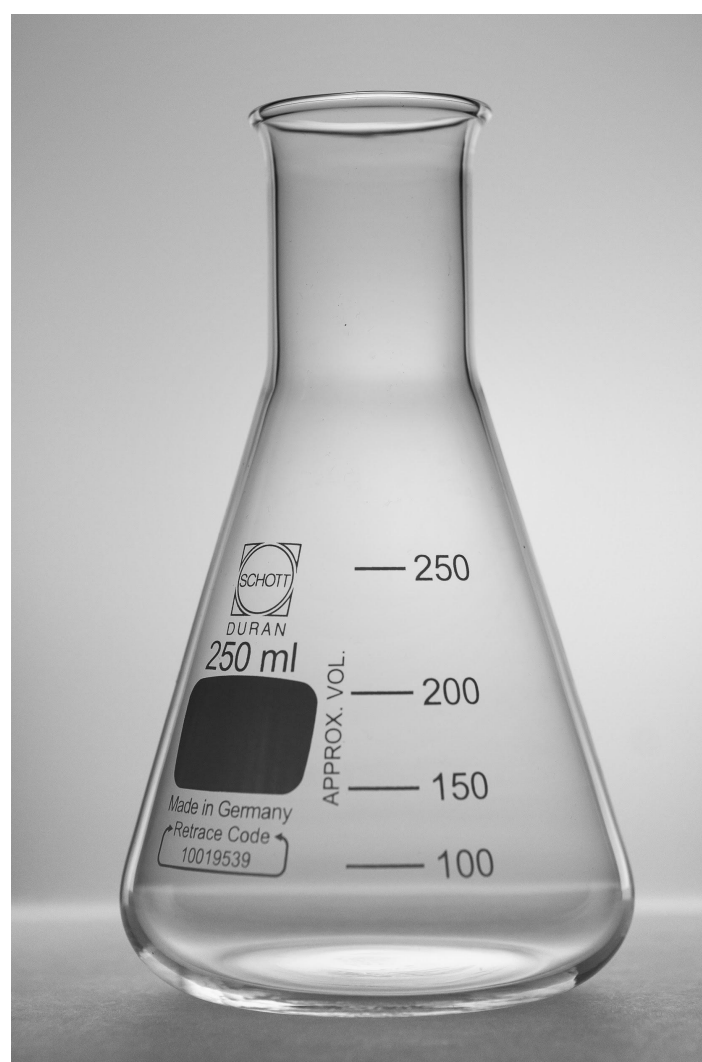
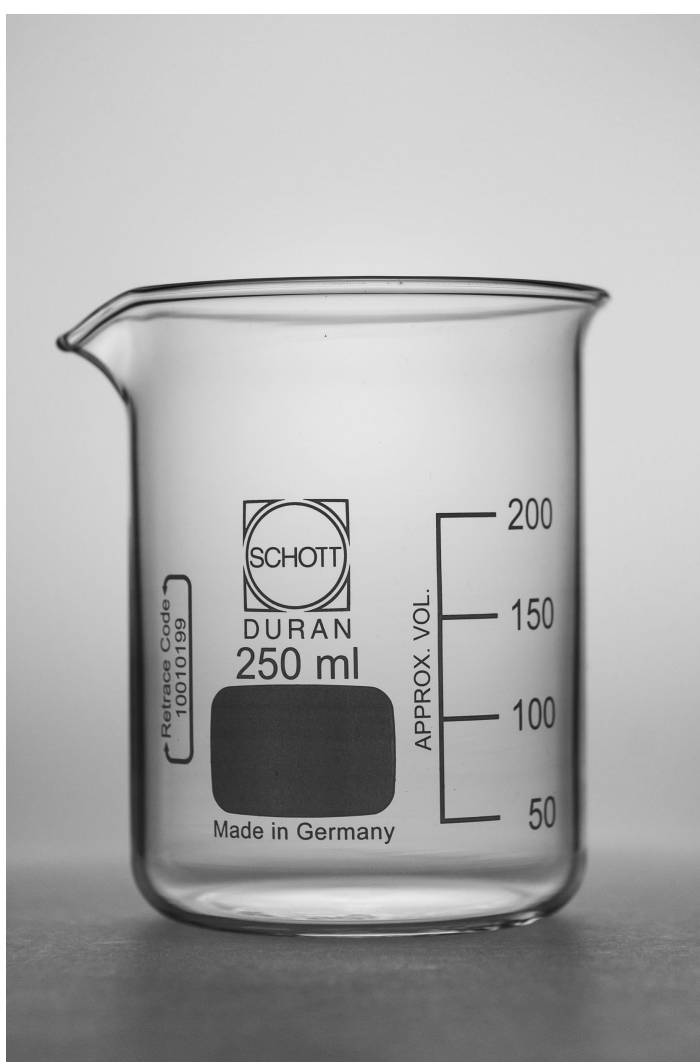
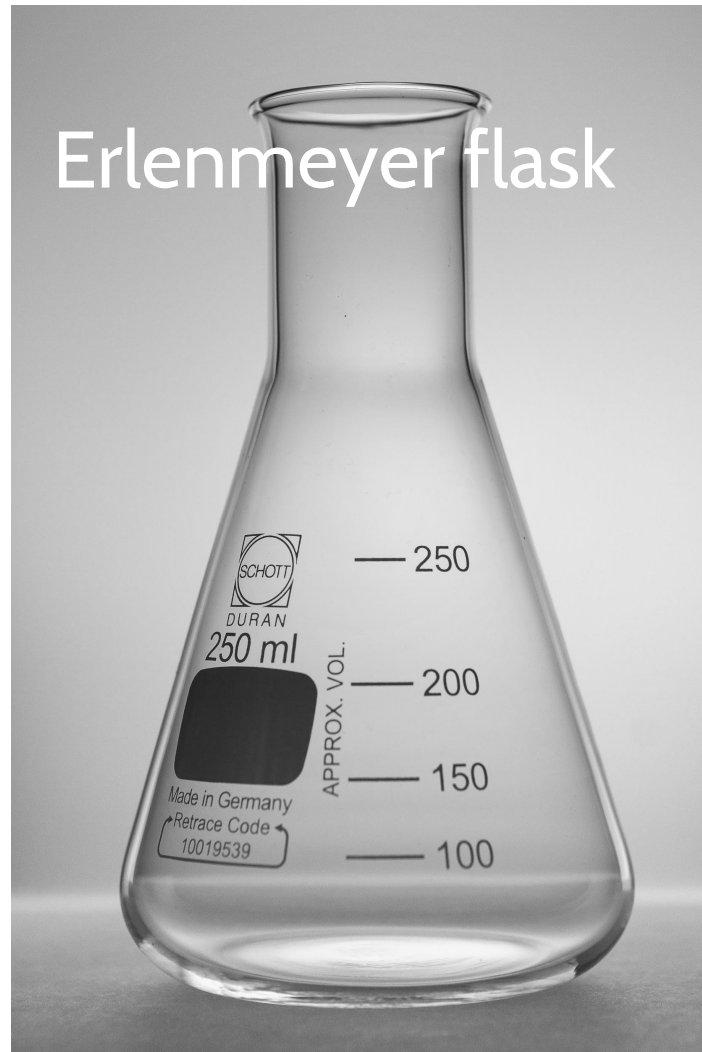
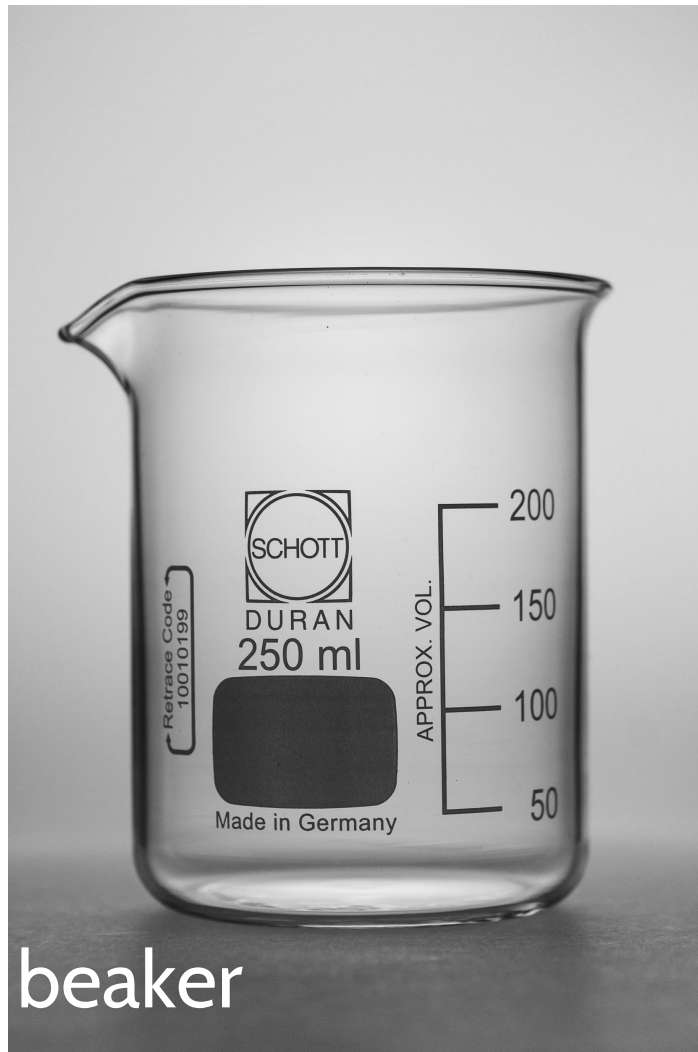


LAB EQUIPMENT





LAB EQUIPMENT

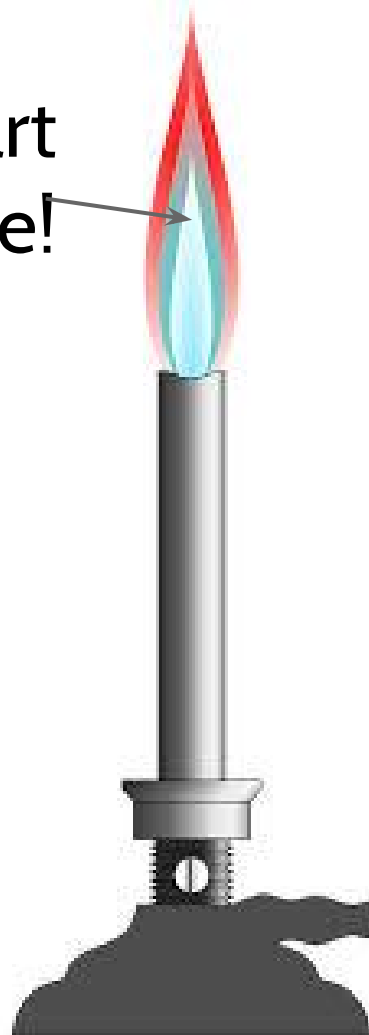


LAB EQUIPMENT

Bunsen
burner



hottest part
of flame!



LAB EQUIPMENT



LAB EQUIPMENT



READING A GRADUATED CYLINDER



1. Get eye-level with liquid line
1. Locate bottom of *meniscus*
1. Identify numerical value of hashmarks
1. Record volume out to smallest hashmark + 1 estimated digit

PRECISION

Degree of
refinement of an
instrument

Consistency,
repeatability



***Extensive* Properties**

Depend on amount of substance present

***Intensive* Properties**

Do NOT depend on amount of substance – just what the substance is

Extensive Properties

Depend on amount of substance present



lots of salt!



small shaker of salt

Extensive Properties

Depend on amount of substance present



Ex: *mass, weight, volume, length, etc.* are both different for the 2 salt samples above

Intensive Properties

Do NOT depend on amount of substance - *just what the substance is*



Ex: *color, temperature, pressure, elasticity, hardness, ductility, malleability, melting point, boiling point, **density*** etc. are all the same for the 2 salt samples above

CALCULATING DENSITY

$$\text{Density} = \text{Mass} / \text{Volume}$$

CALCULATING DENSITY



$$\text{Density} = \text{Mass} / \text{Volume}$$

1. Determine the density of a 4.5 g substance that occupies 40 mL of space.
2. Determine the mass of 20 mL of copper, with a density of 8.96 g/mL

SIGNIFICANT FIGURES *communicating precision*

Rules:

1. All non-zero numbers are significant
2. Zeros between non-zero digits are significant

What about zeros before and after nonzero digits?

SIGNIFICANT FIGURES communicating precision

if decimal is
Present



if decimal is
Absent



SIGNIFICANT FIGURES communicating precision

start counting at the
first non-zero number
and keep counting
until the end



3.14159 6



5,600 2



4.030 4



0.009 1

SIGNIFICANT FIGURES *rounding to appropriate sig figs*

1. 5 or greater, increase by 1
2. Less than 5, stay the same

<i>Sig Figs</i>	
5	12, 306
3	
2	
1	

SIGNIFICANT FIGURES *rounding to appropriate sig figs*

1. 5 or greater, increase by 1
2. Less than 5, stay the same

<i>Sig Figs</i>	
5	12, 306
3	12, 300
2	12, 000
1	10, 000

SIGNIFICANT FIGURES *rounding to appropriate sig figs*

1. 5 or greater, increase by 1
2. Less than 5, stay the same

<i>Sig Figs</i>	
4	0.9450
3	
2	
1	

SIGNIFICANT FIGURES *rounding to appropriate sig figs*

1. 5 or greater, increase by 1
2. Less than 5, stay the same

<i>Sig Figs</i>	
4	0.9450
3	0.945
2	0.95
1	0.9

SIGNIFICANT FIGURES *multiplying and dividing*

1. Determine number of sig figs in each number
2. Calculate product or quotient
3. Round final answer to *FEWEST* number of sig figs from #1

SIGNIFICANT FIGURES *multiplying and dividing*

*Calculate the density
to the correct number of sig figs:*

Mass = 4.80 g
Volume = 1.7 mL

SIGNIFICANT FIGURES *multiplying and dividing*

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{4.80 \text{ g}}{1.7 \text{ mL}}$$

$$2.8235294 \text{ g/cm}^3 \longrightarrow 2.8 \text{ g/mL}$$

(Round to 2 sig figs)

SIGNIFICANT FIGURES *adding and subtracting*

1. Determine number of decimal places in each number
2. Calculate sum or difference
3. Round answer to *FEWEST* number of *decimal places* from #1

SIGNIFICANT FIGURES *adding and subtracting*

A graduated cylinder with some water reads 12.45 mL. I add a marble, and the water level now reads 14.35 mL.

What is the volume of the marble?

SIGNIFICANT FIGURES *adding and subtracting*

A graduated cylinder with some water reads 12.45 mL. I add a marble, and the water level now reads 14.35 mL.

What is the volume of the marble?

$$14.35 \text{ mL} - 12.45 \text{ mL} = 1.90 \text{ mL}$$