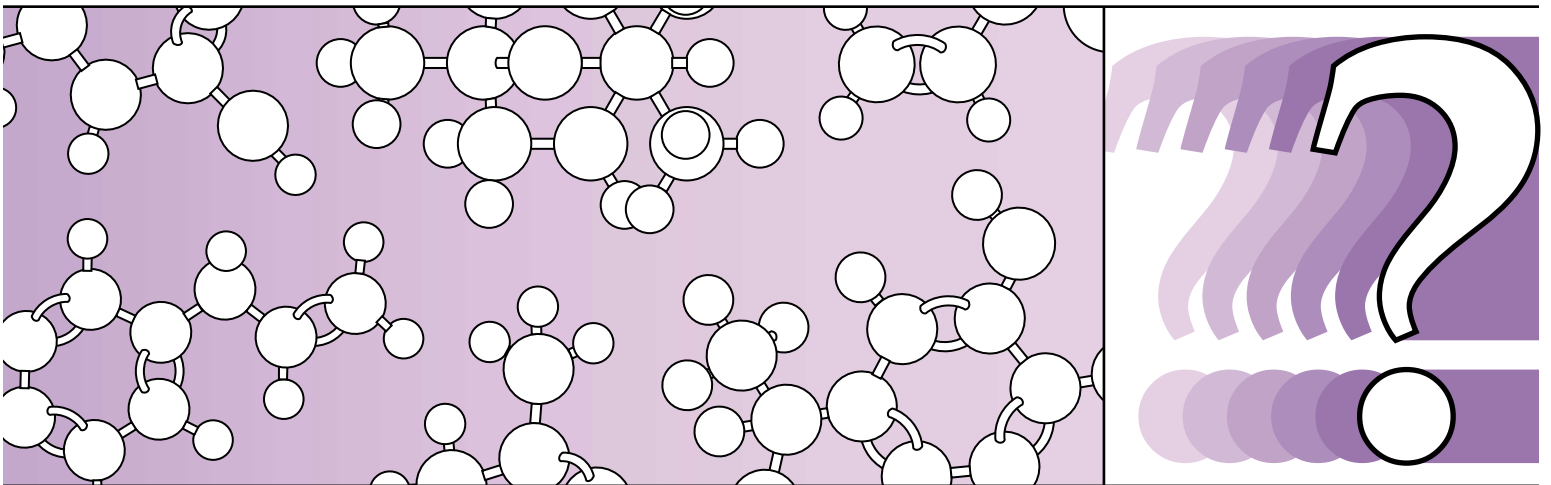


The Pfizer Foundation Biochemistry

Discovery Lab

What molecules give flowers their colors?



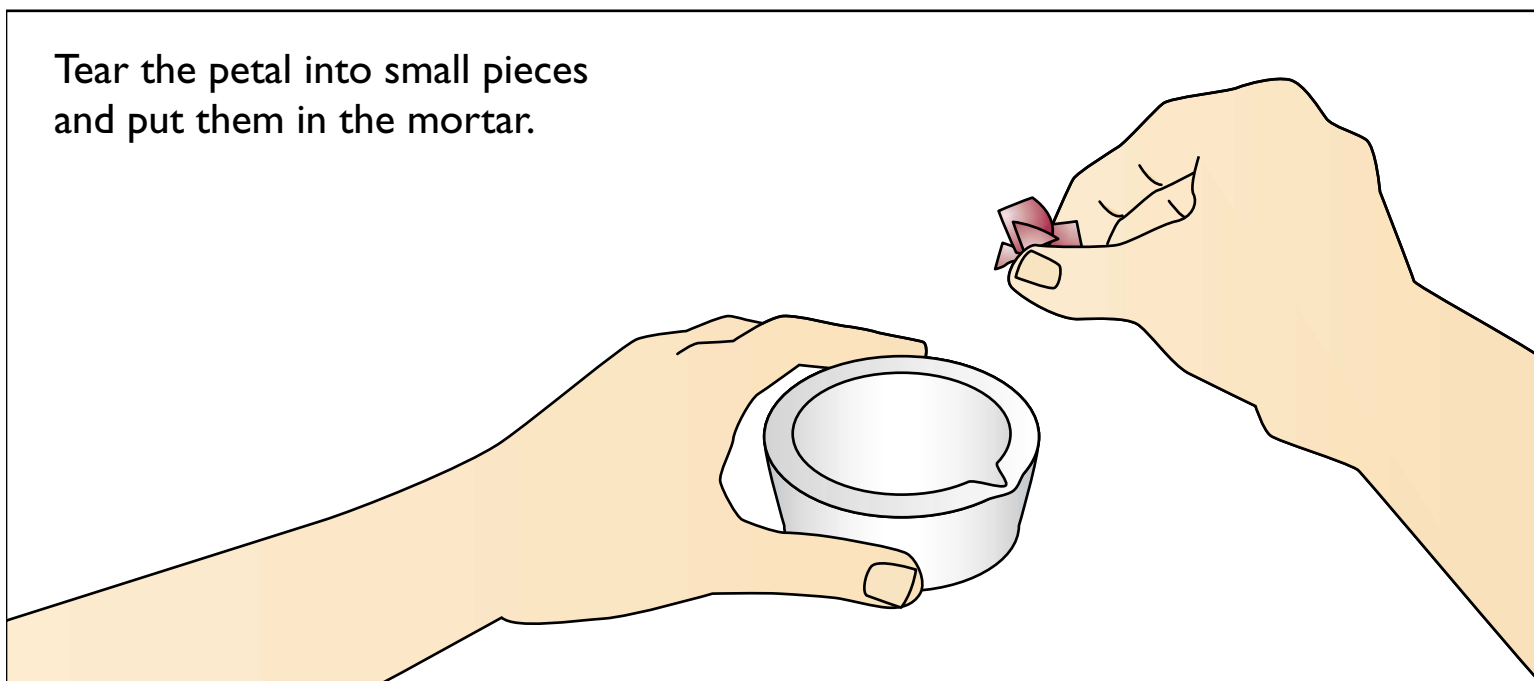
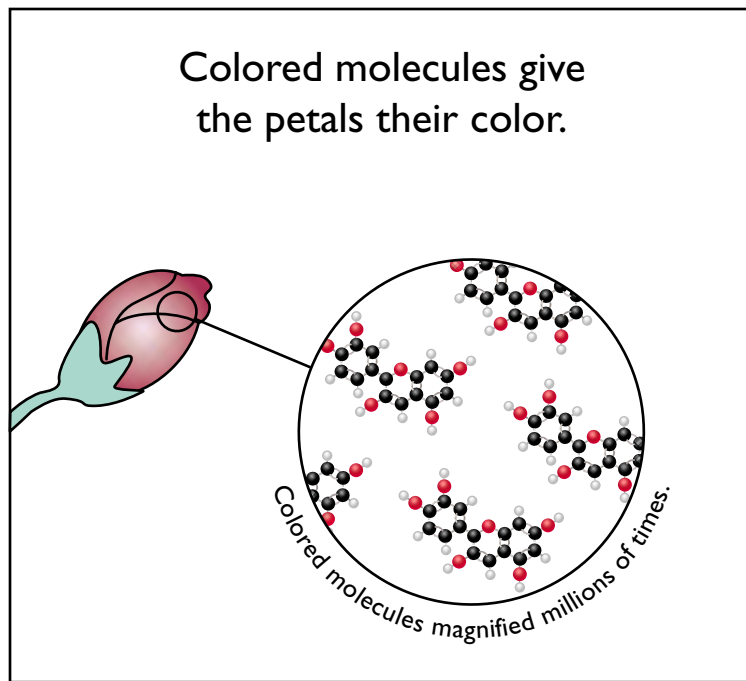
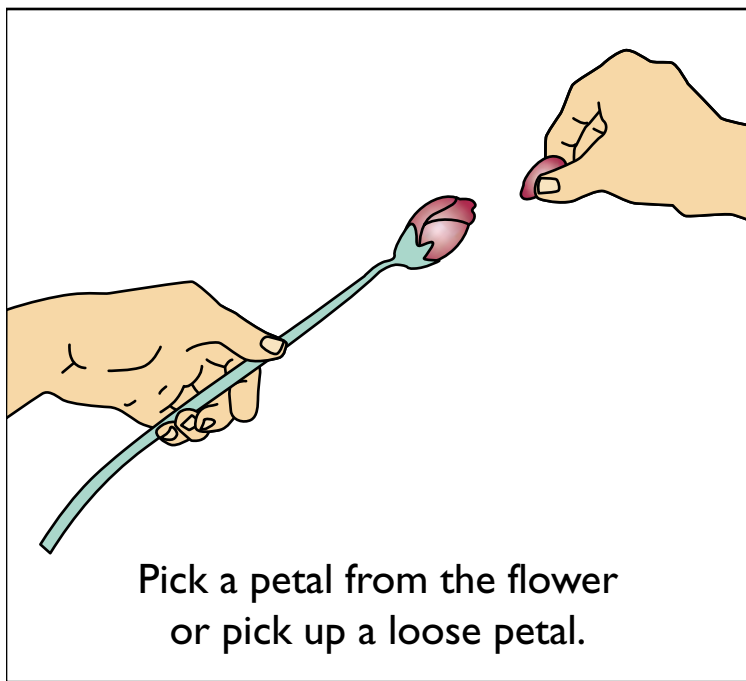
Colored molecules give flower petals their color.

**Collect colored molecules
from a flower petal and
make them change color.**

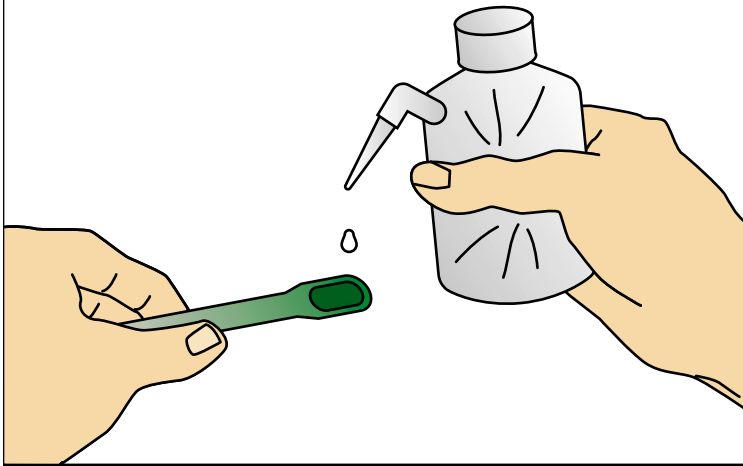
Molecules are tiny
particles that make
up all living things.

**Find out how molecules give
flowers different colors.**

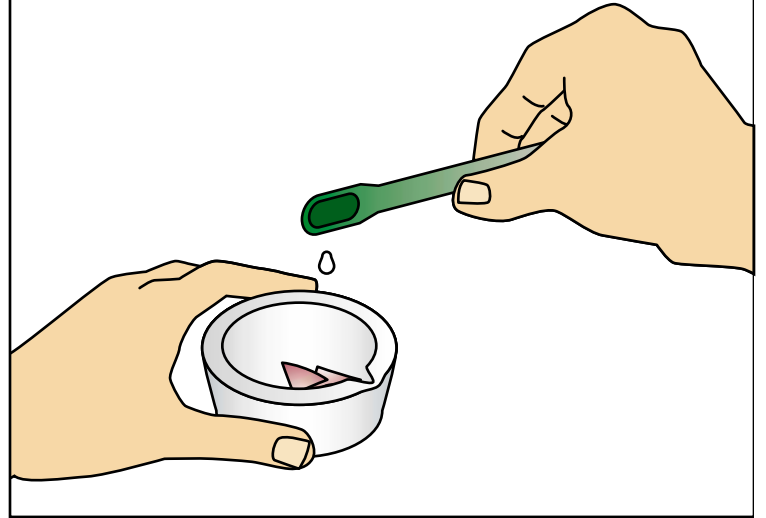
How to collect colored molecules



Fill the spoon to the brim with water.

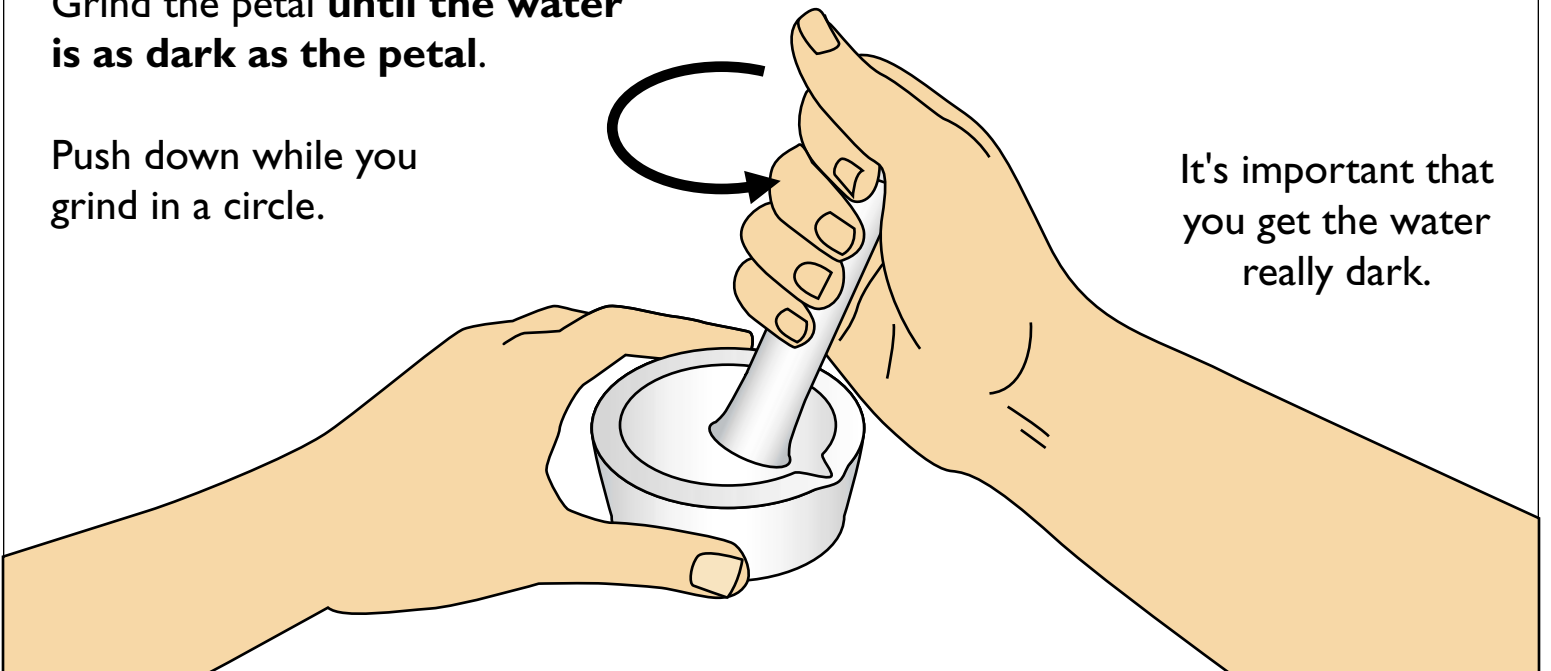


Add the water to the petal.



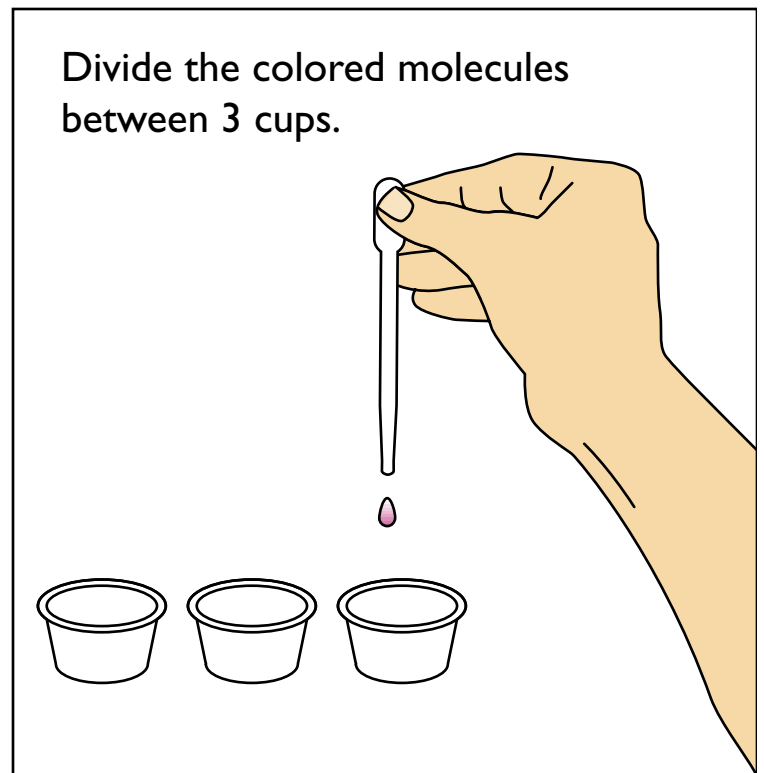
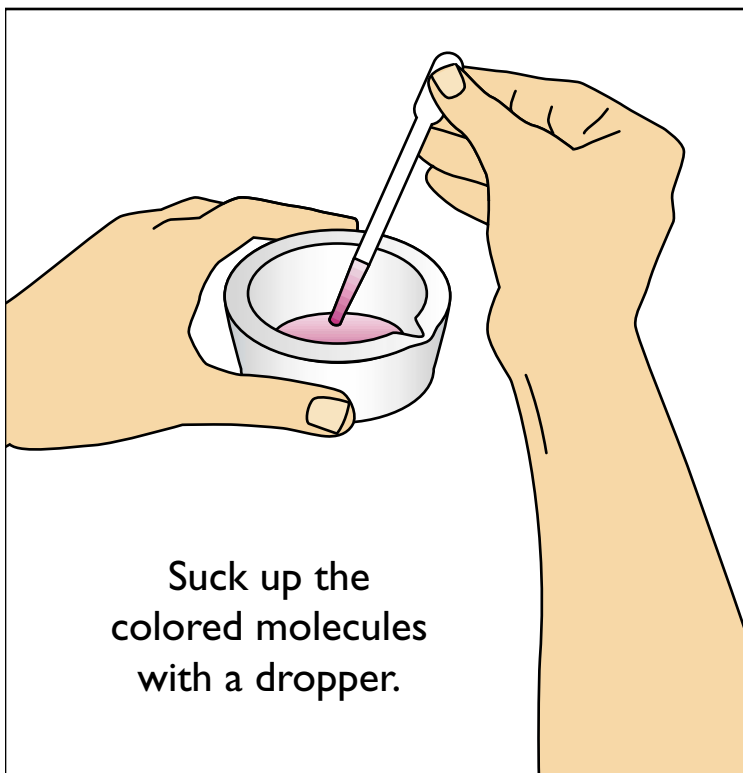
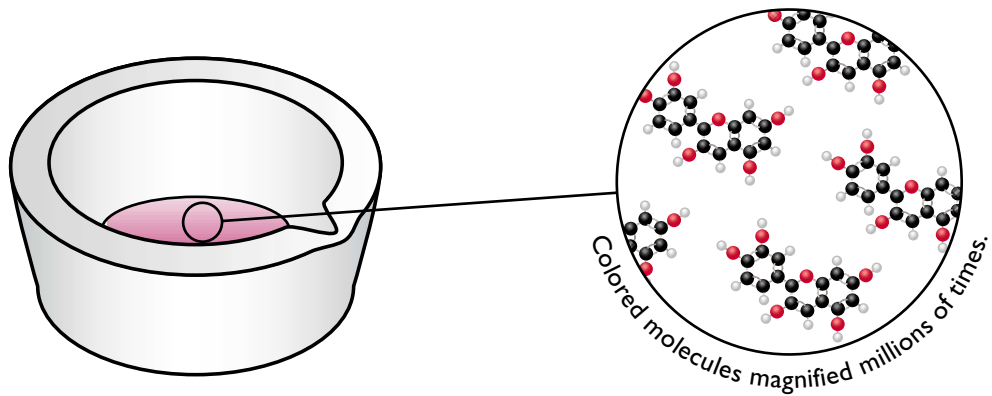
Grind the petal **until the water is as dark as the petal.**

Push down while you grind in a circle.



It's important that you get the water really dark.

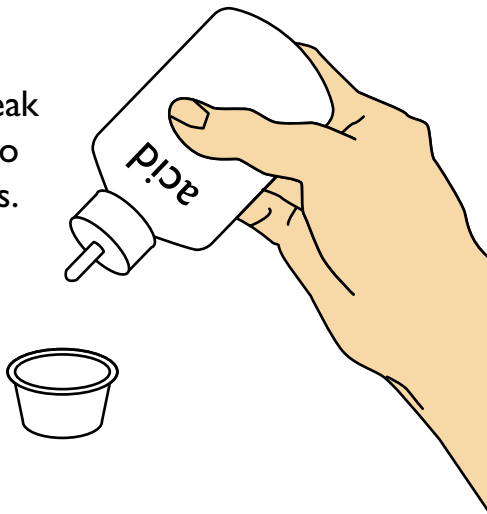
Some of the colored molecules from the petal are now in the water.



How to make the molecules change color

Add acid to one cup of colored molecules until they change color.

This acid is weak like vinegar, so it is harmless.



Compare with another cup to see the color change more easily.

Add base to another cup of colored molecules until they change color.

A base is the opposite of an acid.



Compare with the cup that has not been changed to see the color change more easily.

What colors did you make the molecules change to?

Did you make the color of a crocus



or a tulip?

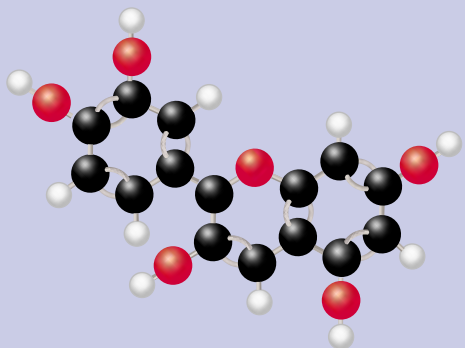


How do the molecules change color?

In acid, the molecules are these colors:



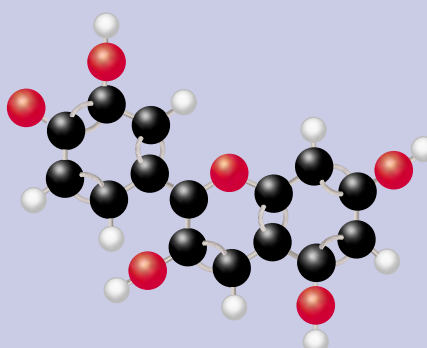
because they have this structure:



In base, the molecules are these colors:




because they have this structure:



You may have made green or yellow molecules if you added a lot of base.

These colors come from other kinds of colored molecules.



Can you spot the tiny difference between the two molecule structures above? (clue: look at the )

This tiny change in structure causes a big color change.

How do these molecules give flowers different colors?

Flowers with acid in their petals are these colors

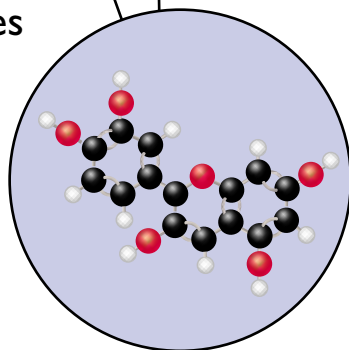


tulip



rose

because their colored molecules are like the ones you made with acid:



Colored molecule

Flowers with base in their petals are these colors

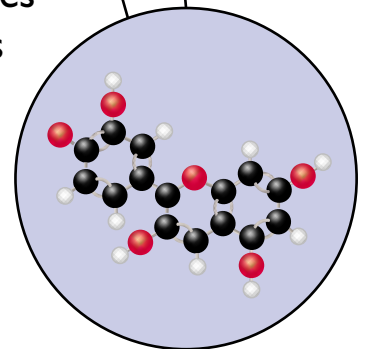


iris



crocus

because their colored molecules are like the ones you made with base:



Colored molecule

Change one of your colors to another color by adding acid or base.



Just like you can change the color by adding acid or base, some flowers can change color by changing the petals between acid and base.



acidic petals



basic petals

Flowers come in more colors than the ones you made.
These other colors are from other kinds of colored molecules.



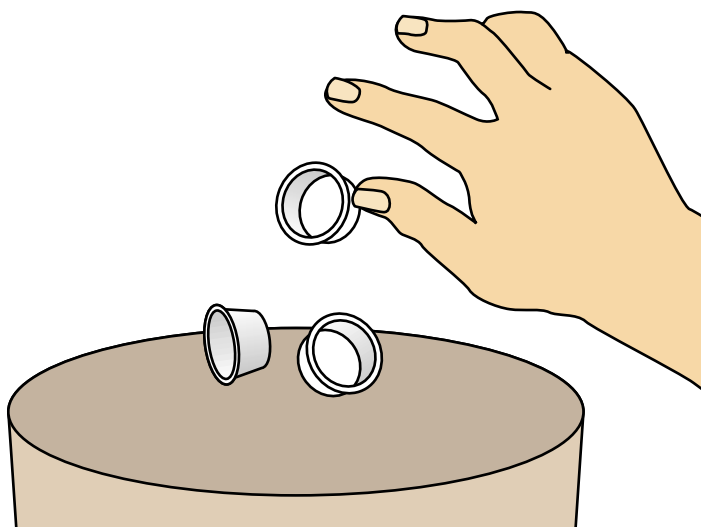
Many colored molecules combine together to
make all the different flower colors that we see.

Do you have a question about molecules and flowers?

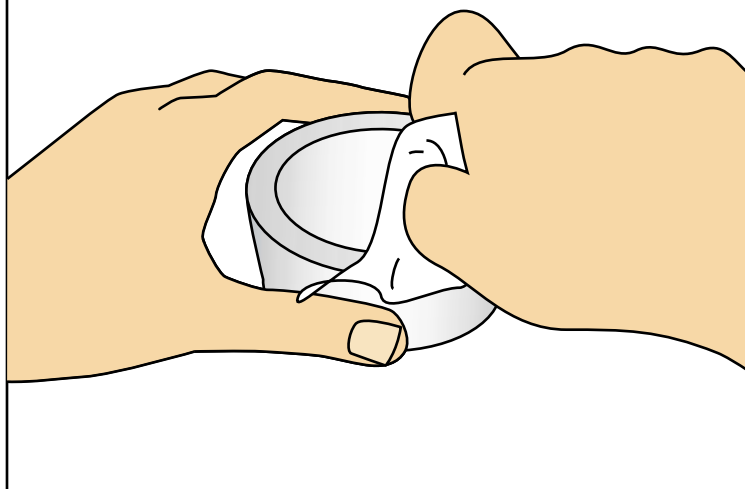
Maybe you can find the answer by experimenting some more.

Ask a staff person if you need help.

When you are done, please throw the cups in the trash ...



... and wipe out the mortar with a tissue.



The Biochemistry Discovery Lab project has been funded by generous support from:

The National Science Foundation: The material is based upon work supported buy the National Science Foundation Grant No. 9814954.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF).

The Pfizer Foundation and the Camille and Henry Dreyfus Foundation, Inc.

The Biochemistry Discovery Lab project has been funded by generous support from:

The National Science Foundation: The material is based upon work supported buy the National Science Foundation Grant No. 9814954.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF).

The Pfizer Foundation and the Camille and Henry Dreyfus Foundation, Inc.