Name KEY Date _____ Class _____

5 ELECTRONS IN ATOMS

Practice Problems

In your notebook, solve the following problems.

SECTION 5.1 MODELS OF THE ATOM

1. How many sublevels are in the following principal energy levels?

a. $n = 1$ (s) → 1
b. $n = 2$ (s, p) → 2
c. $n = 3$ (s, p, d) → 3
d. $n = 4$ (s, p, d, f) → 4
e. $n = 5$ (s, p, d, f) → 4
f. $n = 6$ (s, p, d, f)

2. How many orbitals are in the following sublevels?

a. 1*s* sublevel 1
b. 5*s* sublevel 1
c. 4*d* sublevel 5
d. 4*f* sublevel 7
e. 7*s* sublevel 1
f. 3*p* sublevel 3
g. fifth principal energy level s, p, d, f
h. 6*d* sublevel 5

1, 3, 5, 7 = 16

3. What are the types of sublevels and number of orbitals in the following energy levels?

a. $n = 1$ s, 1
b. $n = 2$ s, 1; p, 3
c. $n = 3$ s, 1; p, 3; d, 5 } for n=3
d. $n = 4$ s, 1; p, 3; d, 5 } for n=4; f, 7 → n=4 only
e. $n = 5$ s, 1; p, 3; d, 5; f, 7

SECTION 5.2 ELECTRON ARRANGEMENT IN ATOMS

1. Write a complete electron configuration of each atom.

a. hydrogen $1s^2$
b. vanadium $[Ar]4s^2 3d^3$
c. magnesium $[Ne]3s^2$
d. barium $[Xe]6s^2$
e. bromine $[Ar]4s^2 3d^{10} 4p^5$
f. sulfur $[Ne]3s^2 3p^4$
g. krypton $[Ar]4s^2 3d^{10} 4p^6$
h. arsenic $[Ar]4s^2 3d^{10} 4p^3$
i. radon $[Xe]6s^2 4f^{14} 5d^{10} 6p^6$

SECTION 5.3 PHYSICS AND THE QUANTUM MECHANICAL MODEL

1. What is the wavelength (λ = ?) of the radiation whose frequency (f) is $5.00 \times 10^{15}\ s^{-1}$? In what region of the electromagnetic spectrum is this radiation? $3.0 \times 10^8 = \lambda \cdot 5.00 \times 10^{15}$ $\lambda = 6 \times 10^{-8}$ UV

2. An inexpensive laser that is available to the public emits light that has a wavelength of 670 nm. What are the color and frequency of the radiation? $\frac{670\ nm}{1} \left| \frac{1\ m}{10^9\ nm} \right.$ $\lambda = 6.7 \times 10^{-7}$ $3.0 \times 10^8 = 6.7 \times 10^{-7} \cdot f$ $f = 4.5 \times 10^{14}$ Hz RED

3. What is the energy of a photon whose frequency is $2.22 \times 10^{14}\ s^{-1}$? $E = 6.626 \times 10^{-34} \cdot 2.22 \times 10^{14}$ $E = 1.47 \times 10^{-19}$ J

4. What is the frequency of a photon whose energy is 6.00×10^{-15} J? $\frac{6.00 \times 10^{-15}}{6.626 \times 10^{-34}} = f$ $f = 9.06 \times 10^{18}$ Hz

5. Arrange the following types of electromagnetic radiation in order of increasing frequency.

a. infrared
b. gamma rays
c. visible light
d. radio waves
e. microwaves
f. ultraviolet

Radio, micro, IR, visible, UV, Gamma

6. Suppose that your favorite AM radio station broadcasts at a frequency of 1600 kHz. What is the wavelength in meters of the radiation from the station?

$\frac{1600\ kHz}{1} \left| \frac{10^3\ Hz}{1\ kHz} \right.$ = 1,600,000 Hz = f

λ = ?

$s = \lambda f$

$3.00 \times 10^8 = \lambda \cdot 1{,}600{,}000$

$\lambda = 187.5$ m