

Electromagnetic Radiation and Spectra

1. The absorption of light of frequency 1.16×10^{11} Hz is required for CO molecules to go from the lowest rotational energy level to the next highest rotational energy level. Determine the energy for this transition in kJ/mol. $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$
 - a) 7.69×10^{23} kJ/mol
 - b) 0.0463 kJ/mol
 - c) 46.3 kJ/mol
 - d) 949 kJ/mol

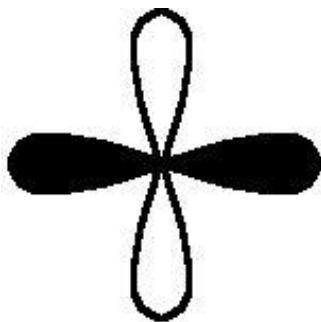
Wave Functions and Quantum Numbers

2. The number of orbitals in a given subshell, such as the 5d subshell, is determined by the number of possible values of
 - a) n
 - b) l
 - c) m_l
 - d) m_s
3. What are the possible values of n and m_l for an electron in a 5d orbital?
 - a) $n = 1, 2, 3, 4, \text{ or } 5$ and $m_l = 2$
 - b) $n = 1, 2, 3, 4, \text{ or } 5$ and $m_l = -2, -1, 0, +1, \text{ or } +2$
 - c) $n = 5$ and $m_l = 2$
 - d) $n = 5$ and $m_l = -2, -1, 0, +1, \text{ or } +2$
4. How many electrons can a single orbital hold?
 - a) $2n$
 - b) 2
 - c) $2l + 1$
 - d) 8
5. Which of the following is *not* a valid set of quantum numbers?
 - a) $n = 2, l = 1, m_l = 0, \text{ and } m_s = -1/2$
 - b) $n = 2, l = 1, m_l = -1, \text{ and } m_s = -1/2$
 - c) $n = 3, l = 0, m_l = 0, \text{ and } m_s = 1/2$
 - d) $n = 3, l = 2, m_l = 3, \text{ and } m_s = 1/2$
6. What are the possible values of l if $n = 5$?
 - a) 5
 - b) 0, 1, 2, 3, or 4
 - c) -4, -3, -2, -1, 0, +1, +2, +3, or +4
 - d) -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, or +5
7. The subshell designations follow the alphabet after f . What is the first shell in which an h orbital would be allowed?
 - a) fifth
 - b) sixth
 - c) seventh
 - d) eighth

8. How many h orbitals are allowed in a given shell?
- 5
 - 6
 - 11
 - 13
9. What is the maximum number of orbitals in the seventh shell?
- 4
 - 15
 - 49
 - 98

Orbital Shapes

10. The orbital sketched below is found in the fifth shell. All lobes are depicted. Which orbital is consistent with this description?
- $5p$
 - $5d$
 - $5f$
 - $4f$



Sections 5.11 - 5.13 Electron Configurations of Multielectron Atoms

11. Which of the following represent electron configurations that violate the Pauli exclusion principle?
- (A) $[\text{Ne}]3s^1 3p^5$ (B) $[\text{Kr}]4d^2 5s^2 5p^3$ (C) $[\text{Ar}]3d^0 4s^2 4p^2$
- only (A)
 - only (B)
 - (A) and (B)
 - (B) and (C)
12. Which of the following represent electron configurations that are allowed but do **not** represent ground-state configurations?
- (A) $[\text{Ne}]3s^1 3p^5$ (B) $[\text{Kr}]4d^2 5s^2 5p^3$ (C) $[\text{Ar}]3d^0 4s^2 4p^2$
- only (A)
 - only (B)
 - (A) and (B)
 - (B) and (C)

13. Which of the orbital-filling diagrams below would be disallowed by the Pauli exclusion principle?

	4s		3d			
(A) [Ar]	↑↓	↑↓	↑	—	—	—
(B) [Ar]	↑↑	↑	↑	↑	—	—
(C) [Ar]	↑↓	↑	↓	↑	—	—
(D) [Ar]	↑↓	↑	↑	↑	—	—
(E) [Ar]	↑↓	↓	↓	↓	—	—

- a) (A), (B), (C), and (E)
 b) (A), (B), and (C)
 c) (A) and (B)
 d) only (B)
14. What is the ground-state electron configuration of Co?
 a) [Ar]3d⁹
 b) [Ar]4s¹3d⁸
 c) [Ar]4s²3d⁷
 d) [Ar]4s²4p⁵4d¹
15. How many unpaired electrons are in an atom of Co in its ground state?
 a) 1
 b) 2
 c) 3
 d) 7
16. What is the ground-state electron configuration of tellurium?
 a) [Kr]4d⁰ 5s² 5p⁴
 b) [Kr]5s² 5p⁵ 5d⁸
 c) [Kr]5s² 5p⁴
 d) [Kr]4f⁴ 4d⁰ 5s² 5p⁴
17. Which have the largest number of unpaired electrons in p orbitals in their ground-state electron configurations?
 a) N, P, As
 b) F, Cl, Br
 c) Ne, Ar, Kr
 d) Te, I, Xe
18. Which of the following have their valence electrons in the same shell?
 a) K, As, Br
 b) B, Si, As
 c) N, As, Bi
 d) He, Ne, F
19. How many valence electrons does sulfur have?
 a) 2
 b) 4
 c) 6
 d) 16

41. b)

2. c)

3. d)

4. b)

5. d)

6. b)

7. b)

8. c)

9. c)

10. b)

11. b)

12. a)

13. d)

14. c)

15. c)

16. a)

17. a)

18. a)

19. c)

(c) 1998 Prentice-Hall, Inc. All rights reserved.