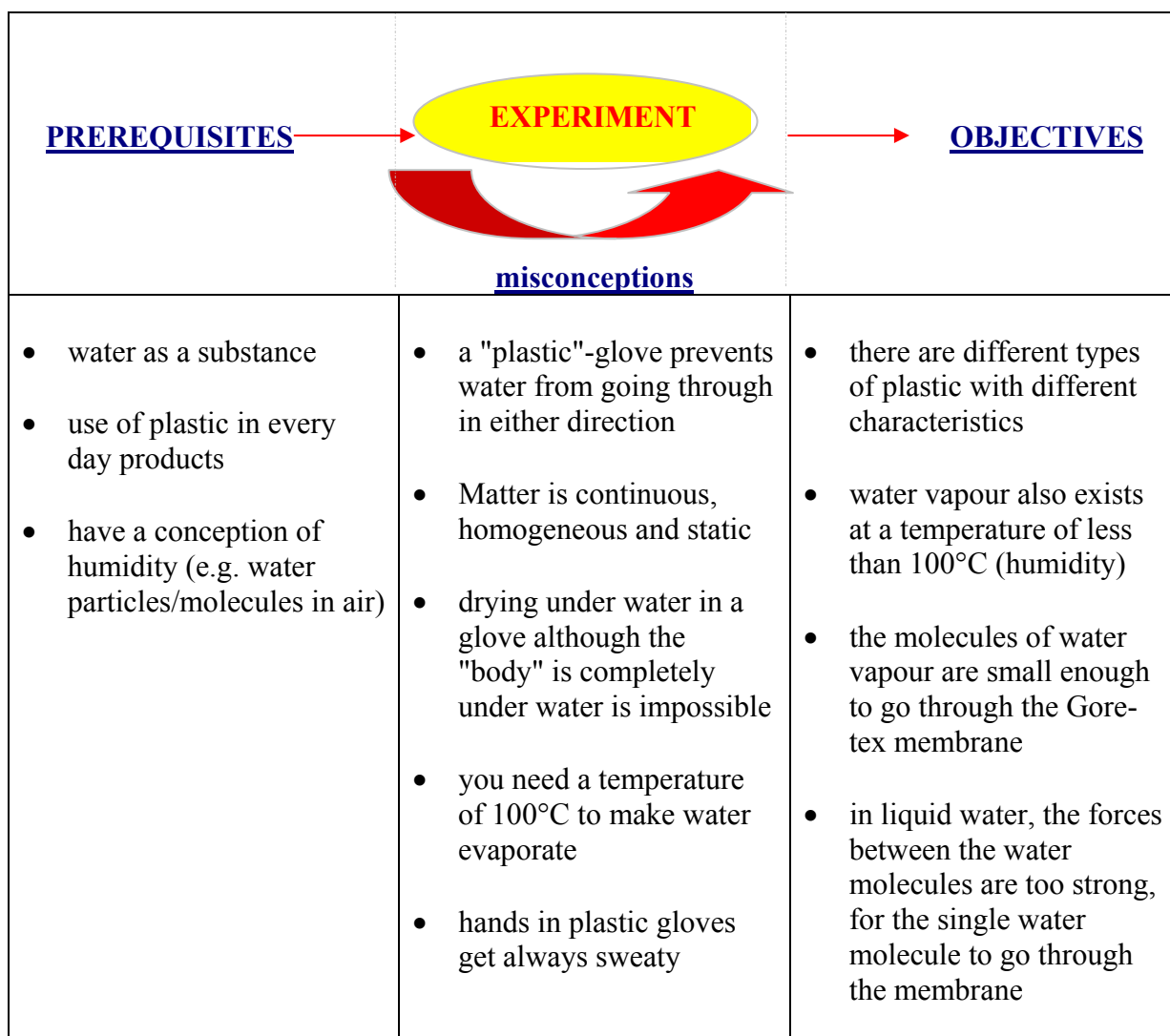


Ejemplo de presentación escrita del experimento:

THE MYSTERIOUS GLOVE ¹

1. INTRODUCTION (theoretical considerations):

Plastic gloves are common every day products. Pupils know their properties from experience. The Gore-tex glove, however, is different! To understand the phenomena observed in this experiment, you need an idea of matter which is not continuous but exists of single particles (in this case molecules) because liquid and gaseous water behave different. So there must be a difference in their intermolecular structure. Additionally, the pupils learn something about water vapour: it exists also under 100°C, called humidity.



¹ Experimento desarrollado en el proyecto “Con-Science. Science as a Tool for Life: Conceptual Change”. (Proyecto Comenius 2.1: 118603-CP-1-2004-1-ES-COMENIUS-C21)

2. DIAGNOSTICS

No.1

Think of plastic gloves and decide which of the following sentences are correct:

- a.) Plastic gloves seal your hands so that nothing can get through to them.
- b.) Plastic gloves are permeable, that means things/liquids can get through them.
- c.) Plastic gloves are impermeable so you get sweaty hands when you wear them.

No. 2

Ice melts into water but is it still the same? Look at the following statements and decide which of them are correct

- a.) Water is always liquid.
- b.) Water exists in different states of aggregation: solid, liquid, gaseous
- c.) Water and ice are different substances and have nothing in common.

No. 3

Which sentence(s) is(are) correct?

- a.) Matter is continuous.
- b.) Matter is made of little particles.
- c.) Matter is homogenous and static

No. 4

What happens to water when you heat it from 20°C up to 100°C or when you cool it down from 20°C to -5°C. Describe what happens with the water

3. EXPERIMENT

APPARATUS

- Gore-tex[®] membrane glove
- PE-glove
- bowl filled with cold water

PROCEDURES

Immerse both bare hands just shortly in a bowl filled with cold water so that they are moist. Now put on the gloves: on one hand the Gore-tex[®]-membrane glove and on the other hand the PE-glove. Immerse both hands with the gloves in the cold water for about 3 minutes. Pay attention that no water is running into your gloves.



OBSERVATIONS

After taking out your hands, both of them feel cold, maybe the one with the PE-glove a bit colder. The hand in the PE-glove is still wet, the hand in the gore-glove is dry!

CONCLUSIONS

The water inside the glove can't go through the PE-Material but it can go through the Gore[®]-glove. Water outside the gloves can't go inside in both cases.

RESULTS

No matter which state water is in, it can't go through the PE-Material, this material is sealed.

Vaporized water, however, can go through the Gore[®]-membrane, but liquid water can't.

This depends on the different intermolecular structure of water in liquid and gaseous form:

In gaseous form the water molecules are nearly single. So they can go through the pores of the Gore-tex[®] membrane. This effect is better the bigger the temperature difference is between the water- and your hand-temperature.

Water vapour exists also at a temperature of less than 100°C.

In liquid form the water molecules are kept together by strong intermolecular forces (H-bonds) and build big clusters.

REFERENCES

- picture: http://www.gore-tex.de/published/gfe_navnode/de.prod.glove.technologie.html
- gore-tex, Der Handschuhtest you can get it from the customerservice by phone: Germany: 00800 23144000

4. SOME IDEAS AND TOOLS (to be used in the lessons)

The start

The teacher demonstrates the two gloves and asks about the differences in their look and their use. If the pupils describe the gloves as waterproof, you can demonstrate this by filling them both with water or you can put them on and dip the hands with the gloves under cold water. Be careful, that no water runs inside the gloves. Here you can also observe, that the hand in the PE glove feels sweaty.

If you want to be sure, that no water runs in the glove or water vapour comes out of the glove, you can put an elastic band around the wrist or you seal the wrist with a tape.

Pupils might have the idea that the water has been soaked from the hand itself like moisturiser in case of the Gore-tex[®] glove. To disprove you just repeat the experiment: change the gloves to see it doesn't depend on the hand.