Name _____ Date _____

Weathering, Erosion and Deposition Data: Freeze-Thaw Cycles and Settling Sediment

Directions: Read the lab notes and study the data table. In number questions, type only the number; the unit is shown next to the box.

The Freeze-Thaw Test

Use the lab notes and the data table to answer these questions.

Freeze, Thaw and Flow

Weathering breaks rock into smaller pieces. Erosion moves those pieces to new places. Deposition happens when the water, wind or ice carrying the pieces slows down and drops them.

One kind of weathering is ice wedging. Water seeps into a crack in a rock. When the water freezes, it expands by about 9 percent, and the ice pushes on the walls of the crack. When the ice thaws, water can seep a little deeper into the crack, which is now slightly wider. Each new freeze pushes the crack wider still.

Lena's class tested four blocks of sandstone. Each block had a mass of 800 grams at the start. For 20 days, two blocks were frozen every night and thawed every day. One of those two had been soaked in water first, and the other was kept dry. A third block was soaked and then kept frozen for all 20 days. A fourth block was soaked and kept at room temperature. At the end, the class collected and weighed the pieces that had broken off each block.

Then the class poured the broken pieces into the high end of a stream table and ran water over them. The water carried the pieces down the sloping table. At the low end, where the water spread out and slowed, the largest pieces dropped first. Sand-sized grains settled a little farther out, and the finest mud stayed in the water longest and settled last.

Mass of the pieces that broke off four 800-gram sandstone blocks in 20 days

Block	Treatment	Times frozen and thawed	Mass of broken-off pieces (g)
A	Soaked in water, frozen each night and thawed each day	20	40
B	Kept dry, frozen each night and thawed each day	20	2
C	Soaked in water, then kept frozen for all 20 days	1	6
D	Soaked in water, kept at room temperature	0	1

1. Each event below comes from the lab notes. Match each event to the process it shows. Write the letter of the matching answer on each line.

1. _____ Ice in the cracks of a soaked block breaks pieces off the sandstone
2. _____ Flowing water carries the broken pieces down the stream table
3. _____ Pieces drop to the bottom where the water spreads out and slows

A. Evaporation
B. Deposition
C. Erosion
D. Weathering
E. Condensation

2. How many more grams of pieces broke off Block A than broke off Block C?

_____ g

3. Percent of mass lost = mass of broken-off pieces ÷ starting mass × 100. What percent of its starting mass did Block A lose?

_____ %

4. Which pair of blocks gives the fairest test of whether water in the cracks is needed for ice wedging?

A. Blocks A and C, because both were soaked in water
B. Blocks C and D, because neither was frozen and thawed many times
C. Blocks B and D, because they lost the least
D. Blocks A and B, because both were frozen and thawed 20 times, but only Block A was soaked in water

5. Which conclusion do the results of this test most likely support?

A. Dry sandstone breaks apart faster than soaked sandstone when it is frozen and thawed.
B. Water that freezes and thaws again and again breaks sandstone apart faster than freezing once or soaking alone.
C. One long freeze breaks sandstone apart faster than many freeze-thaw cycles.
D. Sandstone breaks apart the same amount no matter how it is treated.

6. The lab notes say water expands by about 9 percent when it freezes. In this model, use exactly 9 percent. If 100 cubic centimeters of water fills a crack and then freezes, what volume of ice forms?

_____ cm^3

7. Why does ice wedging work better with many freeze-thaw cycles than with one long freeze?

A. Water shrinks when it freezes, which pulls the crack closed and then open again.
B. Each thaw lets water seep deeper into the slightly wider crack, so the next freeze pushes the crack wider still.
C. The rock itself expands when it freezes, so it must freeze many times to crack.
D. Ice gets harder the longer it stays frozen, so one long freeze should break more rock.

8. A river carrying gravel, sand and mud flows into a calm lake and slows down. Based on what happened in the stream table, which sediment most likely settles closest to where the river enters the lake?

A. The gravel, because the largest pieces drop first when the water slows
B. All three, mixed together in one pile at the same spot
C. The mud, because the finest pieces settle first
D. None of it, because water in a lake keeps all sediment moving