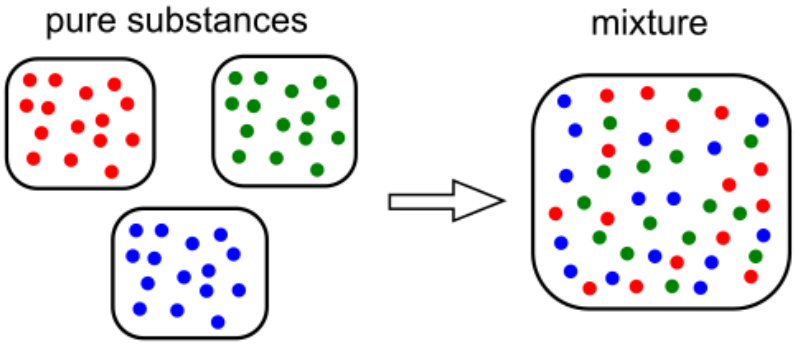
Separating Mixtures: Teacher version



- A **mixture** contains several materials whose molecules are not bound together.
- Mixtures can be separated by physical processes: filtering, dissolving, evaporating, without any chemical reaction needed.
- The amount of a substance can be measured by mass (how heavy it is, in grams) or by volume (how much space it takes up, in milliliters).

Part 1: Make a Mixture (use 1 bowl for the group)

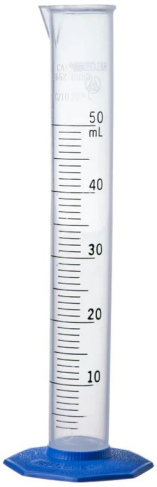
1. Pour the iron filings into the left tray on your scale.
2. Use standard masses and the slider to find the **mass** of the iron filings.

Starting **mass of iron filings**: ___~30_____ g
Then pour the filings into your bowl.

3. Now measure the **mass** of rice in your baggie. Add the rice to the bowl.

Starting **mass of rice**: ___~20_____ g

4. Use the graduated cylinder to measure the **volume** of salt in your baggie. Then add the salt to the bowl.



Starting **volume of salt**: ___~20_____ mL

5. Use the graduated cylinder to measure the **volume** of sand you have. Then add it to the bowl.

Starting **volume of sand**: ___~30_____ mL

6. Mix up everything in your bowl to create a mixture!

Part 2: Purify Components of a Mixture

1. Discuss: Which equipment can you use to separate out which components? Match them below:

Sieve	iron filings
Magnet	rice
Coffee filter	sand

2. Purify out the rice using the sieve. The rest of your mixture should go through the sieve into the large cup. Use the scale to measure how much rice you got out.

Mass of purified rice: ___~20_____ g
Did you get out a similar amount to what you put in? Yes / no (should be close)

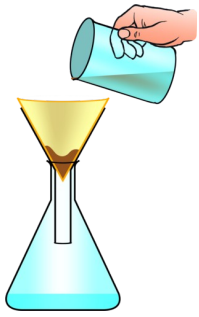
3. Keep the magnet in its baggie. Wave it over the mixture to get the iron filings to jump up. Hold them over a separate cup and reach in the baggie to dislodge the magnet and make the filings fall into the cup. The magnet should never directly touch the iron filings!

Note: for this step, you can split the mixture into multiple cups or bowls so that several students can use their magnets at the same time.

Mass of purified iron filings: __~30_____ g
Did you get out a similar amount to what you put in? Yes / no

If you got more or less than expected, discuss why.

- If purified mass is too small: point out there may still be a few filings left in the mixture (or spilled on table)
- If purified mass is too big: point out there may be some sand that got tangled up with the filings. To improve purity, one can repeat the process with the magnet on the nearly-pure filings.



What is in the remaining mixture? _____sand and salt_____
What volume do you expect the remaining mixture to have? ___~50_____ mL
(sum of the sand and salt volumes put in)

4. Use the graduated cylinder to measure the volume of the remaining mixture.
Measured volume: _____ mL (this may be less than 50 mL if you lost some during the magnetic pull-out)

5. Pour remaining mixture into a single bowl. Add 50mL of water and stir.

The salt **dissolves** in the water, breaking up into individual sodium and chloride atoms. Dissolved materials can pass through a paper filter.

6. Put a coffee filter into the funnel and pour your wet mixture through it.

7. Measure the volume of the sand that remains in the filter. Does it match your original sand volume?

Volume of purified sand: _____~30_____ mL

Will likely be smaller than original because some sand is lost in the magnetic pullout, stuck on the filter, etc.

Discuss:

- Why do you think finding the mass of the purified sand would not be an accurate way to measure how well your purification worked?

When we put it in, the sand was dry. Now it is wet. The same amount of wet sand would weigh more than dry sand because of the extra water attached to it.

- Where is the salt? If you had lots of time (or access to a stove), can you think of a way to get the purified salt out?

The salt is in the 'purified' water that went through the coffee filter. You could dip a finger in it and taste a drop to be sure it is very salty (not recommended to drink too much of it as there may be some impurities left from the iron).

To get out the salt, you could boil the water, or let it evaporate slowly. The water would turn into gas and the salt would be left behind.