

E23 - Wave of Science

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[00:11] Suika

You can see so far away!

[00:15] Suika

The sun's gonna rise soon!

[00:18] Senku

Don't look at the sun through the telescope.

[00:21] Kohaku

If the stones you guys got
are the right ones...

[00:30] Ruri

Wow, it's like a mountain of jewels.

[00:33] Senku

It's not *like* a mountain of jewels.
It *is* a mountain of jewels.

[00:37] Senku

It's a treasure trove of super rare metals.

[00:42] Magma

Jewels, my ass.

[00:44] Magma

They're just slightly heavy rocks.

[00:46] Magma

After all that fuss...

[00:48] Gen

We're going to win against
Tsukasa-chan's army with these rocks.

[00:52] Kokuyo

With these rocks?

[00:54] Kokuyo

I see.

[00:55] Kokuyo

With these gems!

[00:57] Kokuyo

I can see them being heavy
enough to really hurt.

[00:59] Ruri

Father, I don't think that's what...

[01:01] Kohaku

You can't blame him.

[01:03] Kohaku

Father is of an older generation.

[01:05] Kokuyo

What?!

[01:07] Gen

We're up against Tsukasa-chan's army.

They're going to be seriously tough.

[01:11] Gen

Our plan is to make cell phones using these rocks and win the information war.

[01:18] Kohaku

But, Senku, how much longer is it going to take to make our cell phones?

[01:22] Ginro

She's right.

[01:23] Ginro

Once spring comes, Tsukasa-kun's army is going to be rushing in.

[01:27] Senku

The goal's not that far away.

[01:29] Senku

To put it simply...

[01:30] Senku

The vacuum tube is the heart of the cell phone.

SIGN Ramen

SIGN Ramen

[01:33] Senku

Plastics make up its skeleton.

SIGN Ramen

SIGN Ramen

SIGN Ramen

SIGN Ramen

SIGN Ramen

SIGN Ramen

SIGN Ramen

[01:35] Senku

The microphone is the vocal cord.

SIGN Ramen

[01:36] Senku

The gold wire is the veins.

[01:39] Senku

With these four body parts, we can finish the cell phone.

[01:46] Senku

This mega-huge science project
is coming to a close.

SIGN Copper

SIGN Coal

SIGN Charcoal

SIGN Beehive

SIGN Sulfuric

Acid

SIGN Lead

SIGN Tin

SIGN Solder

SIGN Gold

SIGN Wire

SIGN Coil

SIGN Mercury

SIGN Vacuum

Pump

SIGN Phosphorus

SIGN Rochelle

Salt

SIGN Plastic

SIGN Battery

SIGN Circuit Board

SIGN Vacuum Tube

SIGN Light Bulb

SIGN Wine

SIGN Microphone

SIGN Headphones

SIGN Cell Phone

[01:52] Senku

Everyone, we're sprinting all
the way to the goal from here!

SIGN Wave of Science

[03:32] Senku

First, we're going to make the filaments,

[03:34] Senku

which are essential for the vacuum tubes...

[03:37] Senku

using tungsten, the most heat-resistant
metal in the universe,

SIGN Heat Resistance Power Rankings

SIGN Tungsten

SIGN Osmium

SIGN Iron

SIGN Rhenium

SIGN Gold

SIGN Silver

SIGN Lead

SIGN Glass

[03:43] Senku

sleeping inside this blue light.

[03:45] Kohaku

But, Senku, how are we going
to get it out of the stone?

[03:49] Senku

About that... It's going to be tough as hell.

[03:53] Chrome

What the hell are you two doing?!

[03:56] Magma

We're getting it out of the rocks, aren't we?

[03:58] Magma

All we need to do is destroy it.

[04:01] Senku

I mean, that works.

[04:03] Senku

We'll be turning it into powder, anyway.

[04:05] Magma

See? I was right!

[04:07] Ginro

No one asked you!

[04:09] Kohaku

What if you'd been wrong?!

[04:13] Kokuyo

This is unusual.

[04:15] Kokuyo

He's hardly doing it right,
but I've never seen him offer to help.

[04:20] Kokuyo

Did something happen in the cave?

[04:23] (Flashback) Senku

You get to see all the insane stuff
that humanity worked together

[04:26] (Flashback) Senku

for two million years to build.
Stuff you never would've seen otherwise.

[04:30] (Flashback) Senku

And I'll show you so much of it,
it'll make your head spin.

[04:34] (Flashback) Magma

Senku!

[04:35] (Flashback) Magma

I don't care if you're the boss anymore.

[04:38] (Flashback) Magma

At least, until we deal with that Tsukasa guy.

[04:42] Senku

Gee, I don't know.

[04:45] Magma

We're done.

[04:47] Magma

What's next?

[04:48] Senku

I'm going to do chemistry stuff
to this powdered blue rock

[04:51] Senku

to turn it into something
resembling toothpaste.

[04:54] Gen

Right, you're doing chemistry stuff.

[04:57] Gen

The stuff it wouldn't do me
any good to ask about.

[05:00] Senku

Lastly, we're going to get rid of the rust
on the toothpaste stuff using hydrogen,

[05:04] Senku

warm it up in a glass container, and it's done.

[05:08] Senku

It needs to be at least 1,000 degrees.

[05:10] Senku

The hotter it is,
the stronger the tungsten will be.

[05:14] Kaseki

So all we have to do is cook it.

[05:17] Chrome

Hey, it's actually pretty easy.

[05:19] Senku

What are you, stupid?

[05:21] Senku

What would happen to a glass container

[05:23] Senku

if you threw it into a fire
that's 1,000 degrees?

SIGN Tungsten

SIGN Glass

[05:29] Senku

We have to heat up *just* the tungsten
toothpaste inside the glass container.

[05:34] Kaseki

Then we need a heating mechanism
with pinpoint accuracy.

[05:37] Kaseki

How do we do it?

[05:38] Senku

We don't have time. Let's split up the work.

[05:41] Senku

I'll deal with the
toothpaste-making chemistry stuff.

[05:44] Chrome

So who's making the
pinpoint heating mechanism?

[05:48] Chrome

Are there any other science users?

[05:56] Senku

Chrome, you know everything you
need to make one from scratch.

[06:00] Senku

Throw all the science tricks
you've learned at it.

[06:04] Senku

Or do you need Senku-sensei's help?

[06:09] Chrome

Don't make me laugh.

[06:12] Chrome

I'm Chrome!

[06:13] Chrome

I'm a smart-as-hell science user!

[06:18] Chrome

Don't come crying to me for help at your lab.

[06:22] Senku

Yeah, I got the lab stuff.

[06:25] Senku

I'm leaving you in charge of the heating team.

[06:31] Kaseki

You make me jealous.

[06:36] Kaseki

You know, I've always loved
making things, even as a kid.

[06:44] Kaseki

I made all sorts of things—bridges, shields—

[06:47] Kaseki

so that people wouldn't look at me funny.

[06:50] Kaseki

Thanks to that, I get to pretend I'm
still in the game, even at this age.

[06:57] Kaseki

But to be honest, I can't help but
wish I had a maker buddy, too.

[07:06] Chrome

But you have two friends, Old Man Kaseki.

[07:09] Chrome

Maker buddies.

[07:12] Kaseki

Two?

[07:13] Kaseki

Where?

[07:17] Chrome

Right here.

[07:23] Kaseki

Me?

[07:24] Kaseki

Even though I'm almost
fifty years older than you?

[07:28] Chrome

Our age?

[07:28] Chrome

That matters somehow?

[07:59] Chrome

What the hell?!

[08:03] Gen

He's even more gung-ho than usual.

[08:07] Senku

Come help me over here, modern man.

[08:10] Senku

You must know at least a little
more chemistry than the villagers.

[08:13] Gen

I'm not sure.

[08:15] Senku

There's a ridiculous number of steps.

[08:17] Senku

I bet you won't get a millimeter
of this, so I'll make it simple.

[08:21] Senku

Cook the blue gem powder
in sodium hydroxide;

[08:24] Senku

use sea shells, hydrochloric acid,
and ammonia to crystallize it;

[08:26] Senku

and then bake it and mix it with honey.

[08:30] Gen

Okay! I understood all of that, Senku-chan.

[08:34] Gen

Honey! Bake it, and then honey.

[08:37] Gen

I got that much.

[08:39] Senku

Chrome's definitely ten billion times more useful than you.

[08:42] Gen

Nah, I don't think *anyone* could have kept up with that.

[08:46] Gen

You're the only one who gets it, Senku-chan.

[08:50] Chrome

Nothing beats this when it comes to pinpoint heating!

[08:53] Kokuyo

There it is! Chrome's special move!

[08:56] Magma

Quit showing it off.

[08:57] Magma

You're reminding me of bad times.

[09:01] Kaseki

I don't know how much heat it produces, though.

[09:05] Kaseki

Let's set up some metals in order of heat resistance

[09:07] Kaseki

so we can measure the temperature.

[09:22] Suika

It's not even doing anything to the lead, and that's the weakest one.

[09:26] Kaseki

It's winter, after all.

[09:28] Kaseki

If we just had a little more sunlight...

[09:33] (Flashback) Senku

Throw all the science tricks you've learned at it.

[09:37] Chrome

We're using fire, too.

[09:39] Chrome

Add the cotton candy machine to the pinpoint heating!

SIGN Blorp...

SIGN Lead

[09:45] Chrome

Damn! We need more than just me and Suika.

[09:48] Kaseki

We defeated the lead, though.

SIGN Blurrrp

SIGN Gold

SIGN Silver

[09:51] Suika

Wow, we beat gold and silver!

[09:55] Chrome

Good going, battle team!

SIGN Blurrgh

SIGN Iron

[09:57] Ginro

We made it to iron!

[09:59] Chrome

Go, gorilla team!

[10:03] Kaseki

We made it past 1,000 degrees!

[10:06] (Flashback) Senku

It needs to be at least 1,000 degrees.

[10:08] (Flashback) Senku

The hotter it is, the stronger
the tungsten will be.

[10:12] Chrome

No, we need more.

[10:13] Chrome

Add electricity power!

[10:22] Senku

All right, it's done!

[10:24] Senku

Tungsten toothpaste!

[10:27] Senku

How are things on your side, heating team?

[10:29] Chrome

We're just about done.

[10:31] Senku

Not bad, science user.

[10:38] Senku

What the hell is this
all-of-the-above mega set?!

[10:41] Chrome

Senku, you were the one who
said to throw everything at it.

[10:45] Senku

This isn't what I meant.

[10:47] Senku

This thing's ugly as hell.

[10:53] Senku

Honestly, though, this might

actually be the best solution.

[10:57] Senku

If the goal is for all of us to join
together to raise the temperature...

[11:03] Senku

We're going to make a long,
thin blob of tungsten toothpaste.

[11:06] Senku

Zap water with electricity,
and it'll produce hydrogen.

[11:09] Senku

That hydrogen, with a lot of heat,
peels the rust right off the toothpaste.

[11:13] Chrome

Here we go. Pinpoint heating...

[11:16] All

...to several thousand degrees!

[11:32] Senku

We have the most heat-resistant
metal in the universe...

[11:36] Senku

A tungsten filament!

[11:46] Senku

Now, we have everything we need.

***SIGN* Ramen**

[11:51] Chrome

We're on our final sprint
to making cell phones!

[11:53] Kaseki

Let's get it done one step at a time.

[11:56] Kaseki

Time to build the cell phone's
heart, the vacuum tube.

[12:00] Senku

There's some slightly complicated
glasswork we need done to finish that.

[12:05] Senku

I don't know if even you can
handle it, Old Man Kaseki.

[12:10] Kaseki

Oh, please.

[12:11] Kaseki

I made this ridiculously challenging,
twisty thing before.

[12:16] Kaseki

It'll take more than that to scare me.

[12:18] Kaseki

Here, show me the blueprint.

SIGN "Hickman Pump"

[12:24] Senku

It's called a Hickman pump.

[12:27] Senku

Its vacuum action is off the charts!

[12:29] Senku

A level ten billion vacuum pump!

[12:31] Gen

You sound like a vacuum cleaner commercial.

[12:34] Senku

Vacuum tubes are made by
removing as much air as possible.

[12:38] Senku

The prototype we built before was a
simple level-one pump for light bulbs.

[12:44] Senku

It won't give us enough power.

SIGN Air

SIGN Air

[12:46] Kaseki

Where do I even begin?

[12:49] Kaseki

Is this even humanly possible?

[12:53] Gen

In our age, only the super talented
craftsmen built Hickman pumps.

[13:00] Gen

Then again, it was a different age,
so don't feel too bad, Kaseki-chan.

[13:05] Gen

It'll never work.

[13:07] Chrome

Is that true?

[13:08] Senku

Yeah.

[13:09] Senku

It's true, but why would
a mentalist know that?

[13:12] Senku

He's just talking out of his
ass to get Kaseki fired up.

[13:21] Kaseki

I'm fine.

[13:23] Kaseki

I don't need your mental care.

[13:25] Kaseki

It's the complicated stuff that gets me fired up, anyway.

[13:29] Kaseki

In exchange, though...

[13:32] Kaseki

I want to do that thing you did with Chrome the other day.

[13:39] Kaseki

Y'know...

[13:40] Kaseki

as maker buddies.

[13:47] Kaseki

All right!

[13:48] Senku

You can handle the vacuum tube, Kaseki.

[13:53] Kaseki

Gotcha!

[13:59] Ginro

Hey, hey, Senku...

[14:01] Ginro

I just noticed something.

[14:03] Ginro

Old Man Kaseki's acting like a kid and all,

[14:07] Ginro

but he's actually trying to lighten your burden a little.

[14:11] Senku

I know that. What are you, stupid?

[14:16] Suika

S-Senku...

[14:19] Suika

Is there anything we kids can do?

[14:24] Senku

Yeah.

[14:25] Senku

Suika, you guys can handle the wire.

[14:29] Suika

Yay!

[14:31] Suika

We're members of the kingdom of science, too.

[14:35] Suika

We kids are going to make the wire without relying on Senku!

[14:40] ---

Yeah!

[14:43] Senku

Now the chemistry team

can focus on making plastic.

[14:49] Chrome

Yeah!

[14:50] Chrome

Although I have no idea what
this whatever-tic stuff is.

[14:53] Gen

Actually, that's the step on the road map
that I was the most worried about.

SIGN Copper

SIGN Coal

SIGN Charcoal

SIGN Beehive

SIGN Plastic

[14:57] Gen

Can we even make plastic in this world?

[15:01] Gen

Isn't it made from, like,
petroleum or something?

[15:05] Kaseki

Come, Gen, you're with us.

[15:07] Kaseki

I'm going to work you to death in
return for getting me hyped up.

[15:12] Gen

So mean!

[15:15] Chrome

Old Man Kaseki's kind of got
a soft spot for Gen, huh?

[15:23] Senku

Let's hurry up and start making some plastic.

[15:25] Senku

First, we simmer some wood and
boil the liquid that comes out.

[15:29] Senku

Pour it over some hot copper, and—

[15:31] Chrome

Wait, wait, wait!

[15:33] Chrome

I'm completely lost.

[15:35] Chrome

You heat it to get some liquid,
heat that again, and heat that again?

[15:39] Chrome

What are we even doing?

[15:41] Senku

We're modding the heck out of it,

adding and removing ingredients.

[15:45] Senku

Chemistry is all about
addition and subtraction.

[15:49] Senku

We did some addition and subtraction,
and now we have formalin.

[15:52] Senku

It's the stuff you use to preserve corpses.

[15:54] Chrome

The smell!

[15:55] Chrome

Here we go again with the sketchy chemicals
having to do with corpses and stuff!

[15:59] Senku

Good.

[16:00] Senku

Now we just need a ton of coal ash.

[16:03] Senku

Coal ash plus sodium hydroxide
plus formaline makes

[16:07] Senku

humanity's first synthetic plastic, bakelite.

[16:11] Chrome

R-Right.

[16:13] Chrome

So we just need to burn a
crazy amount of coal, right?

[16:19] Suika

My hands are numb from cold.

[16:21] Suika

We aren't getting much work done.

[16:23] Grandpa

What a harsh winter this is.

[16:26] Grandma

I hope no one dies from the cold this year.

[16:34] Kinro

Coal?

[16:35] Senku

Yeah.

[16:35] Senku

We need a stupid amount of it.

[16:38] Senku

This is just the job for you guys.

[16:40] Kinro

Hey, Ginro.

[16:42] Kinro

Where to?

[16:43] Ginro

Oh, you know, I have to train, too.

[16:47] Ginro

And I already work as a guard
protecting the village,

[16:49] Ginro

so I think I'll pass.

[16:51] Kinro

What are you talking about?

[16:53] Kinro

The village elder Senku's word is law.

[17:00] Ginro

This is totally going to
be one of those hard jobs!

[17:02] Kinro

Rules are rules.

[17:18] Suika

It's so warm in this house.

[17:21] Grandma

Let's make a warm meal
for everyone to eat.

[17:25] Grandpa

We can get our work done a lot faster now.

[17:31] Senku

We're only after the ashes from the coals.

[17:35] Senku

If you want to sit by the
fire, suit yourselves.

[17:42] Kokuyo

This is impressive.

[17:46] Kokuyo

What you're making is totally unrelated,

[17:51] Kokuyo

and yet the village becomes
more and more enriched.

[17:56] Senku

Yeah.

[17:57] Senku

That's the way science is.

[18:15] Kokuyo

Senku, my decision to grant you
the throne wasn't in error.

[18:24] Gen

Huh? Zinc-carbon batteries?

[18:26] Gen

Are we using batteries to

finish the vacuum tubes?

[18:30] Suika

The build instructions
and materials are there.

[18:33] Suika

We'll use the manganese
we got in the caves.

[18:36] Gen

So you want me to make them, right?

[18:48] Gen

Zinc for seaweed.

[18:49] Gen

Manganese rice balls.

[18:51] Gen

Coal in the middle.

[18:53] Gen

Look at that, a zinc-carbon battery.

[18:55] Gen

Look at that, a zinc-carbon battery.

[18:57] Gen

Huh?

[18:58] Gen

It's already done.

[19:00] Gen

It wasn't that brutal!

[19:04] Gen

Manganese rice balls.

[19:06] Gen

Tons of manganese.

[19:07] Gen

Manganese rice balls.

[19:09] Gen

Lots of manganese.

[19:11] Gen

Manganese rice balls.

[19:13] Gen

Tons of manganese.

[19:15] Senku

We need 800 of those.

[19:16] Gen

What?! Eight hundred?!

[19:20] Gen

This is brutal.

[19:22] Ruri

I'll help, of course.

[19:26] Kohaku

Here's the wine you asked for.

[19:28] Kohaku

Are you holding a banquet or something?

[19:30] Senku

No, we're making microphones,
the cell phone's vocal cord.

[19:34] Chrome

With wine?

[19:35] Senku

Yeah.

[19:37] Senku

Actually, we're using the pink
grains stuck on the lid here.

[19:42] Senku

Then we mix some cooked seaweed in hot water.

[19:46] Senku

That's it.

[19:48] Kohaku

Which part of this is the "microphone" thing?

[19:51] Chrome

Also, what are these shiny rocks?

[19:54] Senku

They're called Rochelle salts.

[19:56] Senku

They turn sound into electricity.

[19:58] Senku

Tack this onto something light,

[20:00] Senku

like a plastic megaphone,
and you get a microphone.

[21:09] Chrome

We've cleared plastic!

[21:11] Suika

We've cleared wire!

[21:18] Kaseki

We've cleared vacuum tubes!

[21:21] Kohaku

We've cleared microphones!

SIGN Copper

SIGN Coal

SIGN Charcoal

SIGN Beehive

SIGN Sulfuric

Acid

SIGN Lead

SIGN Tin

SIGN Solder

SIGN Gold

SIGN Wire
SIGN Coil
SIGN Mercury
SIGN Vacuum

Pump

SIGN Phosphorus

SIGN Rochelle

Salt

SIGN Beehive

SIGN Battery

SIGN Circuit Board

SIGN Vacuum Tube

SIGN Light Bulb

SIGN Wine

SIGN Microphone

SIGN Headphones

SIGN Cell Phone

[21:27] Senku

The most powerful weapon of modern warfare,

[21:30] Senku

delivering voices over infinite distances...

[21:37] Senku

It's the birth of the cell phone!

[21:39] ---

Yeah, baby!

SIGN Cell phone acquired!!

[21:48] ---

Yay!

[21:52] Chrome

Oh, man!

[21:55] Senku

We managed to finish it before spring.

[22:07] Senku

The final battle against Tsukasa is at hand.

[22:17] Senku

This is exhilarating.

SIGN Voices Over Infinite Distance

SIGN Next Episode

SIGN Voices Over Infinite Distance

SIGN This is a work of fiction, but the plants, animals, and production methods described are based on reality. Foraging and making things on your own accord is extremely dangerous and, in some cases, illegal. Please do not imitate without expertise.

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