Working Draft

Due Date: February ?th, 2022

| FEMMES Winter 2022 - ChEGS |
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| Title | “Magnetic Dirt” |
| Description | In this hands-on experimental exploration, students will be introduced to the concepts of separation technologies, a building block of the chemical engineering profession. Students will first learn from volunteers a bit about the chemical engineering profession and what questions chemical engineers care about. Shortly after, volunteers will explain the concepts behind chemical and physical separations and how chemical engineers use these to mass-produce chemicals (e.g., vaccines, plastics, food, etc.) After explaining a couple of examples of separation technologies and how they are used, students will transition to the experimental activity. Ideally, there will be two volunteers leading the activity: the lead and the experimentalist. The experimental activity will consist of precipitating iron from soil. This type of separation is similar to “electrostatic precipitation”, which is a useful separation technique used as treatment to recover metals. |
| Learning Goals | * Understand the chemical engineering field and what chemical engineers do
* Understand what is a separation technology/process
* Differentiate between physical separations vs chemical separations
* Recognize separation processes in our daily lives
* Use an electrostatic precipitation technique to separate iron from a mud mixture
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| DEI learning component | * Separation technologies have increase the availability of resources to impoverished communities around the world (specially wastewater treatment separations)
* Extracting vitamins to make fortified foods (eg flour) for low income communities
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| Delivery | 1. Chemical engineering profession (2 mins)
2. Separation as a unit operation (this means that is ubiquitous to many things we do, we just group it as specialized idea) (2 mins)
3. Physical separations + real life examples (3 mins)
4. Chemical separation + real life examples (4 mins)
5. Separation as tool to solve challenging problems of this century like water and food supplies (water-energy-food-nexus) (4 mins)
6. Experimental Activity (30 mins)
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| Materials | 1. Soil - Fluval Stratum Aquarium Soil
2. Water
3. Plastic water bottles
4. Neodymium Magnet
5. Paper towel or sheet of paper (for visualizing the black fillings of iron)
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| Amazon List for Materials | Clear Plastic Bottles - 1 for each student[https://www.amazon.com/SUPERLELE-Reusable-Disposable-Containers-Beverages/dp/B07V6W4W1T/ref=sr\_1\_12?keywords=Plastic+Bottles&qid=1643141789&sr=8-12](https://www.amazon.com/SUPERLELE-Reusable-Disposable-Containers-Beverages/dp/B07V6W4W1T/ref%3Dsr_1_12?keywords=Plastic+Bottles&qid=1643141789&sr=8-12)Neodymium Magnet - 1 for each student[https://www.amazon.com/16PCS-Super-Strong-Neodymium-Magnets/dp/B08CXRVRWH/ref=zg\_bs\_1265130011\_1?\_encoding=UTF8&refRID=4VQJ29ZR1CGJQ7C9XSES&th=1](https://www.amazon.com/16PCS-Super-Strong-Neodymium-Magnets/dp/B08CXRVRWH/ref%3Dzg_bs_1265130011_1?_encoding=UTF8&refRID=4VQJ29ZR1CGJQ7C9XSES&th=1) Fluval Aqua Soil - about 15 g or 2 tbsp in small Ziplock bag[https://www.amazon.com/Fluval-Plant-Shrimp-Stratum-4-4-Pound/dp/B00JGQIY48/ref=asc\_df\_B00JGQIY48/?tag=hyprod-20&linkCode=df0&hvadid=167149786275&hvpos=&hvnetw=g&hvrand=7628762018153837045&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9016853&hvtargid=pla-316086452057&th=1](https://www.amazon.com/Fluval-Plant-Shrimp-Stratum-4-4-Pound/dp/B00JGQIY48/ref%3Dasc_df_B00JGQIY48/?tag=hyprod-20&linkCode=df0&hvadid=167149786275&hvpos=&hvnetw=g&hvrand=7628762018153837045&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9016853&hvtargid=pla-316086452057&th=1)<https://www.amazon.com/Ziploc-Snack-Bags-280-Count/dp/B00U9ZFFCY?th=1> |
| Procedure | 1. Using the ziplock bag, crush the soil lightly with hands (or a solid object)
2. Move the soil to one part of the ziplock bag.
3. Drag magnet over dry soil in ziplock bag - observe how chunks of dirt follow the magnet
4. Place dirt in bottle, fill bottle halfway with water (preferably warm)
5. CAP/COVER BOTTLE. Shake bottle to help further break up soil.
6. Place magnet on outside of bottle, rotate around bottle slowly to catch all the iron
7. Slide magnet along bottle to top of bottle, should be able to see small iron bits - not the iron is fully free from the dirt
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