Topic 2.2 How does the periodic table organize the elements?

The Origin of Element Names and Symbols, page 56

	Element	Symbol	Latin Origin
1.	Calcium	Ca	**Ca**lx – Latin for "limestone"
2.	Cesium	Cs	**Cs**aesius – Latin for "bluish grey"
3.	Gold	Au	**Au**rum – Latin for "gold"
4.	Iron	Fe	**Fe**rrum – Latin for "iron"
5.	Lead	Pb	**Pb**lumbum – Latin for "lead"
6.	Rubidium	Rb	**Rb**idus – Latin for "red"
7.	Silver	Ag	**Ag**entum – Latin for "silver"
8.	Tin	Sn	**Sn**annum – Latin for "tin"

	Element	Symbol	Greek Origin
9.	Argon	Ar	**Ar**gon – Greek for "inactive"
10.	Bromine	Br	**Br**omos – Greek for "smelly stench"
11.	Chlorine	Cl	**Cl**oros – Greek for "yellowish green"
12.	Iodine	I	**I**odes – Greek for "violet"

	Element	Symbol	Scientist the Element was Named After
13.	Bohrium	Bh	Niels **Bh**r (contributed to atomic theory)
14.	Curium	Cm	**M**arie and Pierre **C**urie (discovered radium)
15.	Mendelevium	Md	Dmitri **Md**eleev (invented the periodic table)
16.	Rutherfordium	Rf	**Rf**utherford (contributed to atomic theory)

	Element	Symbol	Place the Element was Named After
17.	Americium	Am	**Am**erica
18.	Francium	Fr	**Fr**ance
19.	Germanium	Ge	**Ge**rmany
20.	Polonium	Po	**Po**land

The Predictive Power of the Periodic Table, pages 57–58

1. The table is "periodic" because it shows "recurring or repeating" patterns of properties within groups of elements.

2. Mendeleev arranged the elements by increasing atomic mass in rows. He then placed elements that had similar properties into the same column.

3. The white gaps represented unknown elements that were still to be discovered.

4. He saw that the properties of elements repeated over regular intervals and thought there must be elements with those properties that exist, even though they were not known yet.

5. It was possible to accurately predict properties of unknown elements based on the properties of other elements that were in the same family (or column) within the table.

6. Since the table is organized according to increasing atomic mass, the atomic mass is predicted to be between 95.94 (the atomic mass of Mo) and 101.07 (the atomic mass of Ru).

7. Yes, because they all belong to the same family.

8. He did not place I and Te according to relative atomic mass. He switched these adjacent elements to better classify them into families. He placed I in the same column as other elements (e.g., F and Cl) that had the same properties as I. He placed Te with elements (e.g., O and S) that had the same properties as it.

9. **a)** Eka-boron is located between calcium (Ca) and titanium (Ti).

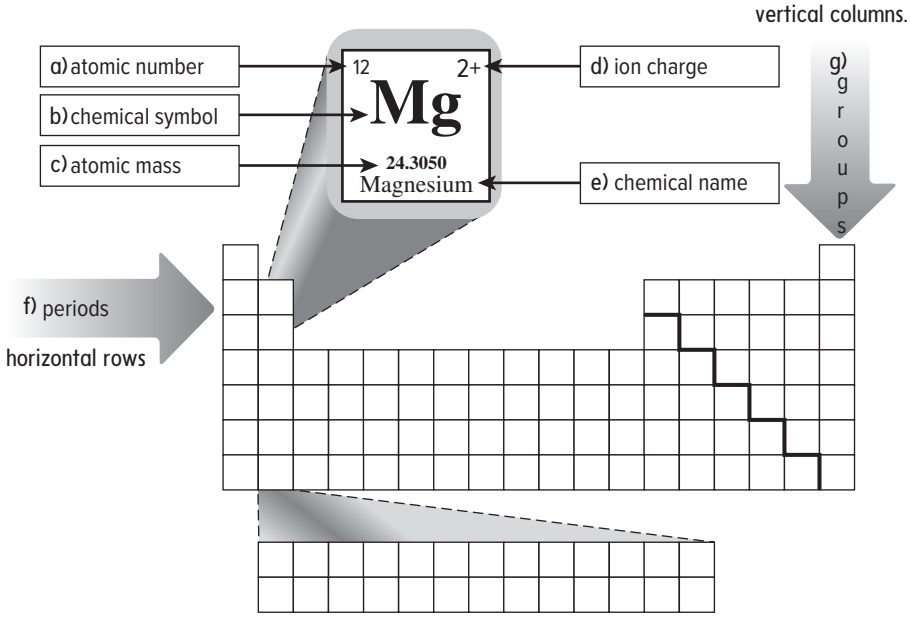
b) Mendeleev was able to predict eka-boron's density and its solubility in acids because he knew that eka-boron belonged to the same family as boron and yttrium, two known elements. Therefore, eka-boron must have similar properties as these two elements would.

c) Boron (B), aluminum (Al), yttrium (Y), and lanthanum (La) are expected to have the same properties as eka-boron.

d) Scandium is eka-boron.

The Modern Periodic Table, pages 59–60

1.



2. a) The **atomic number** is the number of protons in an atom.

b) The **chemical symbol** of an element can be one or two letters. The first letter is capitalized and remaining letter(s) are lowercase.

c) The **atomic mass** is the average mass of an atom of an element.

d) The **ion charge** is the stable ion(s) that atoms of the element can form; it represents the number of electrons an atom tends to lose or gain to become a stable ion.

e) The **chemical name** identifies the element and can come from ancient languages, places, or famous scientists.

f) The **period** is the horizontal row on the periodic table.

g) The **group** is the vertical column on the periodic table.

3. a) Elements are arranged according to their atomic number.

b) When elements are arranged according to their atomic number, they do not need to be reordered because they fit into their correct group based on similar properties.

4. They are organized into groups (columns) and periods (rows). In each period, the atomic numbers of the elements increase from left to right. Elements in each group have similar properties.

5. The atomic number increases.

6. a) i) 20 **ii)** 40.1 **iii)** 2+ **iv)** Ca

b) i) chlorine **ii)** 1– **iii)** 35.5 **iv)** 17

c) i) aluminum **ii)** 13 **iii)** 3+ **iv)** Al

d) i) 34 **ii)** selenium **iii)** 2– **iv)** Se

Metals, Non-metals, and Semi-metals, pages 61–62

1. a) Headings: metals, non-metals, and semi-metals

The subheadings for metals are alkali metals and alkaline earth metals.

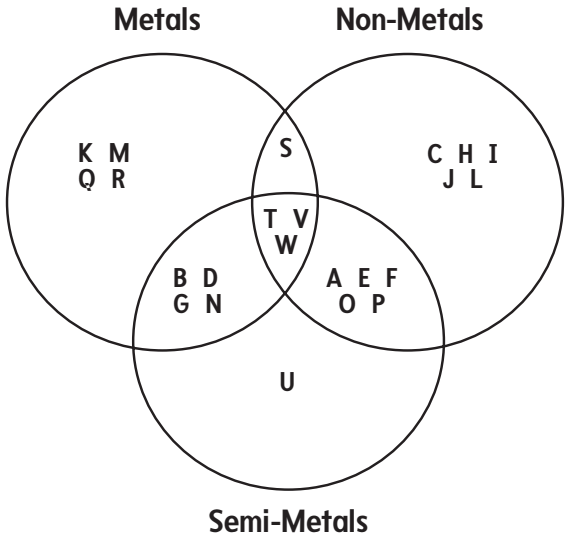
The subheadings for non-metals are hydrogen, halogens, and noble gases.

b) The bold-faced words are metal, non-metal, and semi-metal.

The italicized words are main-group elements, representative elements, transition elements, inner transition metals, alkali metals, alkaline-earth metals, noble gases, halogens, and metalloids.

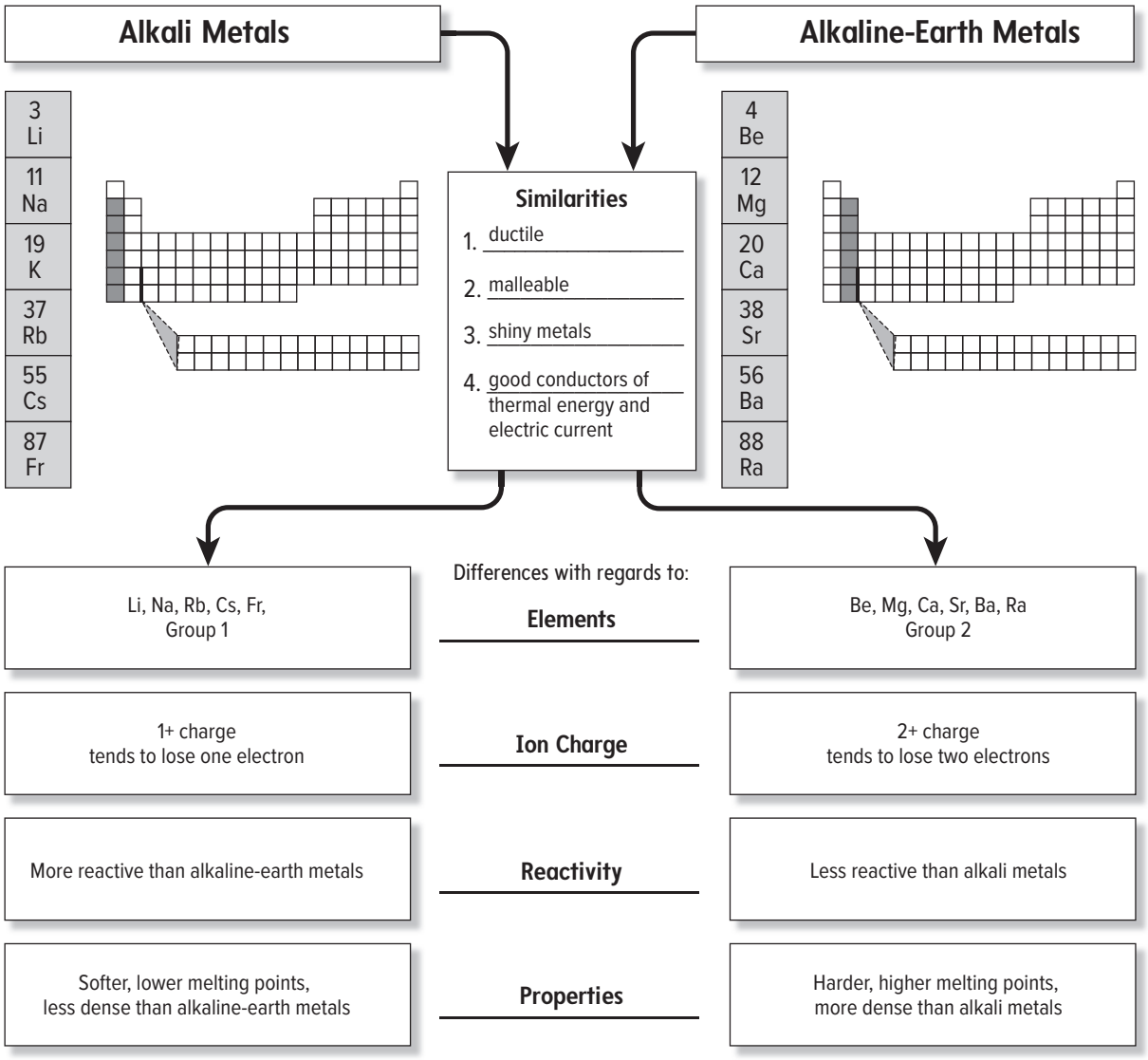
3. Study notes that students make will vary. The notes should summarize the key concepts of metals, non-metals, and semi-metals. They should also mention the main families like hydrogen, alkali metals, alkaline-earth metals, halogens, and noble gases.

4.



Comparing Alkali Metals to Alkaline-Earth Metals, pages 63–64

1.



2. Sodium is an alkali metal so it is more reactive than magnesium, an alkaline-earth metal.

3. Lithium and beryllium are both shiny, solids at room temperature, malleable, ductile, good conductors of thermal energy and electric current, and silver/grey in colour.

4. The melting points decrease, going from the top to the bottom.

5. Alkaline-earth metals have higher melting points.

6. All are solids at room temperature.

7. Density increases for both Group 1 and Group 2.

8. Alkaline-earth metals are denser than alkali metals.

9. None of the alkaline-earth metals would float on water because they all have a density greater than 1 g/cm^3.

2.2 Assessment, pages 63–66

1. E	**6.** D	**11.** D	**16.** D
2. C	**7.** B	**12.** C	**17.** B
3. G	**8.** B	**13.** A	**18.** A
4. F	**9.** B	**14.** D	**19.** B
5. A	**10.** A	**15.** D	**20.** C

21.