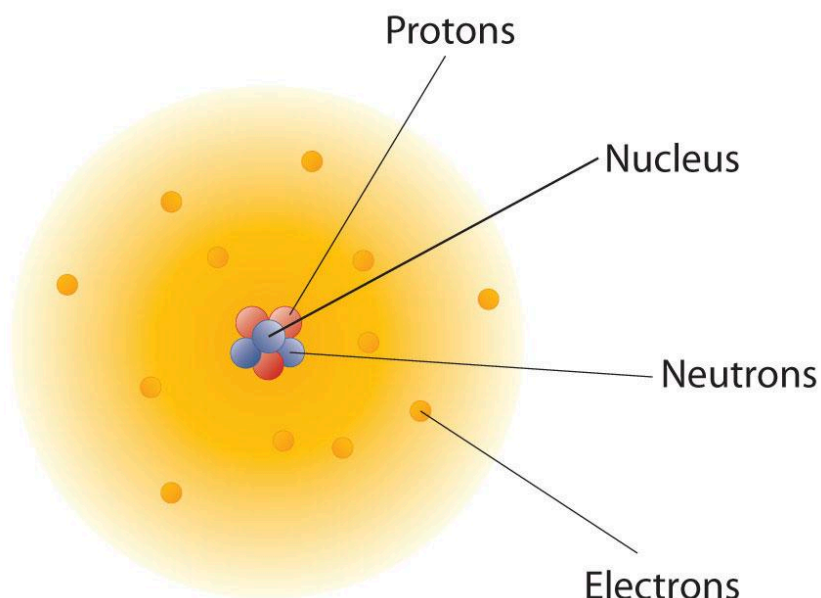


Unit 2: Atoms, Molecules, and Ions
The Modern Atomic Model Worksheet

The Modern Atomic Model describes atoms as composed of subatomic particles. Protons and neutrons, known as nucleons, reside in the nucleus, carrying positive and neutral charges respectively. Electrons, with a negative charge, orbit the nucleus. Protons and neutrons have considerable mass, while electrons are much lighter and have negligible mass. Core electrons are close to the nucleus, valence electrons determine reactivity. The number of valence electrons influences the group number on the periodic table, guiding chemical properties.



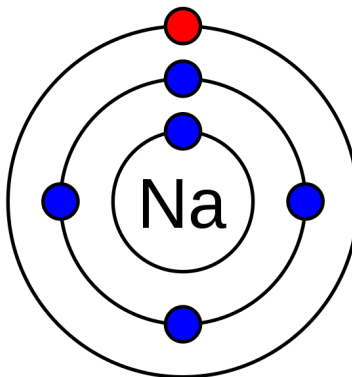
Cite:

https://saylordotorg.github.io/text_introductory-chemistry/s07-01-atomic-theory.html

1. Refer to the diagram above for the following questions.
 - a. What is the charge and mass of an electron in the atom above? (amu = atomic mass unit)
 - b. Where are neutrons located in an atom and what charge do they possess?

2. Which of the following subatomic particles are NOT a part of an atom's nucleus?

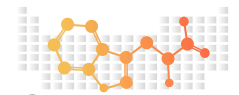
Electrons, fundamental subatomic particles, encircle an atom's nucleus. Core electrons are those closest to the nucleus and have lower energy levels; they shield inner layers from external interactions. Valence electrons, residing in the outermost energy level, dictate an element's chemical behavior and bonding capabilities. Regular electrons collectively form an atom's electron cloud, defining its overall charge and contributing to its intricate structure and reactivity.



Cite: <https://chemistrytalk.org/what-are-valence-electrons/>

3. Compare and contrast the difference between a core electron and a valence electron

4. What does the group number on the periodic table indicate?



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5. How does the presence of valence electrons affect the stability of an atom?

ANSWER KEY

1. Refer to the diagram above for the following questions.
 - a. What is the charge and mass of an electron in the atom above? (amu = atomic mass unit)
 - b. Where are neutrons located in an atom and what charge do they possess?

- a. The electron carries a charge of -1 and has a mass of approximately ~0 amu. This negatively charged subatomic particle orbits the nucleus within the atom, contributing to its overall structure and behavior.
- b. Neutrons are located in the center of the atom, within the nucleus, and they contain no charge. They contribute to the atomic mass without affecting the atom's overall charge, as they are electrically neutral particles.

2. Which of the following subatomic particles are NOT a part of an atom's nucleus?

Electrons are NOT part of an atom's nucleus. They orbit the nucleus at varying energy levels. Protons and neutrons, on the other hand, form the nucleus. Protons carry a positive charge and contribute to the atom's identity, while neutrons are neutral. Quarks are elementary particles that compose protons and neutrons, interacting through strong nuclear forces.

3. Compare and contrast the difference between a core electron and a valence electron

Core electrons, positioned closer to the nucleus in inner shells, play a limited role in reactions due to shielding by valence electrons. Valence electrons, located in the outermost shell, strongly influence an element's chemical properties and reactivity by determining bonding behavior. The count of valence electrons corresponds to an element's group number, whereas core electrons are defined by atomic number and periodic table position.

4. What does the group number on the periodic table indicate?

The number of valence electrons. The group number on the periodic table indicates how many valence electrons an element has in its outermost energy level. Elements in the same group share similar valence electron configurations, which strongly influence their chemical properties and reactivity when forming bonds with other elements.

5. How does the presence of valence electrons affect the stability of an atom?

The presence of valence electrons influences the stability of an atom, with a full valence shell contributing to greater stability. Atoms can share, take, or donate electrons in order to satisfy a full valence shell.