# REACTION MIXTURE INVESTIGATION – LIMITING EXCESS REAGENTS

$$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$$

**Note:** $PbI_2$ is a bright yellow precipitate
$KNO_3$ is a soluble salt and passes through the filter paper

**Data Table:**

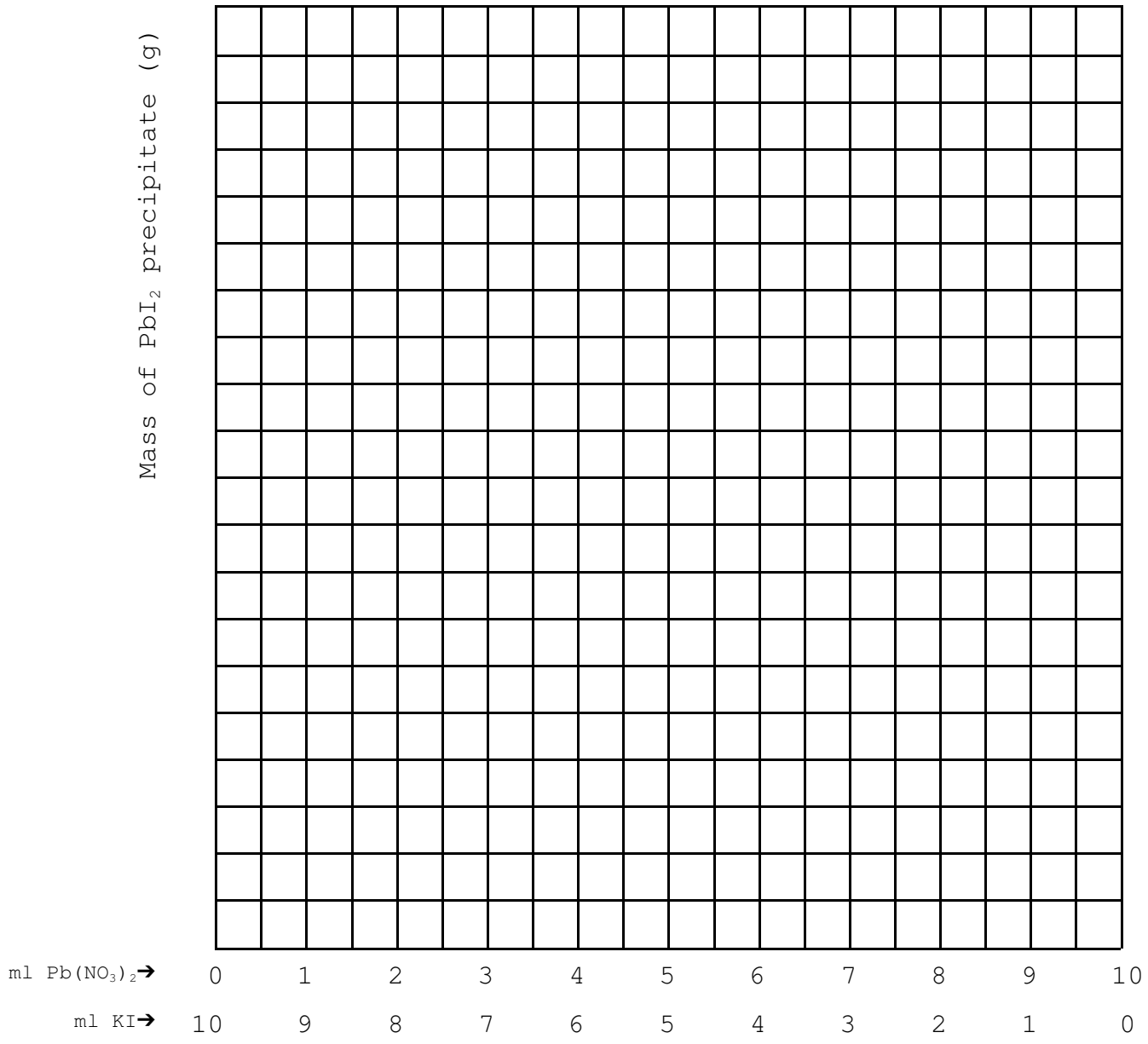
| Trial | Volume of $Pb(NO_3)_2$ Solution (mL) | Volume of KI Solution (mL) | Mass Filter Paper (g) | Mass of Filter Paper Plus Product (g) | Mass of Product (g) |
|---|---|---|---|---|---|
| 1 | 0 mL | 10 mL | | | |
| 2 | 1 mL | 9 mL | | | |
| 3 | 2 mL | 8 mL | | | |
| 4 | 3 mL | 7 mL | | | |
| 5 | 4 mL | 6 mL | | | |
| 6 | 5 mL | 5 mL | | | |
| 7 | 6 mL | 4 mL | | | |
| 8 | 7 mL | 3 mL | | | |
| 9 | 8 mL | 2 mL | | | |
| 10 | 9 mL | 1 mL | | | |
| 11 | 10 mL | 0 mL | | | |

1. Record all data in your table (i.e. copy data that you did not collect).

2. Create a graph of mass (vertical axis) versus volumes (horizontal axis). See next page of graph paper.

3. Plot all points and join with two **straight lines** of best fit that intersect at some point. This should look like an off balance teepee when done. The point of intersection at the top of the teepee represent the maximum possible mass of $PbI_2$ that could form. This is known as the eudiometric point and represents the optimal reaction mixture. You will need to provide the scale on the vertical axis.

## Graph of Mass versus Volume



**Questions (Do on a separate sheet and attach):**

1. What is the maximum possible mass of yellow $PbI_2$ precipitate according to your graph?

2. What are the volumes of $Pb(NO_3)_2$ and KI solutions at this point (use decimals)?

3. Why is the mass of $PbI_2$ less to the left of this point?

4. Why is the mass of $PbI_2$ less to the right of this point?

5. What does it mean when a reaction mixture is optimum?

6. Perform two limiting excess reagent calculations:

a) use 5 mL of 0.1 M $Pb(NO_3)_2$ and 5 mL of 0.1 M KI

b) use the volumes of $Pb(NO_3)_2$ and KI that produce the maximum possible mass of $PbI_2$ (see #1 & 2 above).

c) fully explain the significance of your answers