$\qquad$
$\qquad$ DATE: $\qquad$

## Measuring Matter: Mass, Weight, and Volume

Now that we understand the KMT, we can talk about DENSITY. Density requires knowledge of mass and volume.
MASS: _a mount of maHer in an object

- measured in grams (g) or kilograms (kg)

Mass is different from WEIGHT
WEIGHT: Force of gravity_pulling on an object.

- Measured in Newtons
- The weight of objects is lower $\qquad$ on the moon since the moon's gravity is $\frac{1}{6}$ that of the Earth's.


## MEASURING MASS USING A TRIPLE BEAM BALANCE

There are various types of laboratory balances. The triple beam balance you use may look somewhat different from the one in the Figure below, however all beam balances have some common features.


DIGITAL/ELECTRONIC BALANCE


TRIPLE BEAM BALANCE


Practice Question:
What is the mass indicated by the triple beam balance on the left?

$$
545.2 \mathrm{~g}
$$

VOLUME:
Volume: amount of space occupied by an object

- Measured in $\mathrm{ML}, \mathrm{L} \mathrm{cm}^{3} \mathrm{~m}^{3}$
- $1 \mathrm{~cm}^{3}=1 \mathrm{~mL} ; 1 \mathrm{~m}^{3}=1000 \mathrm{~L}$

Measuring Volume:
A. Volume of LIQUIDS:

- use a graduated cylinder or beaker
- read at eye level
- read from bottom of meniscus (curved surface of water)


Graduated cylinder


Beaker


Erlenmeyer flask


B. Volume of RECTANGULAR SOLIDS:

Volume $=$ length $\bullet$ width $\bullet$ height

$$
V=l \quad \bullet w \cdot h
$$


C. Volume of IRREGULARLY SHAPED SOLIDS:

Use displacement of water technique

1. Measure a specific volume of water
2. Measure volume of water with object submerged in it
3. Subtract volumes to find volume of object

$$
\begin{aligned}
v & =1 \cdot w \cdot n \\
v & =2 \mathrm{~cm} \times 1.5 \mathrm{~cm} \times 2 \mathrm{~cm} \\
& =6 \mathrm{~cm}^{3}
\end{aligned}
$$

