

# Teaching SI

## The International System of Units

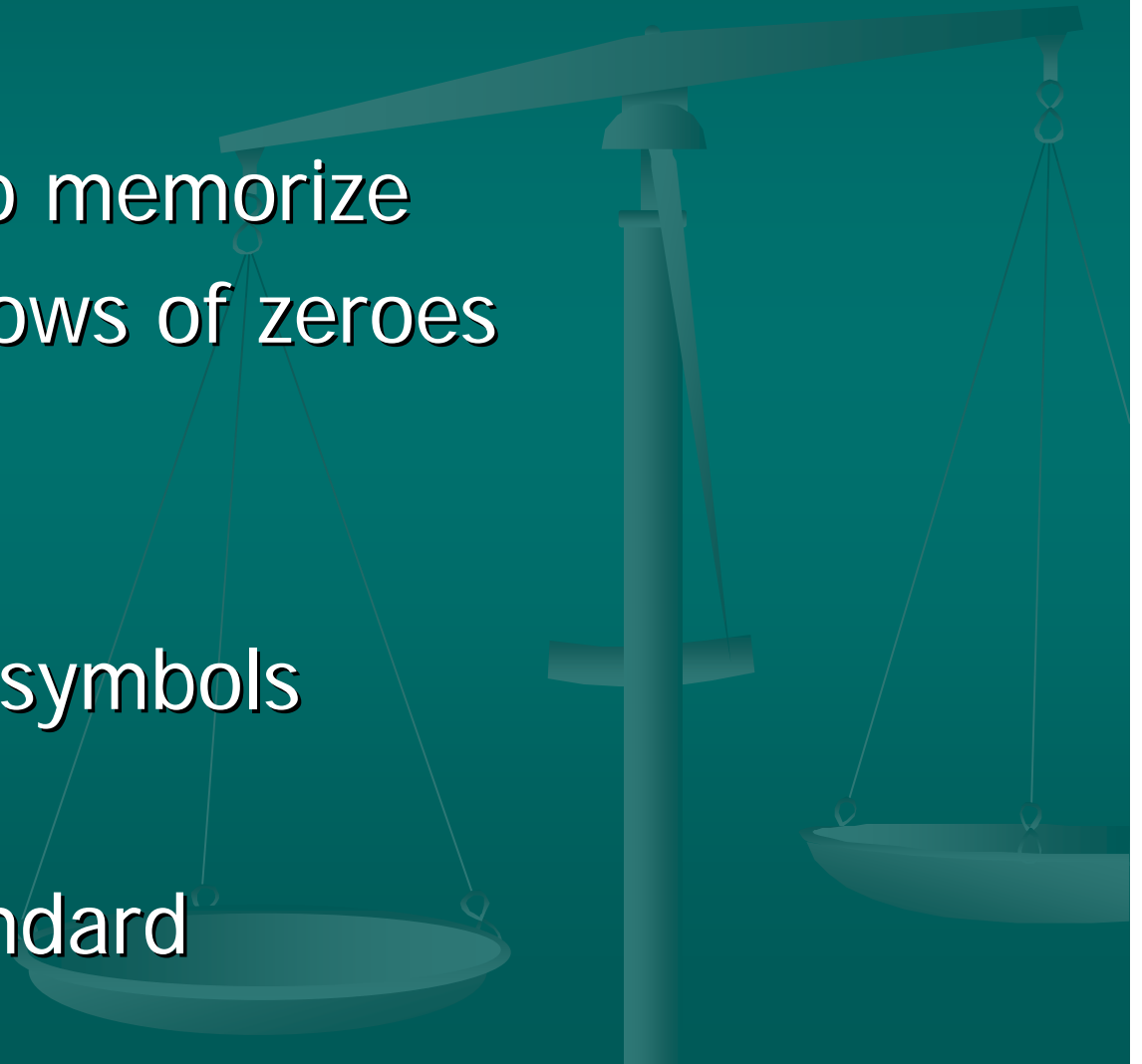
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# Advantages of SI

- No conversions
- No fractions
- No numbers to memorize
- No awkward rows of zeroes
- Complete
- Coherent
- Unambiguous symbols
- Only 30 units
- The world standard





# How to teach SI

- Don't call it "the metric system"
- Don't teach conversions
- Use prefixes to full advantage
- Use everyday examples
- Follow the rules carefully
- Avoid non-SI units
- Require SI in all student papers



# Teaching prefixes

- Learn the 16 regular prefixes by counting
- Change them by jumping the decimal point 3 places
- Don't call this "converting units"
- Set calculator display to ENG
- Avoid the irregular prefixes (h, da, d, c)

except in cm, cm<sup>2</sup>, cm<sup>3</sup>, dm<sup>3</sup>, hm<sup>2</sup>, hm<sup>3</sup>



## Prefixes

- Easy to pronounce
- Require 1 keystroke
- Easy to remember
- Best for calculators
- Precision usually clear

## Scientific notation

- Hard to pronounce
- Require ~20 keystrokes
- Hard to remember
- Best for slide rules
- Precision always clear



# Quantities

kinds of measurement

- number times unit
- infinite variety
- *italic* symbols
- single letter
- case sensitive
- subscripts OK

# Units

standards of measurement

- 30 named SI units
- many combinations
- normal (upright) symbols
- one or more letters
- case sensitive
- no subscripts allowed



# Approved Non-SI units

Use correct symbol!

- liter (L, mL,  $\mu$ L)
- hectare (ha =  $\text{hm}^2$ )
- minute (min)
- hour (h)
- day (d)
- year (a, ka, Ma, Ga)
- degree ( $^\circ$ )
- minute of angle (')
- second of angle (")
- dalton (Da)  
= atomic mass unit (u)

**Don't use other non-SI units unless absolutely necessary!**



## Some non-SI metric units

**DO NOT USE!**

- calorie (cal)
- Calorie (Cal = kcal)
- electron volt (eV)
- kilogram-force (kgf)
- metric ton (tonne)
- angstrom (Å)
- atmosphere (atm)
- mmHg
- molar
- molal
- micron
- bar
- barn
- dyne
- erg
- specific gravity
- gal
- gauss

*and many others*



# SI Imperfections

- SI has 4 imperfections that greatly confuse students
- 3 were inherited from the original French metric system
- These require more time to teach than the entire rest of SI
- They are the main source of student mistakes
- The first 3 could be corrected with special names

## The problems

1. Prefixes on cubic meter are cubed
2. Prefixes on square meter are squared
3. Prefixes on kilogram are offset by 1000
4. The second (a non-decimal, pre-metric Babylonian unit)