Chapter 5.1 Revising the Atomic Model

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1. The Bohr model propose that an electron is found only in specific circular paths or orbits around the nucleus. Electrons in Bohr's model have specific energies. These specific energies of an electron are called energy levels.
2. The quantum mechanical model determines the allowed energy levels an electron can have and the likelihood of finding an electron in various locations around the nucleus.
3. The sublevels have different shapes.
4. Electrons move from one energy level to another by losing or gaining just the right amount of energy-a quantum.
5. In an atom, the electrons occupy certain fixed energy levels, to move from one energy level to another requires the emission or absorption of an exact of energy, or quantum. Thus the energy of an electron is said to be quantized.
6. a. 3 b. 1 c.3 d.5
7. The Bohr model limits electrons to specific circular paths. The quantum mechanical model expresses the probability of findings of an electron in a given location within the electron cloud based on its current energy level.

Chapter 5.2 Electron Arrangement in Atoms

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10. aufbau principle, Pauli exclusion principle, Hund's rule

11. 3d, 4s, 3p, 3s, 2p

12. Atoms tend to occupy the most stable electron configuration possible. Usually this means that the lowest energy sublevels available are filled by electrons before filling higher-energy orbitals (the aufbau priniciple). However, fully filling or exactly half-filling an energy sublevel is more stable than adopting other partially-filled configurations. When there is little difference between two energy levels (like 3d and 4s energy levels), electrons will fill the higher energy sublevel first if it results in that sublevel being fully or exactly half-filled.

13. The 3s and 3p orbitals are already filled, so the last electron must go to the next higher energy orbital, which is 4s.

14. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^3$

6.1 Organizing the Elements

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1. Chemist used the chemical and physical properties of elements to sort them into groups.

2. atomic mass

3. in order of increasing atomic number

4. metals, nonmetals, metalloids

5. a.metal b. metalloid c. nonmetal d.metal

6. b

7. possible answers (any two) lithium, potassium, rubidium, cesium, or francium

8. Atomic number is better for organizing the elements in the periodic table because it is unique for each element. Atomic mass can vary for different atoms of an element, Also, arranging the table by atomic number allows for elements with similar properties to be grouped together.

6.2 Classifying the Elements

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11. sample answers: symbols and names of the elements, atomic number, atomic mass, electron configuration

12. noble gases, representative elements, transition metals, and inner transition metals

13. they are in the same group and have the same number of electrons in the highest occupied energy level

14. a. alkaline earth metal

    b. halogen

    c. alkali metal

    d. alkaline earth metal

15. a. noble gas

    b. transition metal

    c. representative element

16. 5

17. Cu, Cd, Au, Co

6.3 Periodic Trends

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18. Atomic radius generally increase from top to bottom in a group and decreases from left to right across a period.

19. Ions form when electrons are transferred between atoms

20. First ionization energy generally decreases within a group and increases from left to right across a period.

21. Anions are larger and cations are smaller than the atoms from which they form.

22. Electronegativity values generally decrease from top to bottom within a group and increase from left to right across a period.

23. The trends can be explained by variations in atomic structure which affects factors like nuclear charge, the number of occupied energy levels and shielding.

24. sodium, aluminum, sulfur, chlorine; periodic trend

25. a. sodium

    b. phosphorus