

## Light Waves and Energy Worksheet

1. Convert 522 nm to m.

$$522 \text{ nm} \times \frac{1 \text{ m}}{10^9 \text{ nm}} = \boxed{5.22 \times 10^{-7} \text{ m}}$$

2. Convert
- $4.44 \times 10^{-7} \text{ m}$
- to nm.

$$4.44 \times 10^{-7} \text{ m} \times \frac{10^9 \text{ nm}}{1 \text{ m}} = 444 \text{ nm}$$

3. What is the wavelength of a light wave with a frequency of
- $5.7 \times 10^{14} \text{ Hz}$
- ? What color is it?

$$c = \lambda \cdot \nu$$

$$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^8 \text{ m/s}}{5.7 \times 10^{14} \text{ Hz}} = 5.26 \times 10^{-7} \text{ m} = 526 \text{ nm}$$

Green

4. What is the frequency of a light wave with a wavelength of
- $6.2 \times 10^{-7} \text{ m}$
- ? What color is it?

$$\lambda = 6.2 \times 10^{-7} \text{ m} = 620 \text{ nm} \Rightarrow \boxed{\text{orange}}$$

$$c = \lambda \cdot \nu \quad \nu = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{6.2 \times 10^{-7} \text{ m}} = \boxed{4.8 \times 10^{14} \text{ Hz}}$$

5. What is the energy of a light wave with a frequency of
- $7.3 \times 10^{14} \text{ Hz}$
- ?

$$E = h\nu$$

$$E = (6.626 \times 10^{-34} \text{ J/Hz})(7.3 \times 10^{14} \text{ Hz}) = \boxed{4.8 \times 10^{-19} \text{ J}}$$

6. What is the energy of a light wave with a wavelength of 600 nm?

$$600 \text{ nm} = 6.00 \times 10^{-7} \text{ m}$$

$$E = \frac{h \cdot c}{\lambda} = \frac{(6.626 \times 10^{-34} \text{ J/Hz})(3.00 \times 10^8 \text{ m/s})}{(6.00 \times 10^{-7} \text{ m})} = \boxed{3.31 \times 10^{-19} \text{ J}}$$

7. What is the frequency of a light wave with a wavelength of 565 nm? What color is it?

$$565 \text{ nm} = 5.65 \times 10^{-7} \text{ m}$$

$$c = \lambda \cdot \nu$$

$$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{5.65 \times 10^{-7} \text{ m}} = \boxed{5.31 \times 10^{14} \text{ Hz}} \quad \boxed{\text{green}}$$

8. What is the frequency of a light wave with energy of
- $6.22 \times 10^{-5} \text{ J}$
- ? What type of electromagnetic radiation is it?

$$E = h\nu$$

$$\nu = \frac{E}{h} = \frac{6.22 \times 10^{-5} \text{ J}}{6.626 \times 10^{-34} \text{ J/Hz}} = \boxed{9.39 \times 10^{28} \text{ Hz}} \quad \boxed{\gamma \text{ rays}}$$

9. What is the wavelength of a light wave with energy of
- $5.5 \times 10^{-19} \text{ J}$
- ? What color is it?

$$E = \frac{hc}{\lambda}$$

$$\lambda = \frac{hc}{E} = \frac{(6.626 \times 10^{-34} \text{ J/Hz})(3.00 \times 10^8 \text{ m/s})}{(5.5 \times 10^{-19} \text{ J})} = 3.6 \times 10^{-7} \text{ m}$$

$\boxed{360 \text{ nm}}$   
 $\boxed{\text{violet}}$

10. Is an orange flame
- cooler
- or hotter than a blue flame? Explain your answer.

orange flame has ~~shorter~~ small frequency, therefore, it has ~~smaller~~ lower energy.