

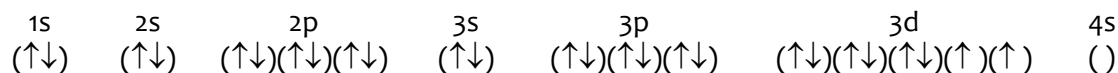
Electrons and the Periodic Table

Multiple Choice

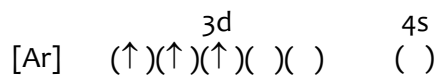
Identify the choice that best completes the statement or answers the question.

- What is the ground state electron configuration of Cr?
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$
- Which of the following elements or ions are paramagnetic in the ground state?
 - Cl⁻
 - Fe²⁺
 - Ne
 - Ca²⁺
 - Sc³⁺
- Which of the following atoms would have the largest second ionization energy?
 - Na
 - Ca
 - Mg
 - Ba
 - Sr
- According to the Bohr model for the hydrogen atom, the energy necessary to excite an electron from $n = 5$ to $n = 6$ is _____ the energy necessary to excite an electron from $n = 3$ to $n = 4$.
 - greater than
 - equal to
 - less than
 - either equal to or greater than
 - either less than or equal to
- Hund's rule predicts that
 - the most stable electronic structure of an atom has electron spins paired.
 - no two electrons will share the same orbital.
 - electrons in an orbital have equal but opposite charges.
 - electrons must have opposite spins to share an orbital.
 - when several orbitals of equal energy are available, as in a given subshell, electrons enter singly with parallel spins.
- Some digital cordless phones operate at 2.4 GHz (1 GHz = 10^9 Hz). What is the energy, in joules, of a single 2.4 GHz photon?
 - 8.3×10^{-35} J
 - 1.6×10^{-24} J
 - 5.4×10^{-19} J
 - 0.96 J
 - 0.13 J
- Place the following atoms in order of increasing ionization energy: C, N, and Si.
 - C < N < Si
 - C < Si < N
 - Si < C < N
 - Si < N < C
 - N < C < Si
- Green laser pointers emit radiation at 532 nm. What is the frequency of this radiation?
 - 8.12×10^{13} Hz
 - 5.64×10^{14} Hz
 - 1.60×10^{15} Hz
 - 9.10×10^{15} Hz
 - 1.60×10^{16} Hz
- All of the following sets of quantum numbers are allowed EXCEPT
 - $n = 1, \ell = 0, m_\ell = 1, m_s = -1/2$.
 - $n = 2, \ell = 1, m_\ell = 0, m_s = +1/2$.
 - $n = 3, \ell = 1, m_\ell = -1, m_s = -1/2$.
 - $n = 4, \ell = 3, m_\ell = -1, m_s = -1/2$.
 - $n = 6, \ell = 3, m_\ell = -3, m_s = +1/2$.
- Place the following ions in order of increasing radius: Al³⁺, F⁻, Mg²⁺, and N³⁻.
 - F⁻ < Mg²⁺ < N³⁻ < Al³⁺
 - F⁻ < N³⁻ < Mg²⁺ < Al³⁺
 - Al³⁺ < Mg²⁺ < F⁻ < N³⁻
 - N³⁻ < F⁻ < Mg²⁺ < Al³⁺

11. The Pauli exclusion principle states that
- no two electrons from a given atom can have the same spin.
 - no two electrons from a given atom can have the same four quantum numbers.
 - two electrons can occupy an orbital if they have the same spin.
 - two electrons can occupy an orbital if they have opposite spins.
 - two electrons can occupy an orbital if they have opposite charges.
12. A line in the Pfund series ($n_{\text{lo}} = 5$) occurs at 3.74×10^{-6} m. What is n_{hi} for this transition? The Rydberg constant equals 2.180×10^{-18} J.
- 6
 - 7
 - 8
 - 9
 - 10
13. What is the electron configuration of Cu^+ ?
- $[\text{Ar}]3d^8$
 - $[\text{Ar}]3d^9$
 - $[\text{Ar}]3d^{10}$
 - $[\text{Ar}]4s^23d^8$
 - $[\text{Ar}]4s^13d^9$
14. What is the total capacity of electrons in $n = 5$, $\ell = 3$?
- 2
 - 6
 - 10
 - 14
 - 32
15. What is the symbol of the atom or ion with the following orbital diagram?



- ${}_{26}\text{Fe}$
 - ${}_{26}\text{Fe}^{2+}$
 - ${}_{27}\text{Co}^+$
 - ${}_{28}\text{Ni}$
 - ${}_{28}\text{Ni}^{2+}$
16. How many orbitals have the following quantum numbers: $n = 6$, $\ell = 2$, $m_\ell = -2$?
- 0
 - 1
 - 3
 - 5
 - 6
17. Place the following atoms in order of increasing ionization energy: Na, Mg, and Al.
- $\text{Na} < \text{Mg} < \text{Al}$
 - $\text{Mg} < \text{Na} < \text{Al}$
 - $\text{Al} < \text{Mg} < \text{Na}$
 - $\text{Al} < \text{Na} < \text{Mg}$
 - $\text{Na} < \text{Al} < \text{Mg}$
18. Calculate the wavelength of the line in the Lyman series that results from the transition $n = 3$ to $n = 1$. The Rydberg constant equals 2.180×10^{-18} J.
- 45.59 nm
 - 72.81 nm
 - 91.12 nm
 - 102.5 nm
 - 136.7 nm
19. What is the symbol of an ion with the following orbital diagram?



- ${}_{21}\text{Sc}^{3+}$
 - ${}_{22}\text{Ti}^{2+}$
 - ${}_{22}\text{Ti}^{4+}$
 - ${}_{24}\text{Cr}^{2+}$
 - ${}_{24}\text{Cr}^{3+}$
20. Place the following regions of the electromagnetic spectrum in order from highest to lowest energy.
- infrared > gamma rays > x-rays > visible > radio
 - gamma rays > x-rays > visible > infrared > radio
 - x-rays > gamma rays > infrared > visible > radio
 - radio > x-rays > gamma rays > visible > infrared
 - visible > infrared > radio > x-rays > gamma rays