

Light Problems Worked Out

their octet?

36. Alkali metals have one valence electron to lose to become more stable. They will combine in a 2:1 ratio with group 16 elements. Name any pair of elements that will combine in that ratio.

EM Spectrum - Chapter 5 in book Round answers to correct # of sig figs

37. Arrange the following types of EM radiation in order of increasing wavelength.

- ultraviolet light
- microwaves
- radio waves
- X rays

38. What is the difference between an electron's ground state and excited state?

39. As wavelength decreases, what happens to energy?

40. Calculate the frequency of a wave that has a wavelength of 1.54×10^{-4} meters. PSYW

$$c = f\lambda \quad \frac{3.0 \times 10^8 \text{ m/s}}{1.54 \times 10^{-4} \text{ m}} = \frac{f(1.54 \times 10^{-4} \text{ m})}{1.54 \times 10^{-4} \text{ m}} \quad f = [2.0 \times 10^{12} \text{ Hz}]$$

41. Calculate the wavelength of a wave with energy 5.00×10^{16} Joules. PSYW

$$E = \frac{hc}{\lambda} \quad (\lambda) \frac{(5.0 \times 10^{16} \text{ J})}{5.0 \times 10^{16} \text{ J}} = \frac{(6.63 \times 10^{-34} \text{ J}\cdot\text{s})(3.0 \times 10^8 \text{ m/s})(\lambda)}{5.0 \times 10^{16} \text{ J}} = [1.0 \times 10^{-4} \text{ m}]$$

42. Calculate the energy of a particle with a frequency of 2.34×10^{24} Hz. PSYW

$$E = hf \quad E = (6.63 \times 10^{-34} \text{ J}\cdot\text{s})(2.34 \times 10^{24} \text{ Hz}) = [1.55 \times 10^{-9} \text{ J}]$$

43. What is the speed of an electromagnetic wave having a frequency of 1.33×10^{17} Hz and a wavelength of 2.25 nm? PSYW

speed of light is constant

$$c = 3.0 \times 10^8 \text{ m/s}$$

44. What is the energy of a photon of red light having a frequency of 4.48×10^{14} Hz? PSYW

$$E = hf \quad E = (6.63 \times 10^{-34} \text{ J}\cdot\text{s})(4.48 \times 10^{14} \text{ Hz}) = [2.97 \times 10^{-19} \text{ J}]$$

45. What is the frequency of light which has a wavelength of 4.90×10^{-7} meters? PSYW.

$$c = f\lambda \quad \frac{3.0 \times 10^8 \text{ m/s}}{4.9 \times 10^{-7} \text{ m}} = \frac{f(4.90 \times 10^{-7} \text{ m})}{4.9 \times 10^{-7} \text{ m}} = [6.1 \times 10^{14} \text{ Hz}]$$