

Atoms and Elements: Mastery Check

Learning target: I can show what I know about atoms, elements, matter, the atomic scale, criteria and constraints, and the periodic table, and connect the ideas in a short paragraph.

Retrieval and mastery check

About 35 min

Individual

MS-PS1-1 · supports

MS-ETS1-1 · practice

independent practice

writing

Name _____

Date _____

Period _____

Directions

Answer every item on your own without notes. For multiple-choice items, circle one letter. For numeric items, show the calculation. For the drawing item, label every part. Finish with the synthesis paragraph in Part B; it is worth as much as four of the short items, so leave time for it.

You will need: This worksheet, Pencil, Ruler for q12

Part A: Retrieval (12 items)

1. Which statement uses the words atom and element correctly?

- ☐ A. A gold ring is a single atom of gold.
- ☐ B. A gold ring is made of the element gold, which consists of many gold atoms.
- ☐ C. A gold ring contains the element gold and the atom gold as two different ingredients.
- ☐ D. A gold ring is an element only when it is melted.

2. Which of these is matter?

- ☐ A. The red light from a neon sign
- ☐ B. The sound of a bell
- ☐ C. The air inside a pumped basketball
- ☐ D. The warmth you feel from a heat lamp

3. True or false: With a strong enough magnifying glass, a person could see a single atom.

- ☐ True ☐ False Explain your thinking:

4. Which unit do scientists usually use to describe the width of an atom?

- ☐ A. centimeters
- ☐ B. kilometers
- ☐ C. picometers
- ☐ D. micrometers

5. A rigid ball reads 598.4 g on a balance when flat and 603.1 g after being pumped, with no change in size. In one sentence, what does this show about air?

6. Calcium has an atomic mass of 40 Da and barium 137 Da. They sit at the top and bottom of a three-element column. Use the halfway rule to predict the atomic mass of the element between them. Show your work.

7. Why did Mendeleev leave empty spaces in his 1869 table?

- ☐ A. Because he ran out of elements to list.
- ☐ B. Because those elements had been discovered but had no names yet.
- ☐ C. Because he predicted that undiscovered elements would fill them.
- ☐ D. Because the printer made a mistake.

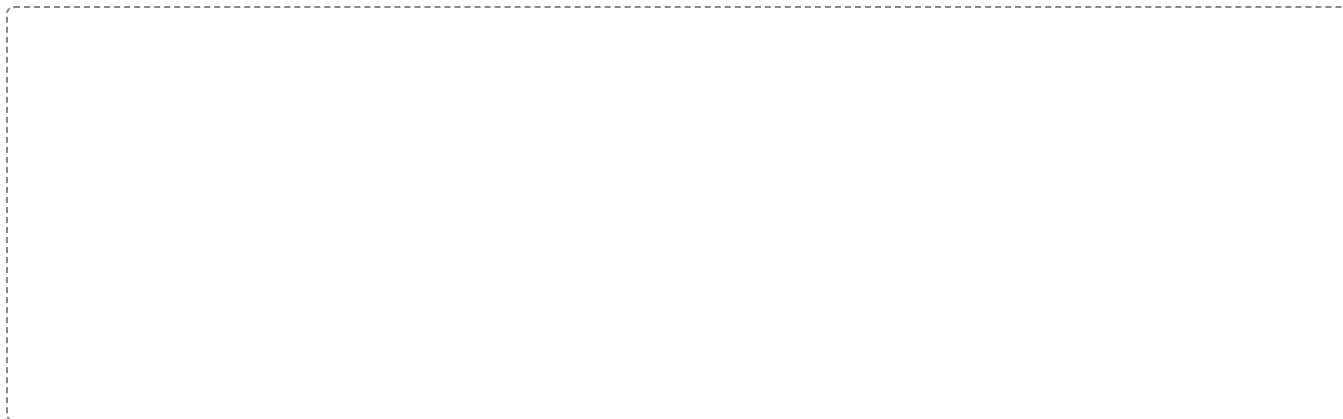
8. Helium, neon and argon share a column of the periodic table. Name one property they share.

9. Write the chemical symbol for each element: sodium ____ potassium ____ carbon ____ iron ____

10. A team designing a microscope writes: 'It must show details as small as 100 pm' and 'We can only use parts already in the lab.' Label each as a criterion or a constraint and explain the difference in one sentence.

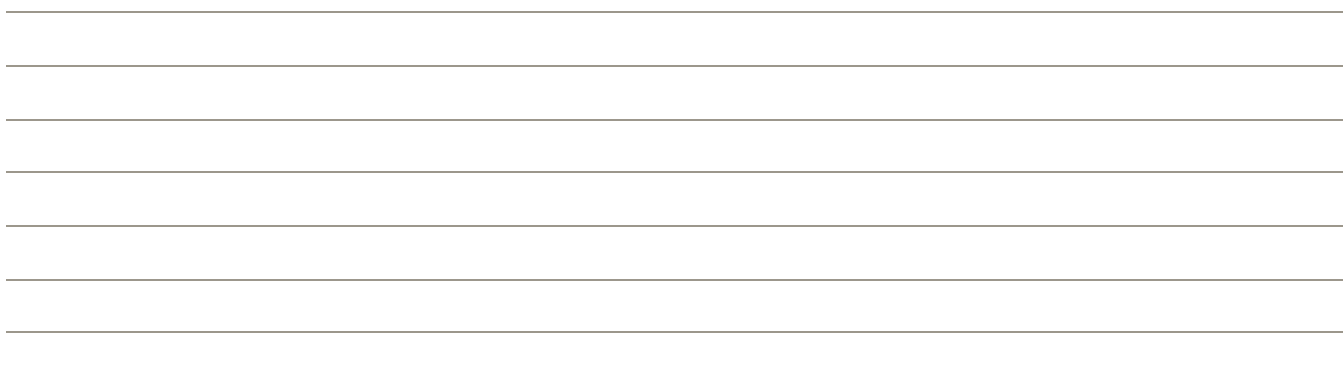
11. Reading across row 3 of the periodic table, sodium is 23 Da and argon is 40 Da. There are seven steps between them. What is the average mass increase per step? Show your work.

12. Draw a small piece of the periodic table showing lithium, sodium and potassium in their column and lithium's row neighbors beryllium and boron. Write each symbol and atomic mass (Li 7, Be 9, B 11, Na 23, K 39). Label which direction is a **group** and which is a **period**, and draw an arrow showing where atomic mass increases.



Part B: Synthesis

13. Write a paragraph (5-7 sentences) that answers: **How did scientists learn to organize the elements before they could observe a single atom, and why does that organization still work?** Your paragraph must use the words atomic mass, group (or column), and predict, and must mention at least one scientist by name.



Paragraph frame for Part B

Sentence 1: what scientists could measure in the 1800s (mass and behavior) and what they could not do (see atoms). Sentence 2: what Döbereiner noticed. Sentence 3: what Mendeleev did with mass and columns. Sentence 4: what he predicted and what happened. Sentence 5: why position in a group lets scientists predict behavior today. Sentence 6: your own concluding sentence about trust in a model.

Two-way check

After the quiz, trade with a partner and grade each other's drawing (q12) using three checks: are the masses in the right places, is the group direction vertical, and does the mass arrow point down the column and to the right along the row? Then write one question of your own about the periodic table that is harder than any item on this quiz, and solve it. Hand both in.