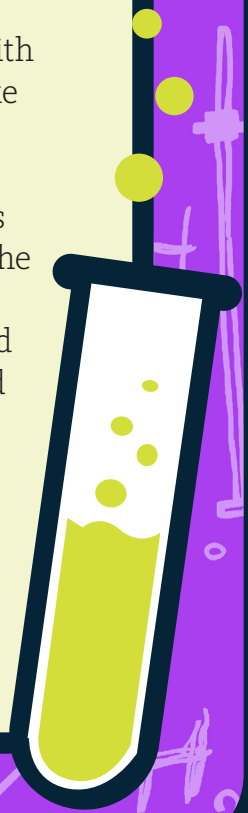
UNLOCKING SCIENCE HANDS ON!

MAKING MOLECULAR MODELS

Many people have traumatic flashbacks to chemistry class when they see a periodic table, but it is really a beautiful reflection of the mind of God. The order and structure we see reminds us that the God who created each of those elements out of nothing is a God of order and not chaos. The way the elements are arranged helps us predict how they will form chemical bonds. The number of electrons in the outer shell (valence electrons) is the same as the group number, and atoms share or trade electrons to get to the happy number of eight. Building molecular models is a lot like putting together a puzzle with the pieces trying to make each atom have 8 (or 2) electrons, just like God intended.

Consider the words from Isaiah 45:18–19 as you think about the order God has placed in his creation, and then go build some models of his molecules; "For thus says the LORD, who created the heavens (he is God!), who formed the earth and made it (he established it; he did not create it empty, he formed it to be inhabited!): 'I am the LORD, and there is no other. I did not speak in secret, in a land of darkness; I did not say to the offspring of Jacob, "Seek me in vain." I the LORD speak the truth; I declare what is right'" (ESV).

Extra Family Fun: Use your favorite foods to build the models or add some melted dipping chocolate to make your molecules extra tasty when you eat them (but don't dip your plastic models in chocolate).



Making Molecular Models

Materials

- ○ Model Material (pick one)
  - Mini marshmallows, multicolored, white
  - Gumdrops, multicolored, white
  - Assorted fruits, cut into small pieces as needed
- ○ Toothpicks
- ○ Periodic table
- ○ Molecular model kit (optional)
- ○ Melting chocolate (optional)

Molecular Model Kit

For each atom, decide which material you will use to represent it in your model and determine its symbol and how many bonds it will form based on its position on the periodic table.

Atom	Symbol	Group/ Electron Number	Number of Bonds	Model Material
Hydrogen				
Carbon				
Nitrogen				
Chlorine				
Oxygen				
Silicon				
Sulfur				

Building Your Models

Now that you have your model kit ready, use the formulas for each of the molecules below to build the molecule and then sketch it in the space provided. Remember to check your model to see if every atom has the right number of bonds (toothpicks) to make it "happy" with eight electrons. The models will get more challenging as you progress. *Parents: You can use an online application like MolView.org to check the structures of the molecules as you create them.*

1. Water—H_2O

2. Methane—CH_4

3. Ethane—C_2H_6

4. Propane—C_3H_8

5. Ammonia—NH_3

6. Carbon dioxide—CO_2 *(Hint: Sometimes carbon forms more than one bond with an atom.)*

7. Ethanol—C_2H_5OH

8. Silicon dioxide—SiO_2

9. Carbonyl sulfide—COS

10. Hydrogen cyanide—HCN

11. Ethene—C_2H_4

12. Chloropropane—C_3H_7Cl *(How many different shapes can this make?)*

13. Acetylene—C_2H_2

14. Build some molecules of your own, but make sure you follow the bonding rules.

Analysis Questions and Discussion

1. Find two elements on the periodic table whose names don't match their symbols. Where do the symbols come from? *E.g., Lead is Pb from the Latin* plumbum *and tungsten is W,* wolfram, *from the German* wolf rahm *for the metal ore.*
2. Do you believe it is more likely that the structure and order we see in the periodic table came from the mind of God as he created things or from random interactions of materials and energy over billions of years (design vs. materialistic evolution)? *Discuss the answer.*
3. What property of carbon makes it an appropriate material for the building block of living things? *It can form four bonds, so it is very versatile, making up the core components of all living molecules. Life on earth is carbon based.*
4. If we can find carbon and water on other planets, does that mean we will find life? *Not necessarily, only if God created it there. But that is the hope of evolutionists.*
5. We use propane in devices like lanterns and cooking stoves. We use acetylene in devices like cutting and welding torches that burn much hotter. Look at the models of the two gases. If burning these gases involves breaking the bonds, why does acetylene burn hotter than propane? *Acetylene burns hotter because breaking the triple bond between the carbons releases more energy than breaking the single bond between the carbons in the propane.*
6. What do you learn about God when you see the order found in his creation? *Discuss various answers, pointing to his consistent character and faithfulness to fulfill his spiritual promises just as he upholds and keeps his physical "promises" in the natural laws he uses to run the universe.*