

Metric Conversions

Video Notes



What is the difference from a measurement and a number?

- Measurement has a unit!
- Metric Prefixes- The backbone of the metric system.



In this lesson you will:

- Define the metric prefixes mega, kilo, deci, centi, milli, and micro.
- Use conversion factors to perform one and two step metric conversions.

Metric Prefixes

- One larger thing equals many smaller things
- Cent (c)
 - $1 \text{ g} = 100 \text{ cg}$
- Kilo (k)
 - $1 \text{ kg} = 1,000 \text{ g}$
- Mega (M)
 - $1 \text{ Mg} = 1,000,000 \text{ g}$
- Deci (d)
 - $1 \text{ g} = 10 \text{ dg}$
- Milli (m)
 - $1 \text{ g} = 1,000 \text{ mg}$
- Micro (μ) lower case Greek letter mu
 - $1 \text{ g} = 1,000,000 \mu \text{ g}$

Prefix questions

1. ? m = 1 km

2. ? km = 1 m

Which is larger:

3. Milliliter or centiliter?

4. Kilogram or megagram?

5. Millimeter or kilometer?

6. A penny = ? Dollar

7. A dime = ? Dollar

8. A megabuck = ? Dollars

9. A kilopenny = ? dollars

Answers

1. 1,000 m
2. 0.001 km
3. Centiliter
4. megagram
5. kilometer
6. Centidollar (100 pennies in a dollar- 100=centi)
7. Decidollar (10 dimes in a dollar- 10=deci)
8. 1,000,000 (mega= million)
9. 10 (1,000/100) Kilo=1,000 pennies- 100 pennies in a dollar.....

Prefix and Base unit Questions?

1. Appropriate to measure the distance from your house to grandma's house in Alabama?
2. Mass of a teaspoon of water?
3. Volume of air in a balloon.
4. Time it takes light to travel from the nearest star.

Answers

1. Kilometer or Megameter
2. Gram, no prefix (remember, a paperclip is one gram)
3. Liter or deciliter, Atomic mass unit (mass of an atom)
4. megasecond

FOLLOW THE METHOD!

To convert from one unit to another:

- Start every problem with a “?”
 - The “?” means how many
 - Example- convert 152 cm to m becomes
 $? \text{ m} = 152 \text{ cm}$
- Conversion Factor- a statement of fact expressed as a fraction equaling one.
 - Fact: $1 \text{ m} = 100 \text{ cm}$
 $\frac{1 \text{ m}}{100 \text{ cm}}$ or $\frac{100 \text{ cm}}{1 \text{ m}}$

FOLLOW THE METHOD! continued

Example:

$$?m = 152\text{cm} \times \underline{\hspace{2cm}}$$

Since we want cm to cancel, we will put cm on the bottom and m on the top (1m/100cm)

$$?m = 152 \text{ cm} \times \underline{1\text{m}} \text{ The cm cancel}$$

$$100\text{cm} \quad \underline{\hspace{1cm}}$$

$$?m = 152 \times 1\text{m}/100 \quad \underline{\hspace{1cm}}$$

$$1.52\text{m}$$

The Method

- Question mark format
- Cancel units
- Insert fact
- Do the math

You do these...

- Convert 62 kg to grams
- Convert 1700 μ s to ds
- 0.0056 mm = _____ km

Answers

- Convert 62 kg to grams
 - ?g= 62kg
 - Multiply by conversion unit of 1,000g/1kg
 - Units of kg cancel
 - $62 \times 1000 = 62,000 \text{ g}$

Answers continued

- Convert 1700 μ s to ds
 - ?ds = 1700 μ s
 - You want the μ s on the bottom
 - For every second you have 1×10^6 seconds
 - There are 10 ds in every s
 - The equation should be like so:
 - ?ds = 1700 μ s \times 1 s \times 10 ds = 0.017ds
 - 1×10^6 μ s 1 s

Answers

- $0.0056 \text{ mm} = \underline{\hspace{2cm}} \text{ km}$
 - $? \text{ km} = 0.0056 \text{ mm}$
 - $1 \text{ m} / 1000 \text{ mm}$
 - $1 \text{ km} / 1000 \text{ m}$
 - The equation looks like this:
 - $? \text{ km} = 0.0056 \text{ mm} \times \underline{1 \text{ m}} \times \underline{1 \text{ km}} = 5.6 \times 10^{-8} \text{ km}$
 - $1000 \text{ mm} \quad 1000 \text{ m}$
 - You must divide by 1000 twice!

Problem set 1

1.59 dg to g

2.9.8 cm to \square m

3.60 L to mL

4.1.4 $\times 10^{-7}$ m to km

5.4500 ks to Ms

FOLLOW THE METHOD!

Conversion Answers

59 dg to g

$$? \text{ g} = 59 \text{ dg} \times 1 \text{ g} / 10 \text{ dg} = 5.9 \text{ g}$$

9.8 cm to \square m

$$\begin{aligned} ? \square \text{ m} &= 9.8 \text{ cm} \times 1 \text{ m} / 100 \text{ cm} \times 1000000 \square \text{ m} / 1 \text{ m} \\ &= 9.8 \times 10^4 \square \text{ m} \end{aligned}$$

Conversion answers continued

60 L to mL

$$\begin{aligned} ?\text{mL} &= 60 \text{ L} \times 1,000\text{mL}/1\text{L} \\ &= 60,000 \text{ mL or } 6 \times 10^5 \text{ mL} \end{aligned}$$

1.4×10^{-7} m to km

$$\begin{aligned} ? \text{ Km} &= 1.4 \times 10^{-7} \text{ m} \times 1 \text{ km} / 1000\text{m} \\ &= 1.4 \times 10^{-10} \text{ km} \end{aligned}$$

Conversions answers continued

4500 ks to Ms

$$\begin{aligned} ?\text{Ms} &= 4500\text{ks} \times 1000\text{s}/1\text{ks} \times 1\text{ Ms}/1,000,000\text{ s} \\ &= 4.5\text{Ms} \end{aligned}$$

How many yards are in 91.44 km

Fact: 2.54 cm in one inch

- Cross out units as you go!!!!



How many yards are in 91.44 km

Fact: 2.54 cm in one inch

$$? \text{ yard} = 91.44 \text{ km} \times 1000 \text{ m} / 1 \text{ km} \times 100 \text{ cm} / 1 \text{ m} \times 1 \text{ in} / 2.54 \text{ cm} \times 1 \text{ ft} / 12 \text{ in} \times 1 \text{ yd} / 3 \text{ ft}$$

$$= 100,000 \text{ yards}$$

Chemistry Quiz

CR1. Which of the following is in correct scientific notation?

- A. 16.5×10^3
- B. 3.0×3^3
- C. 1.3×10^3
- D. 0.54×10^3

Chemistry quiz

CR 2. Express 0.0003 in correct scientific notation.

- A. 0.0003×10^1
- B. 3×10^4
- C. 3×10^{-4}
- D. 0.3×10^4

Chemistry quiz

1. How many centimeters are in 1 meter?

- A. 1
- B. 10
- C. 100
- D. 1,000

Chemistry Quiz

2. What is the first thing you do in any conversion question?

1. Figure out which conversion facts you need.
 - Punch numbers into the calculator.
 - Figure out if you need to multiply or divide.
 - Set up the problem in the question mark format.

Chemistry Quiz

3. Which of the following could be used as a conversion factor?

- A. $1000\text{m} = 1\text{ mm}$
- B. $1000\text{mm} = 1\text{ m}$
- C. $100\text{ m} = 1\text{ cm}$
- D. $1000\text{ cm} = 1\text{ m}$

Chemistry Quiz

4. When you use a conversion factor in a problem, how do you decide what goes on top and what goes on bottom.

- A. use the units to guide you.
- B. take a guess and hope for the best.
- The larger unit always goes on bottom.
- The smaller unit always goes on bottom.

Chemistry Quiz

5. What do you do when you don't know the conversion factor between the two units in the problem?

- A. make up something.
- B. Give up and take a nap.
- C. Use multiple conversion factors.
- D. Change the problem.

Chemistry quiz answers

- CR1--c
- CR2--c
- 1--c
- 2--d
- 3--b
- 4--a
- 5--c