

STATES OF MATTER (teacher's notes)

SOLIDS

About solids:

- Solids don't need a container to keep their shape.
- The molecules in a solid move about really slowly, but when we heat a solid the molecules move about faster than when it is cool.
- We can find tiny crystals in our bones and in our inner ears.
- Glass is amorphous.
- When water becomes cold it contracts up to 4° C, but if it becomes colder water begins to expand because the ice molecules increase the distance from each other because they arrange themselves in a hexagonal pattern. So ice is less dense than water and for this reason ice floats. Due to this fact, life in lakes doesn't die when low temperatures freeze it (the ice is just at the top).
- Railway lines dilate when they get hot, for this reason engineers used to leave a space between one track and another.

Activity 5: Let's grow crystals.

If you use a jar to stir the sugar in it, put a metal spoon into the jar to prevent the jar from cracking because of the hot water.

What happens?

When the water cools, the water can't hold the sugar and the sugar starts to form crystals.

At the same time, the water evaporates and helps to form more crystals.

Activity 6: Let's dilate a solid.

C) The coin can't go through the wire ring.

D) Because the heat (increase of temperature) of the candle has dilated/expanded the coin. When the coin cools down, it will be able to go through the wire ring again because it will contract.

Activity 7: After observing, touching, imagining, drawing, measuring... the whole class is ready to define what a solid is.

- Atoms and molecules cannot move, they have a fixed size and shape. For this reason you can hold a solid.
- Depending on the arrangement of atoms a solid can be:

a) Crystalline:

- Atoms are arranged repeating a pattern (e.g. sugar)
- Most pure solid materials can form crystals if they have the correct conditions.
- Snowflakes are made of crystals. No two snowflakes are the same.

b) Amorphous: Atoms are not arranged repeating a pattern.