#13 Stoichiometry:
Determination of an unknown

Use the same balance for all weighing

First, you react citric acid with pure sodium bicarbonate and measure the volume of CO_2 gas formed:

citric acid + pure sodium bicarbonate

CO_2 + other products

Second, you react citric acid with impure sodium bicarbonate and measure the volume of CO_2 gas formed:

citric acid + impure sodium bicarbonate

CO_2 + other products

If the unknown was pure sodium bicarbonate, you would expect same volume of gas to form, right?

But the unknown is NOT pure sodium bicarbonate. By comparing volumes of gas produced, you can determine the % sodium bicarbonate in the impure mixture.

Set up a ratio like this:

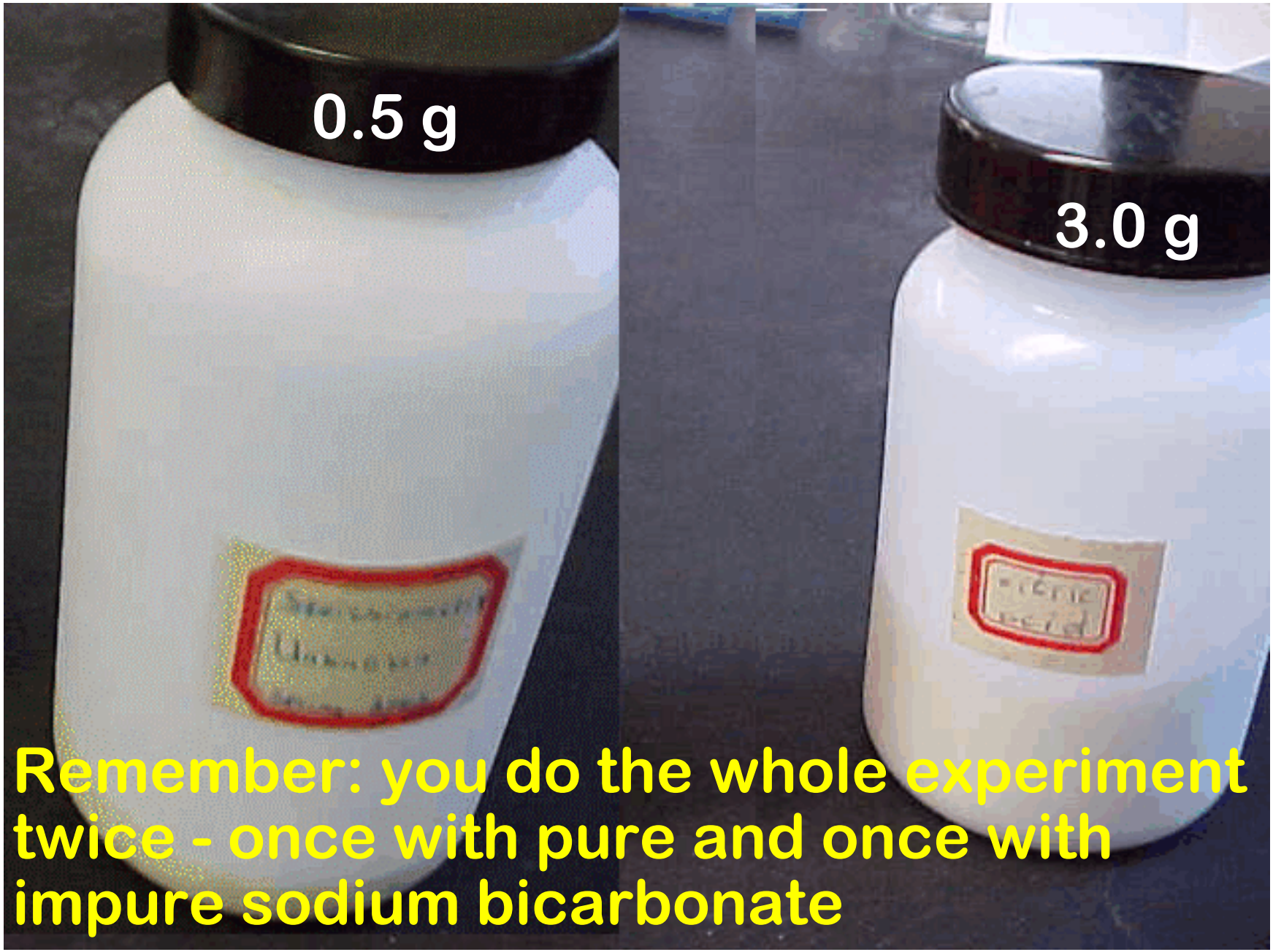
$$\frac{\textbf{mass pure sodium bicarbonate}}{\textbf{mL } CO_2 \textbf{ formed}} = \frac{\textbf{mass impure sodium bicarbonate}}{\textbf{mL } CO_2 \textbf{ formed}}$$

Once you have the mass of sodium bicarbonate in the impure sample, you can calculate the % of sodium bicarbonate in the impure sample.....

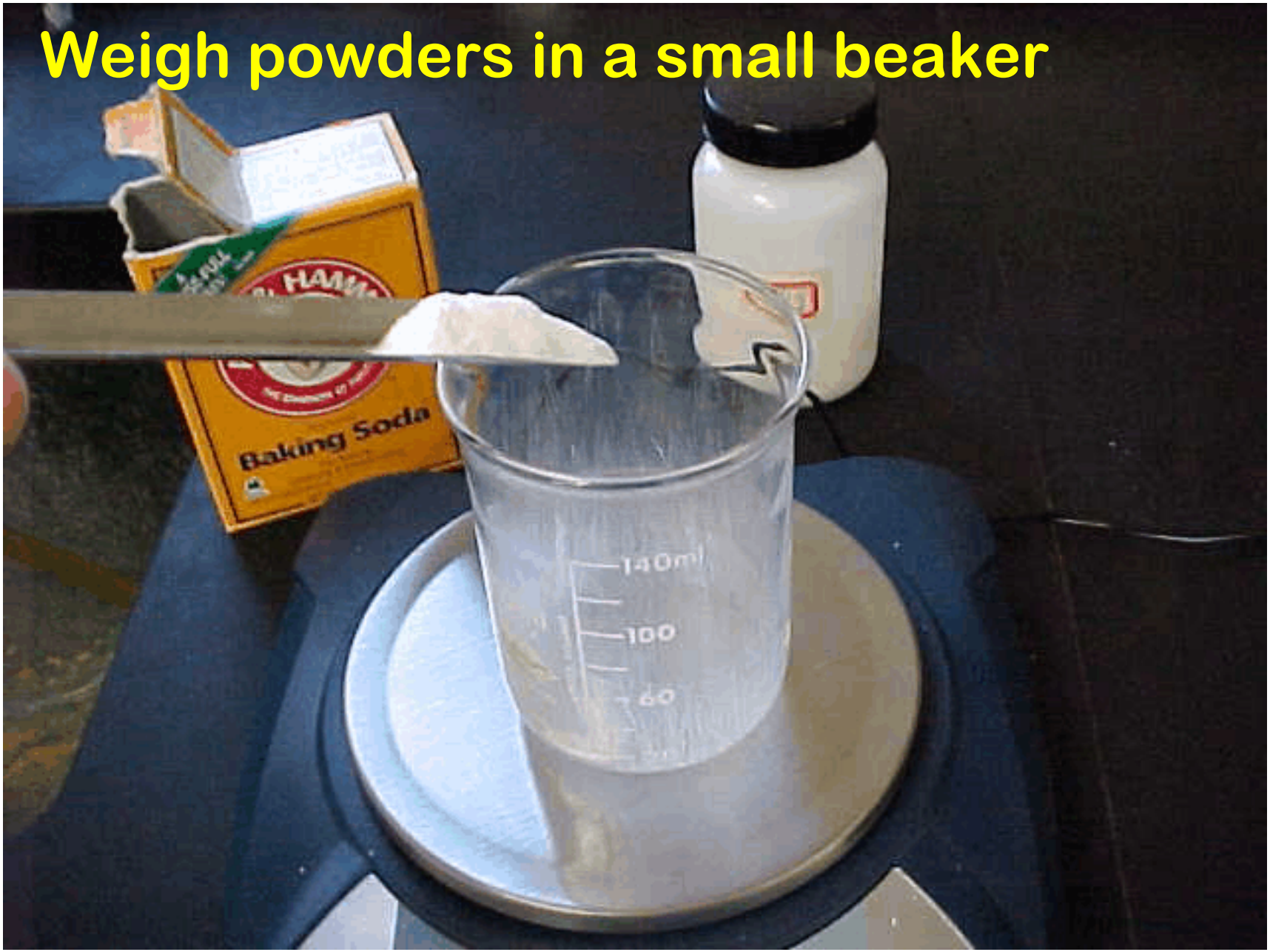
= % SODIUM BICARBONATE
IN IMPURE SAMPLE

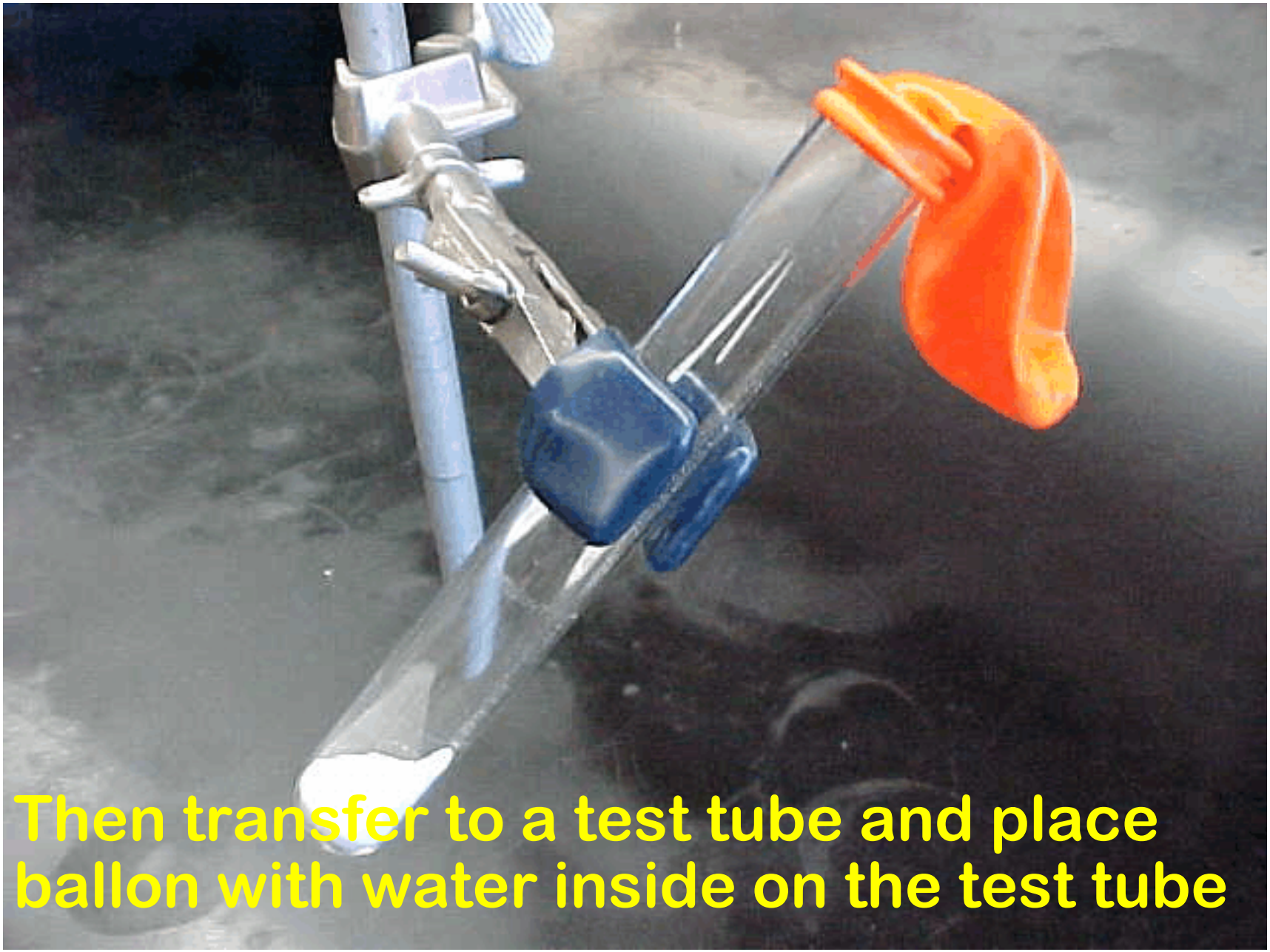
$$\frac{\text{mass of bicarbonate in impure sample}}{\text{mass of unknown sample (= ~ 0.5 g)}} \times 100$$

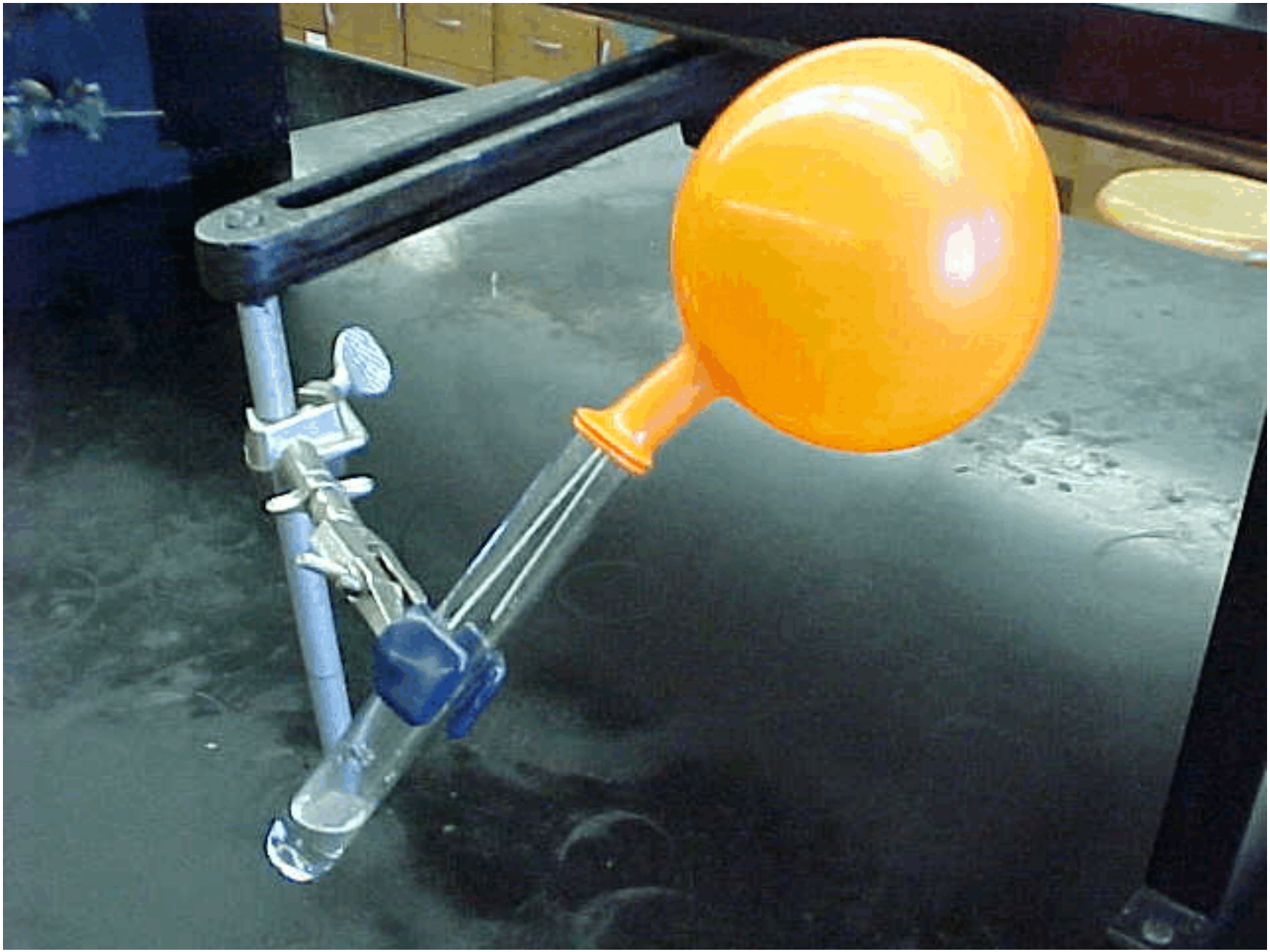

0.5 g
3.0 g
A HOUSEFULL OF USES!
ARM & HAMMER
THE STANDARD OF PURITY
Natural
NOTE: be careful weigh out the samples - don't mix up the masses

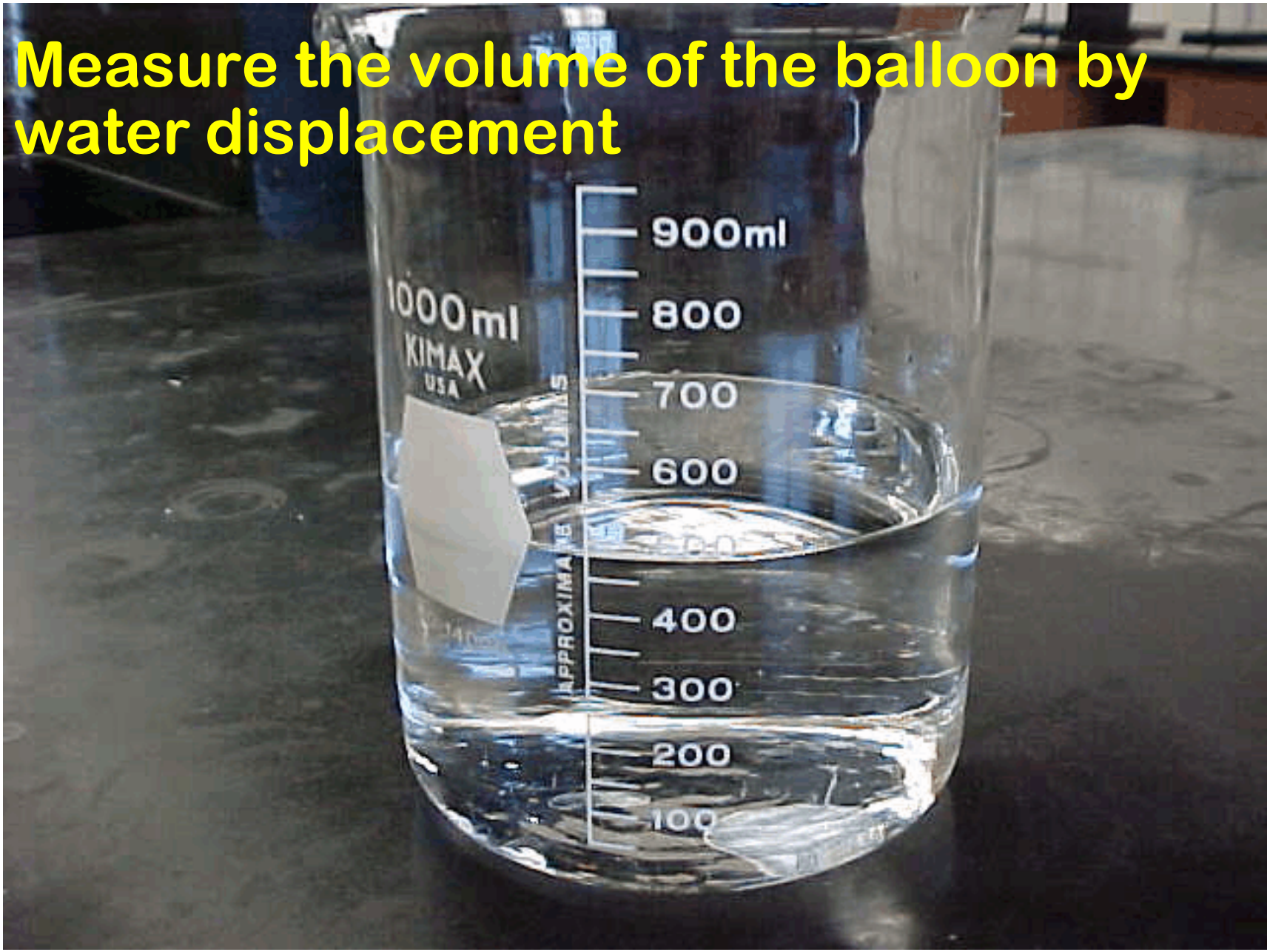

0.5 g
3.0 g
Remember: you do the whole experiment twice - once with pure and once with impure sodium bicarbonate

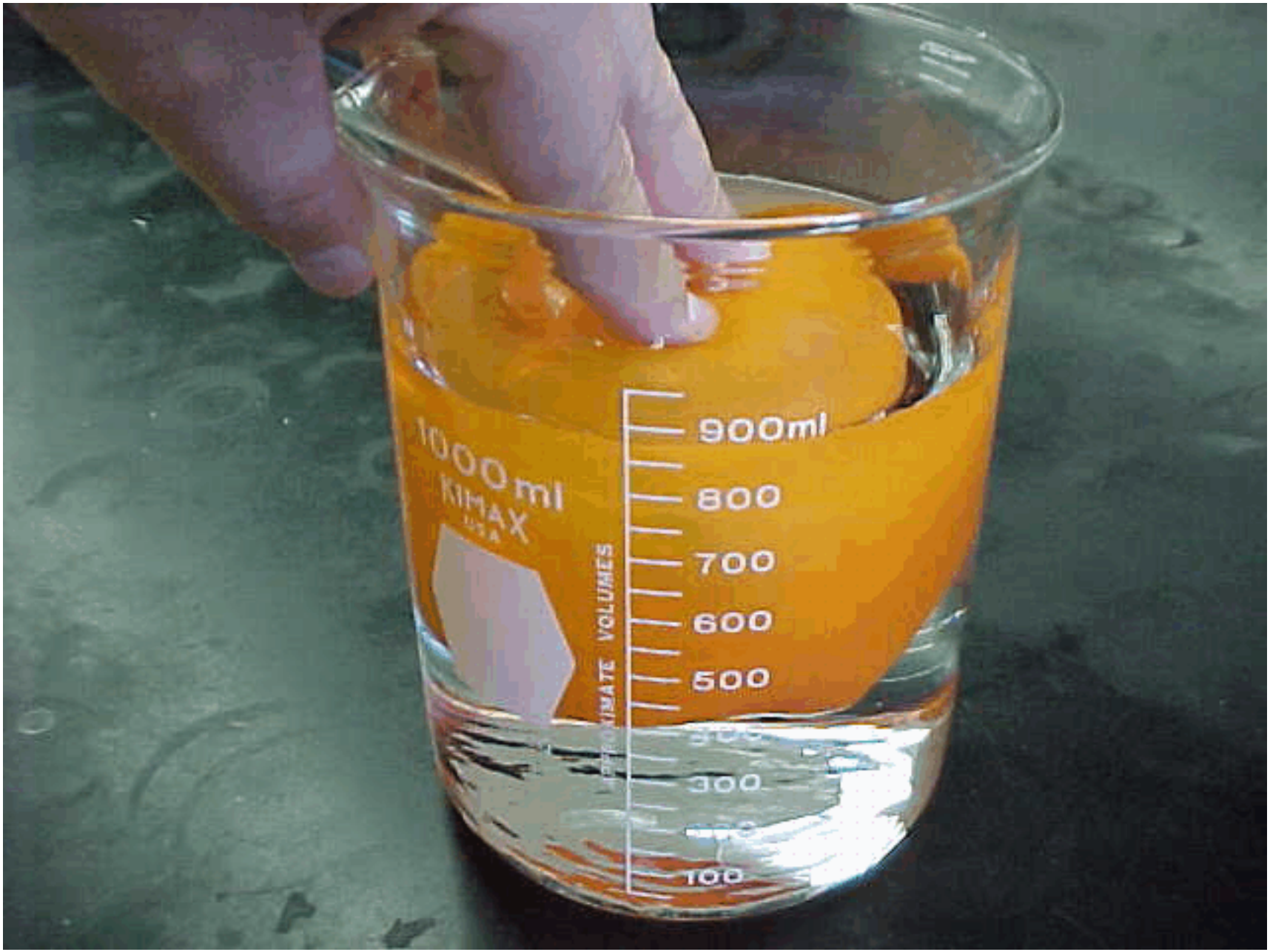
Weigh powders in a small beaker

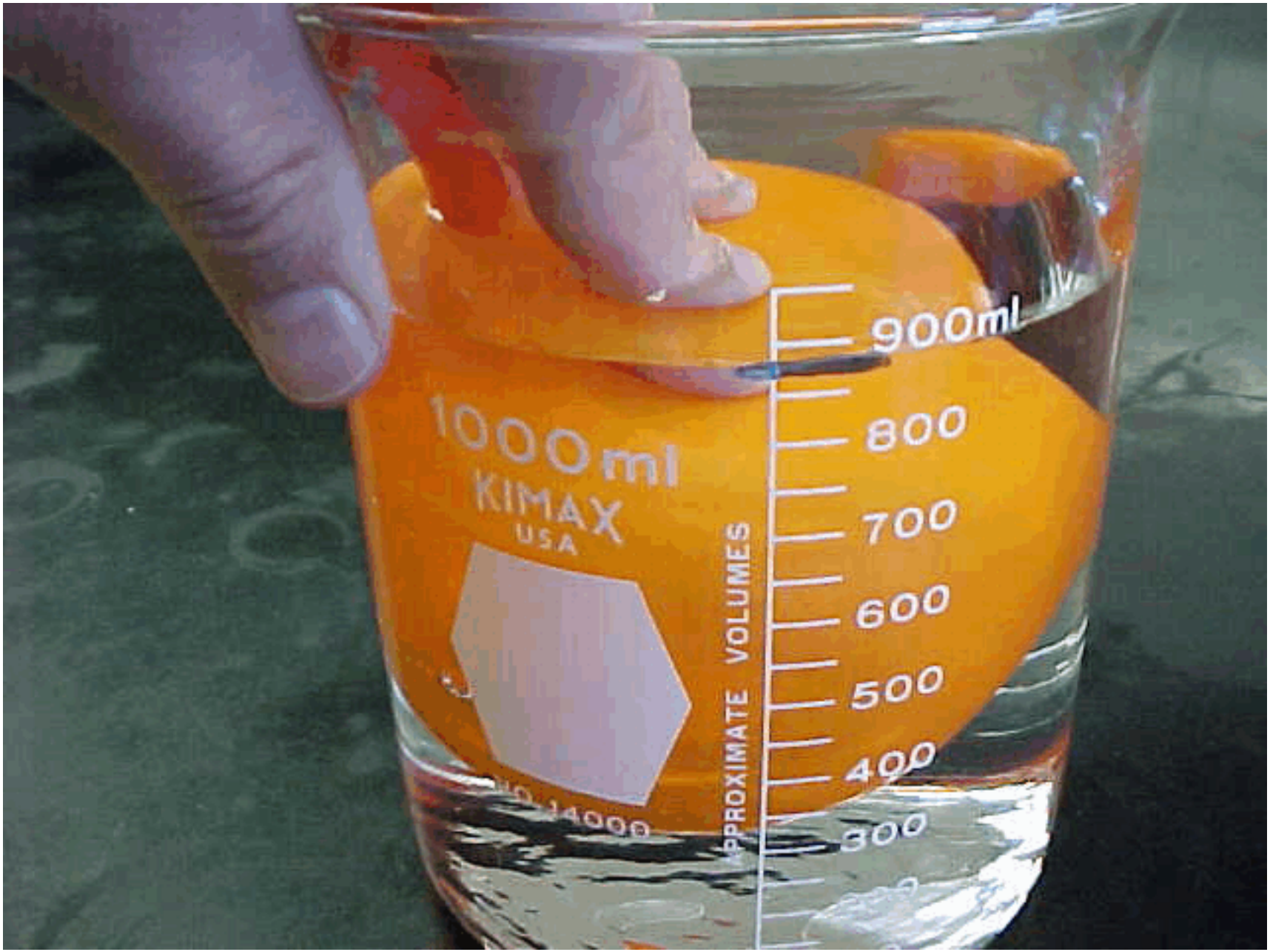


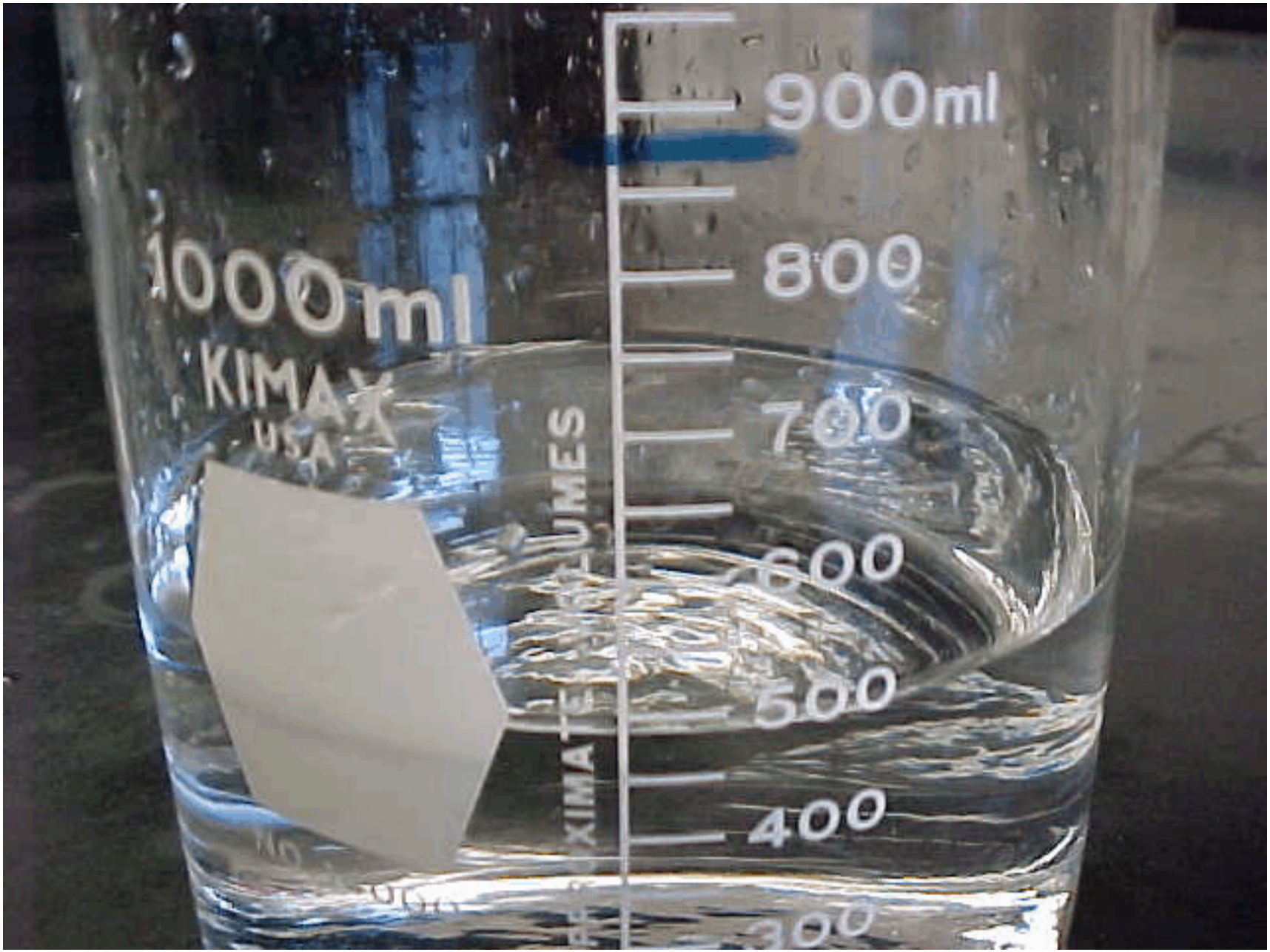

Then transfer to a test tube and place
ballon with water inside on the test tube




Measure the volume of the balloon by water displacement
1000ml
KIMAX
USA
900ml
800
700
600
400
300
200
100


1000ml
KIMAX
900ml
800
700
600
500
300
100


1000ml
KIMAX
USA
APPROXIMATE VOLUMES
900ml
800
700
600
500
400
300


900ml
800
700
600
500
400
1000ml
KIMAX
USA


After removing the balloon, refill the beaker up to the mark to determine the volume of water displaced


KIMBL
USA
PP
10
1000ml
KIMAX
USA
900ml
800
700
600
500