6th Grade Lesson Plan:
Matter, Molecules, and Atoms

Objective: Explain the difference between atoms and molecules and help students understand that molecules are made up of different proportions and quantities of atoms.

Materials: Toothpicks, different colors of gum drops, molecule printouts, and the matter, molecules, and atoms "What You Discovered" worksheet.

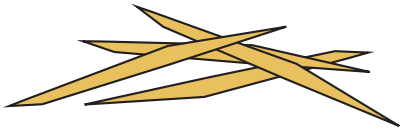
Procedure:

1. Start with a class discussion about matter and how it is made up of molecules that are made up of atoms. You will want to write terms on the board and draw example molecules as you discuss the different concepts.
   a. Ask students a few opening questions, such as: What is matter?
   b. Matter is a physical substance. Everything is made up of matter.
      i. Ask students if they know the different phases of matter. Matter comes in three main phases: **solid**, **liquid**, and **gas**.
   c. Matter can be broken down into molecules.
      i. Ask students if they know what a molecule is.
      ii. Molecules are several atoms bonded together.
   d. Ask students if they know what an atom is.
      i. Atoms are the smallest unit of a chemical element.
   e. Atoms are made up of **protons**, **neutrons**, and **electrons**.
      i. Protons are tiny particles that have a positive charge and add weight to the atom.
      ii. Neutrons are tiny particles that have no charge, but they also add weight to the atom.
      iii. Electrons are even smaller particles. They are so small that they don't add significantly to the weight of the atoms; however, they do carry a negative charge.
   f. Specific combinations of atoms form certain molecules. The molecule made depends on the types of atoms (elements) as well as the number of atoms.
      i. Give examples of common molecules and show the atoms they can be broken down into. Options include water, carbon dioxide, sugar, etc. You can also use molecules from household products such as an essential oil molecule to show the range of possibilities for molecules from simple to complex.
      ii. List some atoms (elements) and molecules on the board and ask students which belongs in each category.

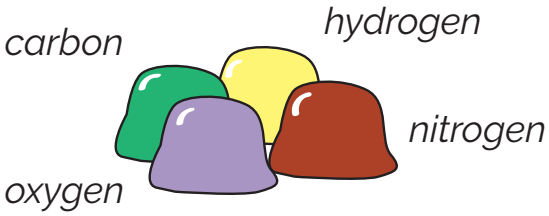
2. Divide the students into groups and have them create molecule models using gum drops and toothpicks. Follow the steps outlined on the dōTERRA® Science for Kids experiment write-up intended to partner with this lesson.

Evaluation: Teachers will evaluate students' understanding by reviewing their responses to the questions on the "What You Discovered" worksheet, as well as the notes they recorded in their notebook.

Supplies:



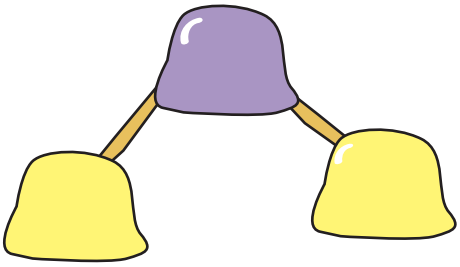
Toothpicks
(chemical bonds)



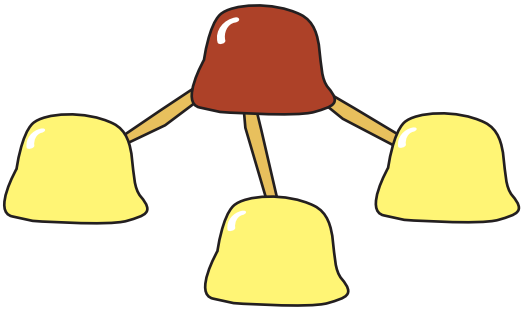
Gumdrops
(atoms)

Diagrams:

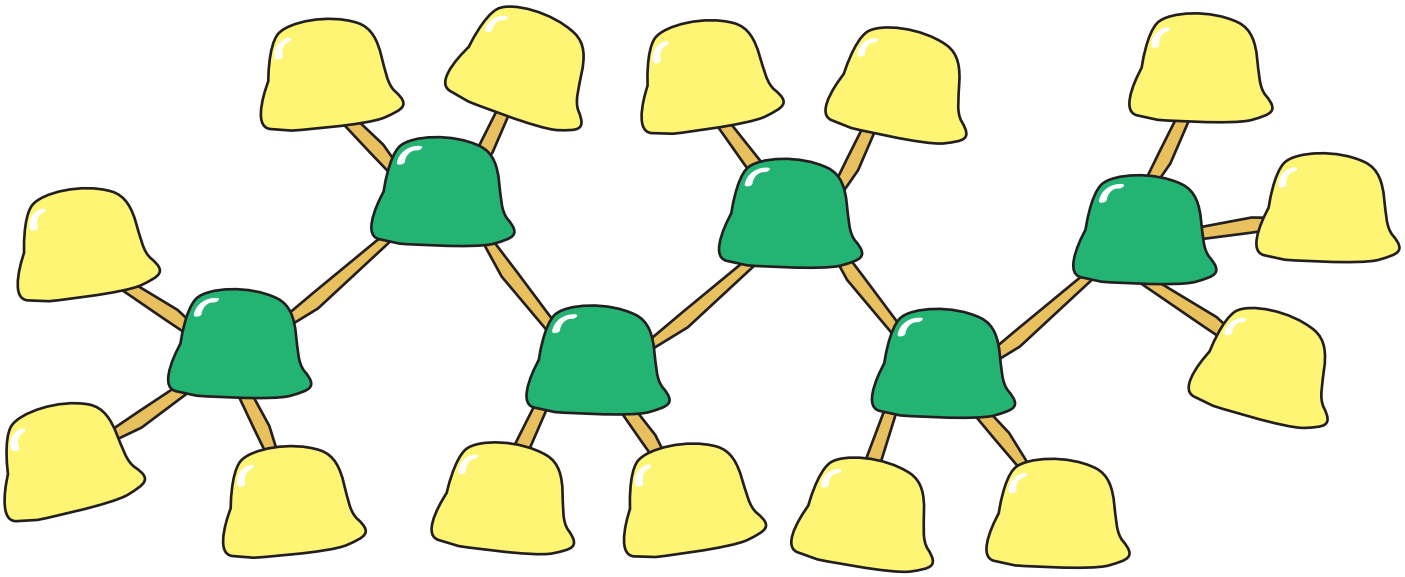
- Water molecule



- Ammonia molecule



- Hexane molecule



Matter, Molecules, and Atoms

What You'll Need:

- **Toothpicks** (24 per group)
- **Different colored gumdrops**

  (1 purple, 1 red, 6 green, and 19 yellow or white.)

  Note: If allergens are a concerns, you can also use clay or styrofoam balls.
- **Molecule diagrams** (for reference)

Hints: Dividing students into groups to make the molecules and answer the worksheet questions works well. If you divide them into groups, you only need one instruction sheet per group.

What You'll Do:

1. For this activity, each color of gumdrop represents a different chemical element. Purple is oxygen, green is carbon, yellow is hydrogen, and red is nitrogen. To start, stick two toothpicks into a purple gumdrop (oxygen). These toothpicks should be at a slight angle to each other, almost making a straight line, but not quite.

2. Place a yellow gumdrop (hydrogen) on the other end of each toothpick so that the molecule now has two hydrogens. This is a water molecule. Check the molecule diagram to see how your molecule compares.

3. Next, stick three toothpicks into a red gumdrop (nitrogen) kind of like you're making a tripod. The angle of the toothpicks should resemble a three-legged stool.

4. Place a yellow gumdrop (hydrogen) on the end of each toothpick so that the molecule now has three hydrogens attached. This is a molecule of ammonia. **Ammonia is produced by decomposition of plants, animals, and animal waste. It can be found in fertilizers and many household cleaners.** Check the molecule diagram to see how your molecule compares.

5. Finally, put four toothpicks into a green gumdrop (carbon).

6. On three of the four toothpicks, place a yellow gumdrop (hydrogen).

7. Place a green gumdrop (carbon) on the last toothpick remaining.

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8. Stick a toothpick into the second green gumdrop (carbon) you added. It should be at about a 90 degree angle from the other toothpick.

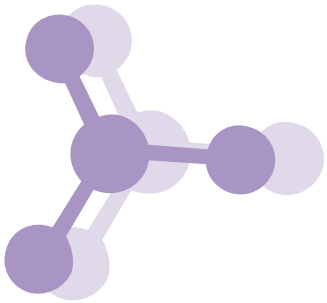
9. Place a green gumdrop (carbon) on this new toothpick.

10. Repeat steps 8 and 9 until you have six green gumdrops (carbon) connected together in a zigzag.

11. Stick three toothpicks into the last green gumdrop (carbon) that you added to the zigzag chain.

12. Stick two toothpicks into the four green gumdrops (carbon) in the middle of the zigzag.

13. Add yellow gumdrops (hydrogen) to each open place on a toothpick. When you are done, there should be a total of 6 green gumdrops (carbon) and 14 yellow gumdrops (hydrogen). This molecule is called hexane. **Hexane is used in glues for things like shoes and roofing. It is also used to extract cooking oils from seeds.** Check the molecule diagram to see how your molecule compares.



What Does It Mean?

In this activity, you got to make three molecules commonly found in the world. Everything in the world consists of matter, which is made up of molecules. Molecules are substances made up of atoms bonded together. An atom is the smallest unit of a chemical element, the purest form a substance can take. The atoms included in a molecule and how they are bonded together determine the type of molecule that is formed.

It's kind of like a recipe. To make the food you want, you need specific ingredients added together in a specific order. For instance, if you want to make chocolate chip cookies, you need to include chocolate chips, while if you want to make raisin cookies, you need raisins instead. You wouldn't add chocolate chips to a raisin cookie because then you wouldn't get a raisin cookie. Molecules are similar in that they are made up of certain atoms, or "ingredients," to make a particular molecule. So if you want water, you need two hydrogen atoms and one oxygen atom combined together, but if you want hydrogen peroxide, you need two hydrogen atoms and two oxygen atoms combined together.

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What You Discovered:

Name **Teacher's Copy**

1. Which atoms did you use to make a water molecule?

   Hydrogen and oxygen

2. What are some ways you use water?

   Drinking it, bathing, cooking, swimming, etc.

3. Which atoms did you use to make an ammonia molecule?

   Hydrogen and nitrogen

4. What is ammonia used in?

   Fertilizers and cleaners

5. Which atoms did you use to make a hexane molecule?

   Hydrogen and carbon

6. What is hexane used in?

   Glues and extracting cooking oils

7. What are molecules made up of?

   Atoms

8. What is one thing you learned about molecules and atoms through this activity?

   Answers will vary

Matter, Molecules, and Atoms

What You Discovered:

Name _____

1. Which atoms did you use to make a water molecule?

_____

2. What are some ways you use water?

_____

3. Which atoms did you use to make an ammonia molecule?

_____

4. What is ammonia used in?

_____

5. Which atoms did you use to make a hexane molecule?

_____

6. What is hexane used in?

_____

7. What are molecules made up of?

_____

8. What is one thing you learned about molecules and atoms through this activity?

_____

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