1. Density - volume displacement given final mass

Question:

A simple way to determine the density of a solid is to immerse the solid in a known quantity of water. When a piece of metal weighing 105 g is placed in a graduated cylinder containing 203 mL of water, the final volume of water read 243 mL.

Calculate the density (in $^{g}/_{mL}$) of the metal.

243 - 203 = 40. mL

$D = \frac{105\,g}{40.\,mL} = 2.6\ g/mL$

_____ $^{g}/_{mL}$

(Answer to 2 significant figures)

2. Density - volume displacement

A simple way to determine the density of a solid is to immerse the solid in a known quantity of water. A graduated cylinder containing 27.97 mL of water initially weighs 72.7 g. When an irregular shaped object is placed in the graduated cylinder, the final mass rises to 119 g and the volume of water rises to 35.27 mL.

Calculate the density (in $^{g}/_{mL}$) of the object.

35.27 - 27.97 = 7.3 mL

119 - 72.7 = 46.3 g

$D = \frac{46.3}{7.3} = 6.3\ g/mL$

_____ $^{g}/_{mL}$

(Answer to 2 significant figures)

3. Density - volume of object is (l)(w)(h)

The following measurements of a metal bar were made by a student.

- length = 5.10 cm
- width = 9.10 cm
- height = 4.10 mm

$V = (5.10\ cm)(9.10\ cm)(0.410\ cm)$

$= 19.0281\ cm^3$

The mass of the bar is 45 grams.

Calculate the density (g/cm^3) of the material.

$V = \frac{45\ g}{19.0281\ cm^3} = 2.4\ \frac{g}{cm^3}$

_____ g/cm^3

(Answer to 2 significant figures)

4. Density - of a flask (filling with water) - given the density of water

A simple way to determine the volume of a flask is to weigh the flask when it is dry and weigh it again when it is filled with water.

The weight of the dry flask = 34.00 g
The weight of the filled flask = 115.4 g

115.4 − 34.00 = 81.4 g

$V = \frac{mass}{D}$

$V = \frac{81.4\ g}{0.9969\ g/mL}$

Given that the density of water is 0.996 g/mL, calculate the volume of the flask in liters.

liter

(Answer to 3 significant figures)

V = 81.7 mL

V = 0.082 L

5. Density - thickness of a sheet of material

Nickel is a very soft metal that can be hammered into extremely thin sheets. If a 3.13 gram piece of Nickel is hammered into a uniform sheet whose area is 45.6 cm^2, what is the thickness of the sheet in meter? Density of Nickel is 8.908 g/cm^3.

- ✓ 7.71E-5 meter
- ○ 0.160 meter
- ○ 0.00611 meter
- ○ 1.27E3 meter

$D = 8.908 = \frac{3.13}{(45.6)t}$

$t = \frac{3.13}{8.908 \cdot 45.6} = 0.007711\ cm = 7.71 \times 10^{-5}\ m$

6. Density - ball bearing

A steel ball-bearing with a circumference of 27.5 mm weighs 5.11 g. What is the density of the steel in g/cm^3?
Given,

- Volume of a sphere = $(4/3)(\pi)(r^3)$, where π=3.14.
- Circumference of a circle = 2 π r

- ○ 1.45E3 g/cm^3
- ✓ 14.5 g/cm^3
- ○ 1.45 g/cm^3
- ○ 0.145 g/cm^3

Circumference = 27.5 mm = 2.75 cm

$Radius = \frac{2.75}{2\pi} = \frac{2.75}{(2)(3.14)} = 0.437898\ cm$

$V = \left(\frac{4}{3}\right)(3.14)(0.437898)^3 = 0.351550\ cm^3$

$D = \frac{5.11\ g}{0.351550\ cm^3} = 14.5\ \frac{g}{cm^3}$

For this question, it says π = 3.14. If you used the function π on your calculator, your answer will be slightly different. But it should still have 3 sig figs.