

Name: \_\_\_\_\_

Period: \_\_\_\_\_

## Electromagnetic Wave Worksheet

### Formulas and Conversion Factors

$$c = \lambda\nu$$
$$E_{\text{photon}} = h\nu$$
$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$
$$c = 3.00 \times 10^8 \text{ m/s}$$

$$1 \text{ m} = 10^9 \text{ nm}$$
$$1 \text{ MHz} = 1 \times 10^6 \text{ Hz}$$
$$1 \text{ mole} = 6.022 \times 10^{23} \text{ objects}$$

1. An electromagnetic wave has a wavelength of 950 nm. Find the energy of one photon with this wavelength.

2. A wave has a frequency of  $3.14 \times 10^{18}$  Hz. Find the wavelength of this wave.

3. A wave has a frequency of 101.5 MHz. What is the energy of one photon with this frequency?

4. A photon has energy of  $1.8 \times 10^{-20}$  J. Find the wavelength of this photon.

5. A photon has energy of  $2.71 \times 10^{-20}$  J. What is the frequency of this photon?

### Extra Practice Problems

I. Wavelength is 250 nm, find the frequency and energy of one photon.

II. Energy of a photon is  $1.7 \times 10^{-14}$  J, what is the wavelength?

III. Frequency is  $7.32 \times 10^{15}$  Hz. Find wavelength and energy of one photon.

IV. Frequency is 103.9 MHz. Find wavelength and energy of one photon.

V. Wavelength is 650 nm. Find the frequency and the energy of one mole of photons.

VI. Energy of a photon is  $4.44 \times 10^{-22}$  J. Find the wavelength and frequency.

### Answers to Extra Problems

I.  $\nu = 1.2 \times 10^{15}$  Hz,  $E = 8.0 \times 10^{-19}$  J

II.  $\nu = 2.6 \times 10^{19}$  Hz,  $\lambda = 1.2 \times 10^{-11}$  m

III.  $\lambda = 4.10 \times 10^{-8}$  m,  $E = 4.85 \times 10^{-18}$  J

IV.  $\lambda = 2.88$  m,  $E = 6.88 \times 10^{-26}$  J

V.  $\nu = 4.6 \times 10^{14}$  Hz,  $E = 180,000$  J

VI.  $\lambda = 4.47 \times 10^{-4}$  m,  $\nu = 6.70 \times 10^{11}$  Hz