



# WHAT IS HEAVIER, A KILO OF IRON OR A KILO OF STRAW?



**SUBJECT AREA: Physics (Density)**

**EDUCATIONAL STAGE: E.S.O.**

**TARGET GRADE: 2º**



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**1 Does the word “density” rings a bell? Have you ever heard it? Your teacher will place a cardboard on the wall and you will be given some yellow post-it in order you to brain-storm all the possible ideas you will come up with.**

Keep the cardboard for later

**2 Click on this link and watch the clip:**

<https://www.youtube.com/watch?v=7U3Oti2L8S4>

What is happening to mass and volume? How these changing properties threaten Luke, Leila and Han? Is there something that is changing?

Prediction

**3 Time for experimenting!!**

Bring 4 different water bottles to class, for example 0.33L, 0.50 L, 1L and 2L bottles. Fill them with water and weigh them with a weighting scale. Draw a graph that represents mass (g) vs V(L).

BOTTLE VOLUME/L	MASS OF THE BOTTLE/g
0.33	
0.5	
1.0	
2.0	



When you observe the graph, what do you see? Is there a relationship between mass and volume?

Now we are going to work with other materials and the 1L and 2L bottle. Fill the bottle with beans, cotton balls and screws. Where do you think the line is going to be? Above water line or below water line?

We will check our predictions by performing a new experiment with 2 bottles filling them with beans, cotton balls and screws. You will get 2 points, draw a line with them. NOTE: We are going to do this experiment only with 2 points for saving time, but for obtain trustable data we need to perform more experiments in order to obtain more points for our line.

<b>Material</b>	<b>Volume /L</b>	<b>Mass of Material/g</b>
<b>Beans</b>	1L	
	2L	
<b>Screws</b>	1L	
	2L	
<b>Cotton balls</b>	1L	
	2L	



Were our predictions correct or not?

**4 A little bit of rock'n roll...**or what is the same some theory to understand what we have been doing till now. For doing so, please click the link below and answer the questions on the “think section”.

<https://ed.ted.com/on/T8Ddyo4g#watch>

Copy here the definition of:

**Mass:**

**Volume:**

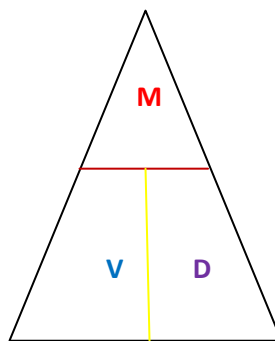
**Density:**

**What are the units used in the video for density? 2 different units are used in the denominator in the video:  $\text{cm}^3$  is used for? ml is used for?**

**Do you think density is a value that does not change? Could it be used as a propertie to identify materials?**



Isolating mass or volume can be difficult for you. You can use this mnemonic rule to remember which variables are multiplied and which one are divided. Just remember the letters that are next to each other are multiplied and if they are one below the other, you have to divide.



Make up a sentence to remember the order of the variables, e.g.: My Vineyard is Dry

Write the 3 possible relationships among the variables:

**5 Roll up your of sleeves!** Time for practicing what you have learnt with some exercises.

A liquid has a mass of 6.2g and occupies a volume of 20 ml, what is its density?



A sample with a density of 3.2 g/ml has a volume of 12.1 ml. What is the mass of the sample?

Calculate the density of a cube using the following information:

- Each side is 3 cm long
- The mass of the cube is 120 g.

We have a ring and we want to know if it is made of pure gold. We put the ring inside a test tube with water, and we measure a volume of 6 ml. Afterwards, we measure the mass on the weighing scale and we obtain a mass of 116g. Is the ring made of pure gold?

NOTE: You will need to look for a table of densities