

**CHAPTER 5 STUDY GUIDE FOR CONTENT MASTERY**

**Electrons in Atoms**

**Section 5.1 Light and Quantized Energy**

*In your textbook, read about the wave nature of light.*

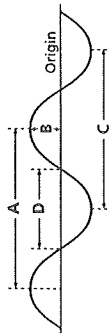
Use each of the terms below just once to complete the passage.

amplitude	energy	hertz
light	wave	speed
	wavelength	

Electromagnetic radiation is a kind of (1) energy that behaves like a(n) (2) wave as it travels through space. (3) Light is one type of electromagnetic radiation. Other examples include X rays, radio waves, and microwaves.

All waves can be characterized by their wavelength, amplitude, frequency, and (4) speed. The shortest distance between equivalent points on a continuous wave is called a(n) (5) wavelength. The height of a wave from the origin to a crest or from the origin to a trough is the (6) amplitude. (7) Frequency is the number of waves that pass a given point in one second. The SI unit for frequency is the (8) hertz, which is equivalent to one wave per second.

Use the figure to answer the following questions.



9. Which letter(s) represent one wavelength? both A and C
10. Which letter(s) represent the amplitude? B
11. If twice the length of A passes a stationary point every second, what is the frequency of the wave?  
The frequency is 2 waves/s or 2 Hz.

**CHAPTER 5 STUDY GUIDE FOR CONTENT MASTERY**

**Section 5.1 continued**

*In your textbook, read about the particle nature of light.*

Circle the letter of the choice that best completes the statement or answers the question.

12. A(n) \_\_\_\_\_ is the minimum amount of energy that can be lost or gained by an atom.  
 a. valence electron    b. electron    **c. quantum**    d. Planck's constant
13. According to Planck's theory, for a given frequency,  $\nu$ , matter can emit or absorb energy only in  
 a. units of hertz.    c. entire wavelengths.  
**b. whole-number multiples of  $h\nu$ .**    d. multiples of  $\frac{1}{2}h\nu$ ,  $\frac{1}{4}h\nu$ , and so on.
14. The \_\_\_\_\_ is the phenomenon in which electrons are emitted from a metal's surface when light of a certain frequency shines on it.  
 a. quantum    b. Planck concept    **c. photon effect**    d. photoelectric effect
15. Which equation would you use to calculate the energy of a photon?  
 a.  $E_{\text{photon}} = h\nu \times \text{Planck's constant}$     c.  $E_{\text{photon}} = \frac{1}{2}h\nu$   
**b.  $E_{\text{photon}} = h\nu$**     d.  $c = \lambda\nu$

*In your textbook, read about atomic emission spectra.*

For each statement below, write *true* or *false*.

- false 16. Like the visible spectrum, an atomic emission spectrum is a continuous range of colors.
- true 17. Each element has a unique atomic emission spectrum.
- true 18. A flame test can be used to identify the presence of certain elements in a compound.
- true 19. The fact that only certain colors appear in an element's atomic emission spectrum indicates that only certain frequencies of light are emitted.
- false 20. Atomic emission spectra can be explained by the wave model of light.
- false 21. The neon atoms in a neon sign emit their characteristic color of light as they absorb energy.
- true 22. When an atom emits light, photons having certain specific energies are being emitted.