

And then the other thing I didn't get to do on Monday was my Why This Matters, and so I want to do that.

Now hair is very much affected by the softness of water.

But instead of me showing you lots of pictures of hair that I found randomly on the internet, googling soft water, hard water, different forms of water, hair, I'm showing you pipes, because that's much more actually relevant in terms of like, for example, whether you can get water into your house at all.

All right?

And this is a real problem.

If you have hard water what it means is you've got minerals in the water.

Right?

Things like magnesium and calcium ions are in the water.

And what happens is, if you run that through pipes, they tend to react and form and deposit.

And you get these deposits of very, very hard mineral deposits around the edges that eventually look like this.

That's not a good thing.

And so you need to soften the water, and that's something you may have heard of.

But now you really know how to think about it, because you can think about it in terms of all of the things that you've learned.

And just as an example, if one of those minerals that's a problem is calcium-- oh, it is, right?

Magnesium is another one that can cause this in pipes.

You've got to somehow take it out of the water or at least make it into a form that makes it like insoluble, so it'll just flow, and it won't have a chance to come around and deposit on the edge there of the pipe.

And so what do you do?

Well, you add, for example-- oh, we've done this before.

Right?

What if I add soda, something called soda ash?

Oh, we know what that is.

That's Na_2CO_3 , and that will give me some ions.

It'll give me some Na pluses, and it'll give me some CO_3^{2-} minuses, and those are in aqueous.

Now, this is all part of the stuff that we've been talking about.

You're dissociating this to get ions in solution, but why do I want these ions?

That's a water softener.

Why?

Because now you can see it.

Right?

Because this one here, this one here is going to remove the calcium.

So if I've got these calcium, these minerals, in the water making it hard water which leads to that and wreaks havoc on your hair, then you get a little of this in there, and you're going to react with the calcium.

Why?

It's because of what we already saw.

If I have this-- this is something we've already looked at-- if I have calcium $2+$, and I have some bicarbonate in there, CO_3^- , then we know that I can get precipitates, Ca-- this is just what we looked at in the goody bag, right-- plus CO_2 plus H_2O .

That's the same kind of reaction that we looked at already.

We have calcium carbonate, calcium carbonate.

Why?

Well, because this is going to give me these.

This is a source for those which then eats up some calcium.

And you think, well, now this can take the calcium ions out, so that it runs through.

That's what you want to do here.

That's how you soften water.

Well, you can add lime which gives me a source of OH minus, and that takes out the magnesium.

And these are ways to change the chemistry of water, so that you don't have as many ions, mineral, these calcium and magnesium ions floating around that cause problems.