

## METRIC CONVERSIONS AND USE PRACTICE ANSWER KEY

**Instructions:** Show your factor-label method set-up. Include all appropriate units. Box/circle your final answer. Although we will ALWAYS use metric units (SI) in Physics, it is still important to be able to visualize metric units by comparing them to units we are more familiar with in our everyday lives.

In addition to metric exponent prefixes that you should know, the following conversion factors may be useful:

<b>1 mile (mi)</b>	=	<b>1609 m</b>
<b>1 inch (in)</b>	=	<b>2.54 cm</b>
<b>2.2 pounds (lb)</b>	=	<b>1 kg</b>
<b>1 lb</b>	=	<b>454 g</b>
<b>1 mL</b>	=	<b>1 cm<sup>3</sup></b>
<b>1 gallon (gal)</b>	=	<b>3.785 L</b>
<b>1 gal</b>	=	<b>8 pints</b>

1. The world record for the Men's 100m sprint, is held by Usain Bolt of Jamaica, is 9.58 seconds. This means he was running at an average speed of 10.44 m/s.

a. How fast was Usain Bolt running in km/hr?

$$\frac{10.44 \text{ m}}{\text{s}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{3600 \text{ s}}{1 \text{ hr}} = 37.58 \text{ km/hr}$$

b. How fast was he running in mi/hr?

$$\frac{10.44 \text{ m}}{\text{s}} \times \frac{1 \text{ mi}}{1609 \text{ m}} \times \frac{3600 \text{ s}}{1 \text{ hr}} = 23.36 \text{ mi/hr}$$

2. According to the Guinness Book of World Records (GWR, 2008), a man from London balanced a 352 lb car (a Mini) on his head for 33 seconds. What is the mass of this car in kilograms?

$$\frac{352 \text{ lb}}{1} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} = 160. \text{ kg}$$

3. The largest single ruby (GWR, 2009), has dimensions of 12.20 in. x 6.49 in. x 5.51 in. What is the volume of this ruby in Liters (L)?

$$12.20 \text{ in} \times 6.49 \text{ in} \times 5.51 \text{ in} \rightarrow 1 \text{ in} = 2.54 \text{ cm} \rightarrow 30.99 \text{ cm} \times 16.48 \text{ cm} \times 14.00 \text{ cm}$$

$$\frac{7149 \text{ cm}^3}{1} \times \frac{1 \text{ mL}}{1 \text{ cm}^3} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 7.15 \text{ L}$$

4. The Georgia Aquarium in Atlanta has the largest amount of water volume of all the world's aquariums (GWR, 2007). It has a total of 63.99 million pints of water in its tanks. How many cubic meters is this equivalent to?

$$\frac{63.99 \times 10^6 \text{ pints}}{8 \text{ pints}} \times \frac{1 \text{ gal}}{1 \text{ gal}} \times \frac{3.785 \text{ L}}{1 \text{ gal}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \text{ cm}^3}{1 \text{ mL}} \times \frac{1 \text{ m}^3}{(100)^3 \text{ cm}^3} = 3.028 \times 10^4 \text{ m}^3$$

5. A Lotus Elise can reportedly accelerate from 0 → 60 mi/h in under 5 seconds! Assume its acceleration is 43,200 mi/hr<sup>2</sup> (miles per hour squared), what is its acceleration in m/s<sup>2</sup> (meters per second squared)?

$$\frac{43,200 \text{ mi}}{\text{hr}^2} \times \frac{1609 \text{ m}}{1 \text{ mi}} \times \frac{1 \text{ hr}^2}{(3600)^2 \text{ s}^2} = 5.36 \text{ m/s}^2$$

6. How many meters long is a standard football field (including the end zones)?

$$\frac{120 \text{ yards}}{1 \text{ yard}} \times \frac{3 \text{ ft}}{1 \text{ ft}} \times \frac{12 \text{ in}}{1 \text{ in}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 110. \text{ m}$$

7. How tall are YOU, in cm? Show all work to convert your height in feet and inches into cm. This is NOT a measuring question - use of meter sticks or rulers is not allowed! ☺

$$\frac{\text{_____ ft}}{1 \text{ ft}} \times \frac{12 \text{ in}}{1 \text{ in}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} = \text{_____ cm}$$

8. The gas tank of a Subaru Forester can hold 15.9 gal. How many Liters of gas is this?

$$\frac{15.9 \text{ gal}}{1 \text{ gal}} \times \frac{3.785 \text{ L}}{1 \text{ gal}} = 60.2 \text{ L}$$

9. Gas costs an average of \$3.10/gallon in Issaquah. Gas cost on average \$1.04/Liter in BC, Canada this week (costs have already been converted to US\$). Who is getting the better deal for gas? Show your calculation to support your answer.

$$\frac{\$3.10}{\text{gal}} \times \frac{1 \text{ gal}}{3.785 \text{ L}} = \$0.82/\text{L}$$

The U.S. pays less! (But we indirectly pay through taxes ☺)

10. Gas mileage for a Toyota Corolla can be 38 mpg (miles per gallon). What is its gas mileage in kilometers per Liter?

$$\frac{38 \text{ mi}}{\text{gal}} \times \frac{1609 \text{ m}}{1 \text{ mi}} \times \frac{1 \text{ km}}{1000 \text{ m}} \times \frac{1 \text{ gal}}{3.785 \text{ L}} = 16 \text{ km/L}$$