Manipulating Variables and Constants EXERCISES

Directions: For each of the following equations, solve for the variable in **bold** print. Be sure to show each step you take to solve the equation for the **bold** variable.

1. $v = \mathbf{a}t$

2. $P = \dfrac{F}{\mathbf{A}}$

3. $\lambda = \dfrac{\mathbf{h}}{p}$

4. $F(\Delta \mathbf{t}) = m\Delta v$

5. $U = \dfrac{G\mathbf{m}_1 m_2}{r}$

6. $C = \dfrac{5}{9}(\mathbf{F} - 32)$

7. $v^2 = v^2 + 2\mathbf{a}\Delta x$

8. $K = \dfrac{1}{2}m\mathbf{v}^2$

9. $v_{rms} = \sqrt{\dfrac{3RT}{\mathbf{M}}}$

10. $F = \dfrac{1}{4\pi\varepsilon_0}\dfrac{Kq_1q_2}{\mathbf{r}^2}$

11. $x = x_0 + v_0 t + \dfrac{1}{2}\mathbf{a}t^2$

12. $n_1 \sin\theta_1 = n_2 \sin \boldsymbol{\theta}_2$

Part II: Factor-Label Method for Converting Units (Dimensional Analysis)

A very useful method of converting one unit to an equivalent unit is called the factor-label method of unit conversion. You may be given the speed of an object as 25 **km/h** and wish to express it in **m/s**. To make this conversion, you must change **km** to **m** and **h** to **s** by multiplying by a series of factors so that the units you do not want will cancel out and the units you want will remain. Conversion factors: 1000 **m** = 1 **km** and 3600 **seconds** = 1 **hour**

$$\left(\frac{25\ \text{km}}{\text{h}}\right)\left(\frac{1000\ \text{m}}{1\ \text{km}}\right)\left(\frac{1\ \text{h}}{3600\ \text{s}}\right) = 6.94\ \text{m/s}$$

What is the conversion factor to convert km/h to m/s?

What is the conversion factor to convert m/s to km/h?

Do the following conversions using the factor-label method. <u>Show all of your work!</u>

1. How many seconds are in a year?

2. Convert 28 km to cm.

3. Convert 450 g to kg.

4. Convert 85 cm/min to m/s

5. Convert 6 grams to kg.

6. Convert 823 nm to m.