UNIT CONVERSIONS WORKSHEET

1. One pound of butter weighs about 0.454kg. How many grams is this? How many milligrams?

2. A sheet of paper is 0.0106cm thick. How many millimeters is this? How many micrometers?

3. A laboratory technician uses a micropipette to measure a 50µL (50 microliter) sample of blood serum for analysis. Express the sample volume in liters.

4. A circular Petri dish with vertical sides has a radius of 7.50cm. You want to fill the dish with a liquid medium to a depth of 2.50cm. What volume of medium in milliliters and liters will be required?

5. Calculate the area of a rectangle that has sides of 1.5 and 2.0m. Express the answer in units of square meters and square centimeters.

6. One of the fastest-moving nerve impulses in the body travels at a speed of 400 feet per second (ft/s). What is the speed in miles per hour?

7. Convert the speed of light (3.00×10^8m/s) to km/year.

8. Convert 2,745mm into kilometers.

9. The world's oceans contain approximately $1.4 \times 10^9 km^3$ of water. What is the volume in liters?

10. During a severe pollution period in a European city, the concentration of lead in the air was $3.0 \times 10^{-6} g/m^3$. What is the concentration expressed in milligrams per liter?

11. A sheet of metal measures 2.5m by 41.2cm and is 3.2mm thick. What is the volume in cubic millimeters? In liters?

12. Alka Seltzer tablets contain 2.1×10^3mg of sodium bicarbonate. How many tablets can be made from 5.5kg of sodium bicarbonate?

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1. $0.454kg\left(\frac{1000g}{1kg}\right) = 454g$ $\qquad$ $454g\left(\frac{1000mg}{1g}\right) = 454{,}000mg$

2. $0.0106cm\left(\frac{10mm}{1cm}\right) = 0.106mm$ $\qquad$ $0.0106cm\left(\frac{10{,}000\mu m}{1cm}\right) = 106\mu m$

   But let's say that you didn't know that there were 10,000μm in 1cm. You could have done the conversion a slightly longer way to get the correct answer by converting to meters first and then on to micrometers.

   $$0.0106cm\left(\frac{1m}{100cm}\right)\left(\frac{10^6\,\mu m}{1m}\right) = 106\mu m$$

3. $50\mu L\left(\frac{1L}{10^6\,\mu L}\right) = 0.000050L = 5.0\times10^{-5}\,L$

4. First, remember that the volume of a cylinder is $\pi r^2 h$, where r is the radius and h is the height of the dish.

   $V = \pi r^2 h = (3.1415)(7.50\text{cm})^2(2.50\text{cm}) = 442\text{cm}^3$

   Remember that $1\text{cm}^3 = 1\text{mL}$, so the volume in milliliters is 442mL. Now to convert to liters:

   $$442mL\left(\frac{1L}{1000mL}\right) = 0.442L$$

5. area = (length)(length). In terms of meters, area = (1.5m)(2.0m) = 3.0m^2.

6. $\left(\frac{400\,ft}{s}\right)\left(\frac{1mi}{5280\,ft}\right)\left(\frac{60s}{1\min}\right)\left(\frac{60\min}{1h}\right) = 272.7\,{}^{mi}\!/_{h}$

7. $\left(\frac{3.00\times10^8\,m}{s}\right)\left(\frac{1km}{1000m}\right)\left(\frac{60s}{1\min}\right)\left(\frac{60\min}{1h}\right)\left(\frac{24h}{1day}\right)\left(\frac{365day}{1year}\right) = 9.46\times10^{12}\,{}^{km}\!/_{year}$

8. $2745mm\left(\frac{1m}{1000mm}\right)\left(\frac{1km}{1000m}\right) = 0.002745km = 2.745\times10^{-3}\,km$

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9. First, let's convert the km^3 to m^3. Since 1km = 1000m,

   $1km^3 = (1km)(1km)(1km) = (1000m)(1000m)(1000m) = 10^9 m^3$.

$$1.4\times10^9\,km^3\left(\frac{10^9\,m^3}{1km^3}\right)=1.4\times10^{18}\,m^3$$

   And we know that 1m3 = 1000L. Therefore, $1.4\times10^{18}\,m^3\left(\frac{1000L}{1m^3}\right)=1.4\times10^{21}\,L$.

10. $\left(\frac{3.0\times10^{-6}\,g}{m^3}\right)\left(\frac{1000mg}{1g}\right)\left(\frac{1m^3}{1000L}\right)=3.0\times10^{-6}\,{}^{mg}\!/\!_{L}$

11. The volume of a rectangular object is V = length x width x height. Let's convert all of the units into millimeters first. V = (2500mm)(412mm)(3.2mm) = $3.3 \times 10^6 mm^3$.

    To convert to liters, the first step is to convert from mm^3 to cm^3.

    $1cm^3 = (1cm)(1cm)(1cm) = (10mm)(10mm)(10mm) = 10^3 mm^3$.

    Then we use the equality $1cm^3$ = 1mL to get to milliliters, and then on to liters.

$$3.3\times10^6\,mm^3\left(\frac{1cm^3}{1000mm^3}\right)\left(\frac{1mL}{1cm^3}\right)\left(\frac{1L}{1000mL}\right)=3.3L$$

12. The question is asking you to do this division problem $\left(\frac{5.5kg}{2.1\times10^3\,mg}\right)$. But you can see that we can't do it because the units for mass are not the same. So we need to convert the kilograms to milligrams and then we can work the problem.

$$\left(\frac{5.5kg}{2.1\times10^3\,mg}\right)\left(\frac{1000g}{1kg}\right)\left(\frac{1000mg}{1g}\right)=\left(\frac{5.5\times10^6\,mg}{2.1\times10^3\,mg}\right)=2.6\times10^3\text{ tablets}$$