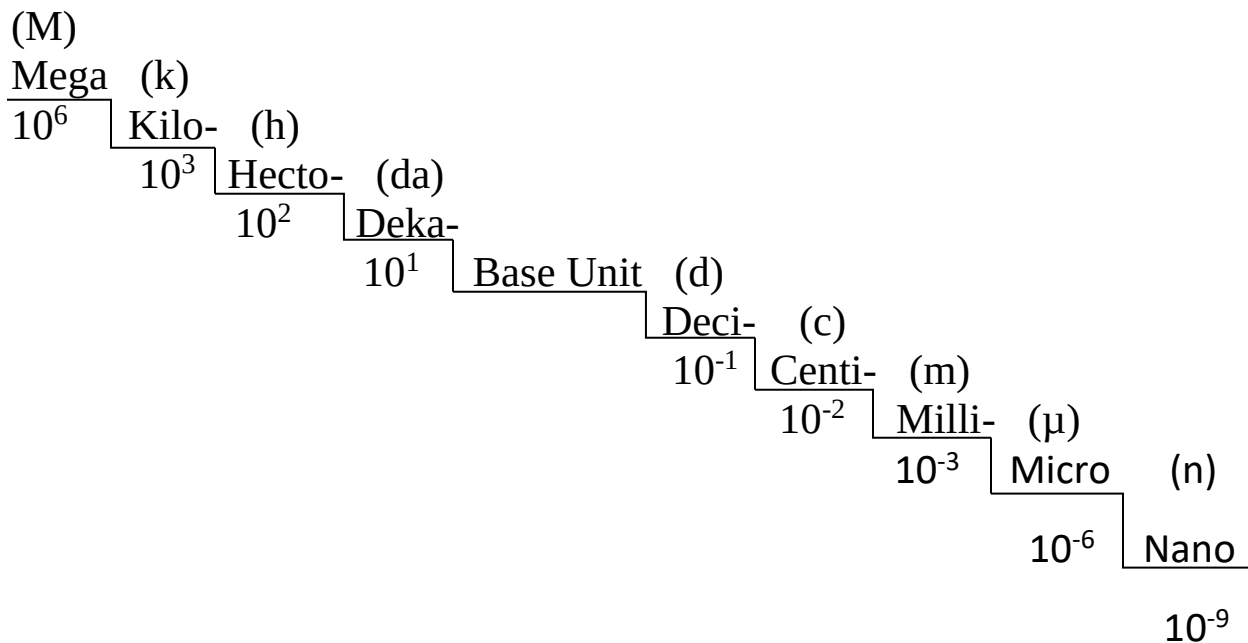


Unit II: Measurement

Lesson 1: International system of units (SI units)

Hebden has a chart for quick reference of the prefix system for units on page 18.

Metric Conversion: Stair-Step Method



Q: What are some of the base units?

A: For volume: L

For length: m

For mass: g

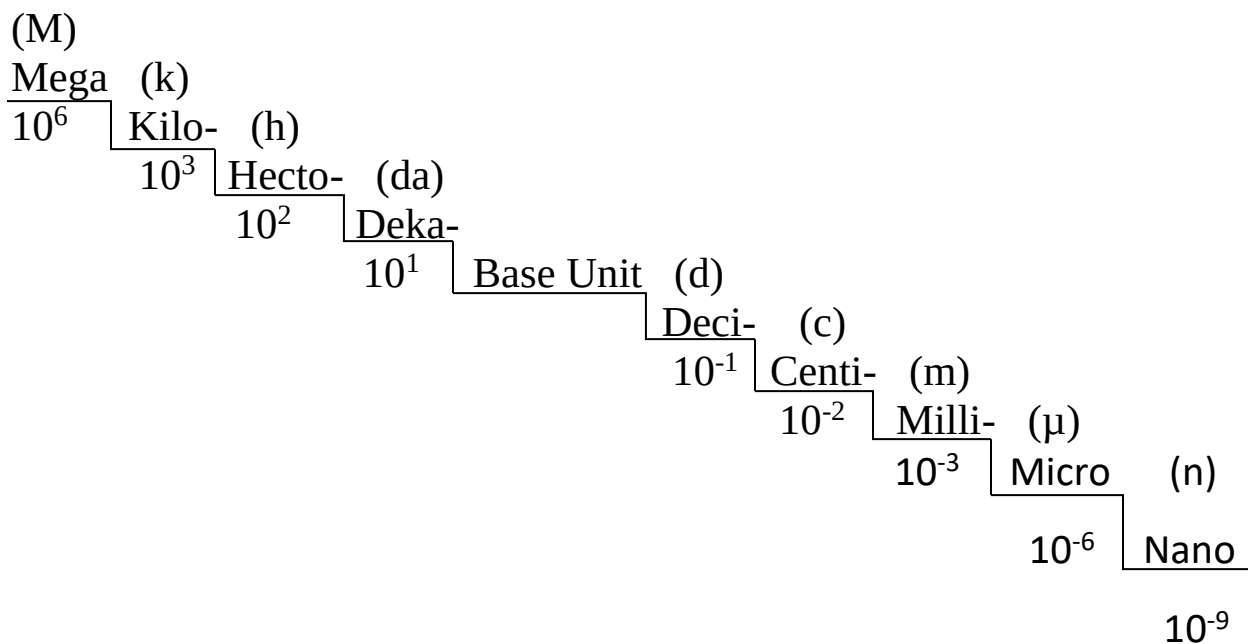
For time: s

For large number of things: mol

For temperature: K (To convert to $^{\circ}\text{C} = \text{K} - 273.15$)

Orally: The staircase above (which lists the prefixes we will use most often) shows that the prefix system is based on powers of 10. You must memorize these.

Metric Conversion: Stair-Step Method



Step #1: Find the prefix the original measurement starts with (if none is given, it is a base unit)

Step #2: Find the prefix you wish to convert to.

Step #3: Count the number of steps and the direction. This is the number of times and direction you must move the decimal.

Exercises: Convert each of the measurements

- 5 dm = _____ m
- 4 mL = _____ L
- 8 g = _____ mg
- 9 mg = _____ μ g
- 2 mL = _____ L
- 6 kg = _____ g
- 4 cm = _____ m
- 12 mg = _____ ng
- 7.02 mL = _____ dL
- 0.03 hg = _____ dag
- 6035 daL = _____ cL
- 0.32 m = _____ hm
- 38.2 Mg = _____ kg

Part II: Rules for working with SI units.

1. Unit symbols are lower case letters (unless named after a person). An exception is L for litre, which was made an upper case symbol to distinguish the symbol from the number 1.
2. A period should not follow the unit symbol unless at the end of a sentence.
3. There is no difference between the unit symbols for singular or plural.
4. Metre and litre are spelt with a “re”. (meter refers to a measuring instrument and not a length)
5. The term mass replaces weight.
6. Use the unit symbol instead of the word when expressing a measurement.
7. For values less than 1, a zero precedes the decimal.
8. Use a space instead of a comma to separate sets of three digits.
9. Use a decimal in place of a fraction. Fractions are infinitely precise and measurements are not.

Exercises: Find the SI errors in each of the following:

1. Michael bought 2 kilos of hamburger.
2. Jill bought 6.0 liters of gasoline.
3. Trevor’s temperature dropped by $.9^{\circ}\text{C}$ (from 39.2 degrees Celsius to 38.3).

4. The car accelerated from rest to 100 Km.
Per hour in 10 sec.
5. The weight of 1ml of water is exactly 1
gms.
6. The package was marked as containing
500Gm. of spaghetti.
7. The height of the solid formed (i.e.,
precipitate) in the reaction was $2 \frac{1}{2}$ c.m.
8. The micrometre measures the distance to
the nearest micrometer.
9. Cameron calculated that, if the molar
weight of calcium carbonate was 100g/mol,
then the number of moles in 0.543gms was
.00543 mols.

Part III: Scientific notation.

To convert decimal to scientific:

1. Place the decimal after the first non-zero digit.
2. Write the remaining digits after the decimal to include the last non-zero digit.
3. Write “x 10”
4. Determine the exponent by counting the number of digits between you “new” and “old” decimal. If the original value is greater than 1, use a positive exponent and if the value is greater than zero but less than 1 use a negative exponent.

Exercises: Convert the following to scientific notation.

1. 67 000 cm -----→ **$6.7 \times 10^4 \text{ cm}$**
2. 456 000 000 L -----→ **$4.56 \times 10^7 \text{ L}$**
3. 0.0098 g -----→ **$9.8 \times 10^{-3} \text{ g}$**
4. 0.000 037 9 mg -----→ **$3.79 \times 10^{-5} \text{ mg}$**