

Name: \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

## I. Calculating Frequency & Wavelength of EM radiation

### A. Defining variables

- Example:*  
What is the variable that we use to represent frequency (Hz)? =  $f$  (aka  $\nu$ )?
- What is the variable that we use to represent wavelength (m) =  $w$
- What is the variable that we use to represent Speed of Light (m/s) =  $c$   
Note: all Electromagnetic Spectrum Waves travel at this same speed
- Speed of light is a constant. How many m/s does light travel?  $3.00 \times 10^8$

### B. Deriving equations

Given the formula .....  $C = f \cdot W$  (aka  $c = \nu \cdot \lambda$ )

- What is the formula for calculating  $f$  (aka  $\nu$ )?  $f = c/w$
- What is the formula for calculating  $W$  ( $\lambda$ )?  $W = c/f$

### C. Calculating Frequency ( $f$ ) and Wavelength ( $W$ )

Show your work! Use a calculator and do the actual math – don't just leave the answer as a fraction!

- Violet light has a wavelength of  $4.10 \times 10^{-12}$  m. What is the frequency?  
 $f = c/w$   
 $= 3.00 \times 10^8 / 4.10 \times 10^{-12}$   
 $= 0.73 \times 10^{20}$   
 $= 7.3 \times 10^{19}$  m
- Green light has a frequency of  $6.01 \times 10^{14}$  Hz. What is the wavelength?  
 $f = c/w$   
 $= 3.00 \times 10^8 / 6.01 \times 10^{14}$   
 $= 0.499 \times 10^{-6}$  m  
 $= 4.99 \times 10^{-7}$  m
- What is the wavelength (in meters) of the electromagnetic carrier wave transmitted by The Sports Fan radio station at a frequency of 640 kHz? (Hint: convert kHz into Hz by multiplying by  $10^3$ .)  
 $f = 6.4 \times 10^{(3+2)} = 6.4 \times 10^5$   
 $w = 3.00 \times 10^8 / 6.4 \times 10^5$   
 $0.47 \times 10^{(8-5)}$  Hz  
 $= 0.47 \times 10^3$  Hz  
 $= 4.7 \times 10^2$  Hz
- Calculate the wavelength of radiation with a frequency of  $8.0 \times 10^{14}$  Hz.  
 $w = c/f$   
 $= 3.00 \times 10^8 / 8.0 \times 10^{14}$   
 $= 0.375 \times 10^{(8-14)}$  m  
 $= 0.375 \times 10^{-6}$  m  
 $= 3.75 \times 10^{-7}$  m