

THE WHY BEHIND THE STATES OF MATTER IS THE ATOMS!

Solid



Those atoms are tightly packed together

Liquid



Those atoms aren't locked together

Gas



Those atoms are going all over the place!



ACT IT OUT!

We are going to go through each of the three states. Act like an atom of each.

POP QUIZ!

Answer each question on your whiteboard.

1. Which state of matter has both a definite shape and volume?
2. Which state are the atoms moving the fastest in?
3. Which state of matter are the atoms in a fixed position?



HAVE SOME CANDY
OR SMALL PIECES OF
SOMETHING?



MODELING THE STATES OF MATTER

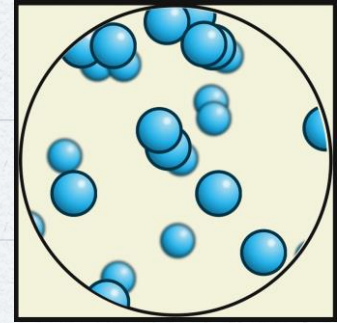
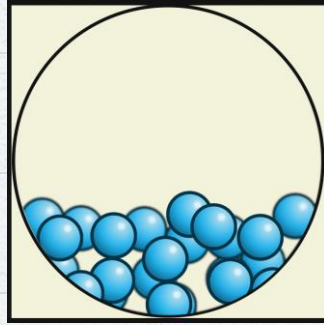
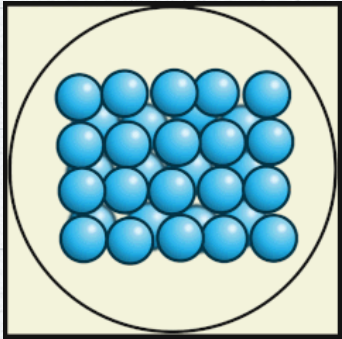
Go grab materials to represent the molecules in the states.

These materials can be things like Skittles, goldfish, or beads. Small and plentiful is what you are looking for.

Have none of these materials? Cool!

Use paper to either create the materials or draw it out.





States of Matter

Three States of Matter



Solid

- Particles in a solid are tightly packaged usually in a regular pattern.
- Particles in a solid will vibrate but cannot move past each other.
- Solids retain their shapes.



Liquid

- Particles in a liquid are close together with no regular pattern.
- Particles in a liquid flow and can easily move or slide past one another.
- Liquids assume the shape of their containers.



Gas

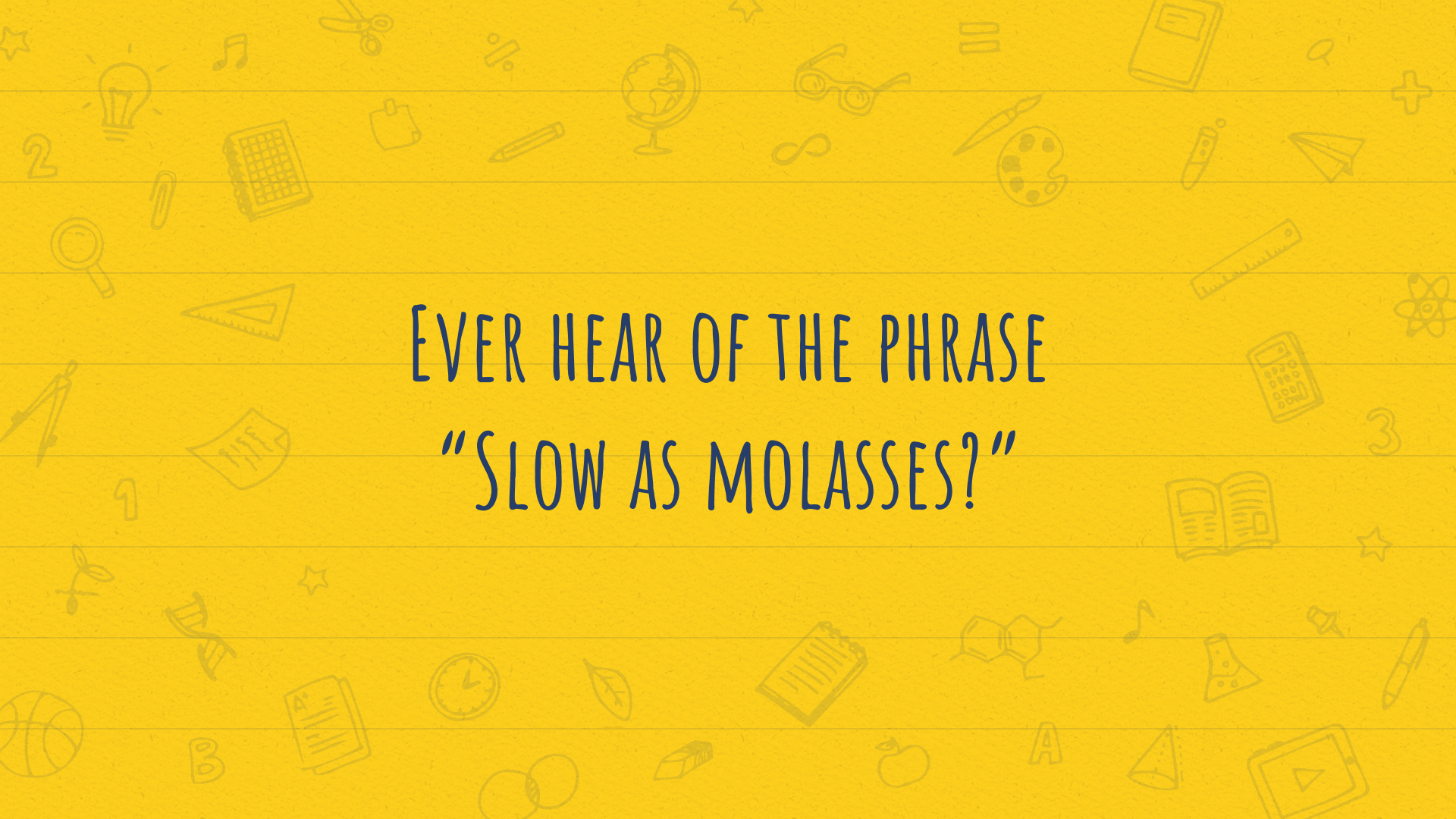
- Particles in a gas are well separated with no regular pattern.
- Particles in a gas vibrate freely at high speeds.
- Gasses assume the shapes of their containers.



Cats are liquids.



**“Liquids ... take the shape of the container while maintaining a constant volume”.
That’s it. So cats are liquid.**



EVER HEAR OF THE PHRASE
"SLOW AS MOLASSES?"

Measuring Viscosity



vegetable oil

motor oil

dish soap

syrup

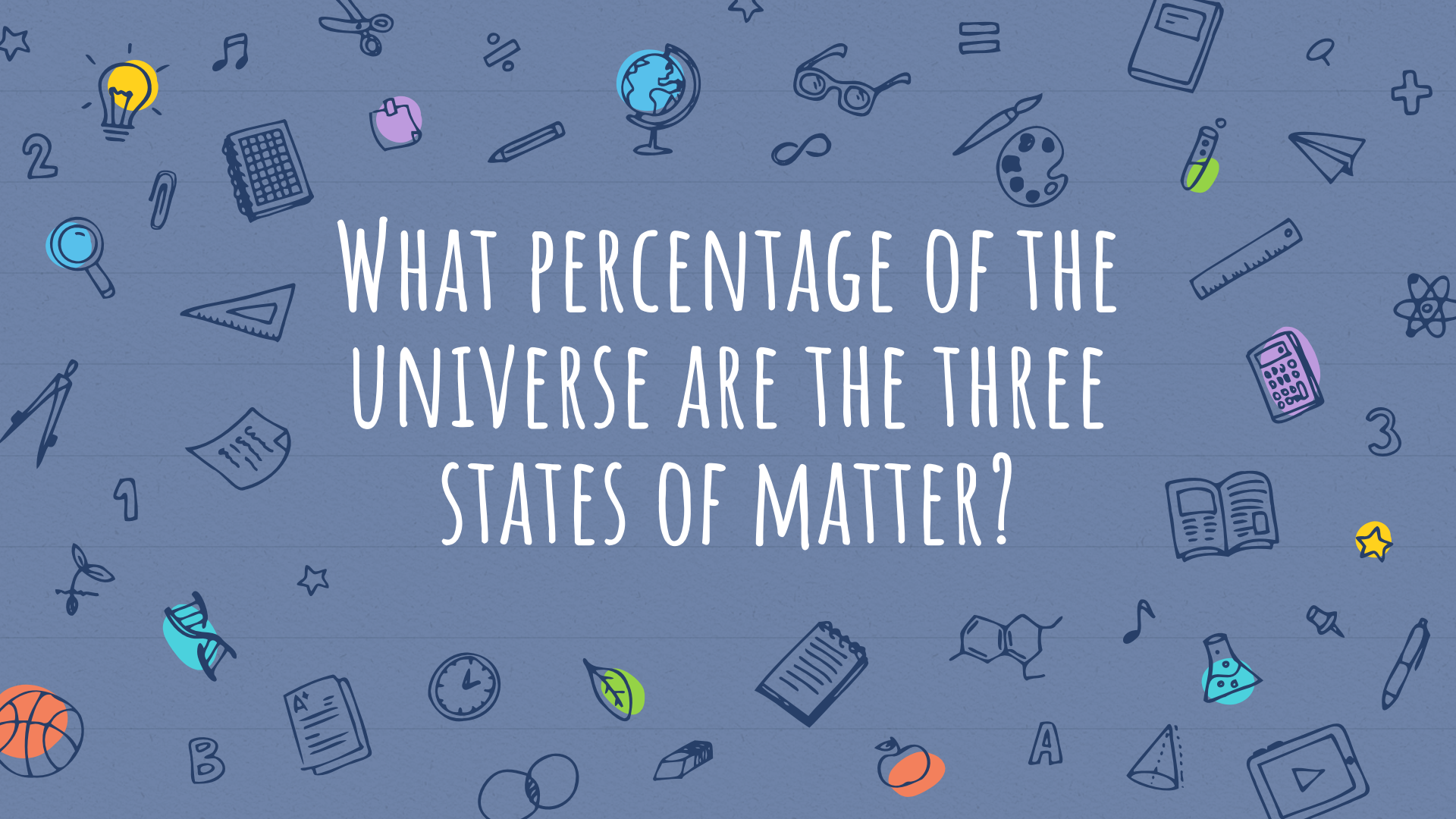
honey

ADDITIONAL VOCAB

VISCOSITY: THE RESISTANCE TO FLOWING

SURFACE TENSION: THE PULL OF MOLECULES IN A LIQUID TO COME TOGETHER (AND STAY THERE)

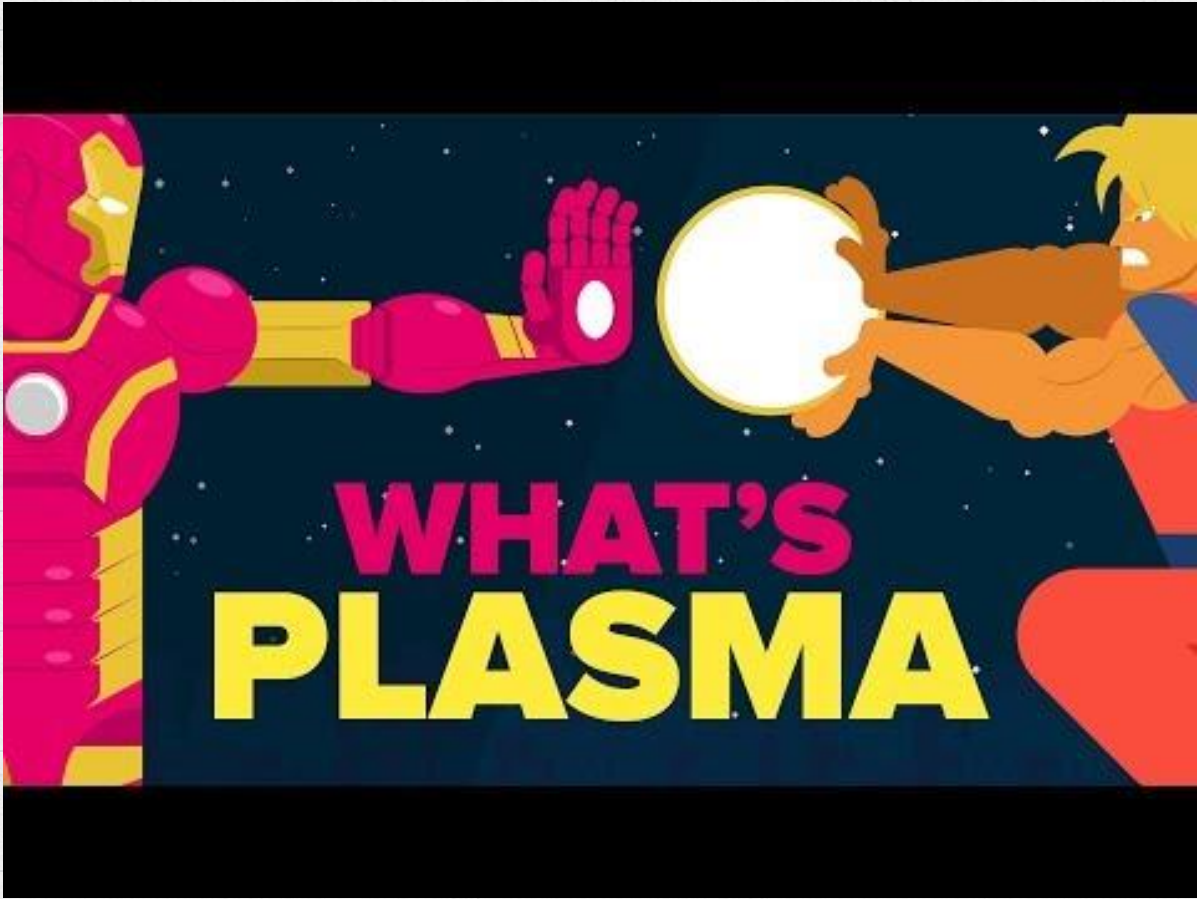




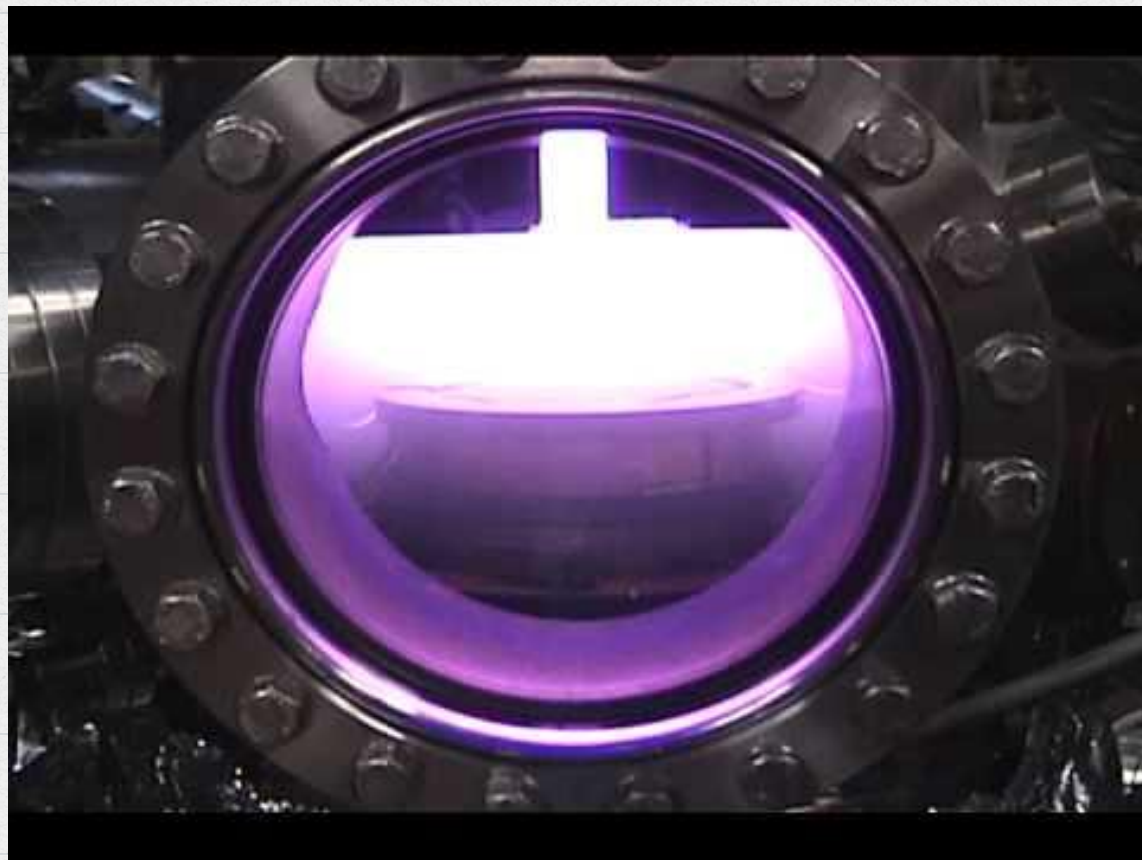
WHAT PERCENTAGE OF THE
UNIVERSE ARE THE THREE
STATES OF MATTER?



The other 99.9%
is plasma!

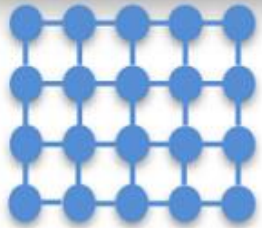


**WHAT'S
PLASMA**





Solid



Liquid



Gas



Plasma



Four States of Matter

PICK YOUR OWN ADVENTURE

1. Breakout room to go more in-depth on the three states of matter as a review.
1. Breakout room to learn more about different states of matter like plasma.
1. Breakout room to finish your notes sheet



OTHER STATES

Plasma

- BrainPop video called States of Matter
- Research more about plasma here: <https://www.livescience.com/54652-plasma.html>
- Create plasma in your microwave (WITH PARENT PERMISSION!!!!!!!!!!!!!!) here: <https://www.youtube.com/watch?v=wCrtk-pyP0I>

5th and 6th states of matter

- Podcast about Superfluids and Bose-Einstein condensates: <https://www.npr.org/2021/08/23/1030367793/ultracold-soup-the-superfluid-states-of-matter>
- Article about Bose-Einstein Condensates and Fermionic Condensates: <https://www.forbes.com/sites/startswithabang/2020/06/09/what-are-the-fifth-and-sixth-states-of-matter/?sh=22310d4e4a7f>

Even more states of matter!

- <https://www.scienceabc.com/pure-sciences/how-many-states-of-matter-are-there.html>
- https://www.school-for-champions.com/science/matter_states_exotic.htm#.YVzjm5rMJJaQ
- <https://www.phy.cam.ac.uk/research/research-groups/qm/exoticstates>
- <https://www.sciencedaily.com/releases/2020/10/201005170841.htm>
- <https://phys.org/news/2016-10-physicists-explore-exotic-states-nobel-winning.html>
- <https://www.semanticscholar.org/paper/Exotic-states-of-matter-in-an-oscillatory-driven-Clerc-Kowalczyk/086abd2223c91a92b6f1fad7dd6636474da5ec65>



BRAINPOP VIDEO:
STATES OF MATTER

THREE STATES OF MATTER

Solid

- Has a shape that doesn't change
- Has a volume that doesn't change
- Atoms are fixed and don't move (except to vibrate)

Liquid

- The shape changes
- The volume doesn't change
- Atoms are not fixed but stay together

Gas

- The shape changes
- The volume changes (can be compressed)
- Atoms are going crazy all over



MOVEMENT IN THE THREE STATES OF MATTER

Solid

Think of students sitting in a classroom. They are in a set shape and usually fixed in place. This is like the atoms in a solid.

Liquid

Think of students moving through a hallway. They are moving past each other but still around each other. This is like the atoms in a liquid.

Gas

Think of students leaving after the bell rings in a school. They are all moving in different directions and away from each other. This is like the atoms in a gas.



SOLIDS / LIQUIDS / GAS

What ways can you remember about the three main states of matter?

THINGS TO HAVE FOR TOMORROW'S CLASS

Cause we are making a non-Newtonian fluid!

- Cornstarch
- Water
- A large bowl
- Paper towels
- Area to possibly make a mess



POP QUIZ!

What state of matter is a material that has no definite shape but DOES have a definite volume?

Liquid!



POP QUIZ!

What state of matter is a material that moves around a lot?

Gas!



POP QUIZ!

What state of matter is a material that has NO definite shape and NO definite volume?

Gas!



WHAT ABOUT THOSE MATERIALS THAT ARE
KIND OF IN THE MIDDLE OF TWO STATES??

⋮ MEL Science

Experiment

Liquid or
solid?



SUPPLIES NEEDED

- Cornstarch
- Water
- A large bowl
- Paper towels


INSTRUCTIONS

Create a non-Newtonian fluid and then analyze it for why it acts like both a solid and a liquid.

Share what happens in Zoom chat!

Don't have the materials? Do the activity that Miss Johnson put in the chat by clicking on the [link](#) to the Lumio activity.





HAVE EXTRA TIME?
FIND OTHER EXAMPLES OF
MATERIALS THAT ARE MORE THAN
ONE STATE OF MATTER!