

MS1 - Examine the role of valence electrons in the formation of chemical bonds.

Indicators:

1. Trace the historical development of the model of the atom from Bohr to the modern quantum understanding, including the contributions of Einstein, Planck, Heisenberg and DeBroglie.
2. Discuss the value of representing scientific understanding of the atom using various types of models, including molecular formula, structural formula, space-filling molecular model, ball-and-stick molecular model and Lewis structure.
3. Examine how evidence and experimentation inform the development and refinement of theories in chemistry.
4. Explain the relationship between the position of an element on the periodic table and its number of valence electrons with reference to the octet rule.
5. Explain the formation of ions and predict their charge in group 1 and 2 elements and non-metals, based on an understanding of valence electrons and the octet rule.
6. Draw Lewis structures (electron dot structures) for group 1 and 2 elements and non-metals, and their ions, based on an understanding of valence electrons.
7. Discuss the role of valence electrons in the formation of covalent and ionic bonds, including the connection to metals and non-metals.
8. Predict the arrangement of atoms and draw Lewis structures (electron dot structures) to represent covalent- and ionic-bonded molecules.
9. Predict the geometry and draw the shapes of molecules with a single central atom using valence shell electron pair repulsion (VSEPR) theory.
10. Predict the nature of chemical bonds within a molecule using the property of electronegativity.