

24: 8th_Science_Density_Main

Teacher: Could you pass these out? Thank you. As you get this paper, please put your name on it. Wait, where's ... Who sits over there? Oh yeah [Caitlin 00:00:17]. So three, three, three, three, three. [00:00:32] could you join Tyler's group today? Oh, wait. Nobody's there, right?

Student: Yeah [inaudible 00:00:37]

Teacher: Nobody's there? Can you join that group today? Thank you. Extras? [00:00:47]. Please put your name on it. [P2 00:00:52] do me a favor and put your group member's first name on there. "student", let's go. Are you guys nervous? Don't be. Did somebody just burp? Well, they've got to cut that out. Oh, god. name, group members.

So let's recap from yesterday. You learned about that word again. What's that word?

Group: Density.

Teacher: Density. So who wants to summarize for us what that word was all about? Go ahead, "student". Try it. [inaudible 00:01:45] The ratio of mass to what? [inaudible 00:01:50] To a substance. There's mass but there's also involving something other. What's the other thing that's equally important?

Student: Volume.

Teacher: Volume, right? It's a fraction ... A ratio of mass to volume. So density is the [00:02:00] amount of matter, a particle that's packed into a given area. You guys remember that? Into a given space. So a bowling ball compared to a beach ball, which one is more dense? Bowling ball, right? There's more stuff, particles packed into the bowling ball. Even though they have the same volume, there's more stuff inside of there. So, if you were to put those two in the ocean, what would happen to the bowling ball?

Group: Sink.

Teacher: It'll probably sink. It's way more dense than a beach ball. So in today's lab it is called, "Water Density." I talk about Italian dressing yesterday?

Group: Yes.

Teacher: Yeah, so I mentioned the layers? I showed you my fish tank?

Group: Yeah.

Teacher: With my sleeping fish up here, right? How they are formed? Well they are two different layers, and it is all based on what?

Group: Density.

Teacher: Density, right? These two liquids have different densities. One of them is more dense than the other, causing it to sink all the way to the bottom. So, today what you're going to go on that side, is you are going to be finding out, "Can water be more dense than water?" Yeah, confusing? Can water be less dense than water? So that's something to think about.

So what we're going to do now is we are going to transition over to the other side. Let's see, group three ... I want you to be ... You're going to go to table one, table two, table three, table four, table five, table six, seven, eight. Take your worksheet, take your pencil, find your table.

Like I mentioned earlier, you are doing a water density lab. Using the materials provided you will attempt to ... If you couldn't already notice. Did you guys notice that? The demo tank is up here, it's kind of weird looking. It's tilted at an angle, but this is a demonstration tank. So your goal today is to recreate it, and through that you're going to learn some things [00:04:00] about water. Now, "STUDENT" can you go eye-level with this thing and tell us what you see? So go eye-level with the water right here. You've got to kind of put your hand down a little bit, and tell us what you see.

STUDENT: It's a mixture of red and blue, and lighter layers in each color.

Teacher: So tell us what's ... What do you see on the bottom? Since they're layers, what's on the bottom? What do you see on the bottom here? Like a blue, do you guys see a blue too? What's above the blue?

Group: [inaudible 00:04:40] A purple one.

Teacher: That's white. We'll call it clear. Now what's on the top?

Group: Red.

Teacher: Red it on top. So what I have here in my demo tank is a series of layers. There are three layers of water. It's just water. You have red on top, you have clear in the middle, and you have blue sitting at the very bottom. Your job today is to recreate that setup using the supplies I will give to you. The first thing you are going to get is this container, and this wood block. The wood block is just to hold it up at an angle. So I'll show you what you're going to do. First thing you're going to do, is you're going to fill this up in the water. Do you want them to use that sink today or no? They can? No.

Student: [inaudible 00:05:22]

Teacher: So when you fill up this water, this is going to be your starting water every time, when you lean it up on the block, your kind of want to have a shore, some land on the top. Does that make sense? You want to have some dry area. That's going to help when you're pouring in your colors. So this is how you start it every single time, and you're going to get a cup, like this, that has measurements on it. It has 100ml as a top measurement. As you attempt to recreate this, you are going to be mixing things into

this cup. Let's say you're trying to make the red layer, [00:06:00] and there is a very specific process on how to do this. Now if I'm trying to create layers in my tub, would it be better to pour it in quickly, or slowly?

Group: Slowly.

Teacher: Slowly, obviously, you don't want to stir it all up. So you have to try to pour this on the shore line, as you call it, the dry area. So you're going to slowly pour it along, and it's going to keep going. You don't want to go very fast, like that, or it's going to stir it all up. Your goal is to create layers. You have to go slow. Do you see a layer forming in that one?

Group: No.

Teacher: No, because I did it wrong on purpose. Your goal is to make layers, not do this. If you make a mistake it is okay. We try, and we try again.

Let's look at the rules. Number one, use no more than 1tb of salt each time you make a layer. You are going to be given salt. As a group you are going to be given one of these containers of salt. You can use no more than 1tb. So if you're try to make, let's say, the red layer. How much salt is the maximum that you can put in?

Group: 1tb

Teacher: 1tb. So don't put more, it's just a waste. It's going to get stuck in the containers, just don't. Use one, that's all you need.

Number two, use only 3 drops of food coloring at a time. So no more than that. Three drops is more than enough to give you a blue colored water, or red colored water, so don't waste it. Number three, this is probably one of the more important ones. Only water from the beakers should be added to the tub. What that means is, let's say you're trying to create the red layer, you don't want to do this, you don't want to go, "Okay, I'm going to put red food coloring right in here." Because it says, "Only add water from the beaker." So you're going to put your water into here, whatever you want to do. Mix it, and then you pour it in like how I showed you. Remember that procedure? How to pour it in? So whatever you mix and you want [00:08:00] to put in that water has to go in the cup first, then you pour it in that way. Don't put anything directly into here. Do you think it's a good idea to stir this thing up?

Group: No.

Teacher: Do not do that, the worst thing you could do.

Last one, you're red layer, which is on top, do you think that's a greater surface area, or lesser surface area?

Group: Greater.

Teacher: Greater, so you're going to need more volume. So how much, how many ml of red water are you going to have?

Group: 100ml

Teacher: 100ml, so your cup is going to be this big. Some of your letters are going to be scratched out because these are old cups, but it's right about there. That's 100ml, and your blue is a smaller surface area on the bottom so you're going to have less. So how much ... How many ml of blue?

Group: 50ml

Teacher: You're going to have 50ml, which is about half way down. So anything you're making the blue layer, you're only going to put 50ml of water. Make sense?

Group: Makes sense.

Teacher: Now, you're going to get food coloring, these containers. You're going to get the teaspoons. The other two things I did not mention yet, were different types of water. ["student" 00:09:02] what kind of water is this?

Student: Hot.

Teacher: Hot, it's hot water. This is pretty much steaming, was boiling water. So it is kind of hot. So you have to be careful. There's a safety button on it, it's pink it says, "Unlock." So you put the pink button first, and then you push the dispense button to dispense hot water. Don't do that, I'm only doing that because I don't want to waste water. That's how you get your hot water. In contrast to hot water, what water do you have? Cold water.

You might have cold water. It is located over here. I know this cooler says cold, but the cold water is actually in this. It's bigger so you can use this if you would like ice water. I know what you're thinking, I can read your minds. Do not drink that water. The reason is, these cups are not mine, so I do not know where they have been, literally. I don't know if some teacher put something in here that you don't want to put by mouth, I don't know. [00:10:00] Do not drink water. If you guys want water after school come back here, I'll be happy to give you guys cold water. Did you hear that? Classroom, lab science, never eat, drink anything in the classroom. Can do?

Group: Can do.

Teacher: Are there any questions on the procedures, or materials? Anything like that? You guys all good?

Let's do number one together. Explain why you think ... For about a minute. Why do you think there are layers in here? So, I'm not asking what formed the different layers, or why are the layers different, or what is in each layer. I'm asking, "Why did the layers

form?" It's kind of a general question. So why do you think there are layers in this ... Not this one. In my demo tank. So discuss it, and then write out your answer. Number one.

Start writing down your answer. Explain why you think layers ... For number one ... Why do you think layers have formed here, in my demo tank? Why is the water not mixing around? I heard a keyword.

The properties of density, and why is it separating the layers of water?

I don't want to say loud.

Student: Be excited.

Teacher: Collaborative. Collaborative is a good word. Of course you can, when it's time ... Supposed to cover my demo but I forgot.

Student: [inaudible 00:11:24]

Teacher: No, no. I was going to put it over here, and then like unveil it. Here's the demo tank, but I forgot. I didn't want to mess up my demo tank. No, that was the bigger one.

Let's do number two, and then you guys are off. Hypothesize, so using the correct format, what you will need to do to recreate this demo tank. So the correct format of a hypothesis is?

Group: If, then, because.

Teacher: If, then because, so if we ... Well you know what you have, right? [00:12:00] You can use whatever I mentioned. You have salt, you have cold, you have hot, you have tap water.

Student: [inaudible 00:12:06]

Teacher: You do not. You need to investigate and hypothesize on your own.

Teacher: Can we feel the water?

Teacher: No, you cannot feel the water.

Group: [inaudible 00:12:32]

Teacher: You can do anything you want with the supplies I gave you, as long as you follow the rules.

Group: [inaudible 00:12:40]

Teacher: You guys can do anything you want ...

Group: Can we put [inaudible 00:12:52]?

Teacher: So your ... Like a past experience? Sure.

Group: [inaudible 00:12:59]

Student: Does it have to be in that order of the dye?

Teacher: No, as long as you reach your main goal, which is right here.

Student: Because at the beach the surface of the water is [inaudible 00:13:08]

Teacher: Because the surface of the water is what?

Student: Because the surface of the water is [Crosstalk 00:13:18] ... The temperatures of the water is different.

Teacher: Different meaning? Oh, okay.

Student3: Are we right?

Teacher: I don't know, we'll find out. That's a good theory, I mean you're thinking about it so, it's good.

If you're done, start looking at the data table for number three. If you're done, while other groups finish up.

Student4: What should I call that? Over there?

Teacher: The demo tank.

About another 30 seconds to wrap up your hypothesis.

Confident? Oh, no. Are you guys confident?

Group: Yes.

Teacher: How do you guys feel? Confident?

Experimenting. I can't tell you guys enough how important this step is. Because, like I mentioned before, you probably might fail, at least once. [00:14:00] I'm not saying you will, but there's a good chance that you might, but it's okay. Because as long as you are taking down your data, if you are taking observations and noting down what happened when you did a certain thing, if it's wrong, have you learned from it?

Group: Yes.

Teacher: What did you learn, "student"? If something is wrong, what did you learn?

Student: That it's wrong.

Teacher: So next time would you repeat the same thing? No, you wouldn't. So it's very important, even if it goes wrong, you have to make sure that you're recording your data. Because, what I'm going to tell you, right after you have a failure, dump it out and try again. Ryan, did you guys hear? Ryan? You're going to dump it out and try again. Don't dwell on it. Don't, "Oh, we're never going to get it." Look at your notes, make sure you're recorded. Let's say you're trying for the blue. Where does the blue have to go? The bottom. Let's say you mix up your blue, you pour it in, and it goes straight to the top. So many students are going to have the tendency to just dump it, let's try something different. You have to go back for your data. Record what happened, what you did to the blue, so that you don't repeat that same mistake again.

On Thursday, when you guys come back, we're going to expand on this lab and it's going to be even more difficult. So you have to make sure you get an understanding of what's happening with these different types of water. What is it doing? What are the density differences going to be? So you have to make sure you are taking good notes. You explain your observations, you say exactly what you did. Did you put a quarter teaspoon of salt? Did you put half a teaspoon of salt? Did you put all hot water? Did you put half hot water, half tap water? That's what you're going to do.

So on your table it says, "Starting water." So what did I do for my starting water on this one right here? When I had this small one right here? What did I do? I just filled it up with what?

Group: Nothing.

Teacher: I just filled up with what? I used tap water. So that's your starting water. What color would you say that would be?

Group: Clear.

Teacher: [00:16:00] The second part is where you are going to fill in your information. Based on your hypothesis, what are you guys going to attempt? What is your approach to solve this problem? I'm not going to ask for your opinions, I kind of want you to just go for it, and see what happens, because you have time ... Putting as you add things to the water, because like I said, Thursday you're going to need this information.

I think that's all I got for you, if you get it, call me over I want to see. That's all I got. Any questions on procedure, materials, what do you do? When you do start, I will assign you guys to a specific sink so please work in that specific area so you don't get in the way of everybody else.

Your supplies are over there. Person with the shortest hair, can you go and grab one set of supplies for your table, and you may begin.

Can your guys tables stand up? Can you guys use this sink? You guys share this sink. Can you guys, too? You guys share this sink, right here. Just be careful of that. "student" and "student", you guys share that sink.

What did you guys end up doing for that [inaudible 00:17:25]?

Student: We put the salt and then we put [inaudible 00:17:22]

Teacher: Do you think it's the way you poured it in, maybe? Possibly, because I did say it makes a big difference how you pour it in, right? If you guys think that's what's causing it ... How many ... How much water did you put in?

Student: Just these.

Teacher: Well try it again. Dump it out and try it again.

Student: Mr. [inaudible 00:17:39] is this ...

Teacher: What did you guys do first? Tell me. Let me see your notes.

Student: We did blue hot water.

Teacher: You put blue, how water? And you put red, was it the same kind of water? Did it make a difference? So what did you guys learn from all of this?

Student: That we need hot water.

Teacher: What is the hot water doing in the tub?

Student: It makes [inaudible 00:18:03] [00:18:00]

Teacher: Where is the hot water in the tub right now?

Student: At the bottom.

Teacher: What can you say about hot water?

Student8: We should put it in red and put [inaudible 00:18:15] in the blue water.

Teacher: Maybe. Use your mistakes to learn something. I hope you guys wrote down what happened as you put hot water. It went to the top. Make sure you track that because that's going to help you. You do have to make a top layer, right? You know now what stays on top. Use that.

Student: I got it!

Teacher: You've got it? The blue, let me see what you did for blue.

Student: We just ... Cold water.

Teacher: Just cold water? It sort of stayed down a little bit, but not like mine. What else could you do to make sure that water stays down?

Student: We made it [inaudible 00:19:02]

Teacher: You tried cold and it didn't sit all the way down but look at what supplies you have available. Is there any other idea you have? Something has to be done differently, right?

Student0: [inaudible 00:19:21] We need to find out what it is.

Teacher: To which water?

Student: To the [inaudible 00:19:32]

Teacher: You can, but remember your blue water needs to sit on the very bottom. That's what yours is not doing right now. Just cold water? How much blue is that?

Student: 50ml

Teacher: 50ml? Does it look like it's a clear separation of one? Something is a little bit off as far as why it's not separating with the clear. The red is good, you guys have the red down. Now you've got to figure out how do you get that blue to sit on the bottom? [00:20:00] You've already put cold water. What else can you use that I have you to help make it sit down?

What's your insight, "student"?

Student: You know how in the ocean there's layers? Why is it that if we mix this kind of water with salt it doesn't layer, but if we actually [inaudible 00:20:24].

Teacher: There are layers in the deep ocean.

Student: They're salt water, but here we didn't add salt, and it layered.

Teacher: You're learning things about temperature, then.

Student: I think it depends on [inaudible 00:20:40]

Student: Because the ocean resembles that.

Teacher: When you see extreme differences like this you can tell there's separation. What can you conclude about cold water, tap water, and hot water?

Student: The cold water goes into [inaudible 00:20:53] less dense?

Teacher: Less dense?

Student: More dense? So cold water is going to sink.

Teacher: Have you guys ever went swimming in the ocean? Do you swim deep down? What does it feel like?

Student: Colder.

Teacher: Does it relate to this?

Student: We actually did it. Where do we put all of this?

Teacher: Back into the Ziploc. Is there a Ziploc for yours?

Student: No.

Teacher: Maybe it just goes into the bin, then.

That looks better. What did you guys finally realize?

Group: [inaudible 00:21:36]

Teacher: So the red and the blue are hot water?