



## Messy Matter: Student Guide

Use this guide to assist you with gathering materials and following along with the activities in the *Messy Matter* video. The video has three activities you can do along with the Instructor using simple materials. There is a material list below that you can use to gather everything you need for the experiments. During the video the Instructor will let you know when you will use the materials you need. Pause the video when you need time to prep your materials or conduct your experiment. If you don't have the materials, don't worry you can still watch the video and observe the experiments. There are vocabulary words in this guide to assist you if the Instructor mentions a new word you may not yet know. At the end of the video answer the reflection questions to test your knowledge.

**Objective: To explore states of matter and learn how to classify matter by its observable properties.**

**Grades: Pre-K – 2**

### MATERIALS

#### Activity 1: Matter as Molecules

- Paper
- Coloring supplies (crayons/markers)
- Small bowl of cheerios (could be substituted with other objects that are similar in size and shape)

#### Activity 2: Liquids

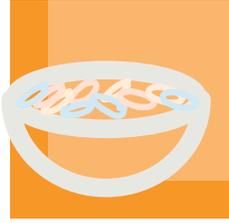
- Water
- Different shaped containers
- Plastic bricks, wooden blocks or items that are of similar size and shape
- Optional: blue food coloring

#### Activity 3: Gassy Balloon

- Soda bottle or other similar container with a small opening
- Baking soda
- Vinegar
- Balloon
- Spoon or paper funnel
- Funnel

#### Activity 4: Oobleck

- Corn Starch
- Container/Bowl
- Spoon
- Water
- Measuring cups (1 cup and ½ cup)
- Food Coloring (Optional)
- Plastic bag or resealable container (optional)



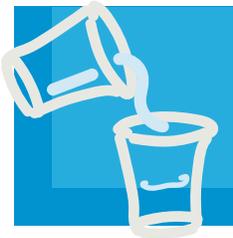
#### MATERIALS

- Paper
- Coloring supplies (crayons markers)
- Small bowl of cheerios (could be substituted with other objects that are similar in size and shape)

## Activity 1: Matter as Molecules

#### WHAT TO DO

1. Using your coloring supplies, (crayons or markers), draw three large cups on your paper. Make sure that all your cups are the same shape and size. Next, let's label each cup; the first cup SOLID, the second cup LIQUID, and the final cup GAS.
2. How do these molecules look in each of the different phases of matter? Make a hypothesis. For your hypothesis I want you to pretend your cheerios are molecules, and arrange them in the cups you drew.



#### MATERIALS

- Water
- Different shaped containers
- Plastic bricks, wooden blocks or items that are of similar size and shape
- Optional: blue food coloring

## Activity 2: Liquids

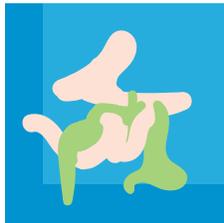
#### WHAT TO DO

1. Pour water into container 1.
2. Then pour container 1 into container 2.
3. Pour container 2 into container 3.
4. Try it into another container. What do you notice is happening?
5. Then try the same thing using the plastic bricks or wooden blocks. What is the difference between using the water and the plastic bricks?



#### MATERIALS

- Soda bottle or other similar container with a small opening
- Baking soda
- Vinegar
- Balloon
- Spoon or paper funnel
- Funnel



#### MATERIALS

- Corn Starch
- Container/Bowl
- Spoon
- Water
- Measuring cups (1 cup and ½ cup)
- Food Coloring (Optional)
- Plastic bar or resealable container (optional)

## Activity 3: Gassy Balloon

#### WHAT TO DO

1. Start by adding some vinegar to your bottle, using a funnel if need be. You may need an adult's help with this part!
2. Next, use the spoon (or paper funnel) to add some baking soda to the balloon.
3. Next, carefully attach the balloon to the lip of the bottle without spilling the baking soda into the bottle just yet.
4. Tip the balloon upright so all the baking soda slides into the bottle, then set the balloon back down and watch.

## Activity 4: Oobleck

#### WHAT TO DO

1. First add 1½ cups of cornstarch in a bowl.
2. Measure 1 cup of water in a separate container. You can add food coloring to the water if you have some.
3. Then slowly add the water to the cornstarch and mix with a spoon. If the mixture is too runny add a teaspoon of cornstarch. If the mixture is too cakey, add a teaspoon of water.
4. Now that we have our mystery matter, let's use our senses to identify what phase of matter it is!
  - > Push Test: Take your finger and poke the oobleck quickly like this. What happens? Try poking the oobleck slowly.
  - > Pick Up Test: Can you pick up the oobleck with your hands? How does it feel? Does it feel different when you squish it vs when it's just flat on your palm?
  - > Pour Test: Try pouring the oobleck from one container to another or your hands back to the container.
5. Once you finish the experiment, you can put away your mystery matter in a resealable container or a plastic baggie. If you don't want to keep your oobleck, you can throw it away.

**VOCABULARY**

**Matter** — anything that has mass and takes up space.

**Solid** — a form of matter where the molecules are closely bound together.

**Liquid** — a form of matter that is settled between solid and gas. Liquid has an almost-fixed volume, but no set shape.

**Gas** — a form of matter where the molecules are really spread out.

**Molecule** — the smallest unit of a substance that has all the properties of that substance.

**Prediction** — to declare or indicate in advance.

**Experiment** — a test or trial.

**Chemical reaction** — a change in a substance that creates something new.

**Carbon dioxide** — a gas produced by animals and people breathing out, and by chemical reactions.

**Pressure** — force over a given area.

**STUDENT REFLECTION QUESTIONS**

Can matter exist as two phases?

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How did you arrange your cheerios differently for a solid than you did for a liquid or a gas?

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What do you think will happen if we put the oobleck in the freezer?

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## WHAT'S HAPPENING?

Molecules make up **matter**, it's anything that has mass and takes up space. The chair you're sitting on is a **solid**, the water you drink is a **liquid**, and the air you breathe is a **gas**. Molecules don't change but the way they move does. Matter changes state when more energy gets added to it. Energy is often added in the form of heat or pressure. The molecules in a solid are held tightly together and don't move easily. The molecules in a liquid are looser and can move about easily. The molecules in a gas are more spread and move faster than the liquid molecules.

**Gas** just refers to a form of **matter** where the molecules are really spread out. A gas fills the space it's in — it's molecules spread out as far as they can until they take up the whole space. The air we breathe is a **gas**, so is the steam we see coming off a pot of boiling water. When **acid** and a **base** meet there is always a reaction. In this case they start to make **carbon dioxide** gas. **Carbon dioxide** is a gas that we actually make in our own bodies, it's present in every breath we exhale. It is odorless, colorless, and hard to sense without additional help. But it does take up physical space, as we can clearly see and feel! The **carbon dioxide** gas molecules are spreading out as far as the balloon allows, trying to fill the whole space of the container. If I were to remove the balloon the molecules would begin to spread out in this room, until they are fully mixed in with the air in this room.

Oobleck is a **non-Newtonian fluid**. A **non-newtonian fluid** acts as a liquid or solid based on force. Notice when you apply force by squishing it, it feels more like a solid, but when you let it rest on your hands, it runs like liquid.

*Check out more activities at [www.nysci.org](http://www.nysci.org).*