Name: _____ **Period:** _____ **Date:** _____ **ID: A**

Chapter 6 Electronic Structure of Atoms: Worksheet #1

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1) Electromagnetic radiation travels through vacuum at a speed of _____ m/s.
   Ⓐ 186,000
   Ⓑ 125
   Ⓒ 3.00×10^{8}
   Ⓓ 10,000
   Ⓔ It depends on wavelength.

2) The wavelength of light that has a frequency of $1.20 \times 10^{13}\ s^{-1}$ is _____ m.
   Ⓐ 25.0
   Ⓑ 2.50×10^{-5}
   Ⓒ 0.0400
   Ⓓ 12.0
   Ⓔ 2.5

3) Ham radio operators often broadcast on the 6-meter band. The frequency of this electromagnetic radiation is _____ MHz.
   Ⓐ 500
   Ⓑ 200
   Ⓒ 50
   Ⓓ 20
   Ⓔ 2.0

4) What is the frequency (s^{-1}) of electromagnetic radiation that has a wavelength of 0.53 m?
   Ⓐ 5.7×10^{8}
   Ⓑ 1.8×10^{-9}
   Ⓒ 1.6×10^{8}
   Ⓓ 1.3×10^{-33}
   Ⓔ 1.3×10^{33}

5) The energy of a photon of light is _____ proportional to its frequency and _____ proportional to its wavelength.
   Ⓐ directly, directly
   Ⓑ inversely, inversely
   Ⓒ inversely, directly
   Ⓓ directly, inversely
   Ⓔ indirectly, not

6) Of the following, _____ radiation has the shortest wavelength.
   Ⓐ X-ray
   Ⓑ radio
   Ⓒ microwave
   Ⓓ ultraviolet
   Ⓔ infrared

7) The wavelength of a photon that has an energy of 5.25×10^{-19} J is _____ m.
   Ⓐ 3.79×10^{-7}
   Ⓑ 2.64×10^{6}
   Ⓒ 2.38×10^{23}
   Ⓓ 4.21×10^{-24}
   Ⓔ 3.79×10^{7}

8) The energy of a photon that has a wavelength of 9.0 m is _____ J.
   Ⓐ 2.2×10^{-26}
   Ⓑ 4.5×10^{25}
   Ⓒ 6.0×10^{-23}
   Ⓓ 2.7×10^{9}
   Ⓔ 4.5×10^{-25}

9) The frequency of a photon that has an energy of 3.7×10^{-18} J is _____ s^{-1}.
   Ⓐ 5.6×10^{15}
   Ⓑ 1.8×10^{-16}
   Ⓒ 2.5×10^{-15}
   Ⓓ 5.4×10^{-8}
   Ⓔ 2.5×10^{15}

10) A mole of red photons of wavelength 725 nm has _____ kJ of energy.
    Ⓐ 2.74×10^{-19}
    Ⓑ 4.56×10^{-46}
    Ⓒ 6.05×10^{-3}
    Ⓓ 165
    Ⓔ 227

11) It takes 254 kJ/mol to eject electrons from a certain metal surface. What is the longest wavelength of light (nm) that can be used to eject electrons from the surface of this metal via the photoelectric effect?
Ⓐ 471
Ⓑ 233
Ⓒ 165
Ⓓ 725
Ⓔ 552

12) Of the following, _____ radiation has the longest wavelength and _____ radiation has the greatest energy.

gamma ultraviolet visible

Ⓐ ultraviolet, gamma
Ⓑ visible, ultraviolet
Ⓒ gamma, gamma
Ⓓ visible, gamma
Ⓔ gamma, visible

13) What color of visible light has the longest wavelength?
Ⓐ blue
Ⓑ violet
Ⓒ red
Ⓓ yellow
Ⓔ green

14) What color of visible light has the highest energy?
Ⓐ violet
Ⓑ blue
Ⓒ red
Ⓓ green
Ⓔ yellow

15) Which one of the following is considered to be ionizing radiation?
Ⓐ visible light
Ⓑ radio waves
Ⓒ X-rays
Ⓓ microwaves
Ⓔ infrared radiation

16) Of the following transitions in the Bohr hydrogen atom, the _____ transition results in the emission of the highest-energy photon.
Ⓐ $n = 1 \rightarrow n = 6$
Ⓑ $n = 6 \rightarrow n = 1$
Ⓒ $n = 6 \rightarrow n = 3$
Ⓓ $n = 3 \rightarrow n = 6$
Ⓔ $n = 1 \rightarrow n = 4$

17) Using Bohr's equation for the energy levels of the electron in the hydrogen atom, determine the energy (J) of an electron in the n = 4 level.
Ⓐ -1.36×10^{-19}
Ⓑ -5.45×10^{-19}
Ⓒ -7.34×10^{18}
Ⓓ -1.84×10^{-29}
Ⓔ $+1.84 \times 10^{-29}$

18) An electron in a Bohr hydrogen atom has an energy of -1.362×10^{-19} J. The value of n for this electron is _____.
Ⓐ 1
Ⓑ 2
Ⓒ 3
Ⓓ 4
Ⓔ 5

19) A spectrum containing only specific wavelengths is called a _____ spectrum.
Ⓐ line
Ⓑ continuous
Ⓒ visible
Ⓓ Rydberg
Ⓔ invariant

20) The deBroglie wavelength of a particle is given by _____.
Ⓐ $h + mv$
Ⓑ hmv
Ⓒ h/mv
Ⓓ mv/c
Ⓔ mv