

Matter Model Detectives

Use particle details to classify samples of matter.

8.6.A "explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline the four sentences that begin with a bold classification label, then number them 1 through 4. Use the particle details in each underlined sentence to identify how that kind of matter is modeled.

Four Jars, Four Models

- ① At a community makerspace, four clear jars help visitors think like particle scientists. Matter can be sorted by asking two questions: Is there one kind of particle or more than one? If there is more than one kind, are the particles spread evenly? A particle model uses repeated symbols or circles to stand for tiny particles. The symbol choices do not show real particle size. Instead, they show which particles are alike, which are bonded, and how they are arranged in a sample.
- ② An element contains only one type of atom. **Element:** A jar of copper pieces would be modeled with identical Cu circles, because every particle is copper. A compound contains two or more elements chemically bonded in a fixed ratio. **Compound:** Pure water would be modeled as identical H₂O groups, with each group containing bonded hydrogen and oxygen atoms. Although both samples are pure substances, their models differ because water has more than one kind of atom in each particle.
- ③ A mixture has substances together without chemical bonding into one new substance. **Homogeneous mixture:** Salt water would show water particles and dissolved sodium and chloride ions evenly mixed throughout one sample, so every scoop has the same composition. **Heterogeneous mixture:** Oil and water would show separate regions with mostly oil particles in one region and mostly water particles in another. The particle models reveal why salt water looks uniform while oil and water have visibly different parts. A mixture's composition can vary, unlike a compound's fixed ratio.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 What two questions does the passage say you should ask when sorting matter?

2 How would a particle model of copper differ from a particle model of pure water?

3 Use the particle details in the passage to explain why salt water is a homogeneous mixture.

4 What feature of an oil-and-water particle model shows that it is heterogeneous rather than homogeneous?

3 YOUR TURN _____ Your own words

Choose four new samples, one element, one compound, one homogeneous mixture, and one heterogeneous mixture. In each row, name the sample, label its classification, draw a particle model, and write one sentence explaining what in your model proves the classification.

SAMPLE	CLASSIFICATION	PARTICLE MODEL	MODEL EVIDENCE

PART 1 • READ AND MARK

Underline the four sentences that begin with a bold classification label, then number them 1 through 4. Use the particle details in each underlined sentence to identify how that kind of matter is modeled. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What two questions does the passage say you should ask when sorting matter?	Ask whether there is one kind of particle or more than one, and, if there is more than one kind, whether the particles are spread evenly.
2	How would a particle model of copper differ from a particle model of pure water?	Copper would have identical Cu particles only. Pure water would have identical H₂O groups, each with bonded hydrogen and oxygen atoms.
3	Use the particle details in the passage to explain why salt water is a homogeneous mixture.	Its water particles and dissolved sodium and chloride ions are evenly mixed throughout the sample, so every scoop has the same composition.
4	What feature of an oil-and-water particle model shows that it is heterogeneous rather than homogeneous?	The model has separate regions, with mostly oil particles in one region and mostly water particles in another, rather than particles evenly mixed throughout.

PART 3 • YOUR TURN (SAMPLE ANSWER)

SAMPLE	CLASSIFICATION	PARTICLE MODEL	MODEL EVIDENCE
Helium	Element	Draw identical, separate He circles.	The model has only one type of atom.
Carbon dioxide	Compound	Draw identical groups with one C circle bonded to two O circles.	Each particle has two kinds of atoms bonded in the same fixed ratio.
Air	Homogeneous mixture	Draw N ₂ pairs and O ₂ pairs spread evenly together.	More than one kind of particle is evenly distributed throughout the sample.
Sand and iron filings	Heterogeneous mixture	Draw separate clusters of sand grains and iron pieces.	The different particles are in uneven, distinct parts of the sample.

Accept any scientifically valid samples and reasonable particle symbols. Each model must show one particle type for an element, bonded different atom types in a repeating fixed ratio for a compound, evenly distributed particle types for a homogeneous mixture, or unevenly distributed particle types or regions for a heterogeneous mixture.