

Problem Set - Density #1 - Answers

1. A sample of stone has a density of 4.23 g/cm³ and a volume of 45 cm³. What is its weight?

$$D = 4.23 \text{ g/cm}^3$$

$$V = 45 \text{ cm}^3$$

$$W = ???$$

There are three significant figures with the density and two with the volume so the answer will only have two significant figures.

$$W = V \times D$$

$$W = 4.23 \text{ g/cm}^3 \times 45 \text{ cm}^3$$

$$W = \underline{190.35 \text{ g}} = \underline{1.9 \times 10^2 \text{ g}}$$

2. A sample of food has a volume of 2.1 liters and a density of 1.05. What is its weight?

$$D = 1.05 \text{ g/cm}^3$$

$$V = 2.1 \text{ l}$$

$$W = ???$$

$$V = 2.1 \text{ l} \times 1,000 \text{ cm}^3/\text{l} = 2,100 \text{ cm}^3$$

There are three significant figures with the density and two with the volume so the answer will only have two significant figures.

$$W = V \times D$$

$$W = 2,100 \text{ cm}^3 \times 1.05 \text{ g/cm}^3$$

$$W = \underline{2,205 \text{ g}} = \underline{2.2 \times 10^3 \text{ g}}$$

3. A sample of Mercury has a volume of 23 ml. What is its weight?

$D = ?$ (On an exam, this value would be given in the question or in a table such as that in the text)

$$V = 23 \text{ ml}$$

$$W = ???$$

$D = 13.6 \text{ g/cm}^3$ for Mercury (i.e., from Table 2.8 in the text).

$$V = 23 \text{ ml} \times 1 \text{ cm}^3/\text{ml} = 23 \text{ cm}^3$$

There are three significant figures with the density and two with the volume so the answer will only have two significant figures.

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$$W = V \times D$$

$$W = 23 \text{ cm}^3 \times 13.6 \text{ g/cm}^3$$

$$W = \cancel{312.8} \text{ g} = \underline{3.1 \times 10^2 \text{ g}}$$

4. A sample of metal alloy weights 1.42 g and has a volume of 0.132 cm³. What is its Density?

$$V = 0.132 \text{ cm}^3$$

$$W = 1.42 \text{ g}$$

$$D = ???$$

There are three significant figures with both the weight and the volume so the answer will have three significant figures.

$$D = W / V$$

$$D = 1.42 \text{ g} / 0.132 \text{ cm}^3$$

$$D = \cancel{10.757,5} \text{ g/cm}^3 = 1.08 \times 10^1 \text{ g/cm}^3 \text{ (or } 10.8 \text{ g/cm}^3 \text{ would be OK too)}$$

5. A balloon has a volume of 3.12 liters and a weight of 2.6 grams. What is its density?

$$V = 3.12 \text{ l}$$

$$W = 2.6 \text{ g}$$

$$D = ???$$

$$V = 3.12 \text{ l} \times 1,000 \text{ cm}^3/\text{l} = 3,120 \text{ cm}^3$$

There are three significant figures with the volume and two with the weight so the answer will only have two significant figures.

$$D = W / V$$

$$D = 2.6 \text{ g} / 3,120 \text{ cm}^3$$

$$D = \cancel{0.000,833,33} \text{ g/cm}^3 = 8.3 \times 10^{-4} \text{ g/cm}^3$$

6. A rock weights 34 g and has a density of 3.4 g/cm³. What is its volume?

$$W = 34 \text{ g}$$

$$D = 3.4 \text{ g/cm}^3$$

$$V = ???$$

There are two significant figures with both the weight and the density so the answer will have two significant figures.

$$V = W / D$$

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$$V = 34 \text{ g} / 3.4 \text{ g/cm}^3$$

$$V = 10 \text{ cm}^3 \text{ (or } 1.0 \times 10^1 \text{ cm}^3 \text{ would be OK too)}$$

7. A sample of Steel weights 1.42 Kg. What is its volume?

$$W = 1.42 \text{ kg}$$

D = ? (On an exam, this value would be given in the question or in a table such as that in the text)

$$V = ???$$

$$W = 1.42 \text{ kg} \times 1,000 \text{ g/kg} = 1,420 \text{ g}$$

D = 7.87 g/cm³ for Iron (i.e., from Table 2.8 in the text, assumes Iron and Steel have the same density).

There are three significant figures with both the weight and density so the answer will have three significant figures.

$$V = W / D$$

$$V = 1,420 \text{ g} / 7.87 \text{ g/cm}^3$$

$$V = 180.432 \text{ cm}^3 = 1.80 \times 10^2 \text{ cm}^3 \text{ (or } 180 \text{ cm}^3 \text{ would be OK too)}$$