

## Chapter 6 Homework

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**Part A Multiple choice** (Select the one that is best in each case. 1 point/question)

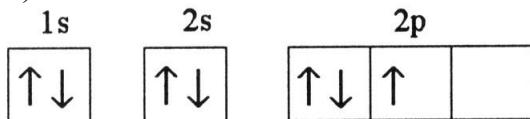
1. Of the following, \_\_\_\_\_ radiation has the longest wavelength and \_\_\_\_\_ radiation has the greatest energy.

ultraviolet      visible      infrared

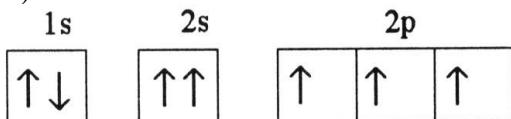
- A) ultraviolet, infrared
- B) infrared, ultraviolet
- C) ultraviolet, ultraviolet
- D) visible, ultraviolet
- E) ultraviolet, visible

2. Which one of the following is the correct electron configuration for a ground-state nitrogen atom?

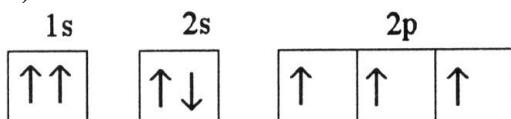
A)



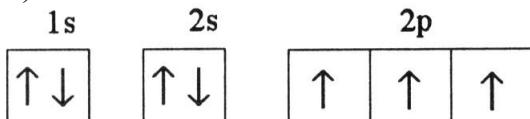
B)



C)



D)



E) None of the above is correct.

3. Which one of the following orbitals can hold two electrons?

- A)  $2p_x$
- B)  $3s$
- C)  $4d_{xy}$
- D) all of the above
- E) none of the above

4. Which of the following is a valid set of four quantum numbers? ( $n, l, m_l, m_s$ )

- A) 2, 1, 0, +1/2
- B) 2, 2, 1, -1/2
- C) 1, 0, 1, +1/2
- D) 2, 1, +2, +1/2
- E) 1, 1, 0, -1/2

5. The photoelectric effect is \_\_\_\_\_.

- A) the total reflection of light by metals giving them their typical luster
- B) the production of current by silicon solar cells when exposed to sunlight
- C) the ejection of electrons by a metal when struck with light of sufficient energy
- D) the darkening of photographic film when exposed to an electric field
- E) a relativistic effect

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6. Which quantum number determines the energy of an electron in a hydrogen atom?

- A)  $l$       B)  $E$       C)  $m_l$       D)  $n$       E)  $n$  and  $l$

7. A spectrum containing only \_\_\_\_\_ wavelengths is called a line spectrum.

- A) Rydberg    B) specific    C) continuous    D) visible    E) invariant

8. The wavelength of an electron whose velocity is  $1.7 \times 10^4$  m/s and whose mass is  $9.1 \times 10^{-28}$  g is \_\_\_\_\_ m.

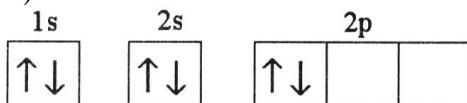
- A)  $4.3 \times 10^{-2}$     B) 12    C)  $4.3 \times 10^{-8}$     D)  $4.3 \times 10^{-11}$     E)  $2.3 \times 10^{-7}$

9. All of the orbitals in a given subshell have the same value as the \_\_\_\_\_ quantum number.

- A) principal  
B) angular momentum  
C) magnetic  
D) A and B  
E) B and C

10. Which electron configuration represents a violation of the Pauli exclusion principle?

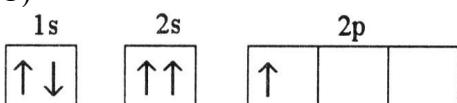
A)



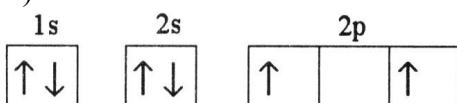
B)



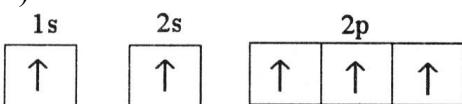
C)



D)



E)



11. According to the Heisenberg Uncertainty Principle, it is impossible to know precisely both the position and the \_\_\_\_\_ of an electron.

- A) mass    B) color    C) momentum    D) shape    E) charge

12. In a  $p_x$  orbital, the subscript  $x$  denotes the \_\_\_\_\_.

- A) energy of the electron  
B) spin of the electrons  
C) probability of the shell  
D) size of the orbital  
E) axis along which the orbital is oriented

13. Which one of the following is **not** a valid value for the magnetic quantum number of an electron in a  $4d$  subshell?

- A) 3    B) 2    C) 0    D) 1    E) -1

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14. A  $4p_z$  orbital in a many-electron atom is degenerate with \_\_\_\_\_.  
A)  $5s$       B)  $3p_z$       C)  $4d_{xy}$       D)  $4p_x$       E)  $4d_z^2$

15. The valence shell of the element X contains 2 electrons in a  $5s$  subshell. Below that shell, element X has a partially filled  $4d$  subshell. What type of element is X?  
A) main group element  
B) chalcogen  
C) halogen  
D) transition metal  
E) alkali metal

**Part B Short questions** (Write legibly and show all work for all steps in the problem)

16. **(4 points)** What is the energy (in kJ/mol) of one mole of yellow photons that have a wavelength of 527 nm?

17. **(8 points)** Using the periodic table as a guide, write the condensed electron configuration and determine the number of unpaired electrons for the ground state of **(a)** C, **(b)** Zn, **(c)** I, **(d)** Cu.

18. **(3 points)** All of the subshells in a given shell have the same energy in the hydrogen atom. In a many-electron atom, the subshells in a given shell do not have the same energy. Why?

## **Chapter 6 Homework Answer Sheet**

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**Name:**

**Student ID:**

**Instructor:**

**Score:**

**Part A Multiple choice (15 points)**

1-5 \_\_\_\_\_

6-10 \_\_\_\_\_

11-15 \_\_\_\_\_

**Part B Short questions (15 points)**