

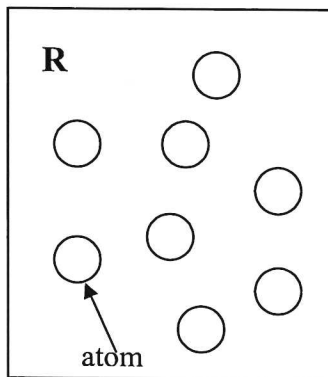
# Classification of Matter

How do atoms combine to make different types of matter?

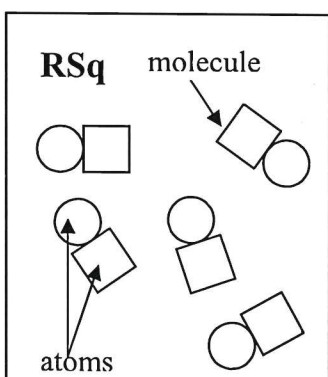
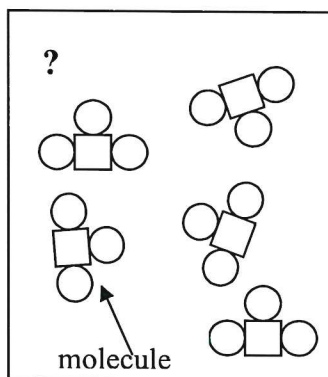
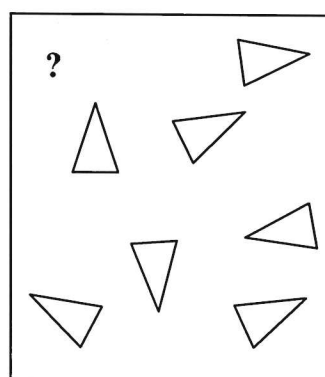
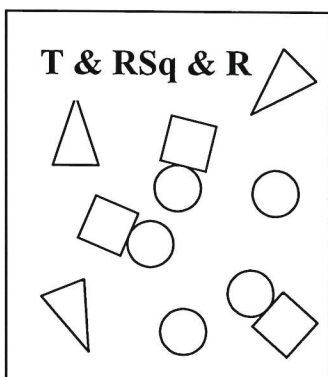
## Why?

Look at the things in this room. They are all matter. That matter may be pure 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 type of particles that thing 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.

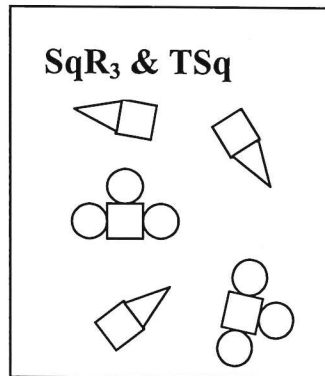
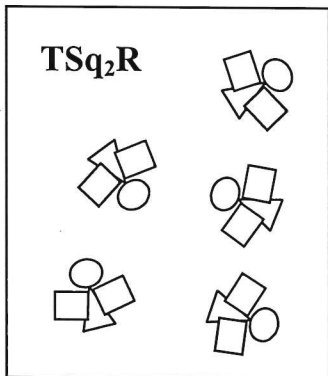
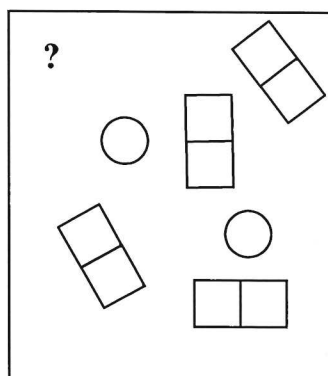
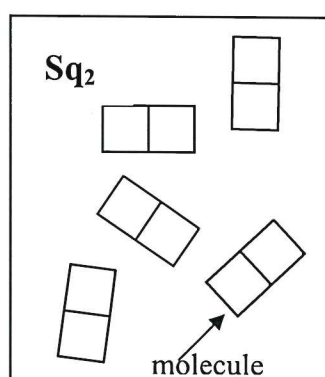
## Model 1




8 particles



5 particles



5 particles

1. Circle a molecule of RSq in Model 1. How many atoms are in a molecule of RSq?
  
2. Circle a molecule of TSq<sub>2</sub>R in Model 1.
  - a) How many different types of atoms are found in a molecule of TSq<sub>2</sub>R?
  
  - b) How many Sq atoms are in a molecule of TSq<sub>2</sub>R?
  
3. a) How many different types of atoms are found in a sample of SqR<sub>3</sub> & TSq?  
  
b) How many different types of molecules are found in a sample of SqR<sub>3</sub> & TSq?
  
4. a) What does it mean when two atoms are touching in the drawings of Model 1?  
  
b) What does it mean when two atoms or molecules are **not** touching in the drawings of Model 1?
  
5. a) Can a *particle* be a single atom?  
  
b) Can a *particle* be a molecule?  
  
c) How many particles are in the drawing representing T & RSq & R in Model 1?
  
-  6. Compare the codes listed at the top of each drawing in Model 1 with the shapes in that box.
  - a) What do the letters R, Sq and T in the codes represent?
  
  - b) What do the small numbers (subscripts) in the codes represent?
  
  - c) When atoms are touching, how is that communicated in the code?
  
  - d) When atoms or molecules are not touching, how is that communicated in the code?
  
  - e) In Model 1 there are three drawings that are labeled “?”. Write codes to properly label these drawings.



7. The manager should appoint one group member to cut apart Model 1 to separate the nine drawings. As a team, sort the pictures into those where all the particles in the drawing are identical, and those that have more than one type of particle in the drawing.

### Read This!

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



8. Identify which set of drawings from #7 are pure substances and which set are mixtures. List the codes for each set here.

Pure Substances		Mixtures
_____	_____	_____
_____	_____	_____
_____	_____	_____

9. How are the codes (chemical formulas) for pure substances different from those for mixtures?

10. As a team, take the set of pure substances drawings from #8 and sort them into those containing only one type of atom and those with two or more types of atoms.

### Read This!

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

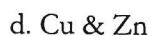
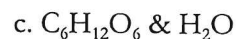


11. Identify which set of drawings from #10 are elements and which set are compounds. List the codes for each set here.

Elements	Compounds
_____	_____
_____	_____
_____	_____

12. How are the codes (chemical formulas) for elements different from those for compounds?

13. Use what you have just learned about chemical formulas to identify the following as element, compound or mixture.



## Extension Questions

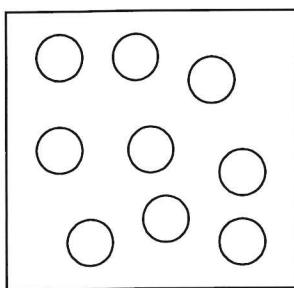
14. Often times it is useful to separate matter. For example, you strain cooked pasta to get the liquid out. In a fuel cell, water is separated into hydrogen and oxygen.

- Which type of matter can be separated by physical methods (no bonds need to break) such as filtering or distillation?
- Which type of matter needs to be separated by chemical methods (breaking of bonds required) such as electrolysis or decomposition?

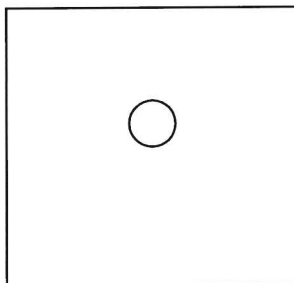
15. Students in a chemistry course were asked the following question on a unit exam:

*“Draw a diagram representing an element using circles as atoms.”*

a) The following diagrams represent the two types of answers given by students. Which drawing is the best representation of an element? Explain.



Drawing A



Drawing B

b) If Drawing B was a sample from the substances in Model 1, which substance(s) could be represented? Is a single atom a good representation of any of them?