Smith's Integrated Science
Unit 1: Energy & the Solar System

Name: ________Answer Key______________
Date: ______________ Period: _______

Wave Speed, Frequency, & Wavelength Practice Problems

$v = f\lambda$	c = 300,000,000m/s
$c = f\lambda$	($c = 3\text{x}10^8$m/s)

Use the above formulas and information to help you solve the following problems. Show all work, and use the factor-label method to perform all necessary conversions.

1. Sound waves in air travel at approximately 330m/s. Calculate the frequency of a 2.5m-long sound wave.

f = 132Hz

2. A wave on a certain guitar string travels at a speed of 200m/s. Calculate the wavelength of an "A" note sounding at 440Hz.

λ = 0.45m

3. A low-frequency radio wave has a frequency of 250,000Hz. What is the wavelength of this radio wave? (Hint: Don't forget that this is an electromagnetic wave, and therefore you should automatically know its speed.)

λ = 1200m

4. A certain microwave has a wavelength of 0.032 meters. Calculate the frequency of this microwave.

$f = 9.375\text{x}10^9$Hz

5. A certain radio wave has a wavelength of 7 inches.

a. Convert the wavelength of this radio wave into meters. (1 meter = 39.37 inches)

0.178m

b. Find the frequency of this radio wave.

$f = 1.69\text{x}10^{9}\text{Hz}$

6. A certain wave on the border between microwaves and infrared waves has a frequency of $2\text{x}10^{12}$ Hz.

a. Calculate the wavelength of this wave in meters.

$\lambda = 1.5\text{x}10^{-4}\text{m}$

b. Convert the wavelength from part A into millimeters. (1 meter = 1000 millimeters)

0.15mm

7. The wavelengths of visible light range from approximately 400 nanometers to 750 nanometers.

a. Convert the 750nm wavelength of the red light into meters. (1 nanometer = $1\text{x}10^{-9}$ meters)

$750\text{x}10^{-9}\text{m}$
(or $7.5\text{x}10^{-7}\text{m}$)

b. Convert the 400nm wavelength of the violet light into meters.

$400\text{x}10^{-9}\text{m}$
(or $4.0\text{x}10^{-7}\text{m}$)

c. Now find the frequency of the **higher-frequency** colored light of parts A and B. (Hint: Before calculating, give some thought to the relationship between frequency and wavelength. Then you only need to calculate for the one color that corresponds to the higher frequency.)

$f = 7.5\text{x}10^{14}\text{Hz}$