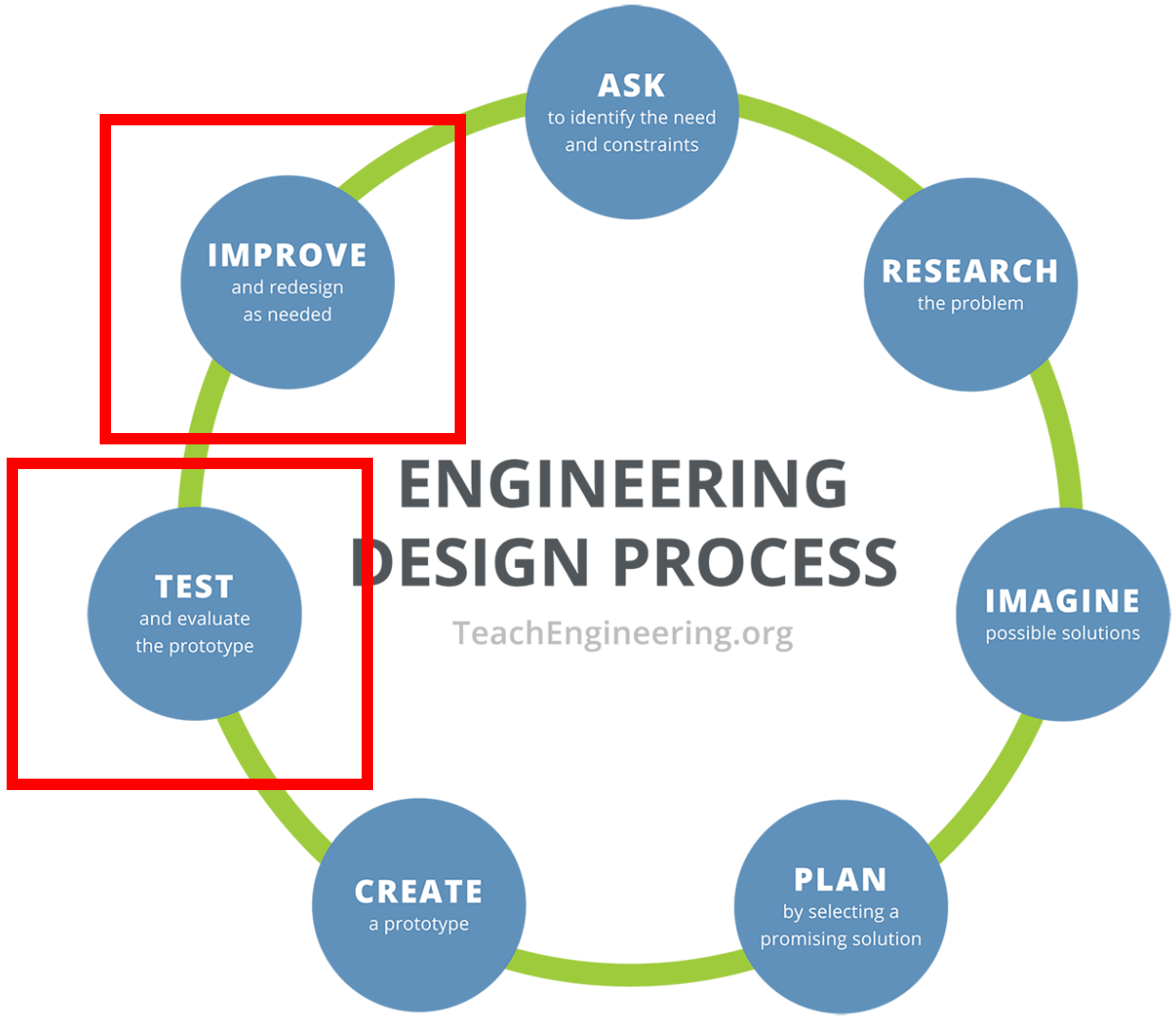
TeachEngineering

Mines to Mobiles: Aqueous Solutions and Environmental Chemistry

Day 4

DAY 4 (45 MINS)



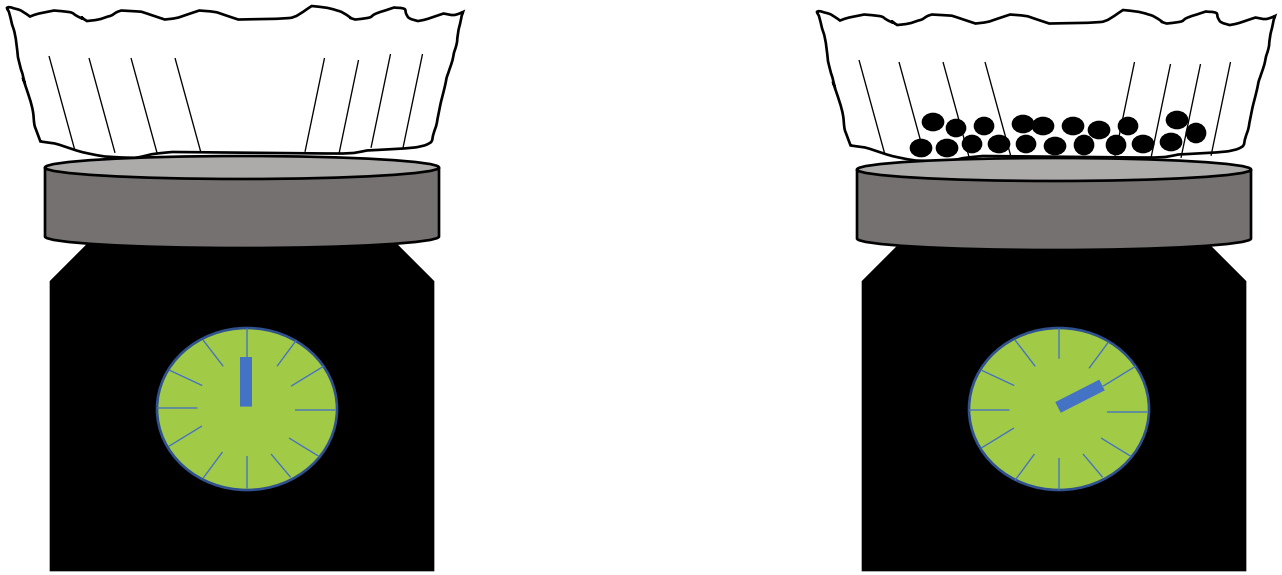
Teach Engineering

DO NOW

Go and weigh your pepper from yesterday!

Be sure to tare the scale with a fresh coffee filter before weighing your filtered pepper

The most pepper you should get is 3 grams. If you have more than 3 grams, you have water in your sample that did not fully evaporate.

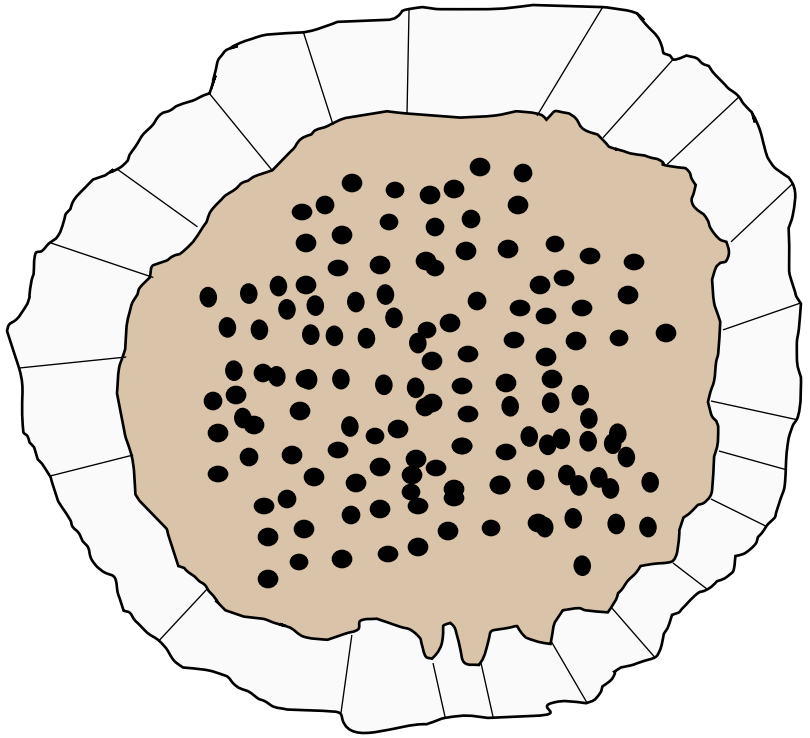


Taking the Mass of the Pepper

HOW WELL DID YOUR METHOD WORK?

On your "**Pepper Purification Plan**," record the amount of pepper you purified.

Check that there are **no salt or sugar solutes** in your pepper that were not dissolved.



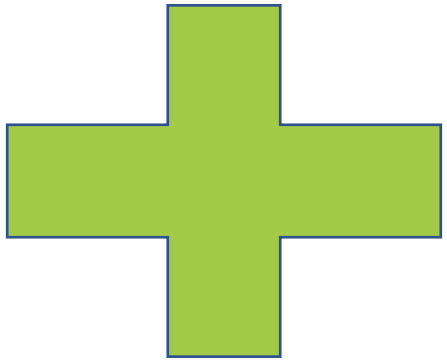
Dried Pepper in Coffee Filter

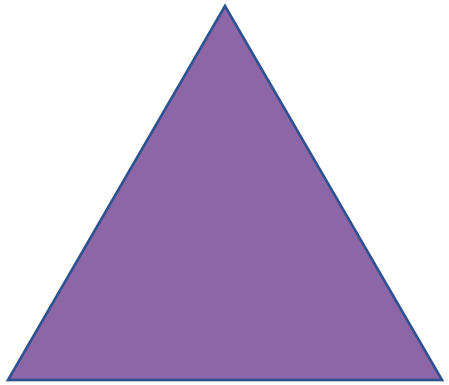
You should have gotten 3 grams of pepper (terbium).

PEPPER REFLECTIONS

Look back at *Question 7* with your group on the Pepper Purification Plan.

If you were to repeat this experiment today, mark any changes on your paper that would either expedite the process or help you extract more pepper solute.





ENGINEERING COMPETITION

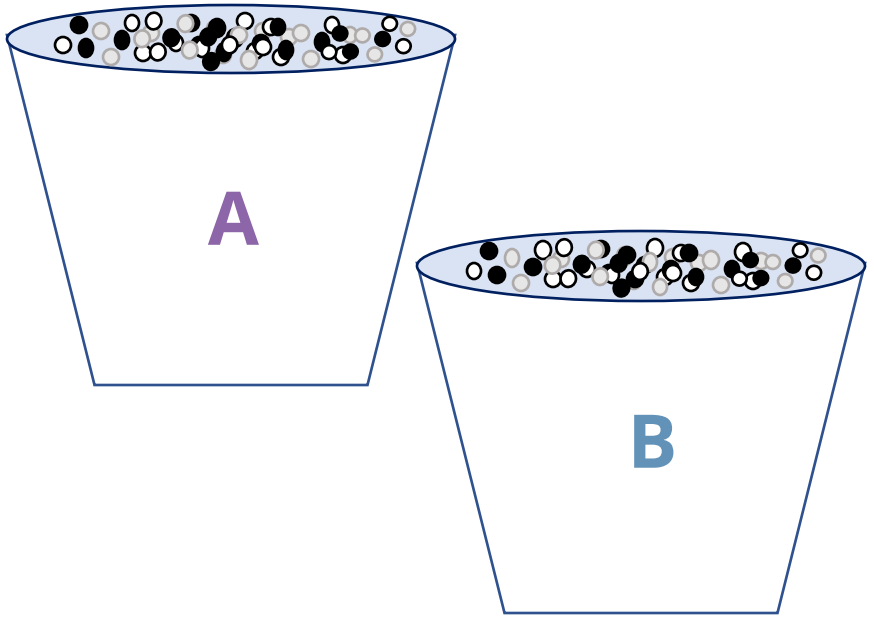
Now that you know how this will work, it's time for a competition!

Your lab group is an Engineering Startup trying to get hired by a larger government contractor to implement eco-friendly mining techniques.

You must propose a pitch to the government contractors to prove you can extract 3 grams of pepper from your metal shipment at the cheapest cost and with the least mess.

You are competing against the other Engineering Startups in the room to get hired for a $45 million terbium mining job in Mountain Pass, California.

The team that extracts all 3 grams of pepper the fastest and cheapest will get hired for the job and win the competition!



AB Shipments

You will have the same shipment as before.

CALCULATE YOUR TOTAL COST

Cost of Supplies and Labor				
Temperature	**Agitation**	**Container**	**Water**	**Mandatory Purchases**
Kettle Water - $10 for 25 mL	Straw - $4	250 mL beaker- $10	$5 for 25 mL	*Paper towel Per Clean Up - $1 per towel
Kettle Water - $20 for 50 mL	Coffee Stirrer/Popsicle Stick - $6	500 mL beaker- $20	$8 for 50 mL	*****Shipment of “metals” - $3
Kettle Water - $40 for 100 mL	Spoon- $10	1000 mL beaker - $30	$12 for 100 mL	*Coffee Filter - $1

Costs of Supplies and Labor Orange

CALCULATE YOUR TOTAL COST

Cost of Supplies and Labor				
Temperature	**Agitation**	**Container**	**Water**	**Mandatory Purchases**
Kettle Water - $10 for 25 mL	Straw - $4	250 mL beaker- $10	$5 for 25 mL	*Paper towel Per Clean Up - $1 per towel
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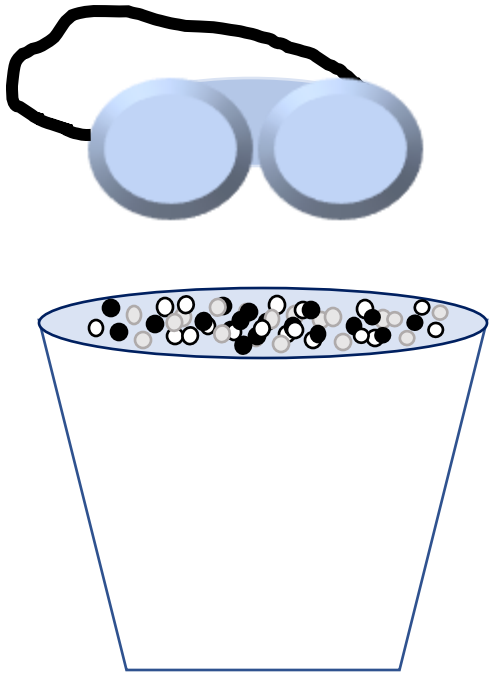
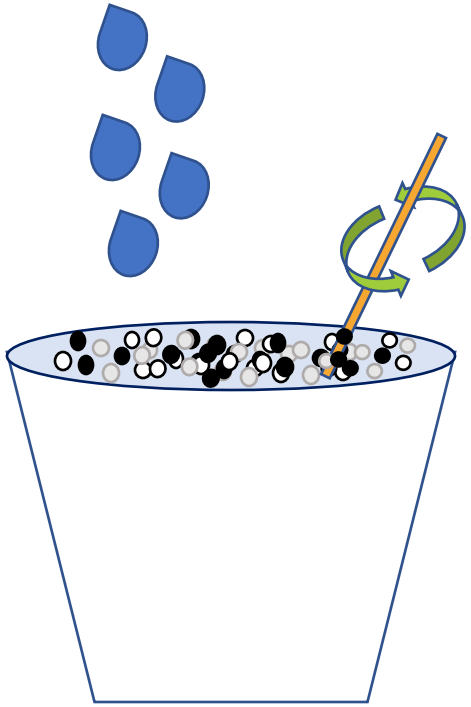
Costs of Supplies and Labor Orange

TEST YOUR BUDGETED PLAN

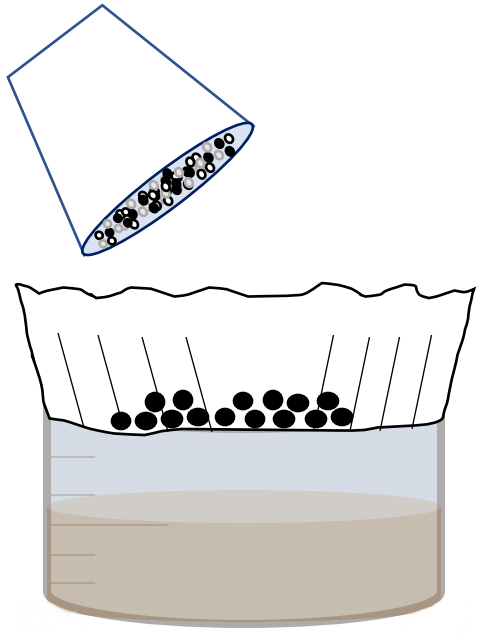
Put on proper safety equipment, and get your shipment from your teacher.



Add your water and dissolve your salt and sugar so only pepper remains.



Rest the coffee filter on top of another beaker/cup and pour your solution through it to filter out the pepper.

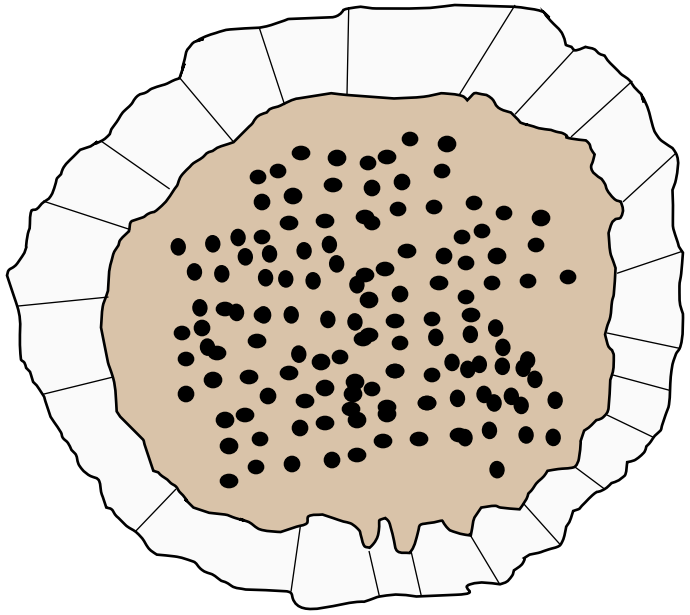


Purifying your Pepper

DRY THE PEPPER OVERNIGHT

Make sure the pepper is spread out as much as possible to allow all the water to evaporate!

If you have any excess water in your pepper, you will be *disqualified from the competition*!



Dried Pepper in Coffee Filter

Remember, the pepper represents the REE "terbium."

Be sure to add up any additional expenses you may have incurred in lab on your Budget Form.

Turn the Budget Form into your teacher after you have cleaned your lab station.

END OF DAY 4

Citations

- Ademski, E. (2025). *AB Shipments* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *Cost and Supplies Table* [Diagram]. Teach Engineering.
- Adem ski, E. (2025). *Cost and Supplies Table Orange* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *Dried Pepper in Coffee Filter* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *Purifying your Pepper* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *Taking the Mass of Your Pepper* [Diagram]. Teach Engineering.
- Teach Engineering. *NGSS Engineering Design Process* [Diagram].
- *TeachEngineering.Org*, https://www.teachengineering.org/populartopics/designprocess. Accessed 24 June 2025.