

The Unlabeled Box: Twelve Samples, Three Sites, No Names

Investigation question: Using only texture and setting clues on property cards, can we work out how each unlabeled rock sample formed, what energy made it, and which field site it came from?

Evidence-based mystery

Groups of 4

1 session

Setup 5 · Activity 38 · Cleanup 4 min

MS-ESS2-1 · practice

MS-ESS2-2 · practice

Name _____

Group _____

Date _____

Your role today

- ☐ **Card reader:** Reads each card aloud in full, including the packing note, and keeps the cards in order on the sorting mat.
- ☐ **Texture judge:** Leads the first decision for each card: are the grains crystals that grew in place, pieces that were carried and stuck, or crystals that were flattened or regrown? Must point to the exact words on the card.
- ☐ **Process and energy tracker:** For each placed card, names the process that formed the rock and the Earth energy source, and checks that the family, process and energy agree.
- ☐ **Recorder and site detective:** Fills in the recording-sheet table, writes the group's confidence for each card, and leads the site-assignment discussion at the end.

Safety

- No hazards from the cards. If real rock samples are used, handle them over the desk, not above the floor, and do not strike or break them; chips can fly.
- Only the teacher performs the vinegar test, wearing goggles, with one or two drops on a sample over a paper towel. Vinegar is a mild acid; rinse skin if splashed and keep it away from eyes.
- Never taste a rock sample, even though card K reports a salty taste; field geologists sometimes do this with known samples, and students never should.

Procedure

1. Read the site briefing together and the three column headings on the sorting mat. Agree on the texture test for each family: crystals that grew in place and interlock (igneous), separate pieces or shells that were carried and stuck together or crystals left by drying water (sedimentary), crystals flattened, lined up, banded or regrown while the rock stayed solid (metamorphic).
2. The Card reader reads card A in full. The Texture judge points to the words that decide the family and places the card in a column or in the 'not sure yet' box. The Process and energy tracker names the process and the Earth energy source. The Recorder writes the row, including a confidence rating from 1 (guess) to 3 (sure).

3. Repeat for cards B through L. Do not skip the packing note; it is a setting clue, not a family clue, and the group should say which kind of clue it is each time.
4. Return to the 'not sure yet' box. For each card there, list the two families it could belong to and the single observation that would settle it. Place it where the evidence leans and keep the confidence rating low.
5. Find the pairs. Two cards describe a rock and the metamorphic rock made from it. Identify both pairs, write which card is the parent and which the child, and name the process that connects them.
6. Assign sites. Using the packing notes and the site briefing, decide which site each sample most likely came from and write it in the table. Some samples fit more than one site; write 'or' and your reasoning.
7. Draw the texture of one sample from each family in the drawing box, as you picture it from the card, and label the feature that gave the family away.
8. Compare your mat with a neighboring group's for two minutes. For any card placed differently, each group states its evidence; change your placement only if the other group's evidence is stronger, and note the change.
9. Answer the analysis questions individually.

Record your observations

Lab 2 recording sheet: The unlabeled box

Fill in one row per card as your group places it. In 'key clue' copy the exact words from the card that decided the family. Confidence: 1 = guess, 2 = likely, 3 = sure.

Sample sort

Card	Family	Key clue (words from the card)	Process that formed it	Energy source on Earth	Likely site	Confidence
A						
B						
C						
D						
E						
F						
G						
H						
I						
J						
K						
L						

Parent and child pairs

Parent card	Child card	Process that connects them	Evidence that they are related

-  Draw the texture you picture for one card from each family (three sketches). Label each with the card letter and circle the feature that gave the family away.

1. Which card did your group place with the lowest confidence? What two families could it belong to, and what single extra observation would settle it?

2. Pick one card and write one observation sentence (what the card says) and one inference sentence (what your group concluded from it).

Analysis questions

3. Cards C and D are both in flat layers, and cards E and F both have lined-up crystals. Explain why 'layers' is not enough to decide a family, and state the test your group used to tell sedimentary layers from metamorphic bands.

4. Cards A, B, H and J are all igneous, yet they look completely different. Rank them from slowest-cooled to fastest-cooled and give the evidence for your ranking.

5. Card A was packed at the 'base of dome' at Site 3, next to a slope of sand with the same colors. Write the story of how this rock formed and reached the surface, and what is happening to it now. Name the energy source for each part of the story.

6. Cards D and G both fizz with vinegar, but one is sedimentary and one is metamorphic. What does the fizz tell you they share, and what texture evidence shows they formed by different processes?

- 7.** Card I has sharp-edged chunks; card C has rounded grains. What does the shape of the pieces suggest about how far each one's sediment traveled before it was deposited? Explain the reasoning.

- 8.** A classmate argues that card K cannot be a rock because its crystals grew from water, not from magma. Evaluate this argument using what you know about dissolved material and the energy that drives evaporation.
