

## STATES OF MATTER (teacher's notes)

### GASES

#### About gases:

#### Gases in general:

- Gas molecules are further apart and move even more freely than molecules in liquids. The gas molecules make contact with one another because as they don't stop moving they hit into each other.
- Some gases such as the yellowish-green chlorine are visible.
- Some gases smell, such as hydrogen sulphide, which smells of rotten eggs.
- Gases have no set shape or volume.

#### Air:

- You can find air everywhere: in water (if you leave a glass of water in a warm place for a few hours, you will see tiny bubbles full of air), objects, living beings (humans, animals and plants).
- Air is light, invisible and odourless.
- Air is about 78 % nitrogen, about 21 % oxygen, less than 1 % carbon dioxide and other gases.
- Water vapour is an invisible gas.

#### Hot air balloons:

- A burner heats the air inside hot air balloons and hot air rises because it is lighter than the air outside.

**Activity 1: Observe, touch... different gases and then complete the table below. Use a tick (✓) or a cross (✗).**

- Provide the children with tubes such as kitchen-roll tubes, toilet-roll tubes, straws... to help them to realize that gases can flow.
- Balloons can help the children to think about gases and they can be useful to develop activity 4.
- Tiny drops of chemicals are given off by foods. They are carried in the air to the smell detectors in our nose.

**Activity 4: Let's investigate if the air that we breath can be weighed.**

D) The inflated balloon is heavier than the other, for this reason the inflated balloon weighs down the ruler at one end.

E) We need the scales to know how many grams the balloon weighs, but help them notice that they have to find out just what the air weighs and not the balloon as well.

**Activity 5: We will compare the weight of the air in your classroom with your weight.**

The air in the classroom weighs more than a child. The air in a room with a width of 5 m x a length of 5 m and a height of 2.5 m weighs about 75 kilograms.

**Activity 6: Can you compress a gas?**

Yes, gases can be squashed or compressed.

**Activity 7: Let's dilate a gas.**

If the "hot air" balloon bursts near the fire or a lit candle it is not because of the fire or the flame it is because hot air expands. To prove it you can pour water into a balloon and leave it on the flame of a candle; the balloon will not burst. The air molecules gain more energy with the increase of temperature and for this reason they move faster and farther apart from one another and then they push at the sides.

C) The "cold air" balloon can go through the wire ring easily and the "hot air" balloon can't go through the wire easily as before.

D) Because hot air expands as a result of the increase in temperature.

**Activity 8: After observing, touching, imagining, drawing, measuring... the whole class is ready to define what a gas is.**

- Molecules in gases are very widely spaced and for this reason gases can fit into different shapes and they always fill the space where they are.
- Gases can flow.
- Gases, unlike solids and liquids, will not stay where they are put.
- Gases can be compressed.