Diagnostic Assessment: Questions about Unit Conversion

The skill of converting between different units of measurement is essential for success in all chemistry.

Answer the following questions **using dimensional analysis** and **showing all of your units**.

Common prefixes	Abbreviation	Equivalent	Common prefixes	Abbreviation	Equivalent
pico-	p	10^{-12}	centi-	c	10^{-2}
nano-	n	10^{-9}	deci-	d	10^{-1}
micro-	μ	10^{-6}	deca-	da	10
milli-	m	10^{-3}	kilo-	k	10^{3}
			mega-	M	10^{6}

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e.g. Convert 34.5 mm to m:

$$34.5mm\left(\frac{1m}{1000mm}\right) = 0.0345m$$

e.g. Convert 23.6 mm to km:

$$23.6mm\left(\frac{1m}{1000mm}\right)\left(\frac{1km}{1000m}\right) = .0000236km$$

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1) Convert 12.5 cm into mm

2) Convert 829 cm into km

3) Convert 42.5 km into cm

4) A rectangular piece of fabric with a length of 1.20 meters and a width of 0.85 meters must be divided into twelve, equal sized units for forensic sampling purposes. What are the dimensions of the twelve smaller portions?

1 in	=	2.54 cm		1 m	=	3.3 ft
1 ft	=	12 in		1 yard	=	36 inches
1 cm^3	=	1 mL		1 metric ton	=	1000 kg.
1 in^3	=	16.4 cm^3		2.2 lb.	=	1 kg
1 ft^3	=	28.3 liter		28.4 g	=	1 oz.
1 gal	=	3.79 liter		16 oz.	=	1 pound
4 qt	=	1 gallon		1 acre	=	43560 ft^2

e.g. Convert 346.5 lb. to kg:

$$346.5lb\left(\frac{1kg}{2.2lb}\right)=157.5kg$$

e.g. Convert 23.6 cm to ft:

$$23.6cm\left(\frac{1inch}{2.54cm}\right)\left(\frac{1ft}{12inch}\right)=0.77\,ft$$

5) Convert 32.3 cm to inches.

6) Convert 465 liters to cubic feet.

7) You are given 3 yards of tape to make evidence labels. How many labels 20 cm in length can you make?

8) Convert the following numbers into scientific notation.

   a) 100   e) 0.000001

   b) 10,000   f) 0.1

   c) 10,000,000   g) 1

   d) 0.001

9) Arrange the following numbers, written as powers of 10, from the smallest to the largest:

$$10^0, \ 10^{-14}, \ 10^2, \ 10^{-3}, \ 10^{-7}, \ 10^4, \ 10^{-9}, \ 10^5 , \ -10$$

10) Convert the following to scientific notation:

   a) 4,256   e) 245,000

   b) 6,234,000   f) 0.000000000012

   c) 0.0026   g) 3.405

   d) 0.00005689   h) 7,000,000,000

Write the following numbers in standard notation:

11) 6.5×10^{-5} 13) 8.314×10^3

12) 3.22×10^9 14) 4.08×10^{-12}

15) Calculate the number of seconds in 3.6 years.

16) A murder suspect was found 200 miles from the crime scene 150 minutes after the time of death. Assuming he actually committed the murder, how fast (in miles per hour) would he have had to drive in his getaway car? Given this information, is he a realistic suspect?

17) How many 325 mg tablets can be produced from 2.50 kg of ibuprofen?

18) A crime suspect fled the scene when police officers entered the building. The police are planning to set up a search, but need to know a realistic search radius. How far could he run in 10 minutes if he can run 5 miles per hour?

19) One baked potato provides an average of 31.0 mg of vitamin C. If 5.0 lb. of potatoes has 15 potatoes, how many milligrams of vitamin C are provided per pound of potatoes?

20) Forensic scientists must be careful to avoid communicable diseases such as HIV/AIDS. In body fluids such as blood or saliva, the HIV virus can survive over 15 days at room temperature and longer if refrigerated. How many hours can the HIV virus survive in liquid at room temperature?