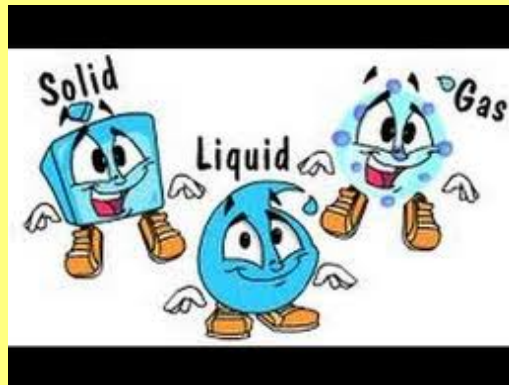


States of Matter




Jan 13-9:36 AM

Water is a liquid, ice is a solid, the air you breathe is a gas. You can point to many examples of solids, liquids, and gases around you. But how would you explain solids, liquids, and gases to someone who knows nothing about them?



Jan 13-9:36 AM



Solid, Liquid, or Gas? (or, Zed's Perplexing Question)

By now Zed has been on Earth for several days. He is just getting to know something about the different kinds of materials here and wants someone to explain the differences between solids, liquids, and gases. You do your best to explain this to him in just three simple lessons. However, Zed is a good student and after thinking over your lessons carefully, he poses some difficult questions.

Jan 13-8:50 AM



Lesson 1

Solid or Liquid?

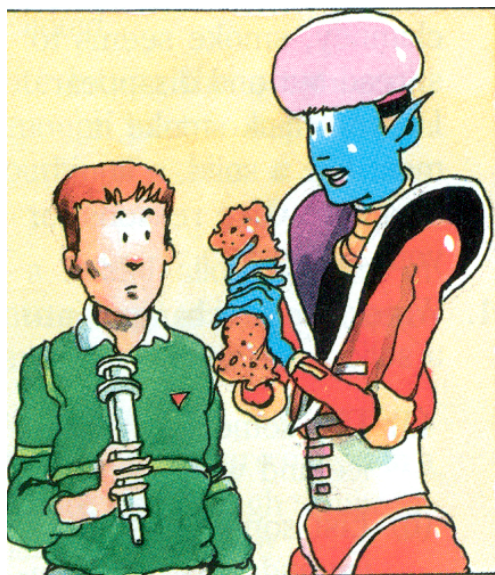
You put a nail in one test tube and water with food coloring in another. You explain to Zed that the nail is a solid and the water is a liquid. How would you explain the difference?

Jan 13-8:54 AM

Zed listens intently. "Ah," he says, "so liquids flow and take the shape of their containers, while solids don't." Then he takes a box of salt, pours it into another test tube, and says, "Salt is a liquid because it flows and takes the shape of its container, right?" Now you have a problem. What do you say to Zed to convince him that salt is not a liquid, but is a solid.



Jan 13-10:18 AM



Lesson 2

Liquid or Gas?

You have two plastic syringes, one filled with water, the other with air. You show Zed how to close the bottom of each syringe. Then you try to push down on the plunger.

Jan 13-8:55 AM



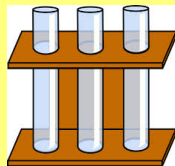
The gas is easily compressed, that is, squeezed into a smaller space. But the water cannot be compressed easily. You explain that this is an important difference between liquids and gases. Gases can be compressed noticeably, but liquids cannot.

Jan 13-10:27 AM



Zed has been listening very closely. He picks up a sponge nearby and squeezes it. Then he says, "This sponge is a gas because it is easily compressed." Is he right? What do you say to Zed now?

Jan 13-10:29 AM



Lesson 3

Solid, Liquid, or Gas?



You have three test tubes. You put some salt in the first one, some water in the second, and a few drops of perfume in the third. Once again, you explain to Zed the differences between a solid, liquid, and gas. What do you tell him now?

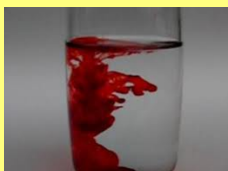


Jan 13-10:31 AM



This time, you also explain to Zed that the sides of a solid, and at the top of a liquid, there is a boundary. This boundary is called the **interface**. For solids and liquids, the interface is easy to see. It is sharp and clear. But the perfume just spreads out in the air, forming no boundary. Soon you can smell it throughout the room.

Jan 13-10:34 AM



Zed thinks about what has been said. Then he takes a test tube of water and puts a drop of red food coloring in it. He watches the food coloring spread out. There is no sharp boundary between the food coloring and the water. He exclaims, "Food coloring is a gas because it spreads out, forming no boundary!" What do you say to him?

Jan 13-10:37 AM



Zed goes away, after thanking you for the explanations. He knows that solids, liquids, and gases are the three states in which matter exists. He also knows that if a solid is ground into a fine powder, you may have to examine one particle to discover its rigidity.

Jan 13-10:42 AM



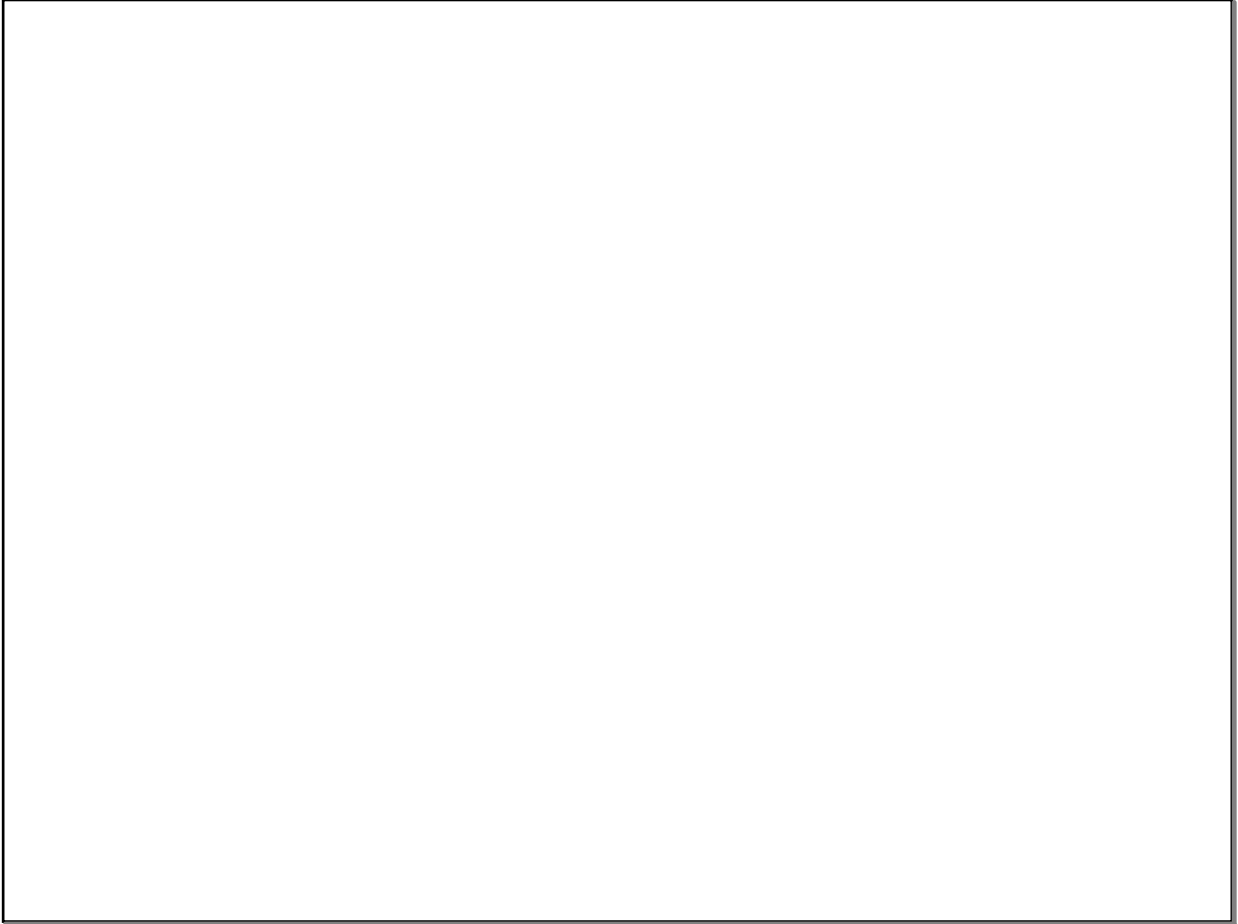
Zed also thanks you for explaining that solids and liquids are not easily compressible, and that it was the gas in the sponge, not the solid part, that was compressed. He is intrigued by the fact that solids and liquids have an interface with air, whereas gases do not. At the same time, while gases and liquids both flow, solids do not.

Jan 13-10:46 AM



Yes, Zed now understands much more about the three states of matter - solid, liquid, and gas. Do you?

Jan 13-10:49 AM



Jan 13-10:50 AM