

CONCEPT Valence electrons are the electrons present in the outermost shell or energy level of an atom. These electrons determine the chemical behavior and reactivity of an atom, as they are the ones involved in chemical bonding and reactions.

The number of valence electrons an atom has is determined by its position in the periodic table. For example, elements in the same group or column have the same number of valence electrons, which is why they exhibit similar chemical properties.

APPLICATION

One example of an application of valence electrons in chemistry is in the development of new catalysts for chemical reactions. Catalysts are substances that increase the rate of a chemical reaction without being consumed in the process. One key factor that determines the effectiveness of a catalyst is its ability to interact with the reactant molecules and influence their electronic properties.

**Periodic Table
of the elements**

H																	He	
Li	Be											B	C	N	O	F	Ne	
Na	Mg											Al	Si	P	S	Cl	Ar	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	
			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

TERMINOLOGY

ATOMIC STRUCTURE: Understanding the basic structure of atoms, including the arrangement of electrons in different energy levels or shells, is essential for understanding valence electrons.

PERIODIC TABLE: The periodic table provides a systematic way to organize elements based on their electron configurations, which in turn determines their chemical properties and reactivity.

ELECTRON CONFIGURATION: The distribution of electrons among the different energy levels and orbitals in an atom is described by its electron configuration, which can be represented using various notations such as the orbital diagram, electron dot diagram, or shorthand notation.

CHEMICAL BONDING: The formation of chemical bonds between atoms, which occurs when valence electrons are shared, gained, or lost in order to achieve a more stable configuration. Chemical bonding can occur through ionic bonds, covalent bonds, or metallic bonds, and understanding the behavior of valence electrons is important for predicting and explaining the properties of different types of chemical bonds. The study of chemical bonding dates back to the 19th century, with the development of theories such as Lewis structures and VSEPR theory.

VALENCE SHELL ELECTRON PAIR REPULSION (VSEPR) THEORY: A heuristic that predicts the geometry of molecules based on the repulsion between electron pairs in the valence shell. The basic idea is that electron pairs in the valence shell will try to maximize their distance from each other to minimize repulsion, resulting in specific geometries for different numbers of electron pairs.

OCTET RULE: A problem-solving technique that states that atoms tend to gain, lose, or share electrons in order to achieve a full outer shell of 8 electrons, which is the same configuration as the noble gasses. The Octet Rule is a useful guideline for predicting the behavior of many atoms and molecules, although there are exceptions to the rule.

