

Processing: Chemical Reactions

Lab Manual – Gr. 7-8

Part 1: Sort a Mixture

Materials:

- Soil sample
- Sifters
- Vinegar dropper bottle
- Water
- Glass container

Personal Protective Equipment:

- Goggles
- Gloves

You have a soil sample which contains waste, called tailings, from a mine site which is extracting limestone. Large slabs of limestone can be sold, but in order to reduce waste, smaller samples of limestone are going to be extracted from the tailings and processed into lime. That lime will be used to restore the soil when we move on from this mine site.

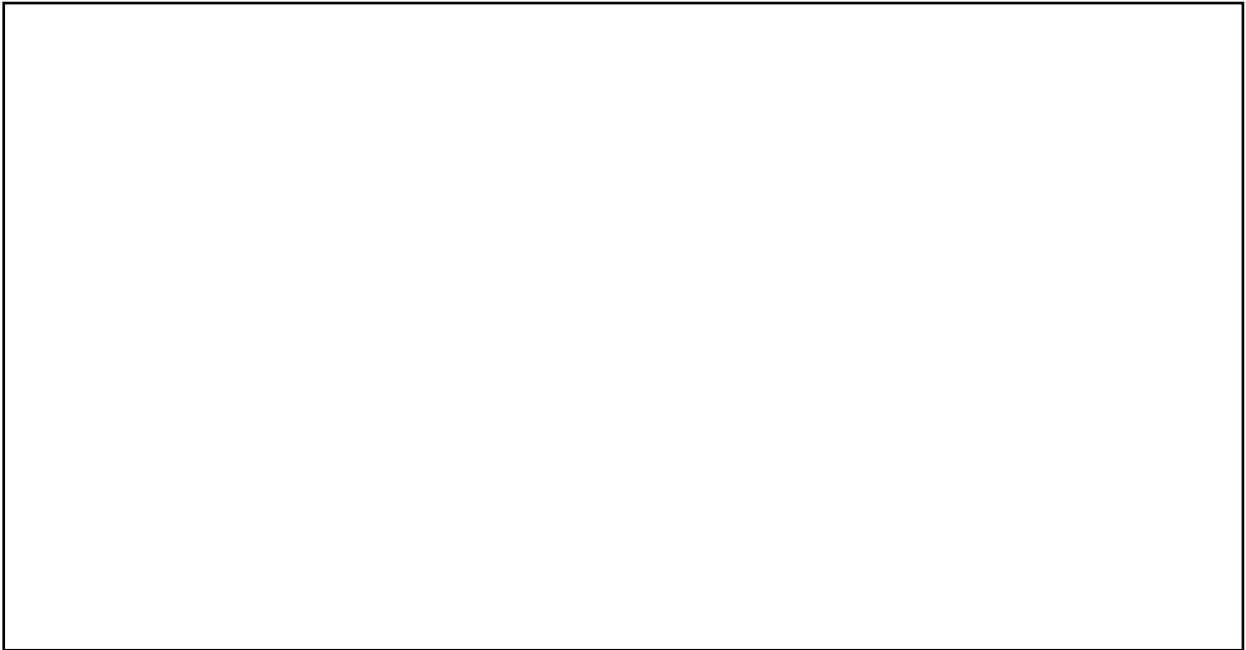
Your first task is to sort the limestone from the tailings.

1. What safety equipment do you need to wear?

2. Is your soil sample a pure substance or a mixture?

3. Is your soil sample a heterogeneous or homogeneous mixture?

4. Draw a diagram of your mixture, labelling what you see in it to the best of your ability.



Steps:

5. Given the materials available to you, how could you separate this mixture? Explain your reasoning.

- A. Put your sifter over your container.
- B. Pour your soil sample into the sifter.
- C. Wiggle and bounce your sifter until the soil has all been sifted out.

6. What do you observe in your sifter? Draw your observations.



7. Have you completely separated this mixture? How can you tell?

D. Discard your soil in the compost.

E. Rinse your container clean.

F. Put your remaining rock sample in the class container and rinse them clean.

8. What is left in this mixture?

We need to figure out which rock is limestone, and which is just rock. Limestone is usually:

- Grey, white, yellow, or brown
- Soft (can be scratched easily)
- Reacts with acid

G. Scratch rocks against each other to test their softness.

H. Separate the ones you think are limestone.

I. On each pebble you predict to be limestone, drop a single droplet from your vinegar dropper bottle.

J. Test each pebble. If it reacts with the vinegar, it is limestone.

K. Sort your limestone and your pebbles into two separate piles.

L. Discard the pebbles outdoors.

9. What happens when vinegar touches limestone?

Part 2: Refine the Product

Materials:

- Vinegar
- Glass container
- Limestone sample
- Stir stick
- Indicator

Personal Protective Equipment:

- Goggles
- Gloves

We still need to process our limestone into lime. We already know that limestone reacts with vinegar. That reaction produces carbon dioxide (CO_2), water (H_2O), and lime ($\text{Ca}(\text{CH}_3\text{COO})_2$).

1. Define a solution.

2. Which products of this reaction do you predict will form a solution?

Steps:

- A. Put a pebble of limestone into your glass container.
- B. Fill the glass container with enough vinegar to cover your pebble.
- C. Leave overnight to dissolve.

3. Was your prediction accurate? How can you tell?

-

Part 3: Isolate the Product

Materials:

- Glass container
- Hot plate
- Lime solution

Personal Protective Equipment:

- Goggles
- Gloves

The lime has been refined from limestone, but it is still in solution, which means it is dissolved in water. We want our lime to be in a solid state. That means there is one step still left in the processing phase.

1. How might a substance be taken out of solution? Explain your reasoning.

Steps:

- A. Plug in and turn on the hot plate.
- B. Put your glass container with the lime solution in it on the hot plate.
- C. Bring your lime solution to a boil.
- D. Let it boil until there is a thick slurry in the container.

Without more specialized equipment, we cannot completely dry the lime solution. The final step would be to put our slurry in a dehydrator for many, many hours. At that stage, we would have a fine powder.

2. What might some intended and unintended consequences be of the ways mixtures are separated in the mining industry?

Congratulations! We have produced lime powder which our mine can use in order to restore the soil when our operations are done.