Math in Chemistry - Dimensional Analysis (DA)

Ronald McDonald is driving down the road going $26.4 \frac{km}{hr}$. If he rides for 4.51×10^9 cm, how long does it take him in seconds (sec)?

? sec (step 1)

4.51×10^9 cm
$26.4 \frac{km}{hr}$ } Step 2

$$(4.51 \times 10^9 \text{ cm})\left(\frac{1 \text{ m}}{100 \text{ cm}}\right)\left(\frac{1 \text{ km}}{1000 \text{ m}}\right)\left(\frac{1 \text{ hr}}{26.4 \text{ km}}\right)\left(\frac{60 \text{ min}}{1 \text{ hr}}\right)\left(\frac{60 \text{ sec}}{1 \text{ min}}\right) = 6.150 \times 10^6 \text{ sec}$$

you have not memorize cm→km directly, you must do both.

$= 6.15 \times 10^6$ sec

Step 4 + Step 5

Step 3 - Since your answer has only one unit, you start with one unit.

Math in Chemistry - Dimensional Analysis (Page 2)

Ronald McDonald is driving down the road going $26.4 \frac{km}{hr}$. How fast is he going in $\frac{cm}{sec}$?

? $\frac{cm}{sec}$ (Step 1)

$26.4 \frac{km}{hr}$ (Step 2, see note below)

$$\left(26.4 \frac{km}{hr}\right)\underbrace{\left(\frac{1000\,m}{1\,km}\right)\left(\frac{100\,cm}{1\,m}\right)}_{\text{you have not memorized km to cm so you need both}}\left(\frac{1\,hr}{60\,min}\right)\left(\frac{1\,min}{60\,sec}\right) = 733.3 \frac{cm}{sec}$$

$$= 733 \frac{cm}{sec}$$

Step 3 - Our answer has units of distance over time so that is what we start with.

Step 4 + Step 5

Note: the question could have given, he traveled 39.6 km in 1.50 hr, so your first parenthese would look like $\left(\frac{39.6\,km}{1.50\,hr}\right)$ since you needed distance unit on top and time on bottom.