

## Electron Configurations & Orbital Diagrams

---

### INSTRUCTOR / SELF-STUDY ANSWER KEY

Answers and reasoning appear in red. Use these to discuss why incorrect choices are incorrect.

#### Part A — Concept checks

**1. Maximum electrons in a p subshell?**

Answer: B. 6 — Three p orbitals hold two each.

**2. Which configuration describes neutral sodium?**

Answer: A.  $[\text{Ne}] 3s^1$  — Sodium has 11 electrons; 10 are in the neon core.

**3. The electron configuration of  $\text{Mg}^{2+}$  is...**

Answer: A.  $[\text{Ne}]$  —  $\text{Mg}^{2+}$  has lost its two 3s electrons.

**4. Which rule describes single filling of equal-energy p orbitals?**

Answer: B. Hund's rule — Hund's rule favors singly occupying degenerate orbitals before pairing.

**5. Which pair of electrons may share one orbital?**

Answer: B. opposite spins — Pauli requires opposite spins for two electrons in one orbital.

**6. For  $\text{Fe}^{2+}$ , which electrons are removed first from neutral Fe?**

Answer: C. 4s — For first-row transition metal cations, 4s electrons are removed before 3d.

#### Part B — Application and explanation

**7. Write the electron configuration of chlorine ( $Z = 17$ ).**

Model solution: Fill 17 electrons:  $1s^2 2s^2 2p^6 3s^2 3p^5$ . Shorthand:  $[\text{Ne}] 3s^2 3p^5$ . Final answer:  $[\text{Ne}] 3s^2 3p^5$

**8. Explain why this guideline matters, with an example of what could go wrong if you ignore it: Do not apply Aufbau as an exception-free law: some atoms such as Cr and Cu have configurations beyond the simplest filling prediction.**

Model explanation: Do not apply Aufbau as an exception-free law: some atoms such as Cr and Cu have configurations beyond the simplest filling prediction. Example/check: Use the lowest-available-energy orbitals while respecting electron capacities. A common introductory order begins 1s, 2s, 2p, 3s, 3p, 4s, 3d.

#### REFERENCE RELATIONSHIP

s holds 2, p holds 6, d holds 10, f holds 14 electrons