

Writing Electron Configuration

Answers

1. Which is the lowest principal energy level of an s orbital? 1
2. Which is the lowest energy level that can have a p orbital? 2
3. Can two electrons in the same atom have the same set of quantum numbers? No
4. Which is the lowest energy level having f orbitals? 4
5. What is the maximum number of electrons in an atom with three principal energy levels?

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6. Write down the abbreviated ground state electron configuration of each neutral atom.

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|---|--|
| i. Na <u>[Ne] 3s¹</u> | ii. Pb <u>[Xe] 6s² 4f¹⁴ 5d¹⁰ 6p²</u> |
| iii. Sr <u>[Kr] 5s²</u> | iv. U <u>[Rn] 7s² 6d¹ 5f³</u> |
| v. N <u>[Ne] 2s² 2p³</u> | vi. Ag <u>[Kr] 5s¹ 4d¹⁰</u> |
| vii. Ti <u>[Ar] 4s² 3d²</u> | viii. Ce <u>[Xe] 6s² 4f¹ 5d¹</u> |
| ix. Cl <u>[Ne] 3s² 3p⁵</u> | x. Hg <u>[[Xe] 6s² 4f¹⁴ 5d¹⁰</u> |

7. Write the electron configuration for the following IONS.

- | | | |
|---|---|---|
| i. Be ²⁺ <u>1s²</u> | ii. Li ⁺ <u>1s²</u> | iii. F ⁻ <u>1s² 2p² 2p⁶</u> |
| iv. Br ⁻ <u>[Ar] 4s² 3d¹⁰ 4p⁶</u> | v. Ba ²⁺ <u>[Kr] 5s² 4d¹⁰ 5p⁶</u> | vi. Ag ¹⁺ <u>[Kr] 4d¹⁰</u> |

8. Place the following orbitals in order of increasing energy: 1s, 3s, 4s, 6s, 3d, 4f, 3p, 7s, 5d, 5p

1s 3s 3p 4s 3d 4f 5p 6s 5d 7s

9. Determine if the following electron configurations are correct:

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|---|---|
| i. 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 4s ² 4d ¹⁰ 4p ⁶ 5s ¹ | <u>No. It should be 3d¹⁰ and not 4d¹⁰</u> |
| ii. 1s ² 2s ² 2p ⁶ 3s ³ | <u>No. There can only be 2 electrons in an s-orbital</u> |
| iii. [Rn] 7s ² 5f ⁹ 6d ² | <u>No. 5f shell must be filled before the 6d shell</u> |
| iv. [Ar] 5s ² 4d ¹⁰ 5p ⁵ | <u>No. The noble gas should be [Kr], not [Ar]</u> |
| v. [Xe] 6s ² 4f ⁰ | <u>Yes.</u> |

10. What two elements are exceptions to how we normally write electron configurations? Write the expected and the actual configuration of each. What rules are followed? What rules are violated?

Cr : Expected - [Ar] 4s² 3d⁴ Actual - [Ar] 4s¹ 3d⁵

Cu : Expected - [Ar] 4s² 3d⁹ Actual - [Ar] 4s¹ 3d¹⁰

Violated Aufbau Principle and followed Hund's Rule and Pauli's Exclusion Principle



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- Which is the lowest principal energy level of an s orbital? _____
- Which is the lowest energy level that can have a p orbital? _____
- Can two electrons in the same atom have the same set of quantum numbers? _____
- Which is the lowest energy level having f orbitals? _____
- What is the maximum number of electrons in an atom with three principal energy levels?

6. Write down the abbreviated ground state electron configuration of each neutral atom.

- | | |
|---------------|----------------|
| i. Na _____ | ii. Pb _____ |
| iii. Sr _____ | iv. U _____ |
| v. N _____ | vi. Ag _____ |
| vii. Ti _____ | viii. Ce _____ |
| ix. Cl _____ | x. Hg _____ |

7. Write the electron configuration for the following IONS.

- | | | |
|---------------------------|----------------------------|----------------------------|
| i. Be^{2+} _____ | ii. Li^{1+} _____ | iii. F^{-} _____ |
| iv. Br^{-} _____ | v. Ba^{2+} _____ | vi. Ag^{1+} _____ |

8. Place the following orbitals in order of increasing energy: 1s, 3s, 4s, 6s, 3d, 4f, 3p, 7s, 5d, 5p

9. Determine if the following electron configurations are correct:

- | |
|--|
| i. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^6 5s^1$ _____ |
| ii. $1s^2 2s^2 2p^6 3s^3$ _____ |
| iii. $[\text{Rn}] 7s^2 5f^9 6d^2$ _____ |
| iv. $[\text{Ar}] 5s^2 4d^{10} 5p^5$ _____ |
| v. $[\text{Xe}] 6s^2 4f^{10}$ _____ |

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