OpenStax	Learning Outcomes	
6.1	Describe characteristics of electromagnetic radiation.	
6.1		Define electromagnetic radiation.
6.1		Distinguish among amplitude, wavelength, and frequency.
6.1		Describe the general trends in the electromagnetic spectrum (frequency, wavelength, and energy).
6.1		State the colors in the visible region along with energy, frequency, and wavelength trends.
6.1		Recall that light in the visible region has wavelengths from 400-750 nm.
6.1		Classify regions of the spectrum as higher or lower in energy than visible region.
6.1		Distinguish between constructive and destructive interference.
6.1		Describe diffraction in waves.
6.1	Complete calculations related to electromagnetic radiation.	
6.1		Recognize that c is the speed of light.
6.1		Convert between frequency and wavelength.
6.1		Calculate among values of energy, frequency, and wavelength.
6.1		Relate energy to the number of photons.
6.1	Describe the photoelectric effect.	
6.1		Explain the concept of threshold frequency and how it affects the ejection of electrons.
6.1		Explain how intensity and wavelength affect the electrons emitted (or not) in the photoelectric effect.
6.1		Recognize that the photoelectric effect led to the understanding of the particle nature (photons) of light.
6.1		Calculate energy/frequency/wavelength associated with photoelectric effect.
6.1	Describe the emission of electromagnetic radiation.	
6.1		Distinguish between emission line spectra and the continuous spectrum of white light.
6.2		Relate the Bohr model to the emisson spectrum of hydrogen.
6.2		Relate the energy of the photon emitted or absorbed to the energy change of the electron..
6.2		Complete calculations for hydrogen atom using the Rydberg equation.
6.3	Recognize the wave-particle duality of light.	
6.3		Explain how the interference pattern from a beam of electrons supports that electrons behave as waves.
6.3		State the deBroglie formula and identify all variables.
6.3		Use the deBroglie formula in calculations.
6.3	Describe Heisenberg's uncertainty principle	
6.3		Explain the inversely proportional relationship between the uncertainty of position and the uncertainty of the velocity.
6.3	Summarize the meaning and relevance of the quantum numbers.	
6.3		Identify each of the four quantum numbers.
6.3		Define the meaning of each of the quantum numbers.
6.3		Give the possible values for each quantum number.
6.3		Identify sets of allowed/disallowed quantum numbers.
6.3		Pair angular momentum quantum numbers with the shape of orbitals.
6.3		Describe the shape of each orbital type (s, p, d, and f).
6.3		Describe the relationship between nodes and orbitals.
6.3		Given select values of quantum numbers, determine the number of orbitals or electrons with those values.
6.3		Define degenerate.
6.3		Rank the energy level of sublevels within a principal level (s, p, d, f)
6.3		Define the Pauli exclusion principle.
6.3		Explain how the Pauli exclusion principle affects the values of quantum numbers.
6.4	Write the electron configuration of an element.	

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6.4		Describe Hund's rule and its effect on electron arrangement.
6.4		Define aufbau principle.
6.4		Draw orbital diagrams of neutral atoms.
6.4		Write electron configuration of neutral atoms.
6.4		Distinguish between valence and core electrons.
6.4		Determine the number of valence electrons in an atom.
6.4		Write electron configurations for transition metals (including exceptions for d4 and d9 elements).
6.4		Define diamagnetic and paramagnetic.
6.4		Determine if an element is diamagnetic or paramagnetic based on electron configuration.
6.4	Identify patterns in electron configurations based on arrangement in the periodic table.	
6.4		Relate the electron configuration of a group of elements to their arrangement in the periodic table.
6.4		Write the quantum numbers for any electron in an atom based on its orbital diagram or electron configuration.
6.5	Summarize periodic trends for effective nuclear charge and atomic radius.	
Link		Explain the relationship between charge and distance in Coulomb's law. (http://tinyurl.com/shlding)
Link		Describe shielding of electrons by other electrons. (http://tinyurl.com/shlding)
6.5		Define effective nuclear charge.
Link		Describe penetration and its effect on the energy of sublevels in multielectron atoms. (http://tinyurl.com/shlding)
6.5		Recognize that interactions between charged particles, shielding, and penetration lead to the sublevel splitting in a principal level.
6.5		Identify the trends in effective nuclear charge.
6.5		Define atomic radius for atoms.
6.5		Identify the trends in atomic radii.
6.5		Explain the trends in atomic radii and effective nuclear charge.
6.5		Estimate the value of the effective nuclear charge of an electron.
6.5	Summarize periodic trends of ions and isoelectronic series.	
6.5		Describe the size of an ion relative to its parent atom.
6.5		Define isoelectronic.
6.5		Identify isoelectronic species.
6.5		Rank isoelectronic species according to size.
6.5	Summarize perioidic trends for ionization energy.	
6.5		Define ionization energy.
6.5		Write the reaction that represents the first ionization of an atom.
6.5		Describe trends in first ionization energies.
6.5		Describe trends in second and successive ionization energies.
6.5		Identify element based on sequence of ionization energies.
6.5	Summarize periodic trends for electron affinity.	
6.5		Define electron affinity.
6.5		Write the reaction that represents the process associated with the first electron affinity.
6.5		Describe "trends" in electron affinity values.
	Summarize periodic trends for metallic character.	
6.5		Define metallic character.
6.5		Describe trends in metallic character.
6.4	Describe formation of ionic compounds.	
6.4, 7.1		Write the electron configuration of an anion.
6.4, 7.1		Write the electron configuration of a cation.