

## Video Transcript for the *Four of the States of Matter* Activity:

Hello! My name is Michele and I am a member of the IBEX Education and Public Outreach team. We've designed a series of videos to show you how to facilitate the IBEX educational activities for an informal audience, such as museum visitors or after-school participants. This video is for the activity entitled the "Four of the States of Matter."

Now, this is a kinesthetic activity and it illustrates three of the states of matter—solid, liquid, gas— and, adds a fourth state, plasma. Now, plasma is something that people probably have heard of, but they don't really know what it is. So, this activity will help investigate what plasma is all about.

Now, by the way, in case you were curious— there is actually a fifth state of matter. It's called a Bose–Einstein condensate. Why don't talk about it during this activity; it doesn't have anything to do with the IBEX mission. But, you may want to read up on it just bit. One of your audience members could ask about it. So, it's good to be prepared, just in case.

Most of what you need for Four of the States of Matter is included in the lesson plan itself. I have a copy of it here. You'll need the electron badge, so make as many copies as you need. You'll want to cut this one out.

You'll also need the proton badge. And this is on the back; so again, make as many copies as you need. Now, we've included a little square on here because we've attached the proton badge to a lanyard. Now, you don't have to use a lanyard. You can use a piece of string. You could even use a piece of masking tape to stick the proton badge to one of your participants. But the important part is they need to wear this in some way.

Now, the electron badge, you just need to cut it out and you'll need a little piece of masking tape on the back. So, this one the participants will have to take off of themselves at some point during the activity. So, make as many copies like I said, and it will be up to you as to whether or not you let your participants keep the proton or electron badge. You may have to replace them from time to time. You can laminate them if you want to make them a little more sturdy.

Now, as for setup for Four of the State of Matter, that's easy. You just need a space big enough to accommodate somewhere between five and ten people in a straight line, a little bit of extra space for the audience to watch, and enough room for your participants to move around a bit. It's as easy as that.

So, the first thing you'll want to do is invite a few people to participate in this activity. And through their actions, they're going to demonstrate the characteristics of four of the states of matter. And, they'll learn about a NASA mission that is examining the effects of the fourth state of matter, which is plasma on our Solar System— and that's IBEX!

So, once you've gathered your participants and your audience, you'll want to give each participant an electron badge to stick somewhere on a piece of clothing; and then give each a proton badge to wear.

Have the group stand in a straight line and face the audience; and they'll all want to start by linking elbows. This is how they will begin the activity.

Throughout your facilitation, the participants will change how they are arranged with each other to represent each state of matter.

Now, throughout all these states of matter, to get them from one state to the next involves an increase in energy. Adding energy to a solid causes it to melt to a liquid; adding energy to a liquid causes it to evaporate into a gas.

Finally, to represent the plasma state of matter, even more energy is added, so that electrons come off of their atoms. What is the atom's charge now? Positive. What is the charge of the electron? Negative. This soup of positively charged atoms and negatively charged electrons all whizzing about is a plasma.

The final science connection to make is that the IBEX spacecraft studies plasma's effects on the boundary region of our solar system.

And when participants complete the activity, you can use the assessment section of the lesson to figure out if your audience understood what this activity was all about.

We hope you have enjoyed learning about the Four of the States of Matter Activity. For more information and to download the lesson plan, please visit the IBEX website at [www.ibex.swri.edu](http://www.ibex.swri.edu).

Thanks for watching!