

Crayon Rocks: Press It, Warm It, Melt It, Then Recycle It

Investigation question: Which rock-cycle processes can we model with crayon shavings, what energy does each one need, and where does the wax stop behaving like rock?

Physical model

Groups of 4

1 session

Setup 5 · Activity 40 · Cleanup 8 min

MS-ESS2-1 · practice

Name _____

Group _____

Date _____

Your role today

- ☐ **Shaver:** Makes the crayon shavings with the sharpener or plastic knife, keeps colors separate at first, and later shaves the finished igneous sample for the recycle step.
- ☐ **Presser:** Folds the foil packets, applies cold pressure for the sedimentary step and warm hand pressure for the metamorphic step, timing each press.
- ☐ **Observer:** Examines every sample with the hand lens before and after each step, describes grain size, edges and color boundaries aloud, and draws the textures.
- ☐ **Recorder and runner:** Fills in the process log, carries the foil cups to and from the teacher's warm-water station, and writes the group's predicted texture before the recycle step.

Safety

- The warm-water bath is handled by the teacher only. Water at 65 to 75 °C can scald; students never carry, touch or lean over it. The teacher moves foil cups in and out with tongs and sets them on the cooling tray before a runner collects them.
- Melted wax is hot enough to burn skin. Nobody touches a cup until the wax has gone fully solid and dull (about two minutes in ice water, five or more in air).
- Safety goggles for everyone during the melting and ice-water steps; wax can spit if water gets into a cup.
- Sharpeners and plastic knives only. Scrape away from fingers. No metal graters or craft blades.
- Use only crayons labeled non-toxic, and treat them as not food. No eating or drinking in the lab, and wash hands at the end.
- Wax must not go down a drain. All scraps go in the zip bag; foil is folded and binned.
- Keep the ice-water cup on the desk, not in a hand, when a cup of melted wax is lowered into it, and lower slowly so water does not splash into the wax.

Procedure

1. Make sediment. The Shaver shaves each crayon onto its own foil square until there is about a tablespoon of each color. The Observer looks at one color under the lens and the group records the texture: loose, sharp-edged, separate pieces. Decide which Earth process this step models and what supplied the energy in the model (your hand) and on Earth.

2. Mix the colors on one square and spread them in a layer about 1 cm thick. Fold the foil into a flat envelope.
3. Make sedimentary rock. The Presser puts the envelope under the heavy book and presses straight down with both hands for 60 seconds. No warming. Open the packet carefully, examine with the lens, and record: do the grains still have edges? Are the colors still separate? Does the cake hold together or crumble?
4. Make metamorphic rock. Re-fold the same cake in fresh foil. The Presser holds the packet flat between both palms and squeezes as hard as possible for two full minutes while the Timer counts; palms warm the wax to body temperature. Then press under the book for another 30 seconds. Open and examine: look for flattened grains, smeared color boundaries and bands. Record whether any part of the sample became liquid.
5. Split the metamorphic sample in half. Put each half in a muffin liner inside a foil cup. The Runner carries both cups to the teacher's station and returns to the desk.
6. Make igneous rock (teacher step). The teacher floats both cups in the warm-water bath until the wax is fully liquid, about three to five minutes, then uses tongs to set cup A on the cooling tray for the group to collect and lowers cup B, still in its foil, into the group's ice-water cup held on the desk. Cup A stays on the tray at room temperature so it cools slowly.
7. While the cups cool, fill in the energy columns of the process log for every step so far, and write a prediction: will the fast-cooled and slow-cooled samples look different? How?
8. When both samples are solid and dull, examine them with the lens. Compare surface texture, cracks and color blending between the ice-water sample and the slow-cooled sample. Record what is the same and what differs.
9. Choose a recycle route. As a group, pick one finished sample and one new route from the rock cycle (for example igneous to sediment to sedimentary rock, or sedimentary straight to metamorphic, or the slow-cooled igneous sample shaved and re-melted). Write the route and the predicted texture on the recording sheet before you start.
10. Run your chosen route using the same steps as before (shaving, cold press, warm press, or a teacher melt). Record the result next to your prediction.
11. Draw the four textures (sediment, sedimentary, metamorphic, igneous) in the drawing box with labels, then answer the analysis questions individually.

Record your observations

Lab 1 recording sheet: Crayon rocks

Fill in one row after each step. In the energy columns, say what supplied the energy in the model (for example, your hand, your body heat, the warm water) and what supplies it on Earth (the Sun and gravity, or Earth's hot interior).

Process log

Step	Earth process this models	Energy source in the model	Energy source on Earth	Texture afterward (grain size, edges, color boundaries, liquid?)
1. Shaving the crayons				
3. Cold press, 60 s				
4. Warm press, 2 min				
6A. Melt, then slow cool in air				
6B. Melt, then fast cool in ice water				
10. Our recycle route				

Our recycle route

Starting sample	Route (list the processes in order)	Predicted texture (before)	Observed texture (after)

 Draw what you saw under the lens for each of the four stages: sediment, sedimentary, metamorphic, igneous. Label each drawing with its stage and one word for the texture (loose, cemented, banded, blended).

1. Did any part of the sample become liquid during the warm press (step 4)? What evidence tells you it changed anyway?

2. Compare your recycle-route prediction with what you observed. What was right, and what surprised you?

Analysis questions

3. The cold press and the warm press used the same wax and the same amount of force. Describe how the two results differed and explain which Earth process each one models.

4. For each of these model steps, name the energy source on Earth and say whether it belongs to the surface budget (Sun and gravity) or the interior budget: shaving the crayon, pressing under the book, warming with your palms, melting in the bath.

5. In real igneous rock, slow cooling makes large crystals and fast cooling makes tiny ones. Did the slow-cooled and ice-water wax samples show that difference? Explain what this tells you about the limits of the crayon model.

6. Your group chose one recycle route, but other routes were possible. List two other routes a group could have run starting from the metamorphic sample, naming the processes in order.

7. Real sediment is cemented by minerals that water leaves between the grains. Your cold-pressed cake had no cement. What held it together, and how does this make the model different from real sandstone?

8. A group shaved 10.0 g of crayon at the start and, after all the steps, their finished samples and scraps added up to 9.6 g. Where did the missing 0.4 g most likely go, and what does this say about matter in the rock cycle on Earth?
