Sturman BHS

HINTS & ANS RANGES + *CORRECTIONS* ← forgot exponents. see 1, 2, & 5.

Name STURMAN
Period ____ Date ____

Sample Light Energy Problems

* 1. Find the smallest increment of energy that a water molecule can absorb from a single microwave photon, wavelength 4.00×10^{6} nm. $(4.5 - 5.3 \times 10^{-23} J)$

* 2. Find the wavelength, in nm, of a photon that gives off 7.53×10^{-20} J of energy. (2500 - 2700nm)

3. Compare the energy entering your eyes, per photon, for blue sunglasses and red sunglasses.

Blue $\lambda = 450nm$ Blue $(4.25 - 5.5 \times 10^{-19} J)$

Red $\lambda = 750nm$ Red $(2.40 - 2.80 \times 10^{-19} J)$

4. A carbon dioxide laser used in surgery has a frequency of 30 GHz. What is the energy of a single photon emitted from this laser? $(1.5 - 2.5 \times 10^{-23} J)$

$1\ GHz = 1 \times 10^{9}\ Hz$

*5. If this laser emits 1.0×10^{4} J of energy every second, then how many photons are emitted each second? $(4.5 - 5.5 \times 10^{26}$ photons/sec)

6. Satellite dishes are designed to receive waves of 3.90m. What is the frequency of these waves in MHz? (73 - 79 MHz)

Ans. Ranges

Name STURMAN

Period _____ Date _____

LIGHT PROBLEMS

1. Calculate the smallest increment of energy that an object can absorb from yellow light, wavelength 589nm. ($2-5 \times 10^{-19} J$)

2. A laser, used to weld detached retinas, produces radiation with a frequency of $4.69 \times 10^{14}\ s^{-1}$. What is the energy of this radiation? ($2-4 \times 10^{-19} J$)

3. The orange light given off by a sodium vapor, used for street lamps, has a wavelength of 625nm. How much energy does it give off? ($2-4 \times 10^{-19} J$)

4. A laser that emits light energy in pulses of short duration has a frequency of $4.69 \times 10^{14}\ s^{-1}$. It deposits 1.30×10^{-2} J of energy during each pulse. How many quanta of energy does each pulse deposit? ($1-2 \times 10^{-2} J$)

5. What is the wavelength, in nanometers, of a photon that gives off 1.88×10^{-18} J of energy? (90-110nm)

6. What color light gives off 4.417×10^{-19} J of energy? (300-500nm)

7. How much energy does an AM radio wave emit if its frequency is $1.00 \times 10^{6}\ s^{-1}$? ($5-7 \times 10^{-28} J$)