

What Are Valence Electrons?

Worksheet

Valence electrons are electrons in the outermost shell of an atom. They determine an element's chemical reactivity and bonding behaviour. Main-group elements have valence electrons equal to their group number (except for Groups 2 and 13-18).

Questions

1. Chlorine (Group 17) has how many valence electrons?

- A) 5
- B) 6
- C) 7
- D) 8

2. Which element is most stable and unreactive?

- A) F (fluorine)
- B) O (oxygen)
- C) He (helium)
- D) N (nitrogen)

3. Oxygen (O) has 6 valence electrons. In water (H₂O), oxygen forms how many bonds?

- A) 1
- B) 2
- C) 3
- D) 4

4. Silicon (Si, Group 14) has how many valence electrons?

- A) 2
- B) 4
- C) 6
- D) 14

5. How many valence electrons does sodium (Na, Group 1) have?

6. Phosphorus (P, Group 15) forms PCl₃. How many valence electrons does P use?

7. Compare the stability of neon and fluorine.

8. Define: What are valence electrons?

9. Define: How do you count valence electrons for main-group elements?

10. Define: Why is a full valence shell stable?

Answer Key

1. C) 7 - Group 17 elements have 7 valence electrons. Cl: $1s\ 2s\ 2p\ 3s\ 3p$.
2. C) He (helium) - Helium (Group 18, 2 valence electrons) has a full shell and is extremely stable.
3. B) 2 - O has 6 valence electrons and needs 2 more; it forms 2 bonds with H atoms.
4. B) 4 - Group 14 elements have 4 valence electrons. Si: $[\text{Ne}]\ 3s\ 3p$.
5. Na is in Group 1 Group number = valence electrons (for main-group) Sodium has 1 valence electron
6. P has 5 valence electrons (Group 15, count as $15-10=5$) In PCl_5 , P uses all 5 valence electrons to bond with 5 Cl atoms
7. Neon (Ne, Group 18): 8 valence electrons, full shell extremely stable Fluorine (F, Group 17): 7 valence electrons, wants 1 more very reactive
8. The electrons in the outermost shell of an atom; they participate in bonding and determine reactivity.
9. The group number equals the number of valence electrons (Groups 1-2 and 13-18).
10. Atoms with full valence shells have satisfied electron configurations and do not need to bond (e.g. noble gases).

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