

The Quantum Mechanical Model

Read from **Lesson 2: The Quantum Mechanical Model** in the **Chemistry Tutorial Section, Chapter 5 of The Physics Classroom:**

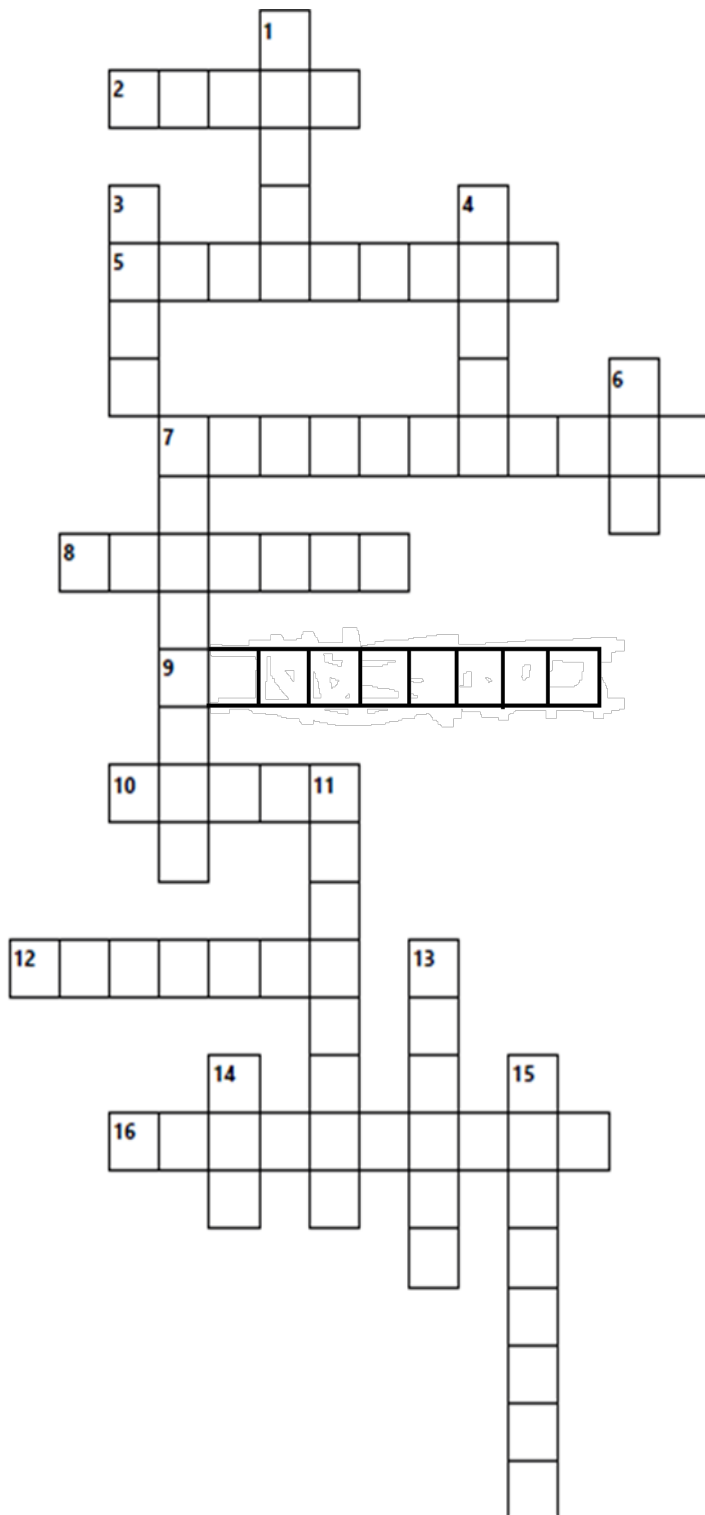
Part a: [Schrodinger's Wave Mechanical Model](#)

Part b: [Orbitals](#)

Part c: [Energy Levels](#)

Part d: [Quantum Numbers](#)

Part 1: The Quantum Mechanical Model Crossword Puzzle



Across

2. The number of orbital types within a p sublevel.
5. Which quantum number describes the energy level of an electron and electron cloud size
7. Developed the wave equation
8. Which mechanical model is a mathematical description of the atom and its electrons
9. Hypothesis about wave-particle duality
10. The rule that explains why one electron will occupy each orbital in nitrogen's 2 p sublevel before a second electron is added to each orbital
12. Is described by ℓ or the space may be occupied by a pair of electrons within a sublevel
16. His uncertainty principle states that it is impossible to know the location and momentum of an electron at the same time

Down

1. Number of orbitals in the f sublevel.
3. Electrons in the same orbital are distinguished from one another by their direction of their ____.
4. The exclusion principle states that when 2 electrons are in the same orbital, they will have opposite spin direction.
6. Maximum number of electrons that can be held in the d sublevel.
7. This is the first element on the periodic table to have an electron in its 3d sublevel in its ground state.
11. The letters s, p, d, f specify a particular ____ within an energy level
13. This principle states that electrons first fill the lowest energy orbitals before beginning to fill orbitals with the next highest energy
14. The total number of completely filled sublevels in an atom of calcium in its ground state
15. This is the first element on the periodic table to have an electron in its 7s orbital in its ground state

Early Models of the Atom

Part 2: Electrons and Quantum Numbers

- Which orbital is filled after the following orbitals:
 - 1s _____
 - 5p _____
 - 3d _____
 - 2p _____
 - 7s _____
 - 4s _____

- How many electrons can be held in:
 - the 6p sublevel _____
 - any 4f orbital _____
 - the 3d sublevel _____
 - the third energy level _____
 - the $2p_x$ orbital _____
 - the 2d sublevel _____
*(**Be careful with this one!)*

- Which element can be described as having:
 - 64 electrons in their electron cloud _____
 - two electrons in their 7s orbital _____
 - a completed 3d sublevel _____
 - 4 electrons in their 4p sublevel _____
 - a half full 5f sublevel _____
 - three times as many electrons as the element has the electron configuration of $1s^2 2s^2 2p^6 3s^2 3p^6$

Never trust an atom – they make up everything!

