

# A Soluble Separation Solution

M1-13 PHYSICS

# Question

- Will five coffee filters do a better job separating sand and salt than only one coffee filter?

# Abstract

- When I started this experiment I wanted to find out if I could separate salt and sand without sifting through grains of salt and sand. I used the method provided in the “Materials and Procedure” section of this document. The Purpose of the experiment was to show people how to separate sand on the beach and natural salt deposits or if someone accidentally mixes them and wants to un mix them without having to sort through each grain. My Hypothesis was “If I use five coffee filters instead of one, the salt and sand will separate. The coffee filters will filter out more of the heavier material leaving the lighter material to pass through the filters.” My hypothesis was incorrect because the greater amount of coffee filters made it harder for anything to pass through and get filtered.

# Hypothesis

- If I use five coffee filters instead of one, the salt and sand will separate. The coffee filters will filter out more of the heavier material leaving the lighter material to pass through the filters.

# Materials

- Strainer
- Salt (60 mL)
- Sand (60 mL)
- Glass canning jars with lids
- Water
- Measuring cup (100 mL volume)
- Pot
- Spoons (2)
- Coffee filter
- Funnel
- Oven mitts
- Lab notebook

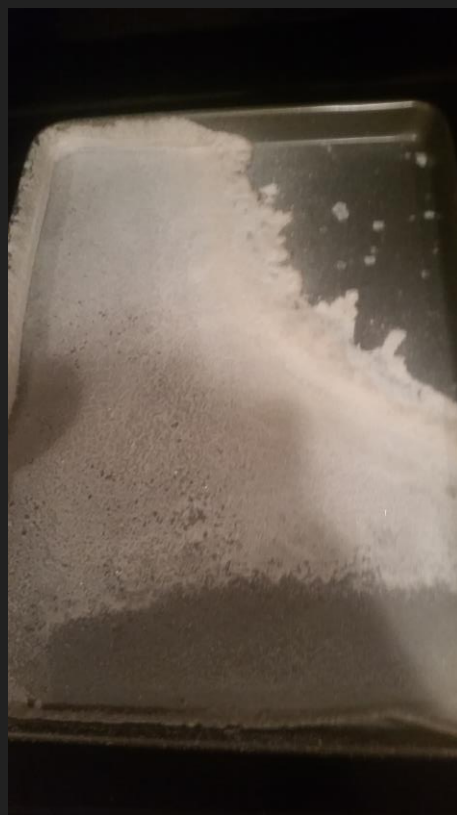
# Procedure

- Add 60 milliliters (mL) (or 1/4 cup) of salt, and 60 mL of coarse sand.
- Close the jar and shake so the sand and salt are mixed together well.
- Put pot on the stove and heat the water to boil
- Pour 120mL of boiling water into the jar of sand and salt mixture
- Stir
- Put the funnel in the jar then add the filter to the over the jar funnel
- Pour the solution in to the filter.
- Scrape off the excess salt and sand that didn't filter through and add it to the jar.
- Place both jars on the oven at 325 degrees Fahrenheit. (435.928K)
- When the water evaporates from jars let them to cool with the oven off.
- Use the measuring cup to measure the amount of salt and sand left in each jar.

# Procedure

- **Independent Variable:** The independent variable is the number of coffee filters used to separate the sand and salt.
- **Dependent Variable:** The dependent variable is the ratio of salt to sand from the different amounts of coffee filters.
- **Control:** The control is just a jar of mixed salt and sand to make sure that they don't separate themselves.

# Experimental Pictures



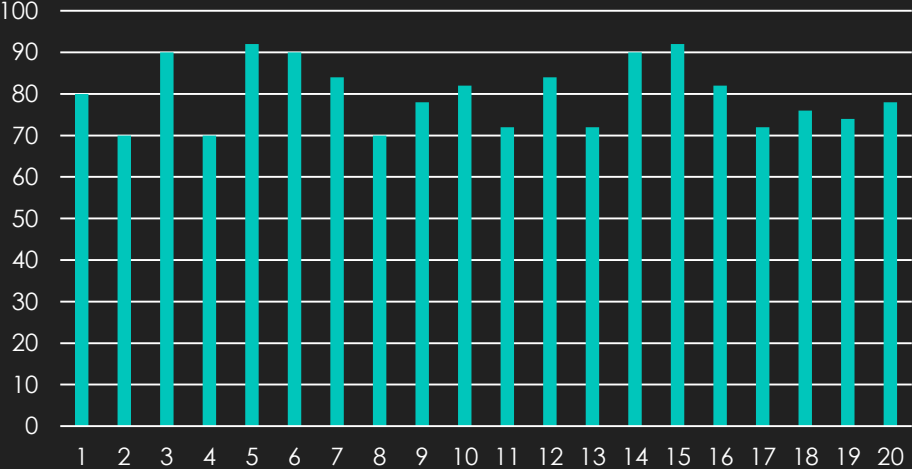


# Results (table form)

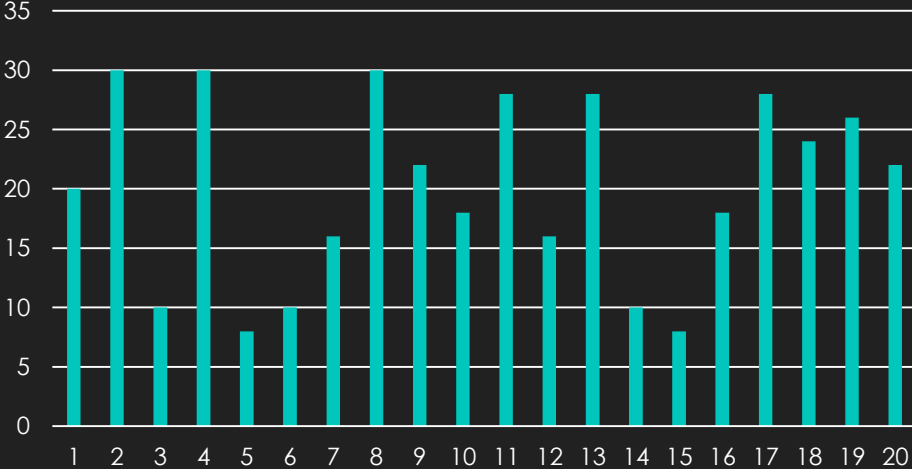
Trial	Filters	Salt Start (ml)	Salt End (ml)	% Recovered	% Lost
1	5	50	40	80	20
2	10	50	35	70	30
3	5	50	45	90	10
4	10	50	35	70	30
5	5	50	46	92	8
6	10	50	45	90	10
7	5	50	42	84	16
8	10	50	35	70	30
9	5	50	39	78	22
10	10	50	41	82	18
11	5	50	36	72	28
12	10	50	42	84	16
13	5	50	36	72	28
14	10	50	45	90	10
15	5	50	46	92	8
16	10	50	41	82	18
17	5	50	36	72	28
18	10	50	38	76	24
19	5	50	37	74	26
20	10	50	39	78	22

# Graph

### Salt Recovery Percentage



### Salt Loss Percentage



# Conclusion

- My hypothesis was not supported because the amount of filters doesn't matter. Dissolving happens at a molecular level which means no matter how many of my cheap coffee filters I used the results would be the same. The molecules are way smaller than the little holes in the coffee filters.

# Works Cited

- Chem4Kids.com. (n.d.). *Solutions and Mixtures*. Retrieved June 5, 2012, from [http://www.chem4kids.com/files/matter\\_solution.html](http://www.chem4kids.com/files/matter_solution.html)
- Chem4Kids.com. (n.d.). *Evaporation of Liquids*. Retrieved June 5, 2012, from [http://www.chem4kids.com/files/matter\\_evap.html](http://www.chem4kids.com/files/matter_evap.html)
- BBC. (n.d.). *Compounds and Mixtures - Separating mixtures*. KS3 Bitesize. Retrieved June 5, 2012, from [http://www.bbc.co.uk/schools/ks3bitesize/science/chemical\\_material\\_behaviour/compounds\\_mixtures/revise9.shtml](http://www.bbc.co.uk/schools/ks3bitesize/science/chemical_material_behaviour/compounds_mixtures/revise9.shtml)
- "How Much Sea Water Can I Safely Drink?" *Safety*. N.p., n.d. Web. 21 Sept. 2016.
- "Rules for All Projects." *Student Science* N.p., n.d. Web. 25 Aug. 2015. <[https://student.socletforscience.org/rules#ill#projects%20\(^Intel ISEF rules for all projects^\)](https://student.socletforscience.org/rules#ill#projects%20(^Intel%20ISEF%20rules%20for%20all%20projects^))>
- "Sand and Gravel." *Minerals Education Coalition*. N.p., n.d. Web. 13 Sept. 2016.
- "The Many Uses of Salt." *The Many Uses of Salt*. N.p., n.d. Web. 21 Sept. 2016
- "What Is Salt?" *What Is Salt?* N.p., n.d. Web. 13 Sept. 2016.
- "What Is Sand?" *LiveScience*. TechMedia Network, n.d. Web. 13 Sept. 2016.
- "What Is Water Used For?" *What Is Water Used For?* N.p., n.d. Web. 14 Sept. 2016.
- "Who Invented the Paper Coffee Filter?" *Coffee Detective*. N.p., n.d. Web. 14 Sept. 2016.