


Chapter 05

Study Guide Answers

- Light behaves as both a wave and particle.
- Describe an electromagnetic wave electric and magnetic fields oscillating at right angles to each other and the direction of the wave
- Describe the basic properties of electromagnetic radiation.

Property	Definition	Determines
Amplitude	Height from origin to crest	Brightness
Wavelength	Distance between successive crests of waves	Color of light
Frequency	Rate that waves repeat	Energy
Wave speed	Speed of a wave – speed of light 3.0×10^8 m/s	

- What is the formula that relates wavelength and frequency? $\lambda = c/\nu$
- What is Planck's formula? $E=hu$
- What type of relationship does Planck's formula express for frequency and energy? direct and proportional
- The concept that energy is made up of discrete pieces is called quantization.
- Light is made up of packets of energy called photons.
- The model that treats electrons as waves of quantized energy is called the quantum mechanical model.
- Fill in the EM spectrum chart below

Low Frequency				High Frequency		
radio	microwaves	infrared		ultraviolet	x-rays	gamma rays
High Wavelength			Visible Light	Low Wavelength		

- Areas within the electron cloud where electrons are likely to be found are called orbitals.
- The distribution of electrons among orbitals is given by the atom's electron configuration.
- When electrons are located in the lowest energy orbitals possible the atom is said to be grounded.
- When electrons absorb energy, they are said to be excited.
- As electrons lose energy, they give off that energy in the form of photons of light.
- Define the following:
 Aufbau principle: electrons fill orbitals based on energy – lowest energy orbitals are filled first
 Pauli Exclusion principle: no more than 2 electrons in an orbital – paired electrons must have opposite spins
 Hund's rule: electrons will spread out in orbitals of equal energy until forced to pair up

- Fill in the following table regarding the types of sublevels in each energy level.

Energy Level	Sublevels	Maximum Number of Electrons
1	s	2
2	s,p	8
3	s,p,d	18
4	s,p,d,f	32
5	s,p,d,f	32
6	s,p,d,f	32
7	s,p,d,f	32

- Fill in the following table regarding sublevels and orbitals.

Sublevel	Shape	Number of Orbitals	Maximum Number of Electrons
s	sphere	1	2
p	3 dumbbells	3	6
d	4 clovers, 1 dumbbell	5	10
f	too complicated	7	14

- What are the four symbols that represent the quantum numbers for an electron? n,l,m,s
- The number of sublevels in an energy level = the principal quantum number (n).

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