

Matter Detectives

Use physical clues to sort samples of matter.

6.6.B “investigate the physical properties of matter to distinguish between pure substances, homogeneous mixtures (solutions), and heterogeneous mixtures;”

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each physical-property clue and circle the words that name a sample as pure, homogeneous, or heterogeneous, so you can connect evidence to classification.

Clues in a Sample

- ① Physical properties are traits you can observe or measure without making a new substance. They include color, state, magnetism, solubility, density, and melting point. A pure substance has one kind of particle and a fixed composition. It has characteristic properties, such as a specific melting point. In the lab, students heat a small sample of candle wax. It melts over a range of temperatures, so that observation alone does not prove the wax is pure. Scientists compare several properties before deciding.
- ② At the aquarium station, a student stirs table salt into water until no crystals remain. The liquid looks the same throughout, and a drop taken from any part gives the same electrical conductivity reading. This is a homogeneous mixture, also called a solution. Salt and water are still present, but the salt particles are spread evenly and are too small to see. If the water evaporates, salt stays behind. Evaporation separates the mixture without changing either substance.
- ③ Another team shakes a jar holding water, sand, and small iron filings. At first, different materials can be seen in the jar. Soon, sand settles at the bottom, while some filings can be removed with a magnet. This sample is a heterogeneous mixture because its composition is not uniform. Different parts have different physical properties and can often be separated by physical methods. A sample from the top would not contain the same materials as a sample from the bottom.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 Why does the candle wax melting over a range of temperatures not prove that the wax is a pure substance?

2 What two observations show that the salt water is uniform throughout?

3 What type of mixture is the salt water? Use the way its salt particles are arranged to explain your answer.

4 Give two pieces of evidence that the jar with water, sand, and iron filings is a heterogeneous mixture.

3 YOUR TURN _____ Your own words

Make three mystery-sample entries. Describe physical-property evidence for one pure substance, one homogeneous mixture, and one heterogeneous mixture, then classify each entry and give a reason.

SAMPLE	PHYSICAL-PROPERTY EVIDENCE	CLASSIFICATION AND REASON

PART 1 • READ AND MARK

Underline each physical-property clue and circle the words that name a sample as pure, homogeneous, or heterogeneous, so you can connect evidence to classification. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Why does the candle wax melting over a range of temperatures not prove that the wax is a pure substance?	A melting range alone does not prove purity. Scientists must compare several physical properties before deciding.
2	What two observations show that the salt water is uniform throughout?	The liquid looks the same throughout, and samples from any part give the same electrical conductivity reading.
3	What type of mixture is the salt water? Use the way its salt particles are arranged to explain your answer.	It is a homogeneous mixture, or solution, because the salt particles are spread evenly and are too small to see.
4	Give two pieces of evidence that the jar with water, sand, and iron filings is a heterogeneous mixture.	Different materials can be seen, sand settles at the bottom, and iron filings can be removed with a magnet. Any two pieces of evidence are acceptable.

PART 3 • YOUR TURN (SAMPLE ANSWER)

SAMPLE	PHYSICAL-PROPERTY EVIDENCE	CLASSIFICATION AND REASON
Distilled water	One kind of particle; fixed composition	Pure substance, because it contains only water.
Brass	Uniform solid; copper and zinc cannot be seen separately	Homogeneous mixture, because it is uniform throughout.
Granite	Different mineral grains are visible	Heterogeneous mixture, because different parts are not uniform.

Accept equivalent evidence-based explanations using observations of uniformity, visible parts, settling, magnetism, evaporation, or characteristic properties. For the open task, accept other accurate examples when the classification and physical-property evidence match.