

## Tools for Materials Science - Challenge n°4 - 40'

### “PLASTIC”: IF YOU KNOW IT ...YOU SORT IT!



“Plastic” is much too generic a word: different polymers have different properties and therefore different uses. There are standard identification symbols for each of the commonly used polymers.

Polymers are often sorted by automated flotation using a series of separation tanks where any material which is denser than the liquid falls to the bottom of the tank while materials which are less dense float. Your task is to model the sorting process.

On the table you have different plastic samples (each one with an identification number but NO symbol): some of them you will be definitely able to identify, some others only as “it is A or B”. You have also three “tanks” with pure water, a saturated salt solution and glycerol (propane-1,2,3-triol) in them.

1. First place each sample in the water and observe whether it floats or sinks. Record the results.
2. When you have tested all the samples in water, leave them to dry on a piece of paper towel and move on to the salt solution: this time you need only to test the samples which sank in the water. Record the results.
3. Dry off each of the samples and move on to the next “tank”: this time you need only to test the samples which sank in the salt solution. Record the results.

**CAREFUL!** It may seem that ALL samples float on water and other liquids but ... try to stir vigorously or sink them and watch what happens!

#### Polymer density chart

Common polymers in order of increasing density, compared to three liquids of known density. Polymers listed above the liquid will float in it. Those below will sink. The density of a polymer type can vary within a characteristic range rather than having a single, specific value.

Polymer	Liquid (density in kg/m <sup>3</sup> )
PP (polypropylene) PE (polyethylene)	<b>GROUP 1</b>
	Water 1,0 x 10 <sup>3</sup>
ABS (acrylonitrile butadiene styrene) PS (polystyrene)	<b>GROUP 2</b>
	Saturated salt solution 1,14 x 10 <sup>3</sup>
PMMA (polymethyl methacrylate or “acrylic” or “perspex”) PC (polycarbonate – variable density)	<b>GROUP 3</b>
	Propane-1,2,3-triol (glycerol) 1,26 x 10 <sup>3</sup>
PC (polycarbonate – variable density) PET (polyethylene terephthalate) PVC (polyvinyl chloride)	<b>GROUP 4</b>



**OUTPUT WANTED:**

Fill the table given in the answer sheet

**Answer sheet**

**GROUP N° \_\_\_\_\_**

**Ch.4 --- “PLASTIC”: IF YOU KNOW IT ... YOU SORT IT!**

**Q1** Fill the following table

Sample Number	Floats in:	Sinks in:	Polymer Group
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			



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