

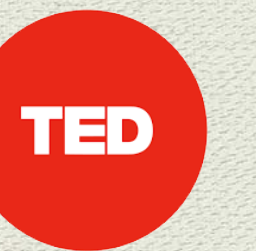


Density and Percent Error

How do we calculate density and percent error?

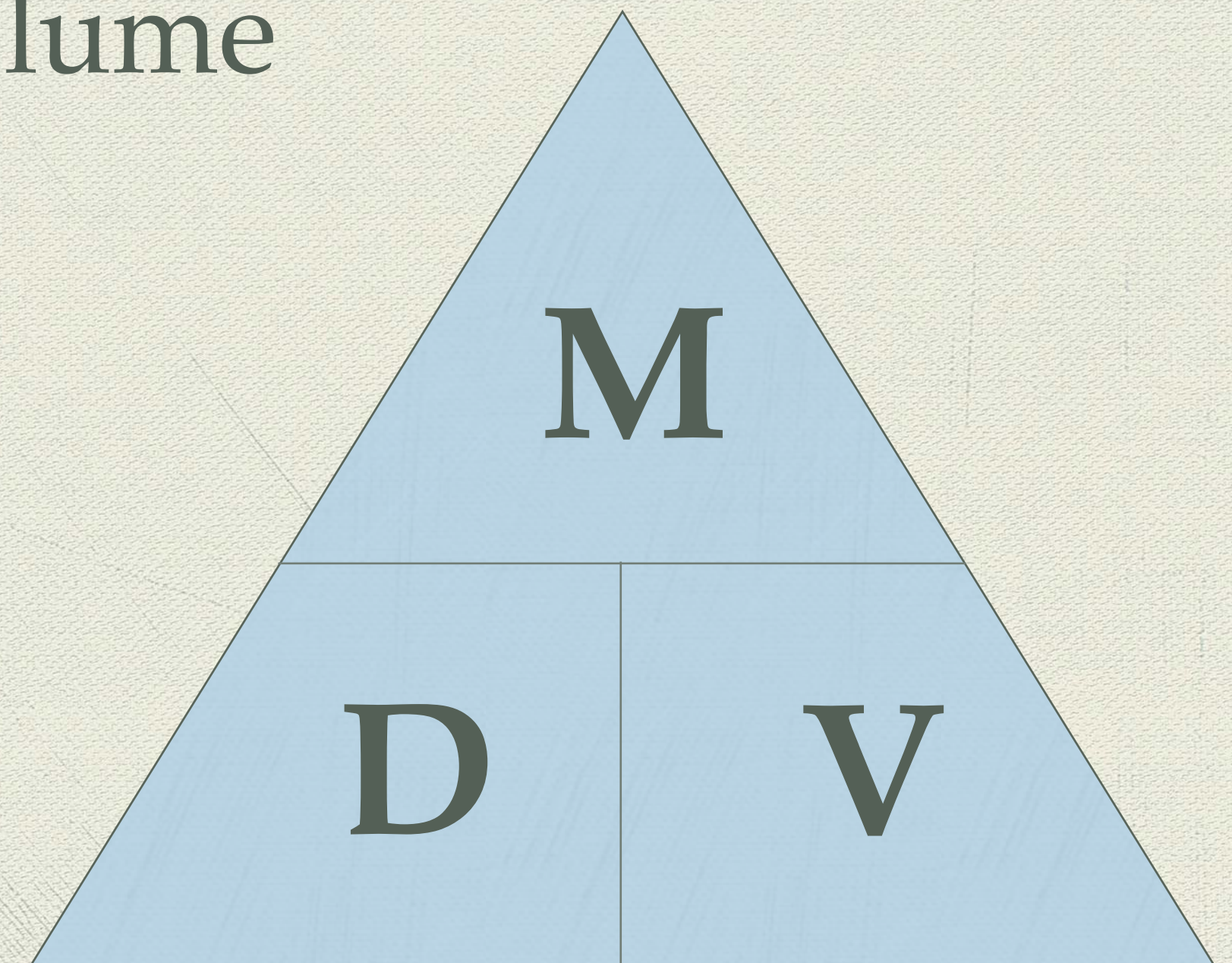


Phenomenon: Ice



Density and Percent Error

- ◆ Density - physical property of matter that can be used to characterize a pure substance
 - ◆ The ratio between mass and volume
 - ◆ Units: g / ml or g / cm³
 - ◆ Formula: density = $\frac{\text{mass}}{\text{volume}}$



Density and Percent Error

◆ Earth Science Reference Tables [ESRT]

$$\text{Eccentricity} = \frac{\text{distance between foci}}{\text{length of major axis}}$$

$$\text{Gradient} = \frac{\text{change in field value}}{\text{distance}}$$

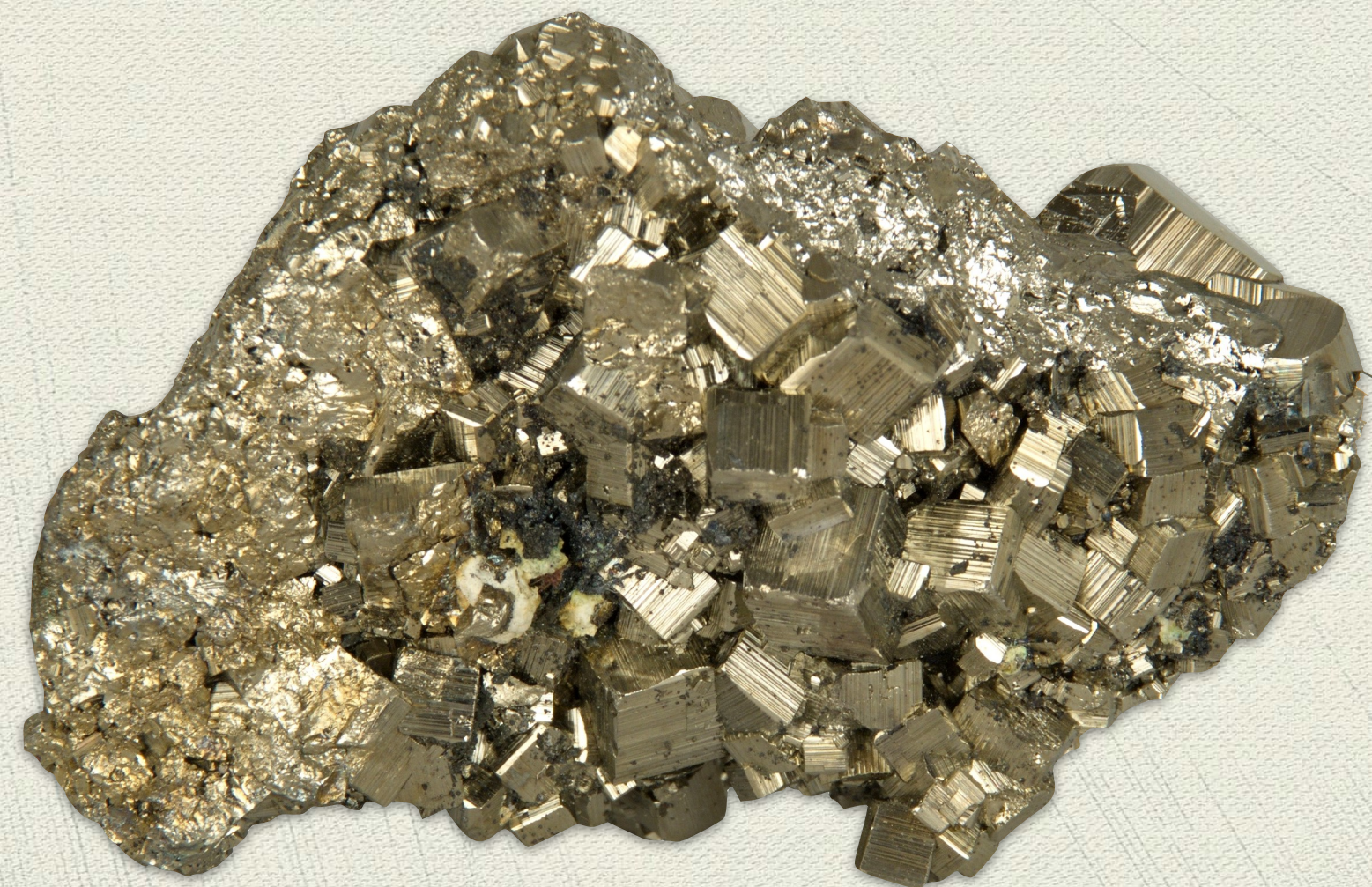
$$\text{Rate of change} = \frac{\text{change in value}}{\text{time}}$$

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

Density and Percent Error

Gold or Pyrite

- ◆ Problem: Charlie finds a goldish rock and thinks he is a millionaire. How can he figure it out?



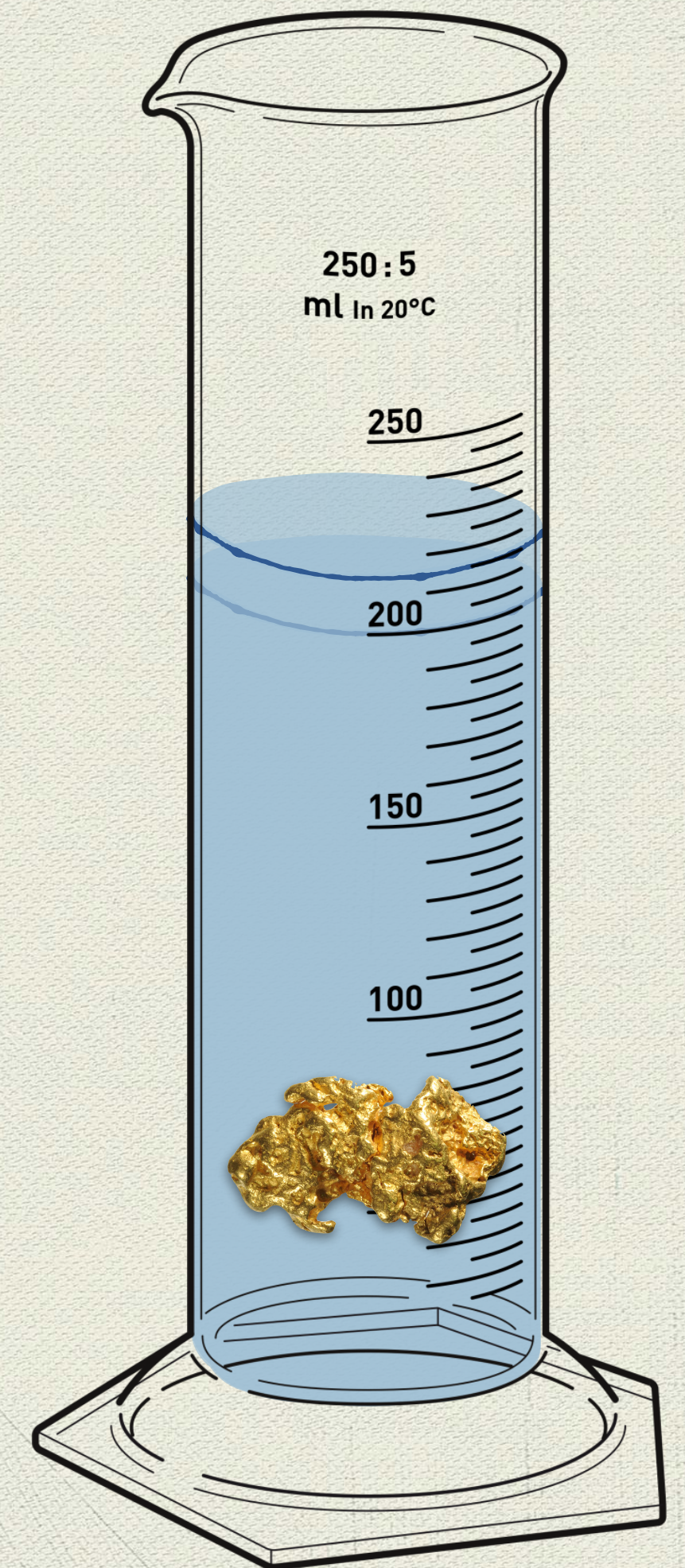
Density and Percent Error

Gold or Pyrite

Volume = 15.0 ml



Mass = 289.5 g



Density and Percent Error

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Density and Percent Error

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$$\text{density} = \frac{289.5 \text{ g}}{15.0 \text{ ml}}$$

Density and Percent Error

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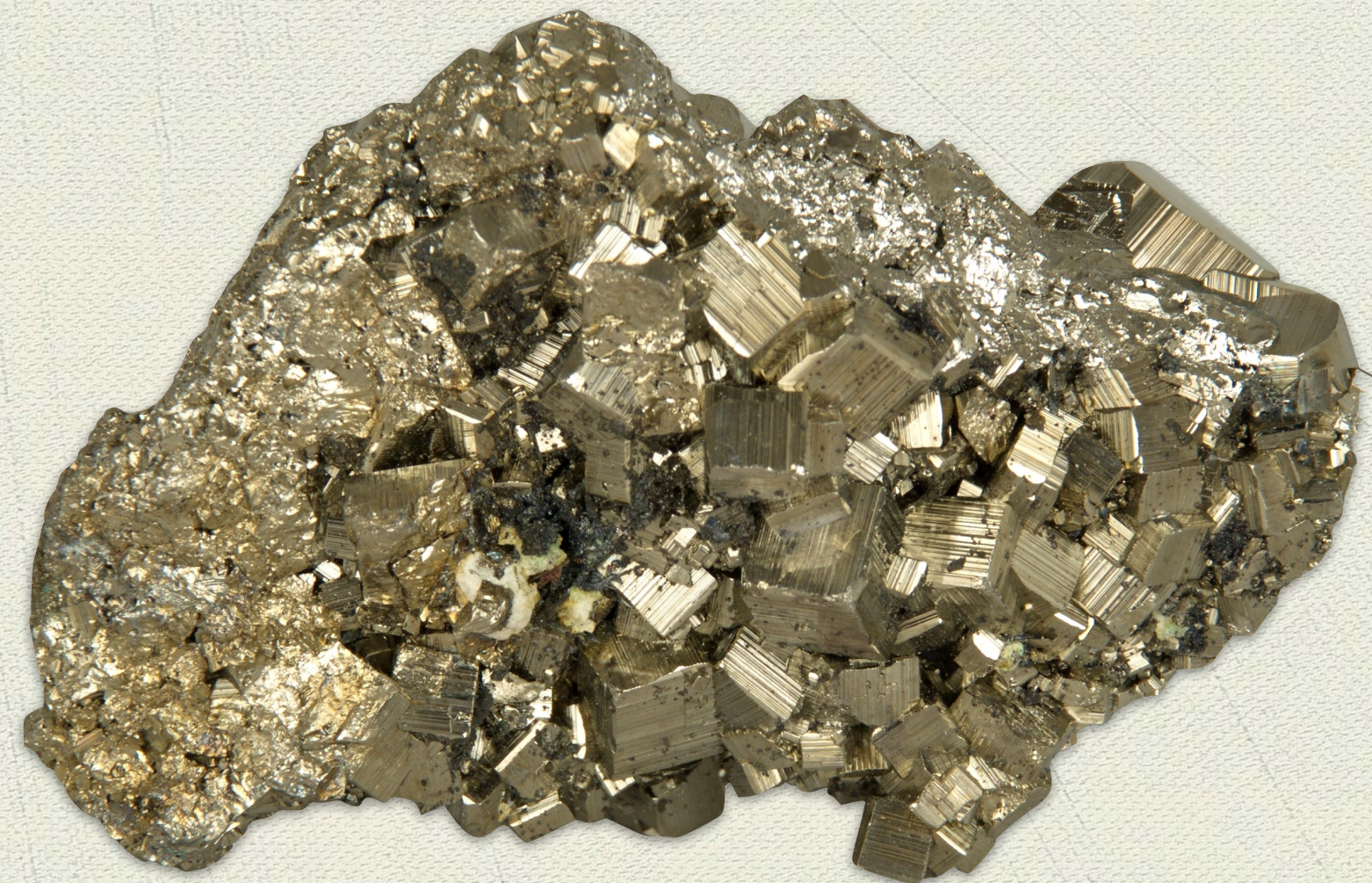
$$\text{density} = \frac{289.5 \text{ g}}{15.0 \text{ ml}}$$

$$\text{density} = 19.3 \text{ g/ml}$$

Density and Percent Error

Gold or Pyrite

◆ *So is Charlie a millionaire?*



Pyrite = 5.0 g/ml



Gold = 19.3 g/ml

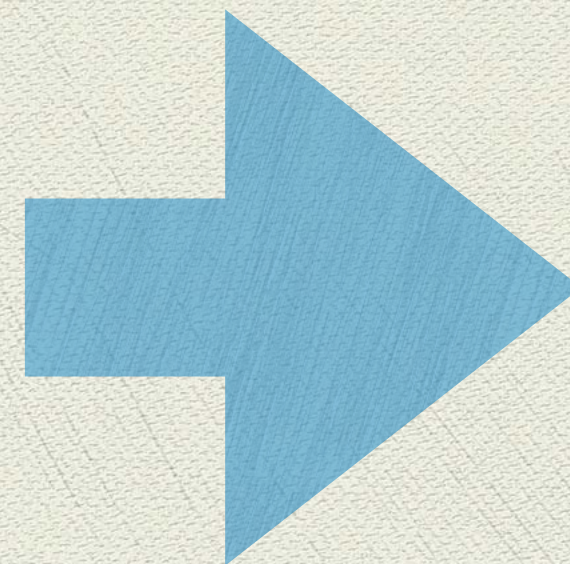
Density and Percent Error

- ◆ All substances are most dense in the solid phase... EXCEPT water
- ◆ How can we tell that solid water [ice] is less dense than liquid water?



Density and Percent Error

- ◆ Every substance can be identified using density
 - ◆ Example: Gold = 19.3 g/cm^3



Density and Percent Error

- ◆ Density of a substance remains the same [constant] unless temperature and / or pressure change
 - ◆ If temperature increases, density will decrease
 - ◆ If pressure increases, density will increase

Density and Percent Error

◆ Percent Error - an expression of the difference between a measured value and the accepted value

◆ Units: %

◆ Formula:

$$\text{deviation [\%]} = \frac{\text{difference from accepted value}}{\text{accepted value}} \times 100$$

Density and Percent Error

- Take a guess on how many gum balls are in the gum ball machine?

nope

nope

nope

nope

nope

nope

nope

nope

nope

Leigh's Guess = 950

nope

Actual = 940 gum balls



Density and Percent Error

$$\text{deviation } [\%] = \frac{\text{difference from accepted value}}{\text{accepted value}} \times 100$$

Density and Percent Error

$$\text{deviation [\%]} = \frac{\text{difference from accepted value}}{\text{accepted value}} \times 100$$

$$\text{deviation [\%]} = \frac{950 - 940}{940} \times 100$$

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Density and Percent Error

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$$\text{deviation [\%]} = \frac{950 - 940}{940} \times 100$$

$$\text{deviation [\%]} = 0.0106383 \times 100$$

$$\text{deviation [\%]} = 1.06 \%$$

earthtoleigh.com