

$$h = 6.63 \times 10^{-34} \text{ J s}$$

Practice Quiz – Quantum Theory of the Atom

1. Which of these types of radiation has the highest frequency?
 a. radio waves b. infrared c. microwaves **d. ultraviolet** e. visible

2. What is the energy of 1.00 mole of photons with a wavelength of 375 nm?

$$E_{\text{photon}} = \frac{hc}{\lambda} = \frac{(6.022 \times 10^{23}) (6.626 \times 10^{-34}) (3.00 \times 10^8)}{375 \times 10^{-9}} = 0.3192 \times 10^6 = 3.19 \times 10^5 \text{ J}$$

3. Einstein's work on the photoelectric effect provided support for the equation:

- a. $KE = 1/2mv^2$
b. $E = h\nu$
 c. $E = mc^2$
 d. $v = c/\lambda$
 e. none of these

4. Match the following:

Quantum Number

n - size
 m_l - orientation
 m_s - electron spin
 l shape

Property

electron spin
 shape
 size
 orientation

5. Which of the following is not a possible combination of quantum numbers:

- a. 4 2 -1 +1/2
 b. 5 4 4 -1/2
c. 3 3 -2 +1/2
 d. 4 0 0 -1/2

6. All of the following statements are consistent with the quantum theory of the atom except:

- a. Black body radiation produces emissions that depend only on temperature.
b. An intense beam of light will always eject some electrons off of a metal.
 c. An ionized metal atom will emit several very specific frequencies of EMR when heated.
 d. The energy of a photon increases as its frequency increases.

7. Which of the following events might change the wavelength of a beam of light:

- a. transmission of light through a solution
b. absorption of light and subsequent emission of light
 c. reflection of light in a mirror
 d. the scattering of light on the particles in a colloid such as milk

8. What is happening in the atom to produce atomic emission spectra?

Electrons that have moved to excited states are emitting visible frequency photons as they return to lower energy states.