



METRIC PREFIXES

General Chemistry I, Dr. Stone

Mega

How many liters are in a ML?

A. 1×10^{-6}

B. 1×10^3

C. 1×10^6

D. 1×10^9

E. none of these

Mega = million

There are one million liters in a ML.

How many liters are in a ML?

A. 1×10^{-6}

B. 1×10^3

C. 1×10^6

D. 1×10^9

E. none of these

micro

How many L equals a μL ?

A. 1×10^{-6}

B. 1×10^6

C. 1×10^3

D. 1×10^{-9}

E. None of these

micro = 1×10^{-6}

How many L equals a μL ?

A. 1×10^{-6}

B. 1×10^6

C. 1×10^3

D. 1×10^{-9}

E. None of these

kilo

How many meters are in 10 km?

- A. 1×10^3 m
- B. 10×10^3 m
- C. 10×10^{-2} m
- D. 1×10^4 m
- E. None of these

kilo = thousand, $10\text{Km} \times 1000\text{m/km}$

How many meters are in 10 km?

- A. $1 \times 10^3 \text{ m}$
- B. $10 \times 10^3 \text{ m}$
- C. $10 \times 10^{-2} \text{ m}$
- D. $1 \times 10^4 \text{ m}$**
- E. None of these

0.62 mile = 1 km

How many meters are in 2.5 miles?

A. 4.0 m

B. 1.55 m

C. 4.0×10^3 m

D. 2.55×10^3 m

E. None of these

How many meters are in 2.5 miles?

$$2.5 \text{ miles} \times \frac{1 \text{ km}}{0.62 \text{ miles}} \times 1000 \text{ m/km}$$

A. 4.0 m

B. 1.55 m

C. 4.0×10^3 m

D. 2.55×10^3 m

E. None of these

pico

How many L equal a pL?

- A. 1×10^{-12} L
- B. 1×10^{12} L
- C. 1×10^9 L
- D. 1×10^{-9} L
- E. None of these

pico

How many L are in a pL?

A. 1×10^{-12} L

B. 1×10^{12} L

C. 1×10^9 L

D. 1×10^{-9} L

E. None of these

Zetta and zepto

- I. Zetta = ZL and zepto is zL
 - II. Zepto = ZL and zetta is zL
 - III. A zL is much smaller than a L
 - IV. a ZL is much smaller than a L
-
- A. I and III
 - B. II and IV
 - C. I, II and III
 - D. IV only
 - E. None of these

Zetta and zepto

- I. Zetta = ZL and zepto is zL
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A. I and III

- B. II and IV
- C. I, II and III
- D. IV only
- E. None of these

Most commonly used:

- Mega 1×10^6 Lake volumes are ML, lotteries are Mega dollars
- kilo 1×10^3 kilogram = 2.206 lbs, Km = 0.62 miles
- deci 1×10^{-1} 65-100mg glucose per dL of blood is normal
- centi 1×10^{-2} There are 2.54 cm in an inch
- milli 1×10^{-3} An ounce is 28 mL.
- micro 1×10^{-6} An e. coli is 2 μm long.
- nano 1×10^{-9} Normal Ferritin is 12-300 ng/mL
- pico 1×10^{-12} Bonds between carbons are 154 pm long
- fempto 1×10^{-15} PSA* can be detected at 1 fg/mL
(*Prostate specific antigen)

Area = length x width

- How many square meters of flooring are needed for a 10ft by 12 ft room?
- What will our answer units be?
- **m²**

What do we need to know?

- 2.54 cm = 1 inch and 12 inches = foot

Procedure:

- Convert ft to inches to cm to m.
- Multiply meters by meters

Area = length x width

- How many square meters of flooring are needed for a 10 ft by 12 ft room?

Convert ft to inches to cm to m.

- $10 \text{ ft} \times 12 \text{ inches/ft} = 120 \text{ inches}$
- $120 \text{ inches} \times 2.54 \text{ cm/inch} = 304.8 \text{ cm}$
- $304.8 \text{ cm} \times 1 \text{ m}/100 \text{ cm} = 3.04 \text{ m}$
- $12 \text{ ft} \times 12 \text{ inches/ft} = 144 \text{ inches}$
- $144 \text{ inches} \times 2.54 \text{ cm/inch} = 365.76 \text{ cm}$
- $365.76 \text{ cm} \times 1 \text{ m}/100 \text{ cm} = 3.65 \text{ m}$

Multiply meters by meters:

$$3.04 \times 3.65 = 11.096 \text{ m}^2 \text{ or } 11 \text{ m}^2$$

Solving Problems

- A swimming pool is 3 m by 10 m and 2.5 m deep. Due to a green algae issue, the water level needs to be lowered by 0.5 m, and then refilled (and treated with chemicals!). The pump removes water at a rate of 24 L per min. How many hours will it take to lower the level of water by 0.5 m?
- What do we need to know?
 - Time it takes to decrease the volume by 0.5 m
 - Answer will be in hours
- What information is available?
 - Rate of 24L per min; Volume removed is 3 m x 10m x 0.5m;
 - $\text{m}^3 = 1000 \text{ L}$
- How do we use the information?
 - Divide volume removed by rate of removal and covert to hours

