

Honors Review ch. 4

1. State the four quantum numbers, then explain the possible values they may have and what they actually represent.

Principal Quantum #, represents Energy Level, $n = 1, 2, 3, 4, \dots$
 Angular Momentum #, represents Shape, $l = n-1$ $l=0$ s $l=1$ p $l=2$ d
 Magnetic Quantum #,

2. State the number of possible electrons described by the following quantum numbers

a. $n = 3, l = 0$ $3s \rightarrow 2$ electrons

b. $n = 3, l = 1$

c. $n = 3, l = 2, m_l = -1 \rightarrow 2$ electrons

d. $n = 5, l = 0, m_l = -2, ms = -1/2$

3. Give the n and l values for the following orbitals

a. 1s $n=1$ $l=0$

b. 3s $n=3$ $l=0$

c. 2p $n=2$ $l=1$

d. 4d $n=4$ $l=2$

e. 5f $n=5$, $l=3$

4. What are the m_l values for the following types of orbitals?

a. s $m_l = 0$

b. p $m_l = -1, 0, +1$

c. d $m_l = -2, -1, 0, +1, +2$

d. f $m_l = -3, -2, -1, 0, +1, +2, +3$

6. How many possible orbitals are there for $n =$; how many electrons?

a. 4 $n^2 = 4^2 = 16$ orbitals $2n^2 = 2(4)^2 = 32$ electrons

b. 6 $n^2 = 6^2 = 36$ $2(n^2) = 2(6)^2 = 72$ electrons

7. Write the electron configurations (practice the long and the shortcut way and orbital notation)

a. He $1s^2$, [He] $1s \uparrow \downarrow$

b. V $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$ [Ar] $4s^2 3d^3$

c. Ni $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$ [Ar] $4s^2 3d^8$

d. Cu $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$ [Ar] $4s^2 3d^9$

e. Br

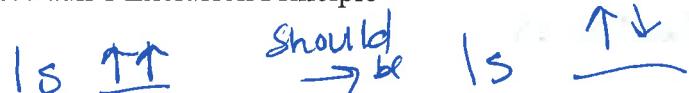
[Ar] $4s^2 3d^{10} 4p^5$

8. Draw a violation for each of the Rules (use orbital notation to demonstrate this)

a. Hund's Rule -



b. Pauli's Exclusion Principle



c. Aufbau's Principle



9. Electromagnetic radiation was detected with a frequency of 3×10^{10} Hz. What is the wavelength of this wave?

$$c = \lambda\nu$$

$$\frac{3 \times 10^8}{3 \times 10^{10}} = \lambda$$

$$\lambda = .01 \text{ m}$$

10. What color has the longest wavelength?

Red (lowest energy)

11. What is the frequency of UV light that has an energy of 2.39×10^{-18} J?

$$E = h\nu$$

$$2.39 \times 10^{-18} = 6.626 \times 10^{-34} \cdot \nu$$

$$3.61 \times 10^{15} = \nu$$

12. What is the wavelength and frequency of photons with an energy of 1.4×10^{-21} J?

$$E = h\nu$$

$$1.4 \times 10^{-21} = 6.626 \times 10^{-34} \nu$$

$$\nu = 2.1 \times 10^{12} \text{ Hz}$$

$$c = \lambda\nu$$

$$3 \times 10^8 = \lambda \cdot 2.1 \times 10^{12}$$

$$\lambda = 1.4 \times 10^{-4} \text{ m}$$

13. What is the energy of a light that has 434 nm?

$$434 \text{ nm} \times \frac{1 \text{ m}}{10^9 \text{ nm}} = 4.34 \times 10^{-7} \text{ m}$$

$$E = \frac{h \cdot c}{4.34 \times 10^{-7}}$$

$$E = 4.58 \times 10^{-19} \text{ J}$$

14. Describe the relationship between the variables Energy, wavelength and frequency.

E is directly related to ν and

inversely related to λ . $\lambda + \nu$ are inversely related

15. Know the constants for the speed of light equation and the energy equation.

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$$

16. Understand the concepts behind the flame test and gas discharge tubes.

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