Section 1.5: The Periodic Table and Periodic Law

Section 1.5 Questions, page 33
1. Answers may vary. Sample answers:
(a) Two examples of a metal are magnesium and iron.
(b) Two examples of a metalloid are silicon and boron.
(c) Two examples of an element that is a gas at room temperature are hydrogen and oxygen.
(d) Two examples of a halogen are chlorine and fluorine.
(e) Two examples of an alkali metal are sodium and potassium.
(f) Two examples of a synthetic element are fermium and californium.
(g) Two examples of an element that is a liquid at room temperature are mercury and bromine.
(h) Two examples of a member of the actinide series are uranium and plutonium.
2. (a) A member of the halogen family in the third period is chlorine.
(b) A member of the noble gases in the fourth period is krypton.
(c) A metalloid in the third period is silicon.
(d) A member of the alkali metal family in the fifth period is rubidium.
3. All the noble gases have filled valence shells. This results in noble gases being unreactive and the fact that they do not readily combine with other elements to form compounds.
4. (a) Mg
(b) Al
(c) N
(d) F
(e) Ar
5. (a)

(b) In order to draw a Lewis symbol once you have drawn the Bohr–Rutherford diagram, simply determine the number of valence electrons and represent these by placing dots around the element symbol.
6. (a) Chlorine has 7 valence electrons.
(b) Sulfur has 6 valence electrons.
(c) Magnesium has 2 valence electrons.
(d) Sodium has 1 valence electron.
(e) Neon has 8 valence electrons.
(f) Carbon has 4 valence electrons.
(g) Aluminum has 3 valence electrons.
7. (a) Cs is more reactive than Ba.
(b) F is more reactive than C.
(c) Na is more reactive than Ar.
(d) Mg is more reactive than Si.
8. Answers may vary. Sample answer: Three periodic phenomena are the phases of the Moon, the tides, and the menstrual cycle.
9. (a) & (b) Answers may vary. Sample answer:
Origins of Element Names

<table>
<thead>
<tr>
<th>Name of element</th>
<th>Origin of name</th>
</tr>
</thead>
<tbody>
<tr>
<td>berkelium</td>
<td>It is named for the University of California, Berkeley, where it was discovered.</td>
</tr>
<tr>
<td>cesium</td>
<td>Comes from the Latin word caesius, meaning “sky blue.” It is named this because of the bright blue lines in its spectrum. Cesium was discovered using flame spectroscopy.</td>
</tr>
<tr>
<td>curium</td>
<td>It is named for Marie and Pierre Curie, who discovered radium and researched radioactivity.</td>
</tr>
<tr>
<td>gold</td>
<td>Its name comes from the Anglo-Saxon word gold, which comes from ghel in the Proto-Indo-European language, which means “yellow/bright.”</td>
</tr>
<tr>
<td>mercury</td>
<td>It is named after Mercury, the Roman god of speed and messenger of the gods.</td>
</tr>
</tbody>
</table>

10. Answers may vary. Sample answer: One alternative periodic table is the “Chemical Galaxy,” designed by Philip Stewart. Instead of rows and columns, the elements are arranged in a spiral. The elements are arranged by their atomic number, starting at the centre of the galaxy and circling outward. The spokes of the galaxy link together elements with similar chemical characteristics. Colours show the different chemical groups. Unlike in the periodic table in the textbook, the spiral means there are no interruptions in the pattern: each element is between both of its neighbours. The design also approximates the sequence of the formation of the elements in the early universe. The proposed element neutronium, thought to exist inside neutron stars, is placed in the centre of the spiral as element 0.