### DCI: Matter and Its Interactions


**Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.** (HS-PS1-1)

**The periodic table orders elements horizontally by the number of protons in the atom’s nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.** (HS-PS1-1), (HS-PS1-2)

**The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms.** (HS-PS1-3)

**A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart.** (HS-PS1-4)

**In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present.** (HS-PS1-6)

**The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.** (HS-PS1-2), (HS-PS1-7)

**Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process.** (HS-PS1-8)

**Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.** (HS-PS1-1), (HS-PS1-3)

**Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (tradeoffs) may be needed.** (HS-PS1-6)
Energy and Matter

In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-PS1-8)
<table>
<thead>
<tr>
<th>Crosscutting Concepts</th>
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<tbody>
<tr>
<td><strong>Energy and Matter</strong></td>
<td><strong>Stability and Change</strong></td>
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<tr>
<td>Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS1-4)</td>
<td>Much of science deals with constructing explanations of how things change and how they remain stable. (HS-PS1-6)</td>
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