View downwards over a white surface                                                      | View downwards over a white surface                                                  |

**Observation:** The color produce in sample solution should not be greater than standard solution. If color produces in sample solution is less than the standard solution, the sample will pass the limit test of heavy metals and vice versa.

**Method B:** Use for the substance which do not give clear colorless solution under the specific condition.

| Test                                                                                                                                                                                                                                                                                                                                                                                                  | Standard                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Weigh specific quantity of test substance, moisten with sulphuric acid and ignite on a low flame till completely charred Add few drops of nitric acid and heat to 500 °C Allow to cool and add 4 ml of hydrochloric acid and evaporate to dryness Moisten the residue with 10 ml of hydrochloric acid and digest for two minutes Neutralize with ammonia solution and make just acid with acetic acid | Take 2 ml of standard lead solution and dilute to 25 ml with water                   |
| Adjust the pH between 3 to 4 and filter if necessary                                                                                                                                                                                                                                                                                                                                                  | Adjust the pH between 3 to 4 by adding dilute acetic acid or dilute ammonia solution |
| Dilute with water to 35 ml                                                                                                                                                                                                                                                                                                                                                                            | Dilute with water to 35 ml                                                           |
| Add freshly prepared 10 ml of hydrogen sulphide solution                                                                                                                                                                                                                                                                                                                                              | Add freshly prepared 10 ml of hydrogen sulphide solution                             |
| Dilute with water to 50 ml                                                                                                                                                                                                                                                                                                                                                                            | Dilute with water to 50 ml                                                           |
| Allow to stand for five minutes                                                                                                                                                                                                                                                                                                                                                                       | Allow to stand for five minutes                                                      |
| View downwards over a white surface                                                                                                                                                                                                                                                                                                                                                                   | View downwards over a white surface                                                  |

**Observation:** The color produce in sample solution should not be greater than standard solution. If color produces in sample solution is less than the standard solution, the sample will pass the limit test of heavy metals and vice versa.

**Method C:** Use for the substance which gives clear colorless solution in sodium hydroxide solution.

| Test                                                                                                                                        | Standard                            |
|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Solution is prepared as per the monograph and 25 ml is transferred in Nessler's cylinder or weigh specific amount of substance and dissolve | Take 2 ml of standard lead solution |

|                                                                    |                                                                                         |
|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| in 20 ml of water and add 5 ml of dilute sodium hydroxide solution |                                                                                         |
| Make up the volume to 50 ml with water                             | Add 5 ml of dilute sodium hydroxide solution and make up the volume to 50 ml with water |
| Add 5 drops of sodium sulphide solution                            | Add 5 drops of sodium sulphide solution                                                 |
| Mix and set aside for 5 min                                        | Mix and set aside for 5 min                                                             |
| View downwards over a white surface                                | View downwards over a white surface                                                     |

### 2 MARKS QUESTIONS

1. Write the principle involved in limit test for heavy metals

### 5 MARKS QUESTIONS

1. Explain the principle and procedure involved in limit test for heavy metals

### 10 MARKS QUESTIONS

1. Write the principle, procedure, reaction involved in limit test for heavy metals