

Reading a Slice of the Periodic Table

Learning target: I can read an element's position, symbol and atomic mass from the periodic table and build a model that shows what the elements in one group have in common.

Diagrams and models

About 35 min

Individual

MS-PS1-1 · practice

visual modeling

independent practice

Name _____

Date _____

Period _____

Directions

Study the grid and the data table. They show the first twenty elements laid out the way the periodic table arranges them: rows are periods and columns are groups. (The full table spreads these eight columns across eighteen, with a block of metals inserted in the middle from row 4 on; this slice keeps the eight columns side by side.) Answer Part A by reading the diagram. In Part B you will draw your own model of one group. Round all masses as shown.

You will need: This worksheet, Pencil, Ruler, Colored pencils (optional)

The first twenty elements (rows = periods, columns = groups)

H 1							He 4
Li 7	Be 9	B 11	C 12	N 14	O 16	F 19	Ne 20
Na 23	Mg 24	Al 27	Si 28	P 31	S 32	Cl 35.5	Ar 40
K 39	Ca 40						

Each tile shows the chemical symbol and the rounded atomic mass in daltons. Blank tiles in rows 1 and 4 are real empty spaces in this slice: row 1 has only two elements, and row 4 continues to the right beyond this sheet.

Data table for the twenty elements

Element	Symbol	Atomic mass (Da)	Row (period)	Column	State at room temperature	A behavior
Hydrogen	H	1	1	1	gas	burns in air
Helium	He	4	1	8	gas	does not react with anything
Lithium	Li	7	2	1	solid metal	fizzes in water
Beryllium	Be	9	2	2	solid metal	does not react with water

Element	Symbol	Atomic mass (Da)	Row (period)	Column	State at room temperature	A behavior
Boron	B	11	2	3	solid	very hard, poor conductor
Carbon	C	12	2	4	solid	forms diamond and graphite
Nitrogen	N	14	2	5	gas	most of the air; unreactive
Oxygen	O	16	2	6	gas	needed for burning
Fluorine	F	19	2	7	gas	most reactive nonmetal
Neon	Ne	20	2	8	gas	does not react; glows red in lamps
Sodium	Na	23	3	1	solid metal	reacts strongly with water
Magnesium	Mg	24	3	2	solid metal	burns with a bright white light
Aluminum	Al	27	3	3	solid metal	light, used in foil and cans
Silicon	Si	28	3	4	solid	used in computer chips
Phosphorus	P	31	3	5	solid	one form catches fire in air
Sulfur	S	32	3	6	solid	yellow; smells when burned
Chlorine	Cl	35.5	3	7	gas	reactive; used to treat water
Argon	Ar	40	3	8	gas	does not react; fills light bulbs
Potassium	K	39	4	1	solid metal	reacts violently with water
Calcium	Ca	40	4	2	solid metal	reacts steadily with water

Part A: Read the diagram

- Which element sits in row 3, column 7? Give its name, symbol and atomic mass.

2. Reading across row 2 from lithium to neon, by how many daltons does the atomic mass increase in total? Then find the average increase per step (there are seven steps). Show your work.

3. Name the three elements in column 1 below hydrogen. Using the data table, state one behavior they share and describe how that behavior changes as you move down the column.

4. Hydrogen is placed at the top of column 1, yet it is not a metal. Using the data table, give one way hydrogen is **unlike** the other column 1 elements.

5. Pretend magnesium's atomic mass has been lost. Use the halfway idea from Döbereiner and Mendeleev with the elements directly above and below it (beryllium and calcium) to predict it. Then compare your prediction with the real value in the table.

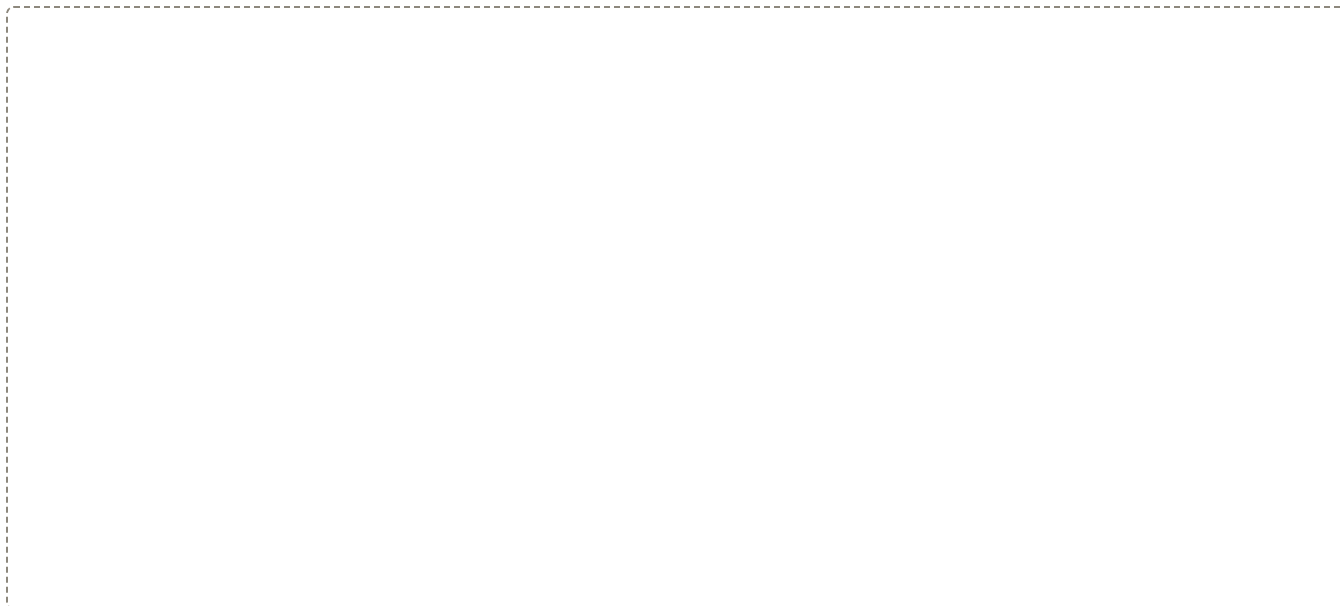
6. Find the one place on this slice where moving to the next element does **not** increase the atomic mass. Name the two elements. Then explain, using column behavior, why scientists keep them in that order anyway.

7. A newly discovered element is placed in column 8, directly below argon. Which description is the best prediction of its behavior?

- ☐ A. It is a solid metal that reacts with water.
- ☐ B. It is a gas that does not react.
- ☐ C. It is a hard solid used in computer chips.
- ☐ D. It is a yellow solid that smells when burned.

Part B: Build a model of a group

-  Choose column 1 (Li, Na, K) or column 8 (He, Ne, Ar). Draw the column as a vertical strip of three tiles. In each tile write the symbol, the atomic mass, the state at room temperature and the shared behavior. Draw an arrow beside the strip showing the direction in which atomic mass increases. Add a fourth, dashed tile at the bottom for the next element in that column, and write inside it two things you predict about that element (its state and its behavior) plus a rough mass range, 'more than ___ Da'. Title your model.



8. Label your model: which feature of your drawing shows 'what the group has in common,' and which feature shows 'what changes down the group'?

9. Explain why a scientist would trust the predictions in your dashed tile more than a random guess.

Finger-tracing the grid

For every Part A question, put one finger on the row number and another on the column number, then slide them until they meet; that tile is the element. Check the symbol against the data table before you copy the mass. For q6, run your finger along row 3 to argon, then jump to the start of row 4, and compare the two masses you just passed.

The missing block

The real periodic table does not put potassium directly under sodium with calcium beside it and then stop. From row 4 on, ten extra columns of metals (such as iron and copper) are inserted between column 2 and column 3. Sketch how this slice would look if row 4 were drawn at full width with ten blank tiles inserted, and explain why keeping aluminum above gallium (the element that was discovered in 1875 to fill a Mendeleev gap) matters more than keeping the rows the same length.