

Why in the Dead Sea can a person lie on the water?

By: Alexandra Burešová

&

Sophia Bodorová

MYP 3

What is Density?

It's a measure of mass per volume. The average density of an object equals its total mass divided by its total volume:

Formula

$$\rho = \frac{m}{v}$$

density mass volume

The diagram shows the formula for density, ρ = m/v. The Greek letter rho (ρ) is on the left, with a blue arrow pointing to it from the word "density" below. The letter 'm' is in the numerator, with a blue arrow pointing to it from the word "mass" above. The letter 'v' is in the denominator, with a blue arrow pointing to it from the word "volume" below. The word "Formula" is written above the equation.

Example

A gold digger went to the mountains and found a piece of quartz a small nugget of gold. The mass of the piece was 100g, and its average density was 8g/cm³. Determine the mass of the gold contained in the piece of quartz if the density of the quartz was 2.65g/cm³ and the density of gold was 19.4g/cm³

$$\begin{aligned} m_{\text{piece}} &= 100\text{g} \\ \rho_{\text{piece}} &= 8\text{g/cm}^3 \\ \rho_{\text{q}} &= 2.65\text{g/cm}^3 \\ \rho_{\text{g}} &= 19.4\text{g/cm}^3 \end{aligned}$$

$$m_{\text{gold}} = V_{\text{gold}} \times \rho_{\text{gold}} = 19.4 V_{\text{gold}}$$

$$\begin{aligned} 19.4 V_{\text{gold}} &= 100\text{g} - 2.65 (12.5\text{cm}^3 - V_{\text{gold}}) \\ V_{\text{gold}} &= 4\text{cm}^3 \end{aligned}$$

$$m_{\text{gold}} = 19.4 \text{ g/cm}^3 \times 4\text{cm}^3 = 77.6\text{g}$$



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Winnie the Pooh climbed into a 90-liter barrel, which was two-thirds filled with honey. At the same time, the level of honey rose to the brim and poured out 9kg of honey. Only the head of Winnie the pooh remained sticking out of the barrel, the volume of which is one-tenth the volume of a bear. Determine the mass of Winnie the pooh if its average density is $1000\text{kg}/\text{m}^3$. The density of honey is $1500\text{kg}/\text{m}^3$.

$$m = V \cdot \rho$$

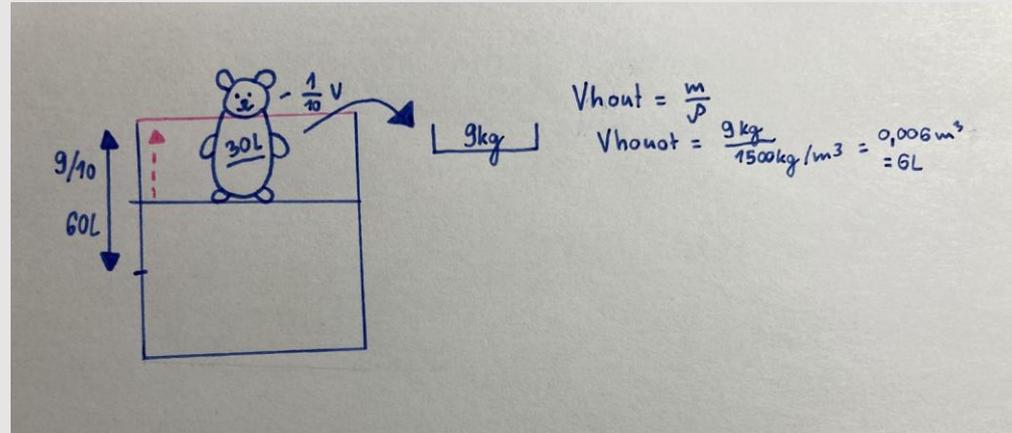
$$m_{wp} = V \cdot 1000\text{kg}/\text{m}^3$$

$$m_{wp} = 40\text{L} \cdot 1\text{g}/\text{m}^3 = 40\text{kg}$$

$$V_{wp \text{ body}} = 30\text{L} + 6\text{L} = 36\text{L} = 9/10$$

$$36/9 = 4\text{L} = 1/10[\text{head}]$$

$$36 + 4 = 40\text{L} = V_{wp}$$



The density of Winnie the Pooh is less than that of honey. That's why he couldn't drown and swam in this honey.

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We will try to make an experiment and prove that the ability to be at different depths depends on the density of the water.

Experiment

Volume of the egg=
50cm³
1st egg= 55.40g
2nd egg= 48.36g
3rd egg= 51.04g

250ml water = egg is on the bottom
p water = 1g/cm³

250ml water + 50g salt= floating up
surface egg
p water = 1.09g/cm³



1st egg finding density=
 $55.40g : 50 = 1.108g/cm^3$
Mass Volume Density

250ml water + 25g salt= floating
undersurface egg
p water = 1.05g/cm³

2nd egg finding density=
 $48.36 : 50 = 0.9672g/cm^3$

3rd egg finding density=
 $51.04 : 50 = 1.020g/cm^3$

Average density = 1.03
g/cm³



Why can people lie on the water?

In salty water of the Dead Sea (density is 1.24 g/cm^3) a most part of the body (density is 1.036 g/cm^3) stays out of the water so, it's hard to drown. It makes swimming similar to floating.



THANK YOU FOR YOUR
ATTENTION!