Making Detrital Sedimentary Rocks

Background:

Sedimentary rocks are made of sediments, eroded pieces of other rocks that are either compacted, cemented or crystallize after the water has evaporated from a solution. Compaction happens when water is squeezed out of porous sediments like sand and clay by layers of sediments that have piled up on top of them. Cementation occurs when minerals in solution like calcite, quartz or iron oxide seep in spaces between pieces of rock and precipitate to form natural glue.

Objective:

To distinguish between detrital sedimentary rocks that are formed by compaction from ones formed by cementation.

Materials:

1. Lab Apron
2. Salt
3. Plaster of Paris
4. Safety goggles
5. Sand
6. Pebbles
7. Scissors
8. Water
9. Three 6 oz paper cups
10. Hand lens
11. Teaspoon
12. Disposable stirring sticks

Procedure:

1. For safety wear your goggles over your eyes and keep on your lab apron.
2. Cut 3 paper cups so that each is only 3 cm deep. Do Not cut the bottom out of the cups.
3. Label each cup A, B And C
4. Fill each cup half full with water
   Part A
5. Add two heaping teaspoons of salt to the water in cup A
6. Stir the until most of the salt has dissolved
7. Add sand slowly to cup A until it almost fills the cup
8. Stir the sand and salt water together
9. Carefully pour out any excess water. Try not to spill out any sand
10. Set cup A in a place where it will not be disturbed for 24 hours
11. Make a hypothesis.

What do you think you will observe when you look at Cup A in 24 hours?

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1. Record your initial data for cup A
   Part B
2. Add one teaspoon of Plaster of Paris to the water in cup B and stir until mixed
3. Add a mixture of half sand and half pebbles to cup B.
4. Mix well. DO NOT POUR ANY EXCESS PLASTER OF PARIS IN THE SINK. It could permanently seal the pipes closed
5. Set cup B in a place it will not be disturbed for 24 hours
6. Make a hypothesis
   What do you think you will observe when you look at cup B in 24 hours?
7. Record your initial data for cup B
   Part C
8. Pour sand into cup C until it almost fills the cup
9. Stir well
10. Carefully pour out any excess water and place pebbles on top of the wet sand
11. Set cup C in a place where it will not be disturbed for 24 hours
12. Make a hypothesis.
    What do you think you will observe when you look at cup C in 24 hours?
13. Record your initial data for cup C
14. Observe the samples in cups A, B and C the next day. Use a hand lens
15. Record your findings for cup A , B and C

Observation Questions:

1. What has happened to the saltwater and sand in cup A? The water evaporated leaving behind salt crystals on the surface of the sand and on the side of the cup. The sand stuck together if you did not touch it too hard or too much. It was like a sandcastle that you build with a bucket at the beach.
2. What type of sedimentary rock would the material in cup A represent? Explain why. The sand is made of little pieces stuck to together so it would be detrital some students will say it is compacted because they squeezed out the water. While others may say the salt crystals are holding the sand together and it is cemented..
3. What has happened to the mixture in cup B? The Plaster of Paris should have gone through the spaces in between the pebbles and cemented the rocks into a conglomerate.
4. What type of sedimentary rock would the material in cup B represent? Sample B is a conglomerate.. Explain why. A conglomerate is a type of sedimentary rock where rounded pebbles have been held together with natural cement like calcium carbonate, silica or iron oxide.
5. What has happened to the sand in cup C? The sand in cup C got wet and dried and fell out of the cup in chunks as sand.
6. What type of sedimentary rock does the material in cup C represent? Cup C would contain a detrital compacted sedimentary rock. It is very weak or fragile. Explain why

Analysis Questions:

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1. Which cups show the process of compaction? Cups C and perhaps A.
2. Which cups show the process of cementation? Cups B and perhaps A.
3. What material forms the natural glue or cement in each cup? Plaster of Paris in cup B and salt in cup A
4. Which cup formed a conglomerate? Explain why Cup B had rocks glued together so it was a conglomerate.
5. Which cup formed the strongest sedimentary rock? Explain why? Cup B. Refer to their handling the samples for their explanations.
6. Why are all the rocks in this lab classified as detrital sedimentary rock? All were made of pieces glued together.
7. Explain why clay might work better than sand the in cup C part of this experiment? Clays stick together.

Follow-up: Take an empty, clean, clear 1 liter plastic soda bottle. Mix an equal amount of Plaster of Paris (by weight) to sand, fine gravel, and pebbles. Add layers of each mixture into the liter bottle. Add seashells to one or two of the layers. Fill the layered container with water. Observe the next day and relate what you observe to the formation of sedimentary rocks on Earth. Use a layer of shells if you want the shells to be easily observed. You may cut off the top of the bottle to make it easier to pour in each sediment layer. Students may calculate how much of each material they will need to fill their strata. Do not inhale the plaster of Paris dust and do not discard any leftover Plaster in the sink. Use disposable mixing containers and stirring sticks. Popsicle sticks and cleaned out plastic food containers work well.

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