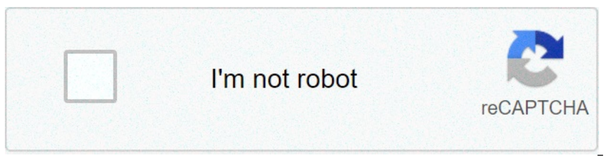

Continue

Unit conversion practice problems worksheet physics

At the end of this section, you will be able to: Use conversion factors to express the value of a given quantity in different units. It is often necessary to convert from one unit to another. For example, if you are reading a European cookbook, some quantities can be expressed in liters units and you have to convert them into cups. Or maybe you're reading directions for walks from one location to another and you're interested in how many miles you'll be walking. In this case, you may need to convert feet or meters to miles. Let's consider a simple example of how to convert units. Suppose we convert 80 m to kilometers. The first thing to do is to list the units you have and the units you want to convert to. In this case, we have units in meters and we want to convert to kilometers. Later, we need to determine a conversion factor relative to kilometers. A conversion factor is a relationship that expresses how many of a unit are equal to another unit. For example, there are 12 in. in 1 ft, 1609 m in 1 mi, 100 cm in 1 m, 60 s in 1 min, and so on. Refer to Appendix B for a more complete list of conversion factors. In this case, we know there are 1000 m in 1 km. Now we can set the conversion of the drive. We write the units we have and then multiply them for the conversion factor so that the units disdetail, as shown: 80m×1km1000m=0.080km.80m×1km1000m=0.080km Please note that the undesired measurement unit cancels, leaving only the desired kilometer drive. You can use this method to convert between any type of drive. Now, the conversion from 80 m to kilometers is simply the use of a metric prefix, as we have seen in the previous section, so we can get the same answer as easily noting that 80m=8.0×101m=8.0×10−2km=0.080km,80m=8.0×101m=8.0×10−2km=0.0km from “kilo- 1.22” means 103 However,conversion factors are useful when converting between units that are not metric or when converting driftas the following examples illustrate. Convert non metric units to metric The distance from university to home is 10 mi and usually takes 20 min to drive this distance. Calculate the average speed in meters per second (m/s). (Note: The average speed is the distance traveled divided for the travel time.) First we calculate the average speed using the specified units, then we can get the average speed in the desired units by selecting the correct conversion factors and multiplying them. The correct conversion factors are those that cancel unwanted units and leave the desired units in their place. In this case, we want to convert miles to meters, so we need to know that there are 1609 m in 1 mi. We also want to convert minutes in seconds, so we use the conversion of 60 s to 1 min. Solution Calculate average speed. The average speed is the distance traveled divided for the travel time. (Take this definition as a date for now. The average speed and other motion concepts are covered in later chapters.) In the form of equation, Media speed=DistanceTime. Average speed=DistanceTime. Replace data values for distance and time: Average speed=10mi20min=0.50mimin. Beam speed=10mi20min=0.50mimin. Convert miles per minute to meters per second by multiplying by the conversion factor that cancels miles and leaves meters, and also by the conversion factor that cancels minutes and leaves seconds: 0.50milemin×1609m1mile×1min60s=(0.50)(1609)60m/s=13m/s.0.50milemin×1609m1mile×1min60s=(0.50)(1609)60m/s Meaning Check the answer in the following ways: Make sure that the units in the conversion canceled drive correctly. If the conversion factor of the unit has been written down to head, the units do not properly delete in the equation. Let’s see the “miles” in the numberer in 0.50 mi/min erases the “mile” in the denominator in the first conversion factor.the “min” in the denominator in 0.50 mi/min erases the “min” in the numberer in the second conversion factor. conversion.that the units of the final answer are the desired units. The problem asked us to solve by average speed in units of meters per second and, after the cancellations, the only remaining units are one meter (m) in the numberer and a second (s) in the denominator, so we actually got these units. Check your understanding 1.2 Light travels about 9 Pm in a year. Since a year is about 3×107s,3×107s what is the speed of light in meters per second? Convert between metric units Iron density is 7,86g/cm37.86g/cm3 in standard conditions. Convert it to kg/m3. Strategy We have to convert grams to kilograms and cubic centimeters to cubic meters. The conversion factors we need are 1kg=103g1kg=103g and 1cm=10−2m.1cm=10−2m However, we have to deal with cubic centimeters cm3=cm×cm×cm×cm),(cm3=cm×cm×cm×cm×cm, so we have to use the second conversion factor three times (i.e., we have to cubate it.) The idea is still to multiply for conversion factors in such a way as to cancel the units we want to free ourselves and introduce the units we want to maintain. Solution 7.86gcm3×kg103g×(cm10−2m)3=7.86(103)(10−6)kg/m3=7.86×103kg/m37.86gcm3×kg103g×(cm10−2m)3=7.86(10−6)kg/m3=7.86×103kg/m3 Significance Remember, it is always important to check the answer. Make sure you cancel the drives correctly in the drive conversion. We see that the gram (“g”) in the numberer in 7.86 g/cm3 erases the “g” in the denominator in the first conversion factor. In addition, the three factors of “cm” in the denominator in 7.86 g/cm3 cancel with the three factors of “cm” in the numberer that we obtain by cubating the second conversion factor. Check that the units of the final response are the units you want. The problem asked us to convert to kilograms per cubic meter. After the cancellations just described, we see the only units we left are “kg” in the numberer and three “m” factors in the denominator (i.e. a “m” factorTherefore, the units on the final answer are correct. Check your understanding 1.3 We know from Figure 1.4 that the diameter of the Earth is on the order of 107 m, so the order of magnitude of its surface is 1014 m2. What is that in square kilometers (i.e., km2)? (Try to do this is converting 107 m to km and then crushing it and then converting 1014 m2 directly to square kilometers. You should get the same answer in both ways.) Unit conversions may not seem very interesting, but do not do so can be expensive. A famous example of this situation was seen with the Mars Climate Orbiter. This probe was launched by NASA on 11 December 1998. On 23 September 1999, while attempting to drive the probe into its planned orbit around Mars, NASA lost contact with it. Later investigations showed a piece of software called SM_FORCES (or “small forces”) was recording the performance data of the propeller in the English units of pounds-seconds (lb-s). However, other pieces of software that used these values for course corrections were expected to be recorded in the SI units of newton-seconds (N-s), as dictated in software interface protocols. This error caused the probe to follow a very different trajectory from what NASA thought it was following, which most likely caused the probe to burn in the Martian atmosphere or shoot in space. This failure to pay attention to unit conversions costs hundreds of millions of dollars, not to mention all the time invested by scientists and engineers who have worked on the project. Since 1 lb (pound) is 4.45 N, numbers were issued by SM_ FORCES too large or too small? Baby?

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