

$C = f \lambda$ or $C = \lambda f$ $E = hf$
 $C = 3.00 \times 10^8 \text{ m/s}$ $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$

11. Name and describe the shapes of the 4 sublevels with studied. How many orbitals does each sublevel have?

s - spherical + 1 sublevel → dumbbell + 3 sublevels
 p - dumbbell + 3 sublevels
 d - 4 leaf clover + 5 sublevels
 f - ?

lowest energy for an e-

13. Name and describe the three rules for determining electron configurations.

1) Pauli Exclusion: only 2 e- per orbital w/ opp. spin.
 2) Aufbau Principle: e- added one at a time to lowest energy orbitals 1st

3) Hund's Rule
 e- occupy equal energy orbitals so max # of unpaired e- exist



14. Diagram the spin of an electron and its corresponding magnetic field

1. What is the frequency of light that has a wavelength of $7.50 \times 10^7 \text{ nm}$?
 What color is this? $C = \lambda f \Rightarrow 3.00 \times 10^8 = 7.50 \times 10^7 \cdot f$
 $f = ?$ $f = 4 \times 10^{14} \text{ s}^{-1}$ **Red**

2. Find the wavelength of an electromagnetic wave with a frequency of $3 \times 10^{17} \text{ hertz}$. What type of wave is this?
 $C = \lambda f$
 $\lambda = 7.50 \times 10^2 \times 10^{-9} = 7.50 \times 10^{-7} \text{ m}$
 $f = 3 \times 10^{17} \text{ Hz}$ $3.00 \times 10^8 = \lambda (3 \times 10^{17})$
 $\lambda = 1 \times 10^{-9} \text{ m}$ radio

3. What is the speed of light through glass if the frequency of the wave is $3.3 \times 10^{14} \text{ s}^{-1}$ and its wavelength is 605 nm ?
 $C = \lambda f = 3.3 \times 10^{14} \cdot 605 \times 10^{-9} = 2.00 \times 10^8 \text{ m/s}$

4. What is the frequency of a wave that has 25 crests passing a given point every $2.8 \times 10^{-16} \text{ seconds}$?
 $f = \frac{\# \text{ waves}}{\text{time}} = \frac{25}{2.8 \times 10^{-16}} = 8.9 \times 10^{16} \text{ Hz}$

5. Find the frequency of a photon that has $3.96 \times 10^{19} \text{ J}$ of energy. What wavelength does this correspond to? What color will you perceive?
 $E = hf$
 $f = \frac{E}{h} = \frac{3.96 \times 10^{19}}{6.63 \times 10^{-34}} = 5.97 \times 10^{14} \text{ s}^{-1}$

6. What is a photons energy that has a frequency of $3.00 \times 10^{16} \text{ s}^{-1}$?
 $E = hf = 6.63 \times 10^{-34} \text{ J}\cdot\text{s} (3.00 \times 10^{16} \text{ s}^{-1}) = 1.989 \times 10^{-17} \text{ J}$

Sturman Key

Name: _____ Period: _____ Date: _____

amplitude → max displacement from equil.
 wavelength (λ) → distance between 2 cons. pts on a wave
 freq. (f) → # waves/sec

e-m wave: don't need medium through which to travel.
 directly related, transverse

Travel at $3.00 \times 10^8 \text{ m/s}$ in air or vacuum, energy + freq. related, transverse

4. Which e-m wave has the highest frequency? Lowest? What color has the highest frequency? Lowest?
 → γ radio
 ↓ violet ↓ red

5. How is frequency of a light wave related to its wavelength? Inversely $C = \lambda f$

6. What does "quanta" mean? a specific amt of energy (packet of energy)

7. Describe the scientific contributions of the following scientists to the development of the quantum mechanical theory.

a. Planck: energy + freq. directly related

b. Bohr: energy of e- is quantized

c. Heisenberg: matter also has wave properties.

d. deBroglie: matter also has wave properties.

8. What is the difference between a continuous spectrum and a line spectrum? Continuous spectrum - all the colors w/ no separation between them

9. How does the quantum-mechanical model explain electron behavior? e- are wave-like + they absorb "quanta" of energy. formed by excited e- from gases.

10. What are the quantum principle numbers? What do they represent? #s that indicate the energy level of an e-.

They are #s 1-7.

$5.03 \times 10^7 \times 10^9 = 508 \text{ nm}$
 GREEN (see e-m spectrum)