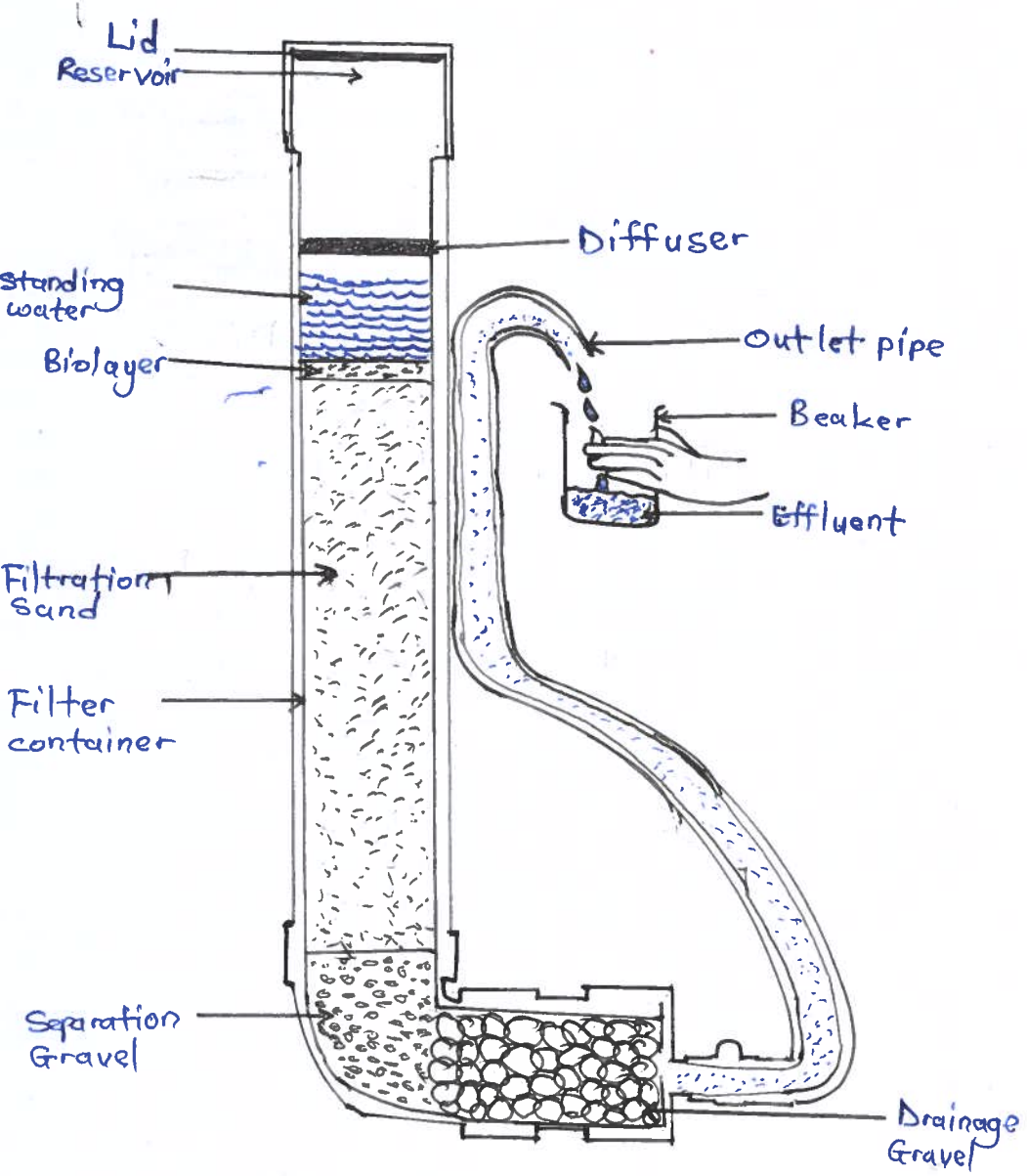
COMPONENTS OF BIOSAND FILTER



THE PURPOSE OF EACH COMPONENT AND DESCRIPTION OF A BIOSAND FILTER

A biosand filter is a technology that purifies dirty water for it to be safe for consumers. The BSF for short removes micro-organism and particles in the water. It removes about 99% of pathogens from the water. This is done by the components in the BSF. Below are some components and their purpose in the BSF.

1. LID: The lid prevents contamination and entry of unwanted pests.
2. Reservoir: It holds water poured during charging.
3. Diffuser: It is used to avoid disturbing the ~~the~~ top sand layer and protects the biolayer from damage when water is poured into the BSF.
4. Standing water: It keeps the biolayer wet and nourished. It is needed because without it, the good microbes in the biolayer will die.
5. Filter container: It houses the sand and the gravels.
6. Biolayer: It contains microbes which produce sticky slime layer that helps to trap bad bacteria.
7. Drainage gravel: It stops the small gravels from moving.

8 Filtration sand: It is the critical part of the set up that helps remove pathogens and small particles.

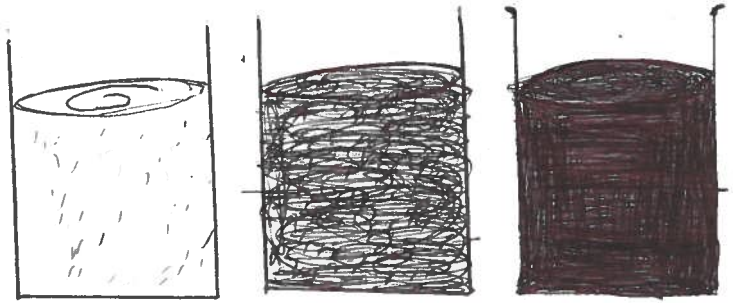
9 Separation gravel: It stops the sand from moving down and blocking the outlet pipe.

10 Outlet pipe: It serves as the passage way for the clean water (Effluent) to come out.

11 Beaker: It is used to collect the clean water that comes out of the set-up.

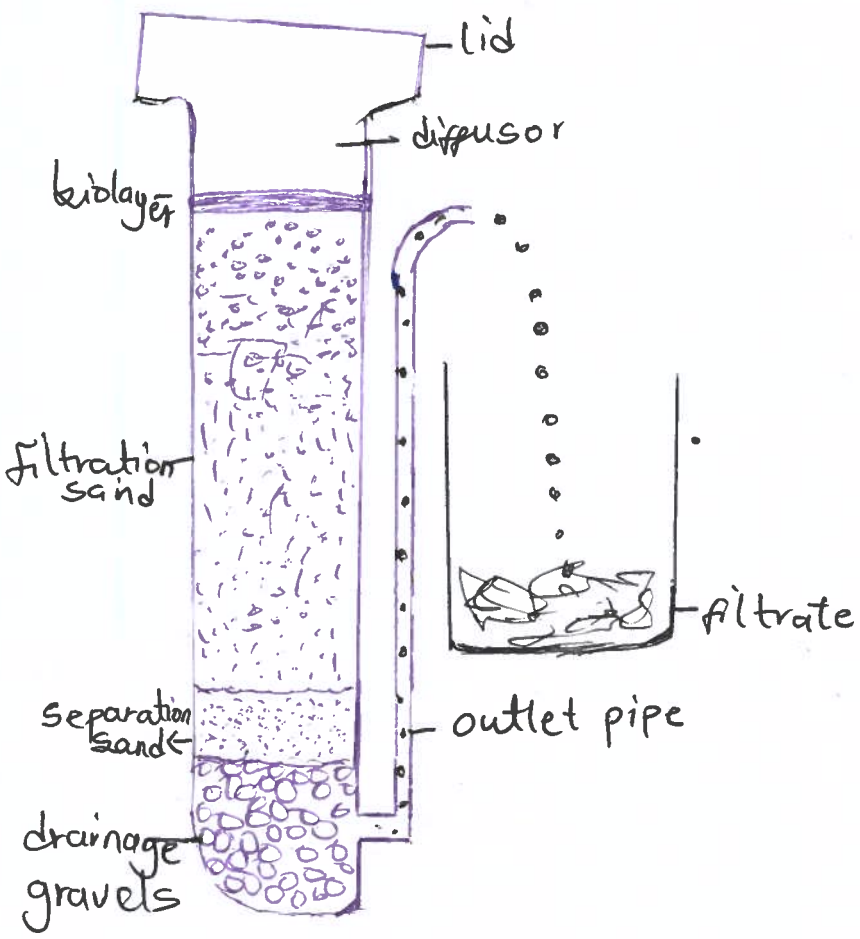
12 Effluent: It is the water that comes out of the outlet pipe.

TURBIDITY



Turbidity is the measure of the cloudiness of water. The higher turbidity, the difficult it is to see through the water. It is measured in nephelometric turbidity units (NTU). In testing turbidity of the water you can use the turbidity tube or the seechi tube. If water appears muddy, its turbidity has reached at least 100 NTU. At 2,000 NTU, water is completely opaque. It consists of a number of substances. Mud, silt, sand, small pieces of dead plants, bacteria, aquatic organisms, algae and chemical precipitates all contribute to turbidity. Also note that, the lower the NTU of the water the cleaner or safer it becomes for people to drink.

GROUP DESIGN



RESEARCH QUESTIONS

① How does the filtration sand affect the influent in the biosand filter.

② How does the biolayer ~~affect~~ the flow of water into the biosand filter.

③ How does the separation sand affect the filtration sand and the drainage gravels in the biosand filter.

④ How does the biolayer affect the pathogens in the biosand.

HYPOTHESIS

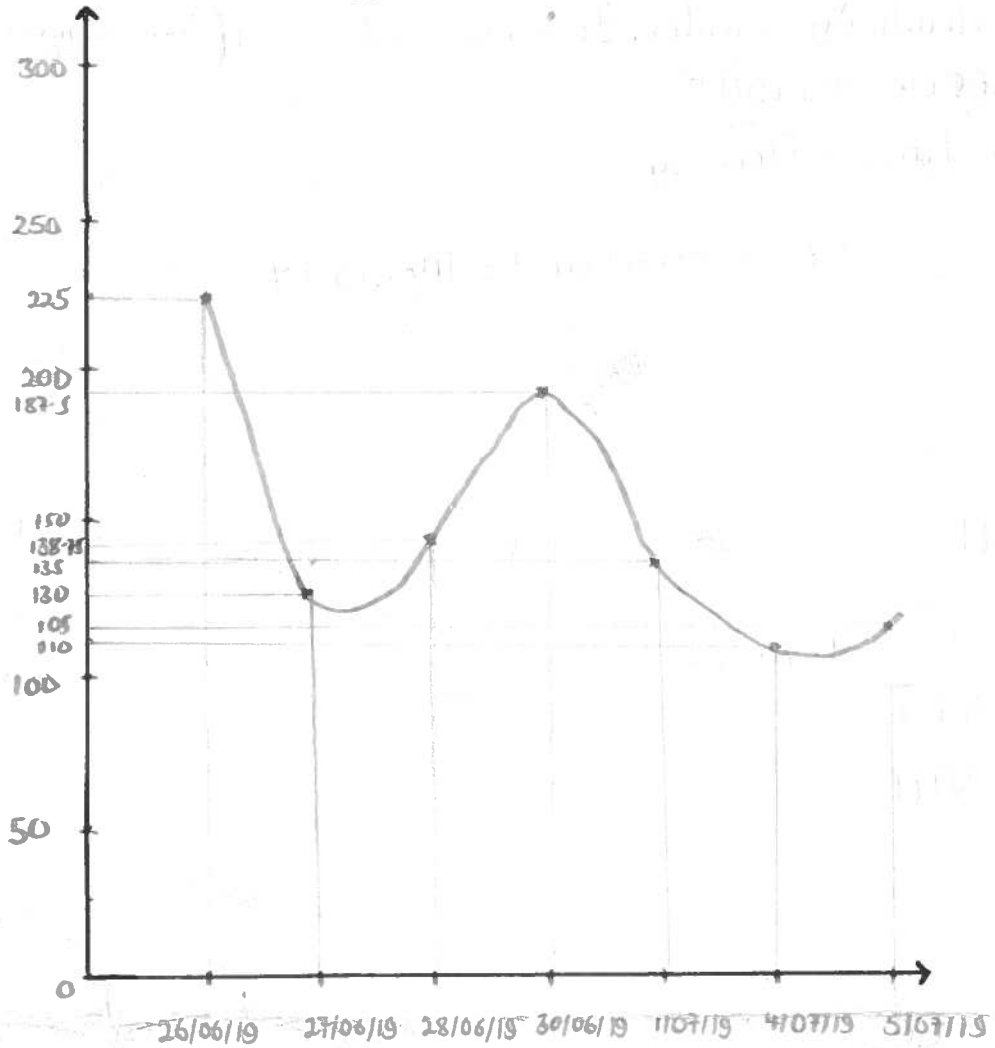
① I think that when we add more filtration sand into the biosand filter, so that it would be able to trap more of the pathogens.

② I think when we increases the grade of the gravels it with create large ~~pores~~ so that the water flowing from the filtration sand will have a high flow rate.

③

DATA COLLECTION

FLOW RATE



You can see from the flow rate chart that, it is measured in 3min/ml From 26th of June, the rate at which the water flows was faster than the other dates. Due to this graph, I got to know that the biolayer was forming. The effluent coming out day in and day out are clean but not crystal clean.

TURBIDITY

Is the measure of the cloudiness of water. It is measured in NTU (Nephelometric Turbidity Units)

CAUSES OF TURBIDITY

- Erosion - Water Discharge - Flooding

USING THE WATER BOTTLE IN CHECKING THE TURBIDITY

Influent

8cm = 185NTU

Effluent

25.5cm = 30NTU

USING THE TURBIDITY METER

Influent: 68.8NTU

Effluent: 23.5NTU

E-COLI

E-coli means Escherichia coli.

X'tics of E-coli.

- ✓ It is rod-shaped
- ✓ It can be harmful
- ✓ It is found in the lower intestine of warm-blooded.

Agar is a food that helps the bacteria to grow and is jelly in nature.
From our experiment, we had the following figures in the table.

50ml		100ml
1 Influent = 139	× 2	= 278
1 Effluent = 2	× 2	= 4
2 Effluent = 1	× 2	= 2
3 Effluent = 0	× 2	= 0
4 Effluent = 6	× 2	= 12

5th JULY, 2019.

CONCLUSION.

In Ghana, water portable for us to drink is 0.5% ~~is~~ for us to drink. On that 0.5% millions of people depends on it for drinking, washing, bathing and cooking. But we found ourselves with less water. So our team which is Parcipatory Action Research (PAR) we decided to see if we could help make our dirty water clean and portable for use. So on our first meeting we did our experiment using water in the process some water spilt on the ground. So we were all discussing about how to make water clean when it becomes dirty or unclean. So we all rise about filtration at the first place. Filtration the process of removing the solid parts from a mixture, for example water or air, by passing it through a filter. So we did our filtration set-up using water bottles, grass, stones and muddy water so we did our setup but we did in groups so that we can get different answers and different conclusions. Some groups got their muddy water clean other got some with particles all because of the way they placed their material so through that experiment we ~~has~~ thought about Sedimentation process, alum, BSF and adding chlorine tablet. So we all decided to test the BSF. We then decided to build the BSF. Our participant brought all the things we needed to build our biosand filter. Before that we talked about BSF and sources of water in Kumasi. We learned 3 sources. That is surface where we get rivers and Lakes, ground water where we get unconfined aquifer and confined aquifer, alternative sources where we get grey water, rainwater harvesting, Desclinated water. When building our BSF as group one ours were set as the control.

	①	②	③	④
Sand	1mmL	1mmL	1-1.4mix	1mmL
Medium	2-4mix	2-4mix	2-4mix	2-4grade
Coarse	6.3-10mix	6.3-10mix	6.3-10mix	6.3
Charge	1L	2L	1L	1L

This is the measurement given to every group to make the biosand filter for us to see if indeed if it can help purify muddy/unclean water. With the BSF we have the drainage gravel which goes first when putting the think in the BSF which we used a pipe. It prevents sand from entering the water and also help the water to flow. The second on the drainage gravel is seperating sand, then comes the filtration sand. We learnt about the biday er which develops on the top of the sand. It develops over time. When the bislayer grow too much, the flow through the filter. After building our biosand filter we need to charge it for us to see if ~~our~~ us to see if our biosand filter is really working. Because us was serving as the control so we will use 1L of muddy to charge it. one our first charge we did not get clean water so ~~clean~~ we assumed that because we didnt wash our stones that brought the bacteria back to the water. So when we continued charging it we found our water being clearer and clearer again. The steps we usually use to charge everyday is, first collect water, stir and collect water in bottle that is as group one we use 1L, we gently pour into the BSF, we remove the lid before we gently pour. Catch water in another container in 3minutes, measure the amount collected, calculate flowrate, record data. We usually go through these steps before we charge our BSF everyday. We also learned about E. Coli which ~~is~~ means Escherichia coli. The bacteria feeds on the food that is the agar. We use chromocult in see if the bacteria feeds more on the effulent or influent. And with our influent we found out that they feed more than the effuleunt and with our effuleunt we find our bacteria one and with the affuleunt we find more than 20 bacteria feeding on the agar. And with our flowrate we used 3minunites we got 225mL, medium we got 187.5 for the same 3 minutes, and we got 105ml for the same 3 minutes and for 4minutes we got 300mls, 1min 75mls and 1 sec

1·25m/s. We also talked about fecal indicator is use to check for fecacal matters in water. Turbidity means the measure of the cloudiness of water. Using bottle: Mark X on water bottle cap. Mark cm on water bottle. 3 Cut top of water bottle off. You start with your influent and after that your effulent. Using the bottle we got our influent to be 8cm = 185NTU, Effulent 25.5cm = 20NTU. Using metre influent = 68.6 NTU, Effluent = 23·5 NTU.

RECOMENDATION [TREATMENT STEPS]

A. TREATMENT STEPS FOR INFLUENTS:

1. Using filtration: Influents can be treated by using filtration method before treating them using other purification methods such as the Bio-Sand filter.

STEPS FOR THE USE OF FILTRATION METHOD:

(i) Make your apparatus such as beaker, separating funnel, filter paper, retort stand, ready.

(ii) Fix the set-up by putting the apparatus at their correct positions.

(iii) Pour the influent into the set-up through the separating funnel.

(iv) As the influent is passing through the set-up, the filter paper will trap the impurities before the influent gets to the beaker with the exception of bacteria and other and other impurities we cannot see with our naked eyes.

Note that, after ~~after~~ purifying the influent with filtration method, it might contain bacteria, so it might not be safe for ~~for~~ human consumption. In this case, we can make it safe using chlorine tablets.

2. Using the sedimentation method: We can treat our influents using sedimentation method before treating them with other methods such as addition of chlorine tablets etc.

STEPS INVOLVED IN THE USE OF SEDIMENTATION METHOD:

(i) With your apparatus such as beaker (Beaker "A" and "B").
(ii) Pour your influent into beaker "A".
~~(iii) Allow the suspended particles to settle beneath the beaker.~~
(iii) Wait for about 5 minutes or more to allow the supended particles to settle beneath the beaker "A".

(iv) Gently pour the water ~~into~~ in the beaker "A" into the beaker "B" leaving the suspended particles that have settled beneath the beaker "A".

(v) Now the water in beaker "B" becomes our clean water but it might not be safe for human consumption because, bacteria might be present in the water in the beaker "B".
In this case, we can add alum to the water to make it safe.

(B) TREATMENT STEPS FOR EFFLUENTS:

After influents have gone through methods of purification such as the use of Bio-sand filter, sedimentation, etc. come out as effluent, we can let the effluent undergo some processes (methods) such as boiling addition of chlorine tablets or alum to make it look clearer and very safe for human consumption. Details of such methods are as follows:

1. Addition of chlorine tablets: One can add chlorine tablets to effluents to make them very safe for human consumption.

STEPS INVOLVED IN ADDING CHLORINE TABLETS TO EFFLUENTS

(i) With the availability of chlorine tablets.

(ii) Measure the chlorine in the correct ratio with regards to the amount of the effluent.

(iii) Add the measured ratio of chlorine to the effluent.

2. By the use of boiling method:
Another way to treat our effluent is the boiling. Through boiling, bacteria will be removed and the effluent will be safe for consumption.

~~STEPS FOR BOILING EFFLUENTS:~~