Name: Solutions

Student #: _____

CHEM 1101 Assignment: Unit Conversion and Significant Figures

Print this page, and write your answers on this page. Submit Hand-Written Solutions. Consider all input values are measured, unless otherwise specified.

1. Carry out the following conversions:
   a. 44 729 J to kJ : $44729\ J \times \frac{1\ kJ}{1000\ J} = 44.729\ J$
   b. 421.6 nm to m : $421.6\ nm \times \frac{1\ m}{10^9\ nm} = 4.216 \times 10^{-7}\ m$
   c. 1.3188×10^{-27} kg to g : $1.3188 \times 10^{-27}\ kg \times \frac{1000\ g}{1\ kg} = 1.3188 \times 10^{-24}\ g$
   d. 172 kJ to J : $172\ kJ \times \frac{1000\ J}{1\ kJ} = 1.72 \times 10^5\ J$
   e. 4.3×10^6 nm to m : $4.3 \times 10^6\ nm \times \frac{1\ m}{10^9\ nm} = 4.3 \times 10^{-3}\ m$
   f. 94.9 kg to mg : $94.9\ kg \times \frac{10^6\ mg}{1\ kg} = 9.49 \times 10^7\ mg$
   g. 7.13 µg to kg : $7.13\ \mu g \times \frac{1\ kg}{10^9\ \mu g} = 7.13 \times 10^{-9}\ kg$

2. Given the conversion factors:

   101 325 Pa = 1 atm (This is exact)
   14.70 psi = 1 atm
   2.54 cm = 1 inch (This is exact)
   6.02×10^{23} = 1 mol
   K = °C + 273
   1000 L = 1 m^3 (This is exact)

   Convert the following:
   a. 1.05 atm to Pa : $1.05\ atm \times \frac{101325\ Pa}{1\ atm} = 1.06 \times 10^5\ Pa$

      kPa : $1.06 \times 10^5\ Pa \times \frac{1\ kPa}{1000\ Pa} = 1.06 \times 10^2\ kPa$ (or 106 kPa)

      psi : $1.05\ atm \times \frac{14.70\ psi}{1\ atm} = 15.4\ psi$
   b. 3.8×10^6 Pa to atm : $3.8 \times 10^6\ Pa \times \frac{1\ atm}{101325\ Pa} = 38\ atm$
   c. 42 L to m^3 : $42\ L \times \frac{1\ m^3}{1000\ L} = 4.2 \times 10^{-2}\ m^3$ (or $0.042\ m^3$)
   d. 74°C to K : $74°C + 273 = 347\ K$
   e. 393 K to °C : $393\ K - 273 = 120.°C$ (or $1.20 \times 10^2\ °C$)
   f. 18.92 inches to m : $18.92\ in \times \frac{2.54\ cm}{1\ in} \times \frac{1\ m}{100\ cm} = 0.4806\ m$

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3. Complete the following calculations – assume that all values are measured, unless the question specifies otherwise (this means your answers must have the correct sig. figs.)
Show your answer in both standard notation and scientific notation.

a. $\frac{574}{(28)(32)} =$ [0.640625] = 0.64 = 6.4×10^{-1}

b. $\frac{23}{(2.4)(-8.6)} =$ [-1.1143] = -1.1 ($= -1.1 \times 10^{0}$)

c. $\frac{(580. - 540.)}{20.} =$ [2] = 2.0 ($= 2.0 \times 10^{0}$)

d. $(5.70 \times 10^{5})(6.24 \times 10^{8}) =$ [3.5568×10^{14}] = 3.56×10^{14}
= 356 000 000 000 000

e. $\frac{12\,628}{(7.40\times10^{-2})(9.02\times10^{-4})} =$ [189 189 189] = 1.89×10^{8}
= 189 000 000

f. log (0.045) = [-1.34679] = -1.35 ($= -1.35 \times 10^{0}$)

g. log (-0.045) = undefined. Cannot take a log of a neg. #.

h. ln (0.045) = [-3.10109] = -3.10 ($= -3.10 \times 10^{0}$)

i. ln (4.50×10^{-2}) = [-3.10109] = -3.101 ($= -3.101 \times 10^{0}$)

Same #, different SF

j. log x = -1.3468; x = [0.0449987] = 0.04500 = 4.500×10^{-2}

k. ln x = 12.95; x = [420836] = 420 000 = 4.2×10^{5}

l. $\frac{327\,421}{8.314}\left(\frac{3.46}{395} - \frac{184}{296}\right) =$ (39381.886)(0.0087595 - 0.621622)
= (39381.886)(-0.612862)
= [-24135.6666]
= -24100 = -2.41×10^{4}