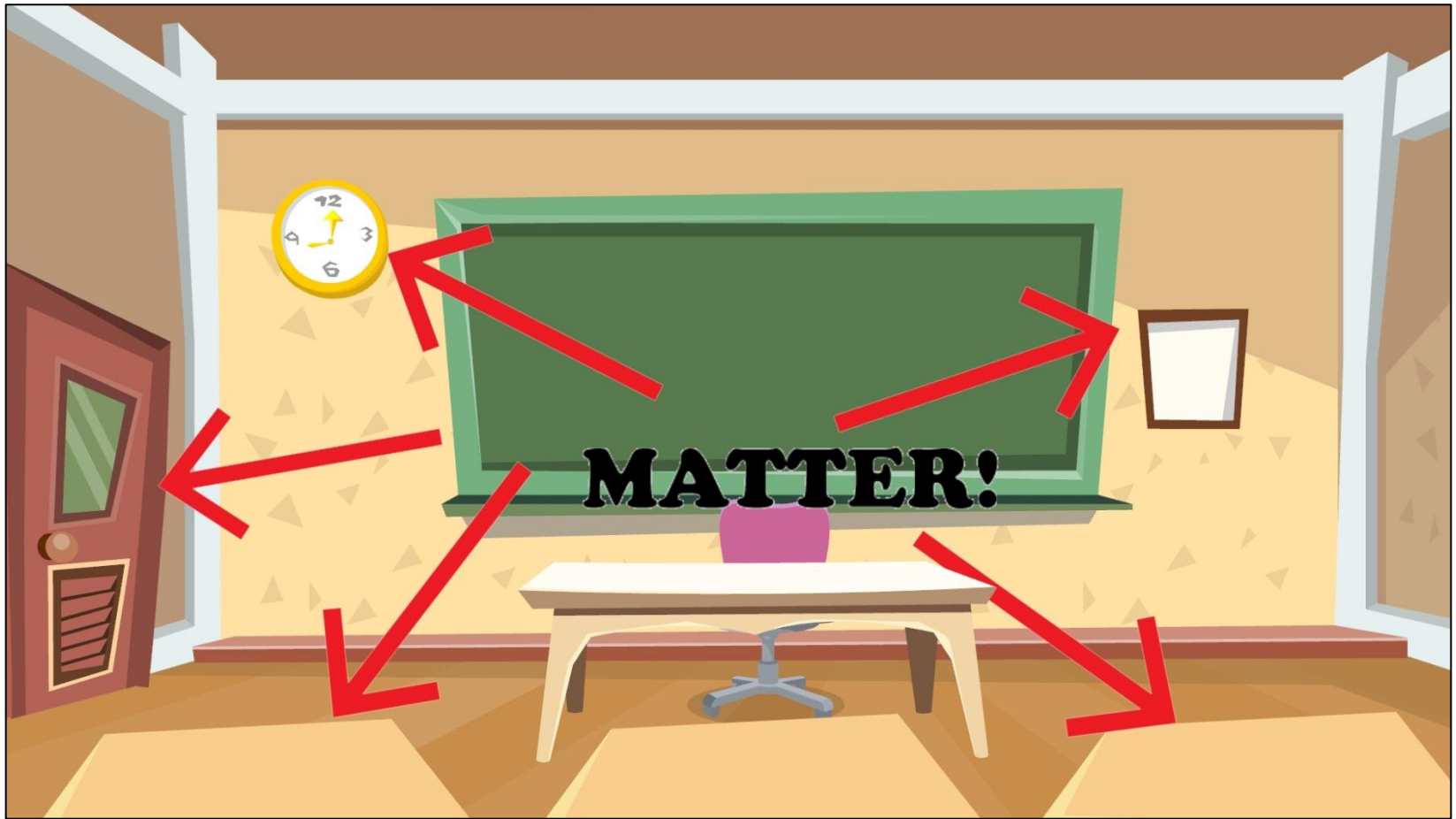


Pure Substances, Mixture and Solutions

Module 2



We've already learned that everything you see, and much of what you can't see, is made up of matter.



solid

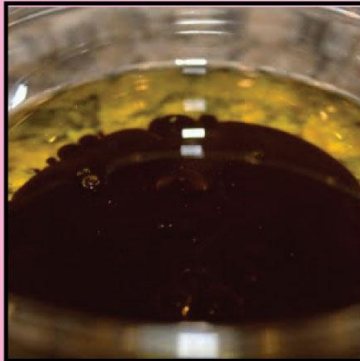
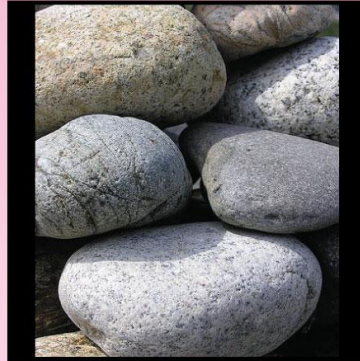


liquid



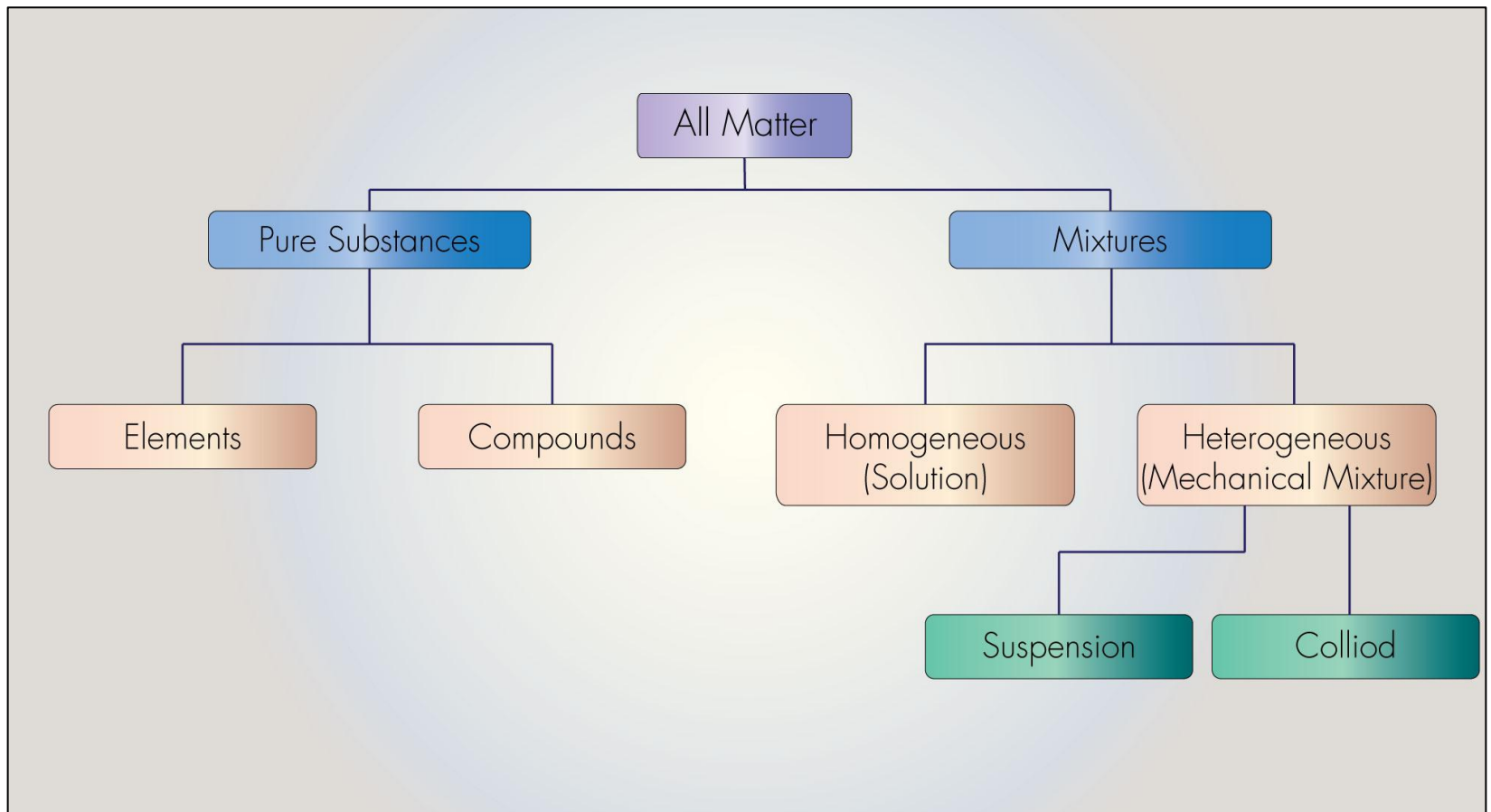
gas

Matter exists in one of three states.



Matter is almost never pure.

Everywhere there are mixtures of different types of matter and different states of matter.

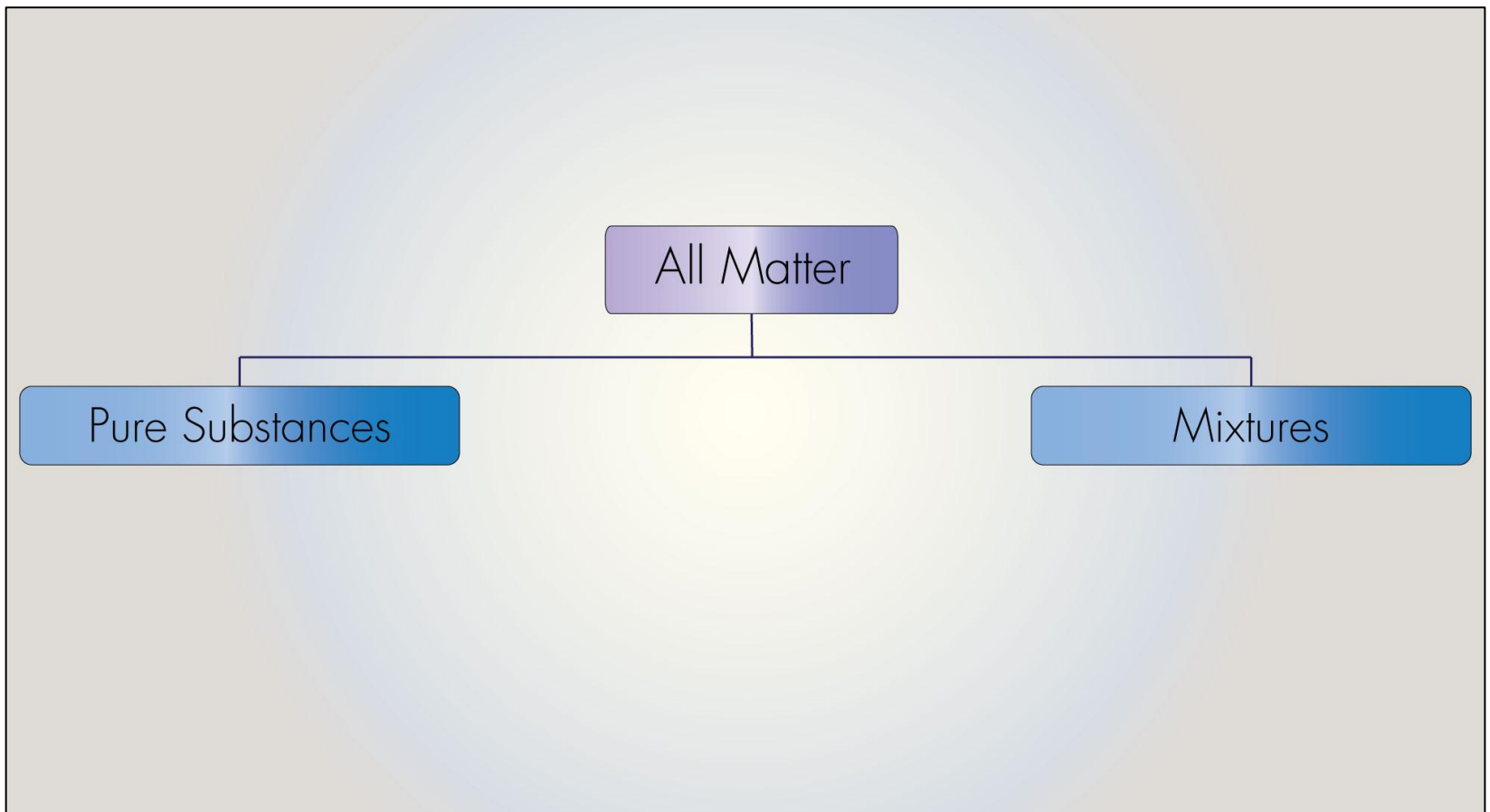


All matter can be categorized depending on how pure and how well mixed it is.



Knowing what kind of mixture something is tells us about its properties.

A solution of sugar dissolved in water will create crystals on a stick when the water evaporates.



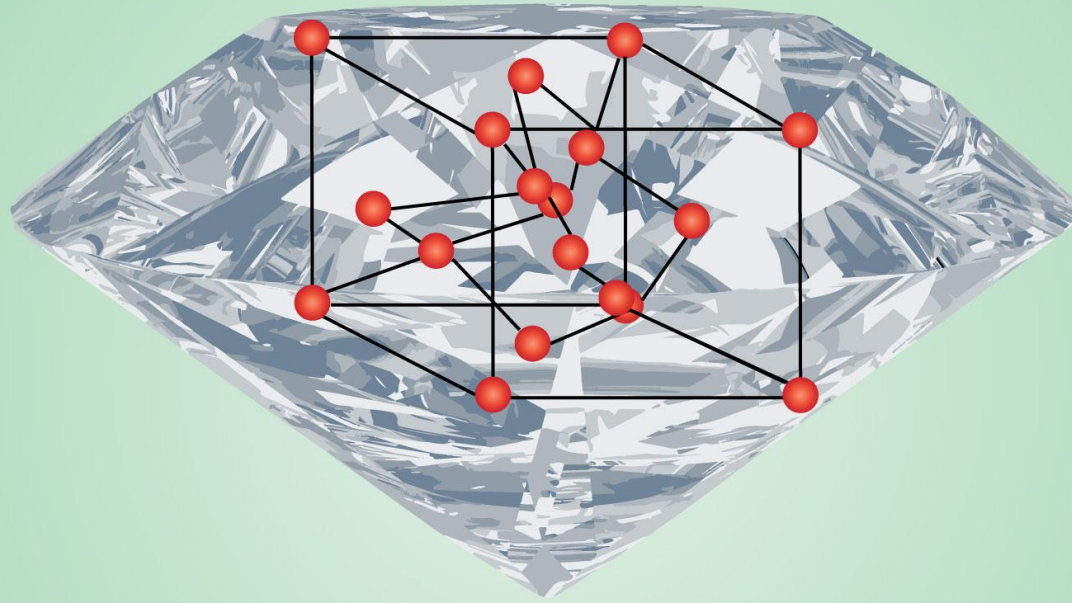
Matter is either pure or a mixture.

Pure Substances

- Contain only one type of particle.
- Cannot be broken down into different parts.
- Have a distinct set of physical properties and characteristics such as colour, odour and hardness.



A pure substance is like an exclusive soccer team that only wants members that are all the same.

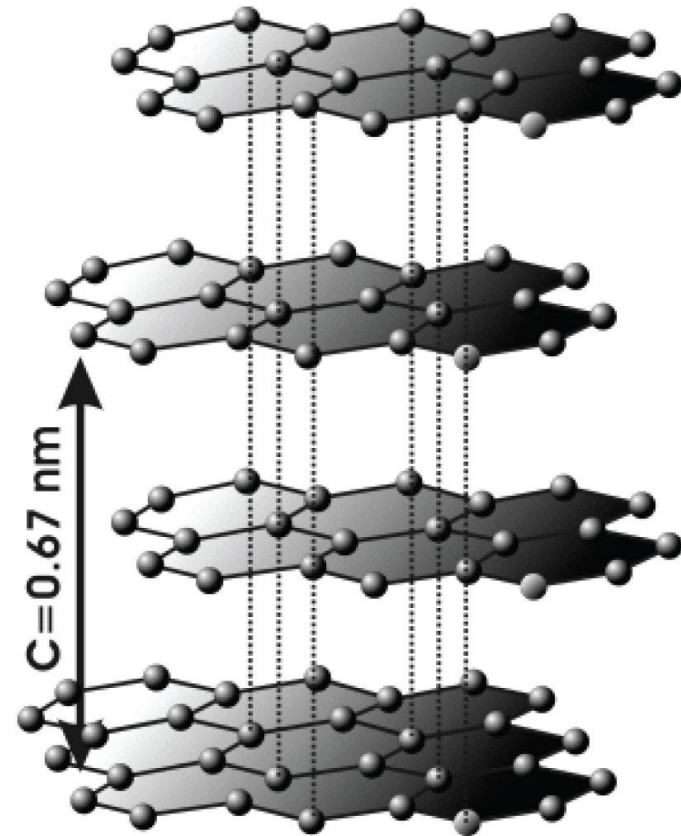


Diamond

First, let's talk solids.

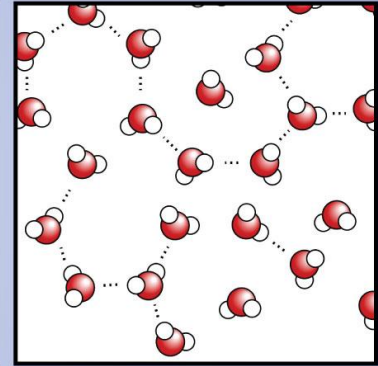
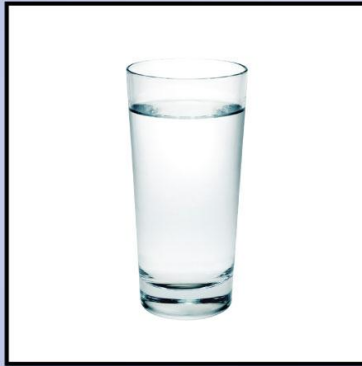
How about a diamond?

Graphite



Graphite (pencil lead) is pure carbon just like a diamond.

How does graphite behave differently from diamonds?

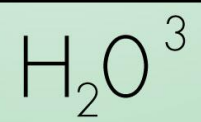


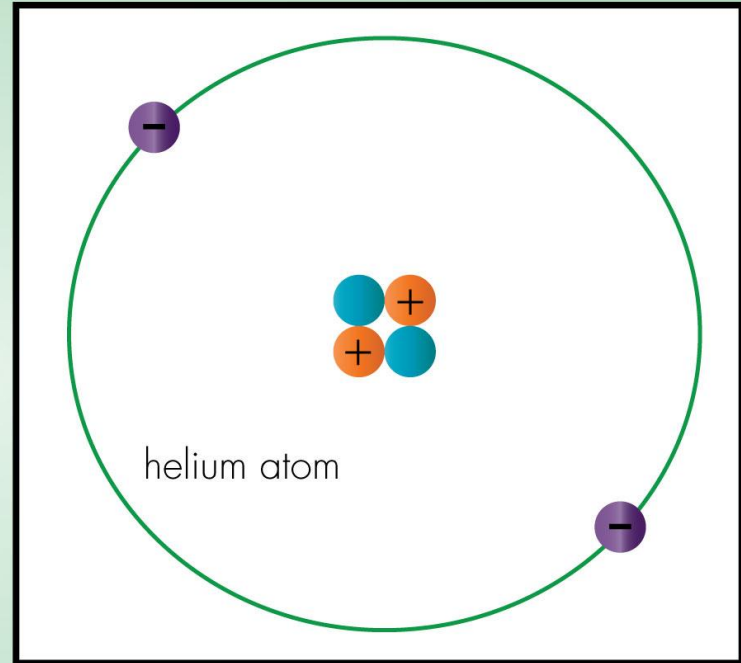
A liquid example:

- Distilled water is a pure substance.
- Each molecule is made up of one oxygen and two hydrogen atoms.



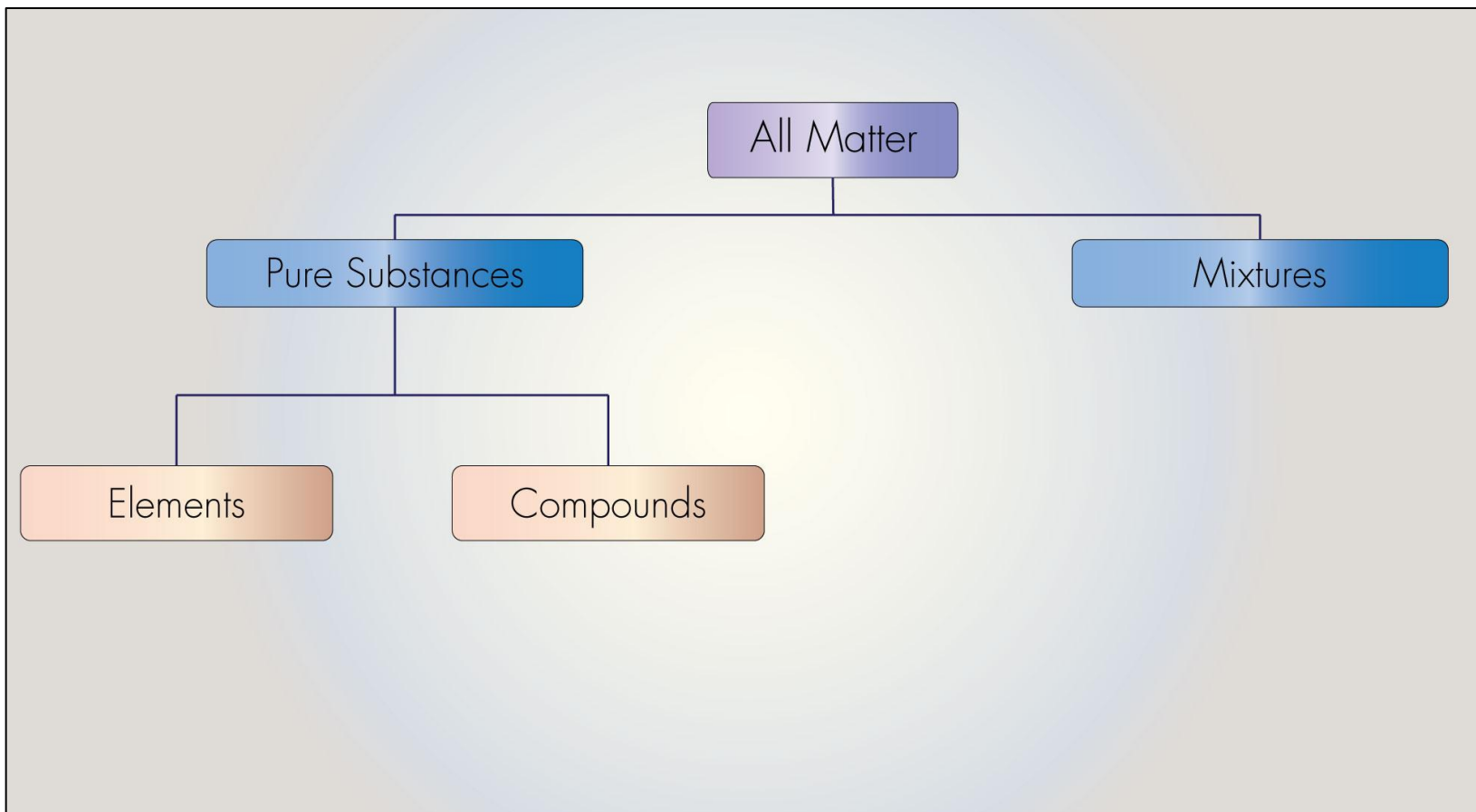
The chemical formula for water is H_2O , but what is the chemical formula for ice?





A gas example:

- Helium is a gas that's a pure substance (He).



All pure substances contain the same type of particles throughout.

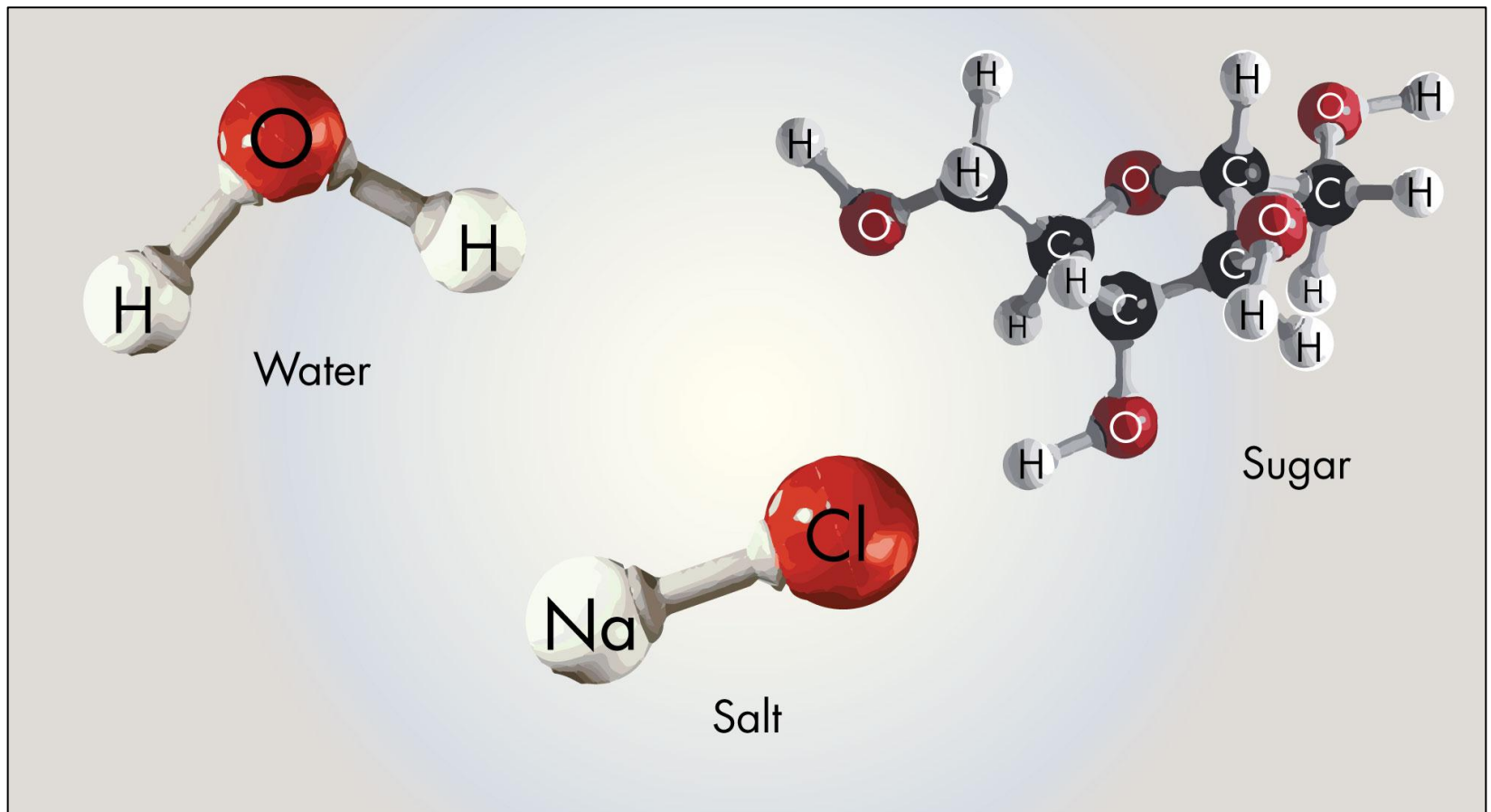
There are two kinds of pure substances:

- Pure substances can be either elements or compounds.



Elements:

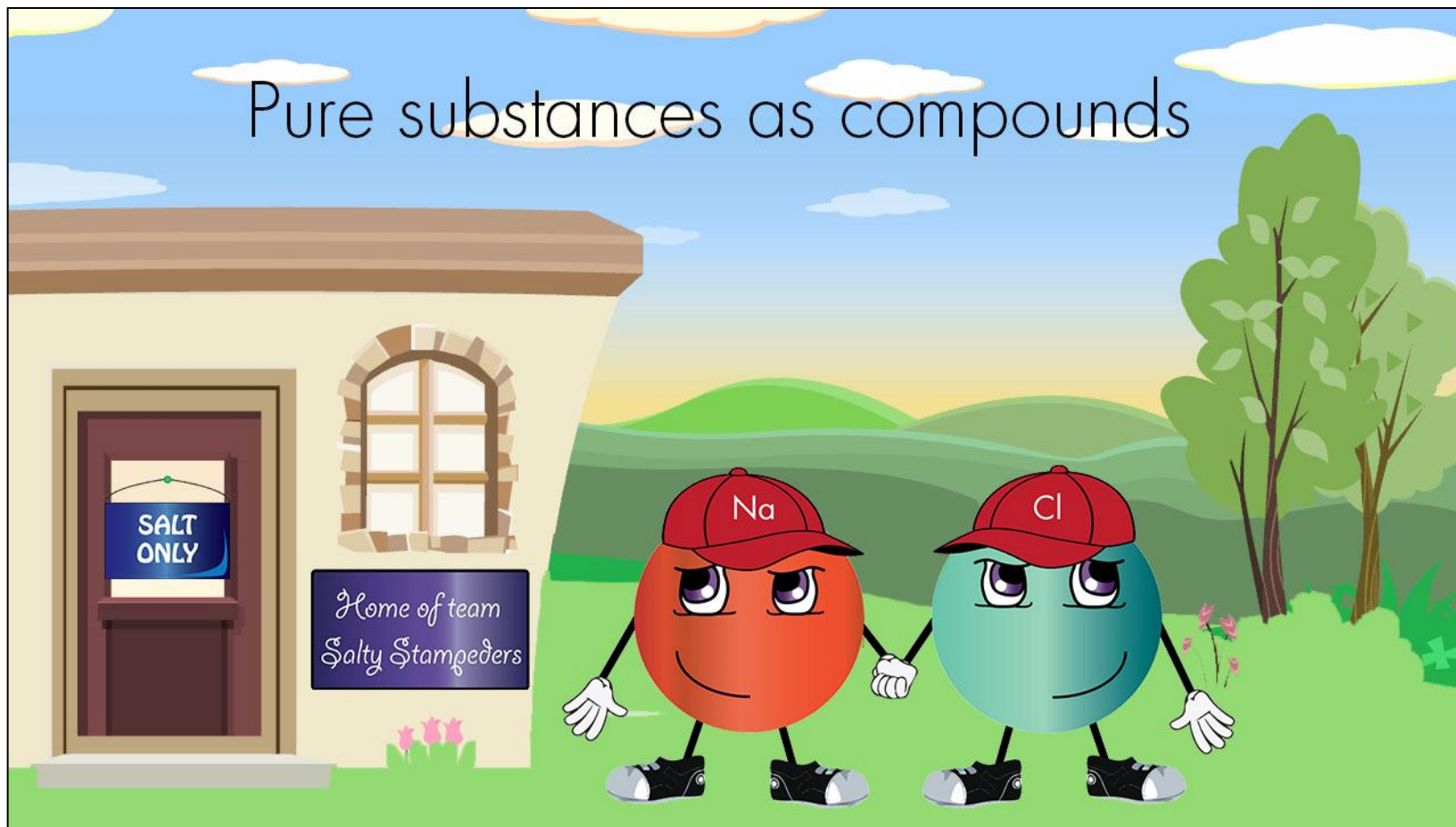
- A team that only takes single atoms of the same type.



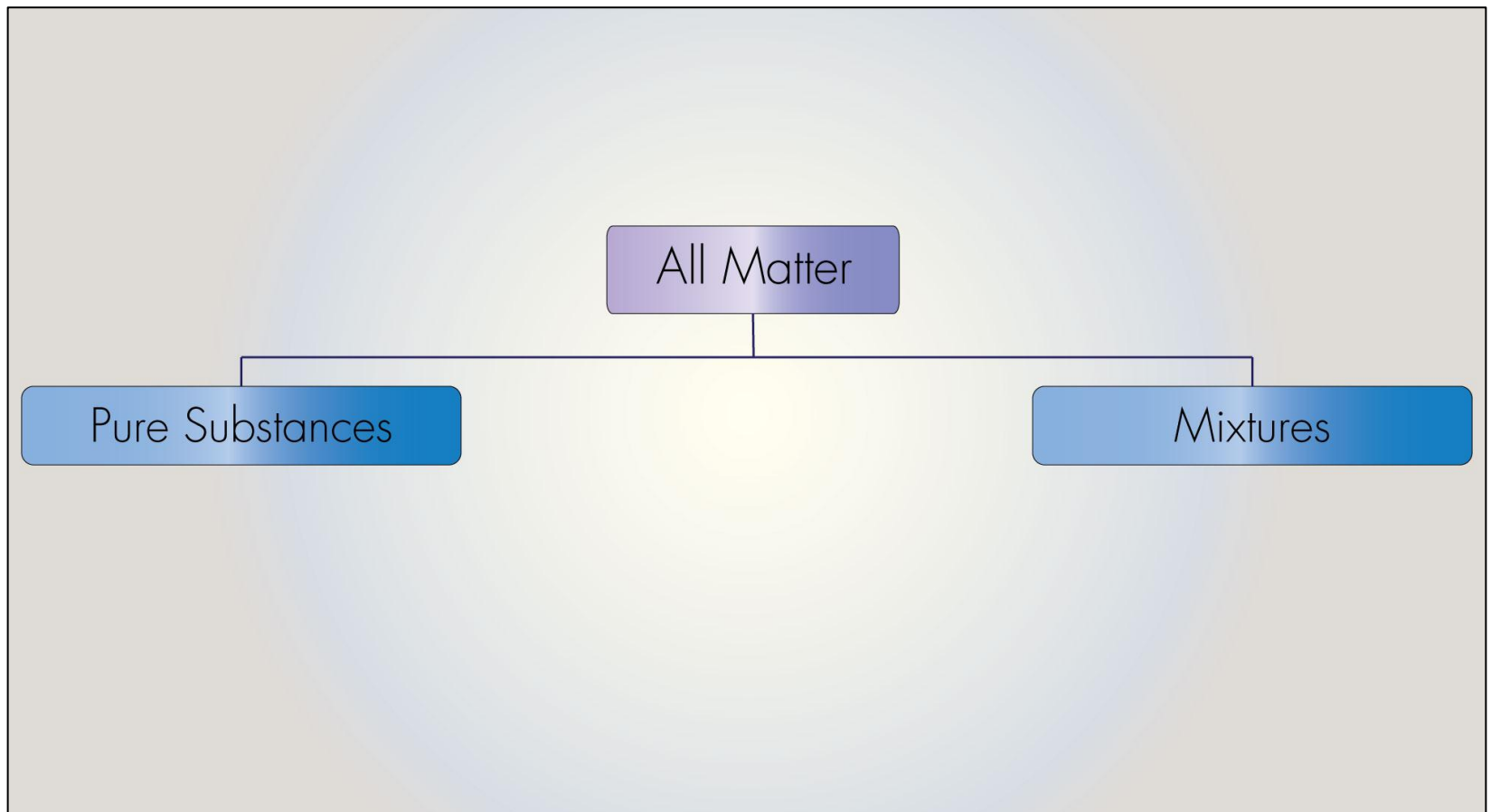
Compounds:

- Pure substances that consist of particles of two or more different elements in definite proportions that cannot be separated by means such as filtering.

Pure substances as compounds



A compound is an exclusive soccer team that lets in couples or families but they all have to be the same.



Mixtures:

- A combination of different kinds of particles.



Chocolate Chip Cookie

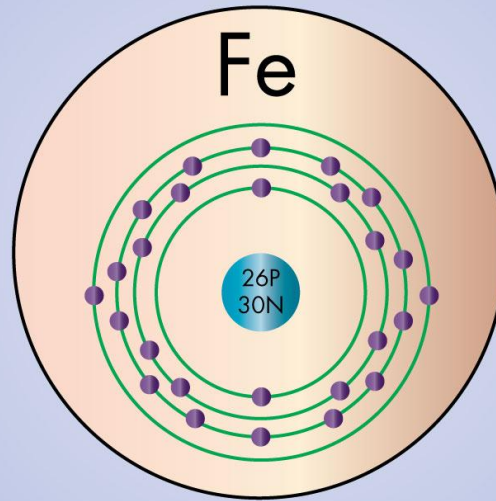
Dough Phase



Chocolate Phase



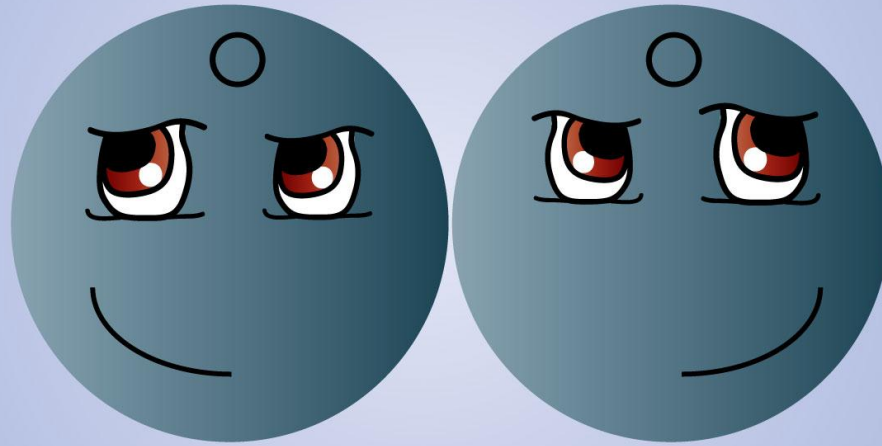
This cookie is a mixture with two phases.



Many different types of elements together make a mixture.

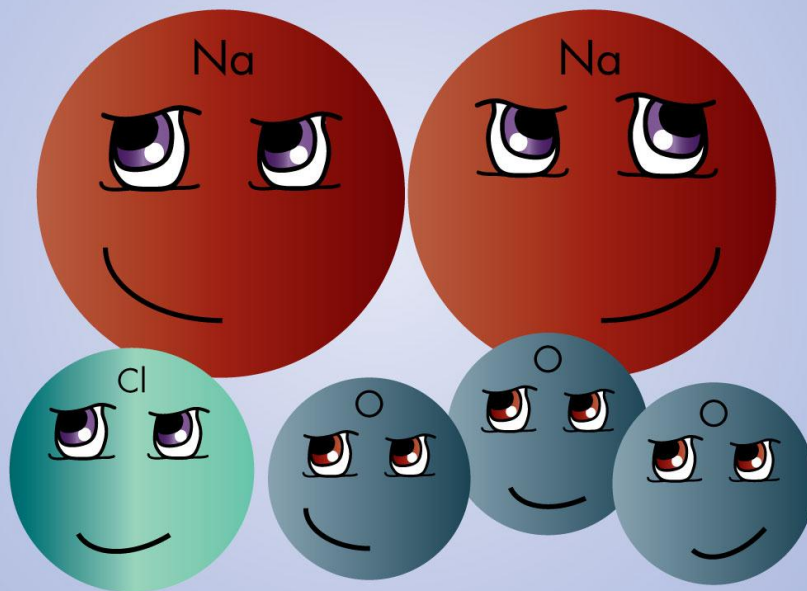
- For example, a mixture can contain elements like iron (Fe).

Oxygen



And mixtures can also contain paired elements like oxygen (O_2).

Sodium Carbonate



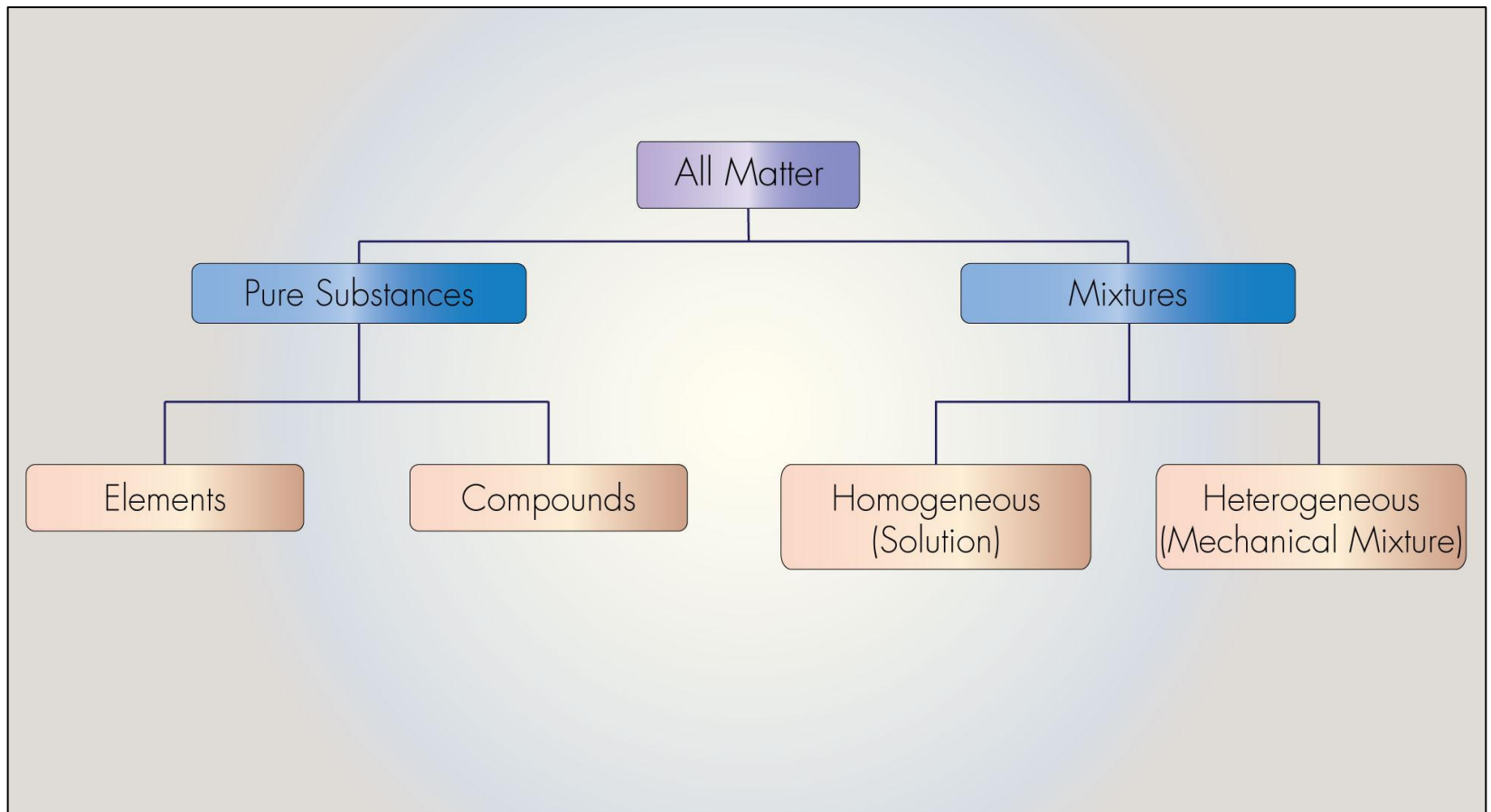
Mixtures can also contain compounds like washing soda or sodium carbonate (NaClCO_3).



People are constantly making mixtures.

For example:

- Salt is often dissolved in the water you use to boil potatoes
- Pigments are combined to make paint.



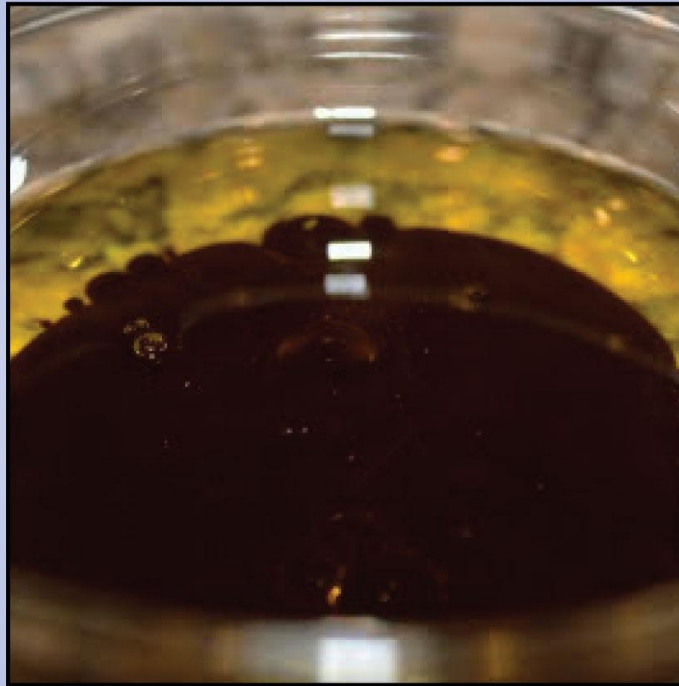
There are two types of mixtures:

- Homogeneous
- Heterogeneous



Homogeneous:

- Homo is a Greek word that means "the same".
- "Geneous" means kinds.
- The word homogeneous means all parts are the same kind.



Heterogeneous:

- Hetero means "different".
- Heterogeneous means something made up of different kinds of parts.
- Components can separate out.



Solutions = homogeneous mixtures.

Sugar dropped into hot tea seems to disappear.

Where does it go?



It dissolves and becomes part of the solution.

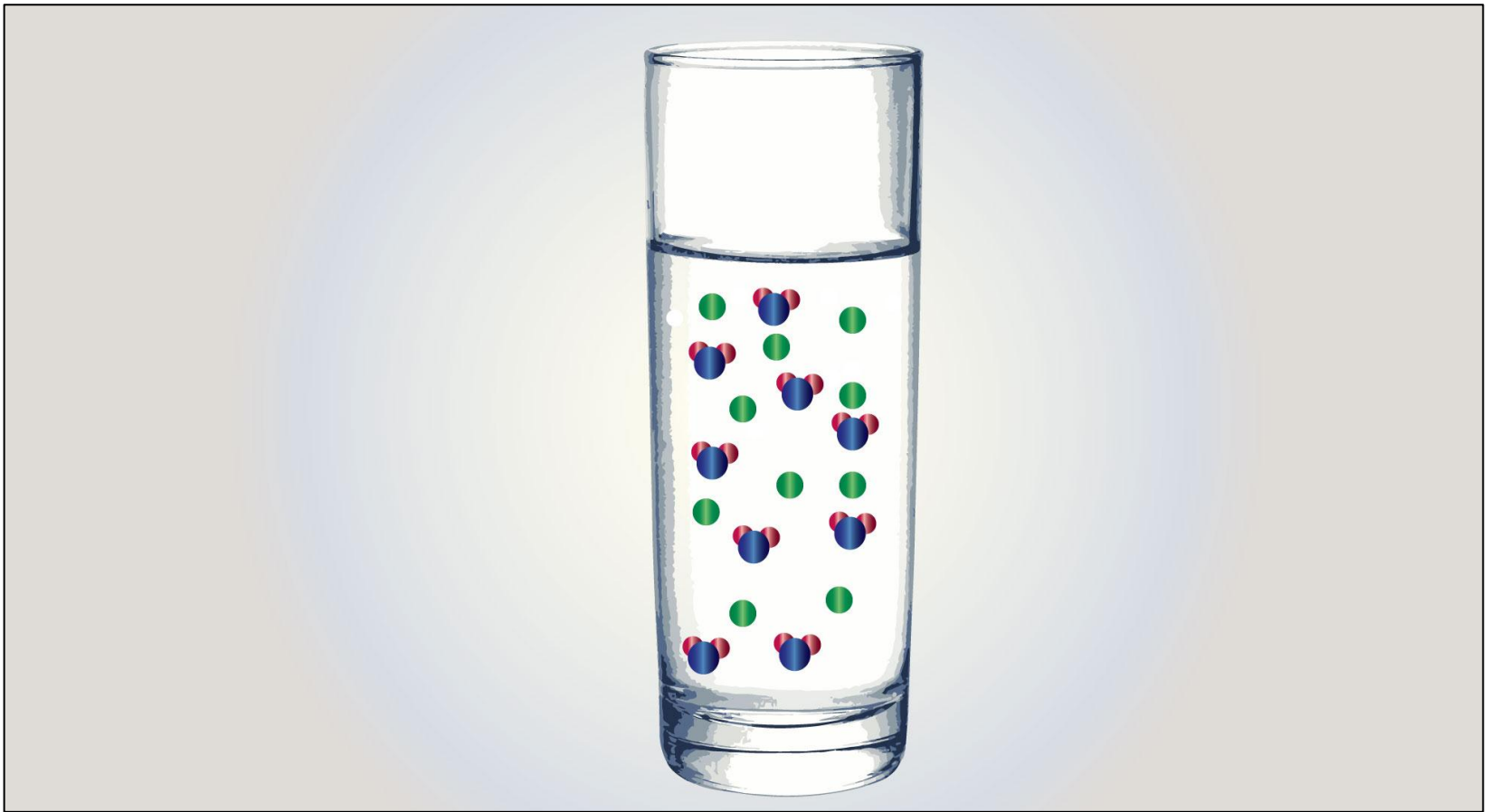
What solutions have you made at home?



All of these are solutions.



Solutions are not just solids dissolved in liquids. How does a fish breathe under water?



Remember homogeneous mixtures?

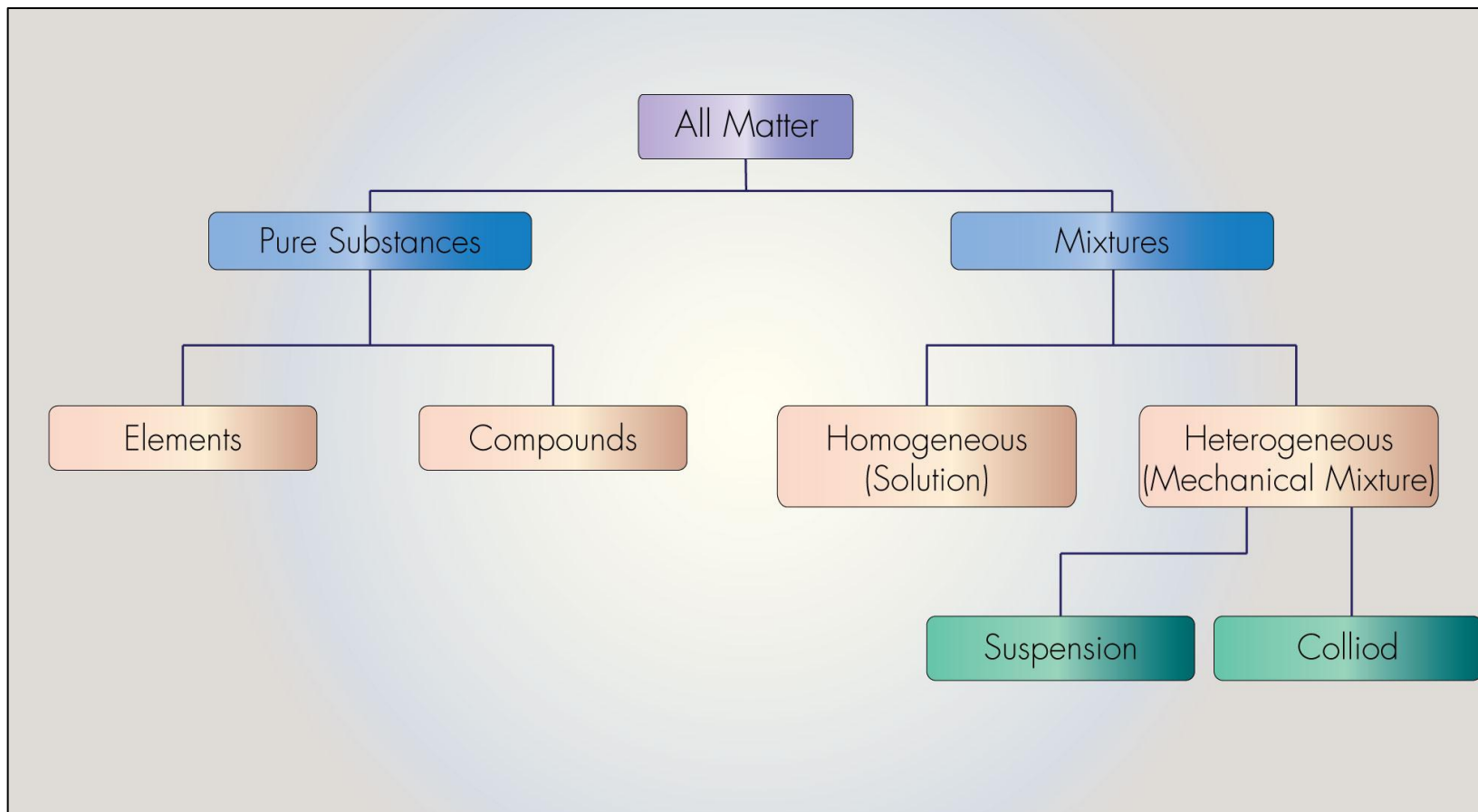


Heterogeneous mixtures have the phases separated.



More heterogeneous mixtures:

- Cereal
- Mixed vegetables
- Trail mix

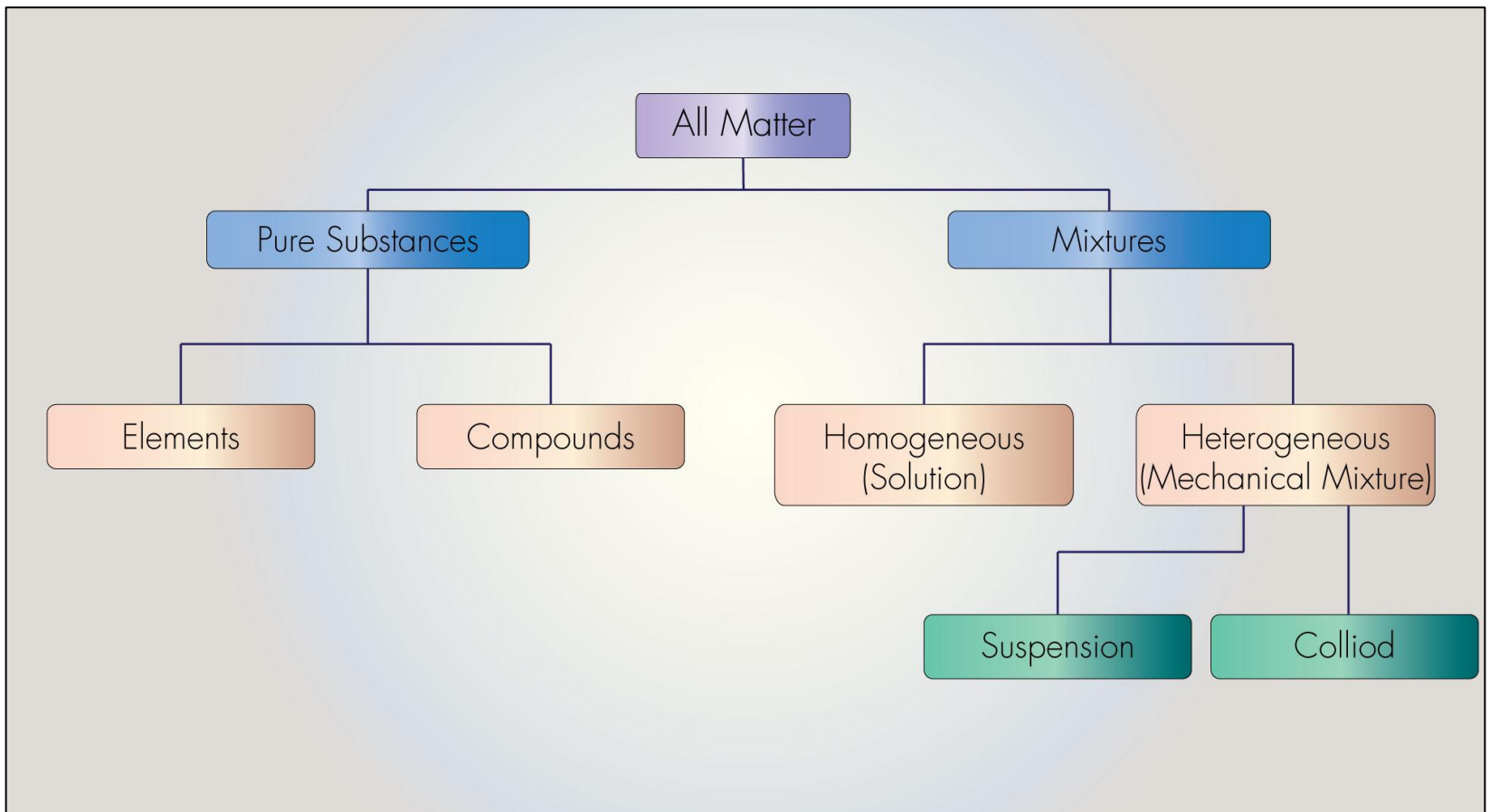


Mechanical mixtures = heterogeneous mixtures.



Mechanical mixture: sand in water.

- Sand in water remains separate; it doesn't dissolve.



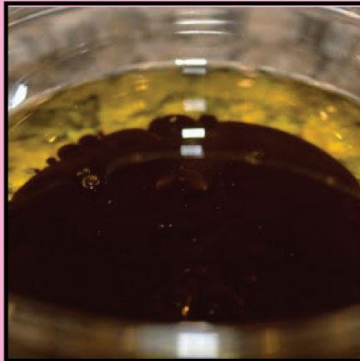
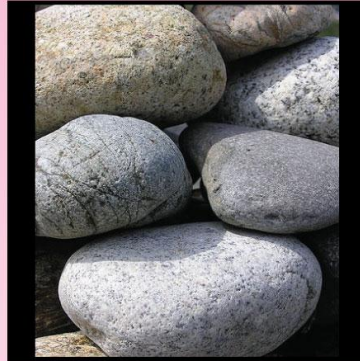
Mechanical mixtures can be:

- Suspensions
- Colloids



Suspensions

- Different phases often visible.
- Solids in a liquid will settle out over time.

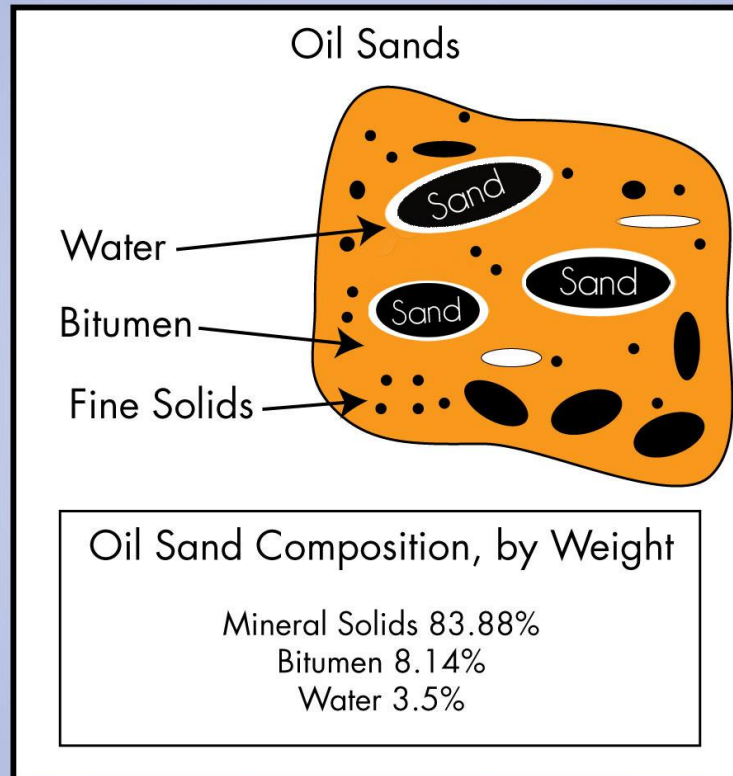


Suspensions are all mechanical mixtures.



Oil sands are mechanical mixture of:

- Bitumen
- Sand
- Water



Bitumen is a very thick fluid like molasses.

Bitumen covers the water and sand in oil sands.



Another example is pop, a suspension of gas in a liquid.
The gas will separate out until almost all is gone.



You create a suspension when jumping in a mud puddle.



In a suspension, the particles can be removed, often by filtering.



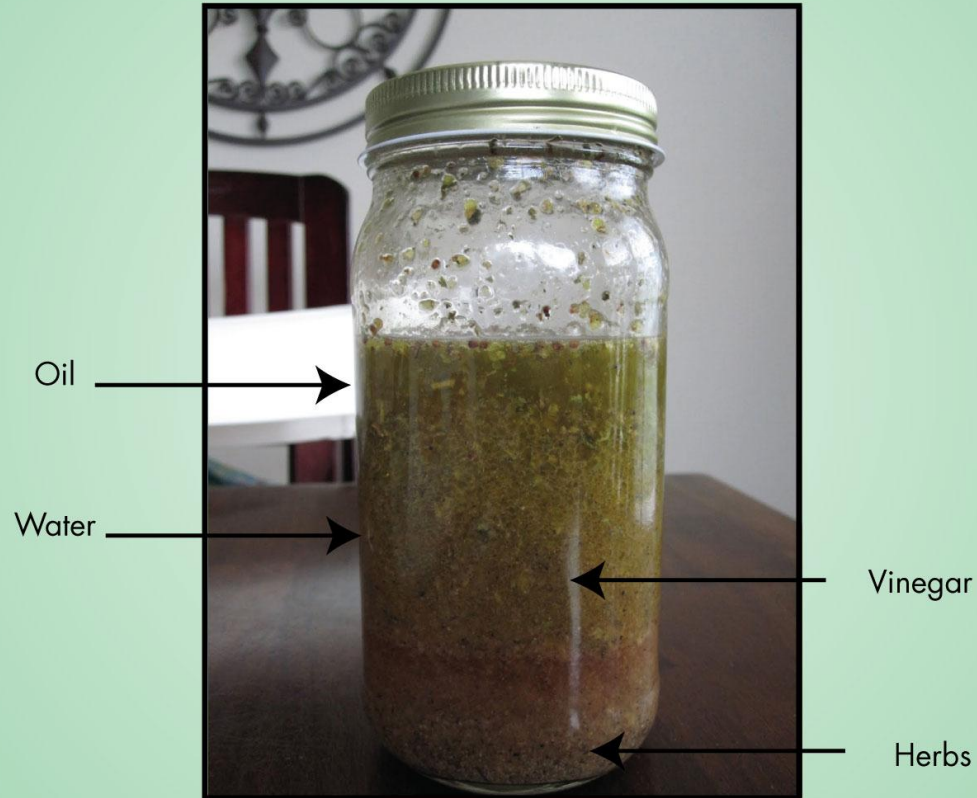
Water + Algae



Dust + Air

Examples of suspensions are algae in water, and dust in the air.

Italian Salad Dressing



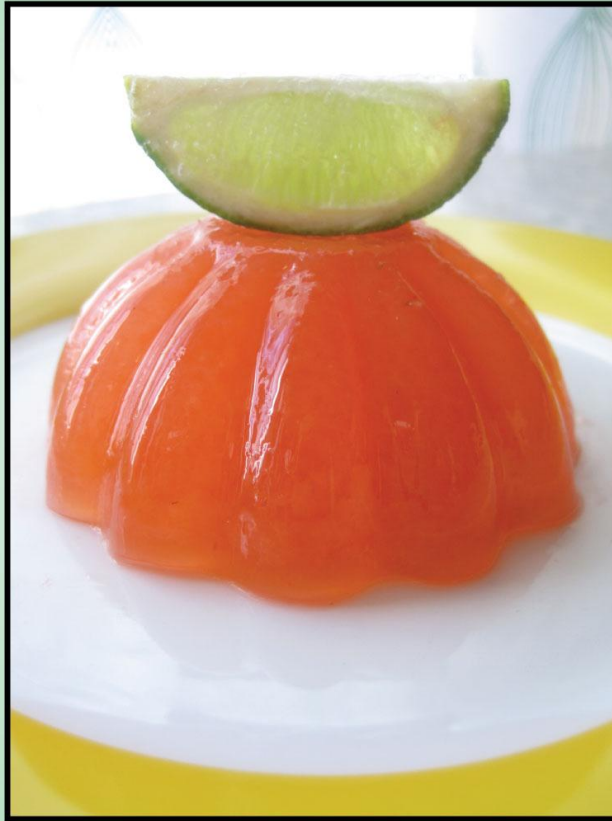
Some salad dressings are suspensions. They contain:

- Oil
- Water and vinegar
- Herbs



Colloids:

- Particles don't settle out.
- For example, milk has tiny droplets of milk-fat, and mayonnaise has oil and vinegar bound together.



Gelatin is a colloid.

Gelatin contains water droplets in a solid protein.



Toothpaste is also a colloid.

- Toothpaste = solid (abrasive) + liquids



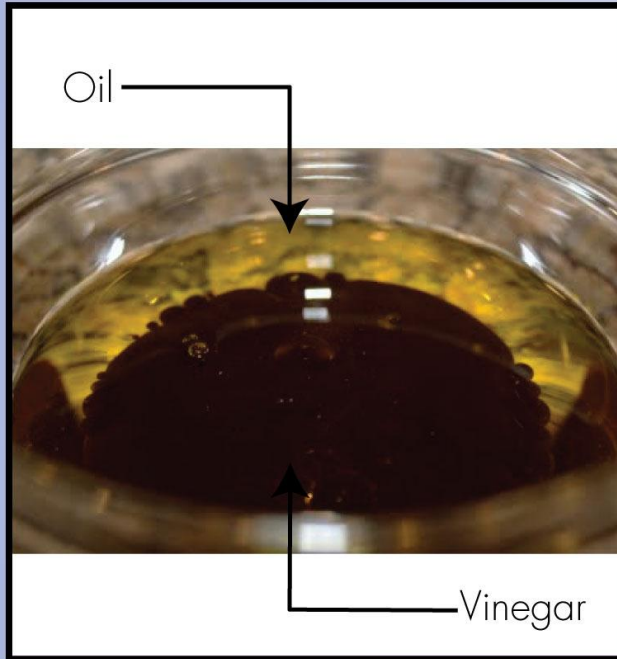
Mixtures can often be separated.

Seawater is a solution containing:

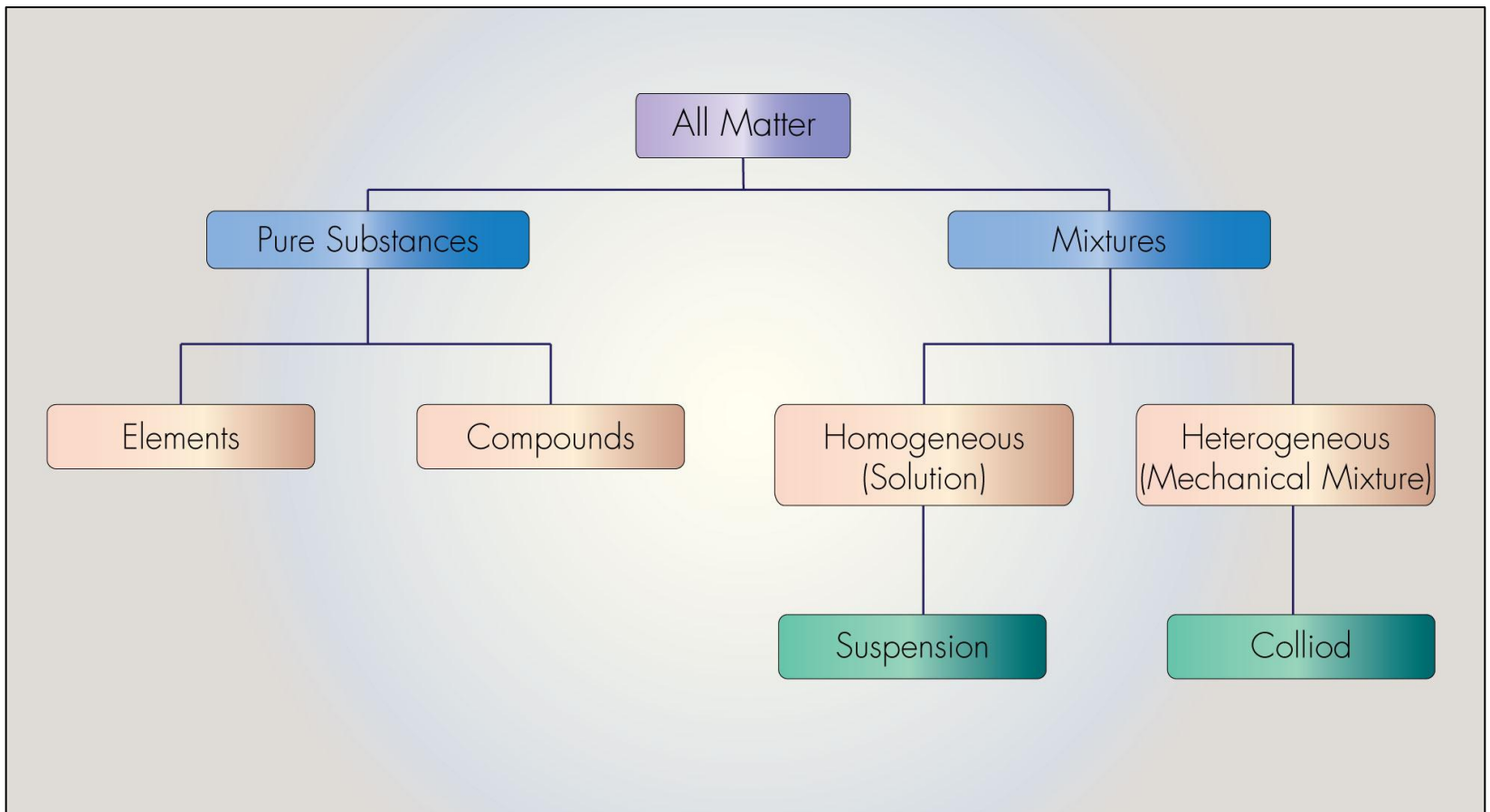
- Water
- Salt
- Other components



How do they get salt to separate from sea water?



- Mechanical mixtures are often easier to separate than solutions.
- Two methods are shown here. What are they?



Let's put all the information back together using this diagram.

All Matter

Pure Substances

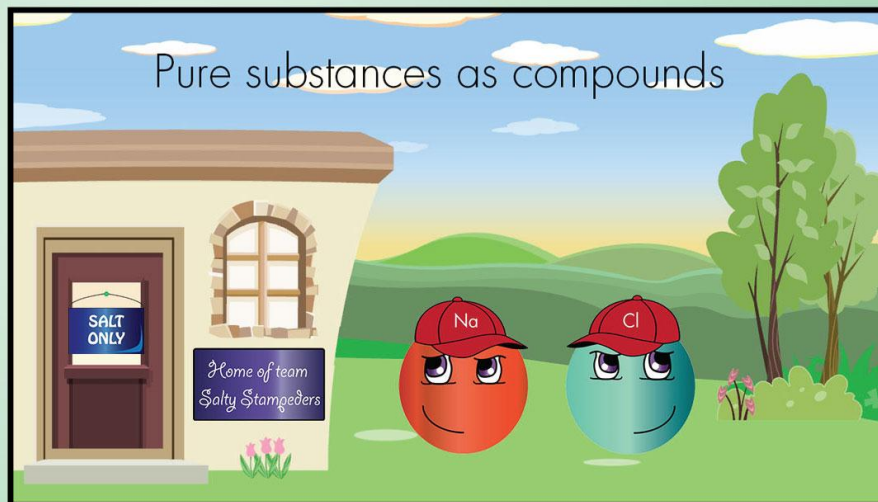


One type of pure substance is an element.

- Element = only one kind of particle.

Pure Substances

Compounds

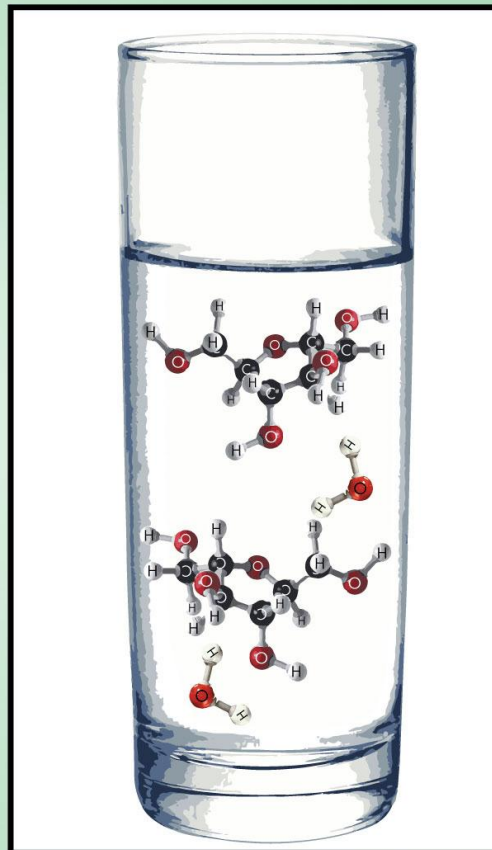


The other type of pure substance is a compound.

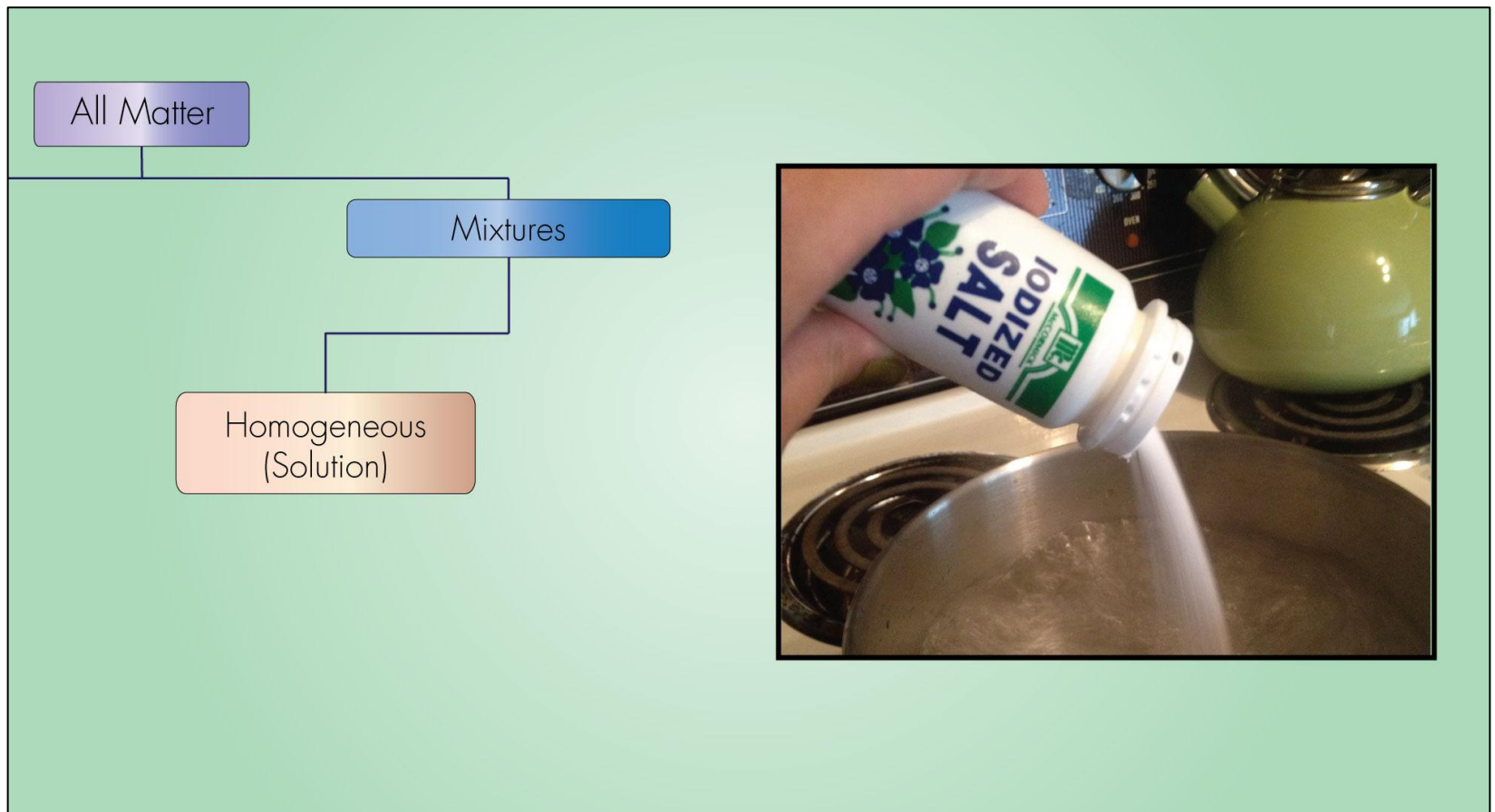
- Compounds = one kind of combined particle.

All Matter

Mixtures

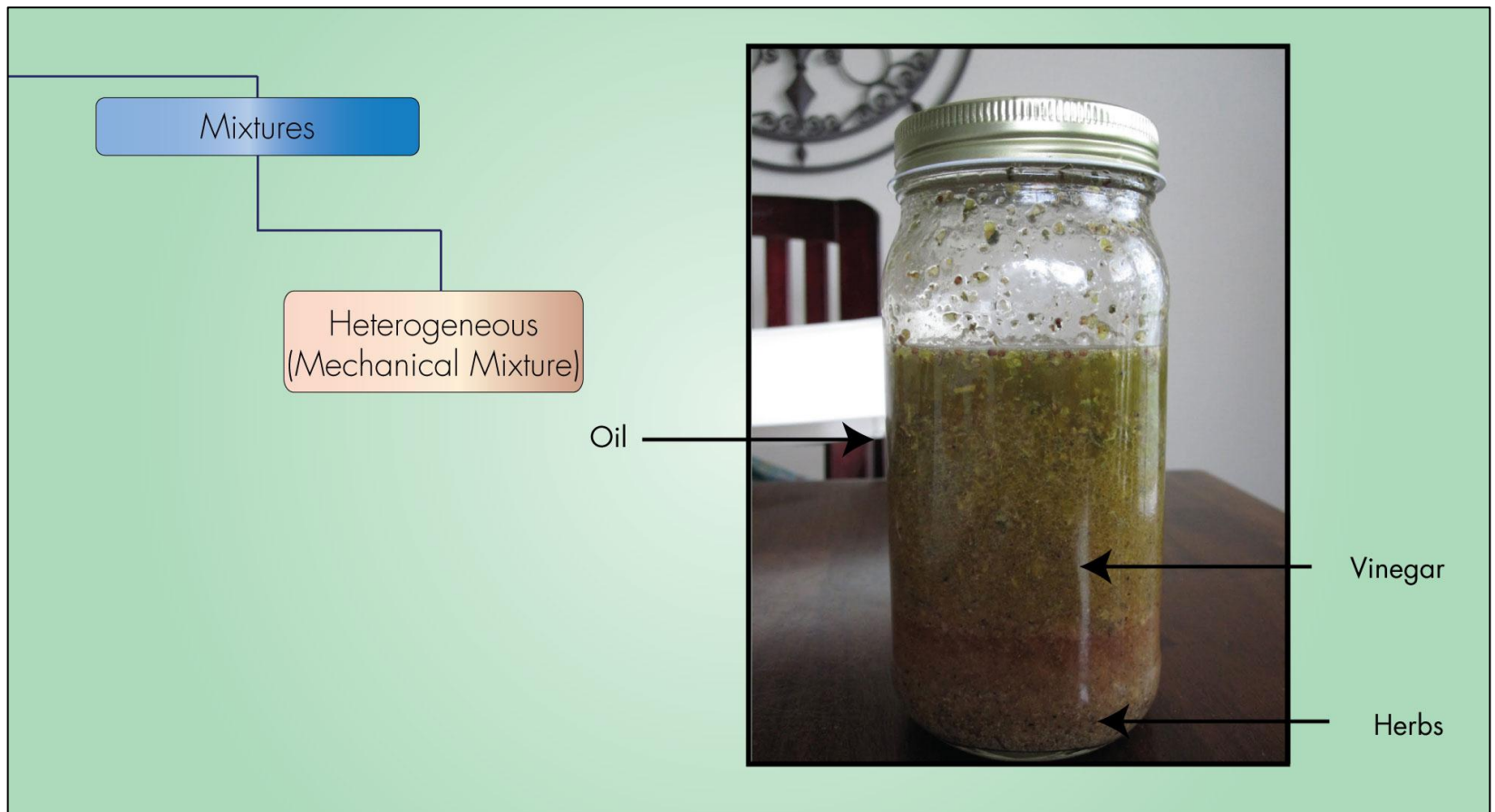


Mixture = different kinds of particles mixed together.



Mixtures can be a homogeneous mixtures (solution).

- Solutions = an even mixture of particles.



Mixtures can also be heterogeneous mixtures (mechanical mixtures).

- Mechanical mixtures = particles of the same kind staying together.

Heterogeneous (Mechanical Mixture)

Suspension

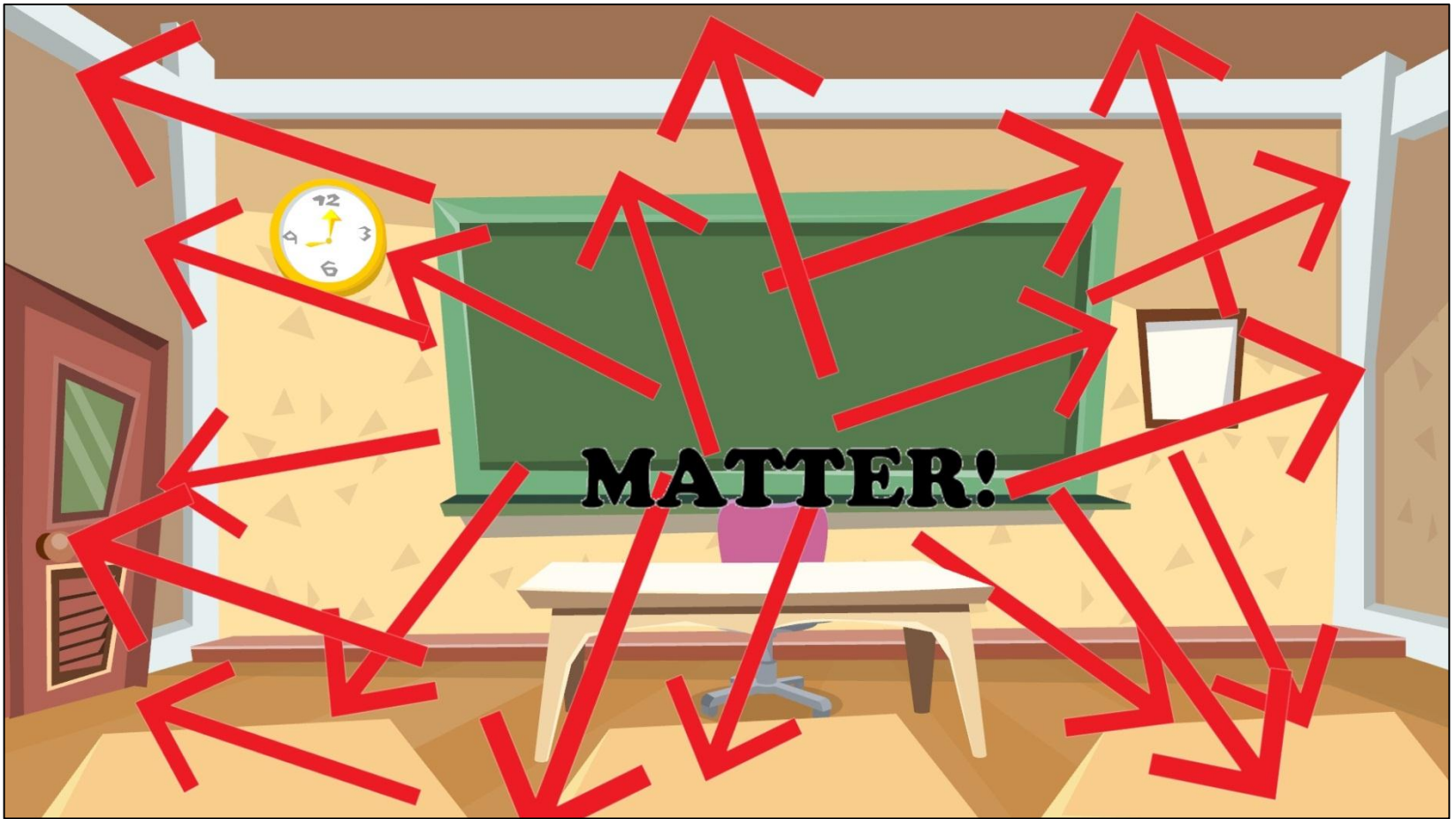


Colloid



Heterogeneous mixtures (mechanical mixtures) can be:

- Suspensions
- Colloids



Now you'll be able to answer the question, "what's the matter?" no matter what matter you are looking!

It is everywhere!