1. How many electrons maximum a shell with principal quantum number = 3 can hold?

2. Consider the cupper atom at its fundamental state. How many electrons are characterized by the magnetic quantum number m_l=+1? (Remark: the electronic configuration of cupper at its fundamental state is [Ar]$4s^1 3d^{10}$ which is an exception to the Aufbau rule).

3. In the cadmium atom at its fundamental level, how many electrons are characterized by the quantum number m_l=-2?

4. Among the electronic configurations below, that do not correspond to a fundamental state, which ones represent an excited state and which ones are impossible (i.e. do not follow a rule of a fundamental principle)?

a) $1s^2 2s^1 2p^1$
b) $1s^2 2s^2 2p^6 3s^2 3p^2 3d^2$
c) $1s^2 2s^2 2p^6 3s^3$
d) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10} 4p^3$
e) $1s^2 2s^2 2p^6 2d^2$

5. The electronic configuration of a neutral atom is the following:

$1s^2 2s^2 2p^6 3s^1 3p^5$
a) What is the atomic number of this element?
b) In what state is this element (fundamental, excited)?
c) How many single electrons are present in this configuration?
d) What are the quantum number values n and l for electrons $3p^5$?

6. What is the fundamental electronic configuration of the following ions:
   a. Br^-
   b. S^{2-}
   c. K^+
   d. Sr^{2+}

7. At fundamental state, how many single electrons should we find in: N, Ar and Sr^{2+}

8. Which elements have a 3+ charged ion with the following electron configurations:
   a) [Ar] $3d^3$

b) [Xe] $4f^{14}$ $5d^{6}$
c) [Ne]
d) [Kr]

9. Considering the ground state, indicate the number of unpaired electrons for the following ions:
Mn^{2+} , S^{2-} , V^{4+} , Pb^{2+}

10. Identify, based on their position in the periodic table, the species that act as reducing agents, oxidizing agents, and those that are chemically inert:
Na, O, Ca, Ne, F, Ar, Cs

11. Why do K^{+} and Cl^{-}, which have the same electron configuration, not have the same ionic radius?

12. Use the periodic table to arrange the following elements in decreasing order of electrical conductivity: Ge, Ca, S, and Si.

Quick answers

1. 18 electrons
2. 6 electrons with a quantum number m_l=+1
3. There is therefore 1 orbital 3d and one orbital 4d that contain together 4 electrons with quantum number m_l=-2.
4. Excited states are a, b and d. C and e are impossible.
5. (a) 16, (b) excited, (c) 2 single electrons, (d) n=3, l=1
6. (a)$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$; (b) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$; (c) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$; (d) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$
7. (a) 3; (b) 0; (c) 0
8. (a) chromium (Cr); (b) iridium (Ir); (c) aluminum (Al); (d) yttrium (Y)
9. (a) 5; (b) 0; (c) 1; (d) 0
10. Reducing agents: Na, Ca, Cs; Oxidizing agents: F, O; Inert: Ne, Ar
11. The nuclear charge is different, so K^{+} ion is smaller than the Cl^{-}
12. Ca > Ge > Si > S