What is the Periodic Table and Electron Configuration?

Worksheet

Electron configuration describes the arrangement of electrons in orbitals around the nucleus, following the aufbau principle and Hund's rule. The periodic table arranges elements so that groups (vertical columns) share the same valence electrons, predicting bonding and reactivity.

Questions

1. What is the electron configuration of carbon (Z=6)?

A) 1s 2s 2p
B) 1s 2s 2p
C) 1s 2s 2p
D) 1s 2s 2p

2. Which orbital is filled after 4s?

A) 3p
B) 3d
C) 4p
D) 5s

3. What do elements in Group 1 (alkali metals) have in common?

A) All have full p orbitals
B) All have 1 valence electron (ns)
C) All have 8 valence electrons
D) All are transition metals

4. How many valence electrons does chlorine (Cl, Z=17) have?

A) 5
B) 7
C) 17
D) 2

5. Write the electron configuration for oxygen (Z=8).

6. Nitrogen has 7 electrons. What is its valence configuration?

7. Why are elements in the same group chemically similar?

8. Define: What is electron configuration?

9. Define: What is the aufbau principle?

10. Define: What are valence electrons?

Answer Key

1. A) 1s 2s 2p - C has 6 electrons: 1s (2) + 2s (2) + 2p (2) = 6 total.

2. B) 3d - Aufbau order: 4s fills before 3d (lower energy), but 3d fills after 4s is full.

3. B) All have 1 valence electron (ns) - Li, Na, K all have ns valence config, making them highly reactive and similar in bonding.

4. B) 7 - Cl: [Ne] 3s 3p 7 valence electrons (3s + 3p). Group 17 pattern.

5. Oxygen has 8 electrons to place. Fill in order: 1s (2) 2s (2) 2p (4) Configuration: 1s 2s 2p Alternatively: [He] 2s 2p

6. Nitrogen: 1s 2s 2p Valence shell (n=2): 2s 2p (5 valence electrons) This explains N's tendency to gain 3 electrons (to reach octet)

7. Group 17 (halogens): F (2s 2p), Cl ([Ne] 3s 3p), Br ([Ar] 3d 4s 4p) All have 7 valence electrons (ns np pattern) Identical valence config identical bonding behavior

8. The arrangement of electrons in orbitals (1s, 2s, 2p) around the nucleus, following the aufbau principle.

9. Electrons fill orbitals in order of increasing energy: 1s, 2s, 2p, 3s, 3p, 4s, 3d, etc.

10. Electrons in the outermost shell. These determine bonding behavior and chemical reactivity.