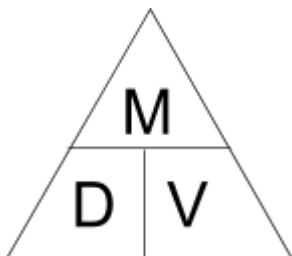


WorksheetCloud: MEMORANDUM

Grade 8

Subject: Natural Sciences

Topic: Introduction to Density: Calculations based on unknown substances and using density tables.



density = mass \div volume

mass = density \times volume

volume = mass \div density

The units for density are:

grams/cubic centimeter (g/cm^3) or g.cm^{-3}

kilograms/cubic metre (kg/m^3) or g.m^{-3}

DENSITY TABLE

Substance	Density (g.cm^{-3})
Platinum	21,50
Gold	19,20
Mercury	13,60
Lead	11,30
Silver	10,50
Copper	8,90
Iron	7,90
Zinc	7,10
Diamond	3,50
Aluminium	2,70

Substance	Density (g.cm^{-3})
Glass	2,50
Magnesium	1,70
Perspex	1,20
Milk	1,03
Water	1,00
Cooking oil	0,92
Ice	0,91
Candle wax	0,87
Pine-wood	0,54
Cork	0,24

ACTIVITY 1:
Based on the WorksheetCloud lesson

Question 1

Gold - in bricks, bars, and coins - has been a form of currency for centuries. In order to swindle people into paying for a brick of gold without actually investing in a brick of gold, people have considered filling the centers of hollow gold bricks with lead to fool buyers into thinking that the entire brick is gold. Will it work?

Lead is a dense substance, but is its density the same as that of gold? Gold has a density of 19.2 g/cm^3

What is the density of lead if a cube of lead has an edge length of 2.00 cm and a mass of 90.7 g?

When calculating volume

$$V = l \times w \times h$$

$$V = 2 \text{ cm} \times 2 \text{ cm} \times 2 \text{ cm}$$

$$V = 8 \text{ cm}^3$$

When calculating density

$$D = m \div V$$

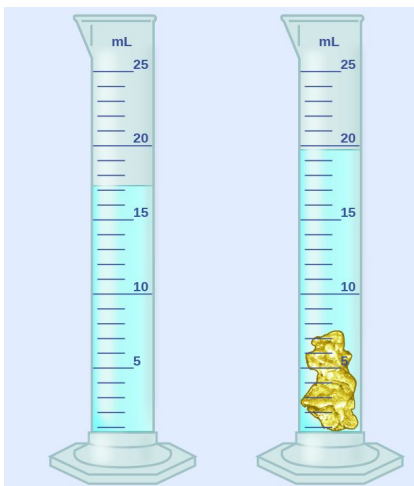
$$D = 90.7 \text{ g} \div 100 \text{ cm}^3$$

$$D = 11.3 \text{ g/cm}^3$$

This will not work as gold has a density of 19.2 g/cm^3

Question 2

An irregularly shaped piece of a shiny yellowish material was weighed and has a mass of 51.84 g. and then submerged in a graduated cylinder, with results as shown.



Volume of object = final volume - initial volume

$$\text{Volume of object} = 19.8 \text{ ml} - 17.1 \text{ ml}$$

$$\text{Volume of object} = 2.7 \text{ ml}$$

When calculating density

$$D = m \div V$$

$$D = 51.84 \text{ g} \div 2.7 \text{ ml}$$

$$D = 19.2 \text{ g/cm}^3$$

This material is likely gold. It has the appearance for gold and very close to the density given for gold is 19.2 g/cm^3

Question 3

A large piece of jewelry has a mass of 132.6 g.

A graduated cylinder initially contains 50.0 mL water. When the jewelry is submerged in the graduated cylinder, the total volume increases to 62.62 mL.

(a) Determine the density of this piece of jewelry.

Volume of object = final volume - initial volume

Volume of object = 62.62 ml - 50.0 ml

Volume of object = 12.62 m

$D = m \div V$

$D = 132.6 \text{ g} \div 12.62 \text{ ml}$

$D = 10.50 \text{ g/cm}^3$

(b) Assuming that the jewelry is made from only one substance, what substance is it likely to be? Explain.

It has a similar appearance to silver and silver has the same density 10.50 g/cm³

ACTIVITY 2:

Can be completed after watching the lesson

1. If a block of copper has a volume of 20cm³, what is its mass?

$D = m \div V$

$m = D \times V$

$m = 8.9 \text{ g/cm}^3 \times 20\text{cm}^3$

$m = 178 \text{ g}$

2. What is the mass of a glass block with a volume of 50cm³?

$D = m \div V$

$m = D \times V$

$m = 2.50 \text{ g/cm}^3 \times 50\text{cm}^3$

$m = 125 \text{ g}$

3. Calculate the mass of 100mℓ of water.

$D = m \div V$

$100\text{ml} = 100 \text{ cm}^3$

$m = D \times V$

$m = 1.00 \text{ g/cm}^3 \times 100 \text{ cm}^3$

$m = 50 \text{ g}$

4. A measuring cylinder contains 40cm^3 of water. A block of lead is carefully placed in the water so the new volume is 47cm^3 . If the density of the lead is $11,4\text{gcm}^{-3}$, what mass of lead was used?

Volume of object = final volume - initial volume

$$\text{Volume of object} = 47\text{cm}^3 - 40\text{cm}^3$$

$$\text{Volume of object} = 7\text{cm}^3$$

$$D = m \div V$$

$$m = D \times V$$

$$m = 11.4 \text{ g/cm}^3 \times 7\text{cm}^3$$

$$m = 79.8 \text{ g}$$

5. When an irregularly shaped solid is placed in a beaker of water, the water level rose from 15cm^3 to 24cm^3 . If the mass of the solid is $80,1\text{g}$, what substance is the object made of ?

Volume of object = final volume - initial volume

$$\text{Volume of object} = 24\text{cm}^3 - 15\text{cm}^3$$

$$\text{Volume of object} = 9\text{cm}^3$$

$$D = m \div V$$

$$D = 80.1\text{g} \div 9\text{cm}^3$$

$$D = 8.9 \text{ g/cm}^3$$

According to the density table the density of Copper (Cu) is 8.9 g/cm^3 . Copper would also be a solid object and could be irregularly shaped.

6. A measuring cylinder contains 40 cm^3 . 79g of lead is carefully placed in the water so that the new volume is 47cm^3 . What is the density of the lead?

Volume of object = final volume - initial volume

$$\text{Volume of object} = 47\text{cm}^3 - 40\text{cm}^3$$

$$\text{Volume of object} = 7\text{cm}^3$$

$$D = m \div V$$

$$D = 79\text{g} \div 7\text{cm}^3$$

$$D = 11.28 \text{ g/cm}^3$$

The density of the lead is 11.3 g/cm^3

7. A glass beaker has a mass of 50g . When 10cm^3 of oil is added to the beaker the mass is 57g . Calculate the density of a type of oil.

Density (D) = ?

Volume (V) = 10 m^3

Mass (m) = ? 7 g (calculation)

$$*57\text{g} - 50\text{g} = 7 \text{ g}$$

$$D = m \div V$$

$$D = 7\text{g} \div 10\text{cm}^3$$

$$D = 0.7 \text{ g/cm}^3$$