

Matter Detective Notes

Use evidence, patterns, and particle motion to explain matter.

PS.2 "The student will investigate and understand that matter is composed of atoms. Key ideas include our understanding of atoms has developed over time; the periodic table can be used to predict the chemical and physical properties of matter..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline one sentence in each paragraph that connects an atomic idea to evidence, a property, or an observable change. Number your underlined sentences 1, 2, and 3 in reading order.

Clues From Matter

- ① Scientists did not see atoms directly when early atomic ideas appeared. Instead, they built models from evidence. John Dalton proposed that each element was made of its own kind of atom. Later experiments showed that atoms contain smaller particles, including negatively charged electrons and a tiny, positive nucleus. Modern models describe electrons in regions around the nucleus rather than on fixed circular paths. Each update changed the model because new evidence explained observations that an older model could not explain.
- ② The periodic table organizes elements by atomic number, the number of protons in an atom. Its columns, called groups, help scientists predict patterns. Elements in the same group often have similar chemical behavior because their outer electrons are arranged similarly. For example, a scientist can use an element's position to predict whether it is likely to react readily with water or to conduct electricity. The table does not predict every detail, but it provides evidence-based starting points for testing a material.
- ③ Kinetic molecular theory explains matter by treating particles as always moving. Temperature measures the average kinetic energy of those particles. When a sealed metal can is warmed, its gas particles move faster and strike the walls more often and with greater force, so pressure rises. In a liquid, warmer particles can overcome attractions more easily, making evaporation faster. These predictions connect events we can observe, such as changing pressure or drying puddles, to particle motion that is too small to see.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 An experiment produces observations that an older atomic model cannot explain. Based on the passage, what should scientists do, and why?

2 Element X is in the same group as an element that conducts electricity. What property might a scientist predict for Element X? Explain your reasoning.

3 A sealed container of gas is cooled. Predict how its pressure will change, and explain using particle motion.

4 Two identical puddles are placed in locations with different temperatures. Which puddle evaporates faster, and why?

3 YOUR TURN _____ Your own words

Create three entries about situations you choose. Use one entry about how atomic models change with evidence, one about a periodic-table prediction, and one about particle motion. In each entry, state the situation and a correct explanation or prediction.

ATOMIC TOPIC	YOUR SITUATION	EXPLANATION OR PREDICTION

PART 1 • READ AND MARK

Underline one sentence in each paragraph that connects an atomic idea to evidence, a property, or an observable change. Number your underlined sentences 1, 2, and 3 in reading order. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	An experiment produces observations that an older atomic model cannot explain. Based on the passage, what should scientists do, and why?	They should revise the model because new evidence should explain observations that the older model cannot explain.
2	Element X is in the same group as an element that conducts electricity. What property might a scientist predict for Element X? Explain your reasoning.	Element X might conduct electricity because elements in the same group often have similar chemical behavior and properties.
3	A sealed container of gas is cooled. Predict how its pressure will change, and explain using particle motion.	Its pressure will decrease. The gas particles will move more slowly and strike the container walls less often and with less force.
4	Two identical puddles are placed in locations with different temperatures. Which puddle evaporates faster, and why?	The puddle in the warmer location evaporates faster because its particles can overcome attractions more easily.

PART 3 • YOUR TURN (SAMPLE ANSWER)

ATOMIC TOPIC	YOUR SITUATION	EXPLANATION OR PREDICTION
Model and evidence	New scattering results do not fit an older atomic model.	Scientists revise the model to explain the new evidence.
Periodic-table pattern	An unknown element is in the same group as a metal that conducts electricity.	It will likely conduct electricity because group members often have similar properties.
Particle motion	A closed plastic bottle of air is warmed.	Its particles move faster and strike the walls more often and with greater force, so pressure rises.

Accept scientifically accurate paraphrases that use the passage's relationships. For the periodic-table response, accept a likely prediction rather than a certainty, since group patterns do not predict every detail.