PS-2 ATOMIC STRUCTURE & NUCLEAR CHEMISTRY- The structure of the atom is used to describe the physical and chemical properties of matter. By understanding how atoms interact through electron redistributions, changes in matter can be predicted.

TS-2.1 History of the Atomic Model (Dalton through Rutherford)- Matter can be described as being composed of small, individual particles called atoms. The evolution of the atomic model is based on scientific investigations that build on previous knowledge

2.1.1 Discuss our current understanding of Dalton's four postulates (atoms are smallest, atoms combine in whole number ratios, Conservation of Mass, all atoms are identical) outlined in his atomic model
Key Ideas: Law of Constant Proportions, Law of Multiple Proportions, Law of Conservation of Mass

2.1.2 Construct a model to explain Thomson's results in finding electrons

2.1.3 Explain how Rutherford used radioactive particles to identify the nucleus

TS-2.2 Subatomic particles- Atoms are composed of smaller, subatomic particles which create the different properties of the elements

2.2.1 Differentiate the three subatomic particles using mass, charge & location in atom

2.2.2 Explain how atomic number is used to identify an element

2.2.3 Calculate the number of protons, neutrons, and electrons in an isotope

2.2.4 Describe how isotopes of an element are different and how they are the same
Key Idea: Mass number

2.2.5 Calculate the atomic mass of an element using isotope masses & abundances

TS-2.3 Nuclear Chemistry- The stability of an atom is based on the composition of the nucleus.

2.3.1 Describe the three types of nuclear decay and what causes each

2.3.2 Determine nuclear stability and predict types of nuclear decay based on neutron/proton ratios
Key Idea: Belt of stability

2.3.3 Write radioactive equations based on radioactive isotope identity and decay pattern

2.3.4 Sketch a graph showing the decay rate of a radioactive isotope and identify its half-life

2.3.5 Differentiate between nuclear fission and nuclear fusion

2.3.6 Discuss environmental & ecological issues associated with using nuclear energy

TS-2.4 Electrons in atoms- The distribution of electrons is important in understanding how elements behave

2.4.1 Quantitatively describe electromagnetic radiation in terms of wavelength, frequency & energy of photons/quanta
Key Idea: Electromagnetic spectrum, speed of light, photons

2.4.2 Using the Bohr model, describe how electrons exist at specific energy levels within atoms
Key Ideas: atomic spectra, emission spectra

2.4.3 Discuss how the quantum model has modified our understanding of the atomic model
Key Ideas: Quantum numbers, orbitals,

2.4.4 Construct electron configurations and orbital diagrams for atoms and monatomic ions
Key Ideas: Pauli's exclusion principle, Hund's rule