

**POGIL: Classification of Matter:**

**How do atoms combine to make different types of matter?**

*Modified from POGIL Activities for High School Chemistry*

Name Answer Key

Group #      Role:                     

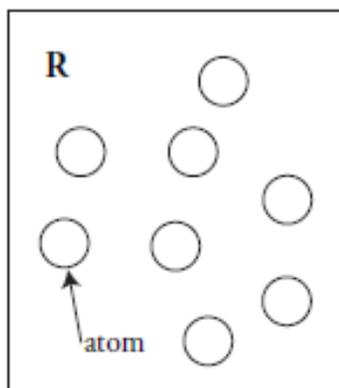
Partners:                                     

**Why?**

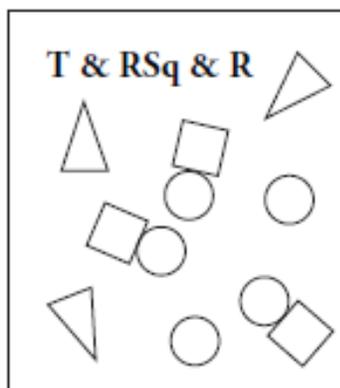
Look at the things in this room. They are all matter. That matter may be a pure substance or it may be a mixture. Can you tell by looking at it? What if you looked at it under a microscope? Then could you tell? Something that looks pure may not really be pure. It depends on what types of particles the matter is made of. In this activity we will explore how the smallest chemical units of matter determine whether something is classified as an element, a compound, or a mixture.

**KEY:** **R** stands for a Round atom. **Sq** stands for a Square atom. **T** stands for a Triangle atom.

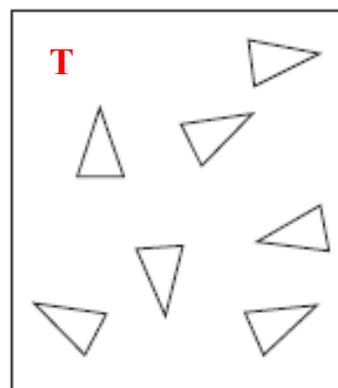
**Model 1 — Atoms, Particles, and Molecules**



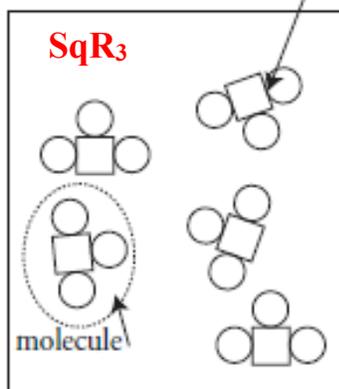
8 particles



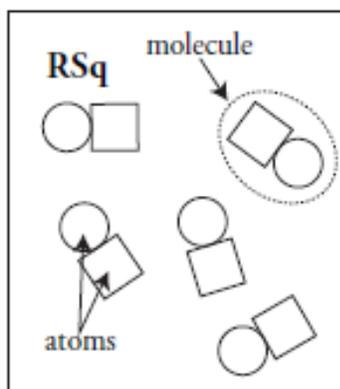
8 particles



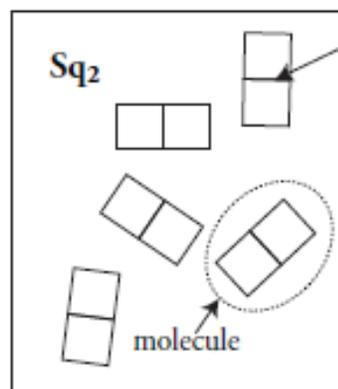
7 particles



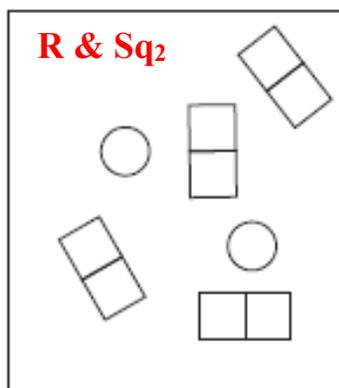
5 particles



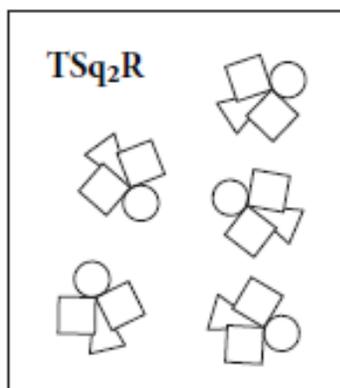
5 particles



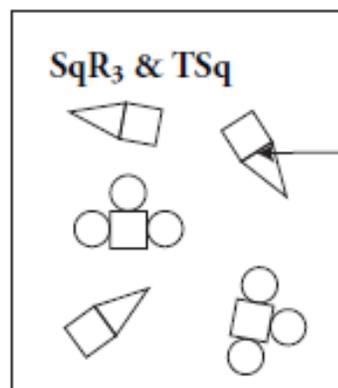
5 particles



6 particles



5 particles



5 particles

- 1) How many atoms are in each molecule of  $\text{RSq}$ ? 2
- 2) How many  $\text{Sq}$  atoms are in each molecule of  $\text{TSq}_2\text{R}$ ? 2
- 3) Why are  $\text{RSq}$  and  $\text{Sq}_2$  both molecules? Two or more atoms are chemically bound in a particle
- 4) How many different types of molecules are found in the sample of  $\text{SqR}_3$  &  $\text{TSq}$ ? 2
- 5) Can a *particle* be a single atom? Y
- 6) Can a *particle* be a molecule? Y
- 7) On Model 1, fill in any missing numbers of particles for each drawing (Show below each box.)
- 8) What is your group's definition of the word "particle" as it is used in chemistry?  
Any single atom or group of atoms that is chemically bound (a molecule)
- 9) In Model 1 there are three drawings that are labeled with a question mark. Write codes to properly label these drawings.
- 10) As a team, sort the laminated set of drawings into two groups—one group where all the particles in the drawing are identical, and a second group in which the drawings contain more than one type of particle.

### Read This!

Matter is classified as a **pure substance** when all of the particles are identical. Matter is classified as a **mixture** if there are different types of particles present.

- 11) Identify which drawings from the previous question are pure substances and which are mixtures. List the codes of each drawing in the proper places below.

| Pure Substances |                        | Mixtures                      |
|-----------------|------------------------|-------------------------------|
| R               | T                      | T & $\text{RSq}$ & R          |
| $\text{SqR}_3$  | $\text{RSq}$           | R & $\text{Sq}_2$             |
| $\text{Sq}_2$   | $\text{TSq}_2\text{R}$ | $\text{SqR}_3$ & $\text{TSq}$ |

### Read This!

**Elements** are defined as pure substances made from only one type of atom. **Compounds** are defined as pure substances made from two or more types of atoms.

- 12) Now as a team, take the set of pure substance drawings from the previous question and sort them into two new groups—those containing only one type of atom and those containing different types of atoms.
- 13) Identify which drawings from the previous question are elements and which are compounds. List the codes for the drawings in the appropriate places below.

| Elements      | Compounds              |
|---------------|------------------------|
| R             | $\text{SqR}_3$         |
| T             | $\text{RSq}$           |
| $\text{Sq}_2$ | $\text{TSq}_2\text{R}$ |

- 14) Use what you have just learned about chemical formulas to identify each of the following as an element, a compound or a mixture.
  - a)  $\text{NaHCO}_3$  compound
  - b)  $\text{Br}_2$  element
  - c) Co element
  - d)  $\text{C}_6\text{H}_{12}\text{O}_6$  &  $\text{H}_2\text{O}$  mixture
  - e) Cu & Zn mixture
  - f) CO compound