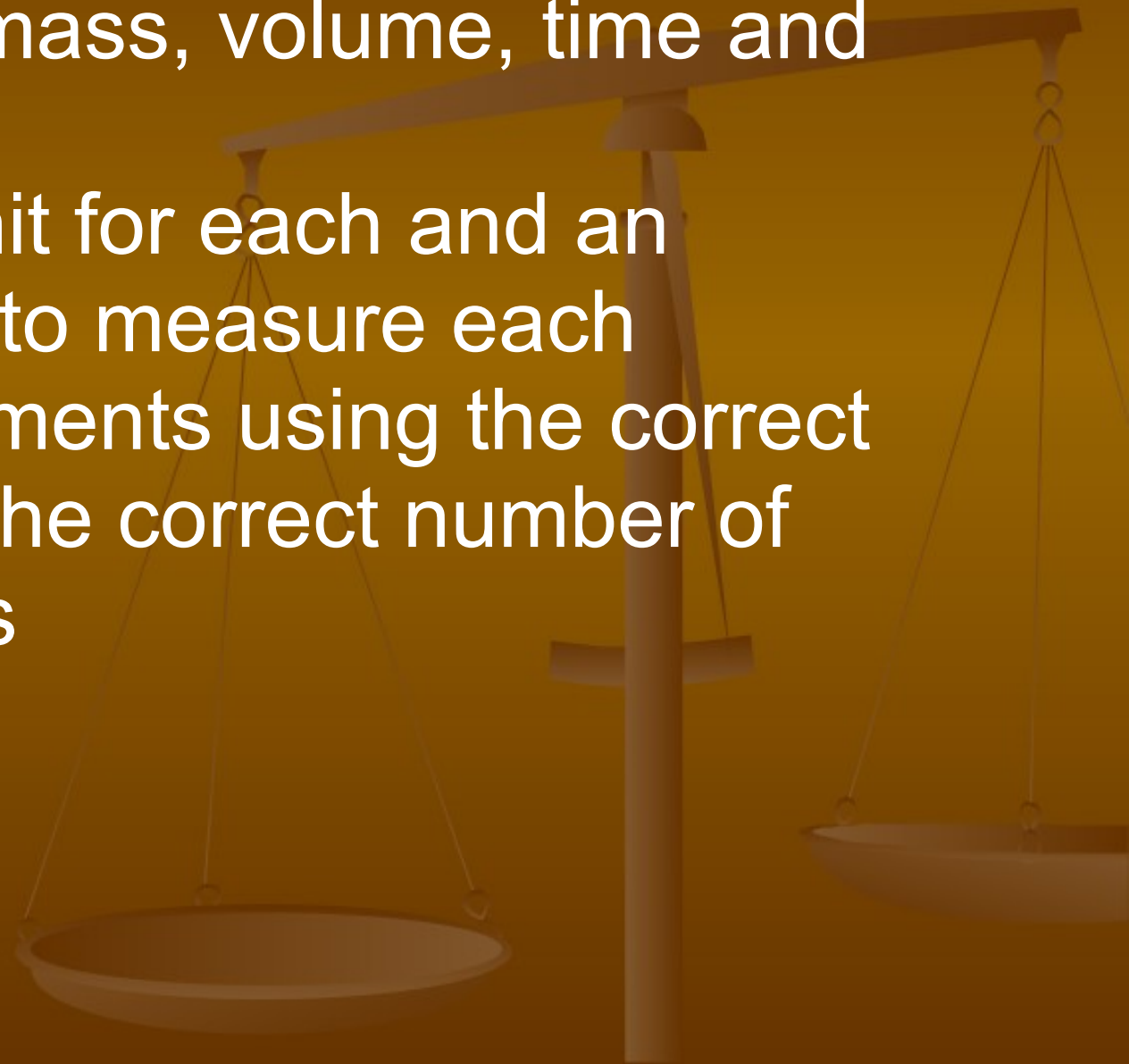


Scientific Measurement Video Notes



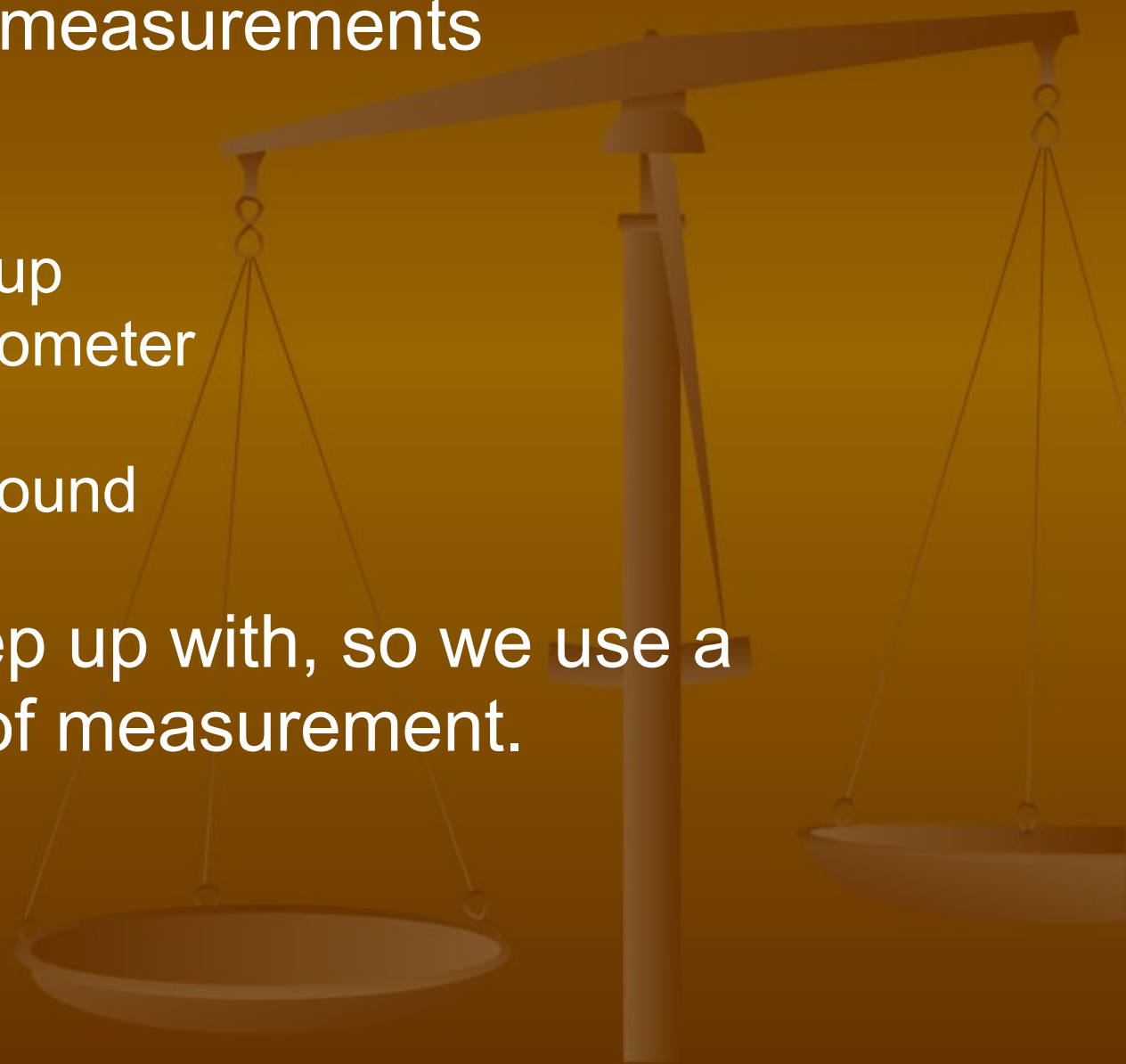
In this lesson you will

- Define length, mass, volume, time and temperature
- Name the SI unit for each and an instrument use to measure each
- Make measurements using the correct unit as well as the correct number of significant digits



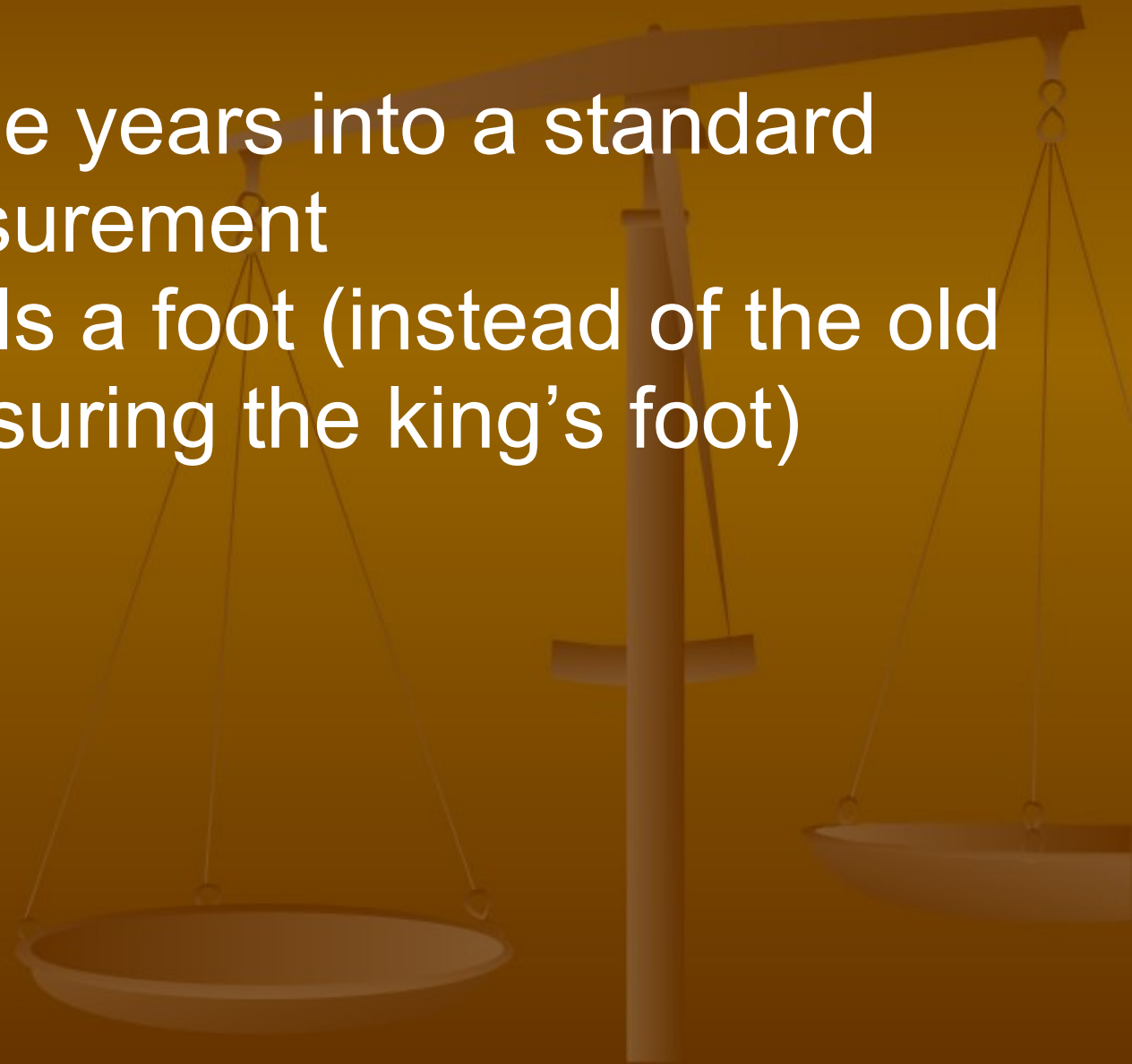
Chemistry

- Relies on precise measurements
- How many
 - Ounces are in a cup
 - Meters are in a kilometer
 - Feet are in a mile
 - Ounces are in a pound
- This is a lot to keep up with, so we use a standard system of measurement.



The English System

- Old system
- Evolved over the years into a standard system of measurement
- 12 inches equals a foot (instead of the old method of measuring the king's foot)
- Inch
- Ounce
- pound



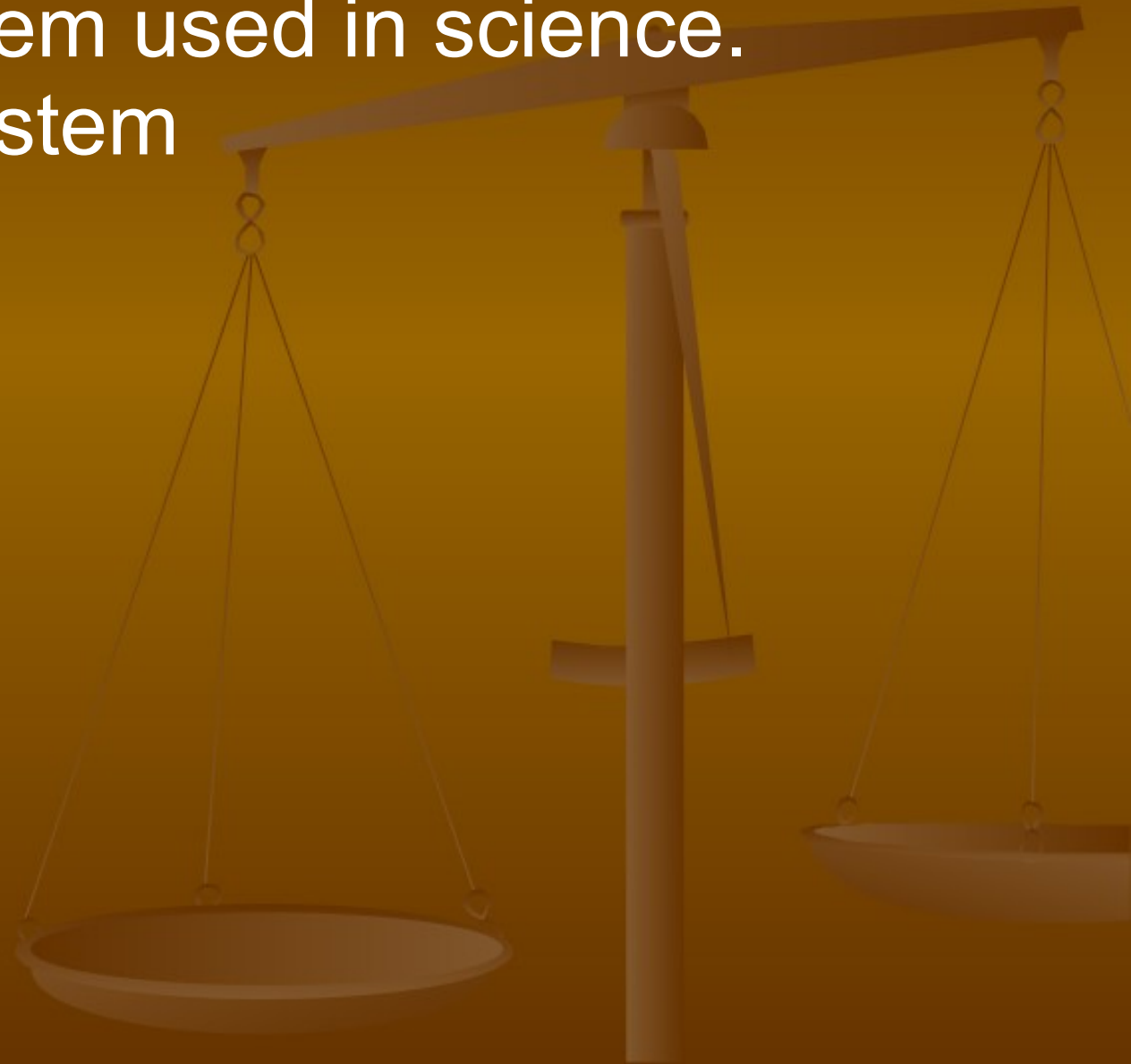
The Metric System

- Used in most countries outside the US and Great Britain
- Some examples are used in the US
 - Liter (like a 2 liter of drink)
 - mm (like 35 mm of film)



International System (SI)

- Measuring system used in science.
- AKA- Metric System



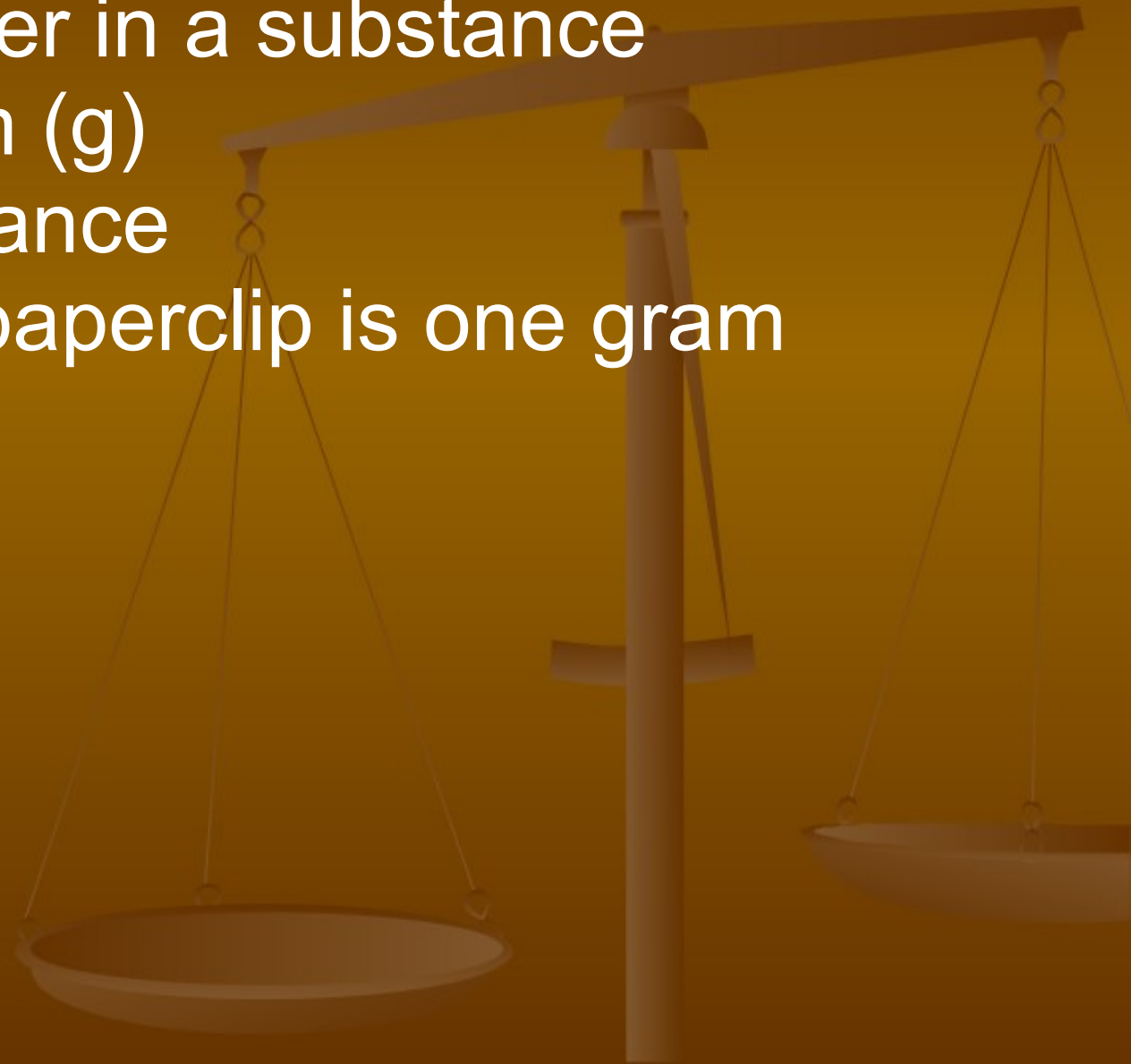
Length

- The distance between 2 points
- Base unit- Meter (m)
- Instrument- meter stick or metric ruler
- Example of use: a road sign stating the distance. Most other countries measure distance in km (kilometers)



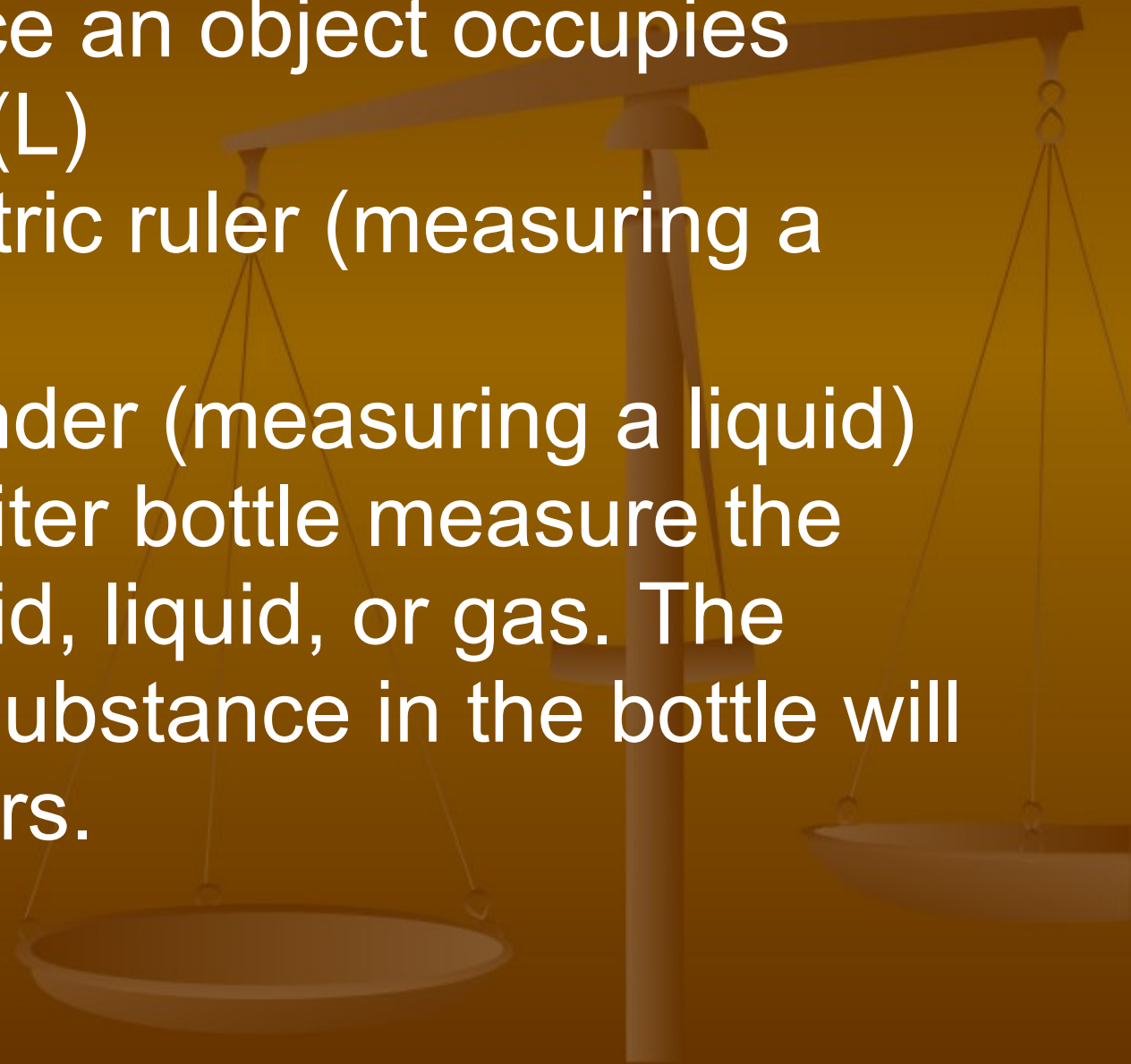
Mass

- Amount of matter in a substance
- Base unit- gram (g)
- Instrument- balance
- Example- one paperclip is one gram



Volume

- Amount of space an object occupies
- Base unit- liter (L)
- Instrument- metric ruler (measuring a solid),
Graduated cylinder (measuring a liquid)
- Example- a 2 Liter bottle measure the volume of a solid, liquid, or gas. The amount of the substance in the bottle will always be 2 liters.



Time

- Interval between two occurrences
- Base unit- second (s)
- Instrument- stopwatch
- Example- watching the clock to see when class is over



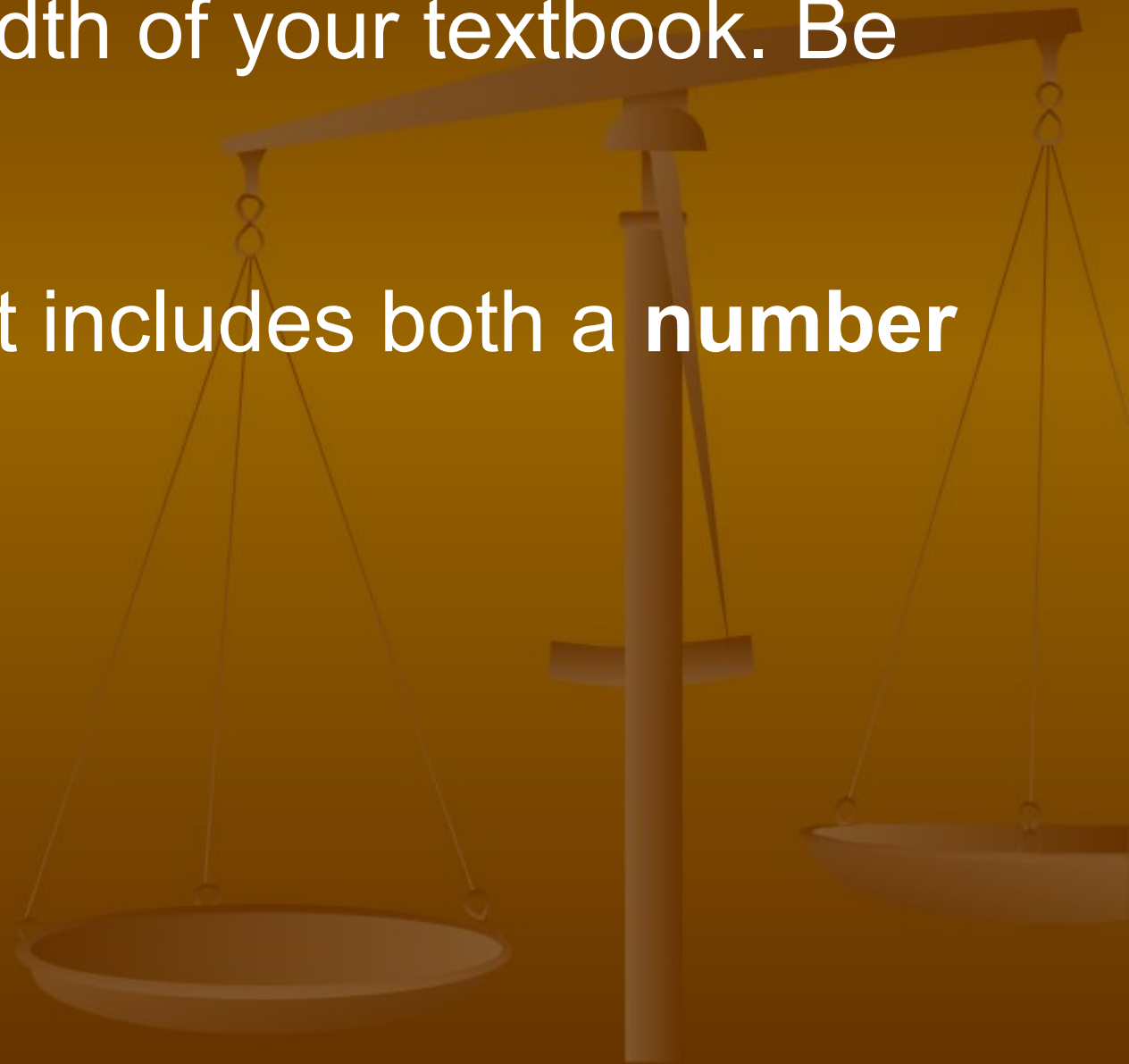
Temperature

- Average kinetic energy of a substance
- Base unit – $^{\circ}\text{C}$ (degree Celsius) or a K (Kelvin)
- Instrument- Thermometer
- Example- taking your temperature if you are sick



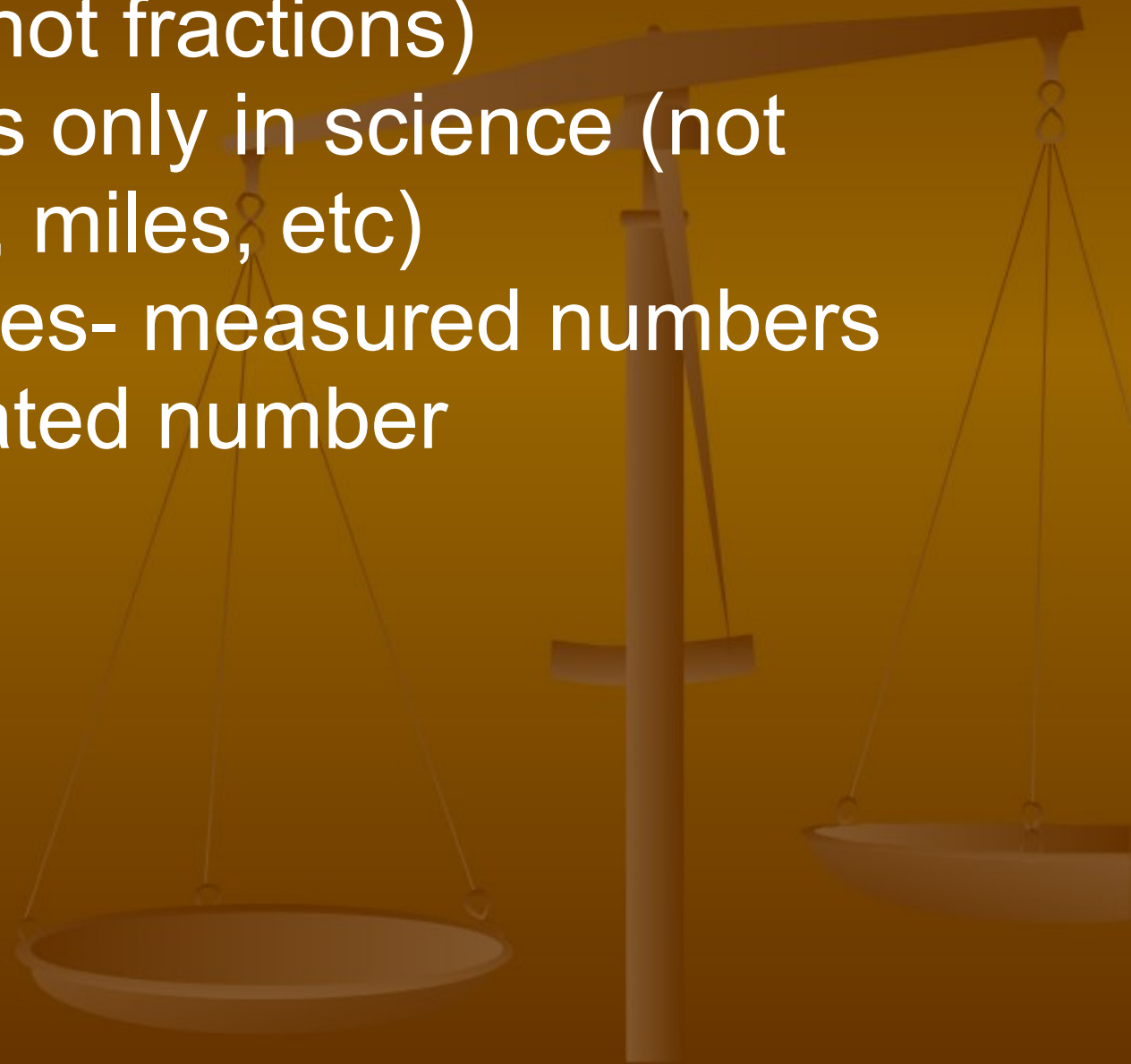
Measuring Example

- Measure the width of your textbook. Be sure to use cm
- A measurement includes both a **number** and a **unit**.

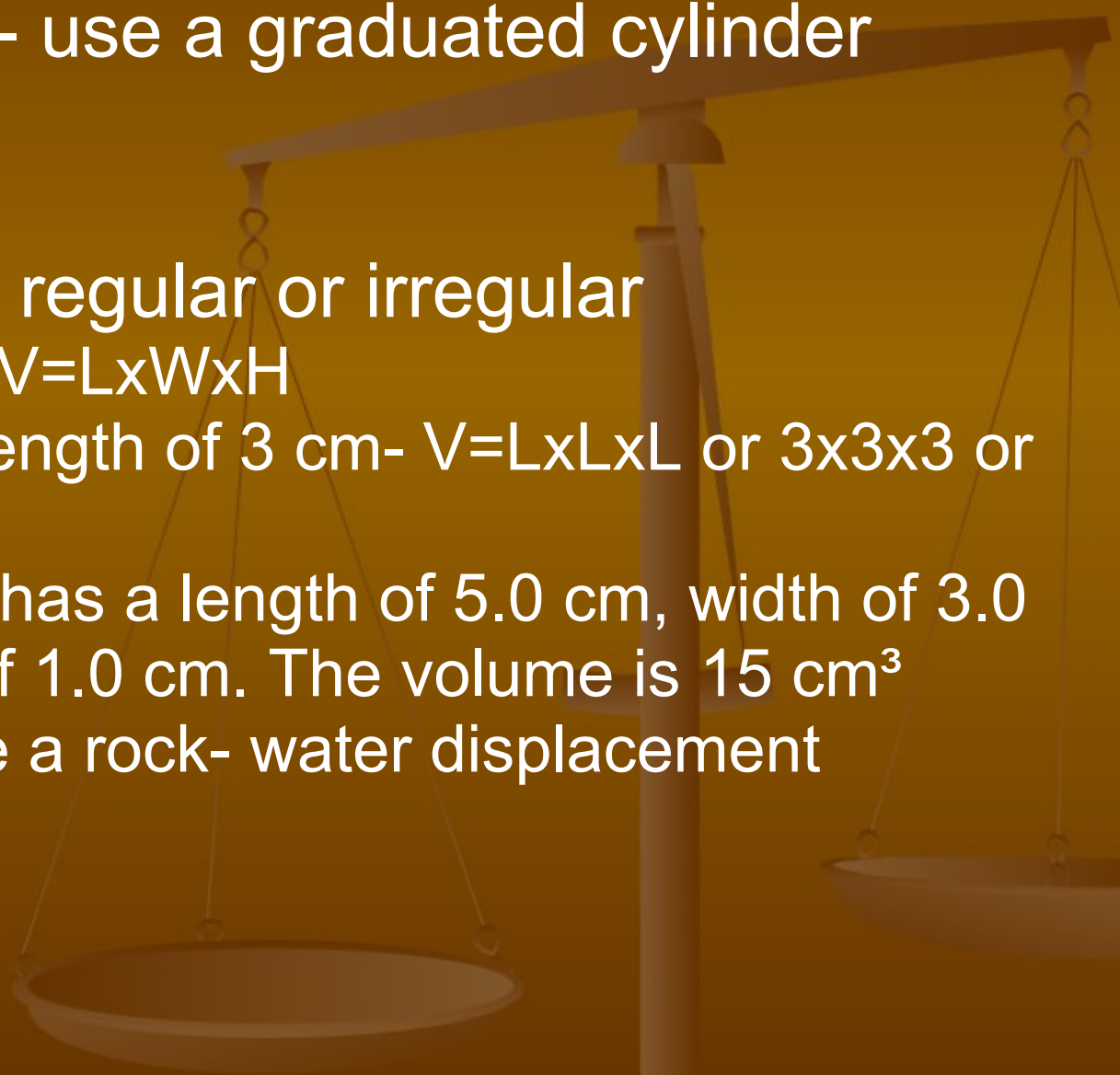


Significant Figures

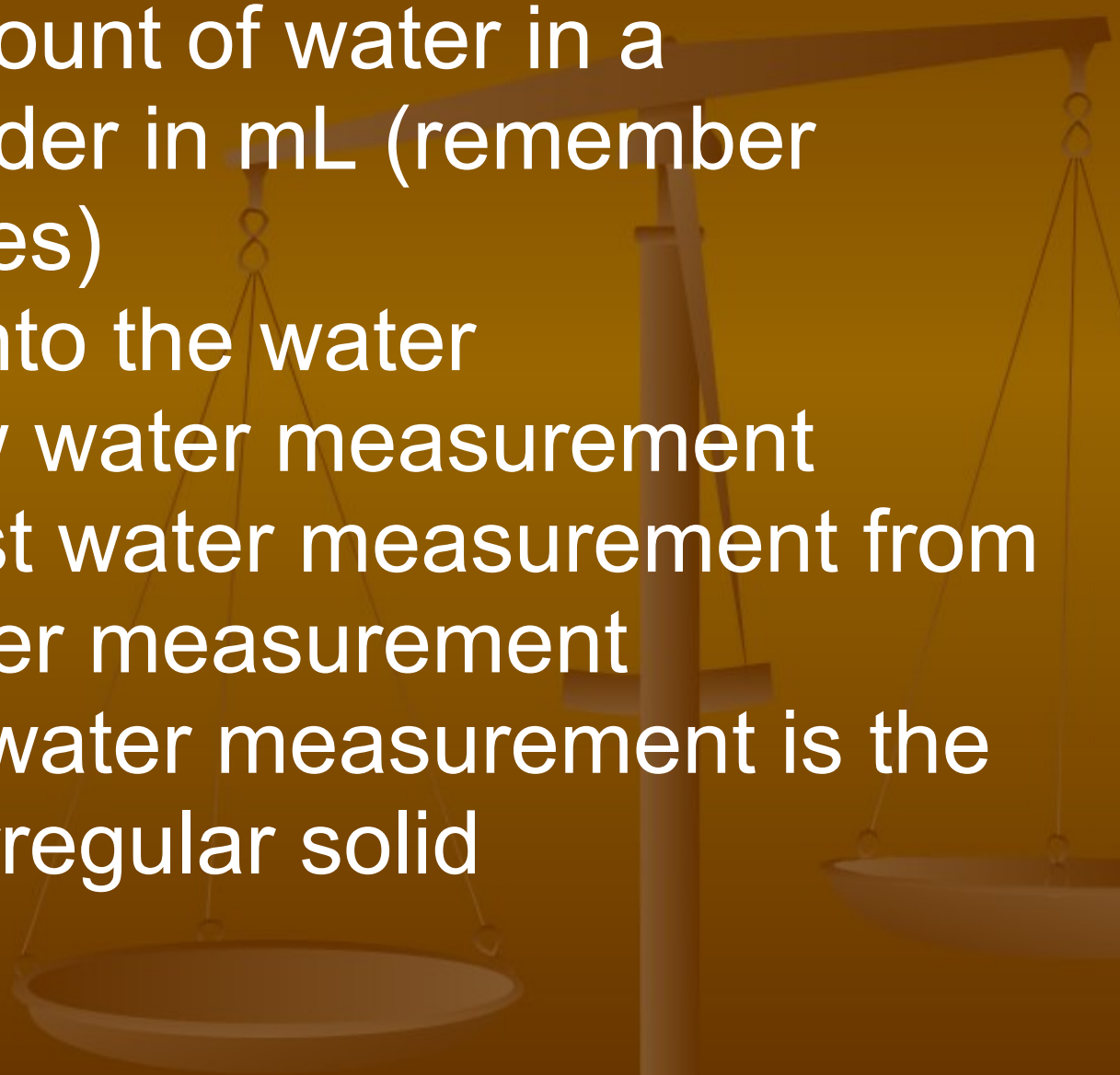
- Use decimals (not fractions)
- Use metric units only in science (not inches, ounces, miles, etc)
- Significant figures- measured numbers plus one estimated number



Examples of Volume Measurements

- Volume of a liquid- use a graduated cylinder (measure in mL)
 - Volume of a solid- regular or irregular
 - rectangular solid- $V=L \times W \times H$
 - Cube has a side length of 3 cm- $V=L \times L \times L$ or $3 \times 3 \times 3$ or 27 cm^3
 - Rectangular solid has a length of 5.0 cm, width of 3.0 cm and a height of 1.0 cm. The volume is 15 cm^3
 - Irregular solid- like a rock- water displacement
- 

Water Displacement

- Record any amount of water in a graduated cylinder in mL (remember significant figures)
 - Drop the rock into the water
 - Record the new water measurement
 - Subtract the first water measurement from the second water measurement
 - The change in water measurement is the volume for an irregular solid
- 
- A faint, semi-transparent image of a balance scale is visible in the background of the slide. The scale is positioned on the right side, with its horizontal beam extending towards the left. Two pans are suspended from the beam by thin wires. The scale is set against a dark, textured background.

Mass



- Many kinds of balances
- Triple beam balance is most popular
- Digital balances are easiest to use (usually measures to the hundredths place)

When taking the mass of a liquid, be sure to measure the mass of the liquid in its holder (a cup). Then measure the cup only. Subtract the mass of the cup from the mass of the cup and water. The result will be an accurate mass measurement of the water only.

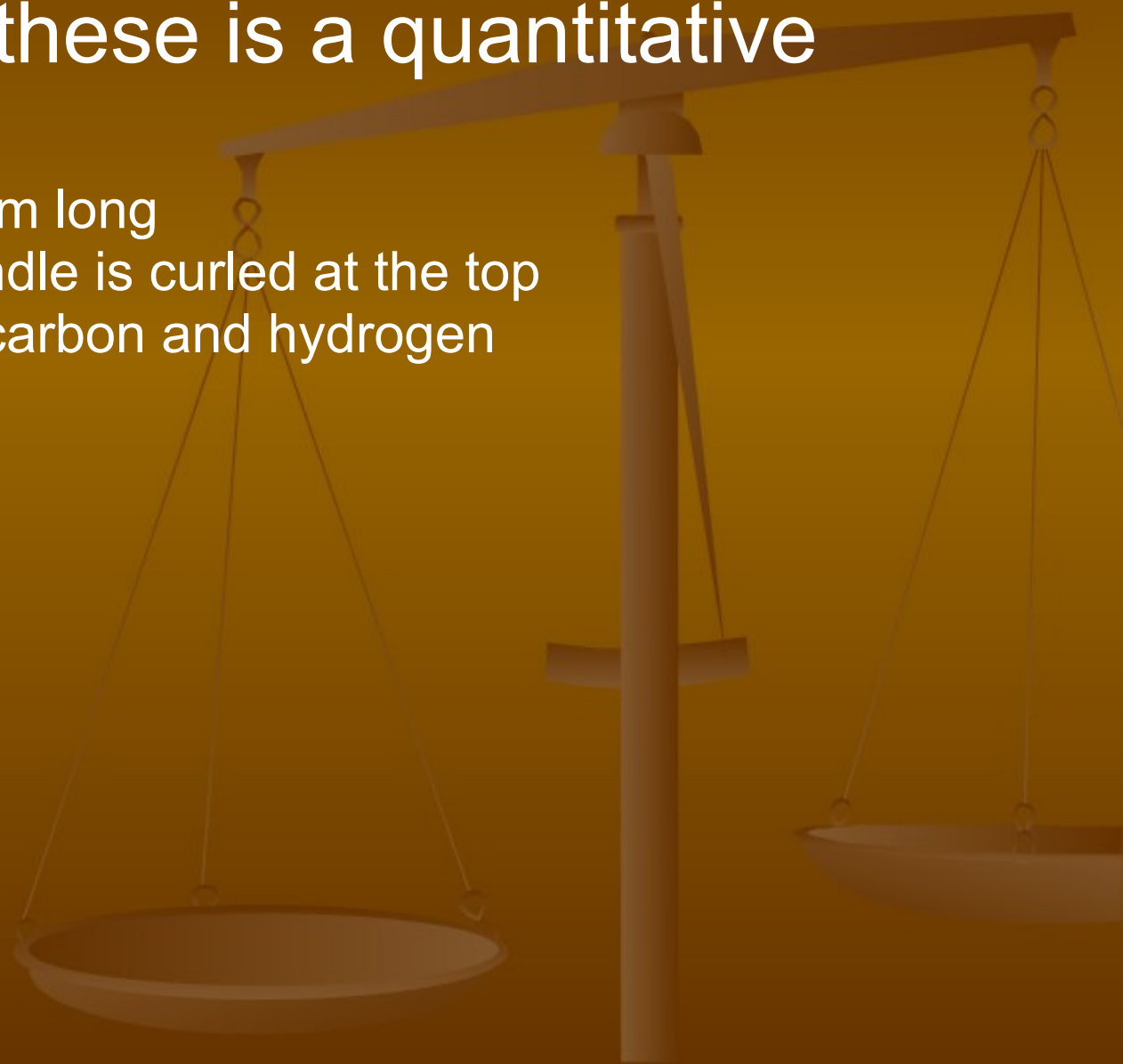
Tricky Fact

- $1 \text{ cm}^3 = 1 \text{ mL}$



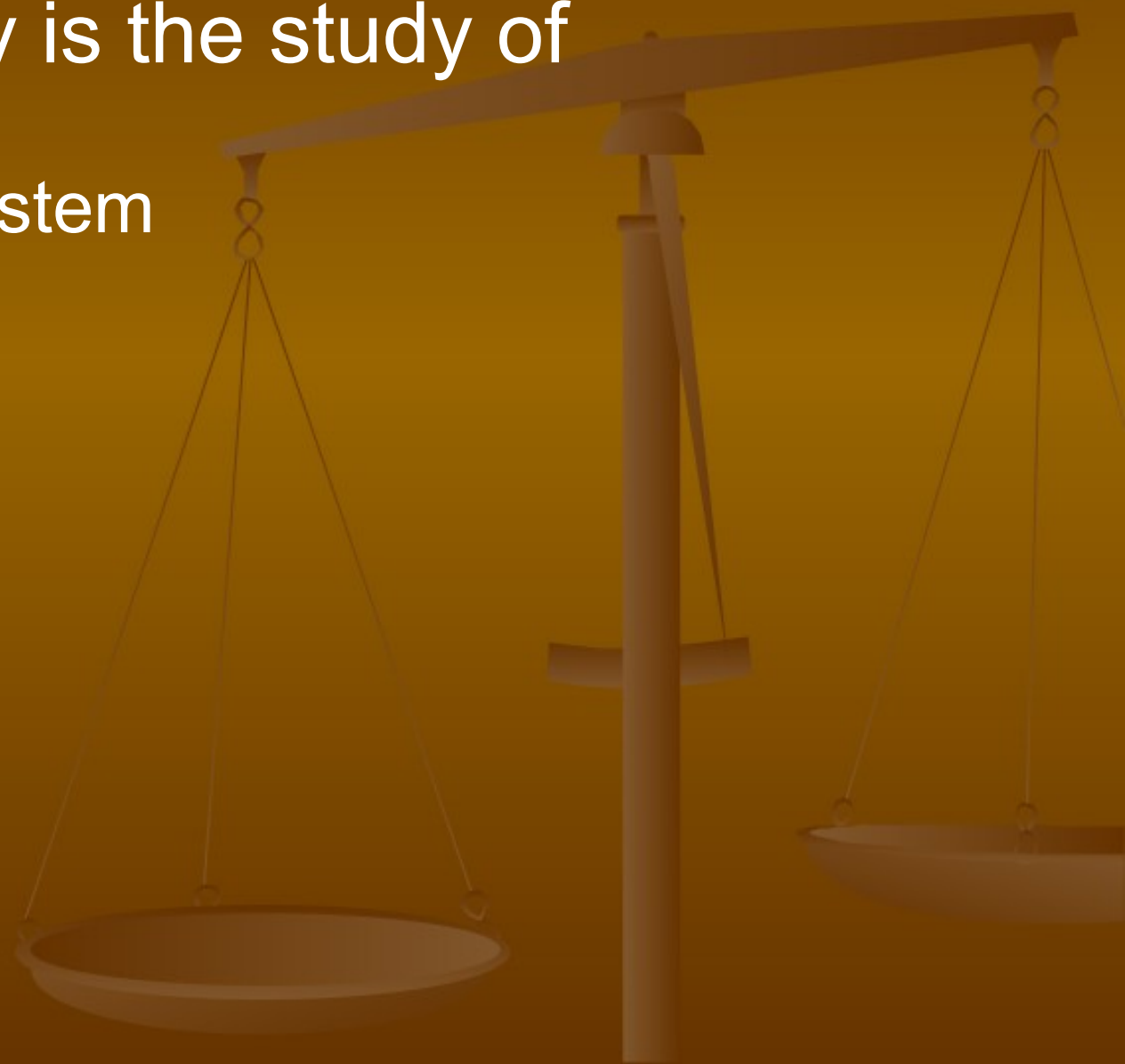
Chemistry Quiz

- CR1- Which of these is a quantitative observation?
 - A. the candle is 2.0 cm long
 - B. the wick of the candle is curled at the top
 - C. the wax contains carbon and hydrogen



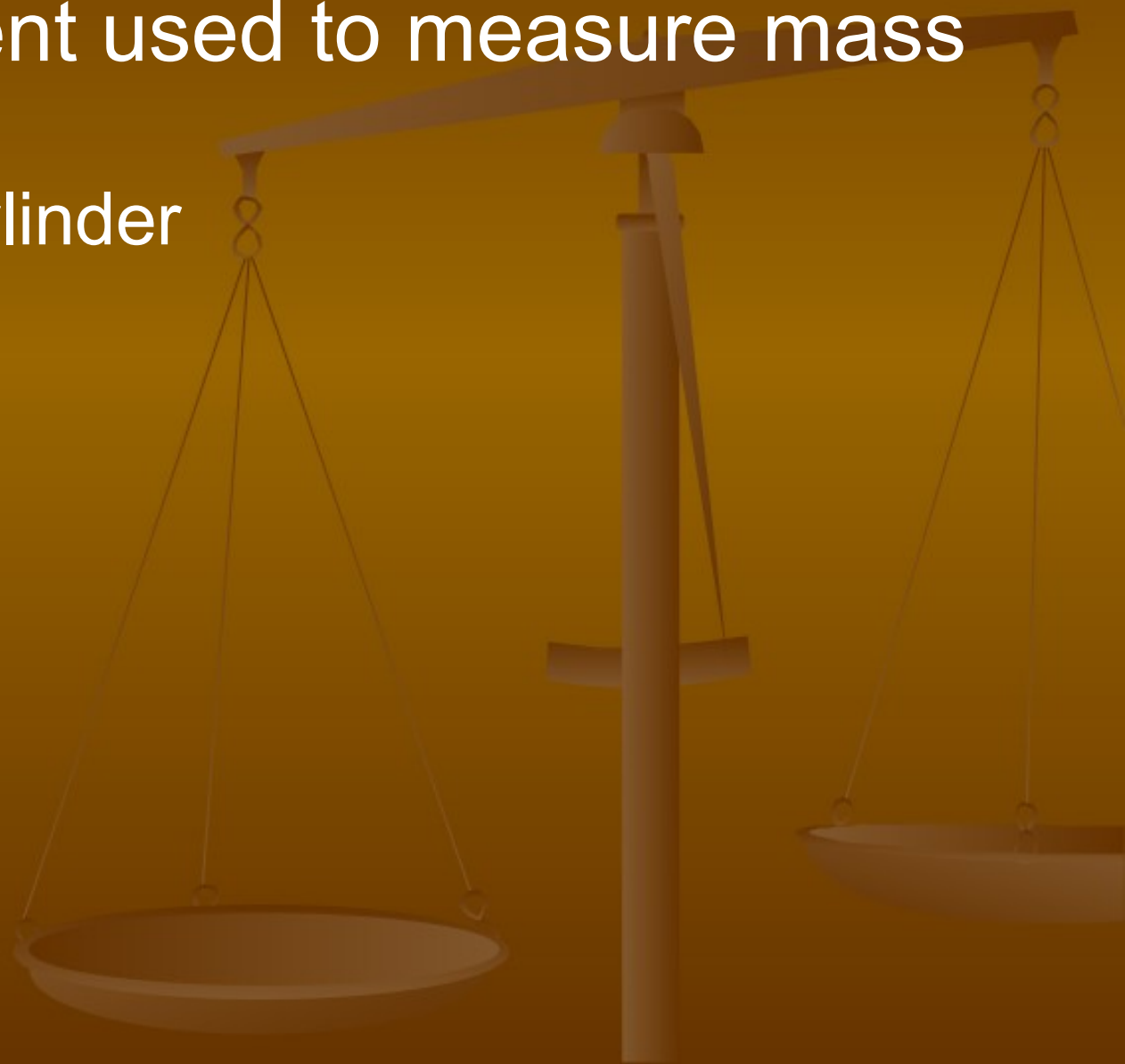
Chemistry Quiz

- CR2. Chemistry is the study of
 - A. candles
 - B. the metric system
 - C. reactions
 - D. matter



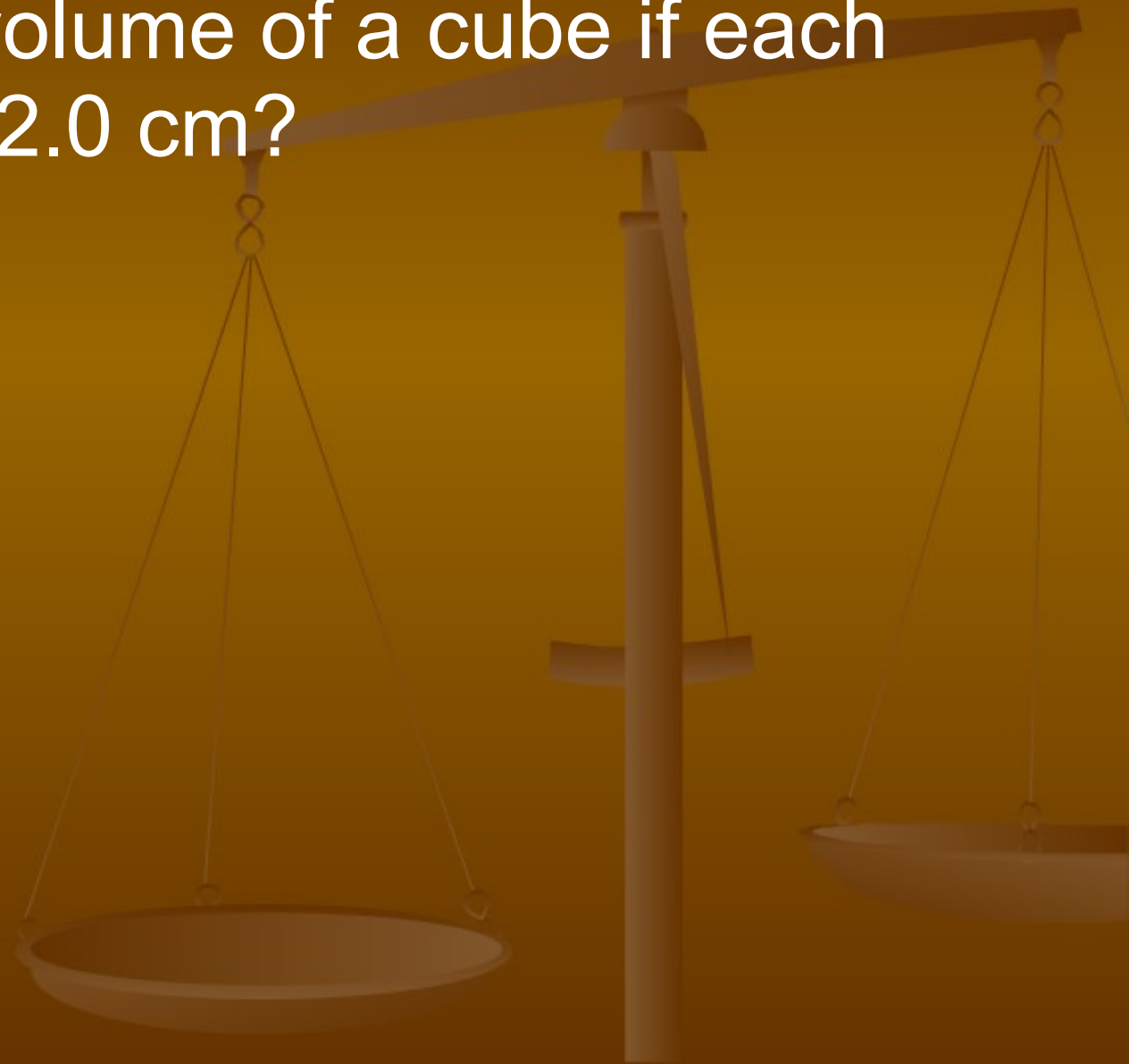
Chemistry Quiz

- 1. The instrument used to measure mass is the
 - A. graduated cylinder
 - B. ruler
 - C. balance
 - D. stopwatch



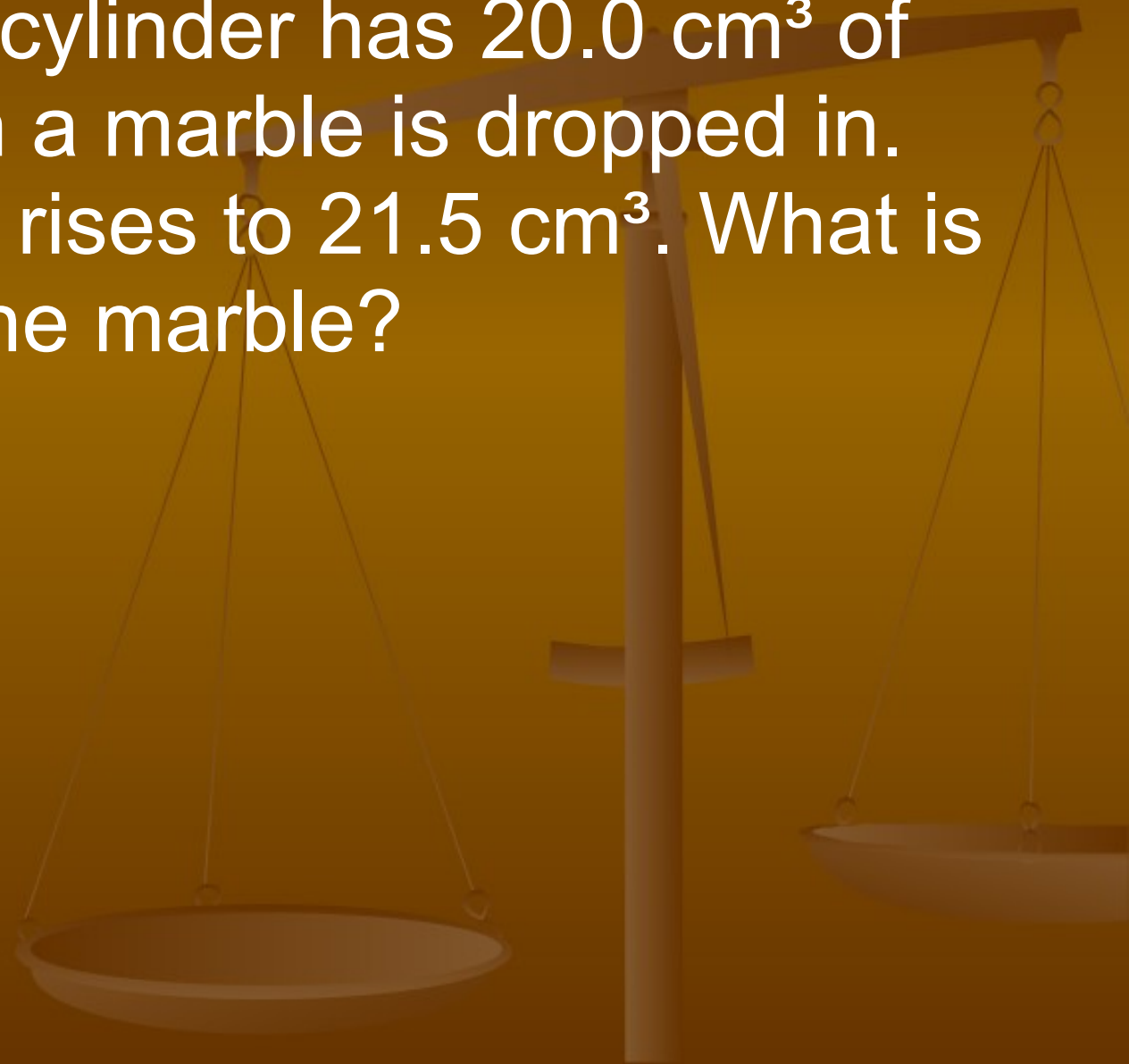
Chemistry Quiz

- 2. What is the volume of a cube if each side measures 2.0 cm?
 - A. 8.0 cm
 - B. 8.0 cm³
 - C. 2.0 cm
 - D. 6.0 cm³



Chemistry Quiz

- 3. A graduated cylinder has 20.0 cm³ of water in it when a marble is dropped in. The water level rises to 21.5 cm³. What is the volume of the marble?
 - A. 20 cm³
 - B. 21.5 cm³
 - C. 1.5 cm³
 - D. 41.5 cm³



Chemistry Quiz

- 4. The process used to find the volume in question 3 is called:
 - A. water displacement
 - B. water subtracting
 - C. irregular volume

